690

AIM-D500-CA DC System Insulation Monitoring Device

User Manual V1.1

Acrel Co., Ltd.

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Contents

1 Introduction 1
2 Model Description 1
3 Functional Characteristics 1
4 Technical Parameters 3
5 Reference Standards 4
6 Installation and Connection 4
  6.1 Appearance and Dimensions 4
  6.2 Installation Method 5
  6.3 Wiring Method 5
  6.4 Wiring Diagram 6
  6.5 Attention 7
7 Programming and Usage 8
  7.1 Panel Description 8
  7.2 LED Indication Description 8
  7.3 Operation Button Description 9
  7.4 Button Operation Instructions 9
8 Communication Instruction 12
  8.1 Communication Protocol 13
  8.2 Function Code Introduction 13
  8.3 Register Address Table 14
9 Application Examples 17
10 Fault Resolution 18

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AIM-D500-CA DC System Insulation Monitoring Device

1 Introduction



With the development of industry, many electrical equipment and factory equipment are powered by DC systems, and the positive and negative poles of the DC system are not grounded. For ungrounded (IT) power distribution systems, insulation resistance monitoring should be performed to ensure the safe operation of the power supply system .

AIM-D500-CA DC system insulation monitoring device can be used in 50~400V DC systems. It can monitor up to 1000V with ACPD300 coupling device for insulation monitoring. The product can monitor the insulation resistance of the positive and negative poles of the DC ungrounded system online. When the insulation resistance is lower than the set value, it will issue a prewarning or alarm signal.

AIM-D500-CA uses the signal injection method for monitoring, which is applicable to the CCS (Combined Charging System) charging standard and the CHAdeMO charging standard. Among them, CCS is widely used in the fast charging system of electric vehicles in Europe and the United States, and CHAdeMO is mainly used in the fast charging interface of electric vehicles in Japan.

The products can also be used in DC systems such as power plants, DC panels of substations, electric vehicle charging devices, UPS power supply systems and other DC power grids.

2 Model Description

AIM – D 500 – CA

- Model Code: CA – Charging device
- Design Serial Number: 500 – Initial Serial Number
- Function Code: D - DC Monitoring
- Product Name: AIM - Acrel Insulation Monitoring Device

3 Functional Characteristics

- Insulation resistance monitoring function. The product can monitor the insulation resistance of the DC system to the ground, and can monitor the insulation resistance of the positive pole to the ground and the negative pole to the ground of the DC system respectively.
- Voltage monitoring function. The product can monitor the voltage between the positive and negative poles of the DC system, the voltage between the positive pole and the ground, and the voltage between the negative pole and the ground.
- LED indication function. The product panel has operation, communication, fault, prewarning and alarm LED indicators to display the product status.

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- LCD display function. The product can display parameter with 128*64 dot LCD.
- Prewarning and alarm function. The product has two sets of independently adjustable set values, which can set prewarning values and alarm values. When the insulation resistance is lower than the set value, the product will send out prewarning and alarm signals.
- Voltage alarm function. The product can monitor the voltage fluctuation of the DC system and send out an alarm signal in time when overvoltage or undervoltage occurs.
- PEKE break alarm function. The product can monitor the connection status of PE, KE and the grounding terminal. When any connection line is disconnected from the grounding terminal, the product will send out an alarm signal.
- Insulation location function. When the DC system voltage exceeds 50V, you can use the "Insulation location" submenu to view the voltage of positive pole to ground and negative pole to ground, resistance of positive pole to ground and negative pole to ground to evaluate the fault location.
- Digital Input function. The product has one DI, connected to an external button switch. The device will reset with short press (<2s, same below), it will self-test with long press (>2s, same below), and it will switch status between the "Monitoring" and "Stop Monitoring" with continuous long press (>5s, same below).
- Digital Output function. The product has two DO, which correspond to insulation prewarning and alarm by default, and they can be modified to overvoltage, undervoltage, reverse connection and other faults. The DO can choose mode of normally open (N/O, same below) or normally closed (N/C, same below).
- Sequence of Events (SOE) function. The product can record 50 SOE with fault type, fault value and fault time, which is convenient for staff to troubleshoot.
- Remote communication function. The product has one RS485 interface and adopts Modbus-RTU protocol for data exchange.
- Self-test and reset function. The product has self-test function, which can be activated by long pressing ▲ button, DI or remote communication. The product has reset function, which can be activated by long pressing ESC button, DI or remote communication. The reset can be set to manual or automatic mode.
- Stop monitoring function. The product can stop insulation monitoring device through DI input, remote communication or submenu "Stop Mode". Currently, the connection between the product and the earth is break through the internal relay, and the dielectric strength of the relay is 3kV.
- Monitoring delay function. The product can set the delay time through the submenu "Start-up Delay" to suppress monitoring interference.
- Guide rail installation. The product is installed using a standard 35 mm guide rail.
- Plug-in terminals. The product adopts plug-in terminals for wiring, which is convenient.

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4 Technical Parameters

Items		Technical Parameters
Auxiliary Power Supply *Us*		AC 85~305V, 50/60 Hz; DC 100~400V
Maximum Power Consumption		≤ 5 W
Applicable Systems		DC ungrounded system
Scope of Application		DC 50~1000V
Voltage Monitoring	Voltage Range *Un*	Rated voltage without APCD300: DC 50~400V Rated voltage with ACPD300: DC 50~1000V
	Measurement Accuracy	2%
	Overvoltage Threshold	100~120% settable
	Undervoltage Threshold	80~100% settable
Insulation Monitoring	System leakage Capacitance *Ce*	≤20μF
	Insulation Resistance Range *RF*	1kΩ~2MΩ
	Insulation Alarm Range *Ran*	1kΩ~2MΩ
	Insulation Prewarning Range	Ran~2MΩ
	Measurement Accuracy	±15% or ± 5 kΩ (Ce≤ 5μF)
	Alarm Response Time	≤10s (RF≤200k & Ce≤ 5μF or Ce≤ 1μF)
Internal Parameters	Measuring Voltage	±24V
	Measuring Current	158.8μA (79.7μA with ACPD300)
	Internal DC Resistance	600kΩ (120kΩ with ACPD300)
Alarm Method		LCD display, LED indicator light, relay output
Digital Input		Internal 5V power supply
Digital Output		2 groups of dry contact relays, alarm custom binding, N/O or N/C settable
Contact Capacity		AC 250V 5A; DC 30V 5A
Sequence of Events (SOE)		50 SOE
Communication		RS485 interface, Modbus-RTU protocol
Rated impulse voltage/pollution degree		4kV/III
EMC electromagnetic compatibility / Electromagnetic radiation		Compliant with IEC 61326-2-4
Installation		DIN rail mounting
Protection Level		IP30
Product Weight		AIM-D500-CA: 252.0g; ACPD300: 86.0g

