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Air Circuit Breaker **HKW1**

CNHK® 黄华集团



Product Overview

The HKW1 series universal circuit breakers are suitable for distribution networks with AC 50Hz, rated voltage up to 660V (690V) and below, and rated current of 630A-6300A. They are used to distribute electrical energy and protect lines and power equipment from overload, undervoltage, short circuit, single-phase grounding and other faults. The circuit breaker has intelligent protection function; Selective protection is precise, which can improve power supply reliability and avoid unnecessary power outages.

Rated working voltage: AC690V and below

Installation method: drawer type, fixed type

Intelligent controller: H type (for communication), M type (ordinary intelligent type), L type (economic type)

Breaking capacity: 80kA, 100kA (effective value)

Number of product poles: 3, 4

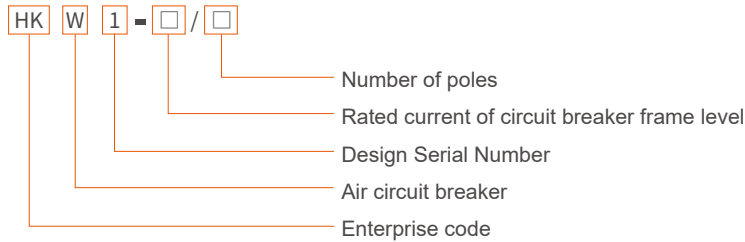
Tripping method: a variety of intelligent trippers, providing different functions

Product frame: 2000, 3200, 4000, 6300A

Rated current: 630A~6300A

Implementation standard: IEC60947-2, GB/T14048.2

Model Meaning and Classification



Classification

- △ Classified by installation method: Fixed type /Drawer
- △ Divided by number of poles: three poles, four poles
- △ Classified by operation method: Electric operation/Manual operation (for maintenance and repair)
- △ Release type: Intelligent controller, undervoltage instantaneous (or delayed) release, shunt release.
- △ Intelligent controller performance
 - a. Intelligent controllers are divided into H-type (communication), M-type (ordinary intelligent), and L-type (economic);
 - b. It has functions such as long delay inverse time, short delay inverse time, fixed time, and instantaneous. The required protection characteristics can be set by the user;
 - c. Single phase grounding protection function;
 - d. Display function: Setting current display, Action current display, Display of voltage values for each line (Voltage display should be provided during ordering);
 - e. Alarm function: overload alarm;
 - f. Self checking function: overheat self checking, microcomputer self diagnosis;
 - g. Test function: Test the action characteristics of the controller.

Normal working and installation conditions

- △ Ambient air temperature

The upper limit value shall not exceed +40℃, and the lower limit value shall not be lower than -5℃. The average value within 24 hours shall not exceed +35℃.

Note: For working conditions where the upper limit exceeds +40℃ or the lower limit is below -10℃ or -25℃, users should consult with our company.
- △ The elevation of the installation site shall not exceed 2000m
- △ Atmospheric conditions

The relative humidity of the atmosphere does not exceed 50% when the surrounding air temperature is +40℃, and there can be higher relative humidity at lower temperatures. The monthly average maximum relative humidity in the wettest month is 90%, and the average minimum temperature in that month is +25℃, taking into account the condensation on the product surface due to temperature changes. Exceeding the specified requirements should be negotiated with our company.
- △ Protection level: IP30
- △ Usage category: Class B
- △ Installation Category

Circuit breakers and undervoltage releases with working voltage of 660V(690V) and below, and primary coils of power transformers for installation category IV; The installation category of auxiliary and control circuits is III.
- △ Installation conditions

The circuit breaker should be installed according to this manual, the vertical inclination of the circuit breaker should not exceed 5°.

Technical data and performance

- △ Rated current of circuit breaker

Rated current of shell frame level I_{nm} (A)	Rated current I_n (A)
2000	(400)630、800、1000、1250、1600、2000
3200	2000、2500、2900、3200
4000	3200、3600、4000
6300	4000、5000、6300

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△ The rated short-circuit breaking capacity and short-term withstand current of the circuit breaker, and the flashover distance of the circuit breaker is "zero" (i.e. there is no flashover outside the circuit breaker)

Chart 2

Rated current of shell frame level	Inm (A)	2000	3200	4000	6300
Icu (kA) O-CO	400V 690V	80 50	100 50	100 50	100 50
Rated short-time making capacity n x Icu (kA) / COS	400V 690V	176/0.2 105/0.25	220/0.2 143/0.2	220/0.2 165/0.2	264/0.2 187/0.2
Rated operating short-circuit breaking capacity Ics (kA) O-CO-CO	400V 690V	65 50	65 50	65 50	100 50
Rated short-time withstand current Icw (kA) 延时 0.4s, O-CO	400V 690V	50 50	80 50	65/80(MCR) 50/65(MCR)	85/100(MCR) 65/75(MCR)

Note: The breaking capacity in the table is the same for the upper and lower incoming lines.

△ The maximum power consumption of the circuit breaker is 360W. Rated continuous current variation of circuit breakers at different ambient temperatures

Chart 3

Temperature °C	Rated Current					
	400A	630A	800A	1000A	1250A	2000A
40	400A	630A	800A	1000A	1250A	2000A
50	400A	630A	800A	1000A	1250A	1900A
60	400A	630A	800A	1000A	1250A	1800A

Note: The derating coefficient for 2500A and above is 0.9, with 4000A in 6300A not derating

△ Protection characteristics and functions of M-type intelligent overcurrent controller:

Chart 4

Long time delay Ir1	Short time delay		Instantaneous		Ground fault	
	Ir2	Error	Ir3	Error	Ir4	Error
(0.4—1) In	(0.4—15) In	±10%	In-50kA (Inm=2000A) In-75kA (Inm=3200A)	±15%	Inm=2000~3000A(0.2—0.8)In max 1200A, min 160A	±10%

Note: When there are three stages of protection at the same time, the setting values cannot cross.

△ The inverse time action characteristic I²TL of the long delay overcurrent protection is (1.5IrL) 2tL, and the action time of (1.05~2.0) Ir1 is shown in chart 5, with a time error of ± 15%.

Chart 5

1.05Ir1	1.3Ir1	1.5Ir1 Settingtime (S)	15	30	60	120	240	480
> 2h no action	< 1h action	2.0Ir1 Settingtime (S)	8.4	16.9	33.7	67.5	135	270

注: tL- setting time of long delay 1.5Ir 1, Tt- action time of long delay

△ Short delay overcurrent protection characteristics

The short time delay overcurrent protection is of definite time limit. If the low multiple is required to be of inverse time limit, its characteristics are as follows: $I^2 Ts = (4Ir1)^2 t_s$, where t_s is the general delay design time and T_s is the short time delay action time; when the overload current is greater than $4Ir1$, it is automatically converted to definite time limit characteristics. See Table 6 for its definite time limit characteristics. The time limit error is ± 15%.

Chart 6

Delay Time (S)				Returnable time (S)			
0.1	0.2	0.3	0.4	0.6	0.14	0.23	0.45

△ The overcurrent trip protection characteristics are shown in Figure 1, and the grounding fault protection characteristics are shown in Figure 2.

△ Functions of M-type intelligent overcurrent controller

a. Ammeter function: Display the operating current and ground leakage current of each phase, display the maximum phase current normally, and also display the current or time values for setting, testing, and faults.

b. Voltage meter function: Display the voltage of each line and show the maximum value normally.

c. Remote monitoring and self diagnostic functions

-The controller has a local fault self diagnosis function: When the computer malfunctions, an error E display or alarm can be issued, and the computer can be restarted. Users can also disconnect the circuit breaker when needed.

-When the local ambient temperature reaches 80 ℃, an alarm can be triggered and the circuit breaker can be disconnected at a lower current (when needed by the user).

-The intelligent controller has signals such as overload, grounding, short circuit, load monitoring, pre-alarm, and trip indication (OcR) output through contacts or optocouplers, making it convenient for users to connect to remote control. The contact capacity is DC28V, 1A, AC125V, 1A.

d. Setting function

The various parameters of the controller can be tuned using the four buttons Settings, +, -, and Storage. Press Set to the desired state (indicated by the status indicator light), then press the + or - keys to adjust the parameter size to the desired value, and then press Store again. The store light will light up once to indicate that the setting value has been locked. The protection parameters of the controller shall not be cross set. After the controller is powered on and reset, press the Set button again to cycle through the various parameters set.

e. Experimental function

By using the Settings, +, -, Release, Do not release, Reset and other keys, various protections of the controller can be checked. Use the Set, +, and - keys to adjust a simulated fault test current (note: do not store and lock it), then press the trip or do not trip key to test, and the controller can enter fault handling. Press the trip button to disconnect the circuit breaker, press the no trip button to keep the circuit breaker connected, and the controller's various indication states are normal. After the experiment, press the Reset or Clear Light button once; Other experiments can only be conducted.

Note: For the convenience of the test, regardless of whether the grounding leakage is set to the tripping or alarm position, the test will be treated as tripping, and the priority will be lower than overload protection. Once a malfunction occurs during the experiment, the controller automatically stops all tests and enters fault handling.

f. Load monitoring function

Set two setting values. ILC1 with a setting range of (0.2 ~ 1) In and ILC2 with a setting range of (0.2 ~ 1) In. The delay characteristic of ILC1 is inverse time characteristic, and its time setting value is half of the long delay setting value; There are two types of ILC2 delay characteristics. The first is the inverse time delay characteristic which has a time setting value of 1/4 of the long delay setting value, and the second is a timed limit with a delay time of 60 seconds. These two types of delay functions are used: the former is used to disconnect unimportant loads in the lower level when the current approaches the overload setting value, while the latter is used to delay the disconnection of unimportant loads in the lower level when the current exceeds the ILC1 setting value, causing the current to decrease and keeping the main circuit and important load circuit powered. When the current drops to ILC2, after a certain delay, an instruction is issued to reconnect the previously disconnected circuit in the lower level to restore power supply to the entire system. Users can choose between the two types of monitoring protection mentioned above, and the monitoring characteristics are shown in Figure 3 and Figure 4.

g. MCR tripping and simulated tripping protection can be turned on according to user requirements, and generally need to be turned on when conducting short delay breaking tests. MCR on/off protection is mainly used when the circuit is closed in a fault state (at the moment when the controller is powered on). The controller has the function of breaking the circuit breaker at low times short-circuit current. The controller is provided with a function of directly sending a tripping signal without the signal being processed by a host chip in case of extremely large short-circuit current.

h. Hot memory function

After controller overload or short circuit delay tripping, before the controller is powered off, memory function simulating bimetal characteristics. The overload energy is released for 30 min to complete the short circuit. In case of overload or short circuit delay fault, the tripping time will be shortened, the controller will be powered off, and the energy will be cleared automatically.

