

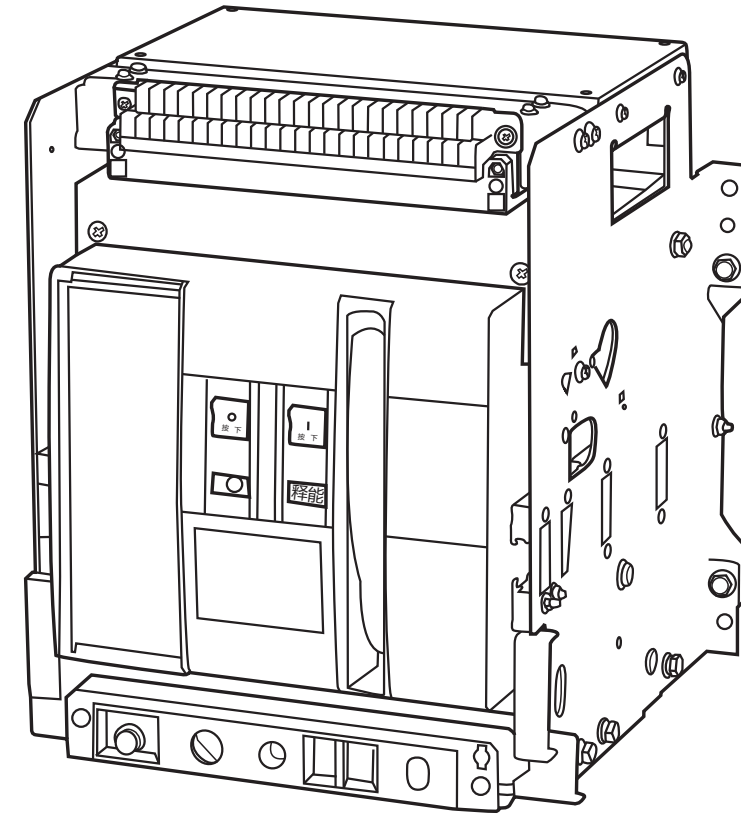


ایٹاٹروا ایٹصال

ایٹصال ایپن، حفاظت پاپ

Intelligent Air Circuit Breaker

PRODUCT MANUAL

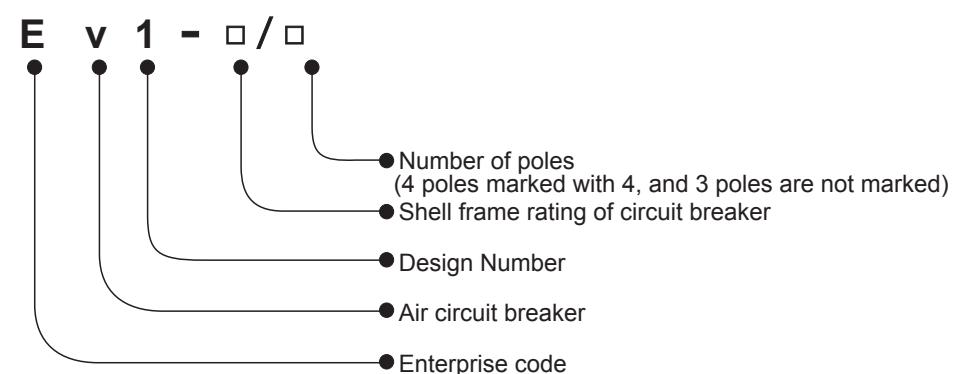


1 Uses and scope of application

Ev1-2000 series intelligent universal circuit breakers (hereinafter referred to as circuit breakers), suitable for distribution networks with AC 50Hz, rated voltage 660V(690V)and below, and rated current 200A-6300A,used to distribute electrical energy and protect lines and power equipment protected against overload, under voltage, short circuit, single phase grounding and other faults. The circuit breaker has intelligent protection function, selective protection precision, can improve the reliability of power supply and avoid unnecessary power failure. At the same time with an open communication interface, can be "four remote" to meet the requirements of control centers and automation systems. The circuit breaker has a pulse withstand voltage of 8000V at an altitude of 2000 meters (corrected according to standards at different altitudes, and the highest does not exceed 12000V). The circuit breaker without an intelligent controller and sensor can be used as an isolator, marked as $\text{—} \text{+}$. Circuit breakers comply with GB 14048.2 "Low-voltage switchgear and control equipment Low Voltage Circuit Breakers" / IEC60947-2 "Low-voltage switchgear and control equipment Circuit Breakers" and other standards.

2 Model meaning and category

● Model and meaning



● Category

Divided by installation method

- fixed type
- drawer type

Divided by the number of poles

Three poles/four poles

Divided by operation method

- Electric operation
- Manual operation (for inspection and maintenance)

● Type of release :

Intelligent controller, under-voltage instantaneous (or delayed) release, shunt release.

● Intelligent controller performance:

- Intelligent controller is divided into: H type (communication type), M type (ordinary intelligent type), L type (economy type)
- With overload long delay inverse time limit, short delay inverse time limit, definite time limit, instantaneous function. The protection features required by the composition can be set by the user;
- Single-phase ground protection function;
- Display function: setting current display, operating current display, main line voltage display (voltage display should be put forward when ordering);
- Alarm function: overload alarm;
- Self-test function: overheating self-test, microcomputer self-diagnosis;
- Test function: test the operating characteristics of the controller.

3 Normal working conditions and installation conditions

Ambient air temperature

The upper limit of ambient air temperature does not exceed + 40 ° C, the lower limit is not lower than -5 ° C, and the average value of 24h does not exceed + 35 ° C.

Note: The lower limit is -10 or -25 for its working conditions, the user should declare with the company; the upper limit is above + 40 ° C or the lower limit is -10 or -25 for its working conditions, the user should negotiate with the company. The altitude of the installation site does not exceed 2000m.

Atmospheric conditions

Atmospheric relative humidity in the weekly chart is +40, when it does not exceed 50%, it can have higher relative humidity at lower temperatures. The average monthly maximum relative humidity of the wettest month is 90%, and the average minimum temperature of the month is + 25 ° C, taking into account the condensation on the product surface due to temperature changes. If you exceed the requirements, the user should consult with the company.

Protection pole: IP30

Pollution degree: III

Use category: B

Installation category

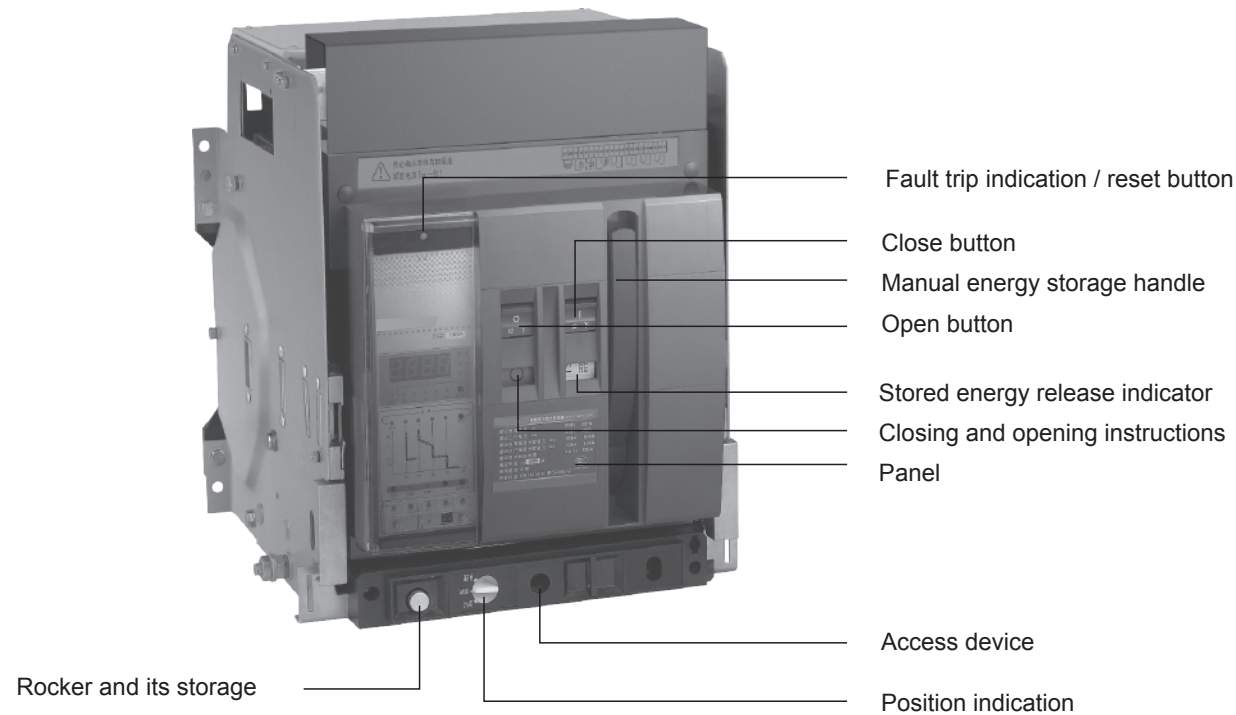
Circuit breakers and under voltage releases with a rated operating voltage of 660V (690V) or less. The primary winding of the power transformer is used for installation category IV; the installation category for auxiliary circuits and control circuits is III.

4 Structure Introduction

Installation conditions

The circuit breaker should be installed in accordance with the requirements of this manual. The vertical inclination of the circuit breaker should not exceed 5 degrees (the inclination of the mine circuit breaker should not exceed 15 degrees).

Circuit breaker front indication



Common faults and troubleshooting

Number	Failure phenomenon	Cause	Troubleshooting
1	Circuit breaker cannot be closed	<ul style="list-style-type: none"> Undervoltage release is not connected to supply voltage The controller moves, the red button on the top of the control panel is not reset Operating mechanism does not store energy The drawer body is not in "connected" or "test" position Key lock in closed position is closing 	<ul style="list-style-type: none"> Check the circuit and power on the undervoltage release Press the reset button Store energy manually or electrically Use the rocker to shake the body to the "connected" or "test" position Open the key lock with a special key
2	Circuit breaker cannot store electric energy	<ul style="list-style-type: none"> The electric operating mechanism is not powered on Power supply capacity is not enough 	<ul style="list-style-type: none"> Check the circuit and power on Check that the operating voltage should be greater than 70%Ue
3	Closing electromagnet does not close the circuit breaker	<ul style="list-style-type: none"> No supply voltage Power supply capacity is not enough 	<ul style="list-style-type: none"> Check the circuit and power on Check that the operating voltage should be greater than 85%Ue
4	Shunt release does not open the circuit breaker	<ul style="list-style-type: none"> No supply voltage Power supply capacity is not enough 	<ul style="list-style-type: none"> Check the circuit and power on Check that the operating voltage should be greater than 70%Ue
5	The fault currents all exceed the long delay, short delay, and instantaneous setting values, and only instantaneous actions occur.	<ul style="list-style-type: none"> Long delay, short delay, instantaneous setting value setting is unreasonable, setting in the same current value range 	<ul style="list-style-type: none"> Re-set according to the principles of $I_{r1} < I_{r2} < I_{r3}$ and considering its range of action
6	Circuit breaker trips frequently	<ul style="list-style-type: none"> The overload protection tripped due to the overload operation on the site. Due to the overload thermal memory function, the power was not cleared in time. 	<ul style="list-style-type: none"> Power off the controller once, or close the circuit breaker after 30 minutes
7	Drawer type circuit breaker rocker handle cannot be inserted into circuit breaker	<ul style="list-style-type: none"> The drawer rail or circuit breaker body is not fully advanced 	<ul style="list-style-type: none"> Fully push the guide rail or circuit breaker body
8	Drawer type circuit breaker body cannot be withdrawn in the separated position	<ul style="list-style-type: none"> The rocker is not pulled out Circuit breaker does not fully reach the separated position 	<ul style="list-style-type: none"> Pull out the rocker Fully reach the breaker to the separated position

5. Long delay overload protection time setting key.

Toggle switch position to adjust time.

6. Short delay protection time setting key.

Toggle switch position to adjust time.

7. Earth fault protection time setting key.

Toggle switch position to adjust time.

8. Clear light key.

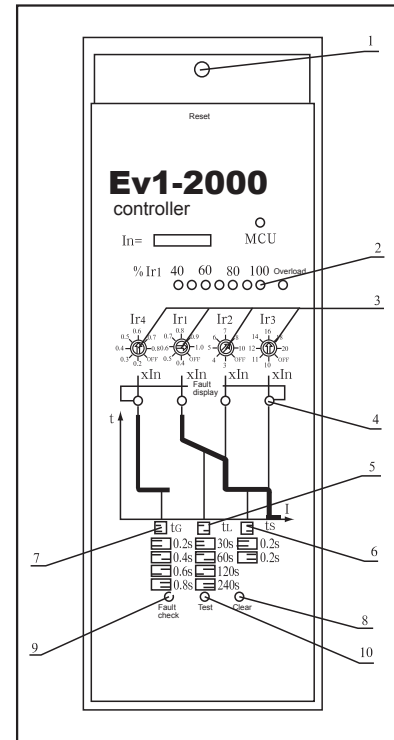
After the controller is set, tested, and faulted, you must press this key to make the controller enter the normal running state.

9. Fault check key.

Press this key after the breaker trips to indicate the cause of the trip. It still has fault memory function after power off.

10. Test key

This key checks the cooperation between the controller and the circuit breaker.



● L type setting method:

1. Long delay setting

a. Rotating In switch setting current from (0.4 ~ 1) In;

b. Turn the tL key to set the time to 30s, 60s, 120s, 240s;

c. If the In switch is turned to the OFF position, this function is exited.

2. Short delay setting

a. Turn the Ir2 switch to set the current from (3 ~ 10) In;

b. Turn the ts key to set the time to 0.2s, 0.4s;

c. If the Ir2 switch is turned to the OFF position, this function is exited.

3. Instantaneous setting

a. Turn the Ir3 switch to set the current from (3 ~ 10) In or (10 ~ 20) In or (7 ~ 14) In;

b. If the Ir3 switch is turned to the OFF position, this function is exited.

4. Ground fault protection setting

a. Turn the Ir4 switch to set the current from (0.2 ~ 0.8) In;

b. Turn the tG key to set the time to 0.2s, 0.4s, 0.6s, 0.8s;

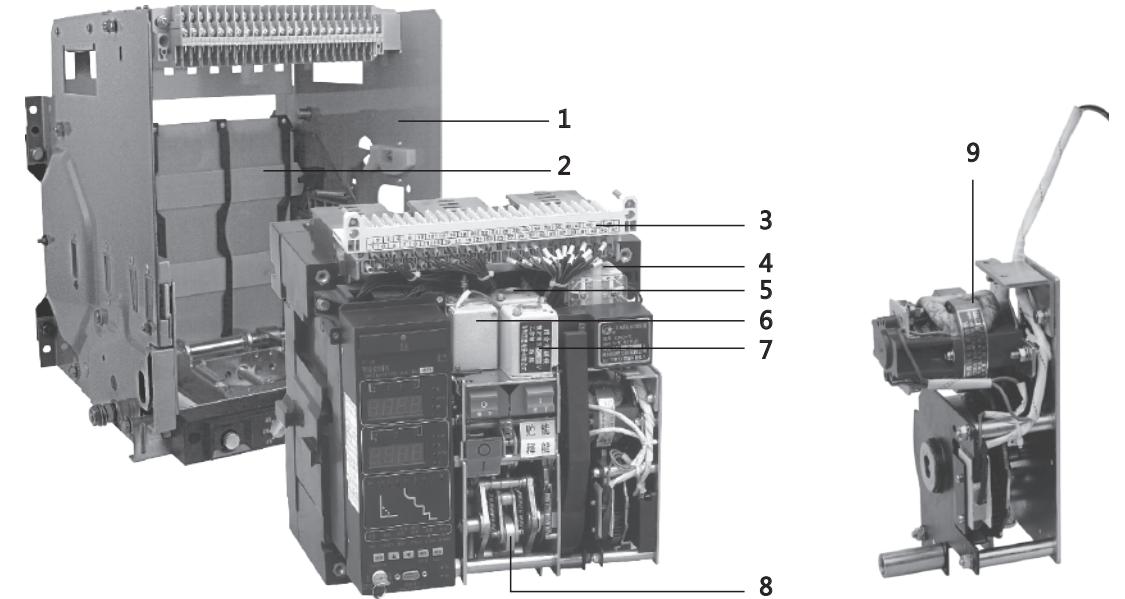
c. If the Ir4 switch is turned to the OFF position, this function is exited.

