

Shanghai Liangxin Electrical Co., Ltd. (Nader)

(NDB5E-40 IoT Miniature Circuit Breaker)

Product Specification

(IPD-ENG-DEV-T20 A1 2016-09-23)

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1. Applicable scope and purpose

- Short circuit protection
- Overload protection
- Over-voltage/under-voltage protection
- Isolation
- Electric energy metering
- Remote opening and closing
- Timed opening and closing

NDB5E-40 series of IoT miniature circuit breakers are applicable to the low-voltage terminal distribution in the industry, civil buildings, energy, communication, infrastructure and other fields.



NDB5E-40 products

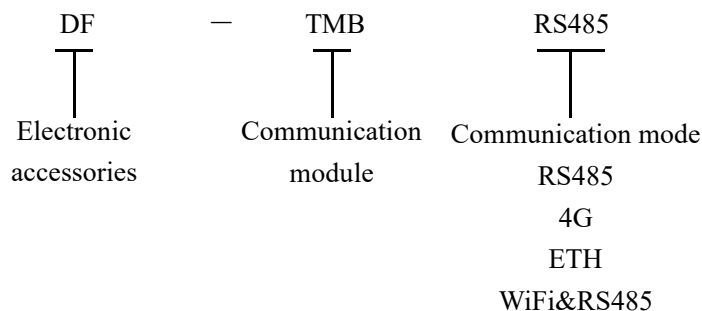
2. Product picture: (the picture is for reference only, and specific kind shall prevail)

3. Specification and model description

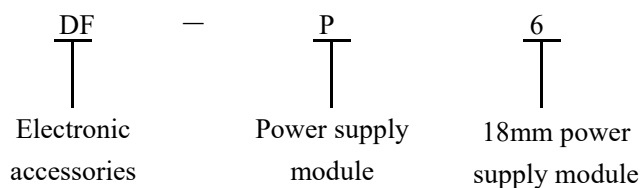
3.1. Circuit breaker module

ND	B	5	E	—	40	C	40	/	1
Nader	Circuit	Design	Internet	Frame	Tripping	Rated	Number		
Low-voltage	breaker	code	of things	current	characteristics	current (A)	of poles		
electrical			Net type	(A)	B	6,10,16,20,	1P+N		
appliance				40	C	25,32,40			
					D				

3.2. Communication module



3.3. Power supply module



4. Main technical parameters

4.1. Main technical parameters of circuit breaker modules

- Electrical parameters
 - Number of poles: 1P+N
 - Rated working voltage: AC230/240V
 - Rated working current: 6A、10A、16A、20A、25A、32A、40A
 - Rated insulation voltage: 500V
 - Rated impulse withstand voltage: 4kV
 - Rated frequency: 50/60Hz
 - Power frequency withstand voltage: AC2500V 50Hz 1min
 - Reference setting temperature: 30°C
 - Rated short-circuit breaking capacity I_{cn} : 6kA
 - Rated running breaking capacity I_{cs} : 6kA
 - Instantaneous tripping characteristics: Type B (3-5) I_n , Type C (5-10) I_n , Type D (10-14) I_n .
- Mechanical and electrical life
 - Mechanical life: 10000 times
 - Electrical life: 4000 times
- Isolating function
 - Practical breaking indication
 - The green identification in the inspection window indicates that the contact is in the disconnection position
- Connection capacity
 - Tunnel terminal blocks
 - Terminal connection area: Minimum 1mm², up to 10mm²
 - connecting screw: M4; Rated torque: 1.2N·M
- Protection class
 - Protection class of the body: IP20
 - To be installed in the distribution box: IP40

- Incoming line mode: upper incoming
- Utilization category: Category A
- Installation category: II and III
- Pollution level: 2
- Product certification and implementation standards
 - Product certificates: CCC, CB
 - Product certification standards: GB/T 10963.1, IEC 60898-1
- Electric operation module
 - Input voltage: 12V
 - Standby power consumption: $\leq 0.5W$
- Environmental protection requirements
 - The product complies with the RoHS standards

4.2. Technical parameters of communication modules

- Input voltage: DC12V
- Antenna interface: SMA radio frequency
- Communication interfaces: RS485, 4G, ETH, WiFi&RS485
- Communication protocol
 - RS485 gateway: Modbus
 - 4G gateway: MQTT
 - ETH gateway: MQTT
 - WiFi&RS485 gateway: MQTT (WiFi gateway function), Modbus (RS485 gateway function)

