

# IT System Insulation Monitoring Device And Fault Location System

ACREL CO.,LTD



Selection  
Guide

Medical Isolated Power Supply and Monitoring System

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Medical Isolated Power Supply and Monitoring System

1.Overview

With electronic medical equipment widely used in hospital, leakage current threats to patients are also growing, especially at those living related sites. When patients in operation or anesthesia, various electrodes, sensors directly into human bodies. Small leakage current can lead to death of patients. In addition, some medical equipment for the maintenance of the lives of patients with severe. Once the device is out of power, it will pose a threat to the life of the patient. Therefore, the electrical design for special place of hospital, it should be strictly used in line with national standards and regulatory requirements for the design of IT systems for power.

Acrel medical IT system insulation monitoring device and fault location system is suitable for hospital operating room, ICU (CCU) and other important places, and can provide safe, continuous, reliable power solutions.

2. Medical Isolation Power Supply Monitoring System

Medical isolation power supply monitoring system is used to centrally monitor the operation of medical IT system in all medical locations. This centralized monitoring system can be installed in the duty room of hospital electrical operation and maintenance personnel, or integrated in other power monitoring systems. Once a set of IT system fails, the electrical maintenance personnel can make a judgment in the first time and deal with it according to the situation on the spot.

2.1 Structure



2.2 Main Functions

Based on touch-screen software, the medical isolation power monitoring system has remote measurement, parameter setting, self-test and other functions. It provides a powerful system integrated tools for isolated power centralized monitoring system of all group 2 medical locations. The main functions of the software are as follows:



■ Primary connection diagram and field distribution display

When fault occurs, the personnel can promptly found the alarm location or region of IT system, and reach the scene in time to troubleshoot.

■ Real-time data acquisition and display

The monitoring parameters included IT system insulation resistance, load current, the transformer winding temperature and insulation fault circuit..

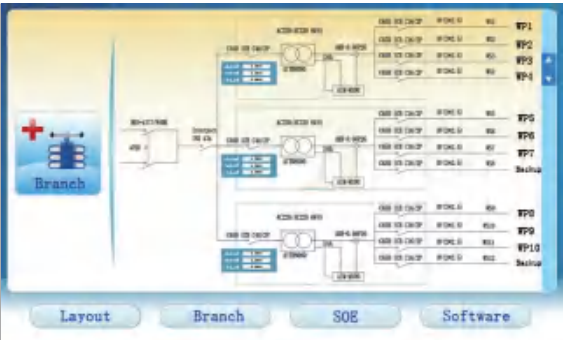


■ Fault alarm

Monitoring system can process and record all kinds of faults, Such as insulation fault, overload, over temperature and wiring disconnection, display the fault type, fault values, fault location and the time on the display screen, start the audible and visual alarm to remind the relevant personnel to troubleshoot. The audible alarm signal can be manually muted.

■ Remote parameter setting and inquiry

Parameters include insulation alarm values, the load current alarm values and isolation transformer temperature alarm values, etc.



■ Graphic display

The system can display the insulation status, load status, isolation transformer temperature conditions and their trends in graph form, which help managers to understand and analyze operational changes in each power system, so maintenance personnel can maintain and repair some of the targeted system.

2. 3 Medical Isolated Power Supply Monitor

● Environment

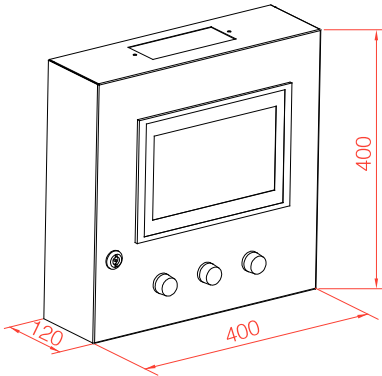
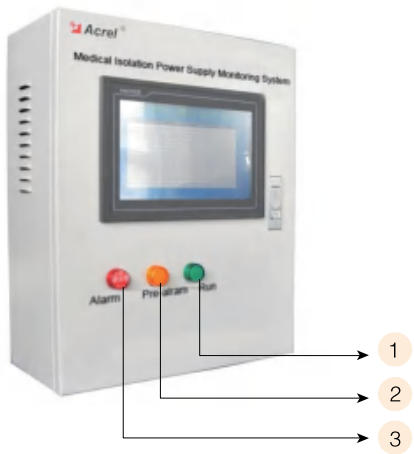
- Operating temperature: -10℃~+55℃
- Storage temperature: -20℃~+70℃
- Relative humidity: ≤ 95% No condensation
- Altitude: ≤2500m
- Pollution Level: Level III
- Installation category: Level III

● The main components

The following table lists the ACREL medical isolation power monitor cabinet main functions and components :

Parameters		Cabinet Name	Medical Isolation Power Supply Monitor Cabinet
Dimensions			500 (H) ×400 (W) ×190 (D)
main components	Computer		10" TFT Color touch screen
	I/O modules		Built-in remote intelligent I/O modules
	Power Modules		Switching Power Supply
	Lights		Red (alarm) Yellow (pre-alarm) Green (normal)

● Structure diagram

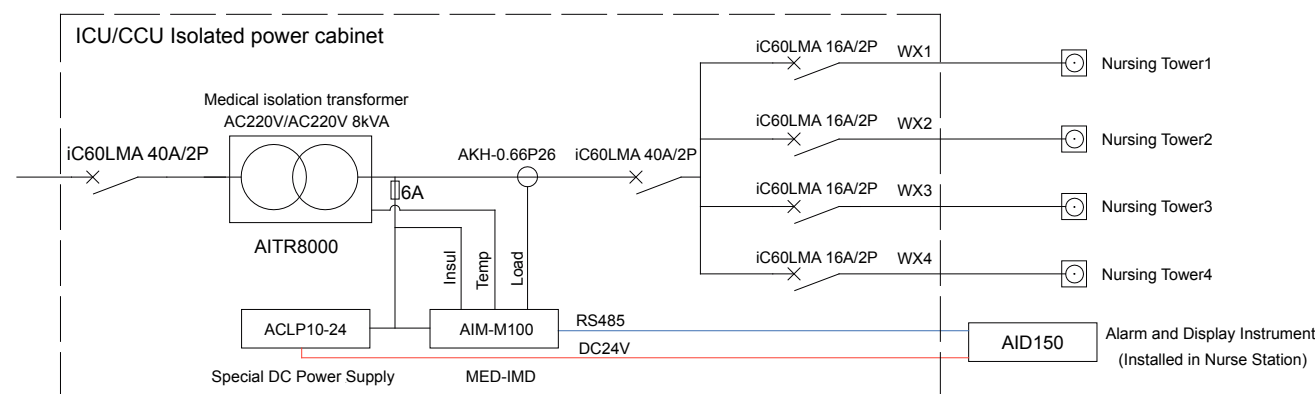


- 1: Operation indicator (green), the indicator light indicates the system is operating normally.
- 2: Pre-alarm indicator (yellow), lights indicate the system receives the pre-alarm signal.
- 3: Alarm indicator (red), light indicator that monitoring system receives the alarm signal.

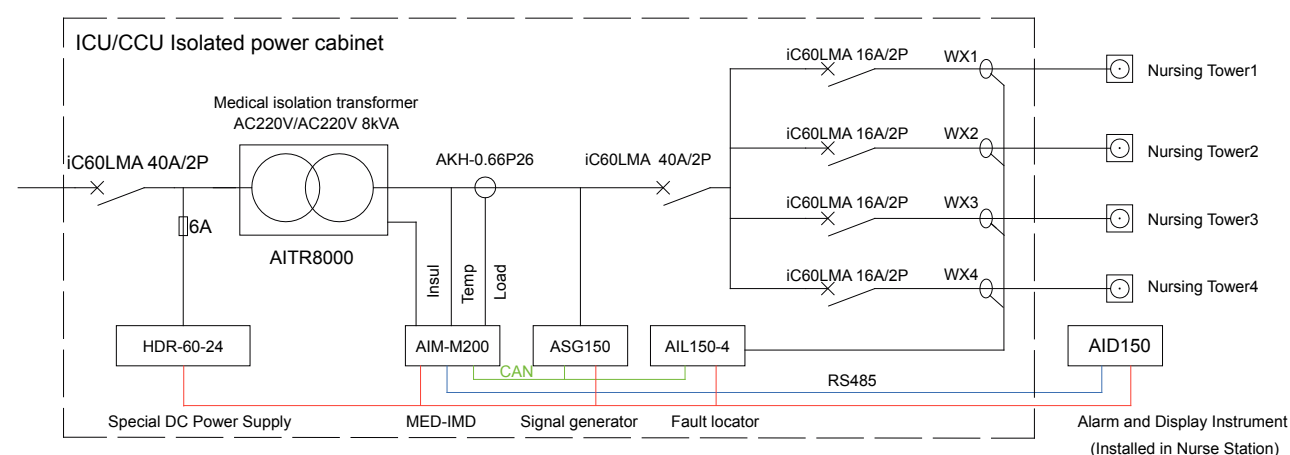


### 3. Power Supply Solution for Medical Locations

#### 3.1 ICU, CCU ward Distribution Solutions (GGF-I8G isolate electrical cabinet system diagram, for example)



Option I: without insulation fault location function



Option II: with insulation fault location function

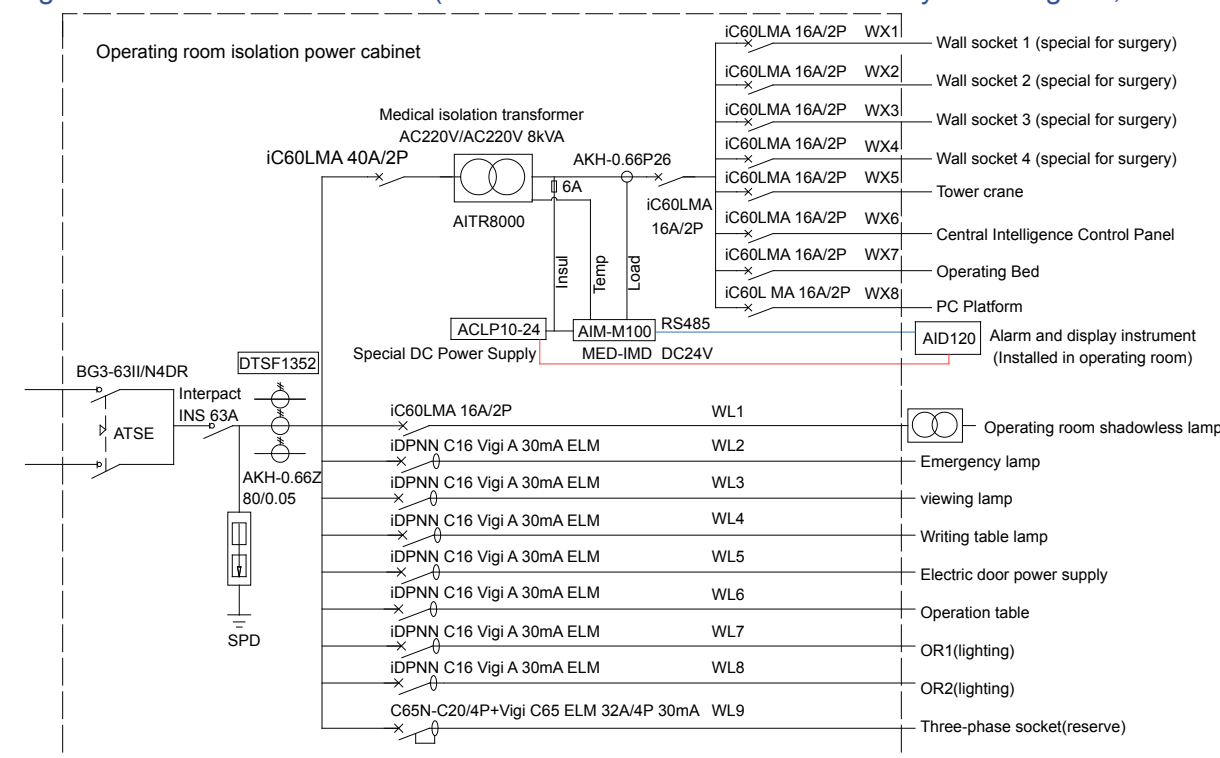
NOTE: 1. In the power distribution solutions of intensive care unit, AID series centralized alarm and display device should be installed in the nurses' station, the hospital staffs of nurses' station monitor the Operating status of each isolated power system

2. In the solutions with insulation fault location function, if the number of located channels is more than eight, two sets of AIL150 locator can be used. The combination can be AIL150-8 and AIL150-4 (up to 20 channels), or AIL150 -8 and AIL150-8 (up to 24 channels).

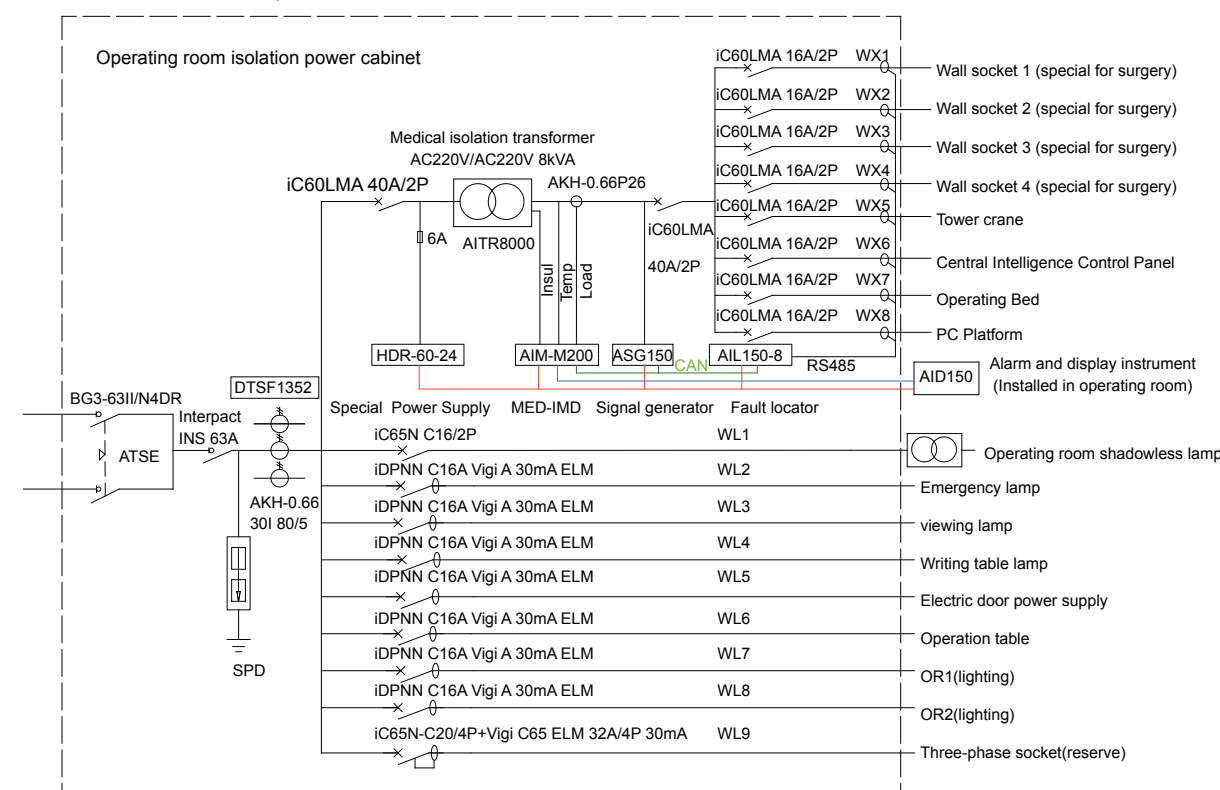
#### ICU solution configuration table

Configuration \ Model	GGF-I6X	GGF-I8X	GGF-I6XL	GGF-I8XL
Isolation Transformer	AITR6300	AITR8000	AITR6300	AITR8000
Insulation monitors	AIM-M100 (or AIM-M10)		AIM-M200	
DC power supply	ACLP10-24		HDR-60-24	
Test signal generator	——		ASG150	
Insulation fault locator	——		AIL150-4	
Output circuit	IT Systems: 4, 8, etc. (can be customized according to the actual needs)			
Current Transformer	AKH-0.66P26			
Breaker	iC60LMA 16A 2P、iC60LMA 40A 2P			
Alarm and display instrument	AID 150 (single set or multiple sets of centralized monitoring)			

#### 3.2 Operating Room Distribution Solutions (GGF-O8G isolate electrical cabinet system diagram, for example)



Option I: without insulation fault location function



Option II: with insulation fault location function

Note: 1. In the operating room power distribution solutions, AID series of external alarm and display device should be installed inside the operating room, and be monitored by the medical staff.

2. In the solutions with insulation fault location function, if the number of located channels is more than eight, two sets of AIL150 locator can be used. The combination can be AIL150-8 and AIL150-4 (up to 20 channels), or AIL150 -8 and AIL150-8 (up to 24 channels).

