● If the color of the photos in this manual does not match the actual product due to photography and printing, please refer to the actual product for accuracy;

● Due to continuous improvement in product technology, all data should be based on the latest data confirmation. Any change is subject to no further notice;

● The final interpretation rights belong to Ruirui Electric (Zhejiang) Co., Ltd.

● Dear customer:

When the life of this product and its supporting accessories ends, please do a good job of recycling the product or its component materials. For materials that cannot be recycled, please also handle them properly. Thank you very much for your cooperation and support!

AceReare

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AceReare

ARW1-1600 Intelligent Air Circuit Breaker

【Operation Manual】

Executive standard:
GB/T14048.2(idt IEC60947-2)
The picture is for reference only and the actual product shall prevail

RUIRUI ELECTRIC (ZHEJIANG) CO.,LTD.

Company Profile

12,000

The standardized workshop covers an area of 12000m^2

300+

With more than 300 employees

150,000,000+

Anual sales (yuan)

1. Group profile

Founded in 2015, Ruirui Electric, headquartered in Yueqing City of Wenzhou, the city of China's electrical appliances, is a modern national high-tech enterprise with R&D as the core and intelligent production as the guide. The company integrates R&D, manufacturing and sales, and has the process production capacity and quality control capacity of the whole process chain of low-voltage circuit breakers. It has become a well-known enterprise brand in the low-voltage circuit breaker manufacturing industry.

The company has two wholly-owned subsidiaries, "Ruirui Electric" and "Kerui Electric". It has established strategic cooperation relationships with nearly 100 high-end customers at home and abroad. Its marketing network covers more than 30 provinces and cities in China mainland, Hong Kong, Macao and Taiwan. Its products are exported to more than 60 countries and regions around the world.

2. Introduction to main products

The company provides users with a complete process chain supporting system solution, covering a wide range of products including mold manufacturing, core heat treatment processes, hardware stamping parts, special-shaped CNC parts, injection molded parts, DMC compression parts, welding riveting parts, electronic components, finished circuit breakers and other series.

3. Enterprise honor

The company has laboratories with sound testing methods, and is also the drafting unit of national standards and industrial standards. Scientific research cooperation was carried out with Shanghai Jiaotong University, Xi'an University of Architecture and Technology, South China University of Technology and other institutions of higher learning to promote the research and development of building hardware accessories, smart home and other products. It has successively won the honorary titles of National High-tech Enterprise, National Intellectual Property Advantage Enterprise, Wenzhou Enterprise Technology Research and Development Center, Yueqing Enterprise Technology Center, Wenzhou Demonstration Enterprise for Integration of Industrialization and informatization; it has won more than ten invention patents, high-tech products in Zhejiang Province and many other awards.

AceReare

ARW1-1600 Intelligent Air Circuit Breaker

1. Purpose and scope of use

The ARW1-1600 series intelligent air circuit breaker (hereinafter referred to as the circuit breaker) is suitable for box substation and wind farm main tower with frequency of AC 50Hz, rated working voltage up to 690V and rated working current 1600A and below. It is used to protect the line and power equipment from overload, undervoltage, overvoltage, short circuit, grounding, current imbalance and other faults. The circuit breaker adopts intelligent controller with precise selective protection and multifunctional functions, as well as complete protection functions. It's especially suitable for distribution network that needs to improve power supply reliability and avoid unnecessary power outage. The ARW1-1600-2H/3H intelligent controller is equipped with communication interface, which facilitates connection with the fieldbus. It can also achieve four remote functions: "telemetering", "remote adjustment", "remote control" and "remote signaling", meeting the requirement of control automation.

There are four types of circuit breakers available: low-temperature resistant type, salt spray resistant type, plateau type and ordinary type.

The product has passed the conpulsary national product certification "CCC" mark.

The product can operate in low temperature environment of -40℃ through low-temperature testing.

The circuit breaker has isolation function, with the symbol of " ⟋⊢✕ ".