5. The controller enters the running state

After all the controller parameters are adjusted, press the clear key.

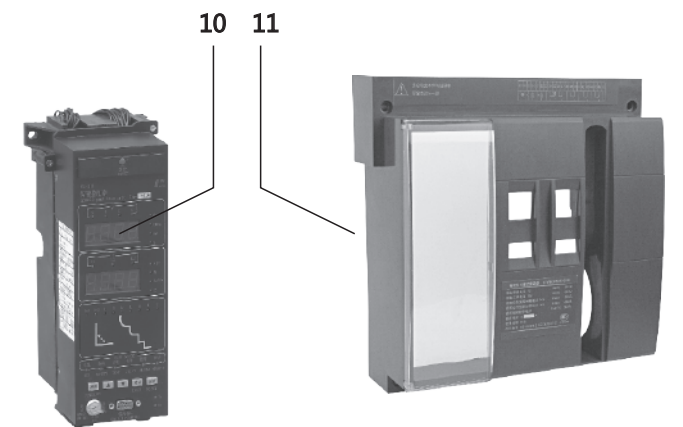
● Ev1 series intelligent air circuit breaker

Ev1-6300 Ev1-4000 Ev1-3200 Ev1-2000



Drawer Circuit Breaker

- 1 Drawer base
- 2 Safety partition
- 3 Secondary circuit terminal (movable)
- 4 Auxiliary contact
- 5 Shunt release
- 6 Under voltage release
- 7 Closing electromagnet
- 8 Operating mechanism
- 9 Electric energy storage mechanism
- 10 Intelligent controller
- 11 Panel



5 Technical data and performance

● Rated current of circuit breaker

Table 1

Shell frame rated current	Inm A	Rated current In A
2000		400、630、800、1000、1250、1600、2000
3200		2000、2500、2900、3200
4000		3200、3600、4000
6300		4000、5000、6300

● The arcing distance of the circuit breaker is "zero"

Table 2

Shell frame rated current	Inm A	2000	3200	4000	6300
Rated limit short-circuit breaking capacity Icu (kA) O-CO	400V	85	100	100	120
	690V	50	65	65	80
Rated short-circuit making capacity n×Icu (kA)/co φ s	400V	176/0.2	220/0.2	220/0.2	264/0.2
	690V	105/0.25	143/0.2	143/0.2	187/0.2
Rated short-circuit breaking capacity Ics(kA)O-CO-CO	400V	2000M50/2000H65	65	65	80
	690V	40	50	50	70
Rated short-time withstand current Icw (kA) 1s, delayed 0.4s, O-CO	400V	2000M50/2000H65	65	65/80(MCR)	85/100(MCR)
	690V	40	50	50/65(MCR)	65/75(MCR)

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

The maximum power loss of the circuit breaker is 360W.

● The rated continuous current of the circuit breaker at different ambient temperatures as follows

Table 3

Ambient temperature °C	Ev1	400A	630A	800A	1000A	1250A	1600A	2000A
40		400A	630A	800A	1000A	1250A	1600A	2000A
50		400A	630A	800A	1000A	1250A	1550A	1900A
60		400A	630A	800A	1000A	1250A	1550A	1800A

Note: The derating coefficient for 2500A and above is 0.9, of which 4000A out of 6300A does not derate.

● Overcurrent controller protection features and functions

Overcurrent controller protection characteristics
a. Setting value Ir (I / In) and error of controller

Table 4

Long delay		Short delay		Instantaneous		Ground fault	
Ir1	Ir2	Error	Ir3	Error	Ir4	Error	
(0.4-1)In	(0.4-15)In	±10%	In ~ 50kA(Inm=2000A) In ~ 75kA(Inm=3200 ~ 4000A) In ~ 100kA(Inm=6300A)	±15%	Inm=2000 ~ 4000A (0.2 ~ 0.8)In Max 1200A Min 160A	Inm=6300A (0.2-1.0)In	±10%

Note: When three stages of protection are available or required at the same time, the setting values cannot be crossed.

● M type or H type controller

1-Reset button. If the circuit breaker is to be closed again after tripping, press the reset button, otherwise the circuit breaker cannot be closed.

2- Current (voltage), time display, can display current (voltage) or time value.

3- "Select" key. Normal running status can cyclically display various current (voltage) values, and fault status or fault check status can cyclically display fault current or time value.

4- LED illuminated indication, can indicate various states and categories.

5- "Clear" button, the controller is set, this button must be pressed after a test failure or before the circuit breaker is closed to make the release in normal operation.

6- "Settings" key. Check or set various protection characteristics current or time. Press this key to cycle through the states.

7- "Fault check" key. After the controller "clears the light", press this key to display and indicate the status of the last fault and the fault current or time value.

The fault current or time is checked cyclically by pressing the "Select" key.

8- "Trip" and "No Trip" keys. Used for test functions.

9- "Save", "+", "-" keys. For setting current or time.

Ir4-Ground protection current setting value.

Ir1-Long delay current setting value.

Ir2- Short delay current setting value.

Ir3- Instantaneous current setting value.

tG- Ground protection time setting value.

tL-Long delay time setting value.

ts- Short delay time setting value.

● L-type controller

1.Reset button

After the circuit breaker is faulty and the test is tripped, press this button to close the circuit breaker again.

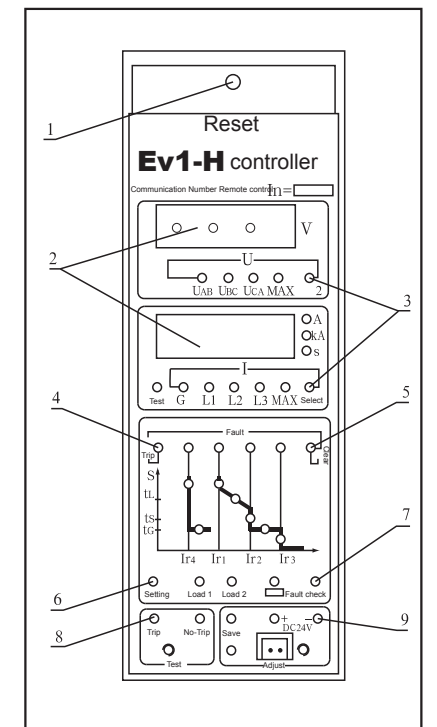
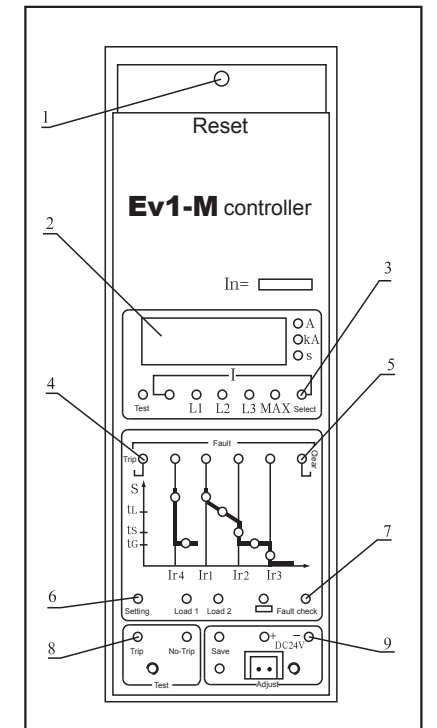
2. Load display

Display overload long delay current

3. Long delay, short delay, delay, grounding protection current setting knob, press the scale value on the knob to set the current of each protection.

4.Fault indicator

Indication fault category



2. Controller test

After the controller parameters are set, before the circuit breaker runs, the user can check various protection functions of the controller as required. Controller test has trip / non-trip option. Press the "trip" key to test, the circuit breaker will break, and press the "No Trip" key to test, no trip signal will be sent, and the circuit breaker will not break. (Note: Type L products only have a trip test, click "Test" Key, the controller sends a momentary signal and the circuit breaker opens).

For overload test, press the "Setting" key to the long delay state, check the overload setting value and then to other current states, press the "+" and "-" keys to adjust the current to $> 1.3I_{r1}$, press the test key to enter the overload test status, the controller delay action by the law of inverse time, and indicating a fault categories and test status. Other characteristics test is the same. After the test, press the "Clear" key to enter the normal running state, and at the same time, press the mechanical "Reset" button to close the circuit breaker.

3. Other usage rules of the controller

When the controller is in the setting and checking state, if the key is not pressed within 1 minute, the key is automatically cleared to enter the running state. At the same time, if a fault occurs, the key function is automatically blocked and the fault processing state is entered.

a. Setting check

After the controller "Clear", in the case of no fault, continuously press the "Setting" key to cyclically indicate various states and the corresponding set current and time value. After checking, please press the "Clear" button (without pressing the button for 1 minute, it will automatically enter the normal running state).

b. Grid operating current and voltage inspection

After the controller "Clear", in the case of no fault, continuously select the "Select 1" ("Select") key to cycle the running current value and ground current value of each phase to display the maximum phase current normally. Press the "Select 2" key, indicating circulation line voltages, the maximum normal display line voltage.

After the controller "Clear", press the "Fault Check" key to display the last fault status and fault current.

After the test or fault is tripped, press the "Select 1" ("Select") key to cycle display the current or time value of the test or fault. The test status is not remembered.

c. Reset

Before closing the circuit breaker, you must press the controller "Clear" button firstly to make the controller enter the normal operating state, and then press the mechanical "Reset" button to close the circuit breaker.

4. The user has special requirements for the characteristics of the product according to Tables 4, 5, and 6, which can be stated at the time of ordering, and the product is set according to the ordering requirements when leaving the factory.

5. The user has no instructions for ordering. The controller uses M type. The factory setting is:

a. The long delay I_{r1} is set to $1.0I_n$, $1.5I_{r1}$ action time is set to 15s.

b. The short delay I_{r2} is set to a value slightly larger than $8I_{r1}$, and the timing limit is 0.4s.

c. Instantaneous I_{r3} is set to $12I_n$.

d. The ground fault I_{r4} is set to $0.4I_n$ and the operating time is set to "OFF". It is only displayed but the circuit breaker is not open.

6. If the user needs to change the factory setting during use, after fully understanding the product, it is allowed to set by the controller according to Table 4.

b. Long delay over-current protection inverse time-lapse action characteristic is $I^2 TL = (1.5I_{r1})^2 t_L$

The action time of $(1.05 \sim 2.0)I_{r1}$ is shown in Table 5. Its time error is $\pm 15\%$.

Note: t_L - Setting time of long delay $1.5I_{r1}$, T_L - Long delay action time

Table 5

1.05 I_{r1}	1.3 I_{r1}	1.5 I_{r1} setting time s	15	30	60	120	240	480
>2h no action	<1h action	2.0 I_{r1} action time s	8.4	16.9	33.7	67.5	135	270

c. Short-time-delay overcurrent protection characteristics

Short-delay overcurrent protection is the time limit. If the low multiple is the inverse time limit, its

characteristics are according to $I^2 T_s = (8I_{r1})^2 t_s$, where t_s is the general delay design time;

When the overload current is $> 8I_{r1}$, it will be automatically converted to timing limit characteristic, which is shown in Table 6. The time limit error is $\pm 15\%$.

Table 6

Delay time s				Returnable time s			
0.1	0.2	0.3	0.4	0.06	0.14	0.23	0.35

d. Figure 1 for overcurrent trip protection and Figure 2 for ground fault protection.

● M type controller functions

a. Ammeter function

Display the running current and ground leakage current of each phase, the maximum phase current is normally displayed, and the current value or time value of setting, test and fault can be displayed.

b. Voltmeter function

The voltage of each line is displayed, and the maximum value is displayed normally.

c. Remote monitoring and self-diagnostic functions

1) The controller has a self-diagnosis function

When the computer fails, it can send out error "E" display or alarm, and restart the computer at the same time. When the user needs it, the circuit breaker can also be opened.

2) When the local ambient temperature reaches 80°C , alarm can be issued, and the circuit breaker can be opened at a lower current (when required by the user).

3) The controller has signals such as overload, grounding, short circuit, load monitoring, pre-alarm, trip indication (OCR) output through contacts or optocouplers, which is convenient for users to use for remote control. The contact capacity is DC28V, 3A; AC125V, 3A.

d. Setting function

Use the "Setting", "+", "-", and "Save" buttons to set various parameters of the controller. Press "Setting" to the state to be set (indicated by the status indicator), and then press the "+" or "-" key to adjust the parameter to the desired value, and then press "Save". The save lamp lights up once to indicate that the setting value is locked. The protection parameters of the controller must not be set crosswise. After the controller is powered off and reset, press the "Setting" key. Various parameters can be checked cyclically.

e. Test function

User can use the "Set", "+", "-", "Trip", "No Trip" and other keys to check the various protections of the controller. Use "Set", "+", "-" keys to adjust the test current (Note: Don't press "Save" to lock), and then press "Trip" or "No Trip" key to test, the controller can enter the fault handing. Press the "Trip" button to open the circuit breaker. Press the "No Trip" button to open the circuit breaker, and the controller's various instructions are normal. After the test, press the "Reset" or "Clear" key before performing other tests.

Note: For the convenience of the test, no matter whether the ground leakage is set in the trip or alarm position, the test is treated as trip, and the priority is lower than the overload protection. Once a failure occurs during the test, the controller automatically stops all tests and enters fault handing.

f. Load monitoring function

Set two setting values, I_{LC1} setting range (0.2 ~ 1) I_n , I_{LC2} setting range (0.2 ~ 1) I_n , I_{LC1} delay characteristic is inverse time characteristic, and its time setting value is 1/2 of long delay setting value; There are two types of I_{LC2} delay characteristics. The first is the inverse time limit function. Its time setting value is 1/4 of the long delay setting value. The second type is the definite time limit and its delay time is 60s. For the two types of delay function, the former is used to cut off the unimportant load when the current is close to the overload setting value, and the latter is used to cut off the unimportant load on the lower level after the current exceeds the I_{LC1} setting value. The circuit and the important load circuit remain powered. When the current drops to I_{LC2} , after a certain delay, a command is issued to switch on the circuit that has been cut off by the lower level again to restore power to the entire system. Users can choose one of the above two types of monitoring and protection. Figure 3 and Figure 4 for monitoring characteristics.

g. MCR trip and analog trip protection, can be shut down according to user requirements. When doing short delay breaking test-generally need to be turned off.