Operating room solution configuration table

Model Configuration	GGF-O6X	GGF-O8X	GGF-O6XL	GGF-O8XL	Remark
Isolation Transformer	AITR6300	AITR8000	AITR6300	AITR8000	
Dual power switching device	Optional Configuration				
Insulation monitors	AIM-M100（AIM-M10）		AIM-M200		IT systems
Test signal generator	—		ASG150		
Insulation fault locator	—		AIL150-8		
DC power supply	ACLP10-24		HDR-60-24		
Current Transformer	AKH-0.66 40I 75/5、AKH-0.66P26				
Breaker	iC60LMA 40A/2P、iC60LMA 16A/2P、iC60LMA 20A/2P				
Alarm and display instrument	AID120（AIM-M100） /AID10（AIM-M10） （installed next to the intelligence panel）		AID150 （installed next to the intelligence panel）		
Feeder circuits	8 × AC220V				TN systems
	1 ×AC380V、8 × AC220V				
Surge Protector	PR20 20KA 3P+N				
Multifunction Meter	DTSF1352				
Residual current operated protective devices	Operating current ≤ 30mA（Type A）				

3.3 Medical Isolation Power Supply Cabinet

Medical isolation power distribution cabinet is designed for medical group 2 power supply requirements .Insulation monitoring device installed in IT system. Each output circuit has a circuit breaker with short circuit protection function; the output circuit in TN-S system has a circuit breaker with leakage protection, Products are divided into GGF-O series three-phase isolated power cabinet, GGF-I series single-phase isolated power supply cabinet, according to the number of input voltage phases. the products meet IEC60364-7-710:2016 Electrical installations of buildings—Part 7-710: Requirements for special installations or locations—Medical locations and IEC 61439-2:2011 Low-voltage switchgear and control gear assemblies—Part2: Power switchgear and control gear assemblies.

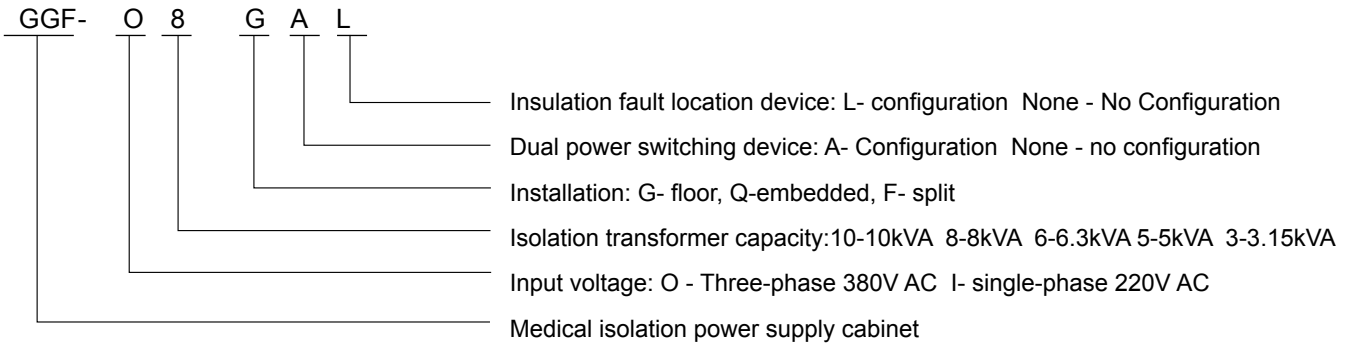


Technical parameters

Technical Parameters	GGF-IXG	GGF-IXQ	GGF-IXF	GGF-OXG	GGF-OXQ	GGF-OXF
Rated voltage	220V AC			380V/220V AC		
Rated Capacity	3.15/5/6.3/8/10kVA		—	3.15/5/6.3/8/10		—
Rated frequency	50/60Hz					
Distribution circuit	IT Systems: 4 or 5 AC220V (can be customized)			IT Systems: 8 AC220V (can be customized)		
	—			TN—S Systems: 1 AC380V, 8 AC220V		
Protection level	IP31	IP34D		IP31	IP34D	
Installation	floor-standing	Embedded		floor-standing	Embedded	
Inlet and Outlet	Bottom	Both bottom and top have access lines		Bottom Inlet and Bottom Outlet	Both bottom and top have access lines	
Communication	RS485 interface, Modbus-RTU protocol					

NOTE: 1.GGF-IXF and GGF-OXF type is separated type; the isolation transformer is placed outside of equipment.  
2.In order to meet the special requirements of install conditions in different places, multiple sets (2-4 sets) isolated power system cabinet can be customized , size of the cabinet is 800 (W) × 400 (D) × 1800 (H) or 800 (W) × 800 (D) × 2000 (H)

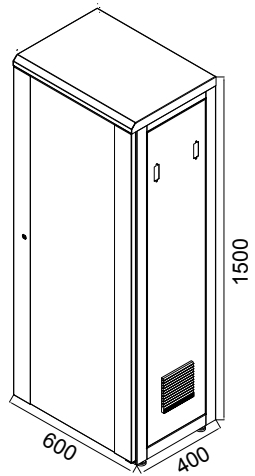
Naming rules



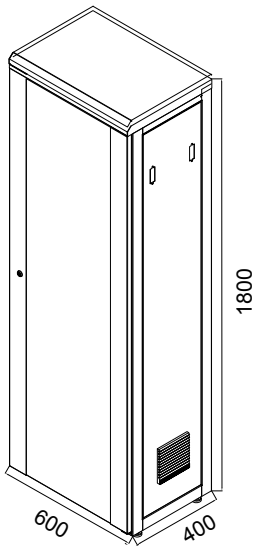
Ordering Information

Order number		Single line	Dual-line automatic switching device	Fault location
Single-phase power supply cabinet	GGF-IXG	■		
	GGF-IXGA		■	
	GGF-IXGL	■		■
	GGF-IXGAL		■	■
	GGF-IXF	■		
	GGF-IXFL	■		■
	GGF-IXQ	■		
	GGF-IXQL	■		■
Three Phase Power supply cabinet	GGF-OXG	■		
	GGF-OXGA		■	
	GGF-OXGL	■		■
	GGF-OXGAL		■	■
	GGF-OXF	■		
	GGF-OXFL	■		■
	GGF-OXQ	■		
	GGF-OXQL	■		■

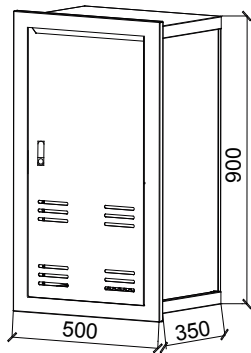
● Dimensions(unit: mm)



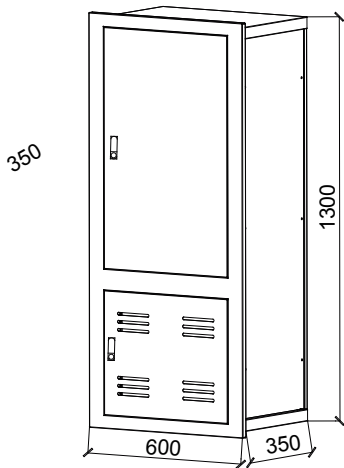
GGF-IXG Series Dimensions



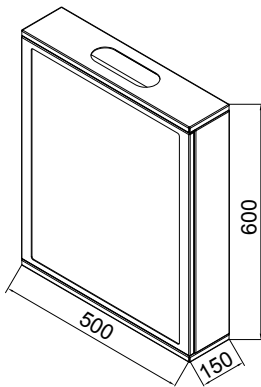
GGF-OXGA/GGF-OXG Series Dimensions



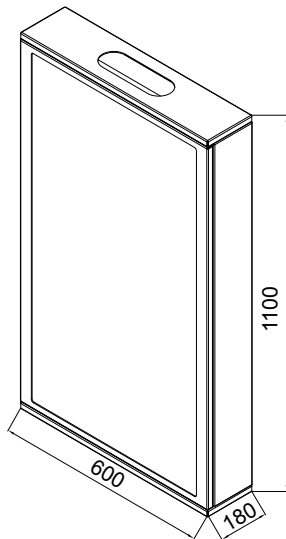
GGF-IXQ Series Dimensions



GGF-OXQ Series Dimensions



GGF-IXF Series Dimensions



GGF-OXF Series Dimensions

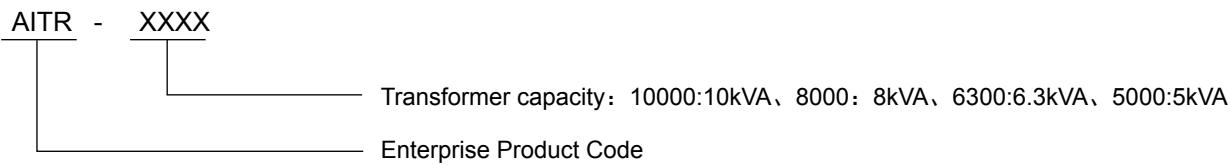
4. Product Introduction

4.1 AITR Series Isolation Transformer



AITR series isolation transformer is specially used in medical IT system. The transformer core is made of silicon steel sheet, the loss is small. Double insulation treatment is adopted between windings, and a static screen is designed to reduce the electromagnetic interference between the two windings. PT100 temperature sensor is installed in the winding, which can be used to monitor the winding temperature. The transformer is treated by vacuum impregnation, which increases the mechanical strength and has anti-corrosion effect. In addition, the product also uses low temperature rise and low noise design, so that it has good temperature rise performance and low noise.

● Naming rules



● Standard

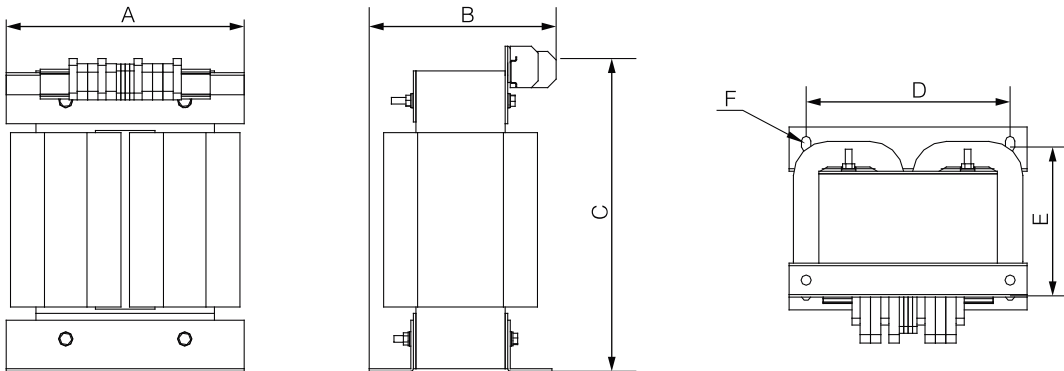
- ◆ IEC 61558-1:2009 Safety of transformers, reactors, power supply units and combinations thereof—Part 1: General requirements and tests
- ◆ IEC 61558-2-15:2011 Safety of transformers, reactors, power supply units and combinations thereof—Part 16: Particular requirements and tests for isolating transformers for the supply of medical locations
- ◆ IEC60364-7-710:2016 Electrical installations of buildings—Part 7-710: Requirements for special installations or locations—Medical locations

● Technical parameters

Rated Capacity	3.15kVA/5kVA/6.3kVA/8kVA/10kVA
Frequency	50/60Hz
Rated input voltage	230V
The output voltage	230V/115V
Inrush current	<12In
Leakage Current	<200uA
No-load output voltage	<235V
No-load output current	<3% In
Short-circuit voltage	<3% Un
Efficiency	>96%
Maximum ambient temperature	<40℃
No-load temperature rise	<33℃
Full load temperature rise	<76℃
Withstand voltage	4200V/Min
Insulation Class	H
Noise Level	<40dB (A)

● Dimensions and model selection

Model	Capacity (VA)	Dimensions(mm)						Weight (Kg)
		A	B	C	D	E	F	
AITR10000	10000	280	275	427	240	190	φ11	92
AITR8000	8000	280	265	427	240	190	φ11	90
AITR6300	6300	280	255	427	240	175	φ11	75
AITR5000	5000	280	255	427	240	175	φ11	73
AITR3150	3150	280	225	427	240	175	φ11	53



Isolating Transformer Dimensions

● Selection description

Any isolation transformer will generate inrush current at start time ,Therefore, for the medical IT systems , In selecting the circuit breaker which is installed in the line circuit into an isolation transformer , Breaker has short-circuit protection and without overload protection, such as ordinary breaker should be selected in line of C, D circuit breaker tripping curves, And the rated current should be determined according to the following relationship with isolation transformer capacity: 10kVA-63A, 8kVA-50A, 6.3/5kVA-40A, 3.15kVA-20A, to prevent the impact of the current circuit breaker switching difficulties or safety-power tripping, resulting in serious medical malpractice .

4.2 AIM-M Series Insulation Monitor



AIM-M10



AIM-M100



AIM-M200

AIM-M Series insulation monitor is designed to medical IT systems to monitor the state of the insulation. When insulation fault occurred, it sends out alarm signals to help staff to handle.

● Product features

- ◆ Insulation monitoring for medical IT systems
- ◆ Load and temperature monitoring for IT transformers
- ◆ PE, temperature sensor, IT systems connection monitoring
- ◆ Adjustable response value for insulation monitoring and current
- ◆ Alarm relay, alarm LED indication when fault occurred
- ◆ RS485 and CAN interface(for AIM-M200 only)
- ◆ Fault record for analyzing the status of IT systems
- ◆ Support fault location(for AIM-M200 only)

● Standard

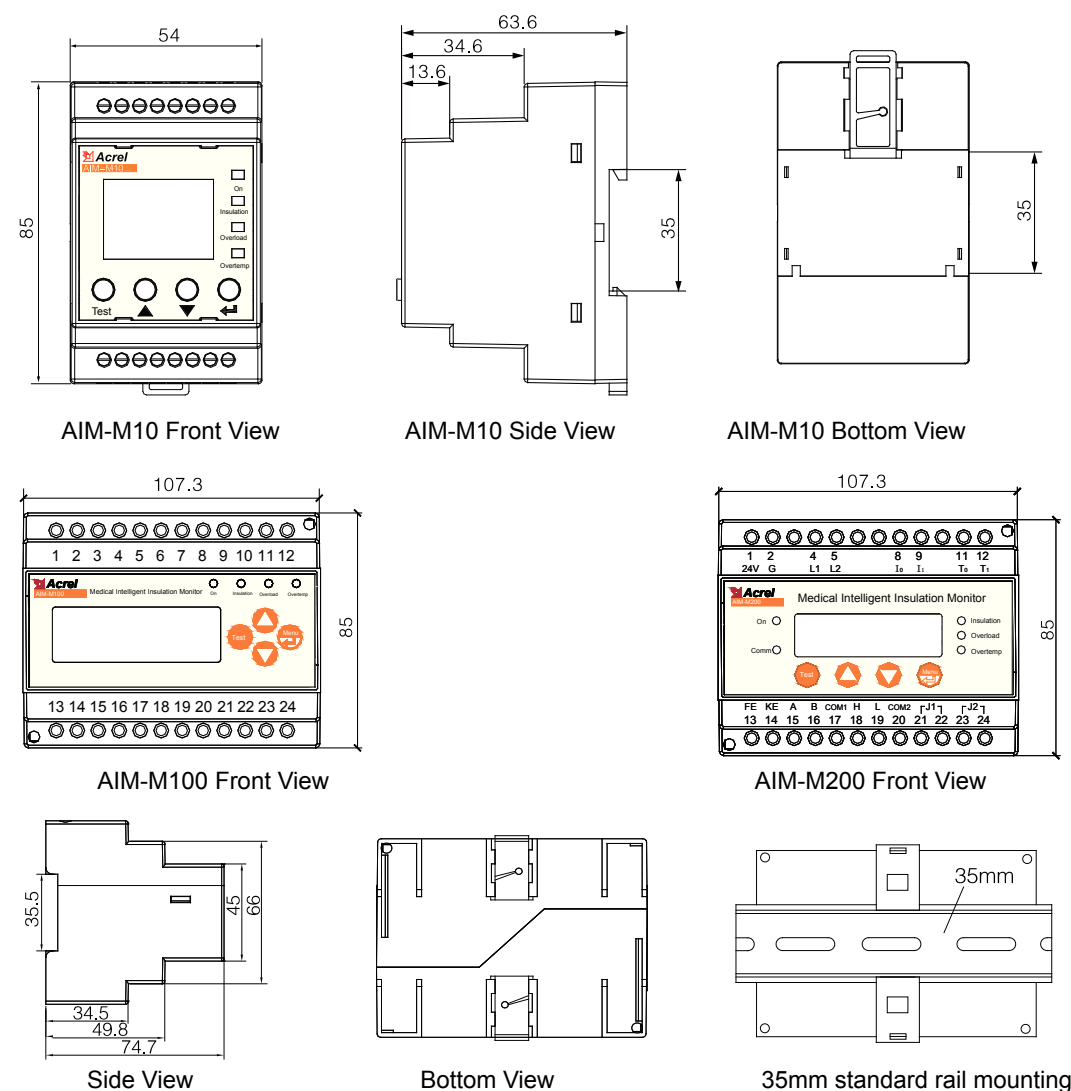
- ◆ IEC60364-7-710:2016 Electrical installations of buildings—Part 7-710: Requirements for special installations or locations—Medical locations
- ◆ IEC 61557-8-2007 Electrical safety in low voltage distribution systems up to 1000V a.c. and 1500V d.c.—Equipment for testing, measuring or monitoring of protective measures — Part 8: Insulation monitoring devices for IT systems

● Parameters

Parameters		Model	AIM-M10	AIM-M100	AIM-M200
Auxiliary power	Voltage		AC220V(±10%)		DC24V(±25%)
	Frequency		50/60Hz		—
	Power consumption		<5VA	< 8VA	<3VA
Insulation monitoring	Insulation resistance measurement range		10 ~ 999kΩ		
	Accuracy		0 ~ ±10%		
	Alarm value range		50 ~ 999kΩ		
	Response time		<2s		
	Measuring voltage		<12V		
	Measuring current		<50uA		
Current Monitoring	Measurement value		2.1 ~ 50A		
	Alarm value range		5 ~ 50A		
	Accuracy		5%		
	Display method		Value display	percentage display	Value and percentage display
Temperature Monitoring	Sensor		PT100		
	Measuring range		-50 ~ +200℃		
	Alarm value range		0 ~ +200℃		
Power output	24VDC		2W	None	
Alarm Output	Output		1 relay	2 relay(programmable)	2 relay (not programmable)
	Contact Capacity		AC 250V/3A DC 30V/3A		
Communications			1 RS485 , Modbus-RTU	2 RS485 , Modbus-RTU	1 RS485, Modbus-RTU 1 CAN, custom protocol
environment	Operating temperature		-10 ~ +50℃		
	Storage temperature		-20 ~ +70℃		
	Relative humidity		5%-95%, No condensation		
	Altitude		≤2500m		
Rated impulse voltage / pollution degree			4KV/3		
EMC & EMR			IEC61326-2-4		



## Installation and dimensions(unit: mm)



## Selection Description

The auxiliary power supply of AIM-M10/AIM-M100 is AC220V, and for AIM-M200, is DC 24V. Only AIM-M200 support insulation fault location function and this can also be turned off through the menu.