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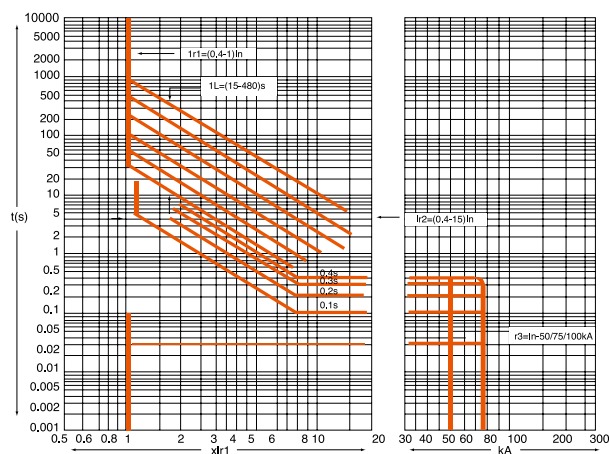


Figure 1

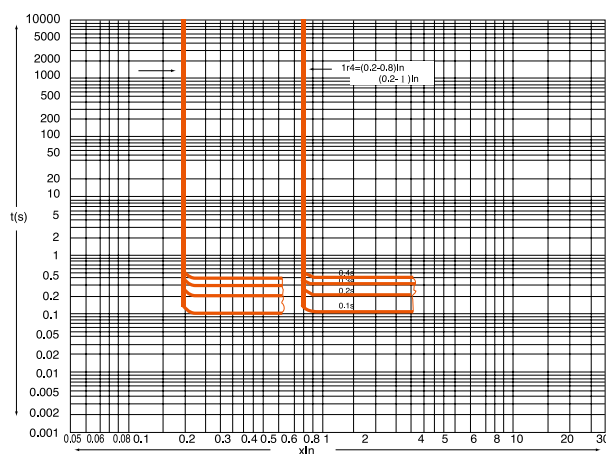


Figure 2

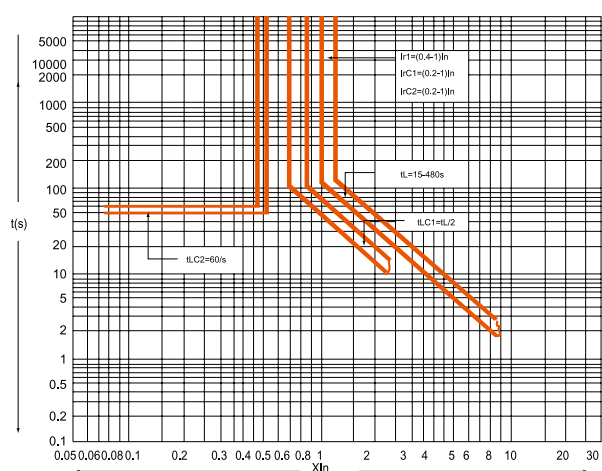


Figure 3

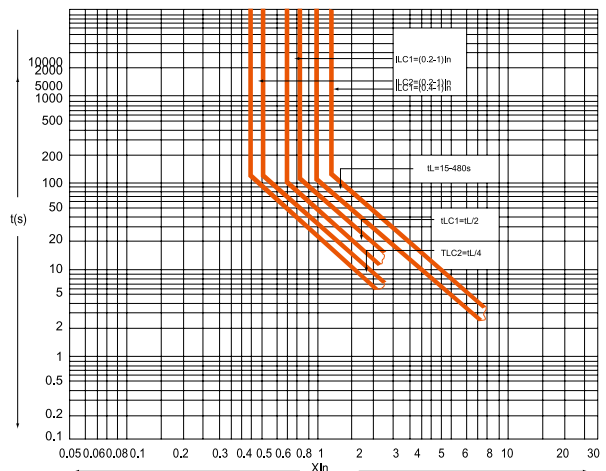
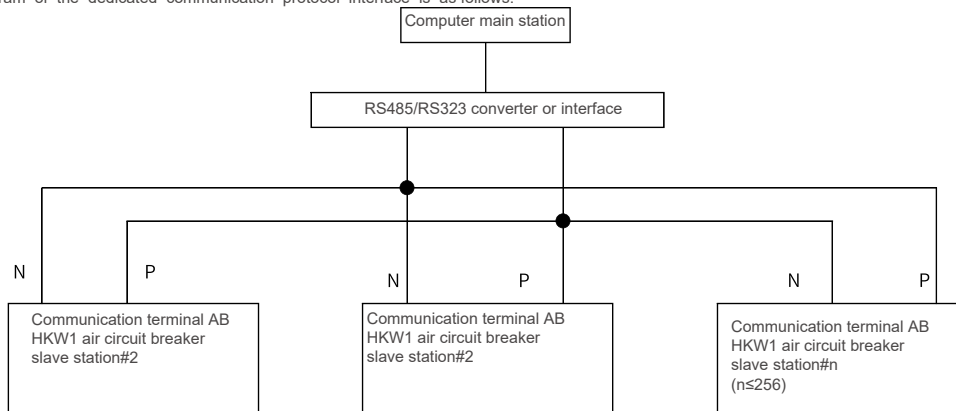


Figure 4

△ H-type intelligent controller

In addition to having all the functions of M-type intelligent overcurrent controller, it also has a serial communication interface, which can form a master-slave local area network system through the communication interface. It consists of 1-2 computers as the master station and several air circuit breakers or other communicable components as the slave stations. The system network structure is shown in the following figure. For the circuit breaker unit, the system can achieve the "four remote" function of long-distance monitoring: monitoring of various grid parameters and operating parameters, monitoring of the current operating status of air circuit breakers, adjustment and download of various protection limit parameters, and control of the opening and closing operations of air circuit breakers. The system is suitable for the construction and renovation of distribution monitoring systems in various power stations, power plants, small and medium-sized substations, industrial and mining enterprises, buildings, etc.

The connection diagram of the dedicated communication protocol interface is as follows:



The connection diagram of the circuit breaker product based on the general DP protocol is shown in Figure 4.

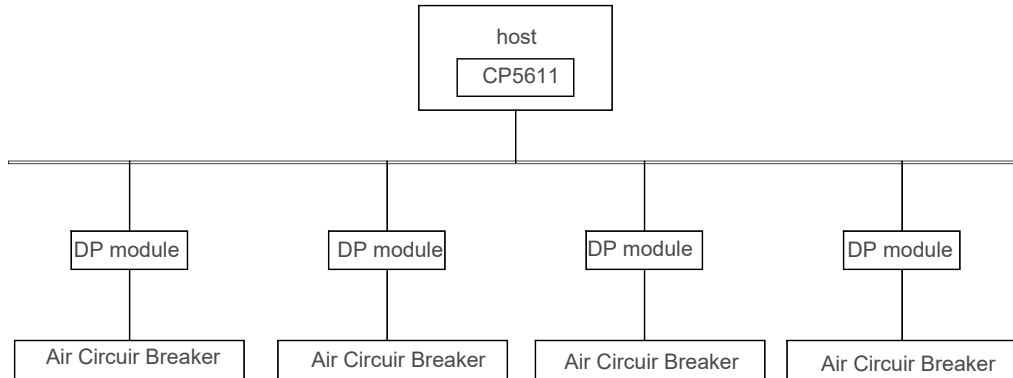


Figure 4

△ Composition of the system

a. Hardware structure of data communication network system

- Intelligent circuit breaker provides standard RS485 communication interface, which is led out from No.10 and No.11 outgoing wires of the circuit breaker;
- Communication medium for system connection; Class A shielded twisted pair cable.

b. the main characteristics of the network

- Bidirectional serial data transfer mode, the product can provide a variety of communication protocols: Low-voltage Electrical Data Transmission Communication Statute V1.0 , PROFIBUS-DP, MODEBUS and so on.
- Strict master-slave mode, i.e., the master is the initiator and controller of the communication, and the slaves can only communicate with the master, but not directly with other slaves.
- The communication baud rate is 9600bit/s, the communication distance is 1.2km, and the baud rate of PROFIBUS-DP can reach 187.5kbit/s for typical applications.

c. Monitoring Software

SS 2000 configuration software can realize the required monitoring and management software configuration application according to different project requirements, and realize operation monitoring and various daily management functions for intelligent circuit breakers.

△ System Functions

a. Remote control

Remote control is to control the operation of energy storage, closure and disconnection of each slave circuit breaker in the system through the master computer. The operator selects the corresponding object from the system interface and clicks the remote control button with the mouse, the system will provide the current operation status of the corresponding object. After the operator inputs the operation password, he can issue the remote control close or break command. The system will pass the command to the corresponding circuit breaker slave station. And the slave station will carry out the operation of breaking and closing, energy storage and so on according to the established time sequence after receiving the instruction, and report the result of remote control to the master station.

b. Remote Adjustment

Remote adjustment refers to setting the protection value of the slave station through the master computer. In the master computer, there is a table of protection values of all slave stations, and the operator selects the corresponding object from the system interface and clicks the remote adjustment button with the mouse, the system will provide the current settings of all the protection values of the corresponding object and the protection value table of the object, and the operator can select the required parameters from the parameter table by inputting the operation password. After the operator enters the operation password, he can select the required parameters from the parameter list, and then click the corresponding button, the master station will download the parameters to the corresponding slave station and report the result of the remote adjustment, and the slave station will modify its own protection value after receiving the instruction.

c. Telemetry

Telemetry refers to the real-time monitoring of grid operation parameters of each slave station through the master computer. The communication slave station reports the following working parameters to the host computer: real-time A, B, C and N phase current values of each slave station, voltage values of UAB, UBC and UCA, etc.

△ The following fault parameters can be recorded:

a. Remote control

The fault A, B, C, N phase current value, UAB, UBC, UCA voltage value, fault type, fault action time, and the fault will be recorded in the fault database.

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△ The computer displays the current real-time current and voltage of each sub-station in the form of bar graph, absolute value table, etc., and displays the operation status of each node in the form of real-time curve.

d. Telecommunication

It refers to checking the model, closure, disconnection status, various protection values, and the operation and fault information status of the slave station through the master computer. Slave circuit breakers report the following parameters to the host computer: switch type, switch status (closed/open), fault information, alarm information, and various protection information.

e. Other system functions

In addition to the four-remote operation and control functions, the system can also carry out a variety of management functions: accidental alarm (information screen, screen promotion, event printing, accidental dialing, sound alarm), event records, inspection and maintenance tagging, shift management, load trend analysis, varieties of reports to print and so on.

L-type intelligent controller

△ The L-type intelligent controller adopts a coding switch and toggle switch setting method, with four protection characteristics of overload long delay, short circuit short delay, instantaneous, and ground leakage, as well as functions such as fault status and load current light column indication. However, it does not have digital display and its functions are not as complete as the M and H types. It is available for users to choose under general conditions.

△ Operational performance of circuit breakers: number of operating cycles.

Chart 7

Rated current of shell level (A)	Total number of operation cycles
2000	10000
3200	5000

△ The working voltage and required power of the shunt release, under voltage release, electric operating mechanism, energy closing electromagnet, and intelligent controller of the circuit breaker.

Chart 8

Required power / Rated voltage / Project			AC (50Hz)		AC (50Hz)	
			220V	380V	110V	220V
Shunt release			24VA	36VA	24W	24W
Undervoltage release			24VA	36VA	-	-
Closing electromagnet			24VA	36VA	24W	24W
Electric operating mechanism	Rated current of circuit breaker enclosure level	2000A	85VA	85VA	85W	85W
		3200A	110VA	110VA	100W	100W
Intelligent controller power supply voltage			AC220V、AC380V、DC220V、DC110V			

Note: The reliable operating voltage range is 70% - 110% for the shunt release and 85% - 110% for the closing solenoid and operating mechanism.

△ The performance of the circuit breaker's undervoltage release is shown in chart 9.

Chart 9

Category		Undervoltage delay release device	Under voltage instantaneous release device
Release action time		Delay 1s, 3s, 5s	Instantaneous
Operating voltage value of the release device	(35%—75%) U_e	Reliable disconnection of circuit breaker	
	$\leq 35\%U_e$	The circuit breaker cannot be closed	
	(85%—110%) U_e	The circuit breaker can reliably close	
If the power supply voltage returns to 85% U_e within 1/2 of the delay time		The circuit breaker keeps closing	-

△ Performance of auxiliary contact:

△ The agreed heating current of the auxiliary contact is 6A.

△ Auxiliary contact type: four normally-open and four normally-closed or six normally-open and six normally-closed;

△ See Table 10 for the abnormal connection and breaking capacity of auxiliary contacts.

Chart 10

Use categories	Connect			Break			Number of on-off operation cycles and frequency of operation		
	I/le	U/Ur	COS or T0.95	I/le	U/Ur	COS or T0.95	Number of operation cycles	Number of operation cycles per minute	Power on time
AC-15	10	1.1	0.3	10	1.1	0.3	10	6 (or the same operating frequency as the main circuit)	0.05
DC-13	1.1	1.1	6Pe	1.1	1.1	6Pe			

Note: When $P_e \geq 50W$ The upper limit of T 0.95 is $P_e \leq 300ms$.

△ The ability to connect and disconnect auxiliary contacts under normal conditions.

Chart 11

Use categories	Connect			Break		
	I/le	U/Ur	COS or T0.95	I/le	U/Ur	COS or T0.95
AC-15	10	1	0.3	1	1	0.3
DC-13	1	1	6Pe	1	1	6Pe

Note: When $P_e \geq 50W$ The upper limit of T 0.95 is $P_e \leq 300ms$.

