

200



AIM-T500 Insulation Monitoring Device

Installation and Operation Manual V1.3

Acrel Co., Ltd.

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Contents

1 Introduction	1
2 Functional characteristics	1
3 Type Introduction	1
4 Technical parameters	2
5 Reference standards	2
6 Installation and connection	2
6.1 Shape and size	2
6.2 Method of installation	3
6.3 Wiring method	3
6.4 Matters need attention	4
7 Program and Usage	5
7.1 Panel.....	5
7.2 LED instructions	5
7.3 Function description of keys	5
7.4 Operation instructions of keys	6
8 Address table	8
9 Typical applications	9

AIM-T500 Insulation Monitoring Device

1 Introduction

AIM-T500 insulation monitoring device is designed and developed by Acrel gathering the design experience of electric power meter industry for many years to monitor the insulation condition of low voltage IT distribution system (ungrounded system). The product adopts advanced micro controller technology, with high degree of integration, compact size and easy installation, and it integrates intelligence, digitalization and networking. The device, with many functions such as insulation fault warning, fault alarm, event recording and so on, can be used in the mines, glass factories, electric furnaces and test facilities, metallurgical plants, chemical plants, and exploded dangerous places, computer center, emergency power supply and other places to monitor the insulation status of IT system in real time. When insulation fault occurs, it will alarm and remind the staff to check the fault.

The products conform to the requirements of enterprise standard Q/VDCL-26-2017 *IT System Insulation Monitor*.

2 Functional characteristics

- 2.1 Function of insulation resistance monitoring, fault warning and alarm for the monitored IT system.
- 2.2 Multiple fault indication function, such as relay alarm output and LED alarm output.
- 2.3 Advanced field bus communication technology, and it can communicate with the host computer management terminal and monitor the operation status of the IT system in real time.
- 2.4 Fault event recording function. It can record the time and type of failure to provide convenience for operators to analyze the operation status of the system and eliminate faults in time.
- 2.5 Applicable for insulation monitoring of AC, DC and AC / DC hybrid IT systems.
- 2.6 Self checking function. realize the fault self-inspection of instrument hardware circuit.
- 2.7 Broken line monitoring function. Monitor the connection condition of the PE/KE function grounding wire.
- 2.8 The free option of manual reset/automatic reset.
- 2.9 Wide range of measurement, Allowable leakage capacitance of the system is large.

3 Type Introduction



Instructions: AIM for Acrel Insulation monitoring device; T for Industrial; 500 for 500 type.

4 Technical parameters

Accessory power supply	Voltage	AC85~265V DC120~370V	Voltage range	System voltage	AC 0~690V DC 0~800V
	Frequency	50/60Hz		Frequency range	40~460Hz
Insulation monitoring	Measuring range	1k~10MΩ	Output	Relay output	Error, warning, Alarm
	Alarm range	10k~10MΩ	Environment	Working temperature	-15~+55°C
	Response time (Ce=1μF)	<5s		Storage temperature	-20~+70°C
	Measuring voltage	<50V		Relative humidity	<95%, without condensation
	system leakage capacitance	<500μF		Altitude	≤2500m
Measuring current	<270μA	Communication		RS485, Modbus-RTU	
Internal parameters	Internal DC impedance	≥180kΩ	Rated impulse voltage /Pollution Level		8kV/III
	Power dissipation	<8W	EMC/ Radiation		IEC61326-2-4