## 4.3 AID Series Alarm and Display Device



AID Series alarm and display devices are remote display and audible and visible alarm devices. AID duplicates fault, alarm and operating message of monitoring devices. When fault occurs, AID gives audible and visible signal to medical staff and technical staff. Additionally, response value of AIM-M series monitoring device can be set by AID remotely. AID Series alarm and display device have three types: AID10, AID120 and AID150, which shall be arranged in operating room or nursing station so that it can be permanently monitored by medical staff.

## Product features

- ◆ Duplicates fault, alarm and operating messages of monitoring device through RS485 bus.
- ◆ Remotely set the response value of Insulation monitor
- ◆ Generating audible and visible signals when fault occurred, the audible alarm can be silenced, but the visible alarm should not be canceled until the fault removed.

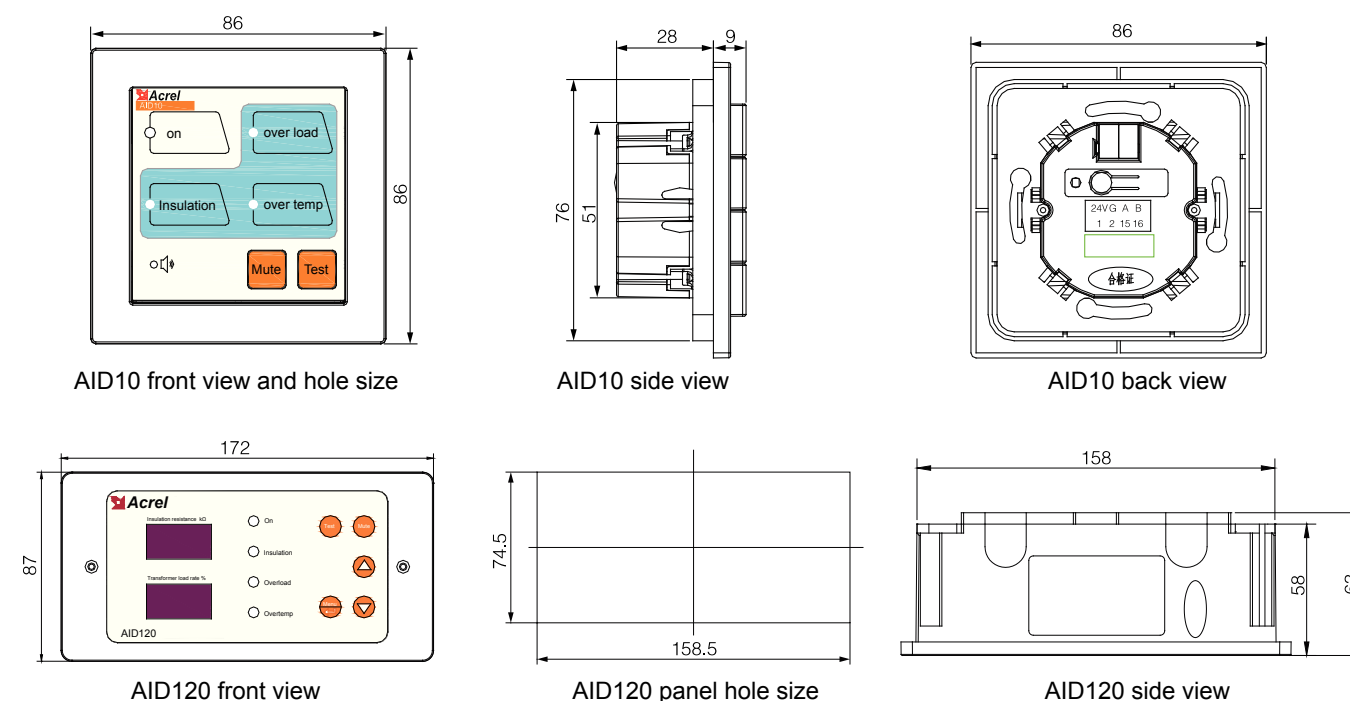
## Standard

- ◆ IEC60364-7-710:2016 Electrical installations of buildings—Part 7-710: Requirements for special installations or locations—Medical locations
- ◆ IEC 61557-8:2007 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

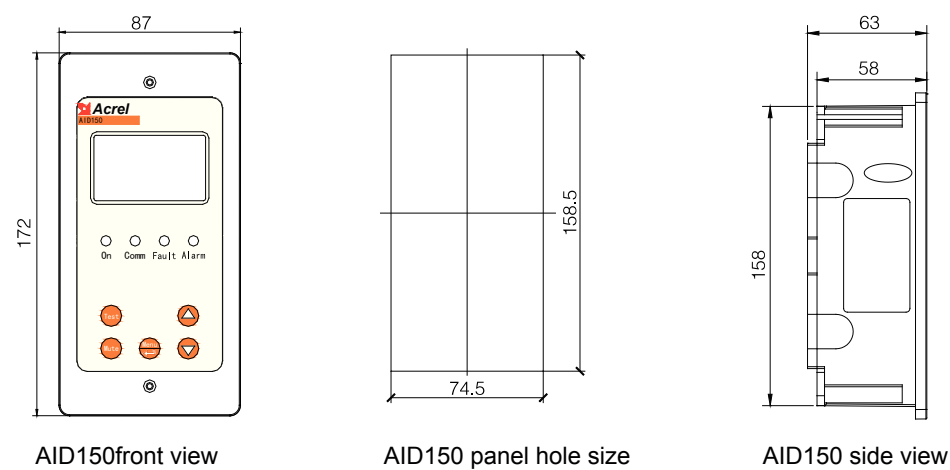
## Technical parameters

Parameters		Model	AID10	AID120	AID150
Auxiliary power	Voltage		DC 24V		
	power consumption		< 0.6W		
Insulation resistance measurement range			—	0—999kΩ	—
Insulation alarm value range			50—999kΩ		
Transformer load rate display			—	percentage display	—
Load current alarm settings			14A、18A、22A、28A、35A、45A		
Temperature alarm value range			0~+200℃		
Alarm			Audible and visible alarm		
Alarm Type			Insulation fault, overload, over-temperature, equipment failure		
Communication			RS485 interface, MODBUS-RTU protocol		
Display method			无	LED Display	128*32 LCD

## Installation and dimensions(unit:mm)







Selection description

Model	Selection Description
AID10	monitoring one AIM-M10, suitable for embedded in wall and cabinet installation
AID120	monitoring one AIM-M100, embedded in wall installation, suitable for operating room or just a single set of IT system in ICU/CCU
AID150	Monitoring up to 16 AIM-M10,AIM-M100,or AIM-M200, embedded in wall installation, suitable for centralized monitoring of up to 16 sets of isolated power supply or residual current monitoring system

4.4 DC power supply

4.4.1 ACLP10-24 DC Power Supply



The power supply module is designed to supply Acrel AID series devices with a supply voltage of DC 24V and a total power consumption of maximum 3VA.

Module is rail mounted, installed on the same rail as insulation monitors.

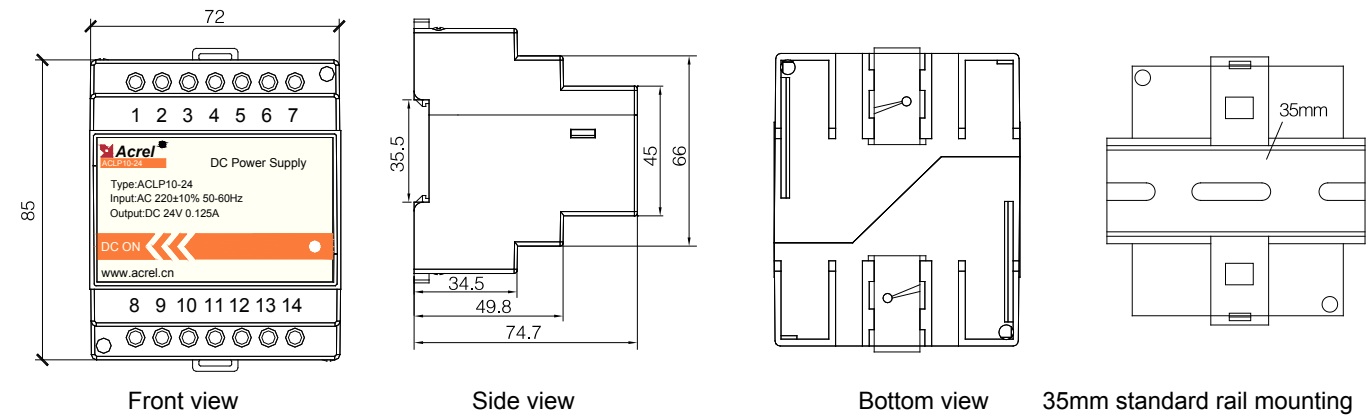
Standard

IEC 61558-1: 2009 Safety of transformers, reactors, power supply units and combinations thereof—Part 1: General requirements and tests

Technical parameters

Input voltage	AC 220V (±10%)
Frequency	50/60Hz
Power	3W
Output voltage	DC 24V±5%
Voltage regulation	≤30%
Temperature rise	≤20℃
withstand voltage	4000V AC/Min

Overall and installation dimensions(unit:mm)



4.4.2 HDR-60-24 DC Power Supply

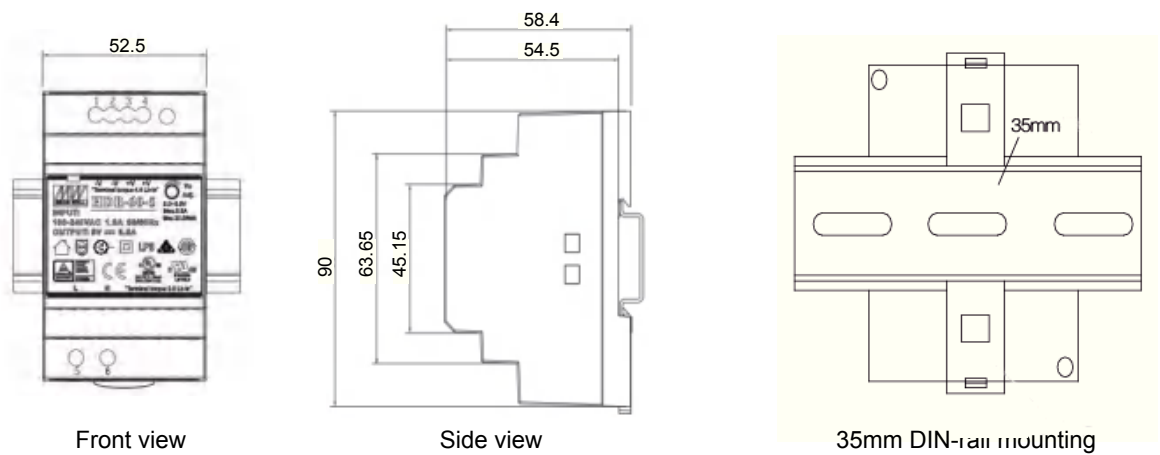


HDR-60-24 DC power supply provides 24V DC power supply for Acrel AIM-M200 Medical intelligent insulation monitor, ASG150 test signal generator, AIL150 series insulation fault locator and AID200 centralized alarm and display, and a total power consumption of maximum 60VA.

Technical parameters

Model	Input	Output	Installation
HDR-60-24	100-240VAC 1.8A	24VDC 2.5A	35mm rail mounting

Overall and installation dimensions(unit:mm)



4.4.3 Selection Description

ACLP10-24 DC power supply is a linear power supply,Its input can be directly connected to the secondary side of the isolation transformer, the total power consumption is 3W,It can only provide 24V DC power supply for AID100, AID120 or AID150. HDR-60-24 is switching power supply, the total power consumption is 60W, and can be used in insulation monitoring and fault localization systems.

4.5 ASG150 Test Signal Generator



ASG150 test signal generator is designed with a 32-bit microprocessor chip and a high-precision signal generation circuit,It can generate a specific test signal.When IT system insulation fault occurs , it start to generate a test signal , and work with insulation fault locator to achieve insulation fault location.

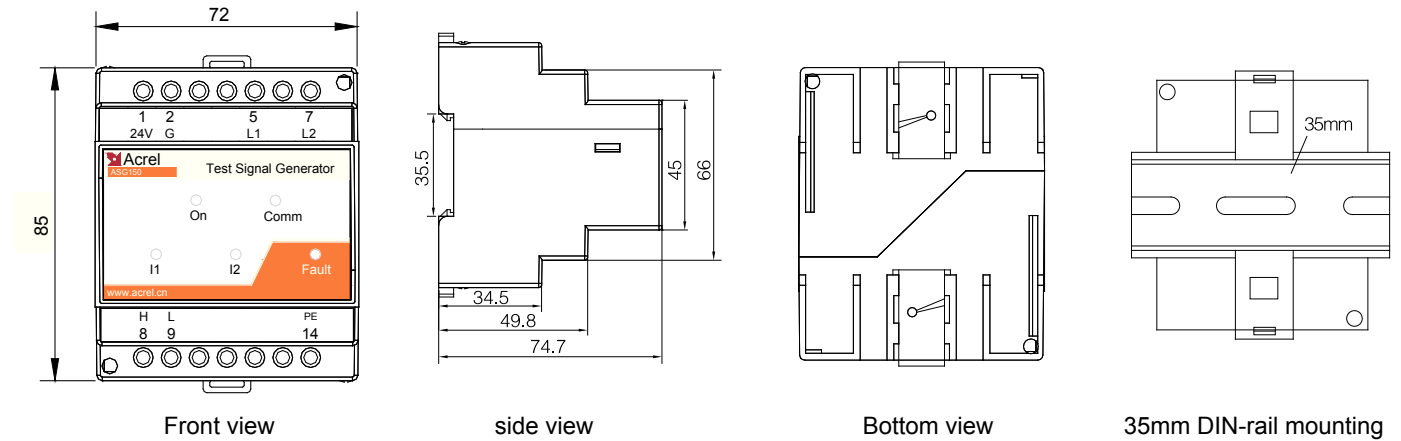
Standard

IEC 61557-9-2007 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 9: Equipment for insulation fault location in IT systems

Technical parameters

Auxiliary power	voltage	DC24V(±25%)
	the maximum power consumption	≤2VA
System be monitored	rated voltage	0~ 242V AC
	rated frequency	45 ~ 60Hz
Location signals	location voltage	<25V
	location current	<1mA
Communication	bus	CAN
	protocol	custom protocol

Overall and installation dimensions(unit: mm)



4.6 AIL150 Series Insulation Fault Locator



AIL150-4



AIL150-8

AIL150-4/AIL150-8 insulation fault locator in conjunction with AIM-M200 insulation monitor and ASG150 signal generator are designed for insulation fault location in medical IT systems. AIL150-4 insulation fault locator can locate insulation faults of four loops, AIL150-8 insulation fault locator can locate eight loops.

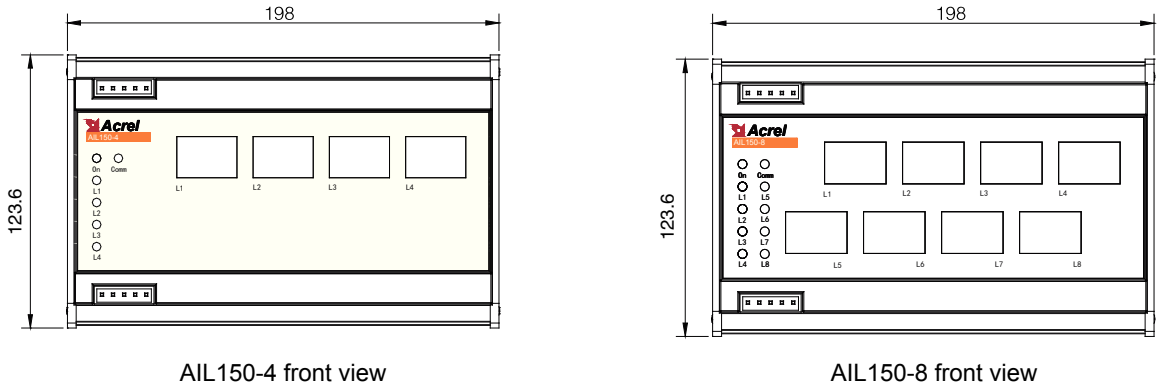
Standard

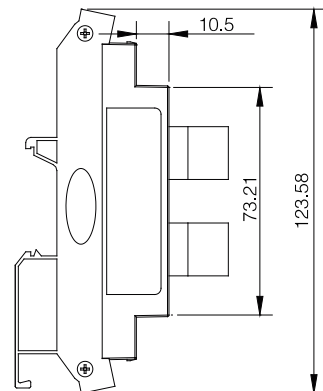
IEC 61557-9-2007 Electrical safety in low voltage distribution systems up to 1000V a.c. and 1500V d.c.—Equipment for testing, measuring or monitoring of protective measures — Part 9: Equipment for insulation fault location in IT systems

Technical parameters

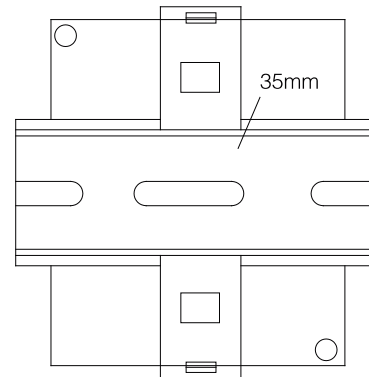
Parameters		Values	
		AIL150-4	AIL150-8
Auxiliary power	voltage	DC24V(±25%)	
	power consumption	≤2VA	
Monitored system	Rated voltage	0~242V AC	
	frequency	45 ~ 60Hz	
Location signals	location voltage	<25V	
	location current	<1mA	
Fault location	the maximum number of loops	4	8
	response time	<2s	
Communications	bus	CAN	
	protocol	Custom protocol	

Overall and installation dimensions(unit: mm)





Side view



35mm DIN-rail mounting

#### 4.7 Protective current transformer

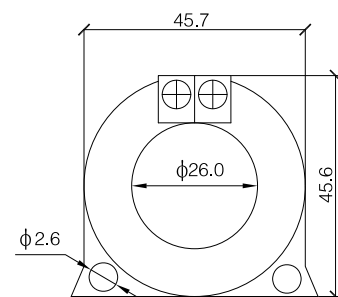


AKH-0.66P26 current transformer is protective current transformer, which is used for AIM-M series insulation monitor to measure the current of the load. Its maximum measurable current is 50A, and the ratio is 2000: 1. The current transformer can be screwed inside the cabinet.