△ Disconnect position key lock

The circuit breaker is equipped with a "disconnect position key lock" accessory (supplied according to ordering requirements), which can lock the circuit breaker in the disconnect position. At this time, neither the closing button nor the discharge (closing) electric touch iron can close the circuit breaker.

Architectural Overview

The fixed circuit breaker mainly consists of a contact system, an intelligent controller, a manual operating mechanism, an electric operating mechanism, and an installation board; The drawer type circuit breaker is mainly composed of a contact system, an intelligent controller, a manual operating mechanism, an electric operating mechanism, and a drawer seat. The circuit breaker is arranged in a three-dimensional form, with the characteristics of compact structure and small volume. The contact system is enclosed in an insulating base plate, and each phase of the contact is separated by an insulating plate to form a small chamber. The intelligent controller, manual operating mechanism, and electric operating mechanism are arranged in front of it to form independent units. If one of the units is broken, it can be completely removed and replaced with a new one.

The drawer type circuit breaker is composed of a plug-in circuit breaker and a drawer seat. The guide rail in the drawer seat can be pushed in and pulled out, the plug-in circuit breaker is positioned on the guide rail to pass in and out of the drawer, and the main circuit is connected through the plug-in connection of the bus on the plug-in circuit breaker and the bridge contact on the drawer seat. The drawer circuit breaker has three working positions: "connection" position, "test" position and "separation" position. The position change is realized by turning the handle in or out. The indication of the three positions is displayed by the pointer on the beam of the drawer base.

When it is in the "connection" position, both the main circuit and the secondary circuit are connected. When it is in the "test" position, the main circuit is disconnected and separated by an insulating partition. Only the secondary circuit is connected, and some necessary action tests can be carried out. When it is in the "separation" position, both the main circuit and the secondary circuit are disconnected. In addition, the draw-out circuit breaker is provided with a mechanical interlocking device. The circuit breaker can be closed only at the connection position or the test position, and the circuit breaker cannot be closed at the intermediate position between the connection position and the test position. See Fig. 5 for the front indication of the circuit breaker.

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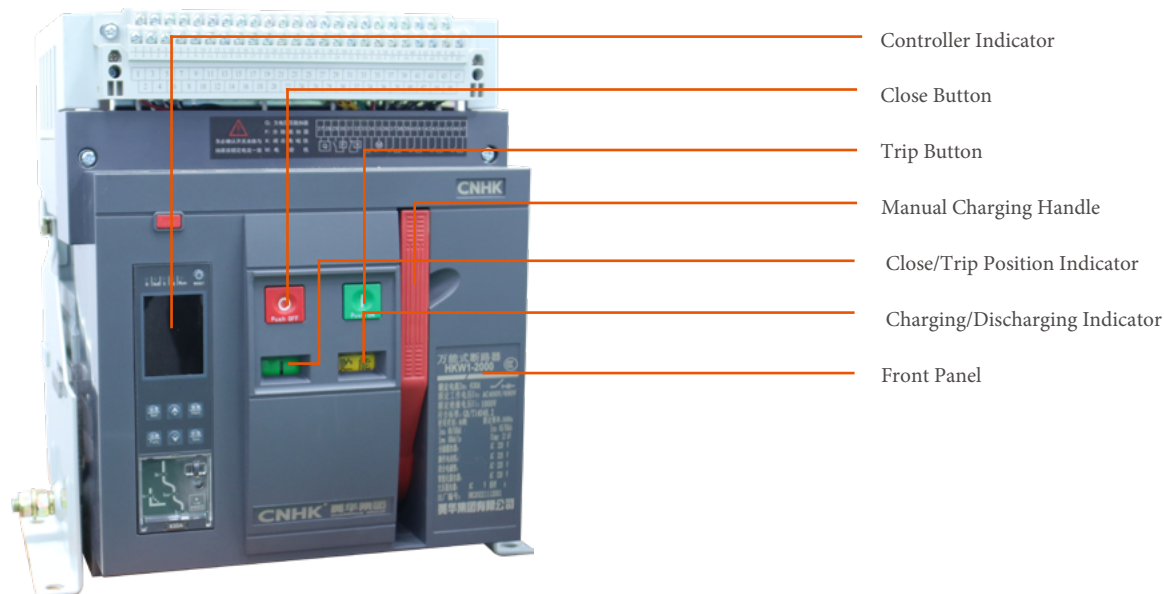


Figure 5

△ Interlocking Mechanism (for Drawout & Fixed Versions)

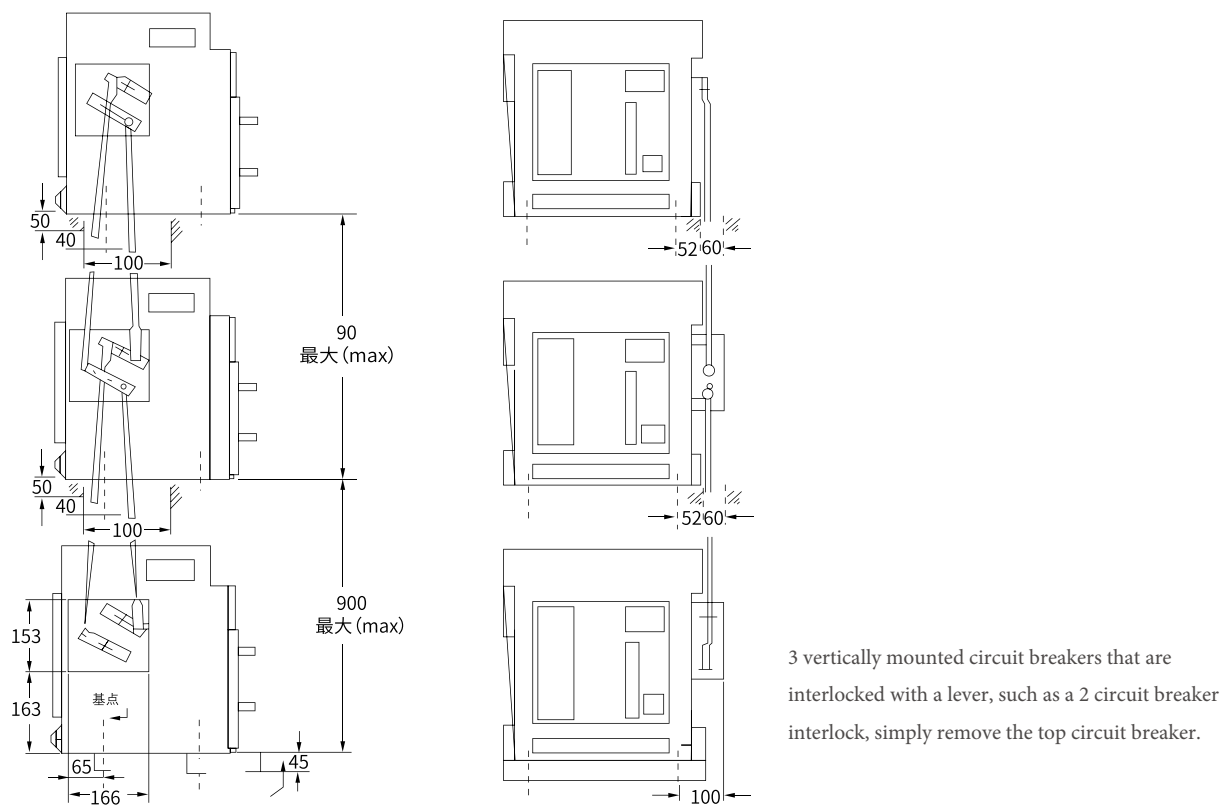


Figure 6a

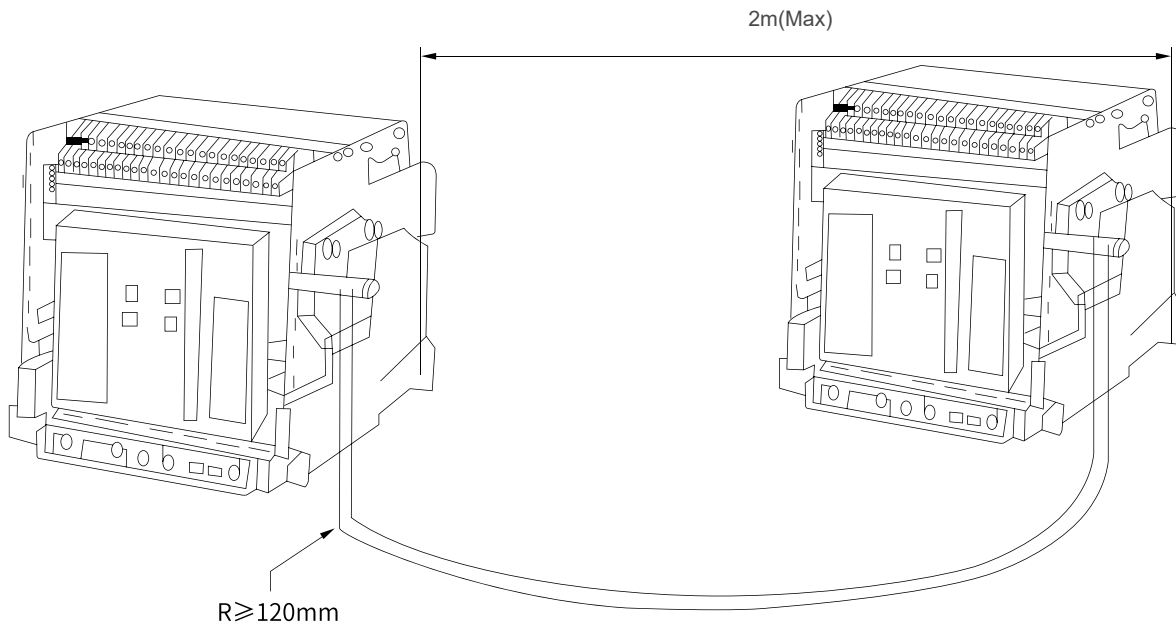


Figure 6b)

△ Terminal Block

There are totally 47 wiring terminals of the circuit breaker. The wiring is simple and convenient for the user to use. See Fig. 7 a), B) and C) for the coil.