5 Reference standards

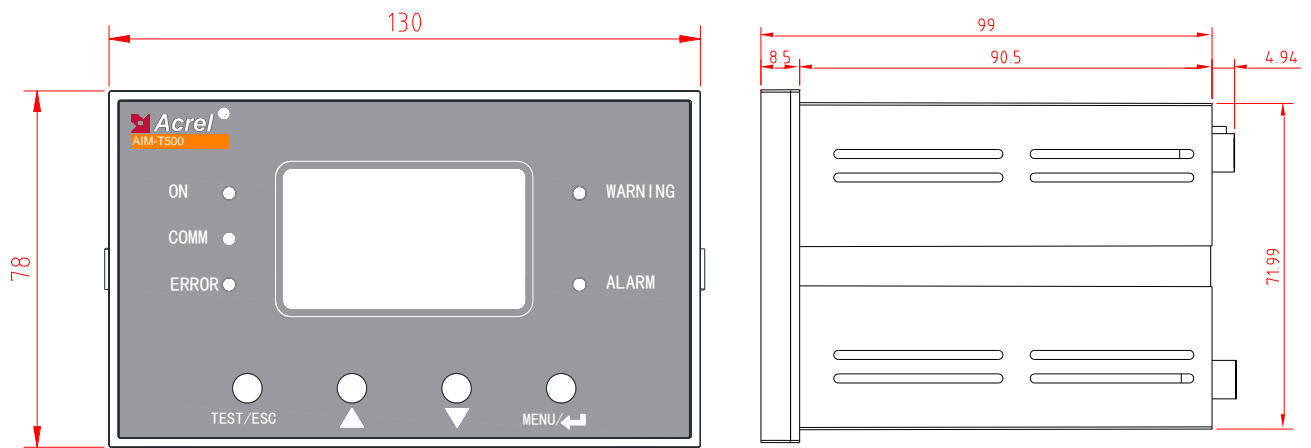
5.1 IEC 61557-8:2014 *Electrical safety in low voltage distribution systems up to 1000V a.c. and 1500V d.c. - Equipment for testing, measuring or monitoring of protective measures - Part 8: Insulation monitoring devices for IT systems*

5.2 IEC 61326-2-4:2020 RLV Redline version *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

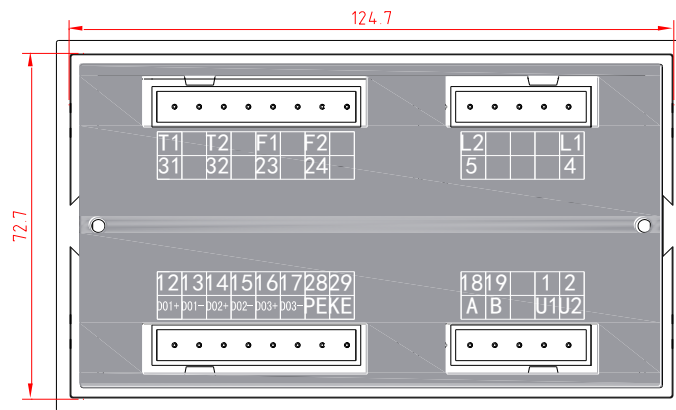
6.1 Shape and size

AIM-T500 externality and installation size (unit: mm)



Front view

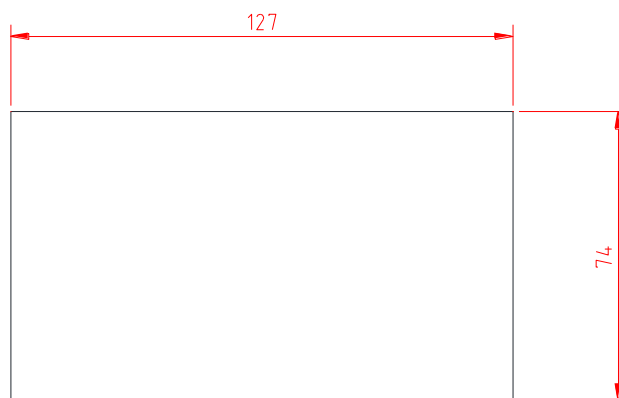
Side view



Back view

The above diagram is the rear view, side view and front view of the AIM-T500 insulation monitoring device of the embedded installation in succession.

6.2 Method of installation



The AIM-T500 insulation monitor adopts embedded installation, and the above diagram is the hole dimensional drawing of the insulation monitor.

6.3 Wiring method

Upper terminals: T1, T2 (31, 32) are self-check terminals. They can judge whether the measurement of the resistance of the instrument is accurate. This function must be used without access

to the DC system. Short connection with T1 and T2 will display instrument measurement results. F1, F2 (23, 24) are interconnected terminals, when two ungrounded systems are interconnected. The instruments that have access to F1 and F2 will stop working, and it will be monitored separately by another instrument. AK (9) is an extension terminal, used for insulation monitoring of IT systems above AC690/DC800V, see ACPD series manual for details. L1, L2 (4, 5) are connected to the monitored IT system (No three-phase neutral phase IT system can be connected to any 2 phase; When a three-phase IT system with neutral lines is connected, both L1 and L2 are connected to the neutral line; When the single-phase DC system is connected, the L1 is connected to the positive stage and the L2 is connected to the negative pole).