1) MCR switch-on and disconnection protection is mainly used when the line fault state is closed (the moment the controller is powered on). The controller has the function of breaking the circuit breaker at a low short-circuit current. The factory setting is 10kA with an error of $\pm 20\%$, and the set current can be determined according to user requirements.

2) The controller is equipped with the function of directly sending a trip signal without the host chip processing when the short-circuit current is extremely large.

h. Thermal memory function

After the controller overload or short-circuit delay trip, before the controller is powered off, it has a memory function that simulates the characteristics of bimetal. The overload energy is released after 30 minutes and the short-time energy is released after 15 minutes. During this period, an overload or short delay fault occurs, the trip time will be shorter, the controller will be powered off, and the energy will be automatically cleared.

10 Installation, use and maintenance

Installation

1. Check whether the specifications of the circuit breaker meet the requirements before installation.
2. Check the insulation resistance of the circuit breaker with a 500V megohmmeter before installation. It should not be less than 10M Ω when the ambient medium temperature is 20 ± 5 °C and the relative humidity is 50% ~ 70%. Otherwise, it should be dried and used until the insulation resistance reaches the requirements.
3. When the circuit breaker is installed, its base should be in a horizontal position and fixed with M10 screws.
4. Reliable protective grounding of the circuit breaker during installation, with obvious grounding marks at the ground.
5. The upper or lower incoming line of the circuit breaker does not change its technical performance.
6. After the circuit breaker is installed and connected in accordance with the relevant wiring diagram, the following operation tests should be performed before the main circuit is powered on (the indication on the drawer circuit breaker drawer base is in the test position).
 - a. Check whether the undervoltage, shunt release, release solenoid (closing) electromagnet, electric operating mechanism voltage match (before the breaker is closed, the undervoltage release must be energized).
 - b. Move the handle on the mask up and down. After seven times, the panel displays "energy storage" and hears a "click", that is, the energy storage is finished. Press the "1" button or release (close) the electromagnet to energize, the circuit breaker is reliably closed (under the condition that the controller reset button is reliably reset), and the handle can be stored to store energy again.
 - c. Operate the motor until the mask displays "energy storage", and with a "click" sound, the energy storage ends, and the motor automatically powers off. Press the "1" button or release (close) the solenoid to energize, and the circuit breaker is closed reliably.
 - d. After the circuit breaker is closed, the controller's trip test should be able to open the circuit breaker regardless of the undervoltage, shunt release or the "0" button on the mask.

● Application of the controller

1. Setting of the controller

Controller long delay current setting: After pressing the "Clear" button, press the "Setting" button until the long delay status indicator is on, displaying the long delay factory current setting value, which is generally I_n and the current setting range is (0.4 ~ 1.0) I_n , press the "+" and "-" keys as required, and increase or decrease at intervals of <2% each time you press it, until the closest current is required. Then press the "Save" key once, the storage indicator turns on and off again, indicating that the long delay current setting value has been stored.

Long delay time setting: After the long delay current setting is over, press the "Setting" key again, the long delay time status indicator lights up, and the long delay time factory setting value is displayed. Press the "+" key to double the time each time you press it; if the time is too long, you can press the "-" key again. Each time you press it, the time is doubled until it is closest to the required time, and then press "Save" Key, the storage indicator lights up and off again, indicating that the long delay time setting is over.

Load monitoring, short delay, instantaneous, grounding and other protection action value setting and action time, the setting method is the same as above, but it corresponds to different status indications. The grounding time setting is in the "OFF" position, indicating a fault condition. The grounding is only an alarm without tripping; the instantaneous setting is in the "OFF" position, which indicates that the protection is canceled. During the setting process of the controller, once there is a fault signal, it will automatically block the function and enter the fault processing state.

(Ev1-6300/4 In=6300A)Drawer circuit breaker installation dimensions and overall dimensions in Figure 16

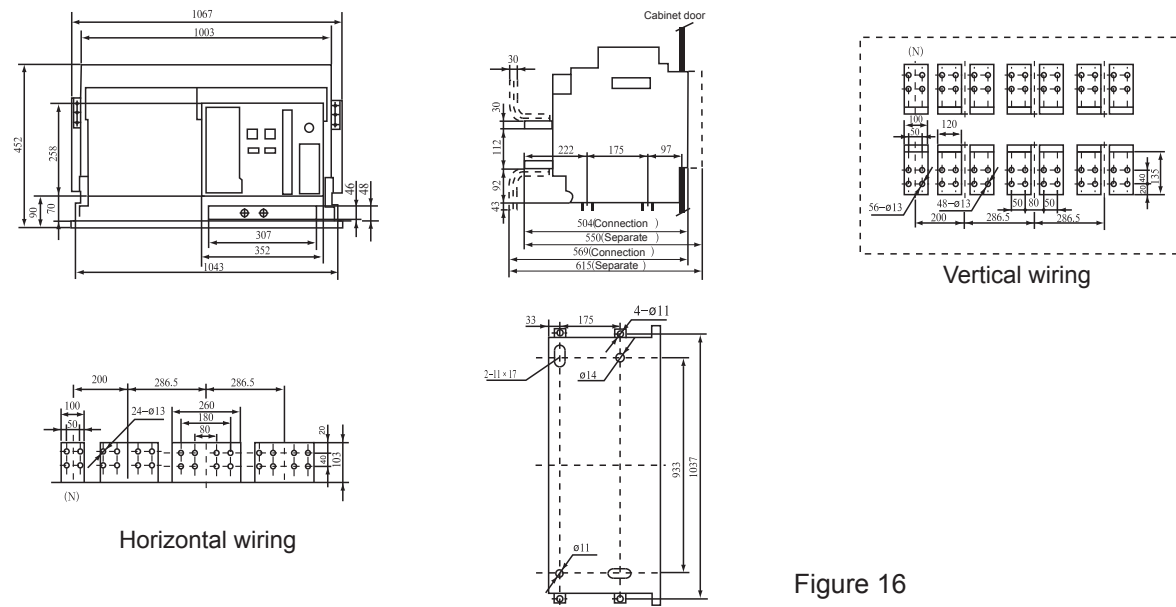
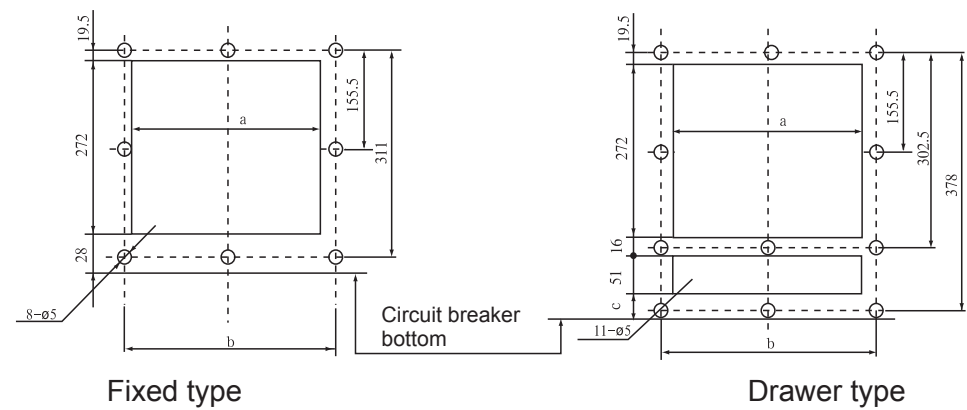


Figure 16

Specification and quantity of external copper bar

Rated current	Specifications	Number of poles	Rated current	Specifications	Number of poles
630A	40×5	2	2900A	100×10	3
800A	50×5	2	3200A	120×10	3
1000A	60×5	2	3600A	120×10	4
1250A	80×5	2	4000A	120×10	4
1600A	100×5	2	5000A	120×10	5
2000A	100×5	3	6300A	120×10	6
2500A	100×5	4			

9 Door frame size and mounting hole pitch



Inm	a mm	b mm	c mm
2000	306	345	0
3200、4000/3	366	405	0
4000/4	306	345	0
6300	366	405	0