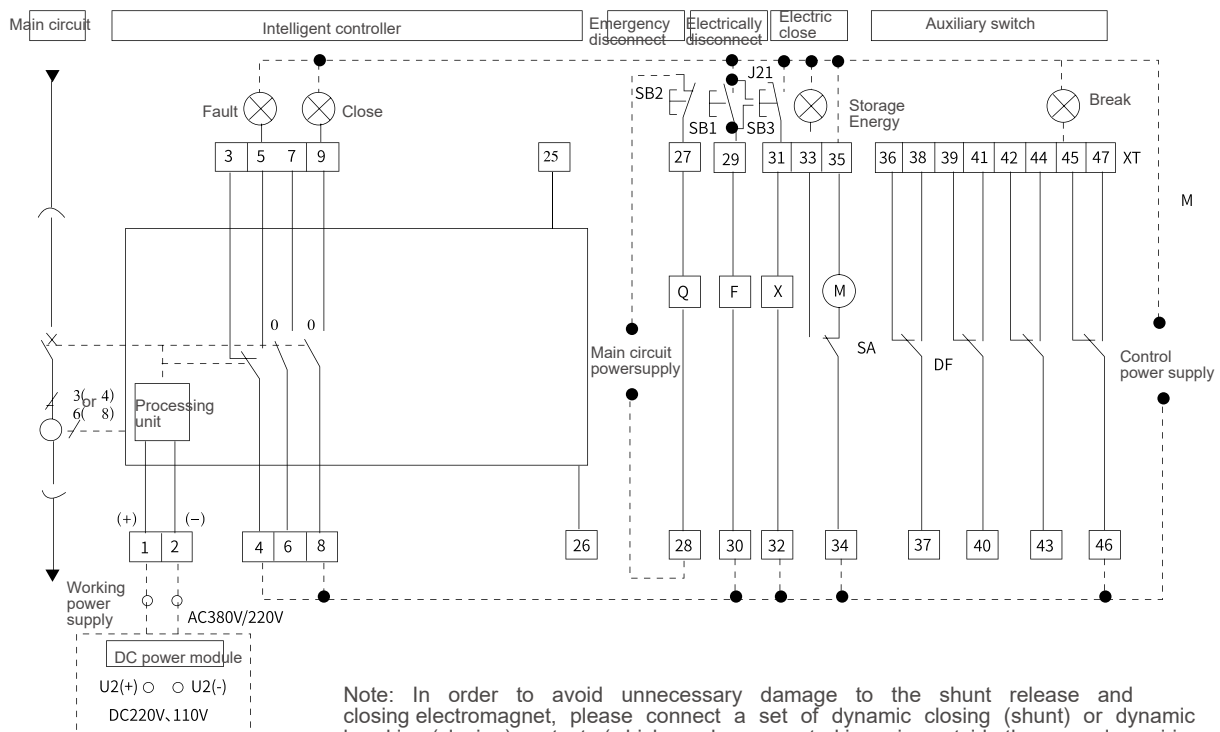
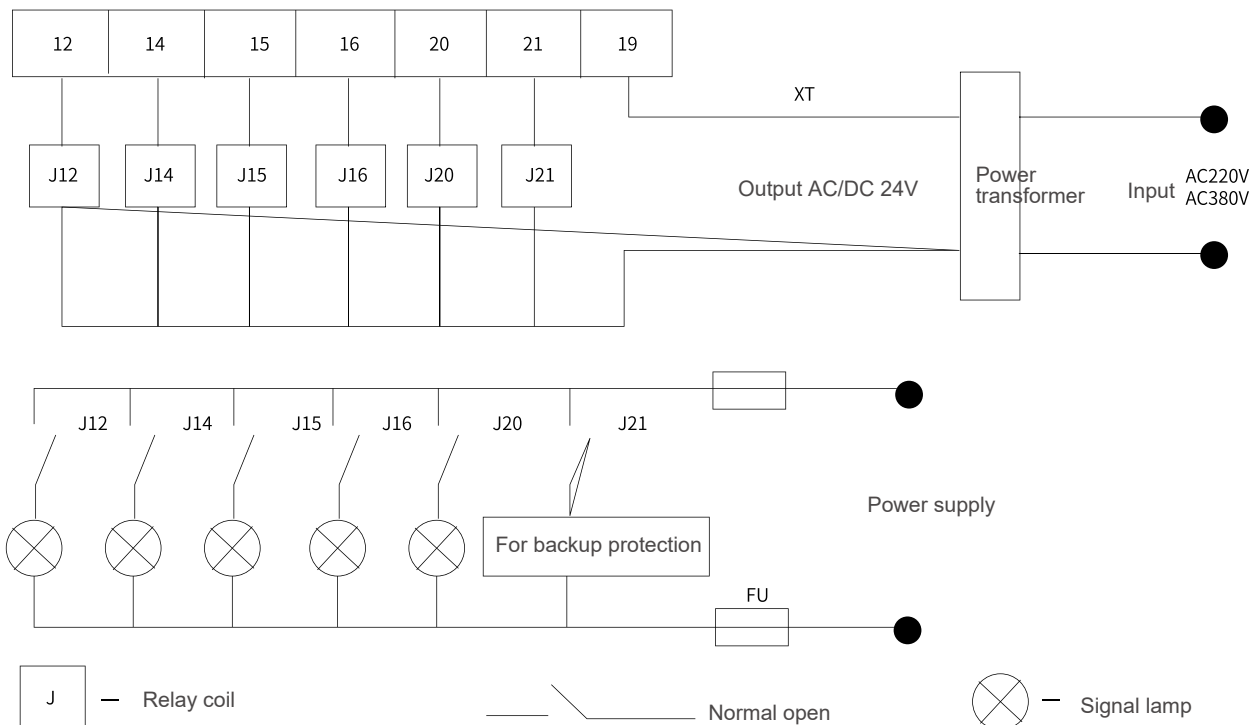


Figure.7a

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- △ If the control power voltages of F, X, and M are different, they should be connected to different power sources.
- △ Terminal # 35 can be directly connected to the power supply (automatic pre energy storage), or connected in series with a normally open button and then connected to the power supply
- △ Terminal # 35 can be directly connected to the power supply (automatic pre energy storage), or connected in series with a normally open button and then connected to the power supply
- △ Additional accessories are provided by the user
- △ When the working power supply of the intelligent controller is DC current, the DC power supply module must be added (at this time, the # 1, # 2 terminals cannot be connected to the AC power supply), and the secondary wiring is as shown in the figure (DC power supply DC110V or 220V is input from U1 (+) and U2 (-). The two output ends of the power module are respectively connected to the terminals 1 (+) and 2 (-) of the secondary wiring base.
- △ Other wiring of intelligent controller:
 - # 1 and # 2 AC working power input (input from DC power modules U1 and U2 in case of DC) # 25 and # 26 external neutral pole or ground current transformer input
 - SB1-shunt button (provided by the user) X-closing electromagnet DF-auxiliary contact Q-undervoltage release or undervoltage delay release
 - SB2-Undervoltage button (provided by the user) M-Energy storage motor F-Shunt trip O-Moving-closing contact (3A/AC 380V)
 - SB3-Closing button (provided by user) XT-Terminal SA-Motor microswitch O-Signal lamp (provided by user)
- △ Other wiring of intelligent controller:
 - # 1 and # 2 AC working power input (input from DC power modules U1 and U2 in case of DC)
 - # 12 Overload pre-alarm signal output
 - # 14 Instantaneous short delay tripping signal output
 - # 15 long delay tripping signal output
 - # 16 grounding (or neutral) fault tripping signal output
 - # 19 signal output common line
 - # 20 Self-diagnosis signal output
 - # 21 tripping signal (or for shunt or under voltage actuator)
 - # 25.26 External Neutral or Ground Current Transformer Input



Wiring diagram for relays with additional functions of circuit breakers

The controller signal output drives the external relay J to output the contact action signal through the terminals 12,14-16, 20 and 21.

△ The power transformer (the user shall refer to the input voltage value in the order specification) shall be provided by the manufacturer. The power transformer can be inserted into the standard guide rail together with the relay base and installed at the appropriate position of the switch cabinet by the user.

△ Relay model: HH62P, AC/DC24V, provided by the user.

△ Self-diagnosis signal output conditions:

Internal temperature of controller > 806C;

The chip is not working properly;

Power loss of controller.

△ Users can choose according to their actual needs. J12, J14-J16, J20, J21 are selected by themselves.

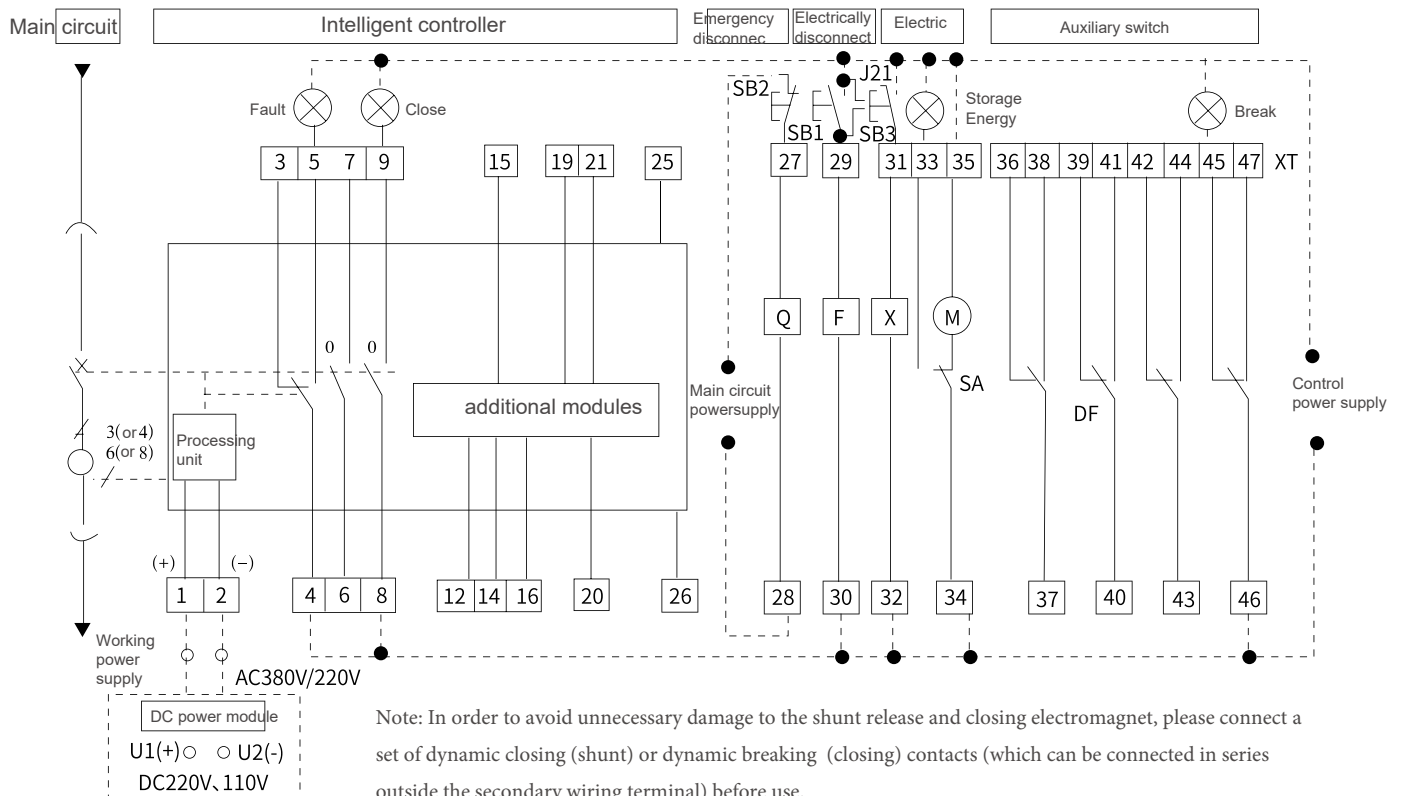


Fig. 7 b) (L-type common basic functions of the controller)

△ If the control power supply voltages of F, X and M are different, they shall be connected to different power supplies respectively.

△ Terminal # 35 can be directly connected to the power supply (automatic pre-energy storage), or connected in series with the normally open button and then connected to the power supply (manual pre-energy storage).

△ If proposed by the user, terminal # 6- # 7 can output normally closed contact.

△ Additional accessories are provided by the user

△ * When the working power supply of the intelligent controller is DC current, the power supply module shall be added (at this time, the # 1 and # 2 terminals shall not be connected to the AC power supply). The secondary wiring is as shown in the figure (DC 110V or 220V is input from U1 (+) and U2 (-), and the two output ends of the power module are respectively connected to terminals 1 (+) and 2 (-) of the secondary wiring base).