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Environmental Parameters	Operating Temperature	-20~+60℃
	Storage Temperature	-25~+75℃
	Relative Humidity	<95%, no condensation
	Altitude	≤2000m

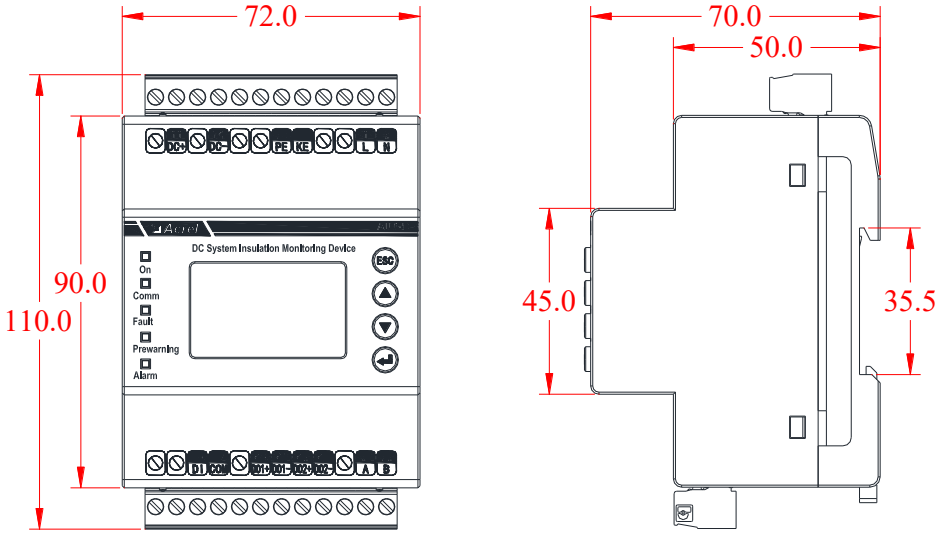
5 Reference Standards

- IEC 61557-8 *Electrical safety in low voltage distribution systems up to 1000V a.c. and 1500V d.c. - Equipment for testing, measuring or monitoring of protective measures - Part 8: Insulation monitoring devices for IT systems*
- IEC 61326-2-4 *Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-4: Particular requirements - Test configurations, operational conditions and performance criteria for insulation monitoring devices according to IEC 61557-8 and for equipment for insulation fault location according to IEC 61557-9*

6 Installation and Connection

6.1 Appearance and Dimensions

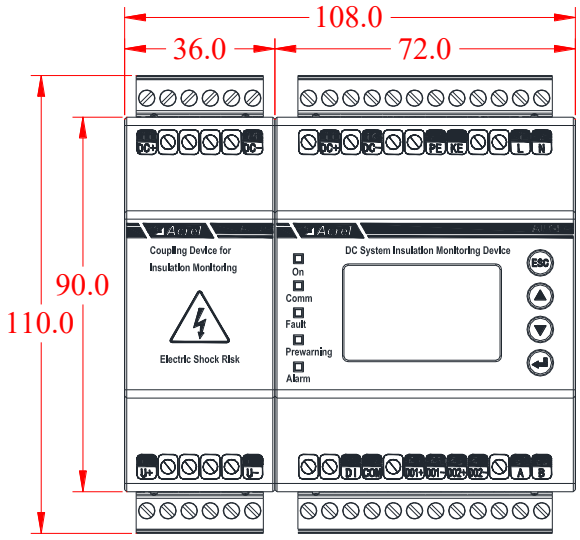
AIM-D500-CA DC system insulation monitoring device uses a plastic shell, and its dimensions are shown in the figure below. (Unit: mm)



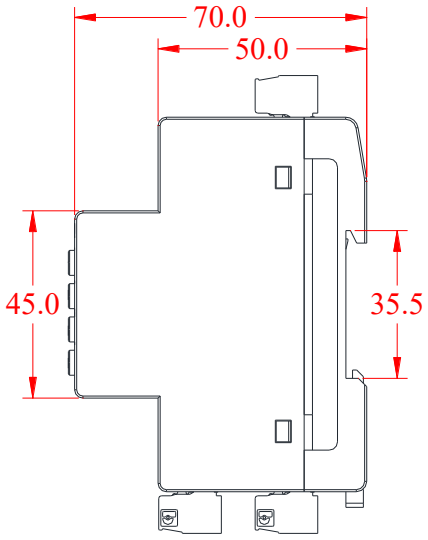
Front view Side view

AIM-D500-CA DC system insulation monitoring device can be used in conjunction with ACPD300 coupling device for insulation monitoring. The dimensions are shown in the figure below. (Unit: mm)

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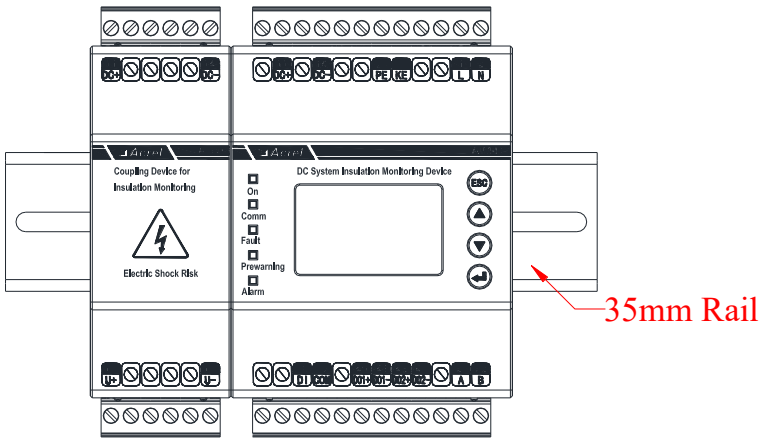
Front view



Side view

6.2 Installation Method

AIM-D500-CA DC system insulation monitoring device adopts rail installation. Install the device on a standard 35mm rail and fix it with a buckle to complete the installation. If used in conjunction with ACPD300, it can be installed on the rail together. The installation effect is shown in the figure below:



6.3 Wiring Method

The AIM-D500-CA DC system insulation monitoring device has wiring terminals on the top and bottom. The top wiring terminals are shown in the figure below:

Positive Negative Ground Ground Power supply

	11		14			28	29			1	2
	DC+		DC−			PE	KE			L	N

The wiring terminals on the top. Terminals 1 and 2 are connected to the auxiliary power supply, terminals 28 and 29 are connected to the grounding terminal block, terminal 11 is connected to the positive pole of the DC system, and terminal 14 is connected to the negative pole of the DC system.