T1	T2	F1	F2	AK
31	32	23	24	9

L2			L1
5			4

Lower terminal: KE, PE (28, 29) are instrument functional grounding lines. They need to be separately connected to the field equipotential grounding terminal. The terminals of U1 and U2 (1, 2) are instrument auxiliary power interfaces. A, B (18, 19) terminals are RS485 communication A and B line interface respectively. They are used to communicate with the host computer. DO1+ and DO1- (12, 13), DO2+ and DO2- (14, 15), DO3+ and DO3- (16, 17) are 3 sets of relay outputs. They successively correspond to error alarm, fault warning, and the two kinds of fault output of fault warning.

12	13	14	15	16	17	28	29
DO1+	DO1-	DO2+	DO2-	DO3+	DO3-	PE	KE

18	19		1	2
A	B		U1	U2

6.4 Matters need attention

6.4.1 Embedded installation of insulation monitor can be installed in a distribution cabinet.

6.4.2 When wiring is installed, connection should be made in connection with the wiring diagram. It is best to connect the wiring with the needle sleeve connector before inserting the corresponding terminal of the instrument and tighten the screws to avoid improper operation of instruments due to poor contact.

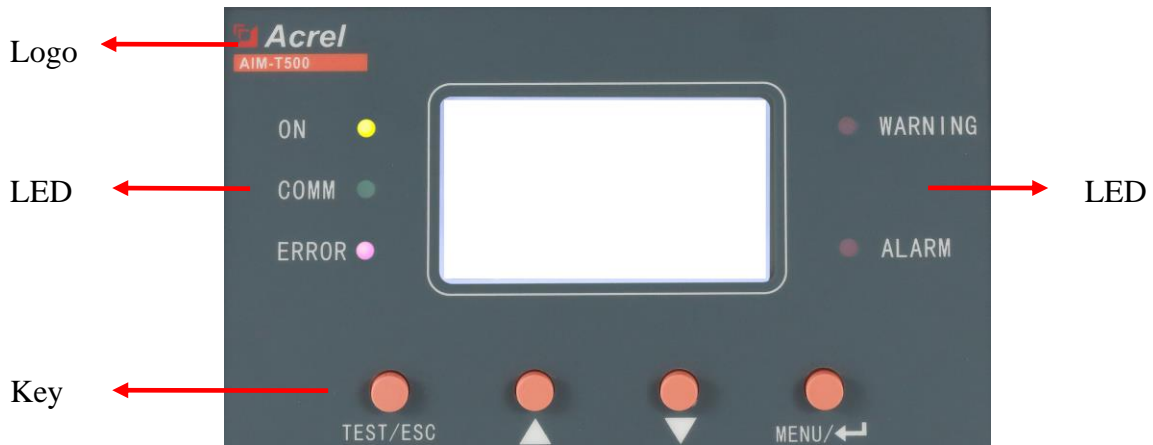
6.4.3 The device provides asynchronous half duplex RS485 communication interface, adopts Modbus-RTU protocol, and all kinds of data information can be transmitted on communication lines. In theory, up to 128 devices can be connected to one line at the same time. Each device can set its address and baud rate through the menu. It is recommended to use shielded twisted pair when communicating with the upper computer system. The cross section of each core should not be less than 0.5mm², and they connect to A, B respectively. When shielding layer is connected to earth, wiring should be kept away from strong cable or another strong electric field. It is recommended that

a matched resistance in parallel should be added between the A and B terminals of the most terminal insulation monitoring device, and the recommended resistance is 120Ω .

6.4.4 The relay output, without power alarm , is a passive output, so an extra power supply is required for the alarm(or caution light).

7 Program and Usage

7.1 Panel



7.2 LED instructions

5 LED indicators are used to indicate the status of the insulation monitor:

“ON”：when the device is working normally, the indicator light flickers,and the scintillation frequency is about once a second.

"COMM": when the device has communication data to receive or send, the indicator light flickers.

"ERROR": when the device PE, KE breaks, the indicator light flickers.

“WARNING”：When the insulation resistance of the monitoring is less than the warning value, the warning indicator light flickers.

"ALARM": when the insulation resistance of the monitoring is less than the alarm value, the alarm indicator light flickers.