2. Model meaning

AR W 1 - 1600 /□/□/□

- Intelligent controller model
- Rated current of circuit breaker
- Number of Poles (three poles: 3, four poles: 4)
- Rated frame current of circuit breaker
- Design code
- Air circuit breaker
- Enterprise code

The circuit breaker meets the following standards:

GB/T14048.1 *Low-voltage switchgear and controlgear-Part 1: General rules*

GB/T14048.2 *Low-voltage switchgear and controlgear-Part 2: Circuit breakers*

GB/T2423.1 *Environmental testing for electric and electronic products-Part 2:Test methods- Tests A:Cold*

GB/T2423.2 *Environmental testing for electric and electronic products-Part 2:Test methods- Tests B: Dry heat*

GB/T2423.17 *Environmental testing for electric and electronic products-Part 2:Test methods- TestsKa: Salt mist*

GB/T20626.1 *Specific environment condition-Electric and electronic products for plateau-Part1: General technical requirements*

GBT20645 *Specific environmental condition- Technical requirements of low-voltage apparatuses for plateau*

3. Normal working and installation condition

3.1 Ambient air temperature

The ambient air temperature is -5℃ -+40℃, and the average shall not exceed ℃; for working conditions where the upper limit value exceeds +40℃ or the lower limit value is below -10℃, users should consult with our factory (except for special statements).

3.2 Altitude

The altitude of the ordinary type shall not exceed 2000m, and if it exceeds 2000m, it shall be reduced in capacity for use. The altitude of the plateau type shall not exceed 5000m.

3.3 Atmospheric condition

When the maximum temperature is +40℃, the relative humidity of the air should not exceed 50%. Higher relative humidity can be allowed at lower temperatures, such as reaching 90% at 20℃. Special measures should be taken for occasional condensation caused by temperature change (condition beyond regulation should be negotiated with the factory).

3.3.2 Pollution level: level 3

3.3.3 Protection level: IP30

3.3.4 Utilization category: Class B

3.4 Installation Category

For circuit breakers and undervoltage releases with rated working voltage and below, the installation category of primary coil of power transformer is IV, and the one of auxiliary circuit and control circuit is III.

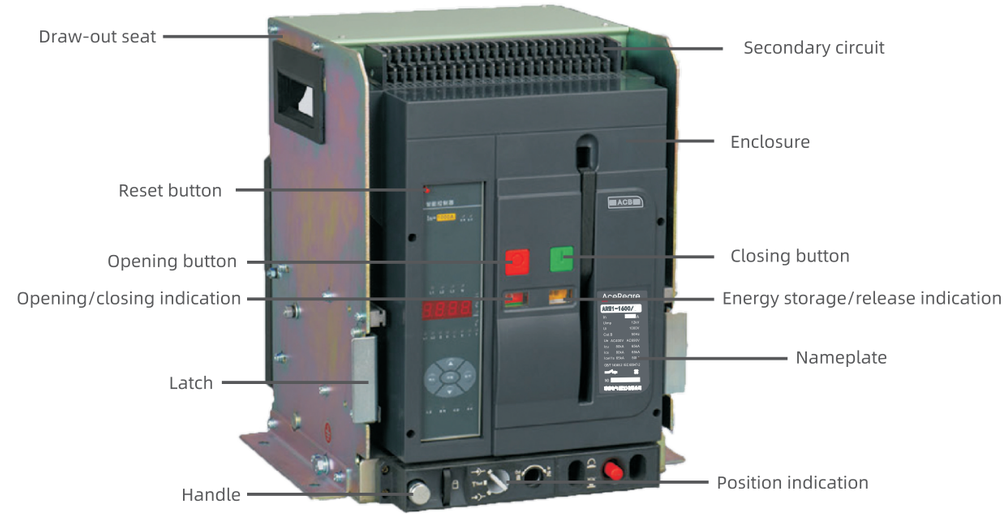
3.5 Installation condition

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

3.6 Transportation and storage

Storage temperature -40℃-55℃, up to 70℃ in a short time (24h)