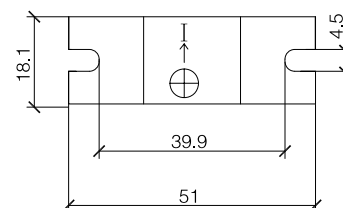
#### Technical Parameters

Input Current	0.5mA~50A	Operating frequency range	0.02-10 KHZ
Output Current	0.025~25 mA	Load Resistance	<200Ω
Temperature Coefficient	100 ppm/°C	Instantaneous current 1s	200A
Phase-shift	10'	Mounting	4×10 Cross recessed pan head screws
Operating temperature	-35~+70°C	Secondary side wiring	Single core wire > 0.75mm <sup>2</sup> 1m
Storage temperature	-40~+75°C		Single core twisted pair > 0.75mm <sup>2</sup> < 10m
Secondary resistance range	95~120Ω	Isolation voltage	5000Vac
Accuracy	0.5%	Linearity	0.5%

#### Overall and installation dimensions(unit:mm)



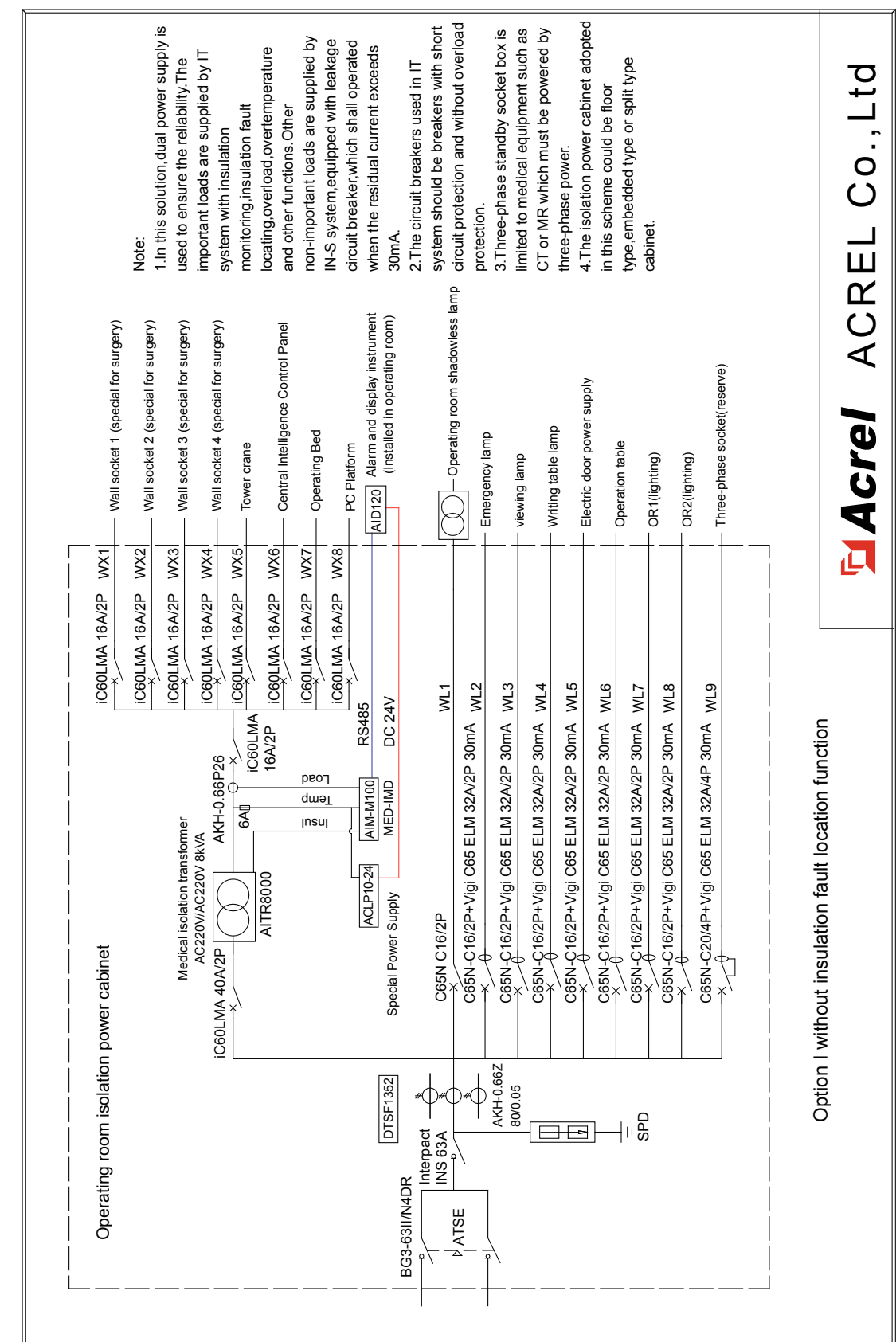
Front View



Bottom view

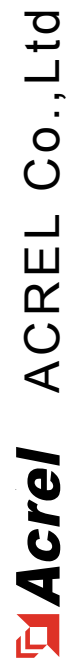
## 5.Applications

### 5.1 Operating Room Isolated Power Supply Design Drawing



Note:

1. In Option I, an IT system is used to supply power, which is equipped with AIM-M10 insulation monitor, monitors the insulation fault, the load current, and the temperature of isolation transformer.
2. The alarm and display device AID150, which usually installed in the nurses station, monitors many IT systems and generates audible and visible alarms when any fault occurs.
3. In Option II, the IT system is equipped with AIM-M200 insulation monitor, ASG150 test signal generator, and AIL100-4 fault locator, is to realize system insulation monitoring, fault locating, load monitoring and temperature monitoring of isolated transformer.
4. The alarm and display device AID200, which usually installed in the nurses station is used to monitor many IT systems and generate audible and visible alarms when any fault occurs.
5. 3 GGF-I series isolated power supply cabinet are available for option1 and 2.
6. All medical equipment for each bed in the ICU/CCU are powered by power outlet on the nursing tower.

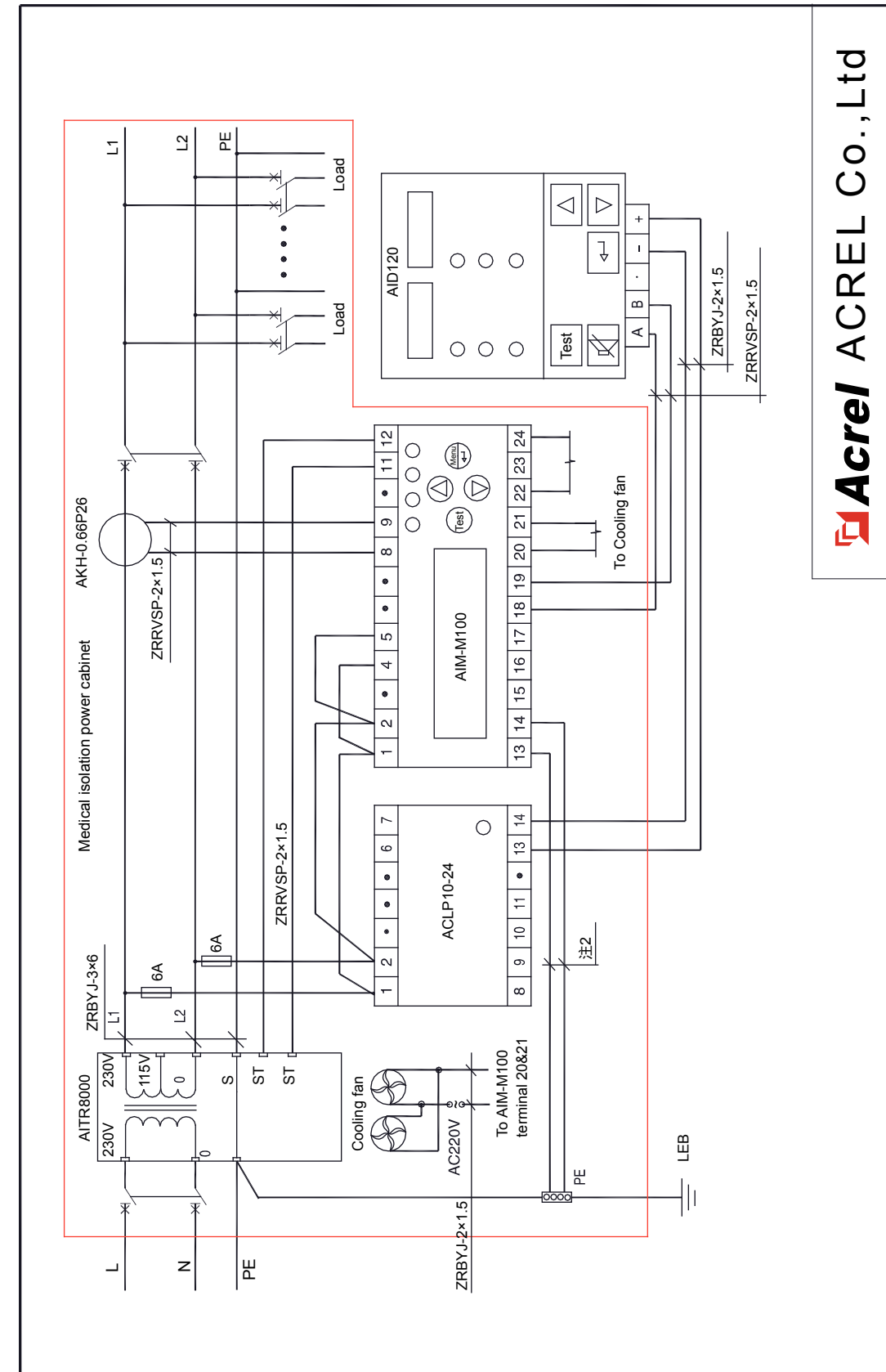


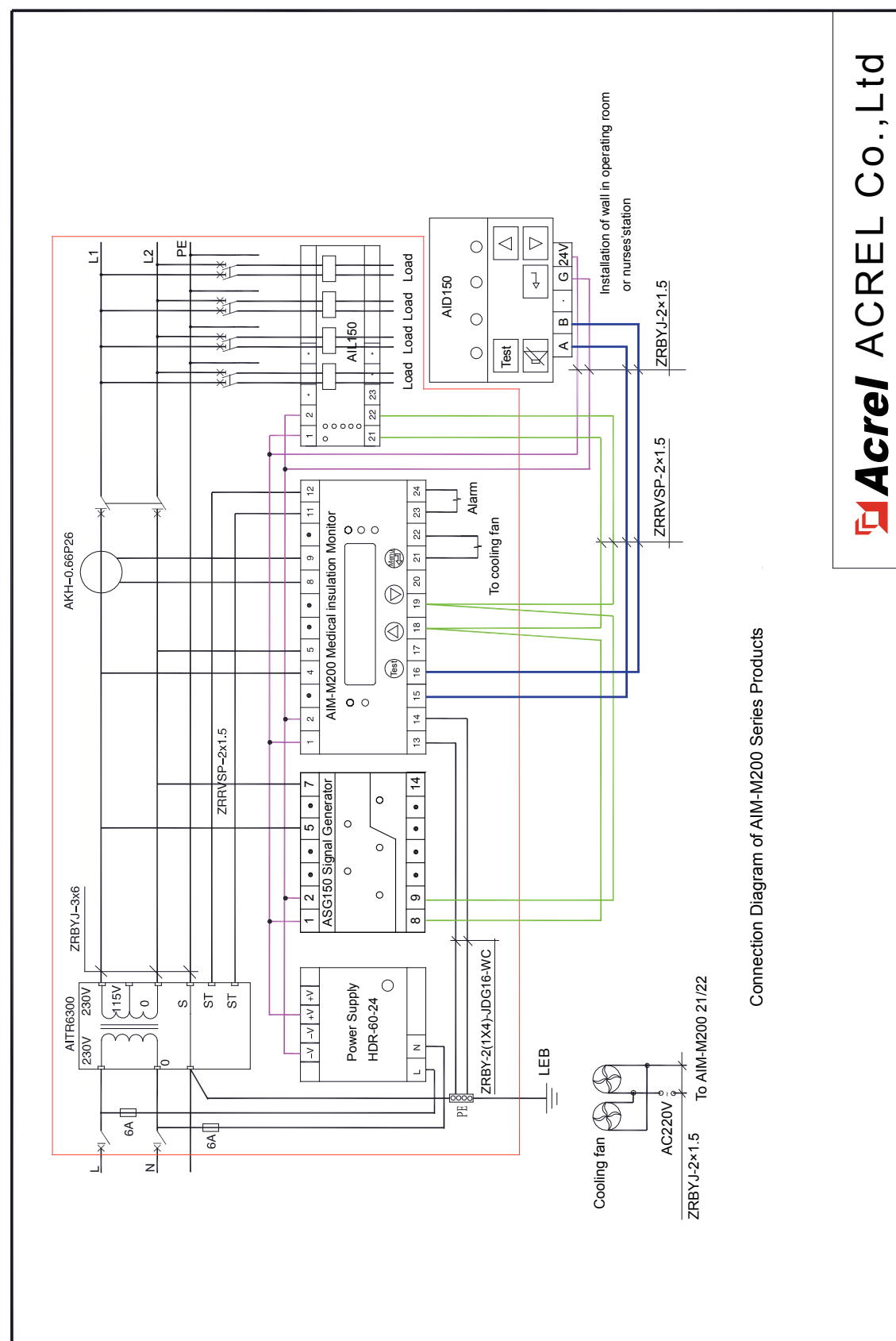
## Power Distribution Scheme of ICU/CCU Ward





## 22





## Medical Residual Current Monitoring Devices

### 1. Overview

Although the local IT system is not mandatory for power supply in some medical locations, such as rescue rooms, delivery rooms and dialysis centers, the safety requirements of distribution system are still very high. ACREL medical residual current monitoring device is developed for leakage current monitoring in such locations. It can monitor leakage current at microampere level, thus providing more precise leakage safety monitoring and ensuring the safe operation of electrical equipment.

### 2. Product Introduction

Medical residual current monitoring are mainly used to monitor the residual current of the trunk and branch of TN-S distribution system in medical places. When the residual current exceeds the pre-set threshold (where the threshold is less than 30 mA for leakage protection current, usually 6-10 mA), the monitor generate an alarm signal to the staff to deal with it in time so as to eliminate the potential safety hazards such as electrical fire, leakage and shock caused by insulation aging, disconnection, etc., and to provide clean, safe and continuous power supply for the equipment.

Medical residual current monitoring products mainly include AIM-R100 residual current monitor, AKH-0.66/L-20 residual current transformer, AID150 centralized alarm and display instrument and ACLP10-24 DC power supply.

#### 2.1 AIM-R100 Medical Residual Current Monitor



AIM-R100 Medical Residual Current Monitor adopts advanced microcontroller technology with high integration, compact size, convenient installation, intellectualization, digitalization and networking. It is suitable for residual current monitoring in medical group 1 and group 2.

#### Product function

- ◆ Monitoring and display of residual current in TN-S system (Type A)
- ◆ Monitoring the connection of residual current transformer
- ◆ Relay alarm output, LED alarm indication and other fault indication functions
- ◆ RS485 bus based on Modbus-RTU protocol
- ◆ Fault recording function, record the time of alarm occurrence and the fault type
- ◆ Self-test function, make sure the residual current detection function is normal or not
- ◆ Remote reset function, by which the residual current monitor can be reset remotely to eliminate alarm information.