4.3. Technical parameters of power supply modules

- Input voltage: AC100-AC250V
- Output capacity: DC12V, 1A

4.4. Intelligent function

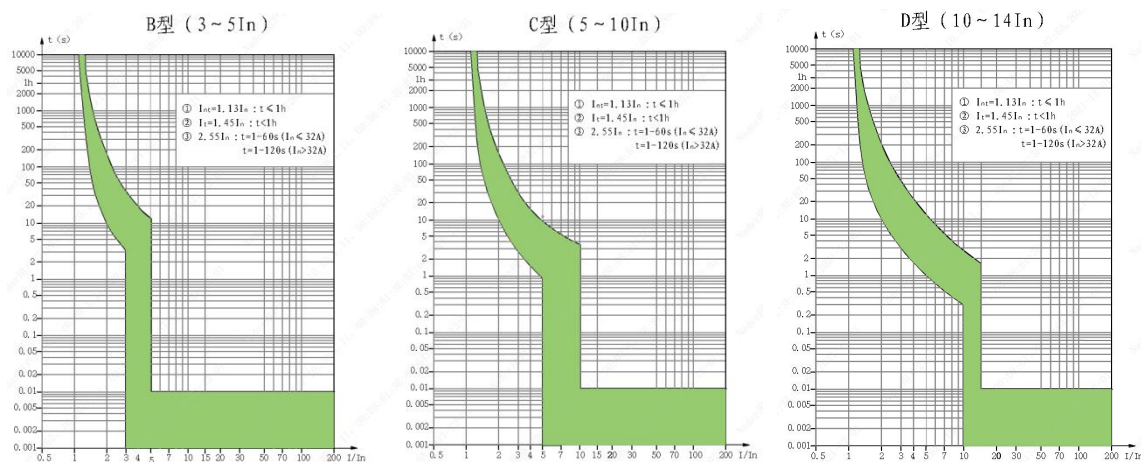
- Protection function
 - Overvoltage protection function: Overvoltage protection value: 275V, overvoltage recovery value 255V; When the voltage reaches the recovery value, the circuit breaker will automatically close (in case of more than three (3) times of automatic closing within 10 minutes, no automatic closing will occur)
 - Undervoltage protection function: Undervoltage protection value 165V, undervoltage recovery value 185V, When the voltage reaches the recovery value, the circuit breaker will automatically close (in case of more than three (3) times of automatic closing within 10 minutes, no automatic closing will occur)
 - Power setting function: Set upper limit for the power to achieve the breaking protection after reaching the set value
 - Overtemperature protection function: alarm in case of over 70°C, and power-off protection in case of over 90°C
 - Time setting function: Set the loop on-and-off time, open or close the loop after the timeout
- Metering function
 - Current metering accuracy: $\pm 0.5\%$
 - Voltage metering accuracy: $\pm 0.5\%$
 - Electric energy metering accuracy: Level 1
 - Temperature measuring accuracy: $\pm 1^{\circ}C$
- Control function

- Remote closing function: $\leq 3s$
- Remote opening function: $\leq 2s$
- IoT interaction function
 - Interfacing of Internet of Things management platform: Manage through the Internet or private network, and control authority by level
 - Mobile phone APP management: Consumer power safety and energy consumption management
 - Local edge computing: Upload of voltage, current, electric energy, temperature and other data
 - Fault data inquiry: inquiry and upload of power use fault and inspection records (10 alarm records, 10 fault records, and 30 location change messages)

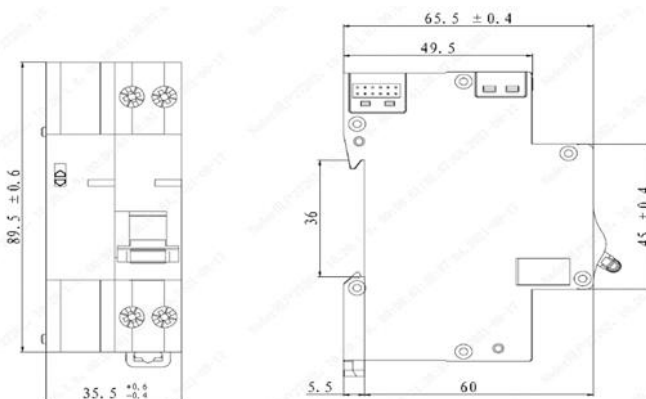
5. Normal Working Environment

- Altitude: $\leq 2000m$, where derating is not required
- Operating ambient temperature: $-25^{\circ}C \sim +55^{\circ}C$
- Relative air humidity: $\leq 95\%$
- The product can withstand the effects of wet air
- The product can withstand the effects of salt mist and oil mist
- The product can be disposed in places that are free from explosive media, media corrosive to metal, insulation damaging gas, and conductive dust
- The product should be installed free from snow and rain