4. Structure introduction



5. Installation, use and maintenance

5.1 Installation

5.1.1 Remove the circuit breaker from the fixed base plate of the packaging box. If the circuit breaker is a draw-out type circuit breaker, first pull out the handle at the lower part of the circuit breaker draw-out seat, insert it reliably into the hole in the middle of the plastic cover of the lower beam of the draw-out seat, shake the handle counterclockwise, and the circuit breaker body will slowly slide towards the outer part of the draw-out seat. When the position indication on the draw-out seat points to the disconnection position, and the handle can no longer be rotated, pull out the handle, and press down the latch on both sides of the draw-out seat, then hook the both sides of the circuit breaker body with two hands to draw out the handle, and pull the handle to the outside of the circuit breaker. When the click is heard, press the latch on the draw-out seat again, and then hold the handle on both sides of the circuit breaker body with two hands, move the circuit breaker body out of the draw-out seat, and then remove the draw-out seat baseplate, and clean the foreign matters in the draw-out seat.

5.1.2 Check whether the specifications of the circuit breaker meet the order requirements. For example, whether the rated working current of the draw-out seat is consistent with that of the body.

5.1.3 Check the insulation resistance of the circuit breaker with a 500V megger, and it should not be less than 20MΩ when the ambient medium temperature is 20℃±5℃ and the relative humidity is 50%~70%. Otherwise, it shall be dried and used only after the insulation resistance meets the requirements.

5.1.4 Place the circuit breaker (fixed) or draw-out seat (withdrawable) on the mounting bracket and fasten it with screws. For the fixed product, directly connect the main circuit busbar to the fixed circuit breaker busbar. For the draw-out product, put the circuit breaker body on the draw-out seat guide rail, insert the handle into the inlet and outlet device hole, and turn the handle clockwise to make the lower position indicator of the draw-out seat at the connection position, indicating that the circuit breaker body is connected in place, and then connect the main circuit busbar to the draw-out seat busbar.
5.1.5 The circuit breaker shall be reliably grounded, and there shall be obvious grounding marks at the grounding point.
5.1.6 Connect according to the secondary circuit wiring diagram of the circuit breaker.
Note: There shall be no nuts, gaskets or other foreign matters in the draw-out unit.

5.1.7 For high temperature resistant salt spray resistant type and ordinary type with an altitude exceeding 2000m, the electrical performance of the circuit breaker can be corrected according to the following table:

Altitude (m)	2000	3000	4000	5000
Working withstand voltage (V)	3500	3150	2500	2000
Working current correction factor	1	0.93	0.88	0.82
Short circuit breaking capacity correction factor	1	0.93	0.71	0.63

5.1.8 The power loss of the circuit breaker's incoming and outgoing lines is shown in the table below

In(A)		200	400	630	800	1000	1250	1600
Power loss (W)	Draw-out type	115	140	161	215	230	250	460
	Fixed type	45	80	100	110	120	130	220

5.1.9 Recommended thickness value for busbar installed by the user is shown in the table below

In(A)		200	400	630	800	1000	1250	1600
Busbar	Thickness	5	5	5	5	5	5	5
	Width	30	30	50	60	60	80	100
	Qty (pc)	1	2	2	2	2	2	2

Note: The specifications in the table refer to the copper bar used when the circuit breaker is installed in an open environment at 40℃ and meets the heating conditions specified in GB/T14048.2