7.3 Function description of keys

There are four buttons in the device. They are Self-checking /Backspace, Up key, Down key, Menu / Enter respectively.

key	Key function
TEST/ESC	In the non-programming mode, it is used to start the instrument self-checking function; In programming mode, it is used to exit.
Up key, Down key	In the non-programming mode, it is used to read the log at the alarm record interface; In programming mode, it is used to increase or decrease the figure.
MENU/↵	In non-programming mode, press button to enter programming mode; In programming mode, they are used as Backspace confirmation or selection key.

7.4 Operation instructions of keys

7.4.1 Key operation under the main interface

(1) When starting up, enter the main interface by default. If there is no other key operation, the system will go into the main interface and work. The insulation resistance value, the leakage capacitance value and the current system time are showed on the main interface.

(2) Check the alarm record. In the main interface, one can enter the event record query interface by pressing the “Up” or “Down” to turn the page to successively query the most recent 20 fault records. The first one is the latest record, and the twentieth record is the oldest one.

(3) Self-examination of the instrument. When press the "TEST" button, the monitor will start the self-examination program to simulate insulation faults and system errors. The 5 LED lights are on at the same time, and the relay is closed. The self-check results will be displayed after 2S or so to check whether the alarm and other functions of the instrument is normal.

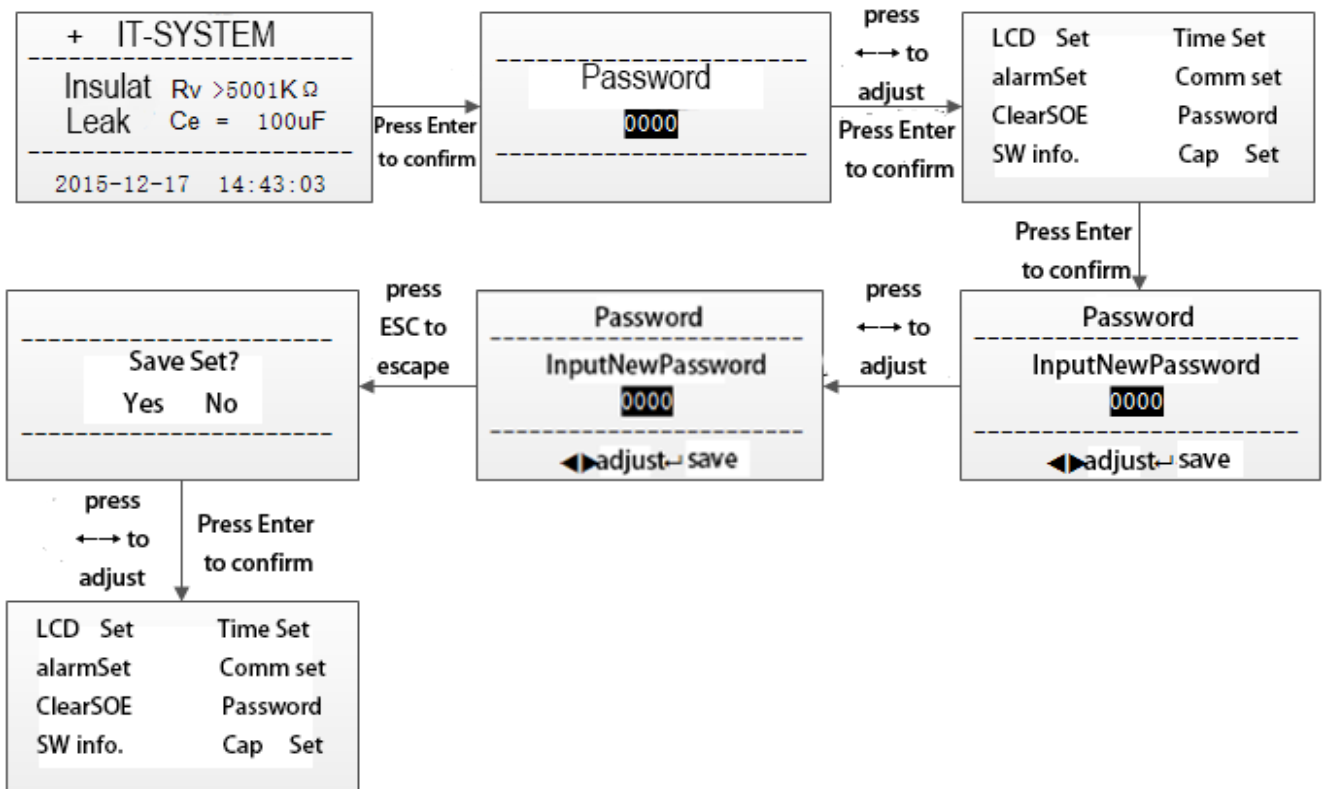
7.4.2 Parameter setting

(1) Enter the menu

Under normal operation, enter the password input page by pressing the \downarrow key. Set the size of number by "Up" and "Down", press " \downarrow " to enter the menu after inputting the correct password. Otherwise, the password error will be displayed and automatically returned after 1s.

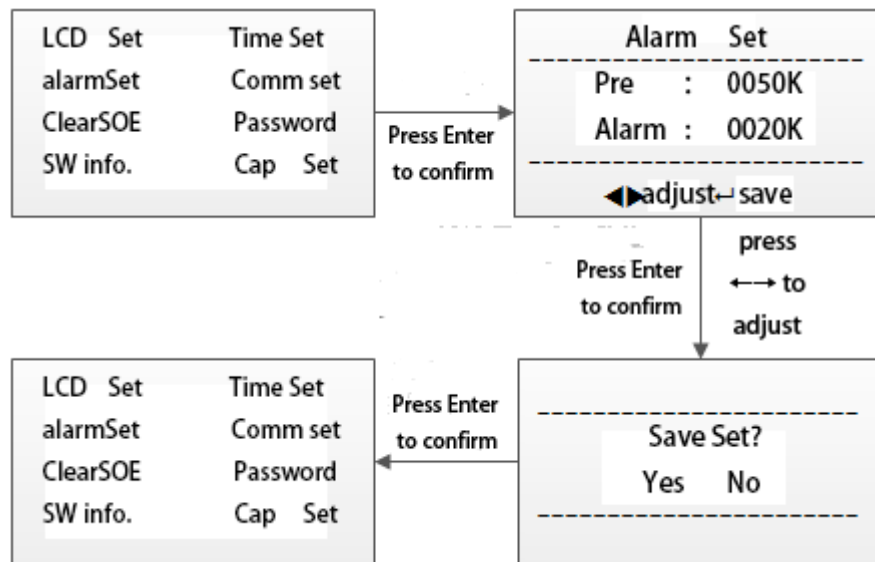
(2) Password setting

Select the option [password settings] after entering the menu, and press the "Up" and "Down" to reset the system password (support long press). Press the " \downarrow " key to selec, and whether to save the settings can be chosen, then press the " \downarrow " key to confirm and then exit. The operation examples are as follows:



(3) Alarm setting

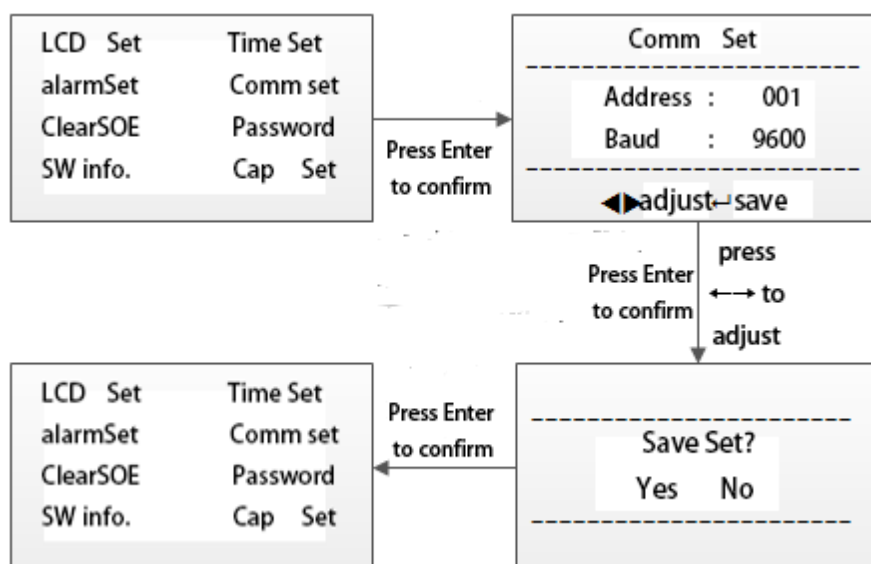
The alarm setting is set up for the size of the insulation warning value and the insulation alarm value of the system. It is at the same level as the "password setting", and has the same entering step. The following is the operation demo of the setting of the early warning value and alarm value. (System default alarm value is 38K, early warning value is 60K)



Press Enter to choose to alter the early warning value or alarm value, press left or right key resize, then press Enter.