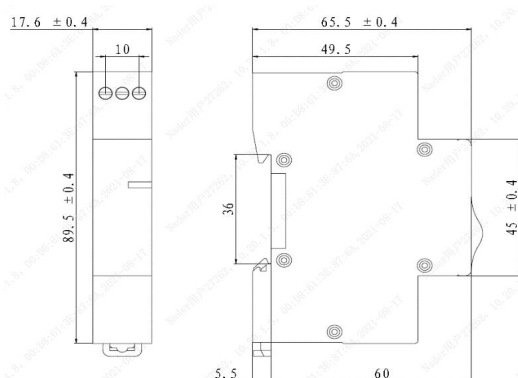
6. Tripping Characteristics



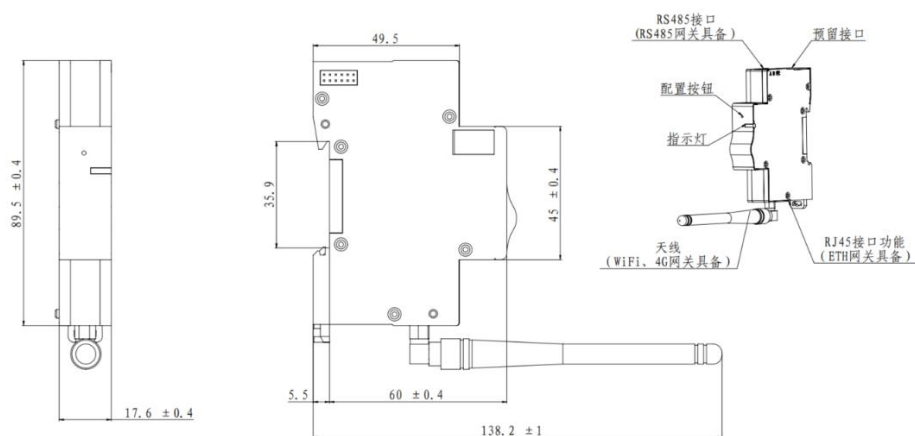
7. Product Dimension and Installation Dimensions



NDB5E-40 Outline and Installation Dimension Diagram



Outline and Installation Dimension Diagram of DF-P6 Power Supply Module



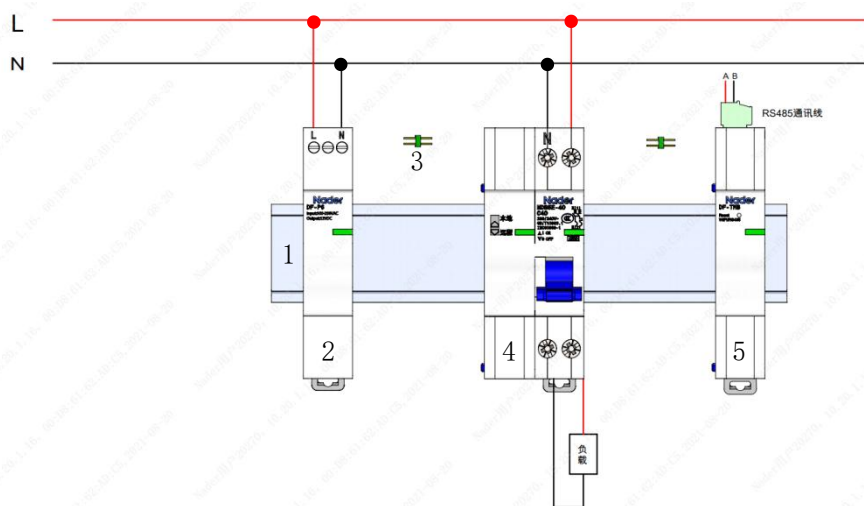
DF-TMB Module Outline and Installation Dimension Diagram

Note: The above figures are the outline and installation dimension diagrams of a single product. The power module is placed on the left side and the gateway module is placed on the right side;

8. Installation Mode

8.1. Product Installation and Cabling Modes

Based on the modular structure, it can be easily installed on the TH35mm×7.5 standard guide.