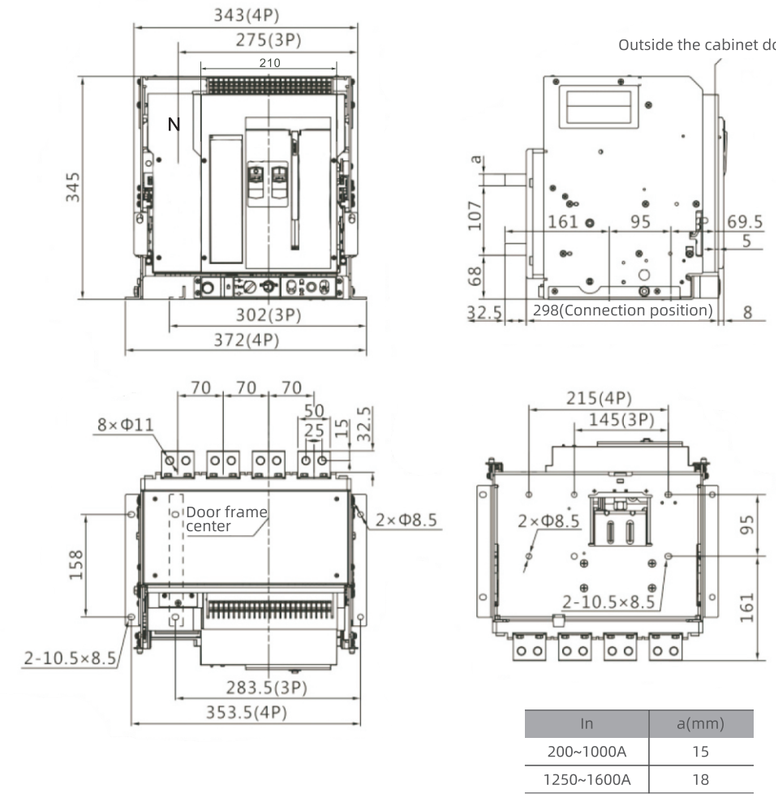
5.2 Use and operation
After the circuit breaker is installed and wired, the following operation tests shall be conducted before the main circuit is powered on (the position indication on the draw-out seat of the draw-out circuit breaker shall be indicated at the test position).
5.2.1 Before use, check whether the rated voltage of the undervoltage release, shunt release, closing electromagnet, electric mechanism and intelligent release is consistent with the voltage of the connected power supply (the undervoltage release must be energized before the circuit breaker is closed).
5.2.2 Turn on the power supply of the secondary circuit. At this time, the electric mechanism will automatically store energy until the "click" sound is heard. The energy storage indicator on the panel displays "Charged", indicating the end of the energy storage operation. If there is no electric mechanism or the electric mechanism cannot store energy, you can manually pull the handle on the face guard up and down for 6 to 7 times until the "click" sound is heard. The energy storage indicator on the panel displays "Charged", indicating the end of the energy storage operation.
5.2.3 Press the " I " button on the face guard or close the electromagnetic iron to energize, and the circuit breaker is reliably closed.
5.2.4 After the circuit breaker is closed, no matter the undervoltage release is powered off or the shunt release is powered on, the circuit breaker can be open either by pressing the "○" button on the face guard or the tripping test of the intelligent controller.
5.3 Maintenance
5.3.1 Check some parameters regularly.
5.3.2 When connecting the external bus with the circuit breaker, various mechanical stresses should be avoided from acting on the circuit breaker.
Note: Before performing maintenance work, ensure that the equipment is powered off. When installing and maintaining the circuit breaker, pay attention to personal safety, and take good personal protective measures and safety measures to avoid danger.

5.4 Main technical indicator

Model		ARW1- 1600
Rated current In (A)		200, 400, 630, 800, 1000, 1250, 1600
Number of poles		3P, 4P
Rated short-circuit breaking capacity	AC-415V	Icu=Ics=50kA Icw/1s=42kA
	AC-690V	Icu= Ics= Icw/1s=36kA
Rated insulation voltage Ui (V)		1000
Rated impulse withstand voltage Uimp (kV)		12
N pole maximum continuous current		100%In
Inherent breaking time (ms)		23~32
Closing time (ms)		≤60
Operation performance (time)	Electrical	6000
	Mechanical	Maintenance free 10000
		With maintenance 20000
Wiring method		Horizontal and vertical