(4) Communication settings

Set up communication address and baud rate, the examples are as follows:



(5) The setting of other information

"Time setting", "LCD setting" and "capacitance setting" function are also included in the insulation monitor. The settings of these parameters are similar to those of the above operation, so no examples are repeated here.

(6) Clear logs

This function is used to clean up fault record information.

(7) Software information

This function is used to look up the software information.

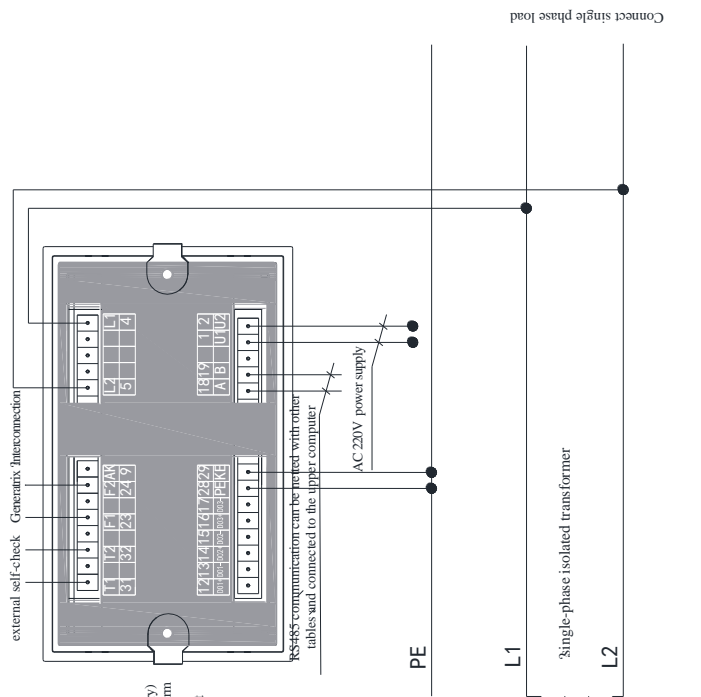
8 Address table

Number	Address	Parameter	Read/write	Number range	Word
1	0000H	Passwords	R	0000-9999 (default:0000)	1
2	0001H high byte	Address	R	1~247 (default:1)	1
	0001H low byte	baud rate	R	0~3: 4800, 9600, 19200, 38400 (unit: bps) (default: 9600)	
3	0002H high byte	Contrast ratio	R	15-60 (default: 30)	1
	0002H low byte	Display time	R	15~250 (unit: second) (default: 60,15light)	
4	0003H high byte	year	R/W	0~99 (unit: year) (default: 0)	1
	0003H low byte	month	R/W	1~12 (unit: month) (default: 1)	
5	0004H high byte	day	R/W	0~31 (unit: day) (default: 1)	1
	0004H low byte	warning mark	R	0: no 1: warning 2: warning and alarm	
6	0005H high byte	hour	R/W	0~23 (unit: hour) (default: 0)	1
	0005H low byte	minute	R/W	0~59 (unit: minute) (default: 0)	
7	0006H high byte	second	R/W	0~59 (unit: second) (default:0)	1
	0006H low byte	data stable	R	0 or 1 (0 invalid, 1 stable)	
8	0007H high byte	warning value (high 8 bits)	R/W	60~4999 (unit: k Ω) (default: 60)	1