The bottom wiring terminals are shown in the figure below:

		30	39		40	41	42	43		21	22
		DI	COM		D01+	D01−	D02+	D02−		A	B

DI Input Prewarning Alarm RS485

The wiring terminals on the bottom. Terminals 21 and 22 are RS485 communication terminals.

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Terminal 21 is connected to terminal A and terminal 22 is connected to terminal B. They cannot be connected in reverse. Terminals 30 and 39 are digital input terminals. Push button switches can be connected. Short press is for reset, long press is for self-test, and continuous long press is for switching status between the "Monitoring" and "Stop Monitoring". Terminals 40 to 43 are relay output terminals. Terminals 40 and 41 are DO1 outputs, and terminals 42 and 43 are DO2 outputs. DO1 and DO2 can be set to alarm association in the menu. The default settings are insulation prewarning and insulation alarm. When insulation prewarning occurs, DO1 is activated. When insulation alarm occurs, DO1 and DO2 are activated. The relay output can be set to N/O or N/C mode. A buzzer or sound and light alarm can be connected externally. The relay is a passive output and requires an external power supply.

The ACPD300 coupling device for insulation monitoring has wiring terminals on the top and bottom. The top terminals are shown in the figure below:

To DC+ To DC -

11					14
DC+					DC−

Terminals 11 and 14 are connected to terminals 11 and 14 of the insulation monitoring device respectively.

The bottom terminals are shown in the figure below:

12					13
U+					U−

Positive Negative

Terminals 12 is connected to the positive pole of the DC system, and Terminals 13 is connected to the negative pole of the DC system.

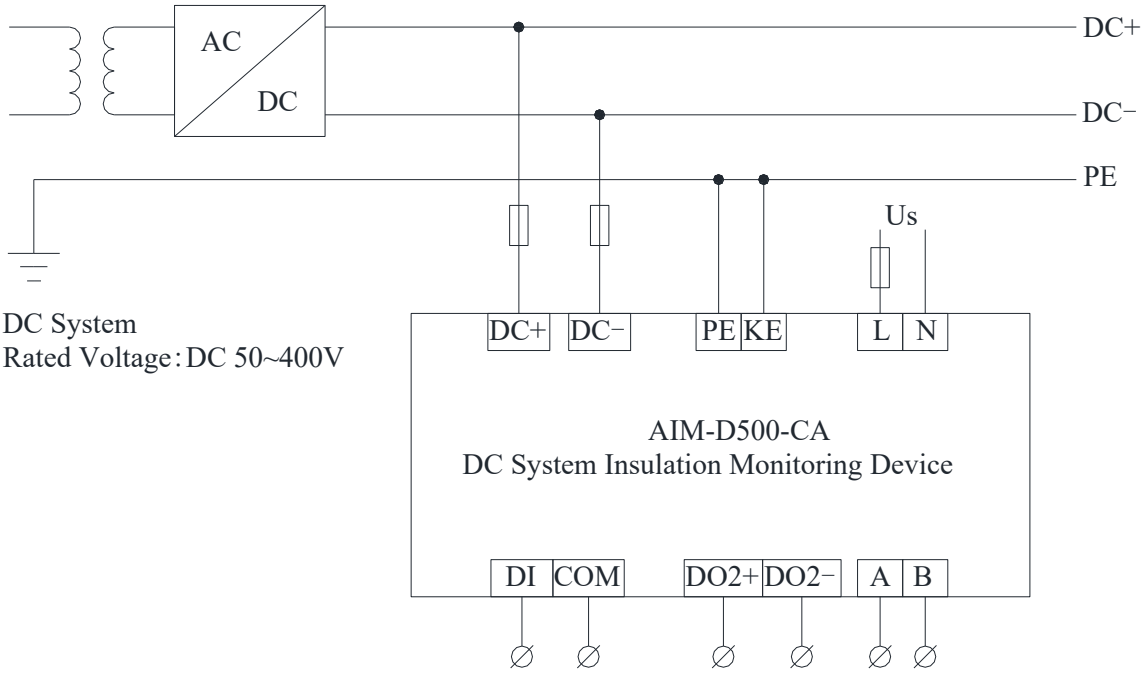
Wiring Specifications:

Auxiliary power supply, functional grounding, DC system positive and negative wiring, relay output wiring, they can use 1.5 mm^2 multi-core copper wire. RS485 communication wiring can use 0.75~1.5 mm^2 shielded twisted pair.

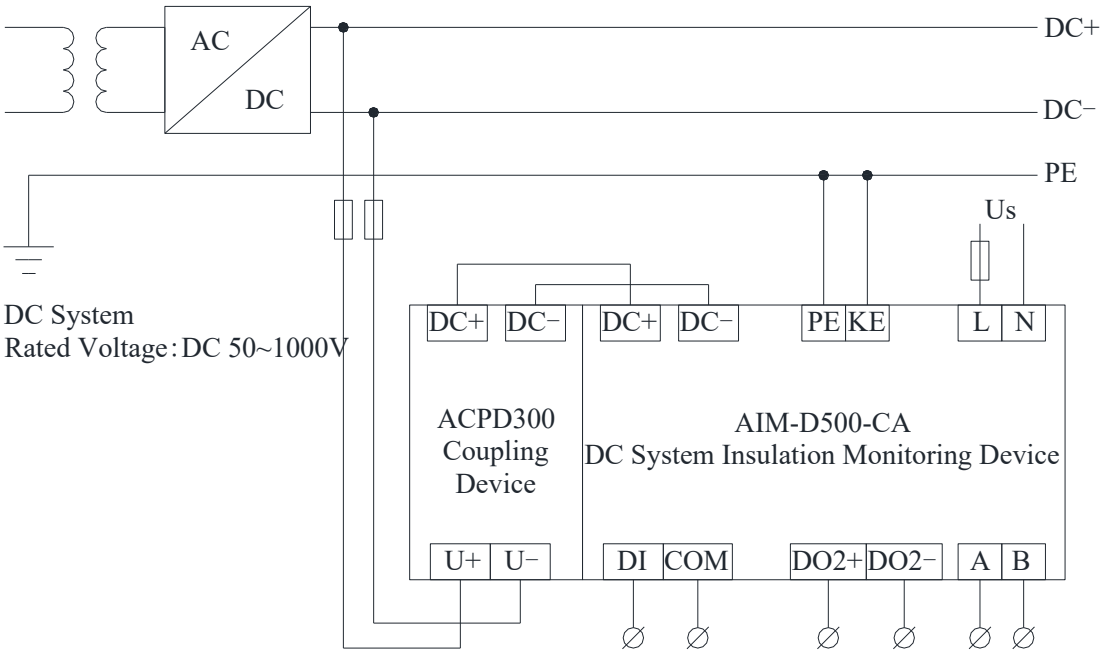
6.4 Wiring Diagram

The wiring method of the AIM-D500-CA DC system insulation monitoring device when monitoring the DC system is as shown in the following diagram:

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The wiring diagram of the AIM-D500-CA DC system insulation monitoring device with ACPD300 coupling device for insulation monitoring when monitoring the DC system is as shown below:



6.5 Attention

(1) When designing and installing insulation monitoring device, it should be noted that only one insulation monitoring device can be installed in one underground system. If multiple insulation monitoring devices are installed in different locations in the same system, a control strategy should be used to monitor the insulation resistance.

(2) The insulation monitoring device can be installed in the distribution box, and the installation location should be free of dripping water, corrosive chemical gases and sediment.

(3) When wiring the insulation monitoring device, the wiring should be carried out strictly according to the wiring diagram. It is best to use a pin-type sleeve connector for crimping, then insert it into the

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device terminal and tighten the screws to avoid malfunction of the device due to poor contact.

(4) The insulation monitoring device should be reliably connected to the monitored DC system to ensure the effectiveness of insulation monitoring device.

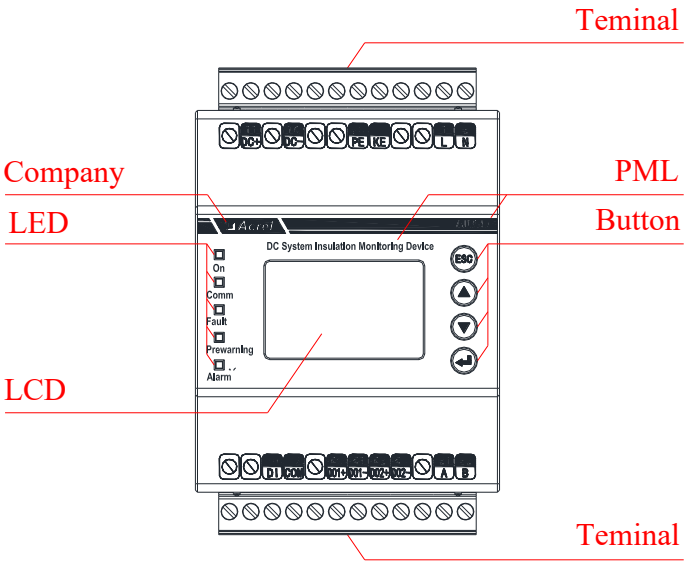
(5) The DO output does not carry power supply, and the alarm (or prewarning light) needs to be equipped with an independent power supply.

(6) The insulation monitoring device should communicate in bus type with shielded twisted pair cables, wire diameter of no less than 0.5mm^2. Keep away from strong electric cables or other strong electric field environments when wiring. When the distance is long or the environment is harsh, a 120Ω matching resistor should be connected in parallel at the head and tail ends.

(7) Non-professionals are strictly prohibited from opening the product casing without authorization to avoid affecting the product function.

7 Programming and Usage

7.1 Panel Description



7.2 LED Indication Description

LED Indicator	Functional Description
On	When the device is operating normally, the indicator light flashes at a frequency of about once per second.
Comm	When there is no data communication, the indicator light is off, and when there is data communication, the indicator light flashes.
Fault	Overvoltage, undervoltage alarm or PEKE break alarm, the indicator light is always on
Prewarning	When the insulation resistance is lower than the prewarning value, the indicator light is always on.
Alarm	When the insulation resistance is lower than the alarm value, the indicator light is always on.

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7.3 Operation Button Description

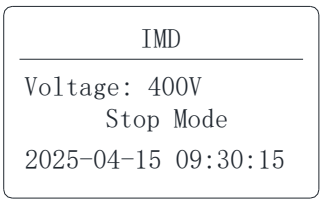
Button	Button Functions
ESC	In non-programming mode, short press is used to return to the main interface, and long press on the main interface can be manually reset. In programming mode, short press is used to return to the previous menu.
▲	In non-programming mode, short press is used to switch to the previous interface, and long press on the main interface starts self-test. In programming mode, it is used to increase or decrease values and select setting items. (Supports long press)
▼	In non-programming mode, short press is used to switch to the next interface. In programming mode, it is used to increase or decrease values and select setting items. (Supports long press)
↵	In non-programming mode, short press to enter programming mode. In programming mode, it is used to confirm the operation.

7.4 Button Operation Instructions

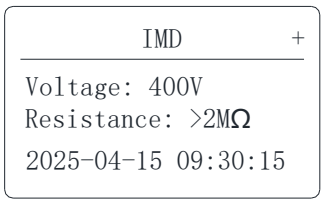
7.4.1 Button Operation in Main Interface

(1) Enter the running mode

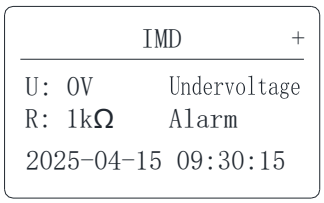
After powering on, the software is initialized and self-test is completed, and the device enters the main interface. The device enters the " Stop Mode " by default, the voltage line displays the DC system voltage, the resistance line displays "Stop Mode", and the bottom displays the current time. After starting the monitoring, the resistance line displays the system insulation resistance to ground, and the "+" or "−" sign in the upper right corner indicates the monitoring status. In the fault status, the voltage and resistance lines display the corresponding values, and the fault information is displayed on the right. In the break status, the resistance line displays "PEKE Break", and the device cannot monitor the system insulation resistance to ground.