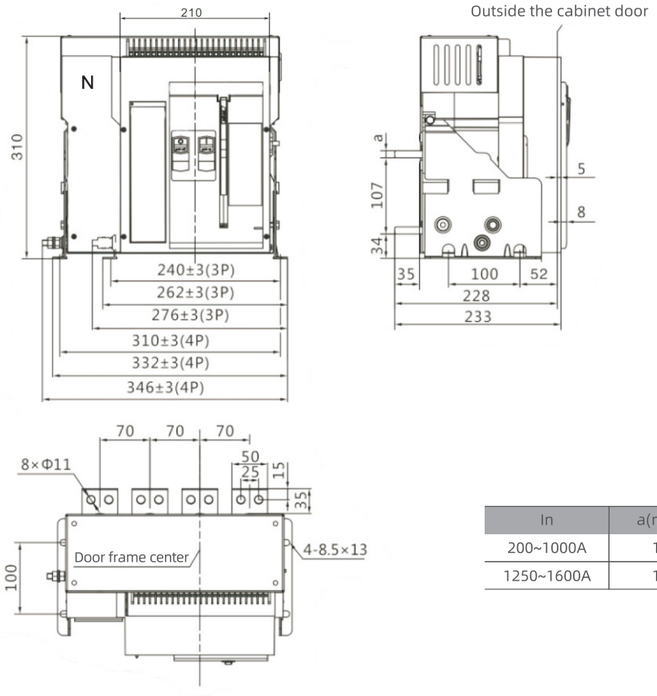
6. Outline and installation dimension

6.1 Draw-out type outline and installation dimension



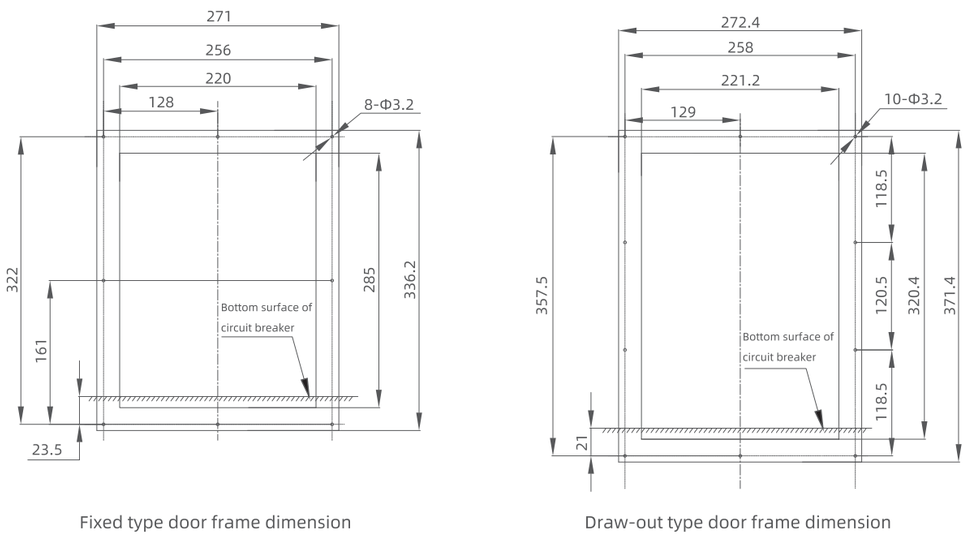
In	a(mm)
200~1000A	15
1250~1600A	18

6.2 Fixed type outline and installation dimension



In	a(mm)
200~1000A	10
1250~1600A	15

6.3 Outline and installation dimension of door frame



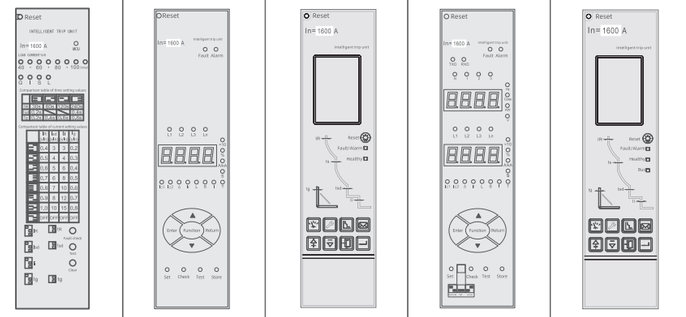
Fixed type door frame dimension

Draw-out type door frame dimension

7. Control unit

7.1 List of intelligent controller functions

ARW1 - 1600 /□/□/□
- Controller function code
- Rated current of circuit breaker
- Number of circuit breaker poles
- Circuit breaker frame current
- Company product code