△ SB1-Shunt button (provided by the user) X-closing electromagnet DF-auxiliary contact Q-undervoltage release or undervoltage delay release

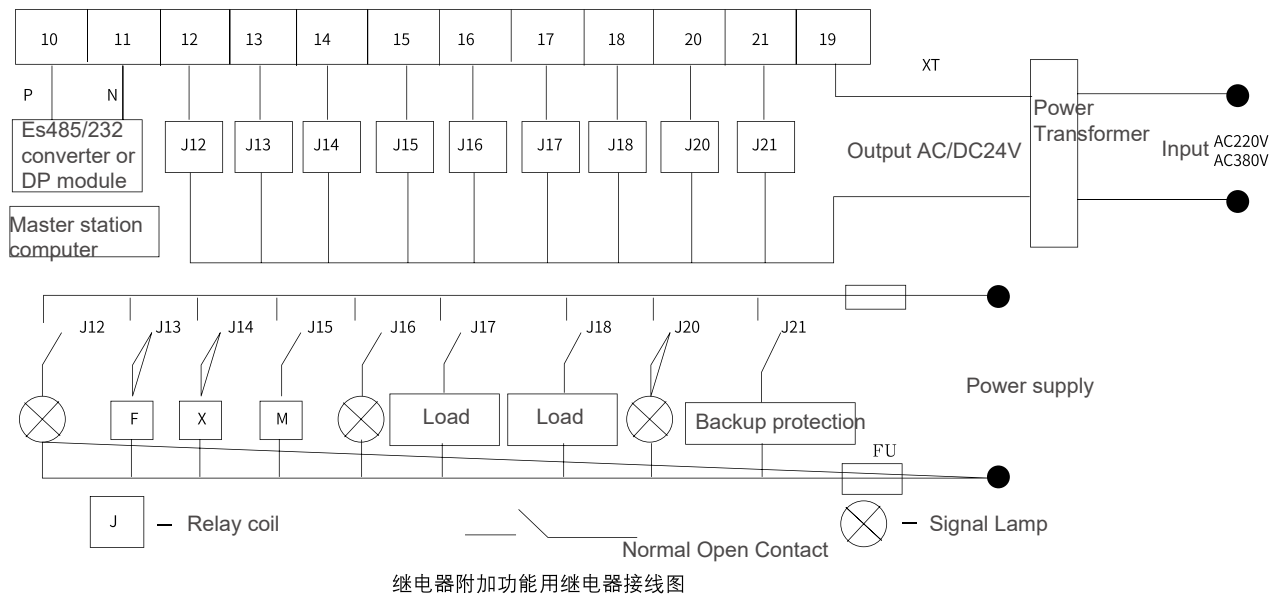
△ SB2-Undervoltage button (provided by the user) M-Energy storage motor F-Shunt trip O-Moving contact (3A/AC 380V)

△ SB3-Closing button (provided by the user) XT-wiring terminal SA-motor microswitch- signal lamp (provided by the user)

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△ Other wiring of intelligent controller:

- △ # 1 and # 2 AC working power input (input from DC power modules U1 and U2 in case of DC)
- # 10 RS485 communication P terminal (simplex) remote regulation and remote communication
- # 11 RS485 communication N terminal (simplex) remote control and telemetry, etc.
- △ # 12 Overload pre-alarm signal output
- △ # 13 communication remote control shunt excitation trip output
- △ # 14 Instantaneous short delay tripping signal output or communication remote control closing output
- △ # 15 long delay tripping signal output or communication remote control energy storage output
- △ # 16 grounding (or neutral) fault tripping signal output
- △ # 17 Load unloading 1 signal output
- # 18 Load unloading 2 signal output
- # 19 signal output common line
- # 20 Self-diagnosis signal output
- # 21 Trip signal (available for shunt or undervoltage actuator)
- # 22 Voltage signal Phase A
- # 23 Voltage signal Phase B
- # 24 Voltage signal Phase C
- voltage signal is directly input to phase from the main circuit.
- # 25.26 External neutral pole or ground current transformer input



△ The controller signal output drives the external relay J to output the contact action signal through the terminals 12-18 and 20-21.

△ RS485/232 converter/power transformer (the user shall refer to the input voltage value in the order specification) shall be provided by the manufacturer, and the power transformer can be inserted into the standard guide rail together with the relay base. To be installed by the user at a suitable location in the open cabinet.

△ Relay model: HH62P, AC/DC24V, provided by the user.

△ The main station computer shall be prepared by the user.

△ The output of terminal 13-15 can be used for remote control of communication. Closing and energy storage. The tripping and signal of the corresponding terminals 14 and 15 are no longer output at this time, and the normally open contact of the corresponding relay can be connected in parallel with the corresponding button for manual control, so that manual control and remote control can be realized. If the remote control function is not required. Terminals 14 and 15 can be connected in series with two signal lamps through the moving contacts of relays J14 and J15 to remotely output corresponding signals. Please indicate whether the remote control function is required in the order specification. The manufacturer determines the corresponding function of the output of terminals 14 and 15 accordingly. The output of terminal 21 can be used as backup protection after pushing relay J21.

△ Self-diagnosis signal output conditions:

The internal temperature of the controller is more than 80 ℃ ;

The chip is not working properly;

Power loss of controller.

△ Users can choose J12-J21 according to their actual needs.

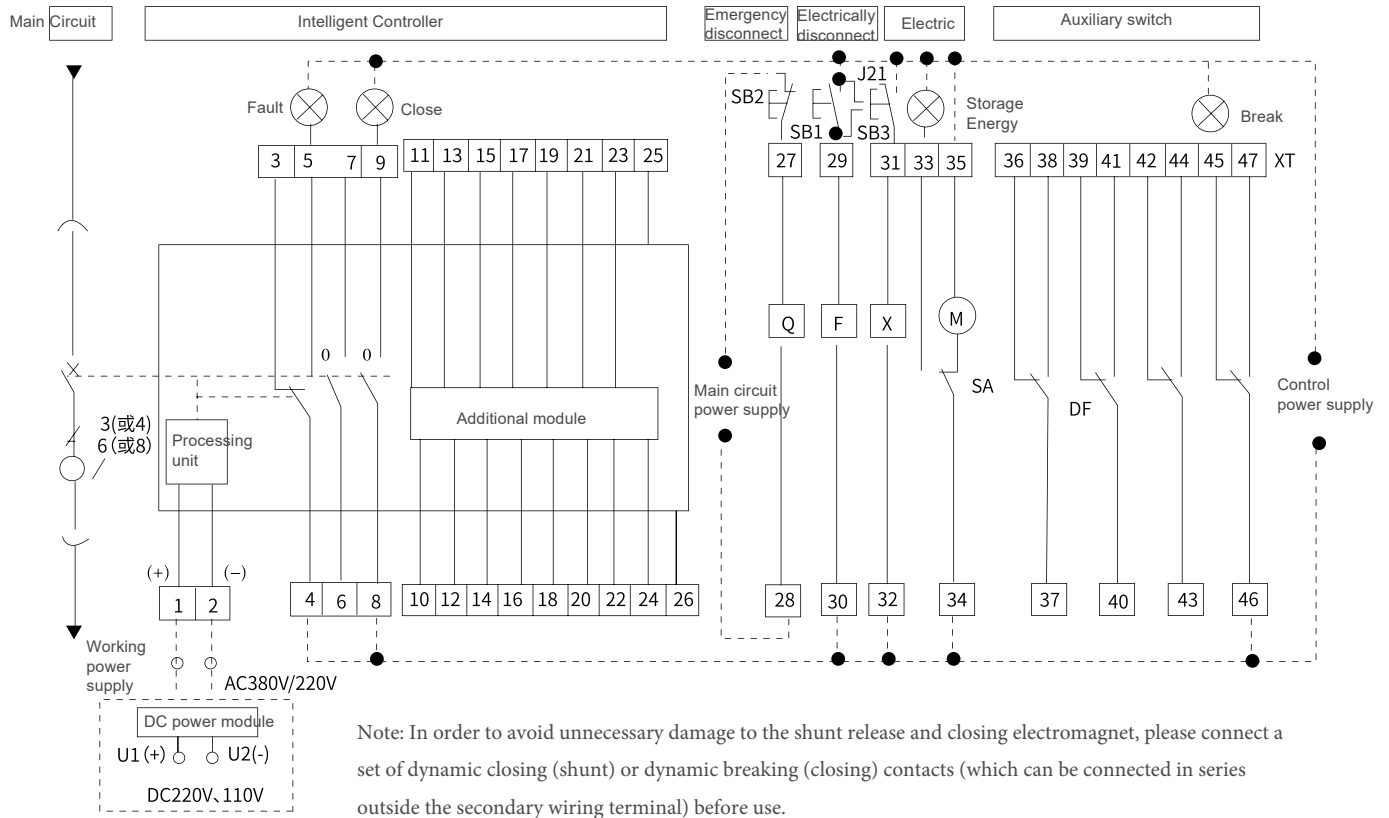
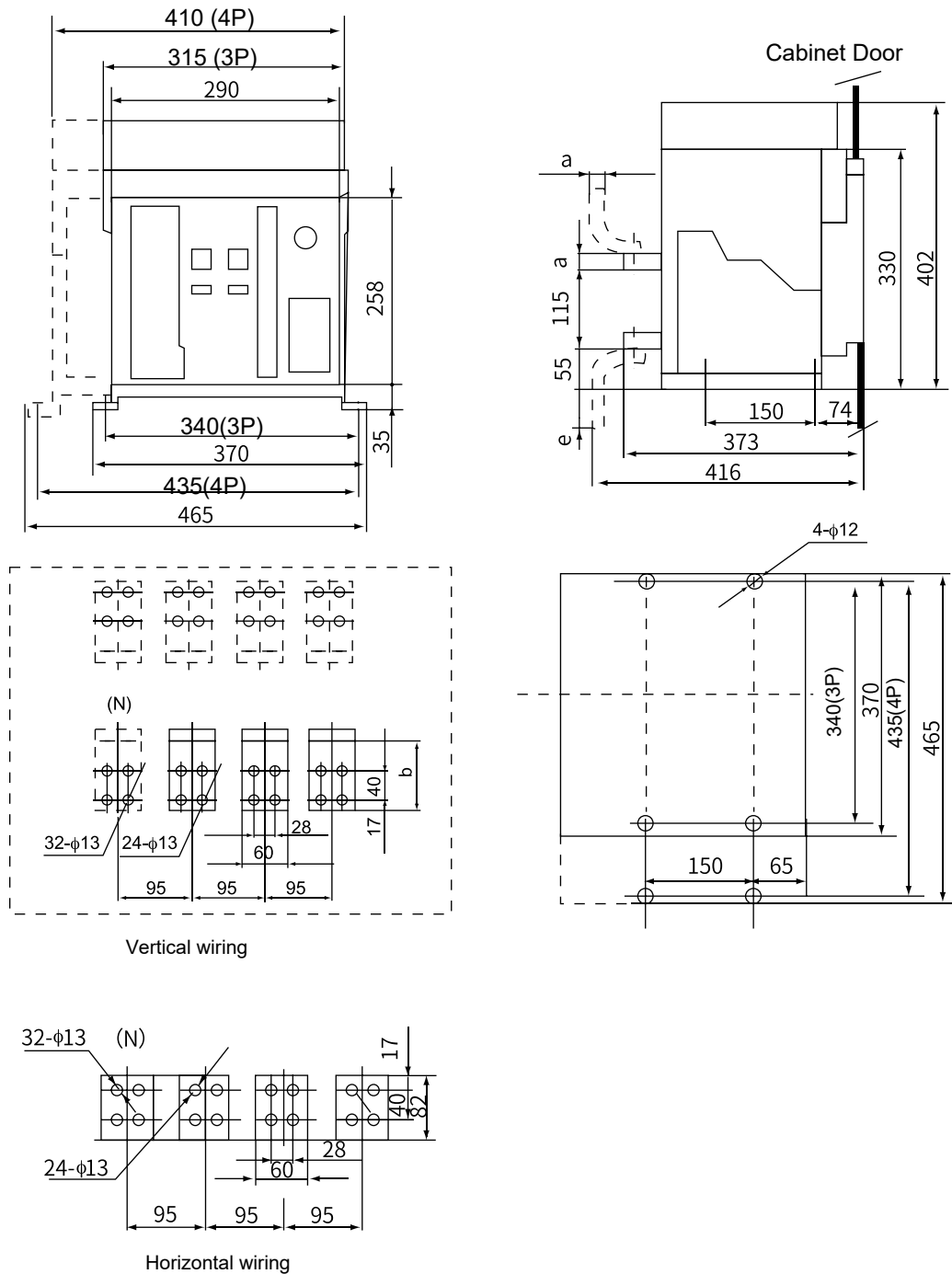


Figure 7c) (The controller is of type L with additional functions)