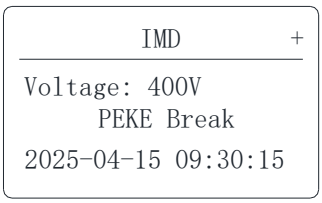
Stop mode



Monitoring status



Fault status

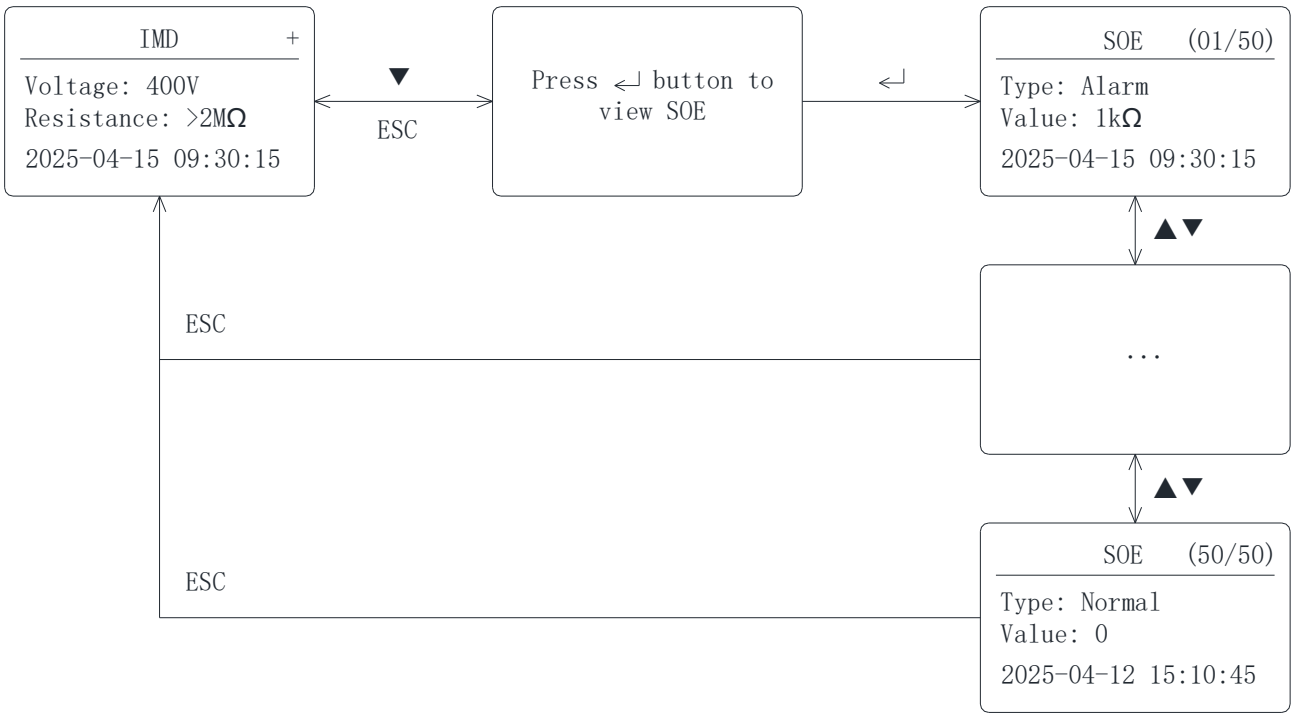


Break status

(2) View SOE

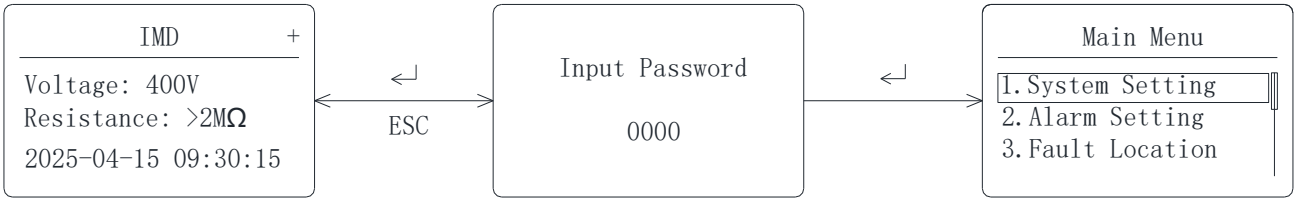
In the main interface, press the "▼" button to switch to the SOE interface, press the "↵ " button to view the SOE. Press the "▲" and "▼" button to switch pages and query up to 50 SOE in sequence, including fault type, fault value, and fault time. The first SOE is the latest record, and the 50th SOE is the earliest fault record. It will be automatically overwritten when there are more than 50 SOE. Press the "ESC" button to return to the main interface.

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(3) Enter Programming Mode

In the main interface, press "↵ " button to enter the password input page. After entering the correct password by pressing the "▲" and "▼" button, press "↵ " button to enter programming mode. The default initial password of the device is 0001.