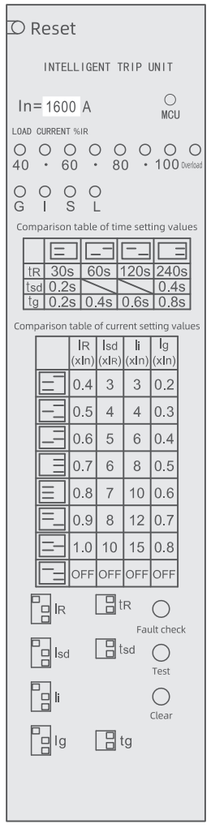


Intelligent controller model		Economic type (2L type)	Standard type (2M type)	Standard type (3M type)	Communication type (2H type)	Communication type (3H type)
Basic function	Long delay protection	●	●	●	●	●
	Short delay protection	●	●	●	●	●
	Instantaneous protection	●	●	●	●	●
	Earth fault protection	●	●	●	●	●
	Load current light column display	●	×	●	×	●
	Load current digital display	×	●	●	●	●
	Test function	●	●	●	●	●
	Fault memory	●	●	●	●	●
	Self diagnostic function	●	●	●	●	●
	Fault alarm indication	●	●	●	●	●
	Fault trip indication	●	●	●	●	●
	On-site user tuning and testing	●	●	●	●	●
	Number of opening and closing operations	×	□	●	●	●
	Contact wear	×	□	●	●	●
Optional auxiliary functions	Pre-alarm	×	×	●	×	●
	MCR function	×	□	●	●	●
	Load monitoring	×	□	□	●	●
	External current transformer grounding protection	×	□	□	□	□
	Over limit tripping function	×	□	●	●	●
	Thermal memory function	●	●	●	●	●
	Four sets of output contacts	×	□	□	●	●
	MODBUS or Profibus-DP protocol (RS485 port)	×	×	×	●	●
	Voltage measurement	×	□	●	●	●
	Frequency display	×	□	●	●	●
	Active power measurement	×	□	●	●	●
	Power factor measurement	×	□	●	●	●
	Electric energy measurement	×	×	●	×	●
	Overvoltage protection (default off)	×	×	●	×	●
	Under voltage protection (default off)	×	×	●	×	●
	Phase sequence protection (default off)	×	×	●	×	●
Human-machine interface description		LED status display, toggle switch operation	Nixie tube display, LED status indication, key operation	LCD display, LED status indication, buttons	Nixie tube display, LED status indication, key operation	LCD display LED status indication, key operation

●represents the default configuration; □represents optional configuration; × represents no this configuration (the minimum operating temperature of the controller is -25℃, please contact the manufacturer for special needs)

7.2 2L type intelligent controller

7.2.1 Control panel diagram and key description



Item	Function
"Reset" red button	After the circuit breaker trips and breaks, you need to press this button to close the circuit breaker again
"Fault check" button	Press this button to display the system's memory of the last line fault protection section
"Test" key	Press this button to conduct an instantaneous tripping test and generate an instantaneous tripping action
Clear button	Press this button to reset the intelligent controller and return to the running state
"IR" three position dip switch	Set the overload long delay protection current value
"Isd" three position dip switch	Sett the short-circuit short delay protection current value
"Ii" three position dip switch	Set the instantaneous short-circuit protection current value
"Ig" three position dip switch	Set the asymmetric grounding (neutral) fault protection current value
"tR" two position dip switch	Set the overload long delayaction time value
"tsd" two position dip switch	Set the short circuit short delay action time value
"Tg" two position dip switch	Set the asymmetric grounding (neutral) fault action time value
"MCU" indicator light	The constant green light indicates that the microcontroller (MCU) is working normally; When the green light flashes, the number of flashes is the microcontroller's self diagnostic error code
"40~100 " indicator light	This group of lights is a load current column indicator light, displaying the percentage of load current and Ir value
"Overload" indicator light	When the red light is on, it indicates that the load current has exceeded the overload long delay protection current value; the overload long delay starts delay action or alarm
"G,L,S,L" indicator light	In actual operation, when a certain fault red light is constantly on, it indicates that fault has occurred in the section where it is located and the intelligent controller has sent tripping command; if a certain fault red liight flashes, it indicates that delayed action or fault alarm is in progress; during fault inspection, when a certain fault red light is on, it indicates that the previous fault occurred in that section; after the instantaneous tripping test, the instantaneous fault red light "I" lights up to indicate that the instantaneous simulated tripping has occurred