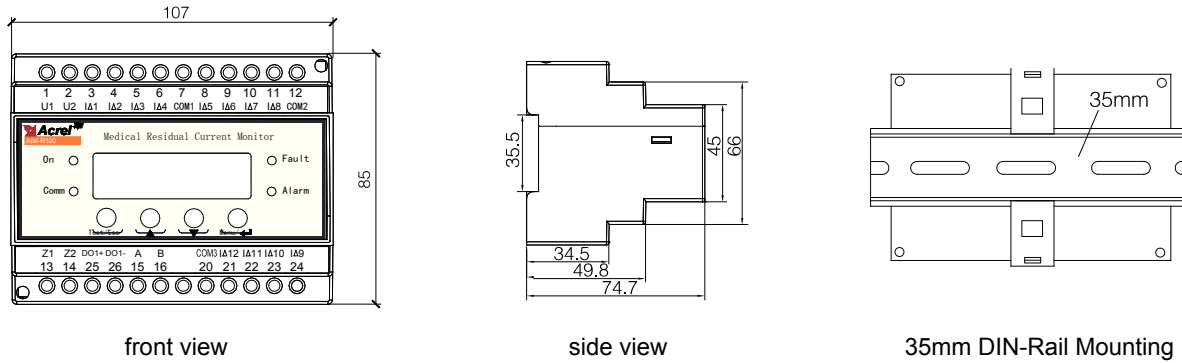
#### Standard

- ◆ IEC 60364-7-710:2016 Electrical installations of buildings—Part 7-710: Requirements for special installations or locations—Medical locations
- ◆ IEC62020: 2020 Electrical accessories—Residual current monitors (RCM) for household and similar uses

● Technical parameters

Parameters		Values
Auxiliary Power Supply	Voltage	AC220V±10%
	Power consumption	≤3VA
Residual Current Monitoring	Loops	12
	measuring range	0~5000mA
	Setting range of alarm value	6~1000mA
	Frequency	50Hz±5Hz
Alarm output	Output mode	1 Relay
	contact rating	AC250V/3A DC30V/3A
communication	interface	RS485
	Protocol	Modbus-RTU
Average trouble-free working hours		≥5000 Hours

● Overall and installation dimensions(unit: mm)



2.2 Residual current transformer

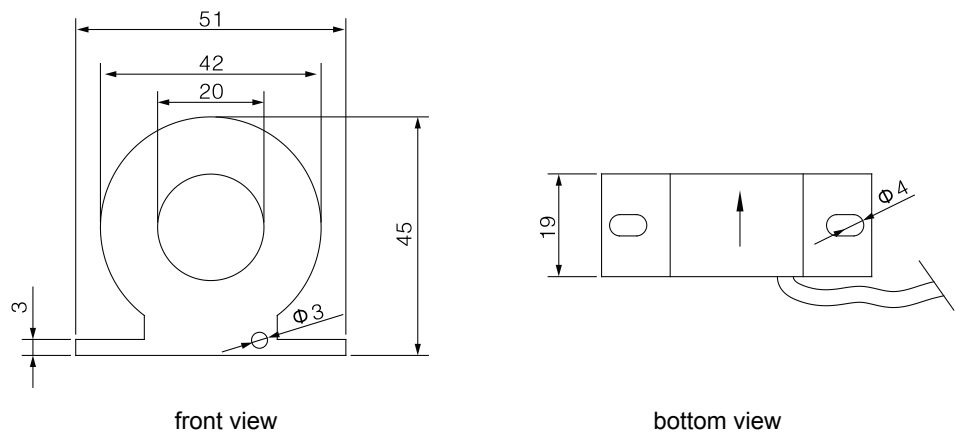


AKH-0.66/L-20 Residual Current Transformer is a designed for AIM-R100 residual current monitoring devices to monitor the residual current status of each circuit with the ratio 2000:1. It can be crewed in the cabinet, and the secondary side is fed with lead, which made it easy to install and use.

● Technical parameters

Type	AKH0.66/L-20
Level	0.2
Ratio	2000:1
Rated current (secondary)	50mA
Secondary output of CT	Self-contained lead

● Overall and installation dimensions(unit: mm)



2.3 Intelligent socket box

AMIS series intelligent socket box is an intelligent product developed by ACREL strict reference to relevant standards. This product is mainly used for TN-S power supply system in medical locations, biological laboratories and purification rooms. As wall socket boxes in these places, when the leakage of sockets or loads exceeds the set value, the socket box will generate alarm signals to remind the staff to check and deal with them in time so as to eliminate potential safety hazards such as personal shock and electrical fire caused by leakage, to provide safety and feasibility for the equipment. Reliable power supply



● Product function

- ◆ Leakage fault alarm function. Monitor the leakage current of the main circuit of the socket box and several branch sockets, monitor the leakage fault of the socket load, and generate alarm signal when the fault occurs.
- ◆ Equipment failure alarm function. Power on and alarm LED indicates the working state of the system
- ◆ RS485 bus based on modbus-RTU protocol. With RS485 communication interface, the socket box can be monitored by external alarm and display devices.
- ◆ Audible and visible alarm function. When fault occurs, an audible alarm sounds and one or more LED light to indicate the fault. The audible alarm can be eliminated manually by pressing the mute button, and the sound alarm function can also be turned off (by pressing the mute button for 3 seconds), but the LED alarm cannot be artificially cancelled until the fault is removed.
- ◆ Power failure alarm function (Just for AMIS 100-J3/B). By built-in battery module, when the socket box loses power, the monitoring system can still generate alarm signal indicating that the socket box has been cut off.

### 3.Application

### 3.1 Design of Residual Current Monitoring in Operating Room

**Operating room isolation power cabinet**

The diagram illustrates the electrical system for an operating room isolation power cabinet. It features a **Medical isolation transformer** (AC220V/AC220V 8kVA) connected to a **Medical isolation switch** (AKH-0.66P26). The system is divided into two main sections: a **Special Power Supply** and a **Residual Current Monitor**.

**Special Power Supply Section:**

- Input: BG3-63II/N4DR, ATSE, Interpact INS 63A, DTSF1352, AKH-0.66Z 80/0.05, SPD.
- Output: iC60LMA 40A/2P, AITR8000.
- Monitoring: Insul, Temp, Load, AKH-0.66P26.
- Control: ACLP10-24, AIM-M100, MED-IMD, AIM-R100.
- Output: RS485, DC 24V, AID150 (Alarm and display instrument).

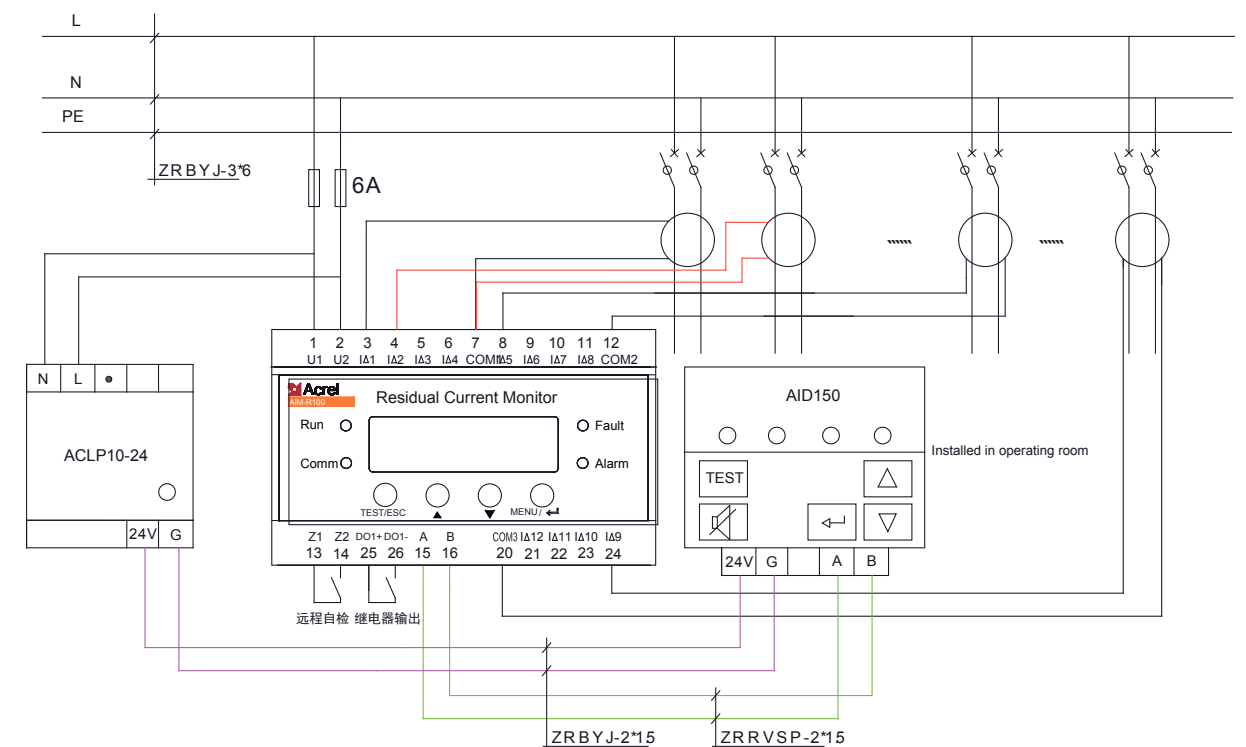
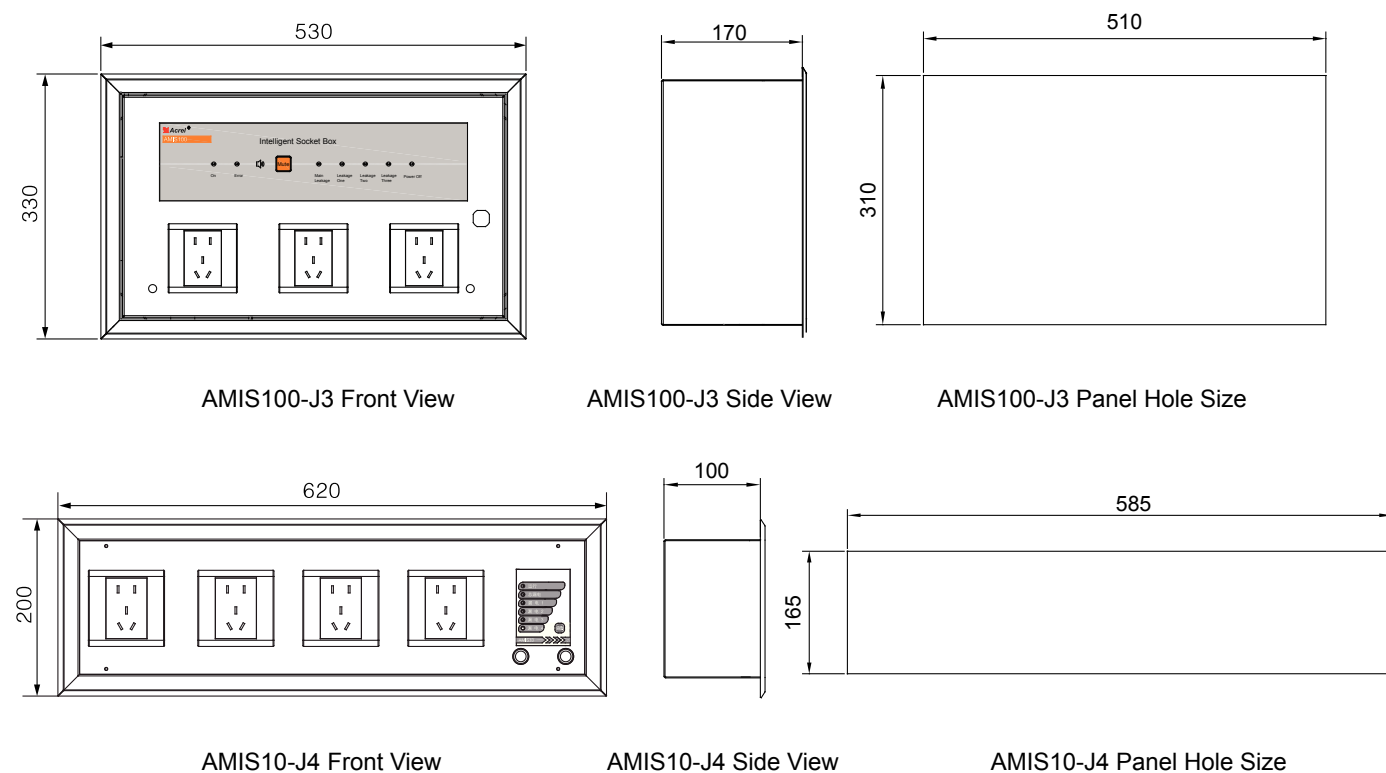
**Residual Current Monitor Section:**

- Input: C65N-C16/2P+Vigi C65 ELM 32A/2P 30mA.
- Output: WL1 to WL9.
- Monitoring: AKH-0.66/L-20.

**Loads and Connections:**

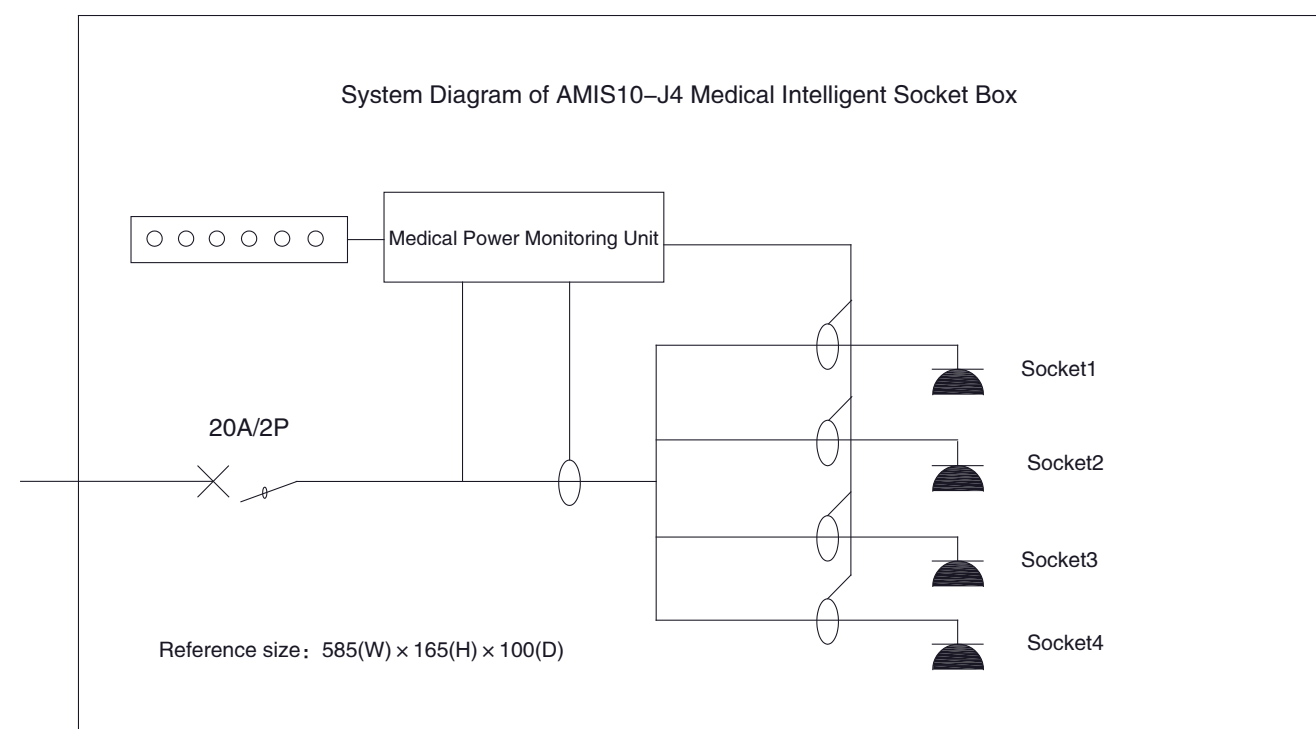
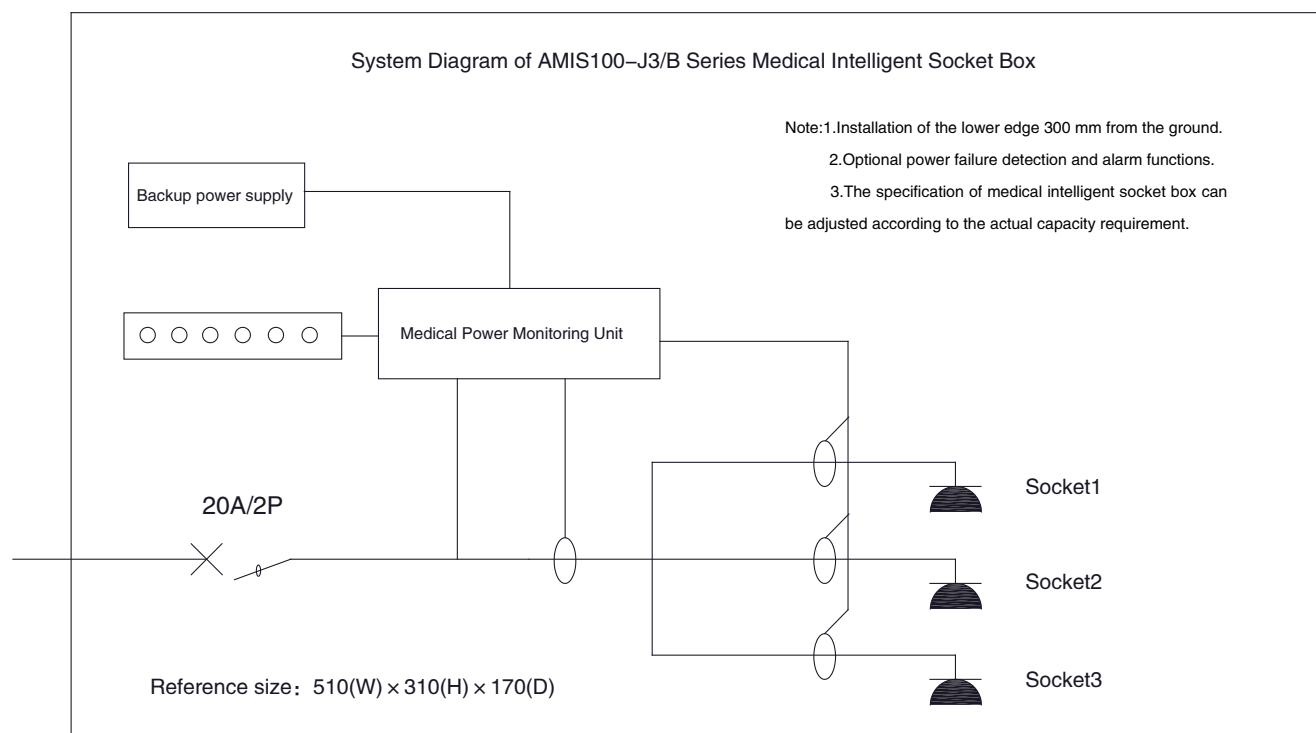
- Wall socket 1 (special for surgery) - WX1
- Wall socket 2 (special for surgery) - WX2
- Wall socket 3 (special for surgery) - WX3
- Wall socket 4 (special for surgery) - WX4
- Tower crane - WX5
- Central Intelligence Control Panel - WX6
- Operating Bed - WX7
- PC Platform - WX8
- Alarm and display instrument (Installed in operating room) - AID150
- (AC220/24V) Operating room shadowless lamp - WL1
- Emergency lamp - WL2
- Viewing lamp - WL3
- Writing table lamp - WL4
- Electric door power supply - WL5
- Operation table - WL6
- OR1 (lighting) - WL7
- OR2 (lighting) - WL8
- Three-phase socket (reserve) - WL9

### 3.2 Connection Diagram of Medical Residual Current Monitor





### 3.3 Diagram of Intelligent socket box



## Industrial Insulation Monitoring Products

### 1. Overview

With the development of industrial technology, leakage current poses a great threat to the safety of industrial production. In order to improve the continuity and reliability of power supply, ungrounded power supply system is adopted in many important industrial locations. AIM-T series industrial insulation monitor is mainly used in AC ungrounded system in industrial fields such as mine, glass plant, electric furnace and test equipment, metallurgical plant, chemical plant, explosion dangerous place, computer center and emergency power supply, to monitor the insulation condition of the IT system to the ground. When the grounding fault occurs in the system, the alarm should be given in time to remind the relevant personnel to troubleshoot. The design of products is strictly in accordance with national standards and norms.