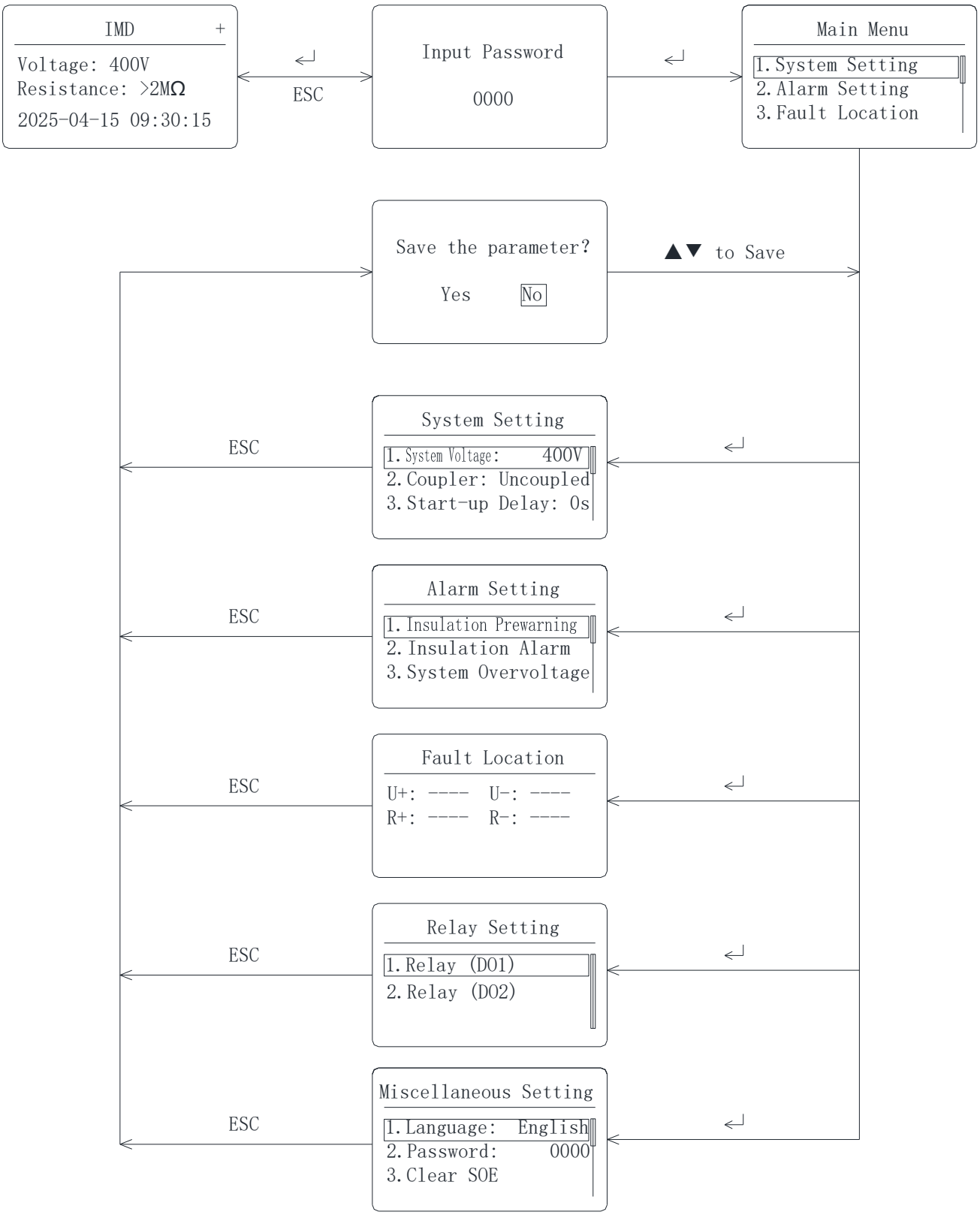
(4) Exit Programming Mode

In programming mode, press the "ESC" button to pop up the save or not interface, press the "▲" and "▼" button to select "Yes" or "No", and after confirmation you can exit programming mode and enter running mode.

7.4.2 Related Parameter Settings

The button operation settings are shown in the figure below:

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7.4.3 Menu and Detailed Parameters

Main Menu	Submenu	Setting Range	Default Value
1. System Setting	1. System Voltage	50V~1000V	400V
	2. Coupler	Uncoupled / Coupled	Uncoupled
	3. Start-up Delay	0~10s	0s
	4. Start-up Auto Monitoring	ON / OFF	OFF

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	5.Stop Mode		ON / OFF	ON (current status)
2. Alarm Setting	1. Insulation Prewarning 2. Insulation Alarm 3. System Overvoltage 4. System Undervoltage	1.Switch	ON / OFF	ON (prewarning/ alarm) OFF (overvoltage/ undervoltage)
		2. Reset Mode	Auto / Manual	Auto
		3. Threshold	1k~2000kΩ (prewarning) 1k~2000kΩ (alarm) 100~120% (overvoltage) 80~100% (undervoltage)	200kΩ (prewarning) 100kΩ (alarm) 120% (overvoltage) 80% (undervoltage)
		4. Response Delay	0~99s	0s
		5. Reset Delay	0~99s	0s
3. Fault Location	U+: U-: R+: R-:		——	——
4. Relay Setting	1. Relay (DO1) 2. Relay (DO2)	1. Default State	N/O or N/C	N/O
		2. Binding Fault	1. Insulation Prewarning 2. Insulation Alarm 3. Overvoltage 4. Undervoltage 5. Reverse Connection 6. PEKE Break 7. Device Fault	1. Insulation Prewarning (DO1) 2. Insulation Alarm (DO2)
5.Communication Setting	1. Address		1~247	1
	2. Baud Rate		4800/9600/19200/38400 /115200	9600
6. Time Setting	1. Date		2000-01-01~2999-12-31	Current Date
	2. Time		00:00:00~23:59:59	Current Time
7. Miscellaneous Setting	1. Language		Chinese/English	Chinese
	2. Password		0000~9999	0001
	3. Clear SOE		Yes / No (Popup)	No
	4. Contrast		20~37	23
	5. Backlight		ON, 0~999s	60s
8. Software Information	No.; version; SN		——	——

Note: In Main Menu "Alarm Setting", if switch is OFF, the reset mode, threshold, response delay and reset delay are invalid.

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8 Communication Instruction

8.1 Communication Protocol

The RS485 interface of the instrument adopts the Modbus-RTU communication protocol. The protocol defines the address, function code, data, CRC code, etc. in detail, which is a necessary content to complete the data exchange between the host and the slave.

8.2 Function Code Introduction

8.2.1 Function code 03H or 04H: Read registers

This function allows users to obtain data and system parameters collected and recorded by the device. There is no limit to the number of data requested by the host at one time, but it cannot exceed the range.

The following example reads data from the 0012H register from the slave at address 01.

Host Send		Sent Information
Address code		01H
Function code		03H
Starting address	High byte	00H
	Low byte	12H
Register count	High byte	00H
	Low byte	01H
CRC code	Low byte	24H
	High byte	0FH

Slave Return		Returned Information
Address code		01H
Function code		03H
Byte count		02H
Register data	High byte	0FH
	Low byte	B4H
CRC code	Low byte	BDH
	High byte	C3H

The slave returns a read result of 0x0FB4, decimal 4020, indicating system voltage is 402.0V.

8.2.2 Function code 06H: Write single registers

Function code 06H allows the user to change the contents of a single register without going outside the defined address range.

The following example writes 0x0000 data to the 002EH register of the slave at address 01.

Host Send		Sent Information
Address code		01H
Function code		06H
Register address	High byte	00H
	Low byte	2EH
Data to be written	High byte	00H
	Low byte	00H
CRC code	Low byte	E9H
	High byte	C3H

Slave Return		Returned Information
Address code		01H
Function code		06H
Register address	High byte	00H
	Low byte	2EH
Data to be written	High byte	00H
	Low byte	00H
CRC code	Low byte	E9H
	High byte	C3H

The host writes 0x0000 to 002EH to indicate that close "Stop Mode" and start insulation monitoring.

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8.2.3 Function Code 10H: Write multiple registers

Function code 10H allows the user to change the contents of multiple registers without going outside the defined address range.

The following example writes 0x2710, 0x0001 to 0031H~0032H registers of the slave at address 01.

Host Send		Sent Information
Address code		01H
Function code		10H
Starting address	High byte	00H
	Low byte	31H
Register count	High byte	00H
	Low byte	02H
Register Count		04H
0031H Data to be written	High byte	27H
	Low byte	10H
0032H Data to be written	High byte	00H
	Low byte	01H
CRC code	Low byte	FBH
	High byte	C6H

Slave Return		Returned Information
Address code		01H
Function code		10H
Starting address	High byte	00H
	Low byte	31H
Register count	High byte	00H
	Low byte	02H
CRC code	Low byte	10H
	High byte	07H

The host writes 0x2710, 0x0001 to 0031H~0032H to indicate that access to coupling device and the rated system voltage set to 1000V.