NDB5E-40 Wiring Diagram

Illustration notes:

No. 1 - Install the guide rail TH35-7.5;

No. 2 - Power supply module (AC power supply). Follow the product printing mark for the wiring with the maximum wire size $\leq 5\text{mm}^2$;

No. 3 - 6-pin 2-row male terminal Model: 2.0/P220-1206A0CS110A1;

No. 4 - Internet of Things miniature circuit breaker (electric operation module on the left, and circuit breaker on the right);

No. 5 - Communication module, and communication interfaces: RS485, 4G, ETH, WiFi&RS485;

No. 4 in the figure is a single IoT miniature circuit breaker. If there are multiple circuits to assemble multiple IoT miniature circuit breakers, they will share a power supply and a gateway; additional 10 IoT miniature circuit breakers can be installed. There is certain delay when the one-button closing function is executed at the rated voltage, and the maximum delay time does not exceed 0.5 s.

8.2. Acquisition means of Gateway MAC



Gateway logo

Local logo function of the communication module (this logo is not provided for RS485 gateway), is used to acquire MAC address of the communication module.

8.3. Introduction to RS485 Module Operation

- Operation instructions:
 - RS485 operation instructions:

Step 1: The red light flashes once after long pressing the Reset button and then release, and the green light flashes quickly (once every 0.2 s), the gateway is addressing; the green light flashes slowly (once every 1 s), and the addressing is completed;

Step 2: Read the gateway point table information (slave number and slave address) according to "Gateway Protocol";

(Gateway slave station address: 0x00, default baud rate: 9600 bps, no check)

Step 3: Read the information of each slave station according to the obtained slave station address, and analyze it according to "NDB5E Series Communication Protocol".

● Instructions:

SN	State	Description
1	Lights off	No power connected
2	Green light constantly on	No slave detected
3	Red light constantly on	Gateway failure (EEPROM failure, SRAM failure, router connection failure, cloud connection failure)
4	Green light flashes-once per second	Registration is completed for normal operation
5	Green light flashes-five times per second	Registering
6	Red light flashes once	Button time indication, long press time is divided into 3 s, 6 s, 9 s and 12 s
7	Long press the button and then release after the red light flashes once	Gateway registration slave
8	Long press the button and then release after the red light flashes 4 times (the yellow light is constantly on during reset, and the green light is constantly on after reset)	Gateway reset

8.4. Introduction to the Interface of 4G Module Mobile APP



The gateway operates normally, so that the user can monitor the power consumption at home in real time through the mobile phone APP. The main control interfaces include four (4) function modules:

energy consumption, equipment, alarm, operation and maintenance.

It is possible to check the number and status of the slave machines on the device interface. Click the specific circuit breaker into the control interface of device information status, where it is possible to check the circuit breaker's device information, operation and maintenance parameters, operation status, measurement data, protection parameter, device log, remote control operation (remote opening and closing: default password 111111) and so on.

8.5. Introduction to Debugging APP Operation of 4G Module Mobile Phone

- Instructions of Bluetooth APP parameter setting and other operations

Step 1: get 18-digit IMEI device code of 4G gateway from the gateway label, for example, "867881049xxxxxx000"

Step 2: Log in Ali Cloud, make the device registration with IMEI information, and record the corresponding 32-digit cloud platform password of the device

Step 3: Install Nader Bluetooth APP "combination" in the mobile phone for parameter setting. Open APP, choose Bluetooth gateway, search the Bluetooth Naderxxxxxx connection; after the connection, switch into the operation password (default password is "666666") input interface, modify the cloud platform password to be consistent with the record platform password of Item ②, so that the gateway will automatically re-networked; with correct parameters and normal networking, the gateway goes into the normal working mode (green light slowly flashes for 1 second).

Note: In Naderxxxxxx, "xxxxxx" corresponds to 6-digit "x" figure in IMEI.

Step 4: the addressing registration of slave circuit breaker: keep pressing the button for three (3) seconds through the small hole with the thimble, and release when LED turns to red light, so that LED will change to quick flashing of green light for 0.2 s; after the address registration, the gateway switches into normal working mode (green light slowly flashes for 1 second). The address of the first circuit breaker closest to the gateway is 100, and the addresses of the circuit breakers are increased with the step of 1 towards the left.

Note: the factory default registration setting of the gateway is one (1) circuit breaker, and when only one (1) slave circuit breaker is installed, Step 4 may be ignored; in case of installing multiple slave circuit breakers, it is required to carry out the addressing and registration as described in Step 4. (If the green light of the circuit breaker is ON all the time, it indicates that the circuit breaker is in normal communication with the gateway; if the green light of the circuit breaker flashes, it indicates that the circuit breaker is not in normal communication with the gateway, and it is required to make the address registration again.)