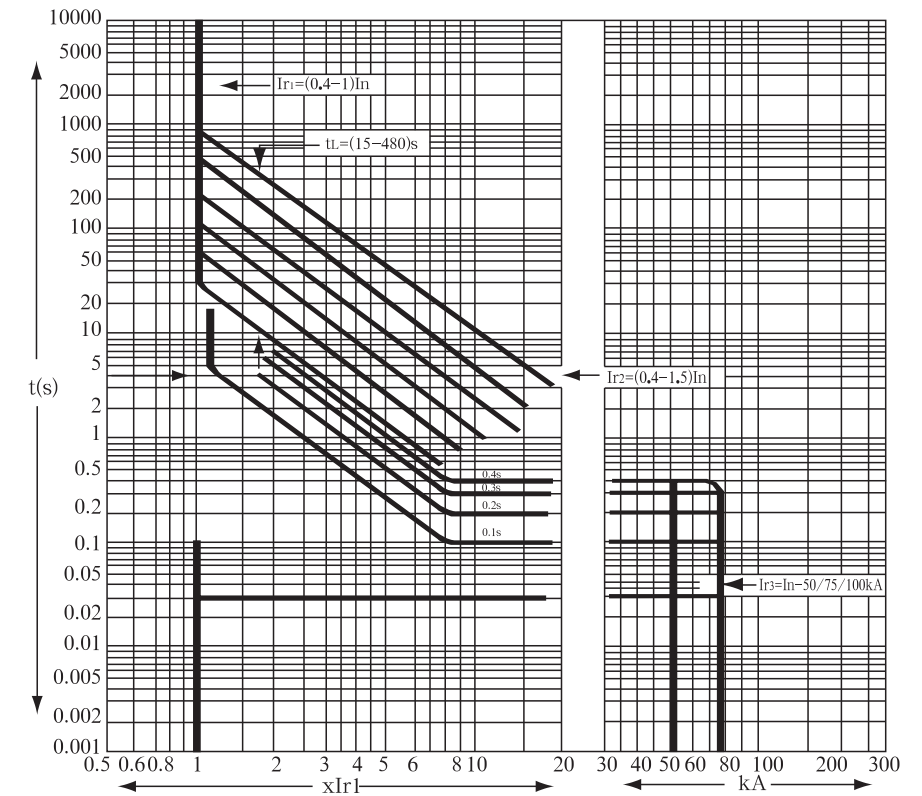


Figure 1

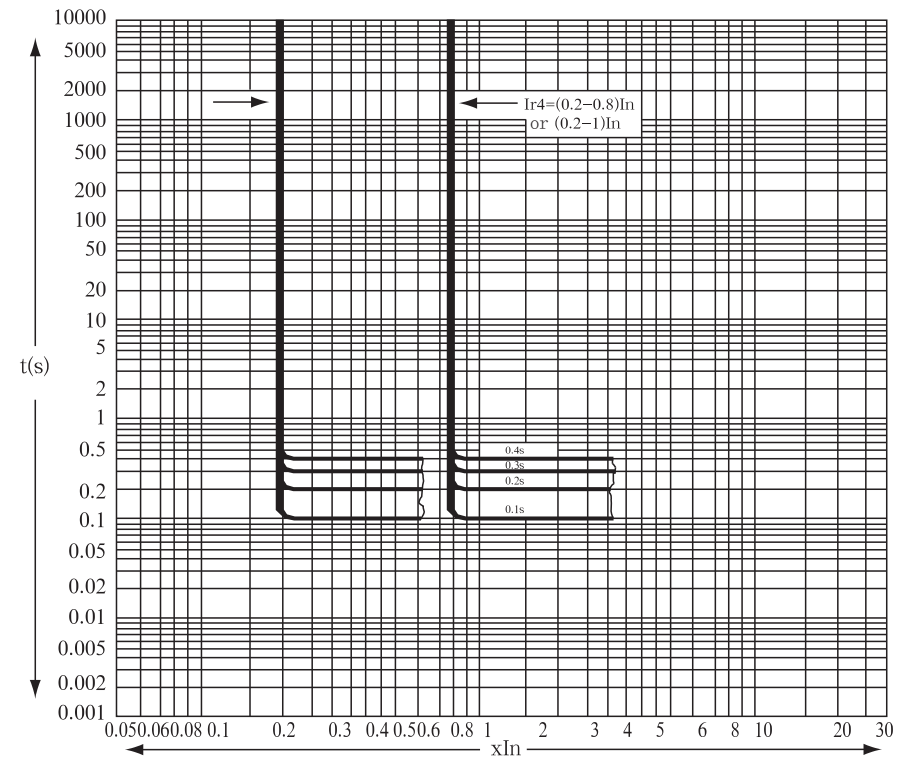


Figure 2

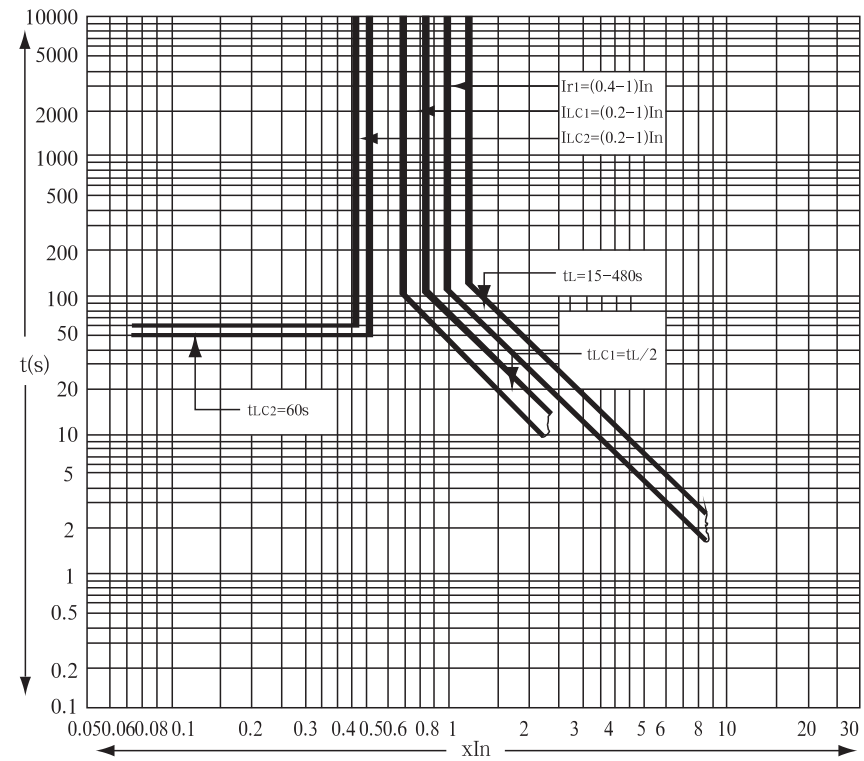


Figure 3

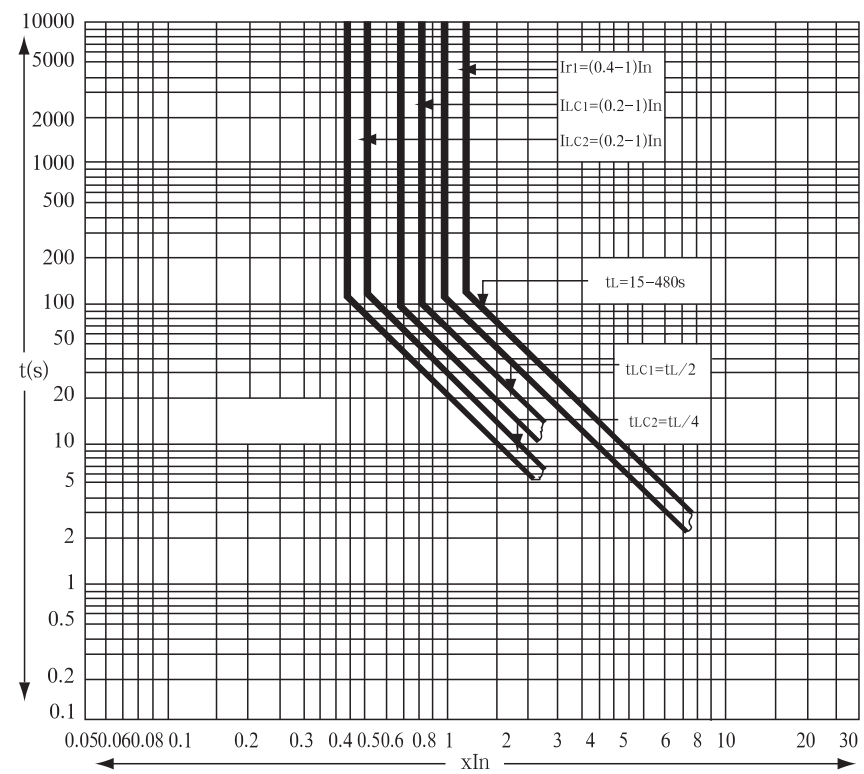
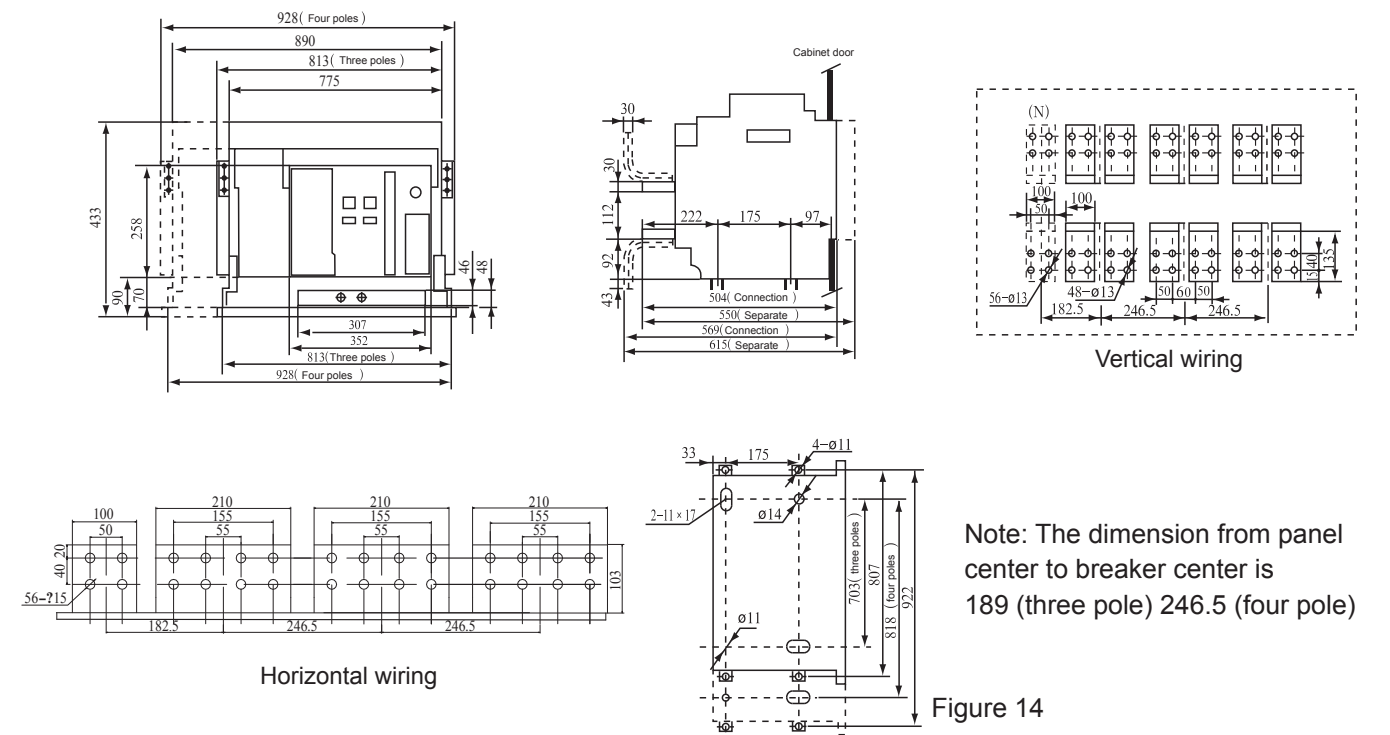


Figure 4

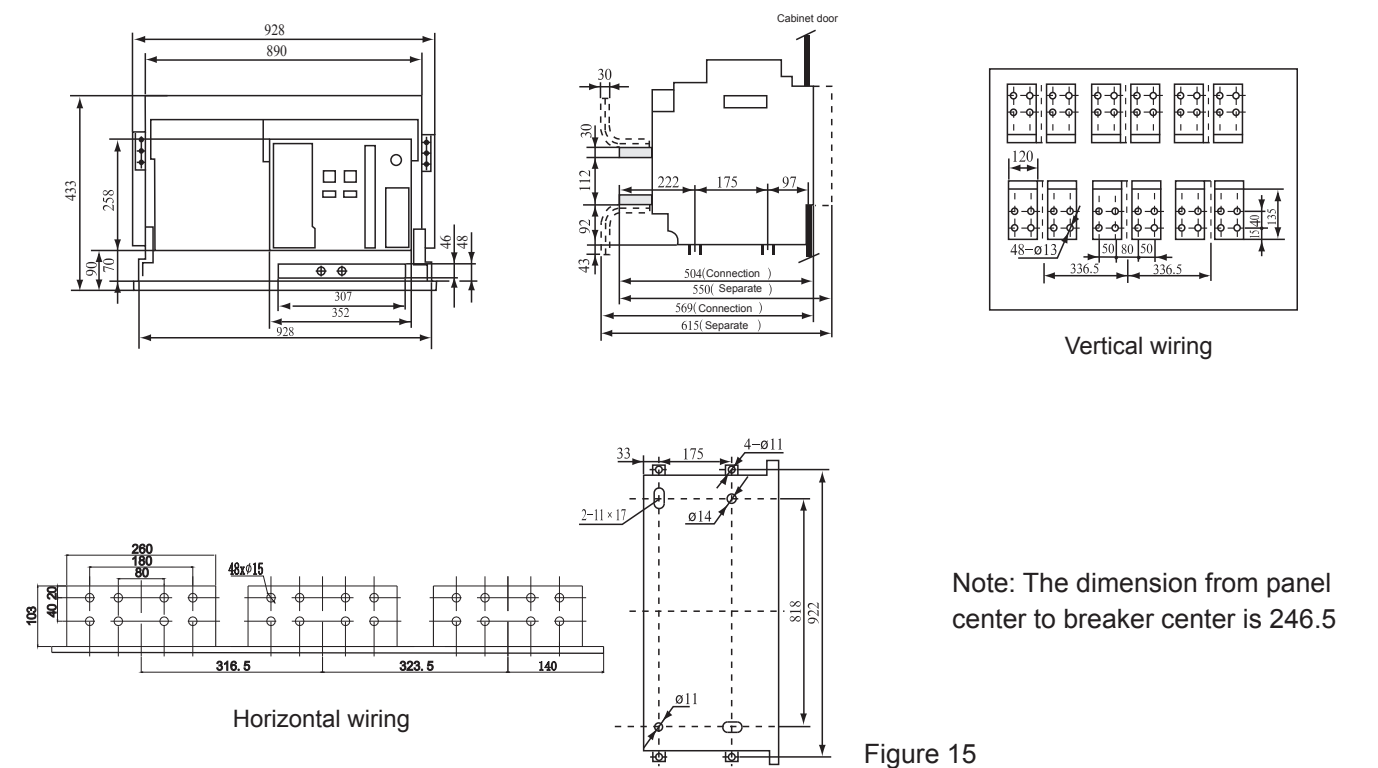
(Ev1-6300、three poles/four poles In=4000、5000)Drawer circuit breaker installation dimensions and overall dimensions in Figure 14



Note: The dimension from panel center to breaker center is 189 (three pole) 246.5 (four pole)

Figure 14

(Ev1-6300 In=6300A) Drawer circuit breaker installation dimensions and overall dimensions in Figure 15



Note: The dimension from panel center to breaker center is 246.5

Figure 15

(Ev1-4000)Drawer circuit breaker installation dimensions and overall dimensions in Figure 12

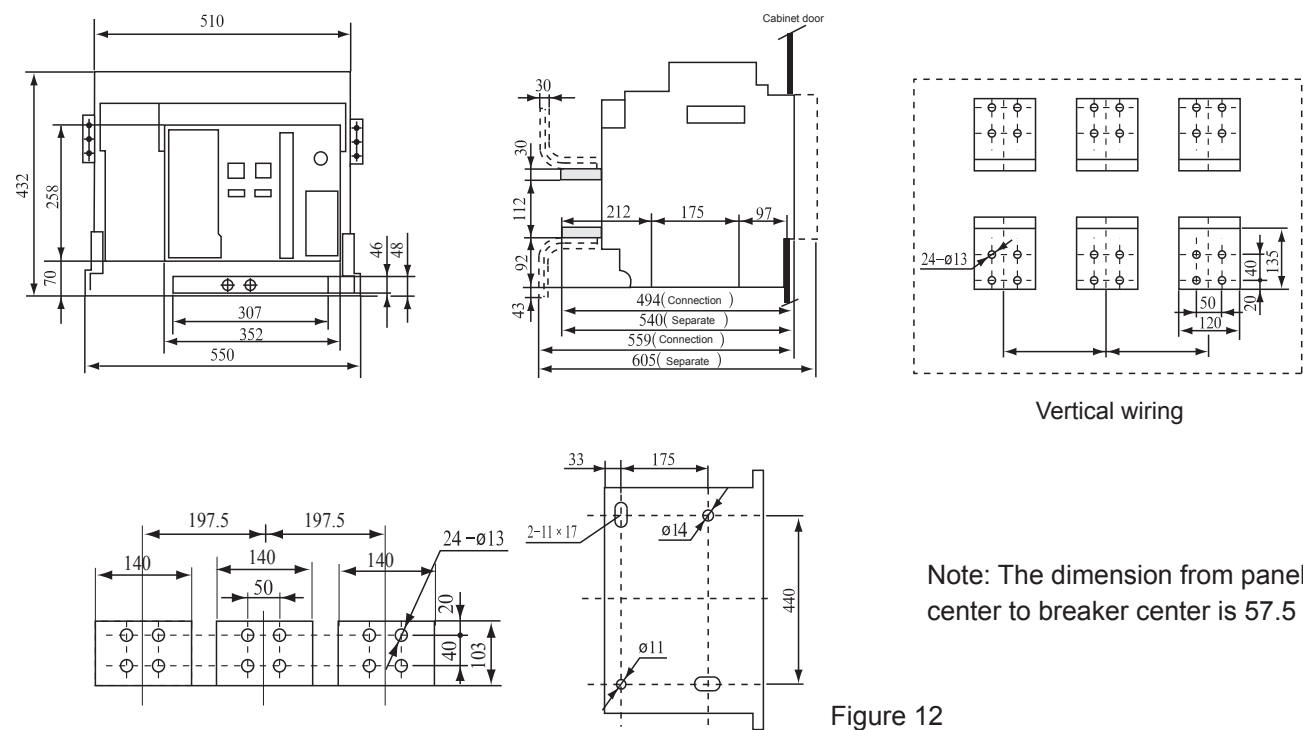


Figure 12

(Ev1-4000/4)Drawer circuit breaker installation dimensions and overall dimensions in Figure 13

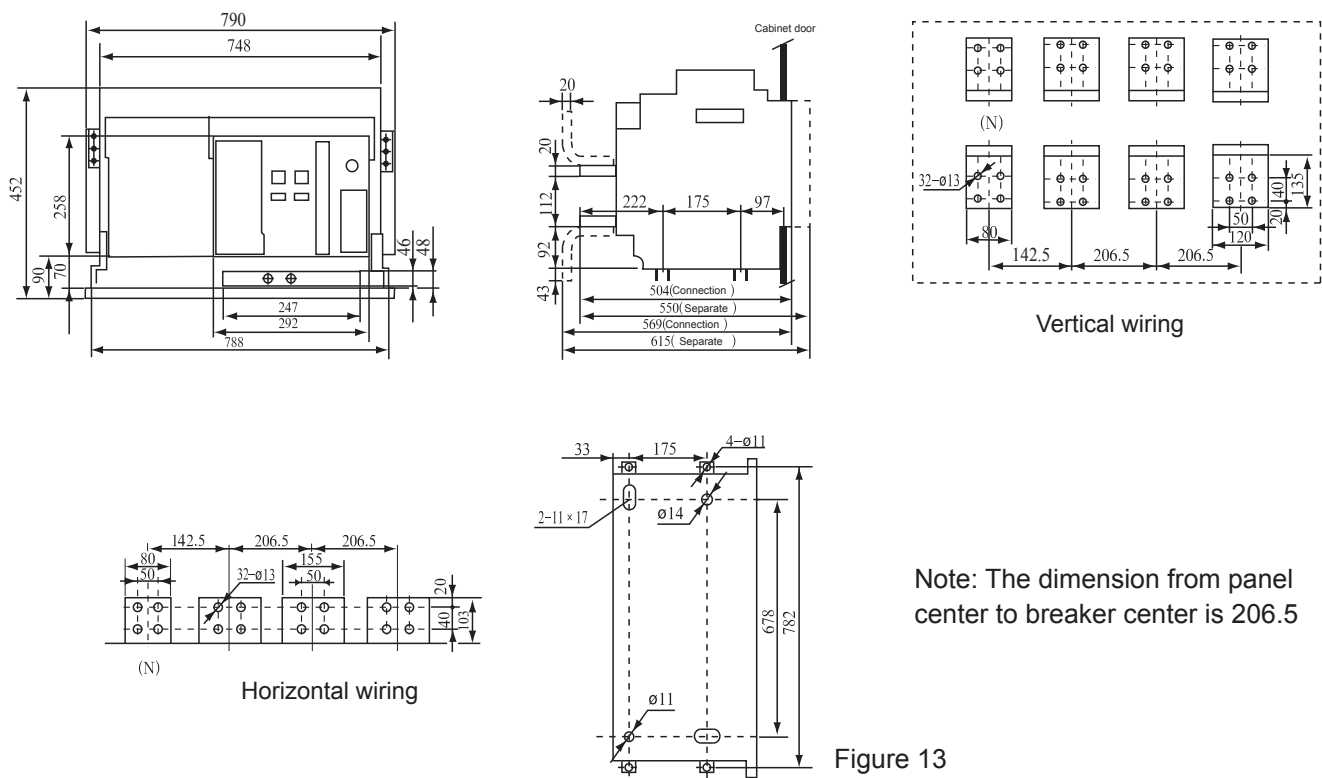
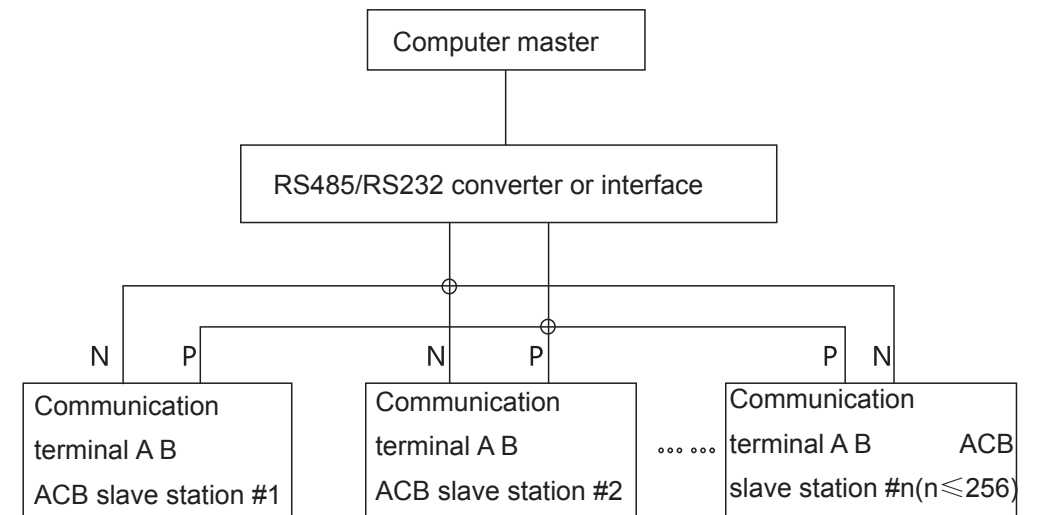