Note: The above data is for reference only. Please refer to the address table for register definitions.

8.3 Register Address Table

No.	Address	Parameter	Read /Write	Value Range	Data Types
0	0000H	Software Number	R		UINT16
1	0001H	Software Version	R		UINT16
2~8	02H~08H	Serial Number	R	14 ASCII codes	UINT8*14
9~15	09H~0FH	Reserved			UINT16*7
16	0010H	Device operating status	R	0: Stop monitoring 1: Monitoring	UINT16
17	0011H	Fault Type	R	bit15~bit7: Reserved bit6: 1 Device fault; 0 normal bit5: 1 PEKE break; 0 normal bit4: 1 Reverse connection; 0 normal bit3: 1 Undervoltage; 0 normal	UINT16

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				bit2: 1 Overvoltage; 0 normal bit1: 1 Insulation alarm; 0 normal bit0: 1 Insulation prewarning; 0 normal e.g. 0003 means 0000 0000 0000 0011	
18	0012H	Voltage of DC+ DC-	R	Value/10, unit: V, 3993 means 399.3	UINT16
19	0013H	Insulation resistance	R	Unit: kΩ	UINT16
20	0014H	DC+ voltage to ground	R	Value/10, unit: V	UINT16
21	0015H	DC- voltage to ground	R	Value/10, unit: V	UINT16
22	0016H	Positive pole to ground Resistance	R	Unit: kΩ	UINT16
23	0017H	Negative pole to ground Resistance	R	Unit: kΩ	UINT16
24~31	18H~1FH	Reserved			UINT16*7
32	0020H	Year	R/W	0~99, decimal value +2000	UINT16
33	0021H	Month	R/W	1~12	UINT16
34	0022H	Day	R/W	1~31	UINT16
35	0023H	Hour	R/W	0~23	UINT16
36	0024H	Minutes	R/W	0~59	UINT16
37	0025H	Second	R/W	0~59	UINT16
38	0026H	Language	R/W	0: Chinese; 1: English, default: 0	UINT16
39	0027H	Password	R/W	0000~9999, default: 0001	UINT16
40	0028H	Contrast	R/W	20~37, default: 23	UINT16
41	0029H	Backlight time	R/W	-1~ 999, unit: s, default: 60, -1: on	UINT16
42	002AH	Address	R/W	1~247, default: 1	UINT16
43	002BH	Baud Rate	R/W	0~4: 4800, 9600, 19200, 38400 115200 (unit: bps) (default: 1)	UINT16
44	002CH	Device Reset	R/W	Write 1 to reset, read is invalid	UINT16
45	002DH	Device Self-test	R/W	Write 1 to self-test, read is invalid	UINT16
46	002EH	Stop Mode	R/W	0: OFF 1: ON, default: 1	UINT16
47	002FH	Automatic monitoring after power on	R/W	0: OFF 1: ON, default: 0	UINT16
48	0030H	Monitoring delay after Power-on	R/W	0~10s, Valid only when automatic monitoring is enabled, default: 0	UINT16
49	0031H	System voltage	R/W	Value/10, unit: V, 500~10000, default: 4000	UINT16

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50	0032H	Coupling device	R/W	0: uncoupled, 1: coupled, default: 0	UINT16
51	0033H	Relay DO1 Alarm association	R/W	bit15: 1 N/C; 0 N/O bit14~bit7: Reserved bit6: 1: Device fault; 0 None bit5: 1 PEKE break; 0 None bit4: Reverse connection; 0 None bit3: Undervoltage; 0 None bit2: Overvoltage; 0 None bit1: Insulation alarm; 0 None bit0: Insulation prewarning; 0 None The default value 0001 means 0000 0000 0000 0001	UINT16
52	0034H	Relay DO2 Alarm association	R/W	Same as DO1 The default value 0002 means 0000 0000 0000 0010	UINT16
53	0035H	Insulation prewarning switch	R/W	0: Off 1: On and reset automatically (default) 2: On and reset manually	UINT16
54	0036H	Insulation prewarning threshold	R/W	Unit: kΩ, 1~2000, default: 200	UINT16
55	0037H	Insulation prewarning delay	R/W	0~99, unit: seconds, default: 0	UINT16
56	0038H	Automatic reset delay	R/W	0~99, unit: seconds, default: 0	UINT16
57	0039H	Insulation alarm switch	R/W	0: Off 1: On and reset automatically (default) 2: On and reset manually	UINT16
58	003AH	Insulation alarm threshold	R/W	Unit: kΩ, 1~2000, default: 100	UINT16
59	003BH	Insulation alarm delay	R/W	0~99, unit: seconds, default: 0	UINT16
60	003CH	Automatic reset delay	R/W	0~99, unit: seconds, default: 0	UINT16
61	003DH	Overvoltage alarm switch	R/W	0: Off (default) 1: On and reset automatically 2: On and reset manually	UINT16
62	003EH	Overvoltage threshold	R/W	100~120, unit: %, default: 120	UINT16
63	003FH	Overvoltage delay	R/W	0~99, unit: seconds, default: 0	UINT16
64	0040H	Automatic reset delay	R/W	0~99, unit: seconds, default: 0	UINT16

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65	0041H	Undervoltage alarm switch	R/W	0: Off (default) 1: On and reset automatically 2: On and reset manually	UINT16
66	0042H	Undervoltage threshold	R/W	80~100, unit: %, default: 80	UINT16
67	0043H	Undervoltage delay	R/W	0~99, unit: seconds, default: 0	UINT16
68	0044H	Automatic reset delay	R/W	0~99, unit: seconds, default: 0	UINT16
69	0045H	Clear SOE	R/W	Write 1 to clear SOE, read invalid	UINT16
70~127	46H~7FH	Reserved			UINT16*58
128	0080H	SOE 1 Fault Type	R	0: Normal 1: Insulation prewarning 2: Insulation alarm 3: Overvoltage 4: Undervoltage 5: Reverse connection 6: Device fault	UINT16
129	0081H	SOE 1 Fault Value	R	Voltage fault, value/10, unit: V Insulation fault, value, unit: kΩ Other faults, value = 0	UINT16
130	0082H	SOE 1 Fault-year	R	0~99, decimal value +2000	UINT16
131	0083H	SOE 1 Fault-month	R	1~12	UINT16
132	0084H	SOE 1 Fault-day	R	1~31	UINT16
133	0085H	SOE 1 Fault-hours	R	0~23	UINT16
134	0086H	SOE 1 Fault-minutes	R	0~59	UINT16
135	0087H	SOE 1 Fault-seconds	R	0~59	UINT16
136~527	0088H~020FH	SOE 2~50 content	R	The format is the same as SOE 1	UINT16*392