- Status indication of gateway LED indication lamps

LED status	Description
Lights OFF	No power is connected for the gateway
Red light is ON all the time	The gateway waits for registration (the quantity of slave computer is 0)
Green light slowly flashes for 1 s	The gateway is connected for normal operation (MQTT protocol is connected with Ali Cloud)
Green light quickly flashes for 0.2 s	The gateway makes the registration for the slave computer
Red light quickly flashes for 0.2 s	The gateway starts the computer for initialization of networking or further networking
Red light is ON all the time	The fault with the hardware in the gateway

- Recovery of plant setting for the gateway

Keep pressing the button for 10 seconds (and when LED turns to red light for the second time) release, so that the gateway will start the parameter resetting and automatic system restart. Then it is required to configure the related parameters and carry out the address registration for the slave machines.

- Forgetting the password of Bluetooth APP

After the modification of the password, write it down; if forgotten, it is possible to reset the system only by recovering the factory setting.

- APP downloading



本地APP下载 (安卓)
密码: 1234567890

8.6. Introduction to ETH Module Operation

- Operation instructions:

- ETH operation instructions:

Step 1: Keep pressing the Reset button till the red light flashes once and then release, so that the green light flashes quickly (once every 0.2 s), the gateway is in the addressing; the red light flashes slowly (once every 1 s), and the addressing is completed;

Step 2: Scan the QR code of gateway, get the gateway's MAC address, configure the upper machine according to the cloud parameter configuration for the platform to be accessed, while referring to "DF-TMB-ETH-云参数配置上位机使用说明.doc", write in the cloud platform access parameters related to the gateway, such as access domain, IP, port, ClientID, Topic of the subject, user name and password and so on;

序号	测试项目	写入内容	测试结果
1	云平台识别码	000D	
2	云域名/云IP	云域名	
3	云端口	见配置	
4	ClientID	唯一ClientID	
5	PubTopic	见配置	
6	SubTopic	见配置	
7	NTP服务器域名	见配置	
8	阿里云用户名	见配置	
9	阿里云DeviceSecret	见配置	

Step 3: after the parameter configuration, the device is connected by the network wire to router, and if green light slowly flashes (once per 1s), it indicates that the registration networking is successful;

Step 4: Log in Web interface or APP, and read the information of each slave station according to the obtained MAC address.

Download link for the upper machine and user instruction of cloud parameter configuration: <https://iot.sh-liangxin.com/ETH/nader-ETH.zip>

● Instructions:

SN	State	Description
1	Lights off	No power connected
2	Green light constantly on	No slave detected
3	Red light constantly on	Gateway failure (EEPROM failure, SRAM failure, router connection failure, cloud connection failure)
4	Green light flashes-once per second	Registration is completed and network is connected for normal operation
5	Green light flashes-five times per second	Registering
6	Red light flashes once	Button time indication, where the pressing time is divided into 3 s and 12 s
7	Red light flashes-once per second	The slave machine has been registered, network connecting fails or the network is to be connected
8	Long press the button and then release after the red light flashes once	Gateway registration slave
9	Keep pressing the button and then release after the red light flashes for 4 times (12 s) (the yellow light is	Gateway reset

constantly on during reset, and the green light is constantly on after reset)

8.7. Introduction to the interface of WiFi module mobile APP



The user can monitor the household electricity use in real time through the mobile APP. The control interface contains six (6) major functional modules: Main interface, intelligent terminal, power curve, parameter setting, historical record, temperature curve; the users can view the power consumption of each circuit according to their needs.

Note: For detailed operation instructions, please refer to the APP operation manual.



本地APP下载 (安卓)
密码: 1234567890

8.8. Introduction to WIFI Module Mobile APP Operation

- Operation instructions:

- WIFI hotspot mode:

Step 1: The red light flashes once after long pressing the Reset button and then release, the green light flashes quickly (once every 0.2 s), and the gateway is addressing; the green light flashes slowly (once every 1 s), and the addressing is completed;

Step 2: The red light flashes twice after long pressing the Reset button and then release to enter the hotspot mode;

Step 3: Turn on the mobile phone to search for WIFI or check the QR code information of the communication module, connect the Wi-Fi with the name of Mac address, and enter the password. The initial password is 1234567890;

Step 4: Open the APP to view and operate.