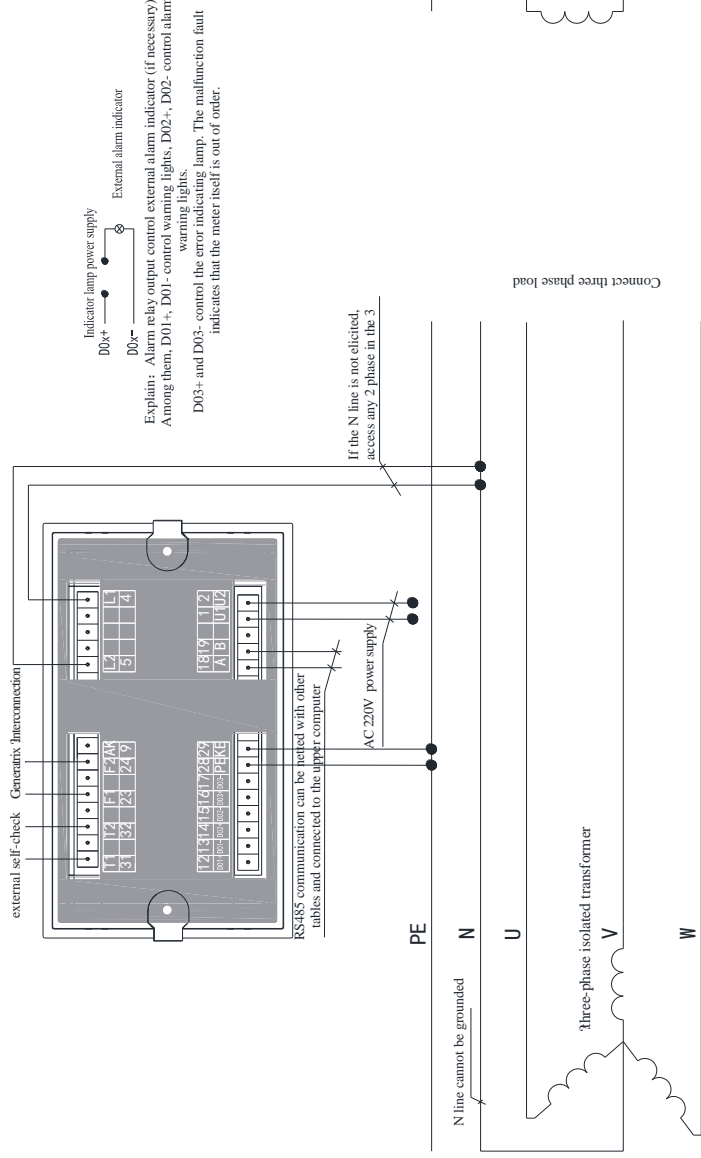
	0007H low byte	early warning value (low 8 bits)				
9	0008H high byte	alarm value (high 8 bits)	R/W	10~4999 (unit: k Ω) (default: 38)	1	
	0008H low byte	alarm value (low 8 bits)				
10	0009H high byte	insulation resistance value (high 8 bits)	R	1~10001 (unit: k Ω)	1	
	0009H low byte	insulation resistance value (low 8 bits)				
11	000AH	SN (high 16 bits)	R	default: 0000000000	2	
12	000BH	SN (low 16 bits)				
13	000CH	reserve			1	
14	000DH	leakage capacity value	R	0~500 (unit: μF)	1	
15	000EH high byte	Symbol of broken line	R	0: no 4:PE/KE broken line	1	
	000EH low byte	current period		2~500 (unit: s)		
16	000FH high byte	Whether access system	R	0: no access system 1: access system	1	
	000FH low byte	reserve				
17	0010H high byte		R	The sequence number of incident record	1	
	0010H low byte		R	Incident1 content: 0~2 0: a fault free record 1: early warning 2: alarm		
18	0011H	incident record 1	insulation resistance value	R	incident 1 insulation resistance value 0~early warning set value (default: 0~50) (unit: k Ω)	1
19	0012H high byte		Year1	R	incident 1 time -year	1
	0012H low byte		Month1	R	incident 1 time -month	
20	0013H high byte		Day1	R	incident 1 time -day	1
	0013H low byte		Hour1	R	incident 1 time -hour	
21	0014H high byte		Minute1	R	incident 1 time -minute	1
	0014H low byte		Second1	R	incident 1 time -second	1
22~116	0015H-0073H	The remaining 19 events are recorded in this part of the space, and the rules and formats are the same as the first.				

9 Typical applications

Typical connection diagram



AIM-T500 insulation monitor is applied to the connection diagram of single-phase IT system



AIM-T500 insulation monitor is applied to the connection diagram of 3-phase IT system

- Note: 1. The source power of meter is AC220V
 2. In DC System, L1 link to +, L2 link to -

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