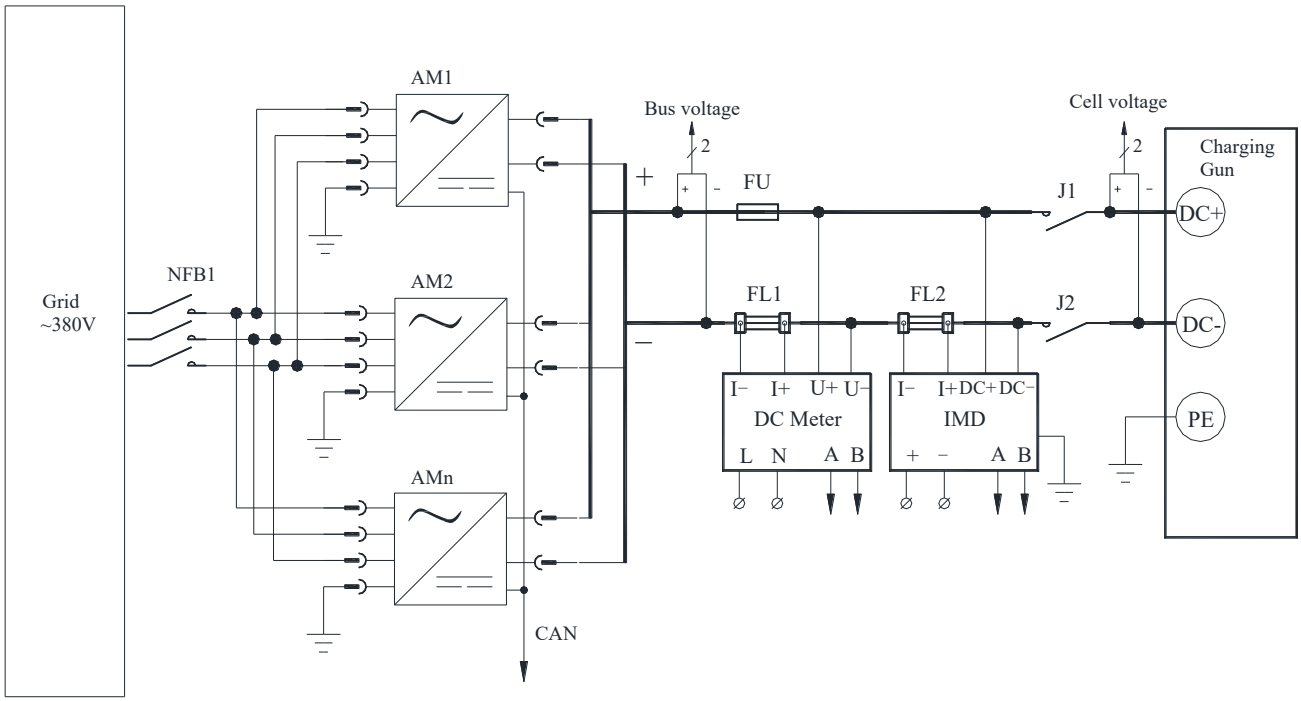
9 Application Examples

Electric vehicle charging device generally consists of cabinet, several AC to DC charging modules, intelligent switching unit, measuring device, controller, contactor, charging gun and so on.

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The following figure shows the schematic of a 60kW DC charging unit.



Among them, the input is 3AC 380V, and after the combination of multiple charging modules, the output is DC 200~750V. The DC meter measures the current, and the IMD measures the voltage, current, and insulation resistance. When the charging pile is in use, the controller sends a command to control the insulation monitor to start, and it returns the results, the controller judges whether to carry out the next operation according to the results. If the insulation level does not meet the requirements, the next operation will not be carried out.

Relevant regulations describe that when R>500Ω/V is regarded as safe; 100 Ω/V<R≤500Ω/V, insulation alarm, but can still be charged normally; R≤100Ω/V is regarded as an insulation fault, and charging should be stopped.

According to the calculation of the output voltage, the insulation resistance value R>100~375kΩ is regarded as safe, and the insulation resistance value R<20~75kΩ is regarded as insulation fault, and charging should be stopped. The safety, stability and reliability of the DC charging system is guaranteed through the coordinated work of the controller and the insulation monitor.

10 Fault Resolution

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After ensuring that the wiring is correct, turn on the device auxiliary power supply to check whether the device is normal. For common problems, the cause can be determined based on the fault phenomenon and troubleshooting can be performed.

No.	Fault Phenomenon	Causes and Troubleshooting
1	The device LCD and LED indicator light are off	Check whether the power supply of the device is normal. If it is normal, contact the manufacturer to replace the device.
2	The device cannot communicate	(1) Check whether the communication tool is normal and whether the communication wiring A and B are correct. (2) Check parameters, confirm the address, baud rate, data format. (3) Check whether the device is damaged. If it is confirmed, contact the manufacturer to replace the device.
3	The device shows "PEKE Break" LED indicator is always on	Check the PE and KE terminal connections. The connections must be reliable.
4	The device displays "Reverse Connection", or "Overvoltage" or "Undervoltage" LED indicator is always on	(1) Reverse connection means the positive and negative poles are reversed. Replace the positive and negative poles after power off. (2) The device automatically monitors the voltage. If the voltage exceeds or falls below the set threshold and the alarm switch is turned on, an alarm will appear and the corresponding system voltage needs to be set.
5	The device displays "Stop Mode"	(1) The device is in stop mode by default, and the communication function can be used to start insulation monitoring. (2) If automatic monitoring is required, set the interface and change the power-on automatic monitoring to on.
6	The device displays "Prewarning" and "Alarm" or "Fault" LED indicator is always on	(1) Check the setting interface. If the prewarning and alarm thresholds are the default values of 200kΩ and 100kΩ, it is necessary to check on-site whether there is an insulation problem. (2) Fault means that the device has a fault after self-test. Contact the manufacturer to replace the device.
7	The insulation resistance display is abnormal, the device and LED indicator display is normal	Check the settings interface, the prewarning and alarm switches are off, change them to on, save and return to the main interface to check whether the alarm is restored

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