7.2.2 Setting of 2L type intelligent controller

Setting of overload long delay current IR: Turn the three-position dial switch on the left side of IR for setting; there are eight effective setting combinations for the three-position dial switch, and the corresponding setting current value for each setting combination can be found in the Current setting value comparison table on the panel.

Setting of overload long delay action time tR: Turn the two-position dial switch on the left side of tR for setting; there are four effective setting combinations for the two-position dial switch, and the corresponding setting time value for each setting combination can be found in the Current setting value comparison table on the panel.

The parameter setting of rest protection sections is similar to that of overload long delay protection. Note: During the setting process, each dial switch must be turned in place.

7.2.3 Test of 2L type intelligent controller

Before the intelligent controller is put into operation, users can conduct an instantaneous trip test on the intelligent controller to check the integrity of the trip system.

Test method: After pressing the "Clear" , press the "Test" button, and the intelligent controller will instantly trip, with the "I" red indicator light on.

After the experiment is completed, press the "Clear" button to enter the running state; at the same time, the red mechanical "Reset" button must be pressed to close the circuit breaker.

7.2.4 Display inspection of 2L intelligent controller

After pressing the "clear" , press the "Fault check" button once, then press the "Test" button six times. After a while, all light-emitting diodes should light up. Pressing the "Clear" button in any state can return to the running state; If no key is pressed, the system will automatically return to running state after 1 minute. After the intelligent controller sends out the trip action, the "Clear" button must be pressed once, and then press the red mechanical "Reset" button again before closing the circuit breaker.

7.2.5 Fault inspection of 2L type intelligent controller

After presssing the "Clear" , press the "Fault check" button, and the system will display the section where the previous fault occurred (i.e. the red light in the section is on). Press the "Clear" button to exit the fault check status and return to the running state.

7.2.6 Self-diagnosis error code of the 2L type intelligent controller

When there is an error in the microcontroller, A/D conversion, E^2PROM, controller over temperature, or magnetic flux disconnection, the intelligent controller can use the number of flashes of the "MCU" light to represent the corresponding self-diagnosis error information, as shown in the table below (the circuit breaker can also be disconnected when needed by the user). If multiple self-diagnosis faults occur simultaneously, the above error information will be displayed in a loop from top to bottom according to the order in the following table.

Microcontroller self-diagnosis error type	The number of flashes of the "MCU" light
Microcontroller error	Continuously flashing
A/D conversion error	2
E^2PROM error	3
Controller over temperature	8
Magnetic flux disconnection	9

7.2.7 Load current column indication function of 2L type intelligent controller

It displays the maximum load phase current on the indicator light column. The display range of load current is (40%~100%) IR+overload indication, with display differential of 10%; display accuracy of 3%

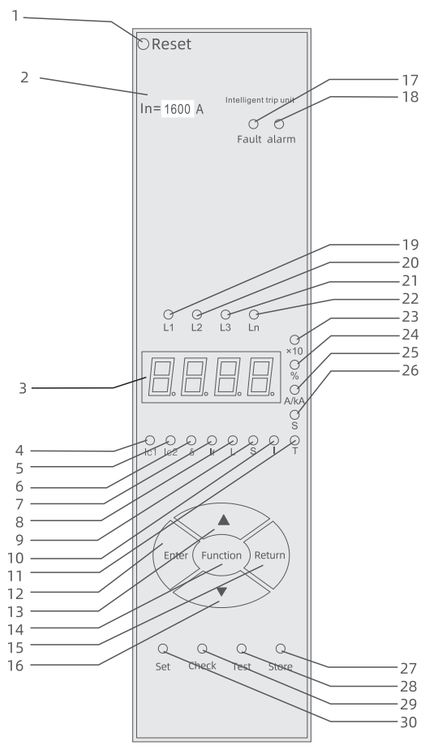
7.2.8 Thermal memory function of 2L type intelligent controller