- RS485 operation instructions:

Step 1: The red light flashes once after long pressing the Reset button and then release, and the green light flashes quickly (once every 0.2 s), the gateway is addressing; the green light flashes slowly (once every 1 s), and the addressing is completed;

Step 2: Read the gateway point table information (slave number and slave address) according to "Gateway Protocol";

(Gateway slave station address: 0x00, default baud rate: 9600 bps, no check)

Step 3: Read the information of each slave station according to the obtained slave station address, and analyze it according to "NDB5E Series Communication Protocol".

- IoT mode (MQTT protocol):

Step 1: Keep pressing the Reset button till the red light flashes once, then release, so that the green light flashes quickly (once every 0.2 s), the gateway is in the addressing; the green light flashes slowly (once every 1 s), and the addressing is completed;

Step 2: The red light flashes twice after long pressing the Reset button and then release to enter the hotspot mode;

Step 3: Turn on the mobile phone to search for WIFI, connect the Wi-Fi with the name of Mac address, and enter the password. The initial password is 1234567890;

Step 4: Open the APP, set the cloud parameters in the parameter settings, fill in the cloud parameters and router parameters;

Step 5: The red light flashes 3 times after long pressing the button and then release to enter the IoT mode. After 10 s, if the parameter setting is correct, the green light flashes slowly (once every 1 s); if the parameter is wrong, the red light is constantly on to return to Step 4 to confirm whether the parameter setting is correct.

● Instructions:

SN	State	Description
1	Lights off	No power connected
2	Green light constantly on	No slave detected
3	Red light constantly on	Gateway failure (EEPROM failure, SRAM failure, router connection failure, cloud connection failure)
4	Green light flashes-once per second	Registration is completed for normal operation
5	Green light flashes-five times per second	Registering
6	Red light flashes once	Button time indication, long press time is divided into 3 s, 6 s, 9 s and 12 s
7	Long press the button and then release after the red light flashes once	Gateway registration slave
8	Long press the button and then release after the red light flashes twice	WIFI hotspot mode
9	Long press the button and then release after the red light flashes 3 times	IoT mode (MQTT protocol)
10	Long press the button and then release after the red light flashes 4 times (the yellow light is constantly on during reset, and the green light is constantly on after reset)	Gateway reset

9. Packaging and Storage

- Maximum packaging quantity per box

Specifications and models	NDB5E-40	DF-P6	DF-TMB 4G
Quantity (Set/Box)	7	15	9

Specifications and models	DF-TMB RS485	DF-TMB WIFI&RS485	DF-TMB ETH
Quantity (Set/Box)	15	9	15

- Storage

The storage temperature is -40°C~+70°C; the relative air humidity is no more than 80%; acidic alkaline or other corrosive gas exists in the ambient air in the warehouse. Under the above conditions, the storage period shall be no more than 18 months since the manufacturing date.

10. List of Accessories and Installation

The following accessory 1 is the standard configuration for every product (1 pc/set), accessory 2 is configured for the product with RS485 function (RS485 gateway) (1 pc/set), and accessories 3, 4 and 5 are configured for the product with wireless communication function (4G gateway, WiFi gateway) (which can be chosen according to the installation environment of the customer). The accessories are installed in the field by the customer, and delivered with the products.



Accessory 1

排针2×6P/2.0/塑高2.0/
P220-1206A0CS110A1



Accessory 2

插件端子/头
/3P/3.5/BCP-350-3-GY



Accessory 3

胶棒天线/SMA内针/弯角108mm/频率
2.4G/G>2DB/VSWR<1.5



Accessory 4

GSM贴片天线/频率824~2170MHz/
线长1m/SMA公头



Accessory 5

吸盘天线/SMA内针/线长1.5M/
频率2.4G/G>2DB/VSWR<1.5

11. Precautions

- The functions of product overvoltage, undervoltage and phase loss protection (3 P/4P products have this function) are closed as the default setting at the plant delivery, and can be opened remotely;
- Remote opening and closing is impossible under the local mode;
- After the protective opening in overvoltage and undervoltage, it will automatically close after the voltage recovery, and remote opening and closing is possible;
- In the remote mode, remote automatic closing is impossible for manual opening;
- After the protective opening in case of fault (except overvoltage and undervoltage protection), remote automatic closing is impossible;
- Any quality problem due to disassembly or debugging of the circuit breaker characteristics without permission will be the liability of the user;
- Under the energized operation state, do not touch the exposed portion of the uninsulated parts on the circuit breaker with bare hand;
- Wiring must be reliable to prevent the malfunction of the circuit breaker or terminal burning due to the abnormal heat generation on the terminal;