### 2. Introduction

#### 2.1 Insulation Monitor and Insulation Monitor Fault Location Products

##### 2.1.1 AIM-T series industrial insulation monitor



AIM-T300



AIM-T500



AIM-T500L

AIM-T series insulation monitors are mainly used in it power distribution system of industrial sites, including AIM-T300, AIM-T500 and AIM-T500L. They are suitable for pure AC, pure DC and mixed AC / DC systems.

AIM-T300 is suitable for AC, DC and AC / DC hybrid systems below 450V, and AIM-T500 is suitable for AC, DC and AC / DC hybrid systems below 800V. Compared with AIM-T500, AIM-T500L adds insulation fault location function.

##### 2.1.2 Industrial insulation monitoring and fault locating products



ASG200



AIL200-12



AKH-0.66 L-45

Industrial insulation fault location products are used in combination with AIM-T500L insulation monitor, mainly including ASG200 test signal generator, AIL200-12 insulation fault locator, AK-0.66L series current transformer, they are suitable for IT distribution system with many outlet circuits.

2.1.3 Insulation coupling device



ACPD100



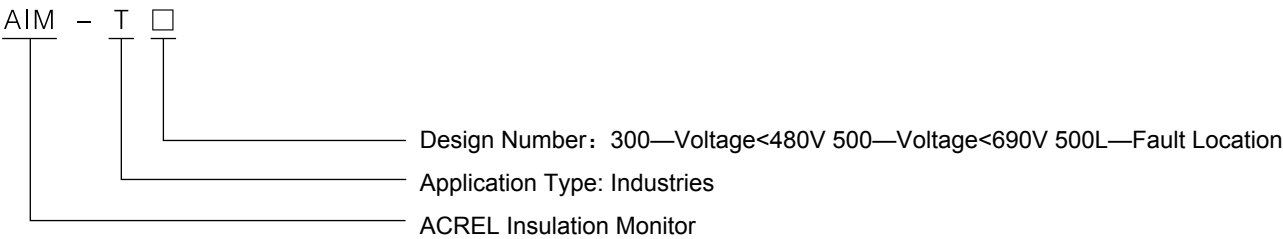
ACPD200

Insulation monitoring coupling device is used with AIM-T500 insulation monitor, mainly including ACPD100 and ACPD200. It is suitable for IT distribution system with AC voltage higher than 690V and DC voltage higher than 800V.

2.2 Standard

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.

2.3 Naming Rules



2.4 Technical Parameters

2.4.1 Insulation monitor technical parameters

Parameters \ Type		AIM-T300	AIM-T500	AIM-T500L
AUX POWER	Voltage	AC 85~265V;DC100~300		
	Power consumption	<8W		
Monitored IT system	Voltage	Up to 480V (AC、DC、AC&DC)		
	Frequency	40~60Hz		
Insulation Monitoring	measuring range	1kΩ~5MΩ	1kΩ~10MΩ	
	Alarm range	10kΩ~5MΩ	10kΩ~10MΩ	
	Relative uncertainty	1~10k: 10k; 10k~5M: ±10%	1~10k: 10k; 10k~10M: ±10%	
	Permissible system leakage capacitance	<150μF	<500μF	
	Response time	<6s	<5s	

Parameters \ Type		AIM-T300	AIM-T500	AIM-T500L
Communication		RS485,Modbus-RTU	RS485,Modbus-RTU	RS485,Modbus-RTU; CAN,customize
Internal parameters	Measuring current	<170μA		
	Insulation fault location	Without	Without	With
	EMC/EMR	IEC61326-2-4		
	Rated impulse voltage /pollution degree	8kV/III		
	Internal DC resistance	≥120kΩ		
output	Relay output	Early warning, alarm		Error, early warning, alarm
Environment	Operation temperature	-20~+60℃		
	Storage temperature	-20~+70℃		
	Relative humidity	5%-95%, No condensation		
	Altitude	≤2500m		

2.4.2 Test signal generator technical parameters

Auxiliary power	Voltage	AC 85~265V DC100~300V
	Power consumption	<7W
IT system	Rated voltage	Single phase AC 220V Three phase AC 0~690V DC 0~800V
Insulation fault location	Response time	<5s
	Location voltage	20V/5Hz
	Location current	0~10mA
Environment	EMC/EMR	IEC61326-2-4
	Operation temperature	-15~+55℃

2.4.3 Insulation fault locator technical parameters

Auxiliary power	Voltage	AC 85-265V DC100~300V
	Power consumption	<5W
Insulation fault location	Response time	<12s
	Location voltage	无
	Location current	无
	Response sensitivity	>0.5mA
Output	Relay output	Alarm
Environment	EMC/EMR	IEC61326-2-4
	Operation temperature	-15~+55℃

2.4.4 AKH-0.66L series current transformer technical parameters

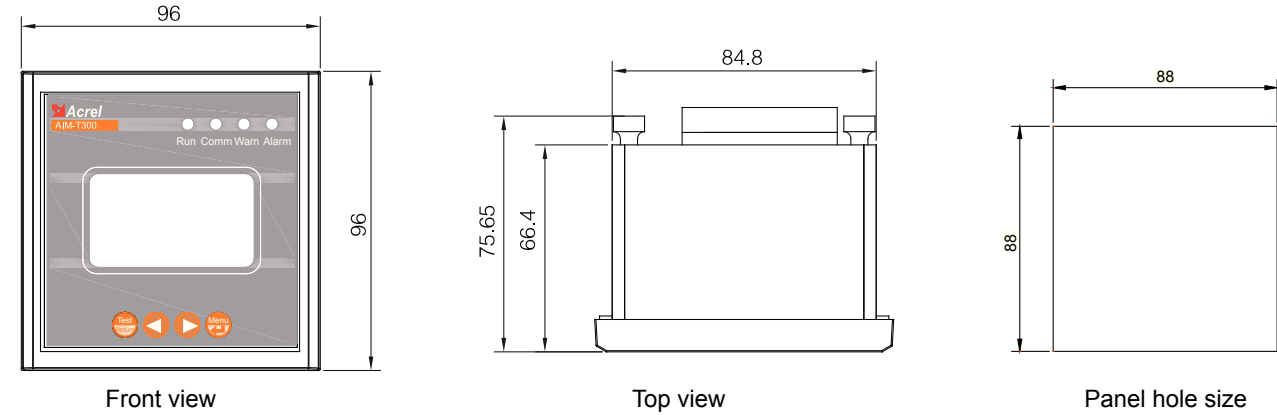
Type	Rated current	Ratio	Level	Overload multiple
L-45	16-100A	5A: 5mA	1	10
L-80	100-250A			
L-100	250-400A			
L-150	400-800A			
L-200	800-1500A			

2.4.5 Insulation coupling device technical parameters

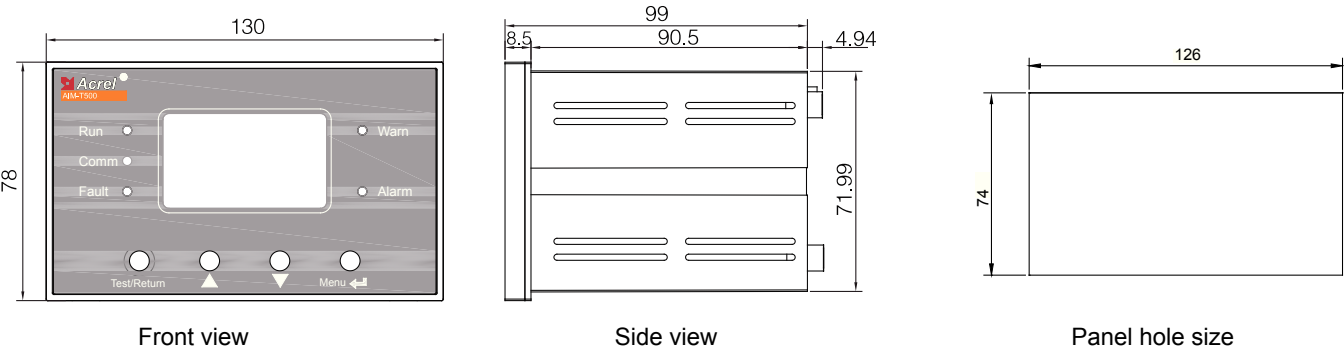
Type	ACPD100	ACPD200
Applicable system	single-phase AC,DC ungrounded system	three-phase AC,DC ungrounded system
Voltage level	AC 0~1150V, or DC 0~1760V	AC 0~1650V, or AC system with DC components 0~1300V
DC resistance	≥160kΩ	AK1≥225kΩ
Operation temperature	-10~+55℃	
Storage temperature	-20~+70℃	
Degree of protection	IP30	

2.5 Overall and Installation Dimensions (unit: mm)

• AIM-T300

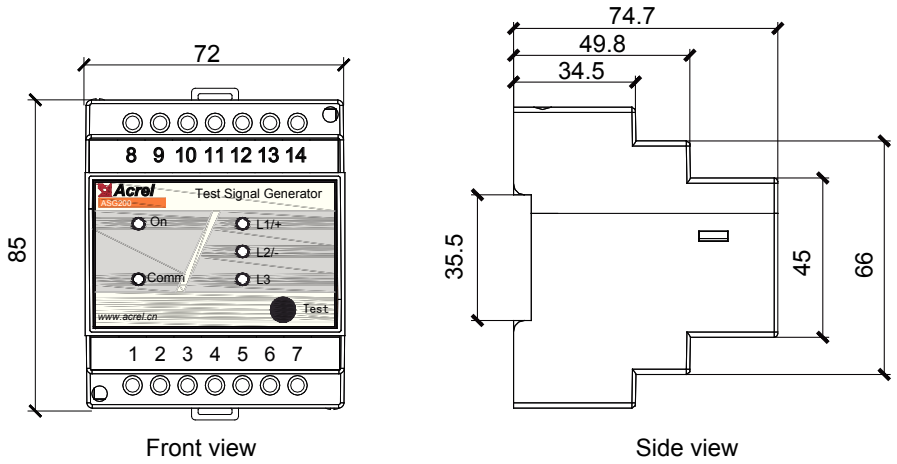


• AIM-T500

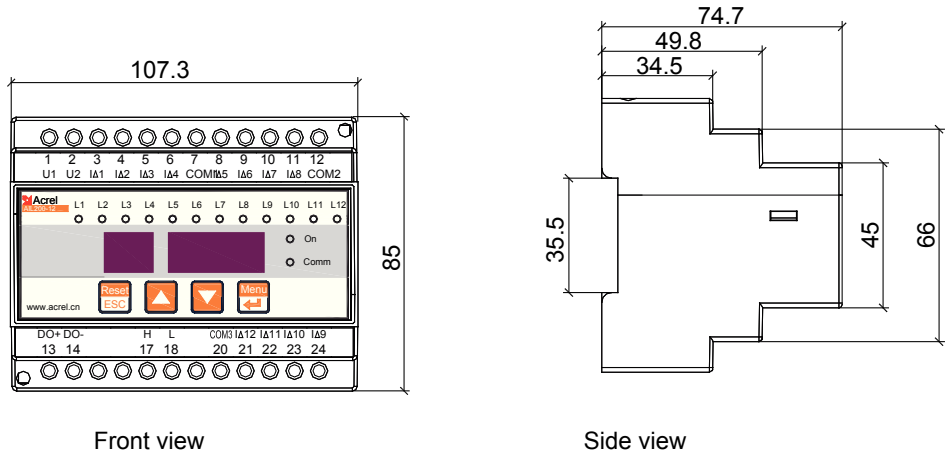


Note: AIM-T500L and AIM-T500 have the same appearance size.

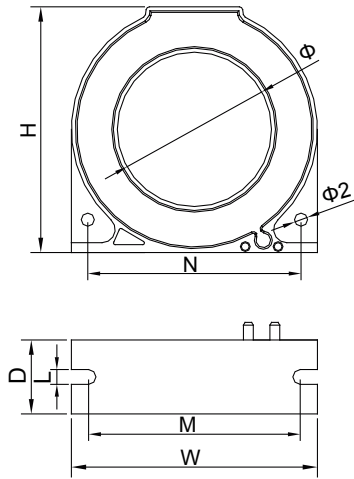
• ASG200



• AIL200-12



• AKH-0.66L series current transformer

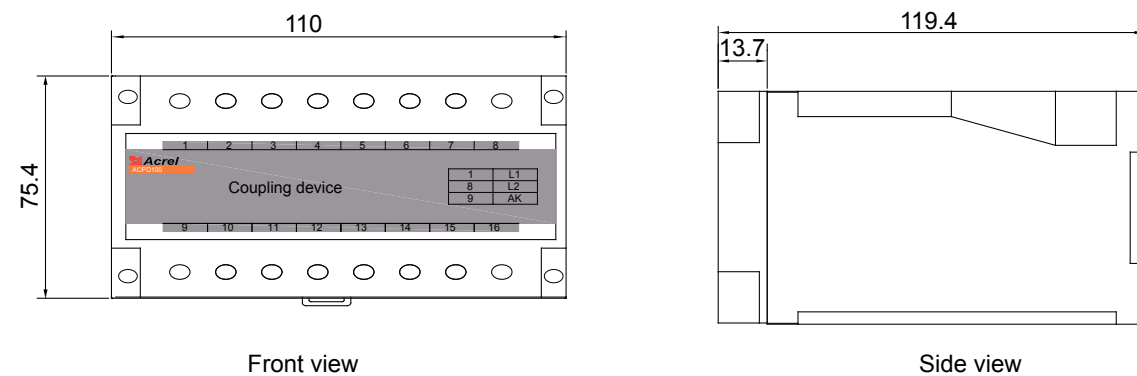


The size parameters of AKH-0.66L series current transformer are shown in the table below:

type	outline dimension (mm)			Hole size (mm)	Installation size (mm)				tolerance (mm)	Weight (g)
	W	H	D		Φ	M	N	L		
L45	75	75	22	46	65	65	4.3	4	±1	200±10
L80	120	120	23	81	105	105	4.4	4		380±20
L100	140	140	23	100	124	124	4.6	4		460±30
L150	196	205	24	150	175	180	4.6	6		850±50
L200	240	247	28	200	214	212	5	6		1200±50

Note: the model of this accessory should be determined according to the actual demand, and the current transformer with corresponding specifications should be selected according to the rated current of the circuit and the thickness of the conductor. (If you have special requirements for the shape and range of the transformer, you can call to discuss).

● ACPD series insulation coupling device

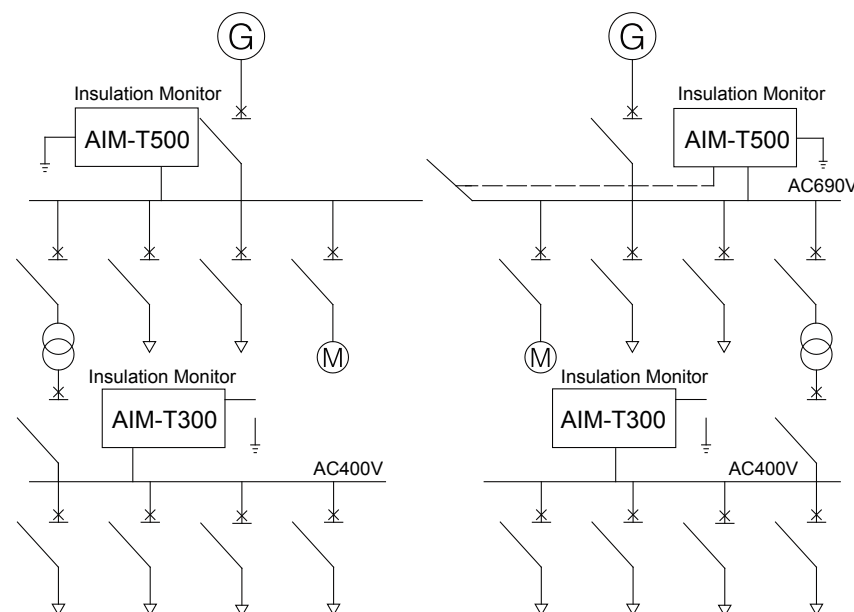


Note: ACPD100 and ACPD200 have the same appearance size.