Figure 13

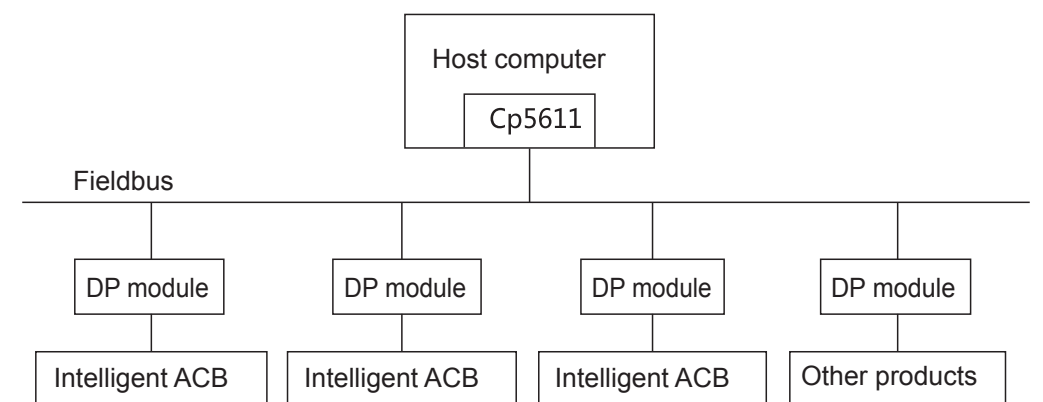
● H type intelligent controller

In addition to all the functions of the M type, it also has a serial communication interface. Through the communication interface, it can form a master-slave structured LAN system (hereinafter referred to as the system). One or two computers are used as the master station, and a number of circuit breakers or other communicable components as the slave station. The system network structure is shown in the following figure. For the circuit breaker unit, the system can achieve long-distance telemetry, remote regulation, remote control, and remote communication functions: monitoring of various network parameters and operating parameters, monitoring of the current operating status of the circuit breaker, and adjustment and download of various protection limit parameters, circuit breaker operation control, etc. The system is suitable for the construction and transformation of power distribution monitoring systems in various power stations, power plants, small and medium-sized substations, industrial and mining enterprises, and buildings.

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



The connection diagram of circuit breaker products based on the general DP protocol is as follows:



System composition

Hardware structure of data communication network system

The circuit breaker provides a standard RS485 communication interface, which is led out from the circuit breakers 10 and 11;

Communication medium for system connection: Category A shielded twisted pair.

Main network features

Two-way serial data transmission mode, the product can provide a variety of communication protocols: "Low-voltage electrical data transmission communication protocol V1.0", PROFIBUS-DP, MODEBUS, etc. Strict master-slave mode, that is, the master station is the initiator and controller of the communication. The slave station can only communicate with the master station, and cannot directly communicate with other slave stations. The communication baud rate is 9600bit / s and the communication distance is 1.2km. The typical application for PROFIBUS-DP communication baud rate is 187.5 kbit / s.

Monitoring software

YSS 2000 configuration software can realize the configuration application of monitoring management software according to different engineering requirements. For circuit breakers, operation monitoring operations and various daily management functions can be realized.

● System functions

Remote control

Remote control refers to the operation control of energy storage, closing and opening of each slave station circuit breaker in the system through the master station computer. The operator selects the corresponding object from the system interface and clicks the remote control button with the mouse, and the system provides the current running status of the corresponding object. After inputting the operation password, the operator can issue the remote control "ON" or "OFF" command. The system transmits the instructions to the corresponding breaker slave station. After receiving the instruction, the slave station performs operations such as breaking, closing, and energy storage according to a predetermined sequence, and reports the results of the remote control to the master station.

Remote regulation

Remote regulation refers to setting the protection setting of the slave station through the master computer. The protection setting table of all slaves is stored in the master computer. The operator selects the corresponding object from the system interface and clicks the remote adjustment button with the mouse. The system provides the current settings of all protection settings of the corresponding object and the protection setting table of the object. After the operator enters the operation password, he can select the required parameters from the parameter table, and then click the corresponding button. The master station downloads the parameters to the corresponding slave station and reports the result of remote adjustment. After receiving the instruction, the slave will modify its own protection setting.

Telemetry

Telemetry refers to the real-time monitoring of the power grid operating parameters of each slave station through the master computer. The communication sub-station reports the operating parameters to the host computer as follows: the real-time current values of phases A, B, C, and N of each sub-station, and the voltage values of UAB, UBC, and UCA.

The fault record can record the following fault parameters

Phase A, B, C, N current value at the time of failure, voltage value of UAB, UBC, UCA, failure type, failure action time, and record the failure in the failure database.

The computer displays the current and voltage of each sub-station by means of bar graphs and absolute value tables, and displays the operating status of each node by real-time curves.

Remote communication

Remote communication refers to the information such as the model of the slave station, the closed and disconnected status, the various protection settings, and the status of the slave station's operation and faults. The parameters reported by the slave circuit breaker to the host computer are: switch type, switch status (closed / open), fault information, alarm information, and various protection settings.

Other system functions

In addition to the remote operation control function, the system can also perform a variety of management functions: accident alarm (information screen, screen push, event printing, accident dialing, sound alarm), event recording, maintenance and listing, handover management, load trend analysis, various report printing, etc.

● L-type controller

L-type controller adopts coding switch and toggle switch setting mode. It has four sections of protection features: overload long delay, short circuit delay, instantaneous, ground leakage, and other functions, such as fault status, load current light bar indication, but no digital display not as complete as M and H.

Only for users to choose in general occasions.

Drawer circuit breaker installation dimensions and overall dimensions

(Ev1-2000、2000/4)Drawer circuit breaker installation dimensions and overall dimensions in Figure 10

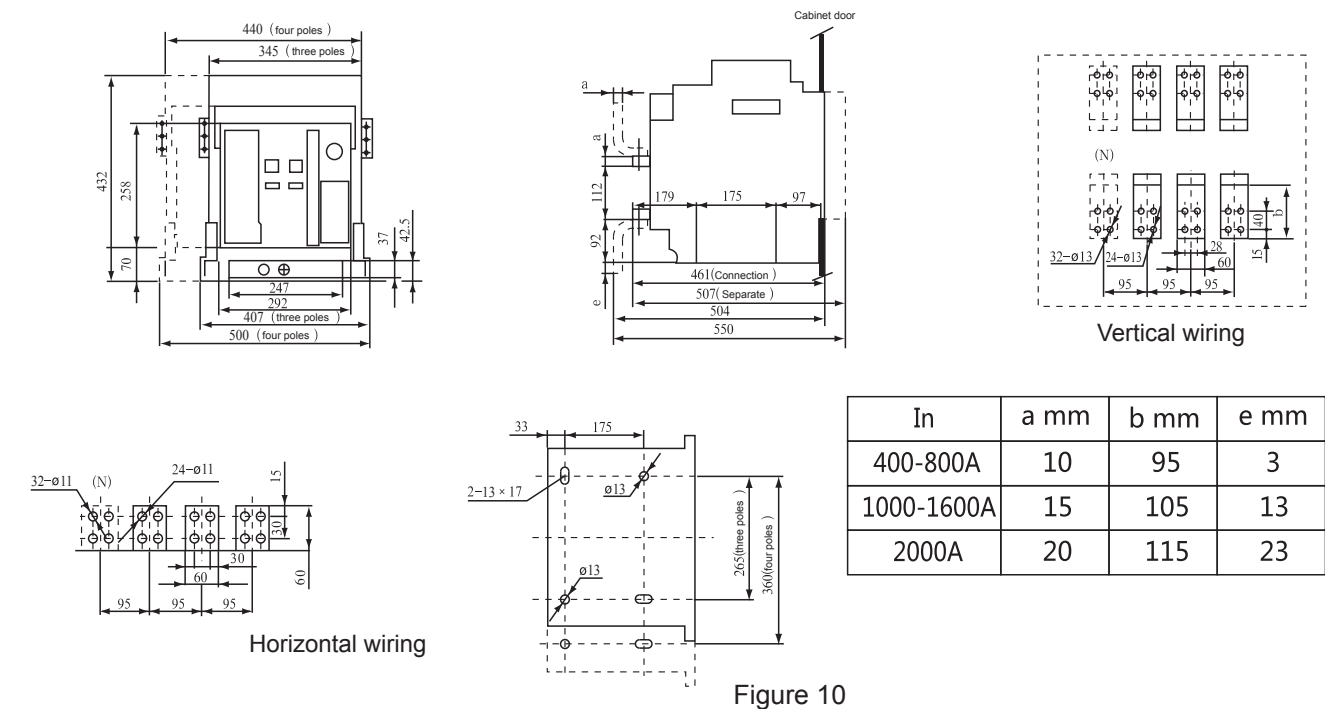


Figure 10

(Ev1-3200、3200/4)Drawer circuit breaker installation dimensions and overall dimensions in Figure 11

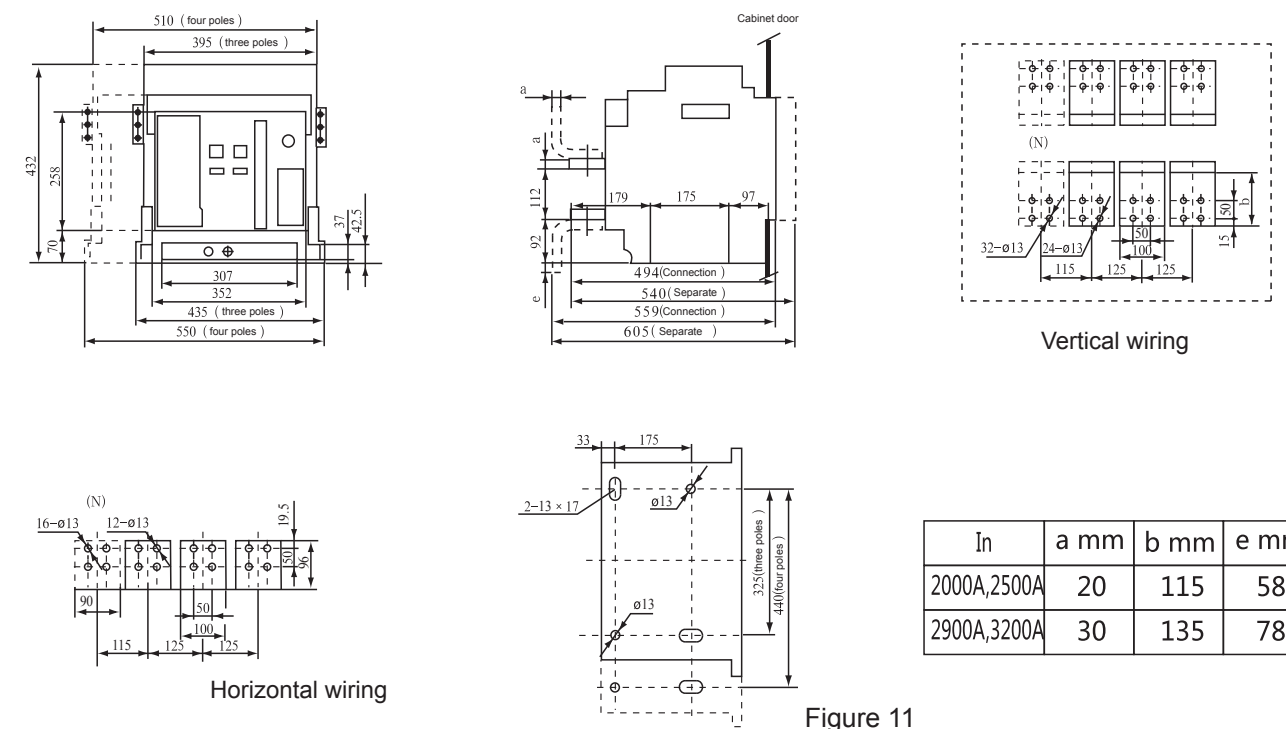


Figure 11

8 Overall and installation dimensions

Fixed circuit breaker installation dimensions and overall dimensions

(Ev1-2000、2000/4) Fixed circuit breaker installation dimensions and overall dimensions

in Figure 8

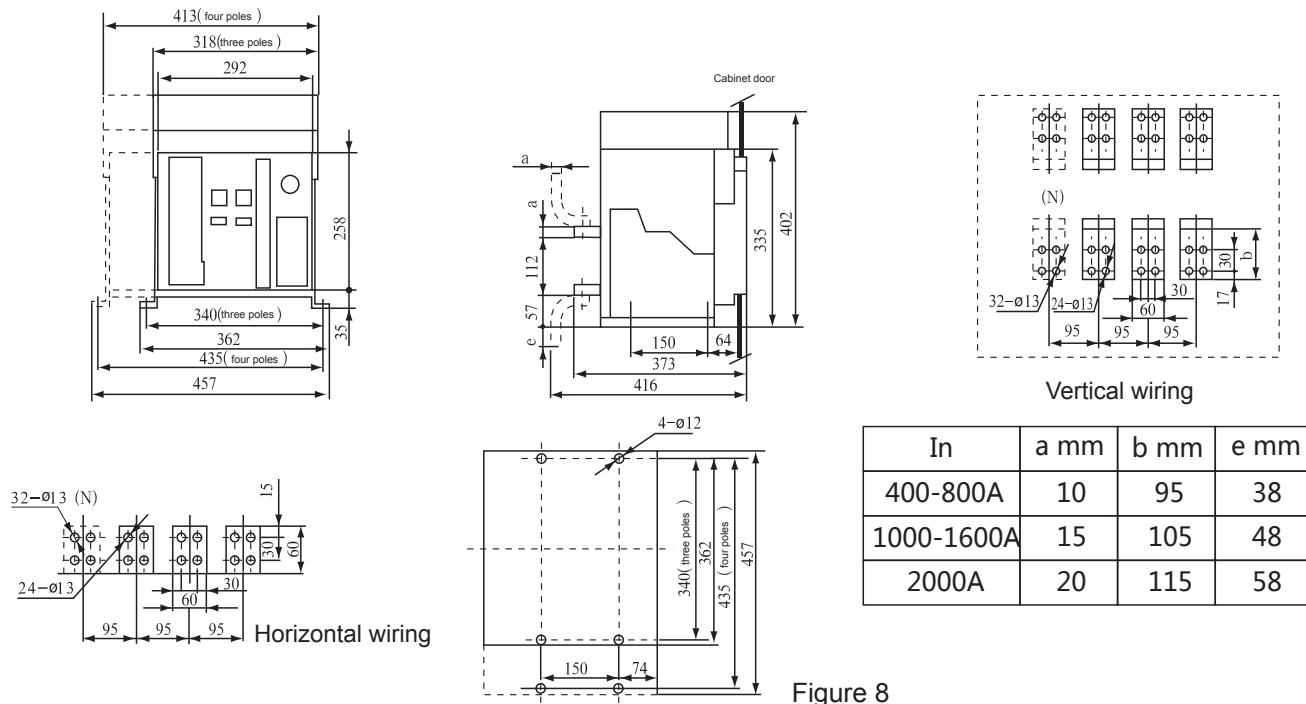


Figure 8

(Ev1-3200、3200/4) Fixed circuit breaker installation dimensions and overall dimensions in Figure 9