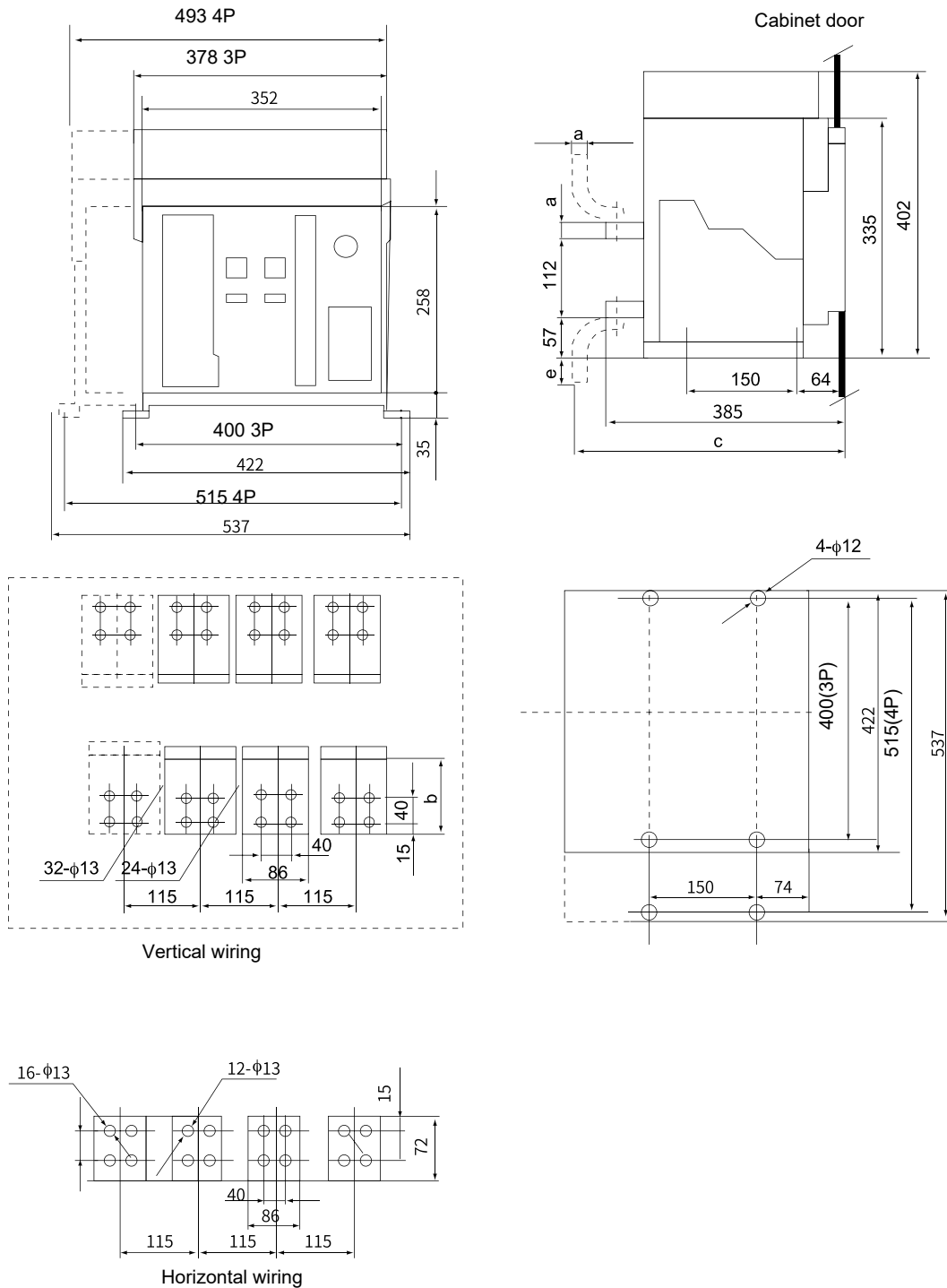
- △If the control power supply voltages of F, X and M are different, they should be connected to different power supplies
- △Terminal #35 can be directly connected to the power supply (with automatic pre-energy storage), or it can be connected in series with a closing button and then connected to the power supply (with manual pre-energy storage).
- △If requested by the user, terminals #6-#7 can output dynamic contact points
- △Additional attachments are to be prepared by the user
- △When the working power supply of the intelligent controller is DC current, a power module must be added (at this time, terminals #1 and #2 cannot be connected to AC power). The secondary wiring is as shown in the figure (DC power supply DC110V or 220V is input from U1(+) and U2 (-). The two output terminals of the power module are respectively connected to terminals 1 (+) and 2 (-) of the secondary wiring socket.
- △SB1-Shunt button (provided by the user) X-closing electromagnet DF-auxiliary contact Q-undervoltage release or undervoltage delay release
- △SB2-Undervoltage button (provided by the user) M-Energy storage motor F-Shunt trip O-Moving contact (3A/AC 380V)
- △SB3-Closing button (provided by the user) XT-wiring terminal SA-motor microswitch- signal lamp (provided by the user)

The installation dimensions and external dimensions of fixed circuit breakers (HKW1- 2000, 2000/4)



In	a mm	b mm	e mm
400-800A	10	95	38
1000-1600A	15	105	48
2000A	20	115	58

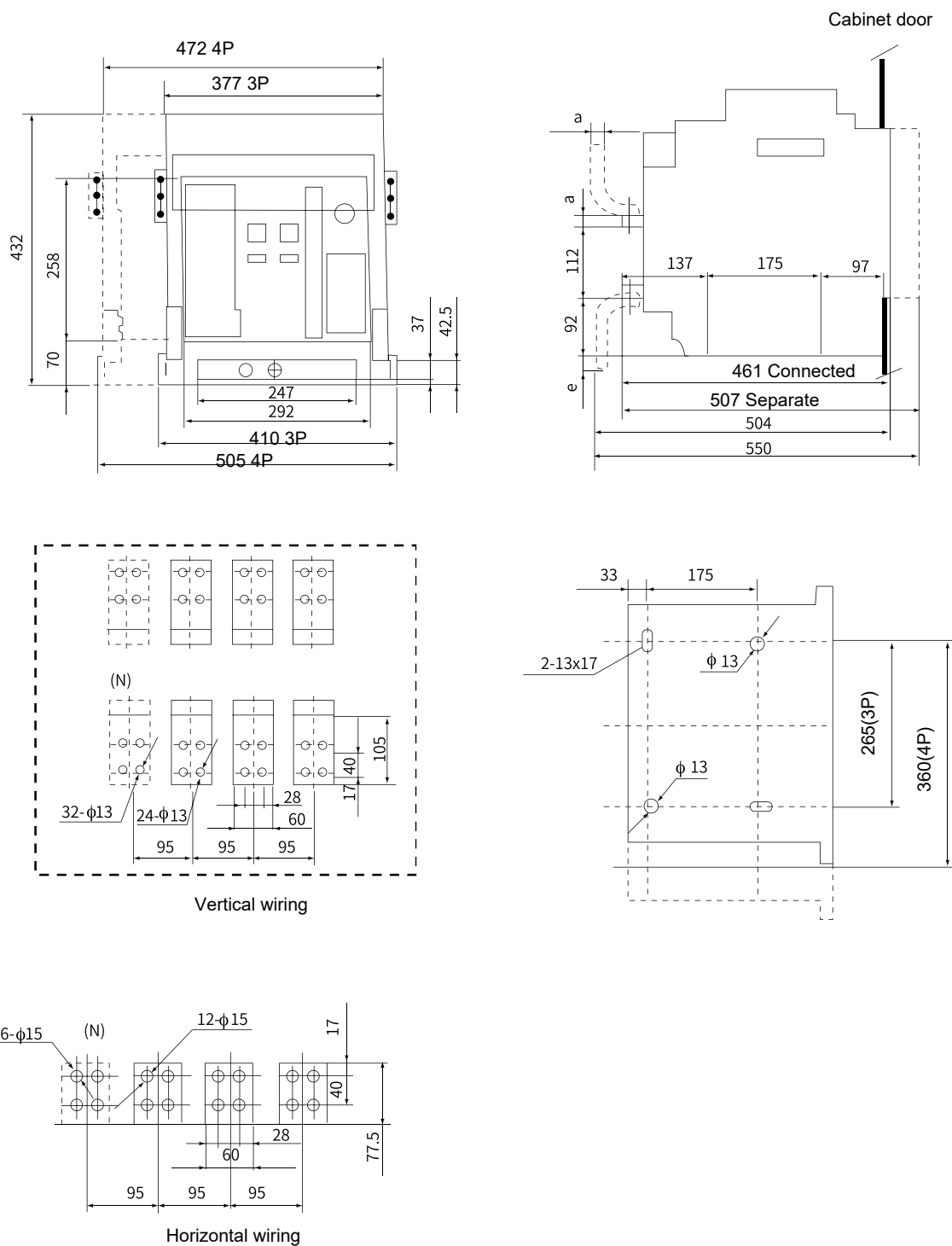
The installation dimensions and external dimensions of fixed circuit breakers (HKW1-3200, 3200/4)



In	a mm	b mm	e mm
2000A、2500A	20	115	58
2900A、3200A	30	135	78

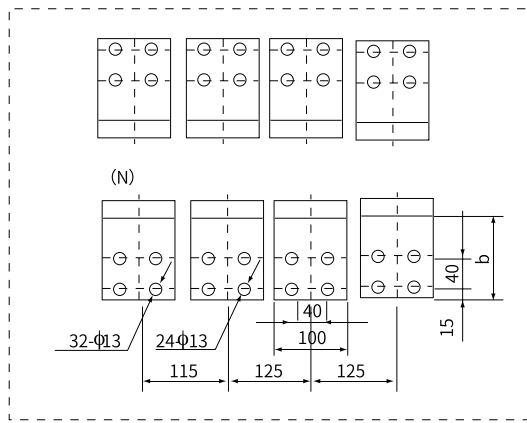
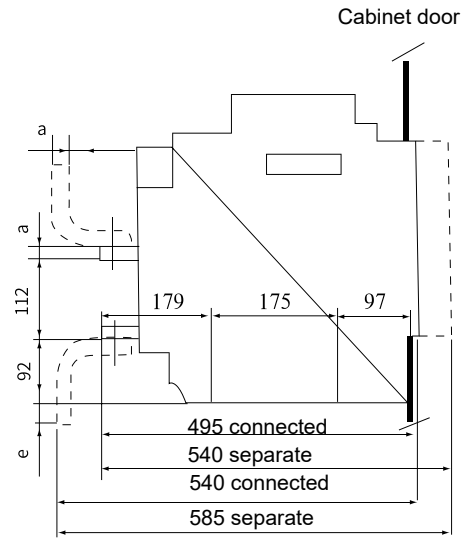
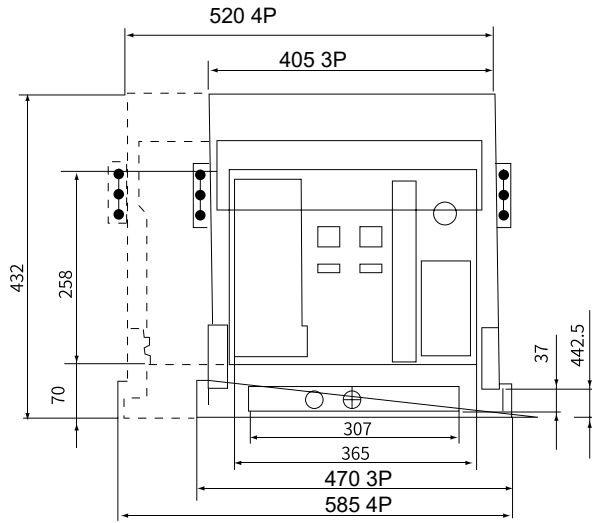
HKW1 AIR CIRCUIT BREAKER

△ The installation dimensions and external dimensions of drawer type circuit breakers (HKW1-2000, 2000/4)