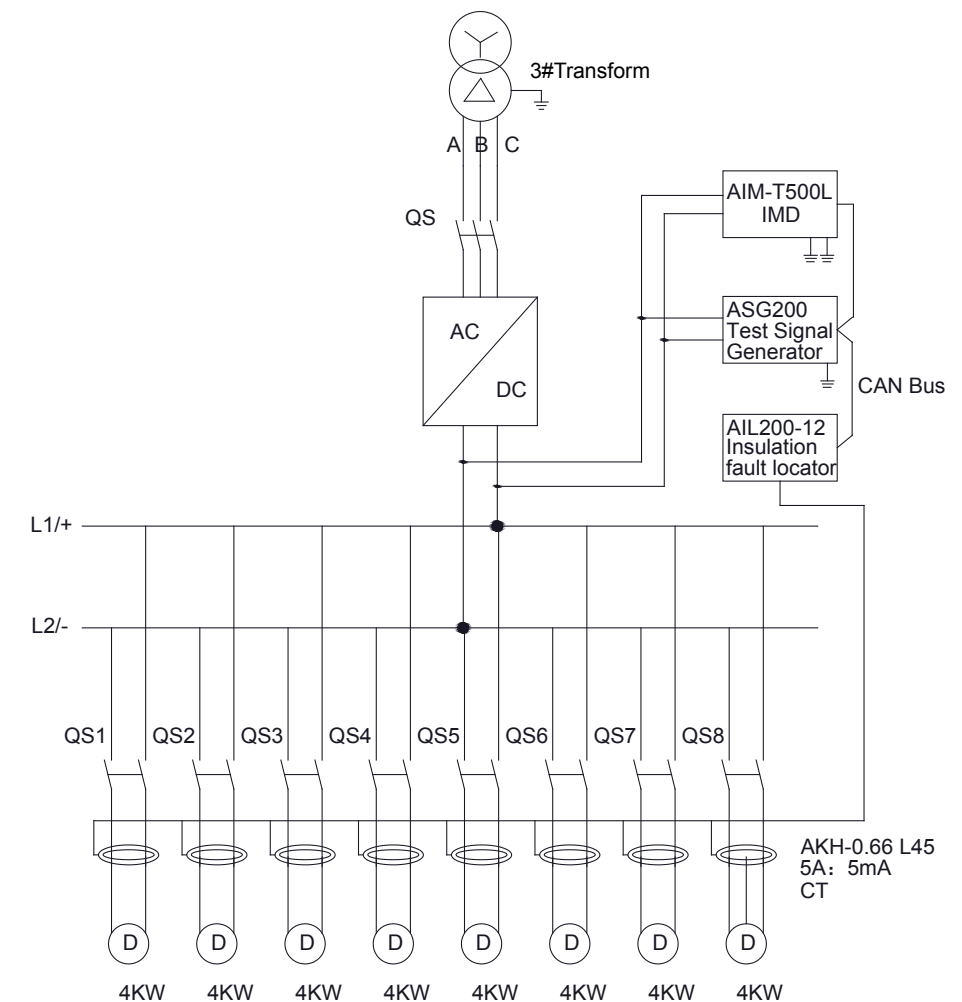
### 3.Product Applications

#### 3.1 Application Schematic Diagram of AIM-T Series

AIM-T300 Insulation Monitor is suitable for AC, DC and AC-DC hybrid ungrounded systems up to 450V. AIM-T500 Insulation Monitor is suitable for AC, DC and AC-DC hybrid ungrounded systems up to 800V. It can real-time monitor the insulation status of IT system to the ground. At the same time, AIM-T500 supports the bus interconnection function of two IT systems, that is, when two IT systems are combined into one IT system through the bus, only one insulation monitor works, and the other automatically stops the insulation monitoring function after the bus switch closes. The application schematic diagram of the insulation monitoring device in the main distribution system is shown below.








When IT power distribution system with multiple circuit in need of fault location, we can use the AIM - T500L series insulation monitoring and fault location system, when the system insulation to reduce or ground fault occurs, the AIM - T500L insulation monitor alarms, ASG200 test signal generator and AIL200-12 insulation fault locator starts to work, after measuring and calculation, locate fault phase line and loop will be showed, the application of insulation monitoring and fault location in distribution systems as shown in the figure below:



#### 3.2 Model Selection

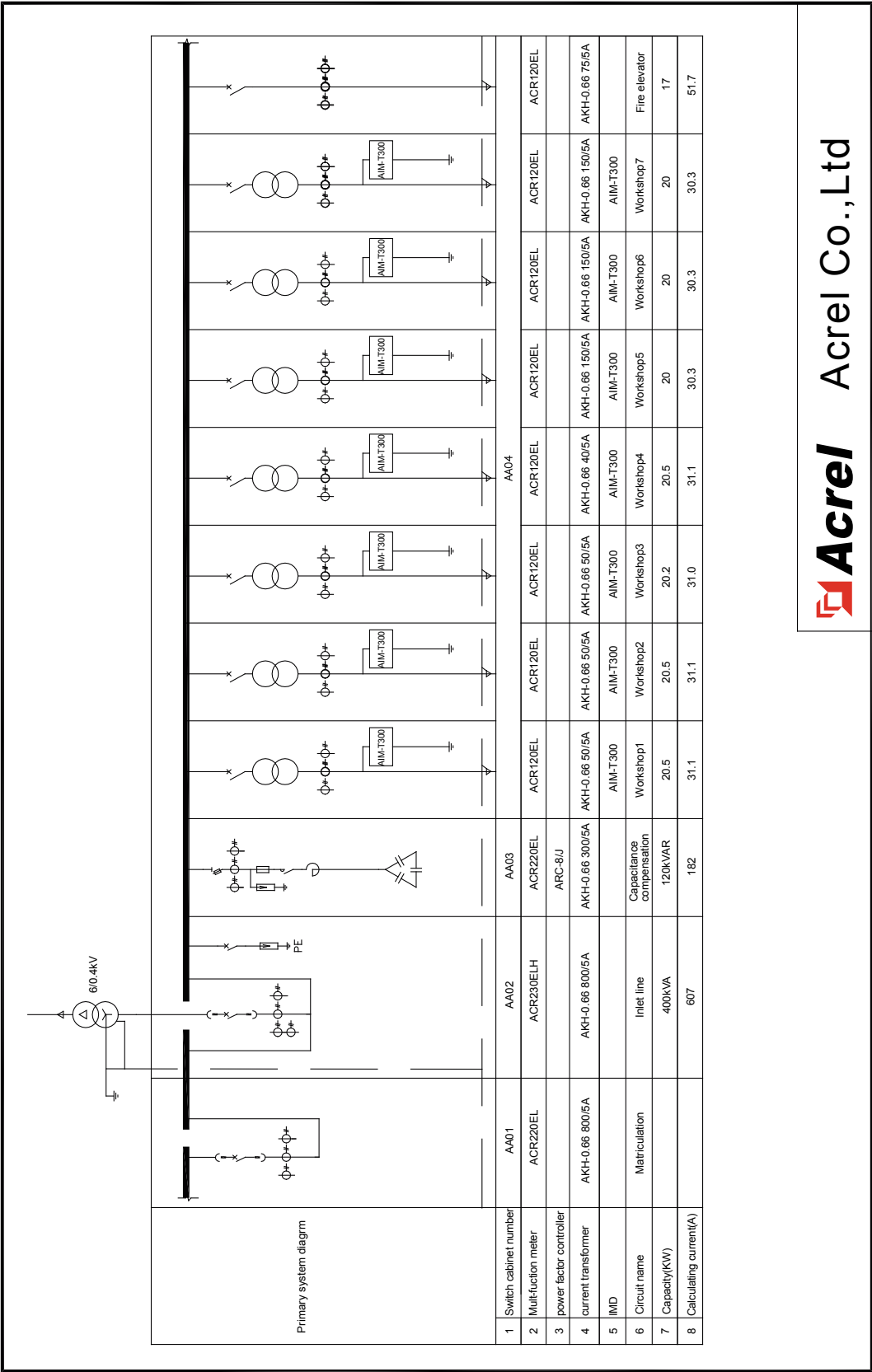
Application occasions	Pictures	Types	Main functions
Mines, glass factories, electric furnaces and test equipment, metallurgical factories, chemical factories, explosion hazard sites, computer centers and emergency power supply sites using IT systems up to 480V		AIM-T300	Insulation resistance monitoring of IT system to earth, 2 relays output, RS485/Modbus protocol, Fault Event Recording, Self-check function, Break-line Monitoring Function
Mines, glass factories, electric furnaces and test equipment, metallurgical factories, chemical factories, explosion hazard sites, computer centers and emergency power supply sites using IT systems up to AC690V or DC800V		AIM-T500/ AIM-T500L	Insulation resistance monitoring of IT system to earth, 3 relays output, RS485/Modbus protocol, Fault Event Recording, Self-check function, Break-line Monitoring Function, Support multiple IT systems interconnection, Insulation fault location (only AIM-T500L).



Application occasions	Pictures	Types	Main functions
Used with AIM-T500L		ASG200	generating positioning signal, Indicating the fault phase line, manual start positioning.
Used with AIM-T500L		AIL200-12	Locate and indicate the fault branch, Single locator can locate 12 branches, Each IT system can be connected with 90 locators to locate 1080 branches in total.
Used with AIM-T500, Specifications are selected according to rated current		AKH-0.66 L-xx	Monitor the positioning current of the loop
Used with AIM-T500		ACPD100	For single-phase AC 0~1150V, DC 0~1760V ungrounded system.
Used with AIM-T500		ACPD200	For AC three-phase 0~1650V, or AC system with DC elements (such as rectifier) 0~1300V ungrounded system

4. Typical Application Diagram

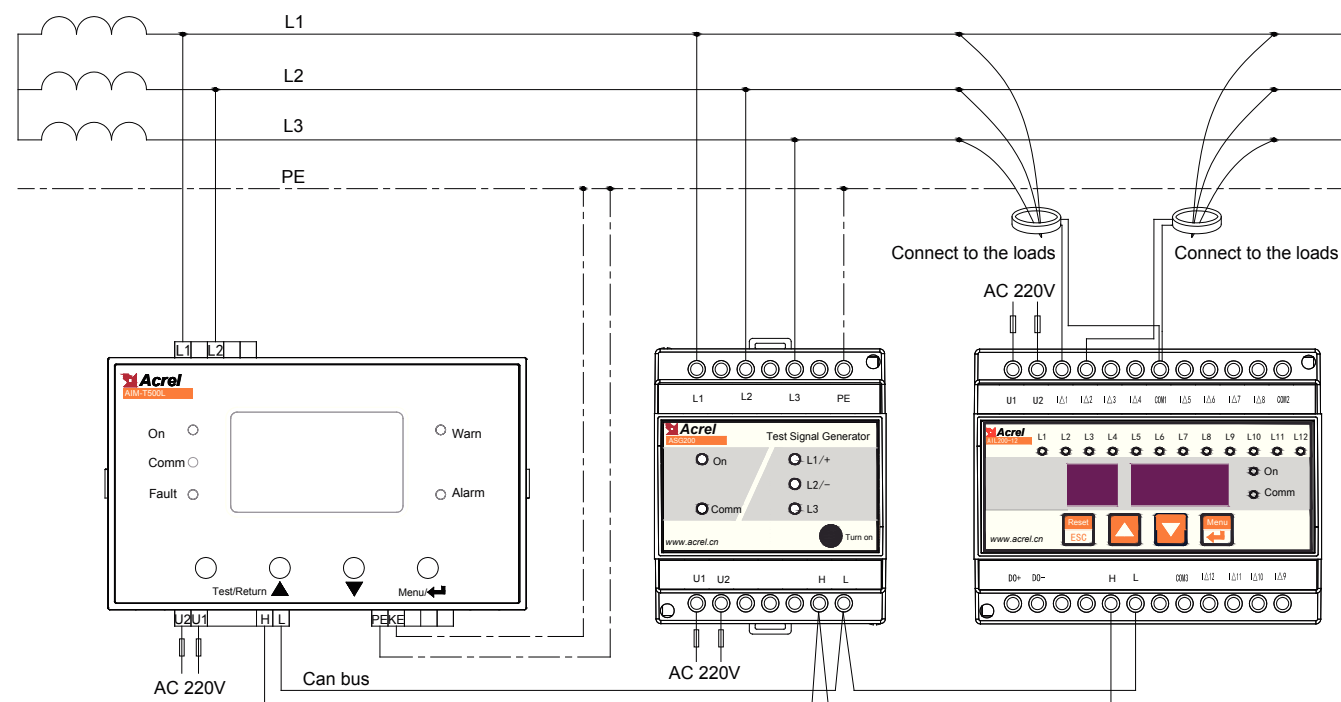
4.1 AIM-T300 Typical Application Diagram



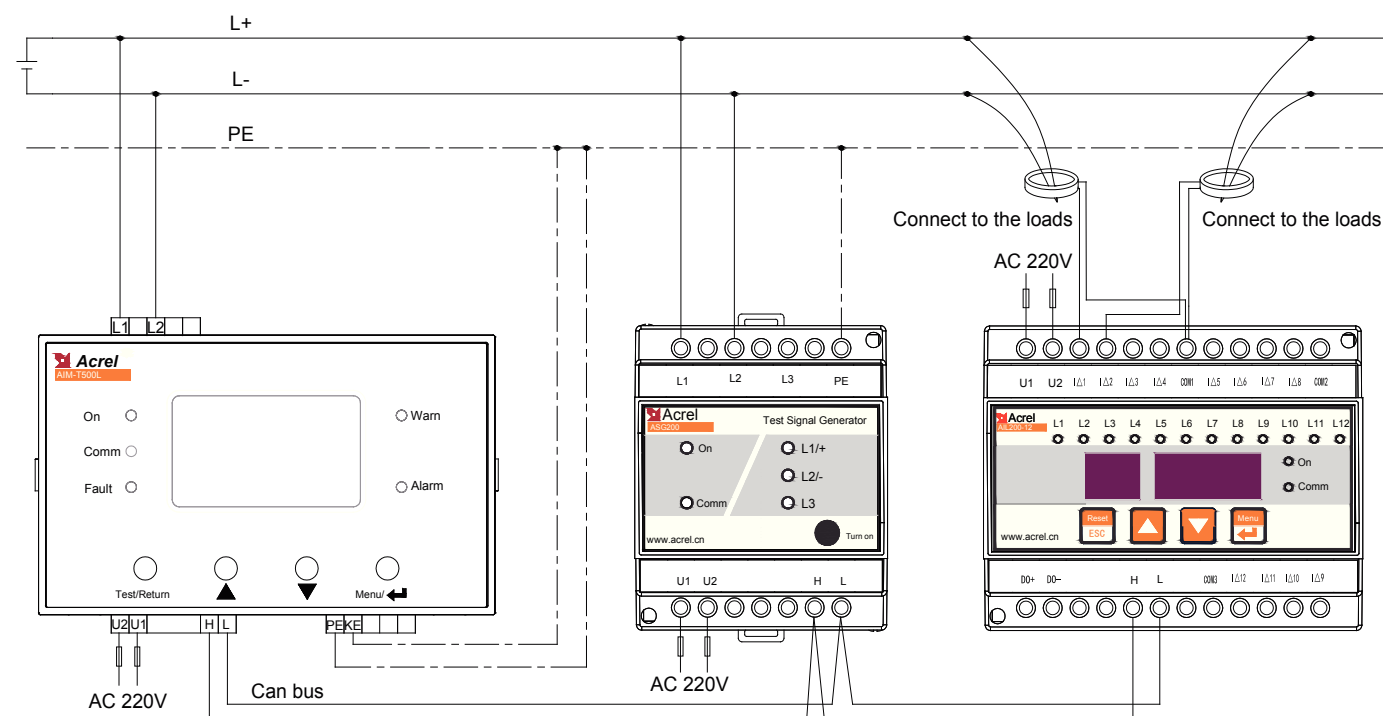


#### 4.5 AIM-T500L Typical Wiring Diagram

- Wiring diagram to 3AC IT system with AIM-T500L, ASG200 and AIL200-12.



- Wiring diagram to DC system with AIM-T500L, ASG200 and AIL200-12.



#### Annex

##### 1. IT / TN / TT Grounding System Introduction

According to the current national standard "Code for design of low voltage electrical installations" , low-voltage distribution system has three ground forms: IT system, TT system, TN systems.

The first letter indicates the relationship between power and ground:

T—the power source has one point directly connected to the ground ;

I—the power source is insulated with the ground or one point is grounded through impedance.

The second letter indicates the relationship between the leakage of electrical installations conductive part and the land :

T—the grounded pole connected with exposed conductible part of the load side electrical installation and the power source grounded pole have no electrical relation ;

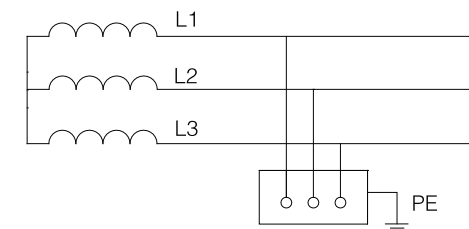
N—The exposed conductive parts of electrical equipment and power supply termination sites have a direct electrical connection.。

When there are other letters, these letters represent a combination of neutral and protective wire:

S—Neutral line and the protection line are separated :

C—Neutral line and the protection line are unity.

##### 1.1 IT System



IT system diagram

- Earthing mode

The power source is insulated with the ground or one point is grounded through impedance, and the exposed conductible part of the electrical appliance is grounded.

- Protection Technology

◆ All exposed conductive parts of electrical equipment in the IT system are Connected to each other and grounded;

◆ Insulation monitoring device is installed in IT systems ,When the system first insulation fault occurs(one phase in the three-phase IT system is grounded, or a wire in single-phase IT systems is grounded), Insulation monitors can produce insulation fault alarm. At this time ,the IT system becomes TN-S system, and it can continue to run;

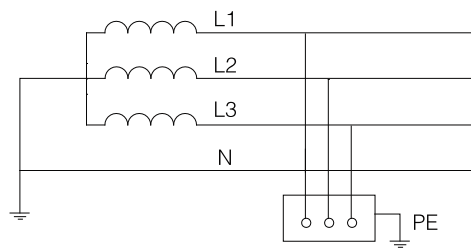
◆ System which is installed over current protection device (circuit breaker or fuse) cut off power supply in the event of a second failure (such as two phases in the three-phase IT systems or two wires in single-phase IT systems are grounded).