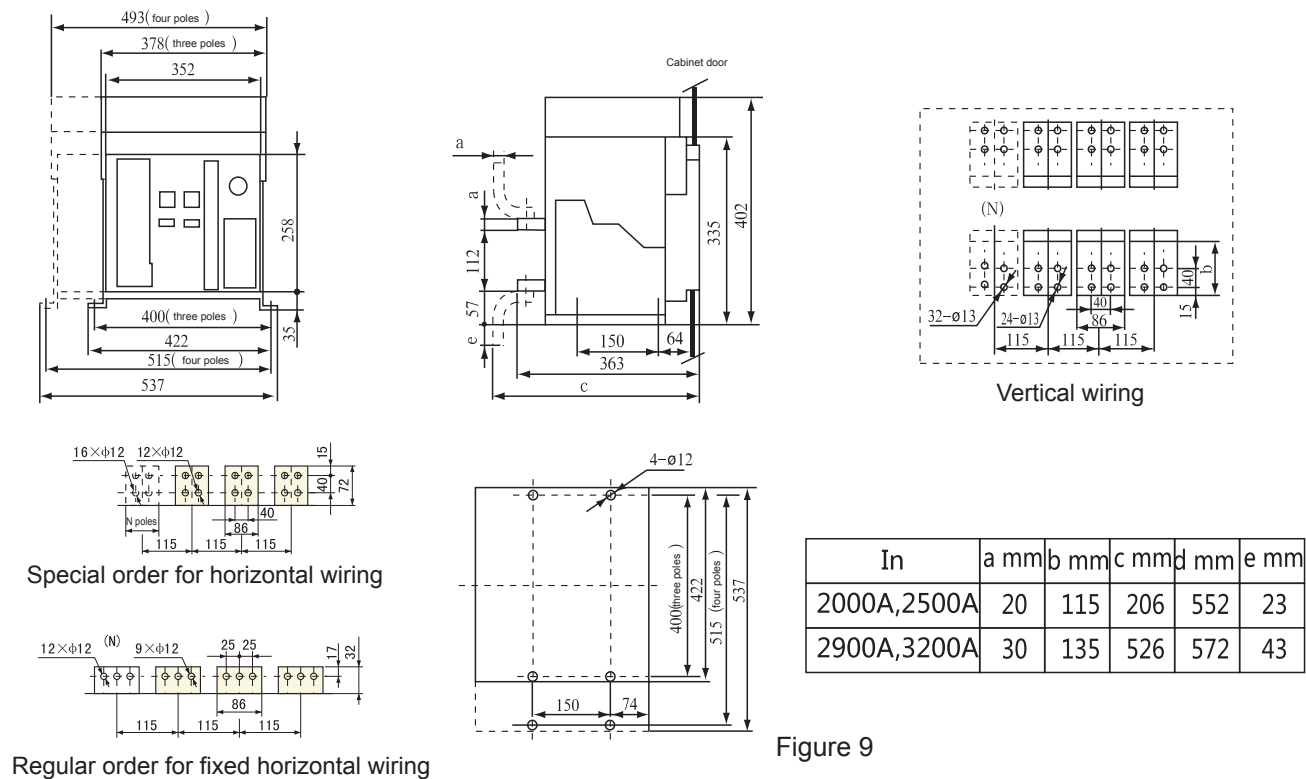


Figure 9

Operational performance of circuit breaker

The operating performance of the circuit breaker is expressed by the number of operating cycles

Table 7

Shell frame rated current(A)	Total number of operation cycles
2000	10000
3200、4000	5000
6300	2000

Voltage and power of shunt release, under voltage release, electric operating mechanism, closing electromagnet and intelligent controller.

Table 8

Required power		Rated working voltage		DC	
		AC(50Hz)		110V	220V
Item		220V	380V	110V	220V
Shunt release		24VA	36VA	24W	24W
Under voltage release		24VA	36VA	-	-
Closing electromagnet		24VA	36VA	24W	24W
Electric operating mechanism	Shell frame rated current	2000A	85VA	85VA	85W
		3200A、4000A	110VA	110VA	110W
		6300A	150VA	150VA	150W
Intelligent controller power supply voltage		AC220V、AC380V、DC220V、DC110V			

Note: Shunt release reliable action voltage range is 70%~110%, closing electromagnet and operating mechanism are 85%~110%.



Performance of circuit breaker undervoltage release

Table 9

Category	Under voltage delay release	Under voltage instant release
Release action time	Delay 1.3.5s	Instant
Release action voltage	35% ~ 70%Ue	Circuit breaker opens reliably
	≤35%Ue	Circuit breaker cannot be closed
	(85 ~ 110%)Ue	Circuit breaker closes reliably
When the power supply voltage recovers to 85% Ue within ½ delay time	Circuit breaker doesn't open	-

Note: Delay time accuracy is ± 10%

Auxiliary contact performance

1. Conventional heating current of auxiliary contact Ith: 10A; Use category: AC-15 Rated working voltage and working current under corresponding use categories: Ue / Ie AC230 / 400V / 5A
2. Auxiliary contact form: (conventional) four-set of conversion, please contact the company for other wiring methods.

● Abnormal contact and breaking capacity of auxiliary contacts

Auxiliary contact making and breaking ability under abnormal use conditions

Table 10

Use category	On			Off			Number and frequency		
	I/Ie	U/Ue	cosφ or T _{0.95}	I/Ie	U/Ue	cosφ or T _{0.95}	Number	Frequency	Power on time (s)
AC-15	10	1.1	0.3	10	1.1	0.3	10	6 (or same frequency as main circuit)	0.05
DC-13	1.1	1.1	6Pe	1.1	1.1	6Pe			

Note: When the upper limit of $Pe \geq 50W \cdot T_{0.95} = 6Pe \leq 300ms$.

Auxiliary contact making and breaking ability under normal conditions

Table 11

Use category	On			Off		
	I/Ie	U/Ue	cosφ or T _{0.95}	I/Ie	U/Ue	cosφ or T _{0.95}
AC-15	10	1	0.3	1	1	0.3
DC-13	1	1	6Pe	1	1	6Pe

Off position key lock

The "open position key lock" attachment of the circuit breaker (provided by order) can lock the circuit breaker in the open position. At this time, the circuit breaker cannot be closed by using the closing button or the release (closing) solenoid.

Structure Overview

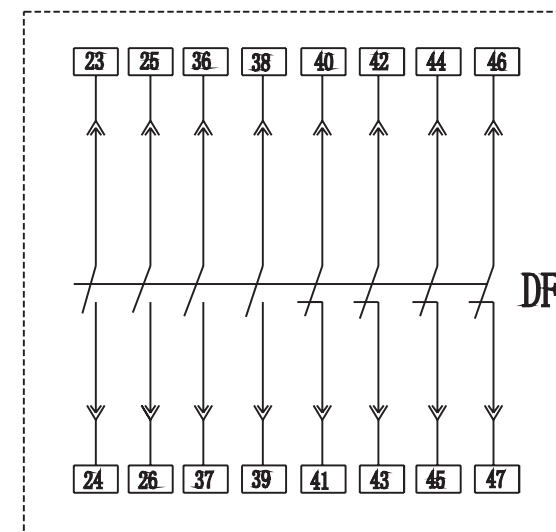
The fixed circuit breaker is mainly composed of a contact system, a controller, a manual operating mechanism, an electric operating mechanism, and a mounting plate.

The drawer type circuit breaker is mainly composed of a contact system, a controller, a manual operation mechanism, an electric operation mechanism, and a drawer base.

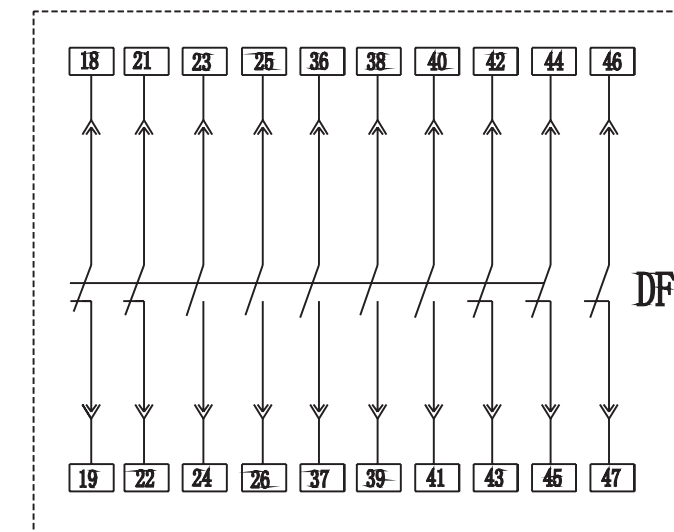
The circuit breaker is a three-dimensional arrangement, which has the characteristics of compact structure and small volume. The contact system is enclosed in an insulating bottom plate, and each phase of the contacts is also separated by an insulating plate to form a small room, and the controller, the manual operation mechanism, and the electric operation mechanism are sequentially arranged in front of it to form independent units. If one unit is broken, it can be removed and replaced with a new one. Drawer type circuit breaker is composed of inserted circuit breaker and drawer base. The guide rail in the drawer base can be pulled in and out, and the circuit breaker enters and exits the drawer on the guide rail. The main circuit is connected through the insertion of the bus bar on the circuit breaker and the bridge contact on the drawer base.

The drawer circuit breaker has three working positions: "connected" position, "test" position, "separated" position, and the position change is achieved by turning the handle in or out. The three positions are indicated by pointers on the base of the drawer base.

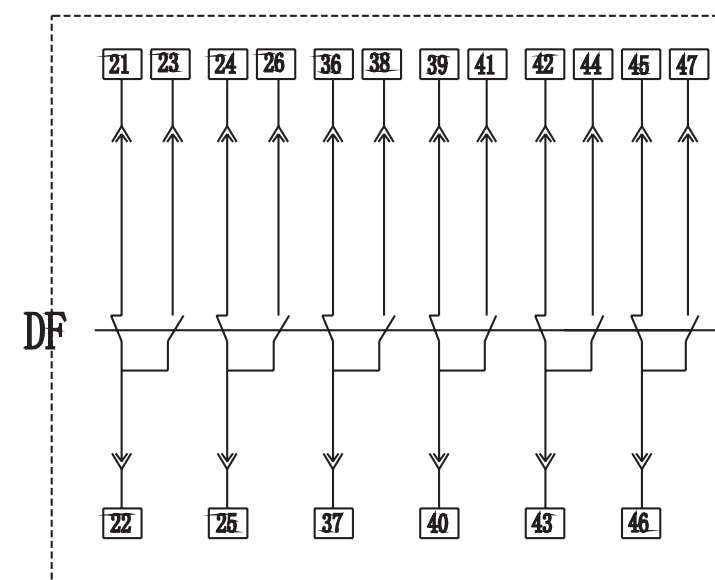
When in the "connected" position, both the main circuit and the secondary circuit are connected; when in the "test" position, the main circuit is disconnected and separated by an insulating partition, only in the secondary interlock position. The circuit breaker can only be closed at the connection position or the test position, and the circuit breaker cannot be closed at the intermediate position between connection and test.



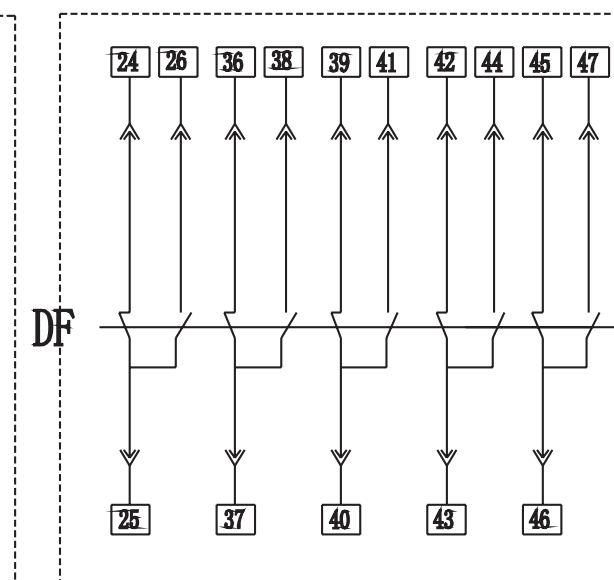
Four-on and four-off
(Special configuration)



Five-on and five-off
(Special configuration)