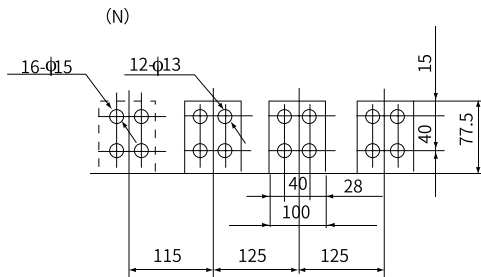
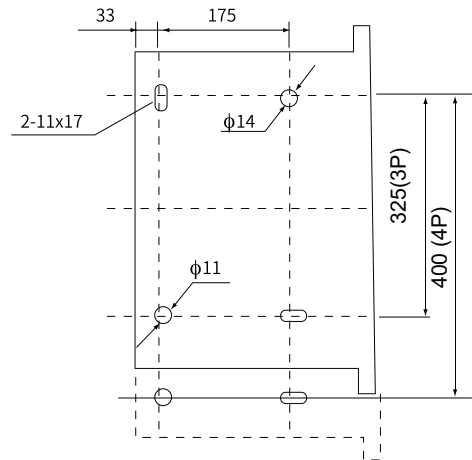


In	a mm	e mm
400-800A	10	38
1000-1600A	15	48
2000A	20	58

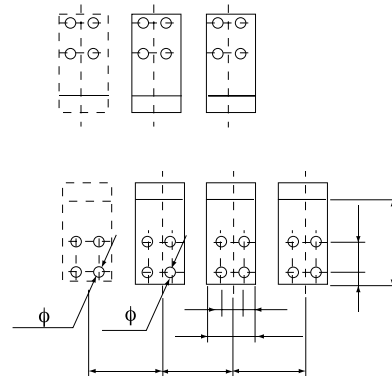
The installation dimensions and external dimensions of drawer type circuit breakers (HKW1-3200, 3200/4)



Vertical Wiring



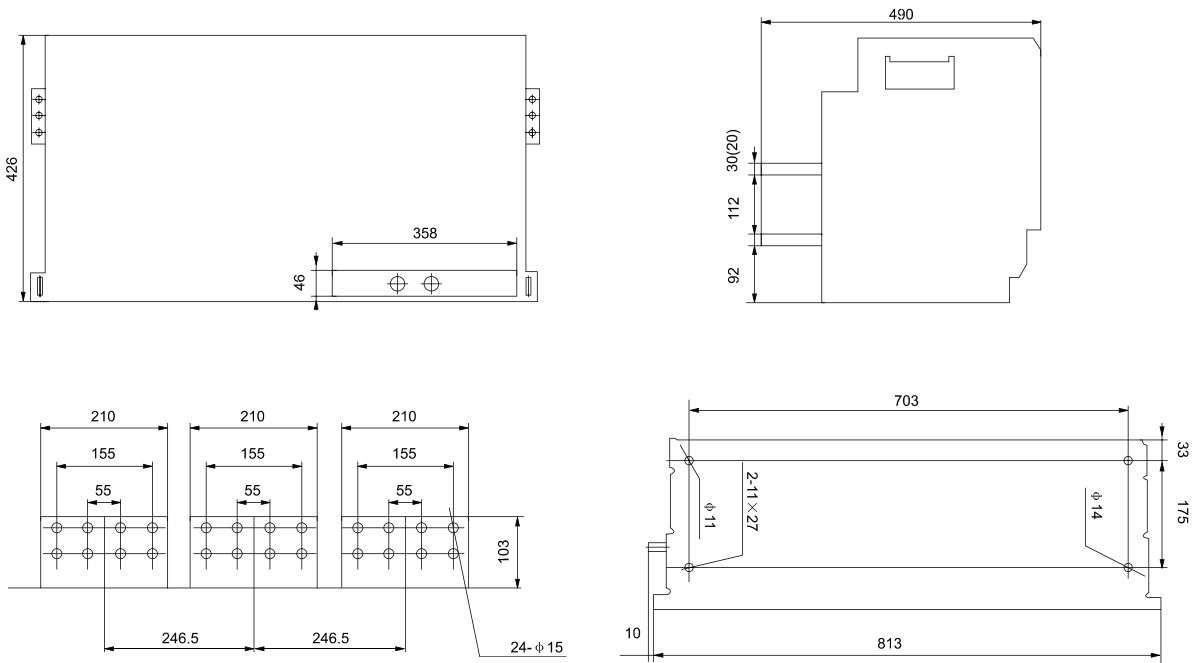
Horizontal Wiring



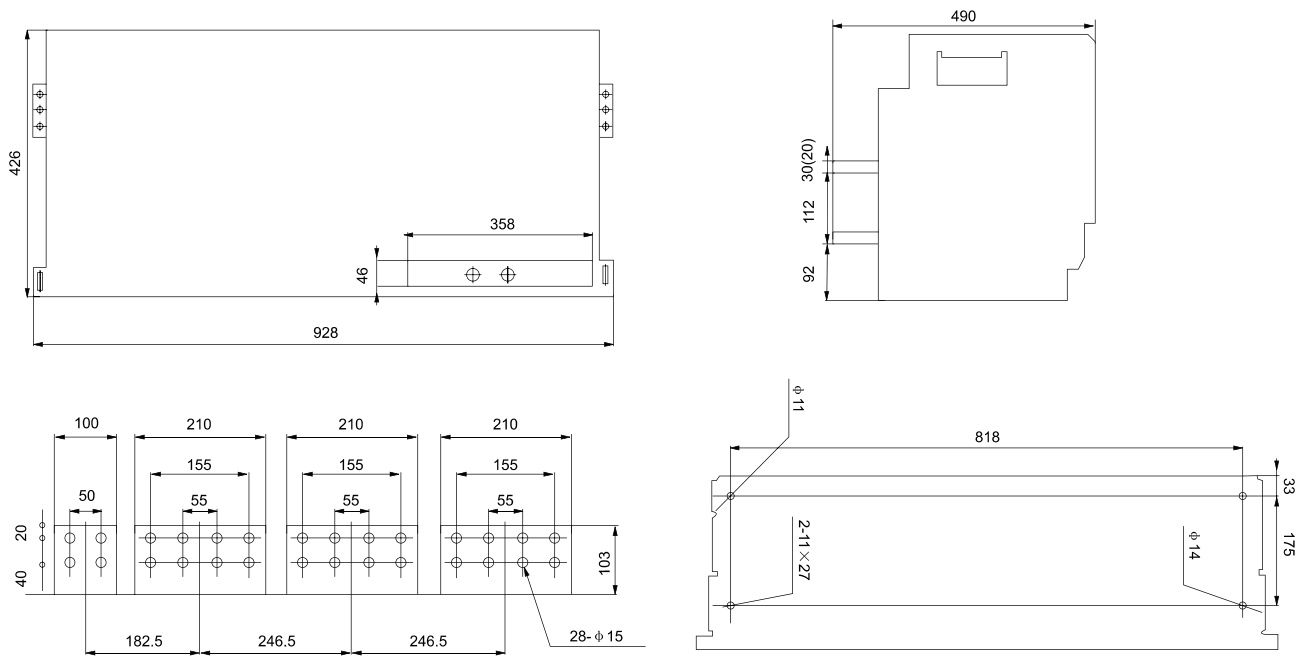
In	a mm	b mm	c mm	d mm	e mm
2000A、2500A	20	115	506	552	23
2900A、3200A	30	135	526	572	43

HKW1 AIR CIRCUIT BREAKER

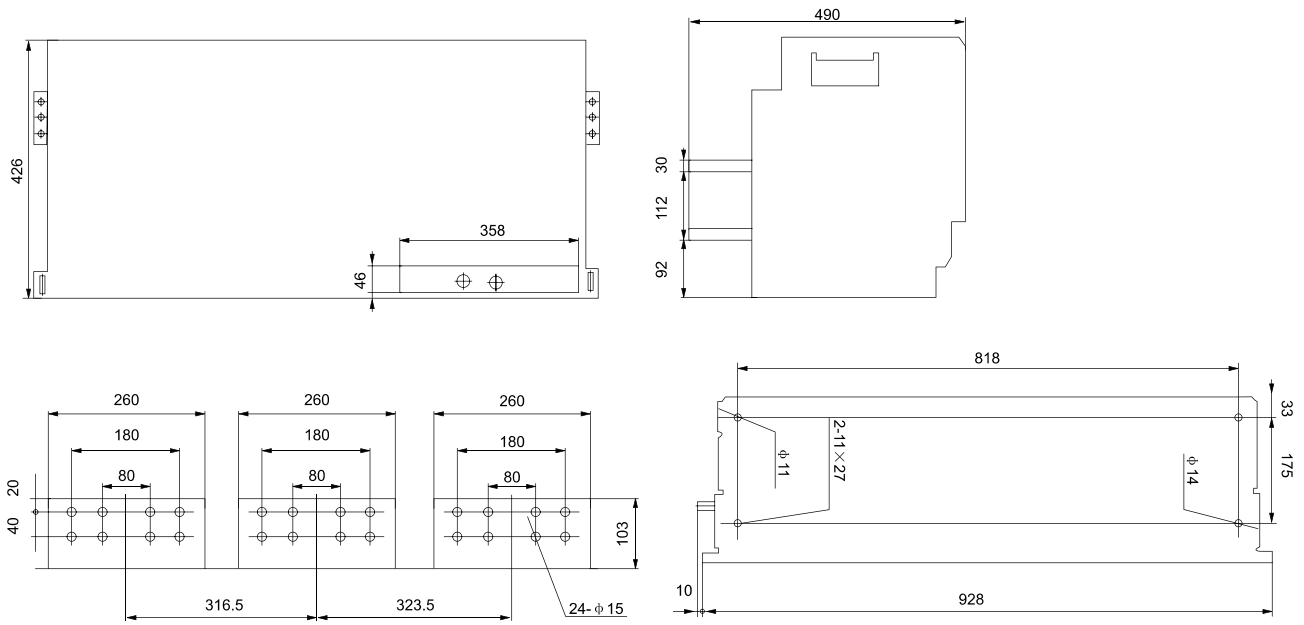
△ The installation dimensions and external dimensions of drawer type circuit breakers (HKW1-4000.5000 3+3/3P)



△ The installation dimensions and external dimensions of drawer type circuit breakers (HKW1-4000.5000 3+4/4P)



△ The installation dimensions and external dimensions of drawer type circuit breakers (HKW1-6300 3+3/3P)



Specification and quantity of copper bars for user connection

Rated current	Specification of external copper bar	Each limit number	Rated current	Specification of external copper bar	Each limit number
630A	40×5	2	2000A	100×5	3
800A	50×5	2	2500A	100×5	4
1000A	60×5	2	3200A	120×10	3
1250A	80×5	2	4000A	120×10	4
1600A	100×5	2			

Door frame size and installation hole spacing

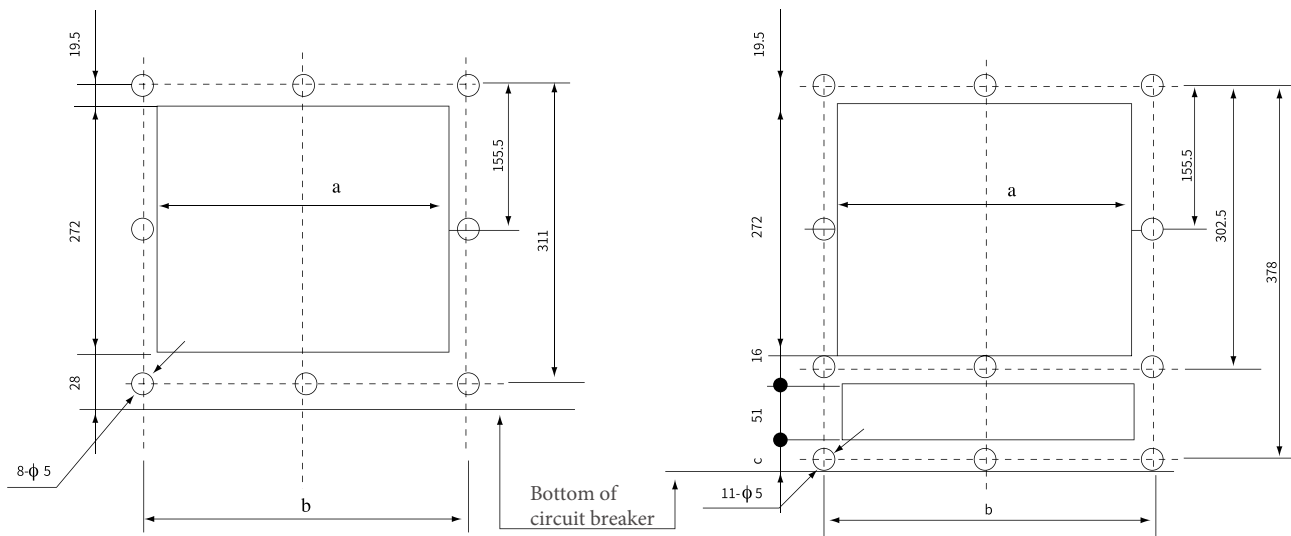


图 12

In	a mm	b mm	c mm
2000	306	345	0
3200	366	405	0

Installation, use and maintenance

Installation:

- △ Check whether the specification of the circuit breaker meets the requirements before installation.
- △ Before installation, use a 500v megohmmeter to check the insulation resistance of the circuit breaker. When the ambient medium temperature is $20\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ and the relative humidity is 50% -70%, the insulation resistance shall not be less than 10 MΩ of the total load. Otherwise, it should be dried. It can be used only when the insulation resistance meets the requirements.
- △ When the circuit breaker is installed, its base shall be in the horizontal position. And secure with M10 screws.
- △ The circuit breaker shall be reliably and protectively grounded during installation, and there shall be obvious grounding marks at the grounding point.
- △ The upper incoming line or the lower incoming line of the circuit breaker does not change its technical performance.
- △ After the circuit breaker is installed and wired according to the relevant wiring diagram, the following operation tests shall be carried out before the main circuit is energized (the indicator on the drawer seat of the drawer type circuit breaker is at the test position):
 - Check whether the voltage of undervoltage, shunt release, energy release (closing) electromagnet and electric operating mechanism is consistent (the undervoltage release must be energized before closing the circuit breaker).
 - Pull the handle on the mask up and down. Seven times later the panel shows. "Store energy" and hear a "click". End of energy storage. Press the "1" button or energize the release (closing) electromagnet and turn it off
 - The breaker is reliably closed (under the condition that the reset button of the controller is reliably reset), and the energy can be stored again by pulling the handle.
 - The motor is powered on until the mask displays "Energy Storage", accompanied by a "click", the energy storage is over, the motor is automatically powered off, press the "1" button or release the energy (the closing electromagnet is powered on, The circuit breaker is reliably closed.
 - After the circuit breaker is closed, whether the undervoltage, shunt release or the "0" button on the mask is used, the tripping test of the intelligent release shall be able to open the circuit breaker.

Usage of intelligent controller:

△ Adjustment of the controller

Controller long-delay current setting: After pressing the "Clear Light" button. Press the "Set" key until the long delay status indicator light is on, showing the factory current setting value for long delay, which is generally I_n . The current setting range is (0.4 -1.0) I_n . Press the "+" and "-" keys as needed. Each time you press, increase or decrease at intervals of less than 2% until you are closest to the required current, and then press again. The "Storage" key, when the storage indicator light is on once and then off again, indicates that the long-delay current setting value has been stored completely.

- Long delay time setting: After the long delay current setting is completed, press the "Set" key again. The long delay time status indicator light will light up, showing the factory setting value of the long delay time. Press the 1+ "key. Each time you press it, the time doubles. If the time is too long, you can press the "-" key again. Each time you press it, the time is halved until it is closest to the required time. Then press the "Save 9" key once. The save indicator light will light up and go off once, indicating that the long delay time setting is completed. The methods for setting the action values and action times of load monitoring, short-delay, instantaneous, grounding and other protection actions are the same as above, but they correspond to different state indications. The grounding time is set to the "OFF" position, indicating a fault status. Grounding only alarms but does not trip. The instantaneous setting at the "OFF" position indicates that the protection is cancelled. During the setting process of the controller, once there is a fault signal, the key function will be automatically blocked and the controller will enter the fault handling state.

-The various protection parameters of the controller must not be set interchangeably. The protection priority of the trip unit is as follows: long delay < short delay < instantaneous. For Lc2 used for reclosing, the set value is less than I_{Lc1} . After all the parameters of the trip unit are set, press the "clear light" button once or reset the power once to put the controller in operation.

△ Controller Test

-After the controller parameters are set, before the circuit breaker operates, users can check various protection functions of the trip unit as needed. The controller test has a trip/non-trip option. When the "trip" key is pressed for the test, the circuit breaker opens. When the "non-trip" key is pressed for the test, no trip signal is sent and the circuit breaker does not open. (Note: The L-type product only has a tripping test. Press the "Test" button once, and the controller will issue an instantaneous signal, causing the circuit breaker to open.)

-For overload test, press the "Set" key to the long delay state, check the overload setting value, and then switch to other current states. Press the "+" and "-" keys. When adjusting the current to $> 1.31I_1$, press the test key once to enter the overload test state. The controller will delay the action according to the inverse time limit rule and indicate the fault category and test status. Other characteristic tests are similar. After the test is completed, press the "Clear Light" button once to enter the normal operation state. At the same time, you must press the "Reset" button of the mechanism once before closing the circuit breaker.

△ Other usage rules of the controller

The controller is in the setting and checking state. If no keys are pressed in the I_{min} , it will automatically clear the keys and enter the normal operation state. Meanwhile, once a fault occurs, the key function will be automatically blocked and it will enter the fault handling state.

-After setting the check controller to "clear the light", continuously press the "Set" key when there are no faults. The cycle indicates various states and the corresponding set current and time values. After checking, please press the "Clear Light" button once (if no button is pressed within 1 minute, it will automatically enter the normal operation state).

-After the grid operation current and voltage check controller "clear the light", in the absence of faults, continuously press the "Select 1" (" Select ") key to cyclically indicate the operating current values of each phase and the grounding current values, and normally display the maximum phase current. Continuously press the "Select 2" key to cyclically indicate the line voltages, and normally display the maximum line voltage.

-After the controller "clears the light", press the "Fault Check" key once, and the previous fault status and fault current will be displayed. After the test or fault is tripped, press the (" Select ") key to cyclically display the current or time value of the test or fault, and the test status will not be remembered.

- Reset: Before closing the circuit breaker, the "clear light" button of the trip unit must be pressed first. Put the controller into the normal state, and then press the mechanical "reset" button once before closing the circuit breaker.

△ If users have specific requirements for the product characteristics based on Tables 4, 5 and 8, they can specify them when placing an order. The product will be adjusted according to the order requirements at the factory.

△ If the user's order has no specified requirements, the controller is selected as Model M1. The factory Settings are as follows:

The long delay is set at $1.0I_n$, and the action time is set at $1.5I_{r1}$ for 15 seconds.

The short-delay I_{r2} is set slightly greater than $8I_{r1}$ values, and the timing limit is 0.4 seconds.

The instantaneous I_{r3} is set at $12I_n$.

The I_{r4} setting for ground fault is $0.4I_n$. When the action time is set to "OFF", only the display is displayed while the circuit breaker remains open. If users need to change the factory setting values during use, they should fully understand

After this product, it is allowed to be set by yourself through the controller according to Chart 4.

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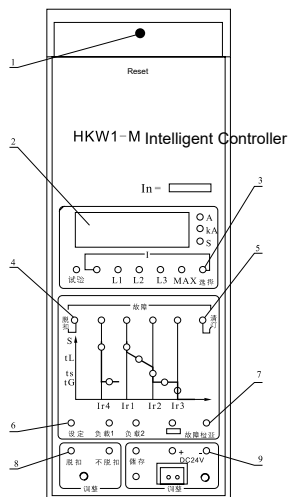


Fig. 13 a)

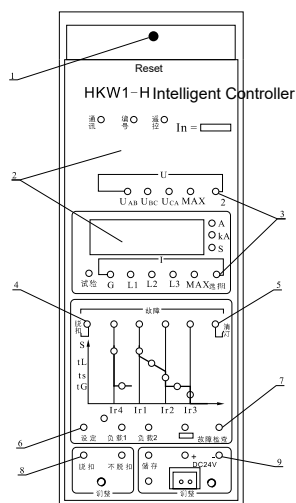


Fig. 13 b)

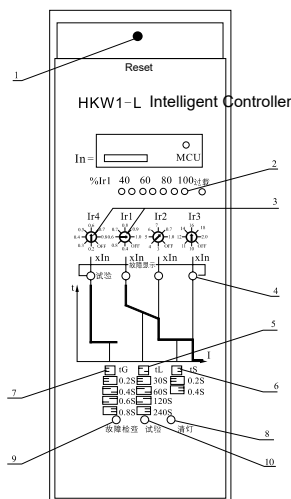


Fig. 14

Structure of circuit breaker control panel

M-type or H-type controllers are shown in Figures 13a) and b).

1- Reset button. If the circuit breaker needs to be closed again after tripping. The position button needs to be pressed once; otherwise, the circuit breaker cannot be closed.

2- Current (voltage) and time display, capable of showing current (voltage) or time values.

3- "Select" key. During normal operation, it can cyclically display various current (voltage) values. In fault status or fault inspection status, it can cyclically display fault current or time values.

4- LED light indication, capable of indicating various states and categories.

5- "Clear the Light" button. After setting the controller, testing faults or before closing the circuit breaker, this key must be pressed once to put the trip unit in a normal operating state.

6- "Settings" key. It is used to check or set the current or usage time of various protection characteristics. Pressing this key can cyclically indicate various states.

7- The "Fault Check" key, after the controller "clears the light", pressing this key can display and indicate the status of the last fault and the fault current or time. Fault current or time is cycled and checked by pressing the "Select" key.

8- The "Release" and "Do Not Release" keys are used when performing test functions.

9- The "Save", "+", and "-" keys are used to set the current or time.

Ir4- Grounding protection current setting value Ir1- Long-delay current setting value Ir2- Short-delay current setting value

Ir3- Instantaneous current setting value tG- Grounding protection time setting value tL- Long delay time setting value tS- Short delay time setting value

△ L-type controller

△ The L-type controller is shown in Figure 14.

1- Reset Button: After the circuit breaker malfunctions or the test trip occurs, press this button to close the circuit breaker again.

2- Load display: Displays overload long-delay current.

3- Long delay, short delay, instantaneous and grounding protection current setting knobs. Adjust the current of each protection according to the scale values on the knobs.

4- Fault indicator light: Indicates the type of fault.

5- Long-delay overload protection time setting key: Adjust the time by toggle the switch position.

6- Short delay protection time setting key: Adjust the time by toggle the switch position.

7- Ground fault protection time setting key: Adjust the time by toggle the switch position.

8- Light Clearing Button: This button must be pressed after the controller is set, tested or faulty to bring the trip unit into the normal operating state.

9- Fault Check Key: After a circuit breaker trips due to a fault, pressing this key can indicate the cause of the trip. Even after power failure, it still has the function of fault memory.

10-Test Key: This key checks the good fit between the controller and the circuit breaker.

△ Setting method of protection characteristics for L-type intelligent controller:

- Long delay setting:

a. Rotate the Ir1 switch to set the current from (0.4-1)In;

b. Press the "tL" key to set the time to 30S, 60S, 120S, and 240S.

c. If the Ir1 switch is rotated to the OFF position, it indicates that this function is out.

- Short delay setting

a. Rotate the Ir2 switch to set the current from (3-10)In;

b. Press the "tS" key to set the time to 0.2 seconds and 0.4 seconds.

c. If the Ir2 switch is rotated to the OFF position, it indicates that this function is out.

-Instantaneous setting

a. Rotate the Ir3 switch to set the current from (3-10)In or (10-20)In;

b. If the Ir3 switch is rotated to the OFF position, it indicates that this function has been exited.

-Ground fault protection setting

a. Rotate the Ir4 switch to set the current from (0.2-0.8)In;

b. Press the "tG" key to set the time to 0.2S, 0.4S, 0.6S, and 0.8S.

c. If the Ir4 switch is rotated to the OFF position, it indicates that this function is out.

-The controller enters the operating state

After all the controller parameters have been adjusted, press the "Clear Light" button.

△ When using a drawer-type circuit breaker, if the user needs to pull out the inserted circuit breaker body, they must first shake the switch to the "disengaged" position, and then pull out the handle before pulling it out.