- Main features

◆ The system has the best continuity of supply, once the first earth leakage fault occurs in internal power supply system, it Will not cause a circuit breaker or fuse action;

◆ Because the system is not grounded, system has the highest security of supply, Leakage current is greatly reduced, to avoid personal shock hazard, and also improve the fire safety.

1.2 TT System



TT system diagram

• Earthing mode

The neutral point of the power is directly connected to ground, and the grounded pole connected with exposed conductible part of the load side electrical installation and the power source grounded pole have no electrical relation;

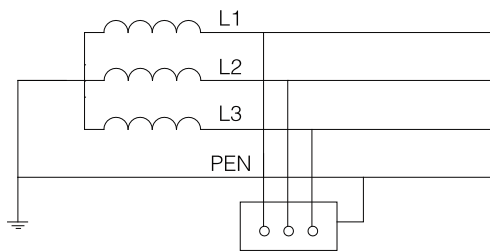
• Protection Technology

All exposed conductive parts of electrical equipment are connected to the ground and residual current operated protective device (RCD) is installed in the system. To ensure personal safety, RCD's rated residual operating current should be less than 30mA (human safety current value).

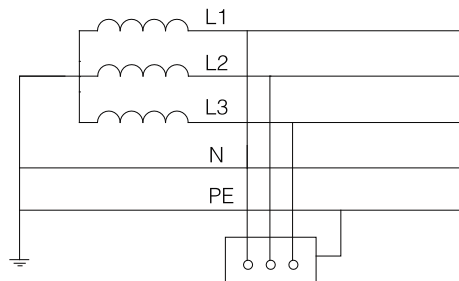
• Main features

When every insulation fault occurs, the system immediately cut off the power. But because RCD which is installed in each circuit ,You can switch the leakage large circuit (the circuit which insulation failure occurs), so the power supply interruption is limited to the faulty circuit;

1.3 TN,TN–S,TN–C and TN–C–S System



TN-C system diagram



TN-S system diagram

• Earthing mode

The neutral point of the power is directly connected to ground, All exposed conductive parts of electrical equipment and external conductive parts are connected to the neutral line.Neutral line (N line) and the protection line (PE line) in TN-S systems are separated. Neutral line (N line) and protection line (PE line) in TN-C system merge into one line(PEN line).If the TN-C and TN-S are used in the same system, that is TN-C-S system, However, TN-C system can not be in the next level of TN-S system.

• Protection Technology

- ◆ Exposed conductive parts and the neutral line are connected and grounded ,this is mandatory requirements in TN system.
- ◆ Over current device (RCD) is installed in the system, and it cuts off the power in the first insulation fault .

• Main features

- ◆ When every insulation fault occurs, the system immediately cut off the power. But because RCD which is installed in each circuit ,You can switch the leakage large circuit (the circuit which insulation failure occurs), so the power supply interruption is limited to the faulty circuit;
- ◆ When an insulation failure occurs, the system will have a greater short-circuit current, with a great fire risk.

2. Examples of Classification and Ranking of Safety Facilities in Medical Locations

2.1 Summary

Health facilities are divided into group 0, group 1 and group 2 by the use of the contact member in contact with the site and place according to 《Electrical installations of buildings—Part 7-710: Requirements for special installations or locations—Medical locations》 (IEC 60364-7-710:2016),Specifically the following table:

Examples of Classification and Ranking of Safety Facilities in Medical Locations

Medical location	Group			Class	
	0	1	2	≤0.5s	0.5s<≤15s
1.Massage room	X	X			X
2.Bedrooms		X			X
3.Delivery room		X	X	X <sup>a</sup>	X
4.ECG, EEG, EHG room		X			X
5.Endoscopic room		X <sup>b</sup>	X	X	X <sup>b</sup>
6.Examination or treatment room		X		X	X
7.Urology room		X <sup>b</sup>	X	X	X <sup>b</sup>
8.Radiological diagnostic and therapy room		X	X		X
9.Hydrotherapy room		X			X
10.Physiotherapy room		X			X
11.Anaesthetic room			X	X <sup>a</sup>	X
12.Operating theatre			X	X <sup>a</sup>	X
13.Operating preparation room			X	X <sup>a</sup>	X
14.Operating plaster room			X	X <sup>a</sup>	X
15.Operating recovery room			X	X <sup>a</sup>	X
16.Heart catheterization room			X	X <sup>a</sup>	X
17.Intensive care room			X	X <sup>a</sup>	X
18.Angiographic examination room			X	X <sup>a</sup>	X
19.Haemodialysis room		X	X		X
20.Magnetic resonance imaging (MRI) room		X	X	X	X
21.Nuclear medicine		X	X		X
22.Premature baby room			X	X <sup>a</sup>	X
23.Intermediate Care Unit (IMCU)			X	X	X

a:Luminaries and life-support ME equipment which needs power supply within 0.5s or less.  
b:Not being an operating theatre.

Note:

1. Medical locations Category Description:

- Group 0 :medical location where no applied parts are intended to be used
- Group 1:medical location where applied parts are intended to be used as follows:
  - externally;
  - invasively to any part of the body, except where group 2 applies

Group 2:medical location where applied parts are intended to be used in applications such as intracardiac procedures, operating theatres and vital treatment where discontinuity (failure) of the supply can cause danger to life



In addition to electric power switching time requirements listed in this table, The duration of 24 h can be reduced to a minimum of 3 h if the medical requirements and the use of the location, including any treatment, can be concluded and if the building can be evacuated in a time which is well within 24 h.

This table is taken from «Electrical installations of buildings—Part 7-710: Requirements for special installations or locations—Medical locations» (IEC 60364-7-710:2016), and add the IT setup requirements.

## 2.2 Power select in different places

Because there is no medical equipment in use in group 0 and group 1 medical facilities, Or associated equipment is only used in non-lethal part of the body, it is possible to use the power devices and leakage current protection of ordinary buildings. TN systems or TT systems are generally used in these places, and are equipped with residual current protection device RCD, when the leakage current exceeds 30mA of leakage accidents, When the leakage current exceeds 30mA leakage accident happens,

RCD breaking fault loop. Even though the cause of medical device is powered down, it will not have a significant impact on the patient, the doctor's diagnosis or treatment may be restarted.

Patients in group 2, often in a state of incapacity, they must rely on some medical equipment to sustain life, or in operation state, any electrical failure of medical devices will give patients to bring about life-threatening. Therefore, we must ensure the reliability of the electric power system of medical equipment, Both to ensure the device directly to the patient leakage current is less than 10μA, and ensuring at the drain current or over current state, a reliable guarantee uninterrupted power supply is working. Given the above two factors, IT supply system must be used in group 2 according to IEC60364-7-710: 2016. In the "civil electrical design specifications" (JGJ 16-2008) Section 12.8.6 : in group 2 medical facilities, power supply circuit which is to sustain life, surgery and other medical electrical equipment and system in "patient area" should be used of medical IT systems.

## 3. Requirements for medical electrical device places in IEC 60364-7-710: 2016

Terms are as follows in GB16895.24-2005/IEC 60364-7-710:2016 Electrical installations of buildings—Part 7-710: Requirements for special installations or locations—Medical locations.

### 710.312.2 Types of system earthing

The TN-C system is not allowed in medical locations and medical buildings downstream of the main distribution board.

### 710.413. Automatic disconnection of supply

#### 710.413.1.3 TN systems

In final circuits of group 1 rated up to 32 A residual current devices with a maximum residual operating current of 30 mA shall be used (additional protection).

In medical locations of group 2, protection by automatic disconnection of supply by means of residual current protective devices with the rated residual-operating-current not exceeding 30 mA shall only be used on the following circuits:

- circuits for the supply of operating tables;
- circuits for X-ray units;

NOTE The requirement is mainly applicable to mobile X-ray units brought into group 2 locations.

- circuits for large equipment with a rated power greater than 5 kVA;
- circuits for non-critical electrical equipment (non life support).

Care shall be taken to ensure that simultaneous use of many items of such equipment connected to the same circuit cannot cause unwanted tripping of the residual current protective device (RCD).

In medical locations of group 1 and group 2, where RCDs are required by this subclause, only type A or type B shall be selected, depending on the possible fault-current arising.

NOTE It is recommended that TN-S systems are monitored to ensure the insulation level of all live conductors.

### 710.413.1.4 TT Systems

In medical locations of group 1 and group 2, the requirements of TN systems (see 710.413.1.3) apply and in all cases residual current protective devices shall be used.

### 710.413.1.5 Medical IT system

NOTE 1: In the United States such a system is identified as an "Isolated Power System".

In group 2 medical locations, the medical IT system shall be used for circuits supplying medical electrical equipment and systems intended for life support, surgical applications and other electrical equipment located in the "patient environment", excluding equipment listed in 713.413.1.3.

For each group of rooms serving the same function, at least one separate medical IT system is necessary. The medical IT system shall be equipped with an insulation monitoring device in accordance with IEC 61557-8 with the following specific requirements:

- ◆ The a.c. internal impedance shall be at least 100 kΩ;
- ◆ The test voltage shall not be greater than 25 V d.c.;
- ◆ The injected current, even under fault conditions, shall not be greater than 1 mA peak;
- ◆ Indication shall take place at the latest when the insulation resistance has decreased to 50 kΩ. A test

device shall be provided;

NOTE 2: In Germany, an indication is required if the earth or wiring connection is lost.

NOTE 3: The necessary additional requirements on IMDs given above are at this time not covered in the equipment standard IEC 61557-8. They will be removed from this publication as soon as they have been treated in the relevant equipment standard.

For each medical IT system, an acoustic and visual alarm system incorporating the following components shall be arranged at a suitable place so that it can be permanently monitored (audible and visual signals) by the medical staff:

- ◆ a green signal lamp to indicate normal operation;
- ◆ a yellow signal lamp which lights when the minimum value set for the insulation resistance is reached. It shall not be possible for this light to be cancelled or disconnected;
- ◆ an audible alarm which sounds when the minimum value set for the insulation resistance is reached. This audible alarm may be silenced.

◆ The yellow signal shall go out on removal of the fault and when the normal condition is restored.

◆ When only one device is powered by a dedicated IT transformer, the transformer may not be equipped with an insulation monitor. Monitoring of overload and high temperature for the medical IT transformer is required.

710.512.1.1 Transformers for medical IT systems

- ◆ Transformers shall be installed in close proximity to, inside or outside, the medical location and placed in cabinets or enclosures to prevent unintentional contact with live parts.
- ◆ The rated voltage Un on the secondary side of transformers shall not exceed 250 V a.c.

710.512.1.6 Medical IT systems for group 2 medical locations

- ◆ Transformers shall be in accordance with IEC 61558-2-15, with the following additional requirements:
- ◆ The leakage current of the output winding to earth and the leakage current of the enclosure, when measured in no-load condition and the transformer supplied at rated voltage and rated frequency, shall not exceed 0.5 mA.
- ◆ Single-phase transformers shall be used to form the medical IT systems for portable and fixed equipment and the rated output shall not be less than 0,5 kVA and shall not exceed 10 kVA.
- ◆ If the supply of three-phase loads via an IT system is also required, a separate three-phase transformer shall be provided for this purpose with output line-to-line voltage not exceeding 250 V.

710.516.5.2.2 Specific Requirements for Safe Power Supply Facilities

710.516.5.2.2.1 Power supply with switching time less than or equal to 0.5s

When a voltage failure occurs in one or more conductors of the distribution panel, the dedicated safe power supply shall maintain the power supply of the operating table illuminator and other important illuminators, such as the endoscope lamp, for at least 3 hours. The switching time for restoring power supply should not exceed 0.5s.

Main Achievements

1. Medical IT Products

- Bozhou Sixth People's Hospital
- Chuzhou Second People's Hospital
- Wuhu First People's Hospital
- 301 Hospital of PLA
- Beijing Friendship Hospital Affiliated to Capital Medical University
- Beijing Naval General Hospital
- Beijing Huairou Hospital
- Beijing Sino-Japanese Friendship Hospital
- Peking University First Hospital
- Shougang Hospital
- Huairou Hospital, Beijing Hospital of Traditional Chinese Medicine
- Peking Union Medical College Hospital
- Yongchuan 2nd People's Hospital of Chongqing Medical University
- 324 Hospital of PLA
- Chongqing Ankang Hospital
- Chongqing Yongchuan District People's Hospital
- Yunyang County People's Hospital
- Fuzhou Mengchao Hepatobiliary Hospital
- Xiamen Jimei Second Hospital
- Fujian Maternal and Child Health Hospital
- Ningde Hospital
- Fuding Baisheng New Hospital of Traditional Chinese Medicine
- Quanzhou Children's Hospital
- Fuzhou Union Medical College Hospital
- Xiamen Children's Hospital
- Zhangzhou Fifth Hospital
- Zhangye People's Hospital
- Qin' an County People's Hospital
- Zhongchuan People's Hospital in Lanzhou New District
- Guangzhou Huangpi Hospital
- Meizhou People's Hospital
- Hengda Medical Beauty Salon
- Jiangmen Central Hospital
- Hima Ophthalmological Hospital
- Guangxi Liuzhou Hospital of Traditional Chinese Medicine



Shougang Hospital



Yunyang County People's Hospital



Zhangye People's Hospital

Laibin People's Hospital  
 Second Affiliated Hospital of Guangxi Medical University  
 Guigang People's Hospital  
 Zunyi first People's Hospital  
 Chishui People's Hospital  
 Guizhou International Hospital  
 Tongren Second People's Hospital  
 Shijiazhuang Fourth Hospital  
 First Affiliated Hospital of Hebei North University  
 Dingzhou People's Hospital  
 Zhao Country Hospital of Traditional Chinese Medicine  
 Tangshan Central Hospital  
 Dengfeng Hospital of Traditional Chinese Medicine  
 Nanyang People's Hospital  
 Nanyang Oilfield General Hospital  
 Changyuan Country Hospital of Traditional Chinese Medicine  
 First Affiliated Hospital of Xinxiang Medical College  
 Dancheng Country Hospital of Traditional Chinese Medicine  
 Xinyang Third People's Hospital  
 Hebi People's Hospital  
 General Hospital of Staff and Workers of Anyang Iron and Steel Co.  
 Luohe sixth People's Hospital  
 Pingdingshan First People's Hospital  
 PLA 211 Hospital  
 Daqing Oilfield General Hospital  
 Hulin People's Hospital  
 Harbin Cancer Hospital  
 Hubei Provincial Hospital of Traditional Chinese Medicine  
 Huanggang Maternal and Child Health Hospital  
 Jingmen Petrochemical Industry Hospital  
 Wuhan Zijing Hospital  
 Sanya Maternal and Child Health Hospital  
 Siping Central Hospital  
 Nanchang Third Hospital  
 People's Hospital of Suzhou High-tech District



Zunyi first People's Hospital



PLA 211 Hospital



Suqian Obstetrics and Gynecology Hospital

PLA 100 Hospital  
 Taizhou Second People's Hospital  
 Suqian Obstetrics and Gynecology Hospital  
 Changzhou Jinling Orthopaedic Hospital  
 Nanjing Jiangbei New District Medical Center  
 Second Affiliated Hospital of Baotou Medical College  
 Ulat Zhongqi People's Hospital  
 Shandong Cancer Hospital  
 Medical Affiliated Hospital of Qingdao University  
 Jinan Children's Hospital  
 Weihai Maternal and Child Health Hospital  
 Hanzhong People's Hospital  
 Northwest Maternal and Child Health Hospital  
 Shanghai Tenth People's Hospital  
 Shanghai Fifth People's Hospital Affiliated to Fudan University  
 PLA 411 Hospital  
 Nigerian Hospital  
 Tzu Chi Hospital, Philippines  
 Luanda General Hospital, Angola  
 Bangladeshi Hospital  
 Osh Surgical Hospital, Kyrgyzstan



Shandong Cancer Hospital



Luanda General Hospital, Angola



2. Industrial Insulation Monitoring Products

- Shandong Weiqiao electrolytic aluminum project
- Shipping project
- Hebei Puyang iron and steel gas power generation project
- Shuli chayangou coal mine in Suijiang County
- Veda paper
- Qingdao No.2 electric control unit
- Guangxi Hualei New Material Co., Ltd
- Electrolytic workshop of relocation project of Chalco Guizhou Branch
- Shanxi Qinan Coal Industry insulation monitoring system
- Yunnan Construction
- New plant of Yunnan Construction and Investment Corporation
- UPS insulation monitoring of No.1 HV station in Benxi Steel Works
- Bayannur industrial and mining machine room project
- CIMC Raffles h457 project
- Datong energy hospital
- Shandong Decheng electric lthy-2 top area special power supply project
- Datong phase II project
- Gaoerqi mining industry, Inner Mongolia
- Yuedong Island oilfield B
- Wenshan alumina phase I
- Yunnan Shenhua Aluminum Industry Co., Ltd
- Eight Oriental ports
- Oriental hope new energy project
- Tongxin mining
- Yuxi mining underground low voltage distribution cabinet project
- Kaifeng Shihe international building materials port project
- Jiangxi energy Internet Project Based on shore power
- Hydropower and aluminum project of Haixin Aluminum Industry
- Xiapu nuclear power plant
- Auxiliary shaft and mining engineering below 580 in Heishan Iron Mine



Shandong Weiqiao electrolytic aluminum project



Veda paper



Yunnan Construction

Certifications



CE Certification of AITR Series Medical Isolation Transformer



CE Certificate of ASG100/150/200



CE Certificate of AID10/120/150/200



CE Certificate of AIL100/150/200



CE Certificate of AIM10/100/200



AIM-M10/100/200/AIL150/ASG150



GGF Isolated Power Cabinet

Statement of compliance with IEC standards