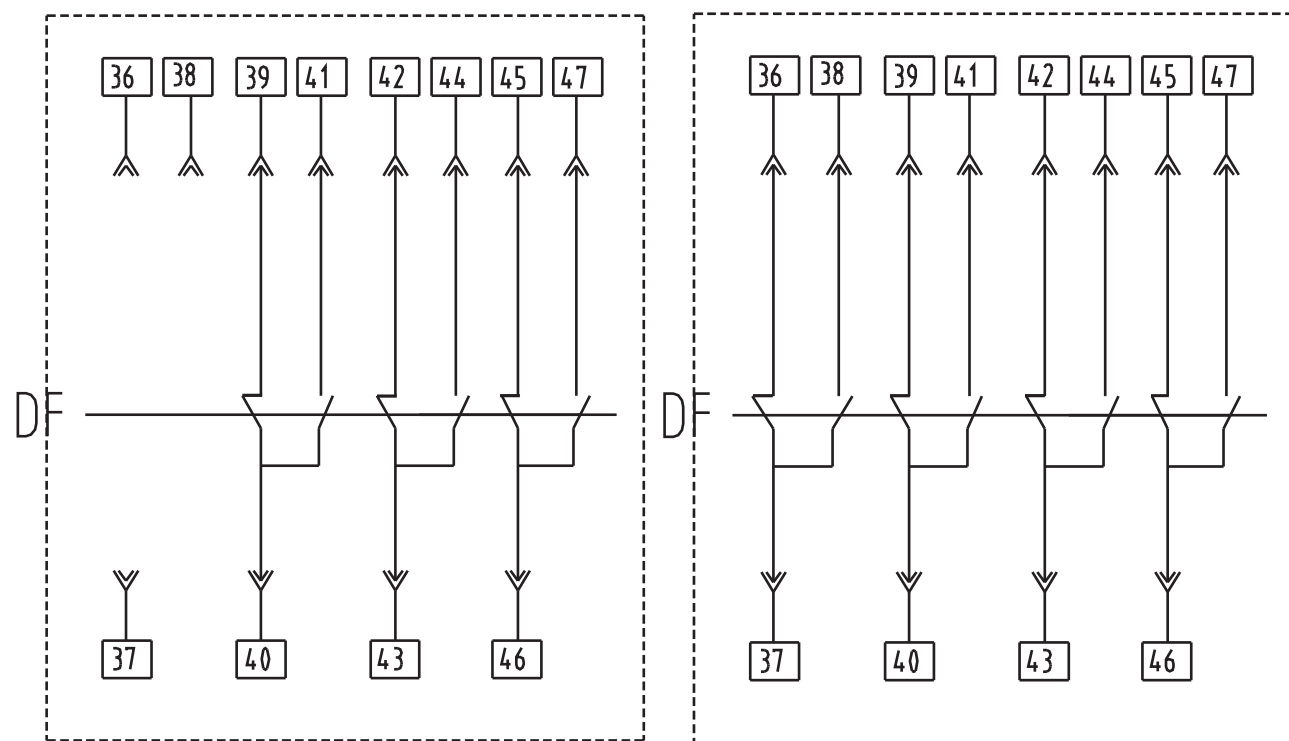


Six-set conversion
(Special configuration)



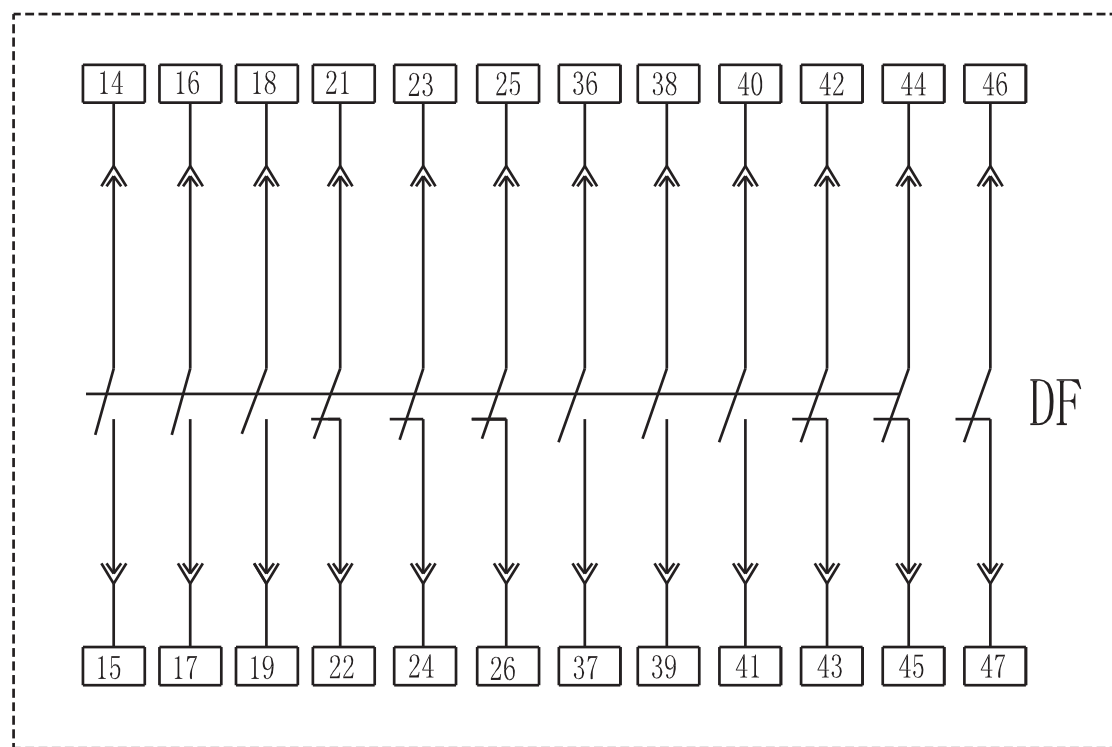
Five-set conversion
(Special configuration)

※ Auxiliary switch type for users



Three-set conversion contact types
(special configuration)

Four sets of conversion contact types
(conventional standard configuration)



Six-on and six-off
(Special configuration)

※ Interlocking mechanism of circuit breaker (applicable for drawer type and fixed type).

Users can use the interlocking mechanism to convert two or three units separately, and can also choose our company's GTQ2Z dual power automatic transfer switch to achieve dual power supply automatic conversion.

Lever interlock

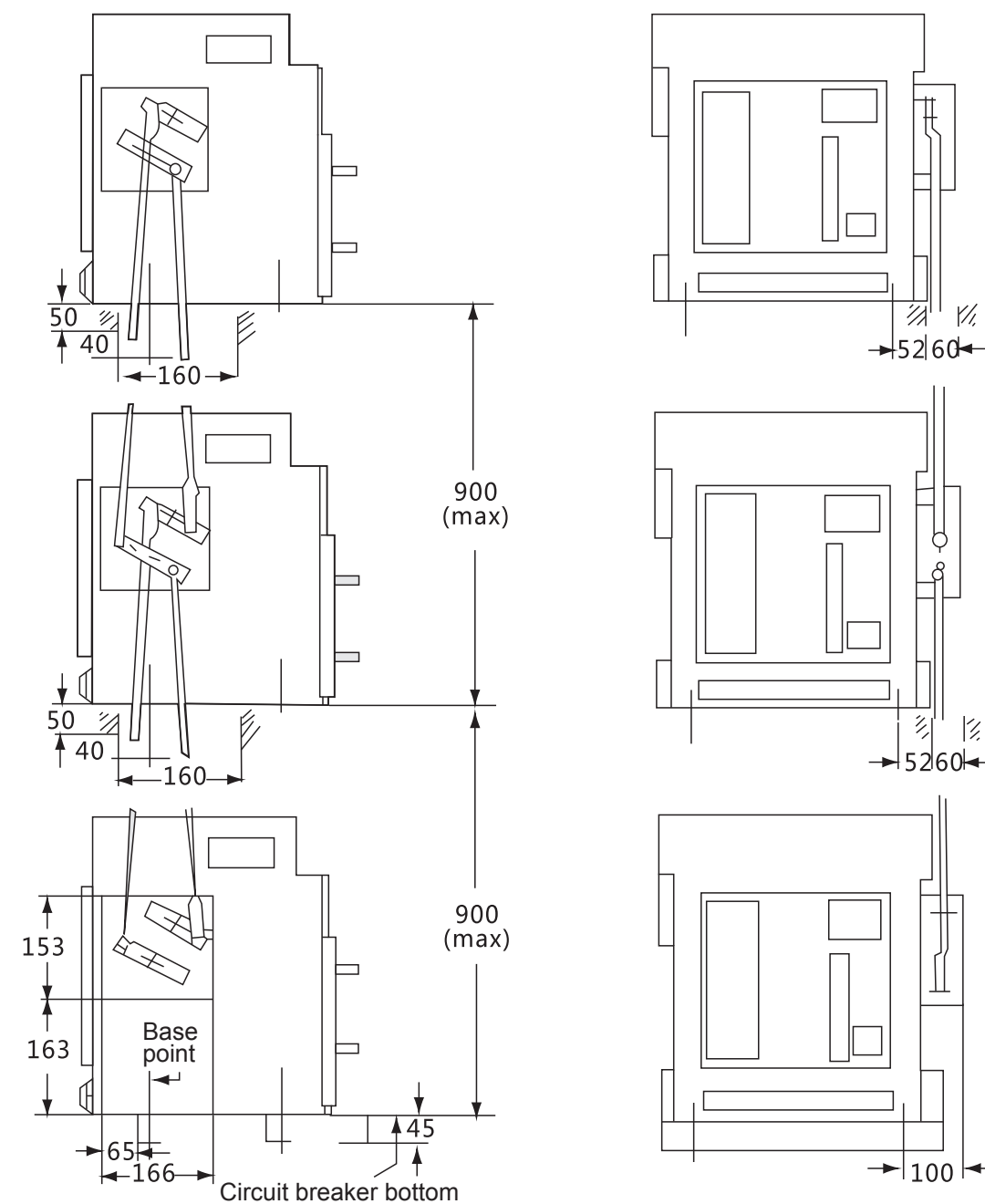


Figure 5(A)

Lever interlocking 3 vertical mounted circuit breakers. If two circuit breakers are interlocked, just remove the top circuit breaker.

Soft interlock (both horizontal and vertical)

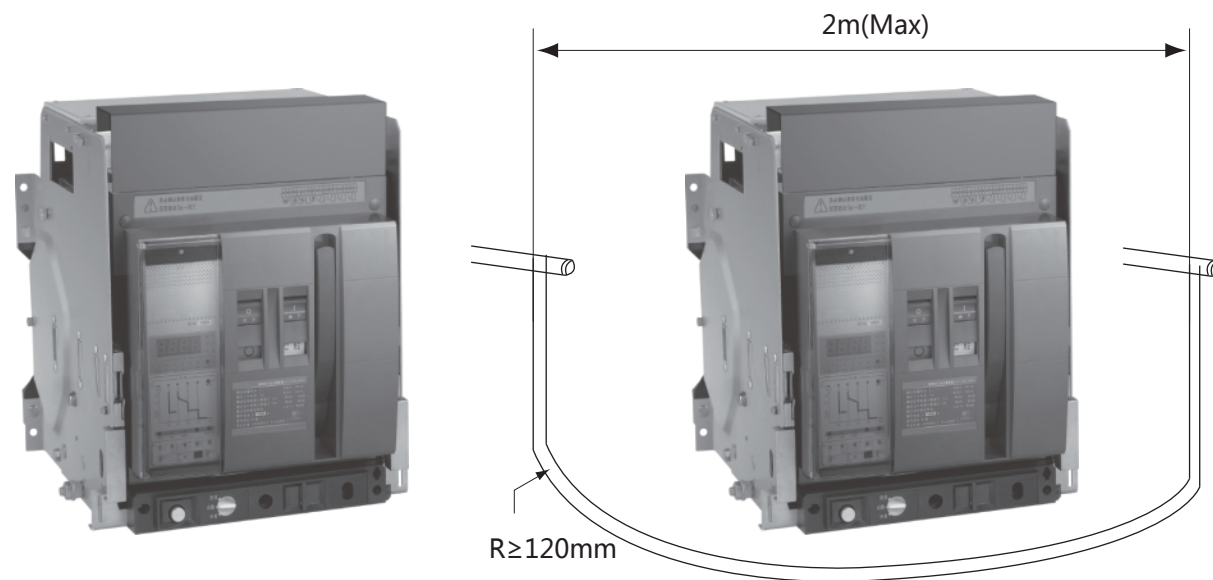
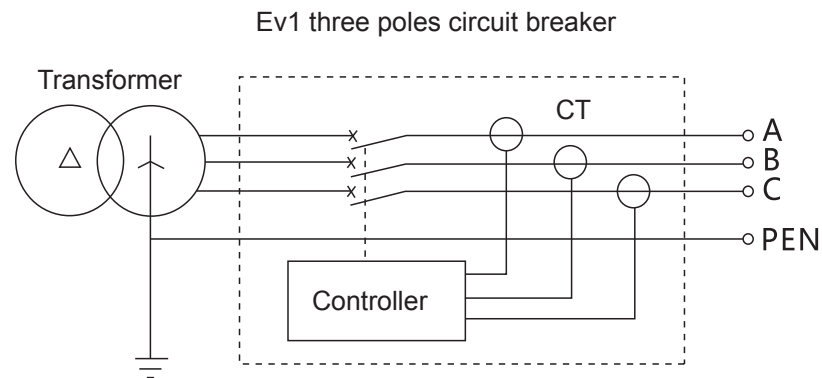


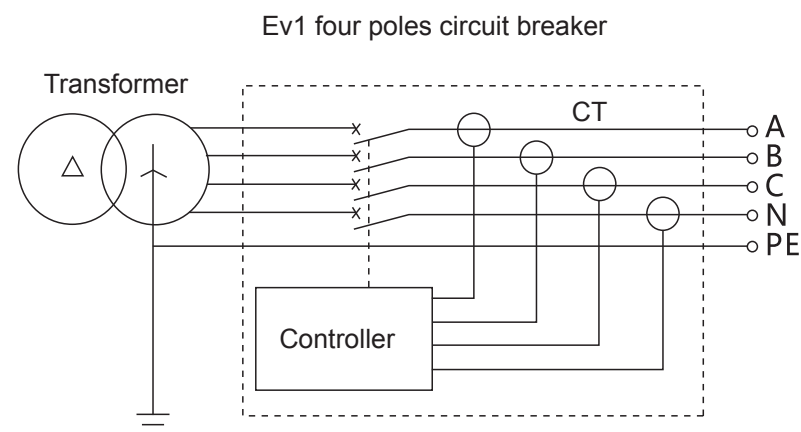
Figure 5(B)

7 Internal wiring method

Ground fault protection circuit



3PT type
D-value type ground fault protection, the signal takes the vector sum of three-phase currents (three-phase unbalanced)



4PT type
D-value type ground fault protection, the signal takes the vector sum of three-phase current and N-phase current

- # 12 Overload pre-alarm signal output
- # 13 Communication remote shunt trip output
- # 14 Instantaneous short delay trip signal output or communication remote close switch output
- # 15 Long delay trip signal output or communication remote energy storage output
- # 16 Ground (or zero) fault trip signal output
- # 17 Load unloading 1 signal output
- # 18 Unloading 2 signal output
- # 19 Signal output public line
- # 20 Self-diagnostic signal output
- # 21 Trip signal (can be used for shunt or undervoltage actuators)
- # 22 Voltage signal A phase
- # 23 Voltage signal B phase
- # 24 Voltage signal C phase
- # 25, 26 external neutral or ground current transformer input

} Direct access from the main circuit

- 1) The controller signal output drives external relay J to output contact action signals through terminals 12 ~ 18, 20, and 21.
- 2) RS485 / 232 converter, DP module, power transformer (users need to specify the input voltage value in the order specification) are provided by the manufacturing company. The power transformer can be inserted into the standard guide rail together with the relay base and installed by the user in the appropriate position of the switch cabinet.
- 3) Relay model: HH62P, AC / DC 24V, provided by the user
- 4) Master computer, provided by the user
- 5) Terminals 13 to 15 can be used for communication remote control opening, closing and energy storage. The trip signals of corresponding terminals 14 and 15 are no longer output at this time. The normally open contacts of the corresponding relays are connected in parallel with the corresponding manual control buttons, which can realize remote control. If the remote control function is not required, terminals 14 and 15 can be connected to two signal lamps in series through the normally open contacts of relays J14 and J15, and the corresponding signals can be output remotely. Please indicate whether the remote control function is required in the ordering specification, and the manufacturer decides the corresponding function of the terminals 14 and 15 according to this. Terminal 21 output can be used for backup protection after pushing relay J21.
- 6) Self-diagnostic signal output conditions: a. The internal temperature of the controller is $> 80^{\circ} \text{C}$. b. The chip is not working properly. c. The controller loses power.
- 7) Users can choose J12, J14 ~ J16, J20, J21 according to their actual needs.

Note:

- (1) If the control power voltages of F, X, M are different, they should be connected to different power.
- (2) Terminal # 35 can be directly connected to the power supply (automatic pre-storage), or it can be connected to the normally open button and connected to the power supply (manual pre-storage).
- (3) If the user asks, terminals # 6 ~ # 7 can output normally closed contacts.
- (4) Additional attachments are provided by the user.
- (5) * When the controller's working power is DC power, DC power module must be added (at this time, terminals # 1 and # 2 cannot be directly connected to AC power).

The secondary wiring is shown in the figure (DC110V or DC220V is input from U1 (+) and U2 (-), and the two output ends of the DC power module are connected to the secondary wiring terminals 1 (+) and 2 (-) respectively)

SB1 shunt button (user-supplied) SB2 under-voltage button (user-supplied) SB3 closing button (user-supplied)

- | | | |
|------------------------|-----------------------|--|
| X closing solenoid | DF auxiliary contact | Q undervoltage release or undervoltage delay release |
| M Energy storage motor | F Shunt release | O Normally open contact (3A / AC380V) |
| XT terminal block | SA motor micro switch | ⊗ signal lamp (user-supplied) |

※ Note:

- (1) If the control power voltages of F, X, M are different, they should be connected to different power.
- (2) Terminal # 35 can be directly connected to the power supply (automatic pre-storage), or it can be connected to the normally open button and connected to the power supply (manual pre-storage).
- (3) If the user asks, terminals # 6 ~ # 7 can output normally closed contacts.
- (4) Additional attachments are provided by the user.
- (5) * When the controller's working power is DC power, DC power module must be added (at this time, terminals # 1 and # 2 cannot be directly connected to AC power).

The secondary wiring is shown in the figure (DC110V or DC220V is input from U1 (+) and U2 (-), and the two output ends of the DC power module are connected to the secondary wiring terminals 1 (+) and 2 (-) respectively)

SB1 shunt button (user-supplied) SB2 under-voltage button (user-supplied) SB3 closing button (user-supplied)

X closing solenoid DF auxiliary contact Q undervoltage release or undervoltage delay release

M Energy storage motor F Shunt release O Normally open contact (3A / AC380V)

XT terminal block SA motor micro switch ⊗ signal lamp (user-supplied)

● Figure 7C (The controller is M-type with additional functions or H-type)

Controller other wiring:

1, # 2 AC working current input (input from DC power modules U1, U2 when DC)

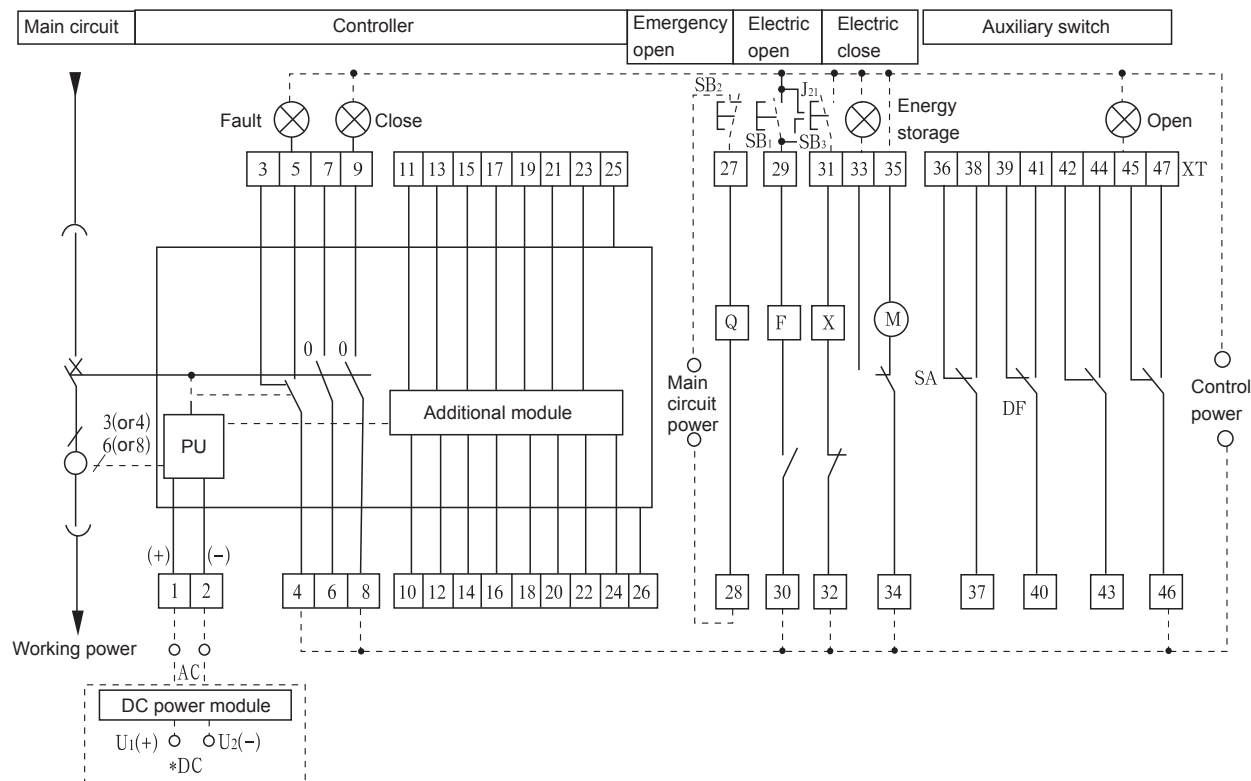
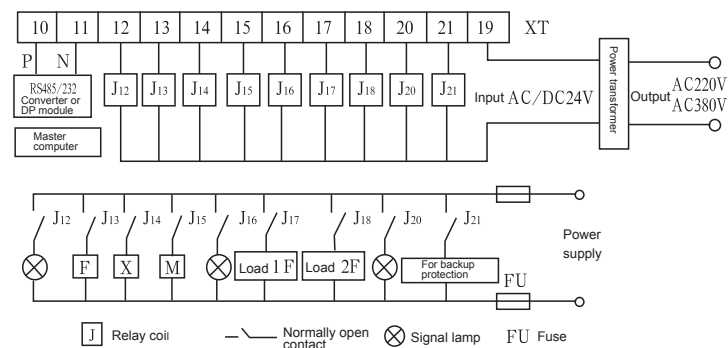
10 RS485 communication

P terminal (simplex)

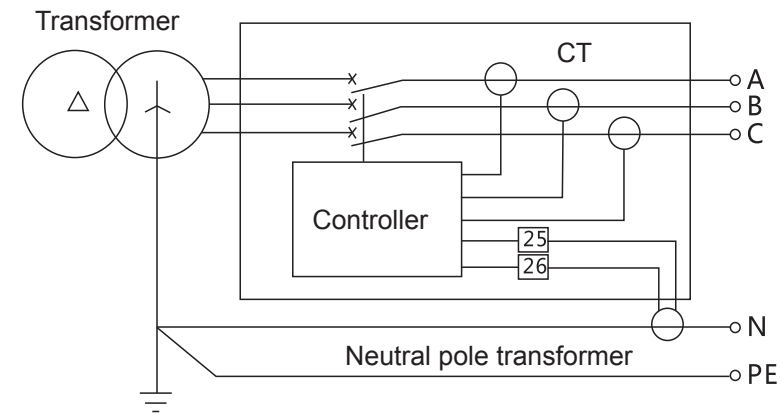
11 RS485 communication

N terminal (simplex)

Remote control, telemetry, remote regulation, remote communication, etc

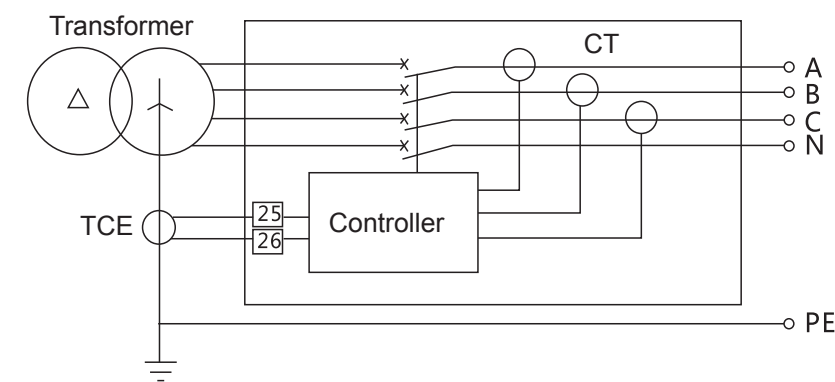


Ev1 three poles circuit breaker



(3P+N)T type
External neutral pole transformer
D-value type ground fault protection, the signal takes the vector sum of three-phase current and N-phase current

Ev1 three poles or four poles circuit breaker



(3P + N) W type
External ground current transformer
Ground current type ground fault protection, the signal is directly taken between the neutral point of the main power supply and the ground

External single-phase ground protection

External transformers are provided to users as accessories. The user will insert it into the busbar by himself and connect the wire (length 2m) to the secondary terminals # 25 and # 26 of the circuit breaker. The size of the center opening of the external transformer (the maximum permissible through-the-bus bar) is as follows:

Model	Width	Height
Ev1-2000 Ev1-4000/4	61	21
Ev1-3200 and above (Except Ev1-4000/4)	83	31

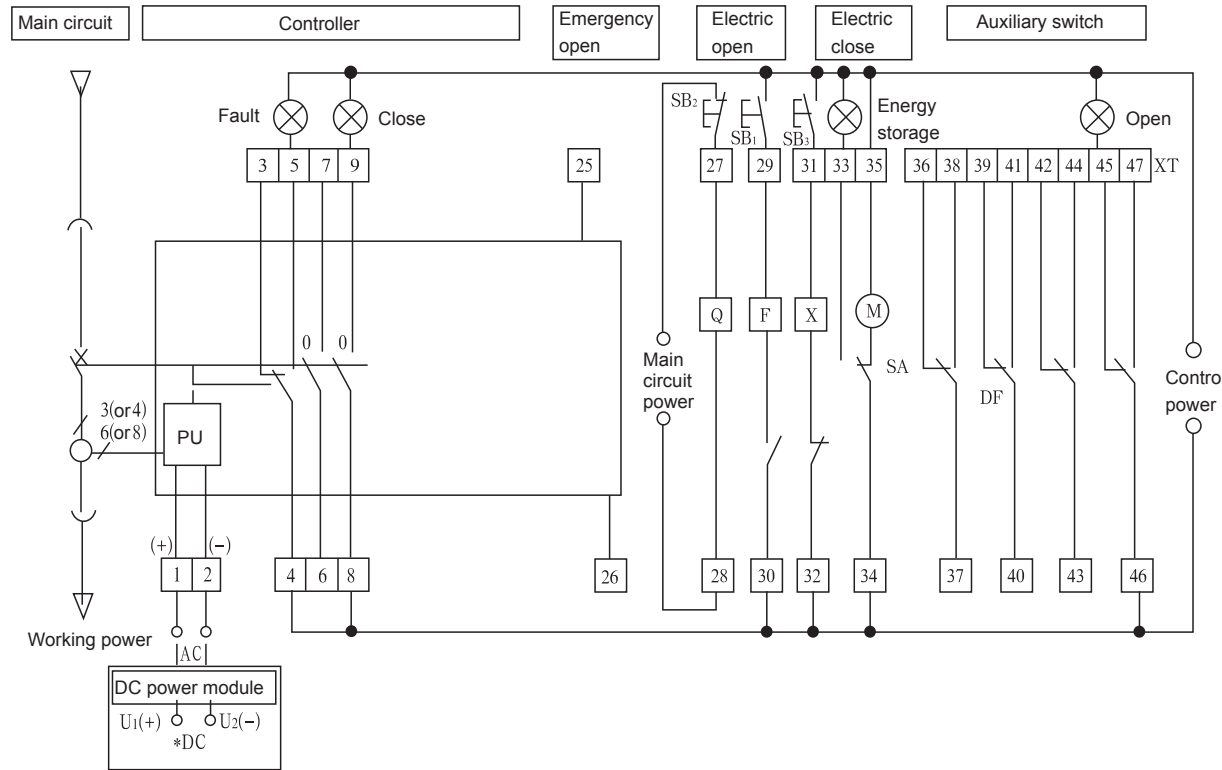
Terminals

There are a total of 47 circuit breaker terminals. The wiring is simple and convenient for users. The wiring diagram is shown in Figure 7A, B, and C.

● Figure 7A (controller is M-type or L-type basic function)

Controller other wiring

- # 1, # 2 AC working power input (input from DC power modules U1 and U2 when DC)
- # 25, # 26 external neutral or ground current transformer input



※ Note:

- (1) If the control power voltages of F, X, M are different, they should be connected to different power.
- (2) Terminal # 35 can be directly connected to the power supply (automatic pre-storage), or it can be connected to the normally open button and connected to the power supply (manual pre-storage).
- (3) If the user asks, terminals # 6 ~ # 7 can output normally closed contacts.
- (4) Additional attachments are provided by the user.
- (5) * When the controller's working power is DC power, DC power module must be added (at this time, terminals # 1 and # 2 cannot be directly connected to AC power).

The secondary wiring is shown in the figure (DC110V or DC220V is input from U1 (+) and U2 (-), and the two output ends of the DC power module are connected to the secondary wiring terminals 1 (+) and 2 (-) respectively)

- SB1 shunt button (user-supplied) SB2 under-voltage button (user-supplied) SB3 closing button (user-supplied)
- X closing solenoid DF auxiliary contact Q undervoltage release or undervoltage delay release
- M Energy storage motor F Shunt release O Normally open contact (3A / AC380V)
- XT terminal block SA motor micro switch ⊗ signal lamp (user-supplied)

● Figure 7B (controller is L type with additional functions)

Controller other wiring:

- # 1, # 2 AC working power input (input from DC power modules U1, U2 when DC)
- # 12 Overload pre-alarm signal output
- # 14 Instantaneous short delay trip signal output
- # 15 Long delay trip signal output
- # 16 Ground (or zero) fault trip signal output
- # 19 Signal output public line
- # 20 Self-diagnostic signal output
- # 21 Trip signal (can be used for shunt or undervoltage actuators)
- # 25, # 26 external neutral or ground current transformer input

- 1) The controller signal drives external relay J to output the contact action signal through terminals 12, 14-16, 20, and 21.
- 2) The power transformer (the user needs to indicate the input voltage value in the ordering specification) is provided by the manufacturing company. The power transformer can be inserted into the standard guide rail together with the relay base and installed by the user at a suitable position in the switch cabinet.
- 3) Relay model: HH62P, AC / DC24V, provided by the user.
- 4) Self-diagnostic signal output conditions: a. The internal temperature of the controller is $> 80^{\circ} \text{C}$; b. The chip is not working properly; c. The controller loses power
- 5) Users can choose J12, J14 ~ J16, J20, J21 according to their needs.