Repeated overloads of the circuit may cause heating of the circuit or equipment. The intelligent controller uses artificial intelligence to handle overheating protection caused by repeated overloads based on its heating and cooling characteristics. After the intelligent controller experiences tripping action due to line overload fault, it can simulate the heat dissipation process of the line or equipment (the accumulated heat is released after a long delay of 30 minutes and a short delay of 15 minutes); if overload fault occurs after the circuit breaker is closed again during this period, the delay action time will become shorter. The intelligent controller can clear all accumulated heat by powering off once. Users may not choose this feature when placing an order (this feature is available by default)

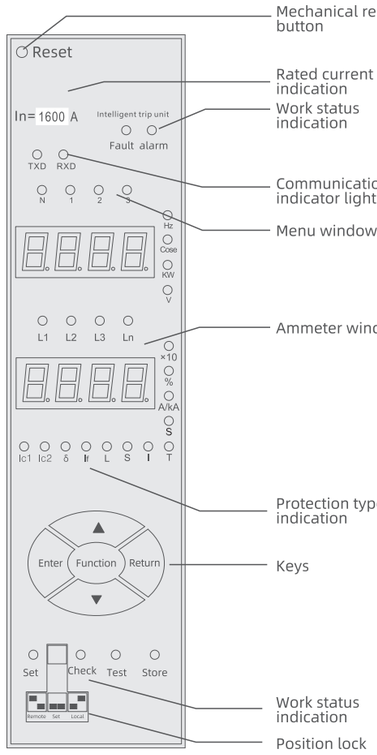
7.2.9 Fault memory function of 2L type intelligent controller

When line fault occurs or the circuit breaker is disconnected, the intelligent controller will automatically remember the faulty section type for future inspection, and the memory data will not be lost after power outage. Only when new fault occurs will the previous fault type data be overwritten and the current fault section type be memorized.

7.3 2M/2H type intelligent controller
7.3.1 Control panel schematic diagram



2M type controller



2H type controller

1 - Reset button
2 - Rated current
3 - Display screen
4 - Load 1 indicator light
5 - Load 2 indicator light
6 - Unbalance rate indicator light
7 - Grounding or leakage indicator light
8 - Overload long delay indicator light
9 - Short circuit short delay indicator light
10 - Short circuit instantaneous indicator light
11 - Self diagnostic fault status indicator light
12 - Enter key
13 - Up key
14 - Function setting key
15 - Return key
16 - Down key
17 - Fault indicator light
18 - Alarm indicator light
19 - A phase indicator light
20 - B phase indicator light
21 - C-phase indicator light
22 - N-phase indicator light
23 - Operation frequency unit indicator light
24 - percentage unit indicator light
25 - Ampere/kilo-ampere unit indicator light
26 - Time second unit indicator light
27 - Storage indicator light
28 - Test indicator light
29 - Check indicator light
30 - Set indicator light

7.3.2 Controller working status display
The status of the controller can be classified into: reset status, parameter setting status, fault query status, simulation test status, fault alarm status, fault display status, self diagnosis fault status and parameter storage status. The differentiation of different statuses is achieved through the combination of indicator lights in the working state indicator area.
① Reset status: The status indicator lights are all off, the controller is in a keyless and fault free operation state, and all parameters are in a cyclic display state.
② Parameter setting status: In this state, the controller can modify the setting values of each section of protection.
③ Fault query status: In this state, the controller can query the parameters of the last fault record.
④ Simulated test state: In this state, the controller can perform simulated instantaneous tripping test and non tripping simulation test.
⑤ Fault alarm status: In this state, the controller has detected that there are power grid parameters exceeding the set value, protection or monitoring starts delay, and the indicator light in the protection category indication area will indicate what type of fault alarm is.
⑥ Fault display status: In this state, it indicates that the controller is in a fault tripping state, and the protection category indication area indicates the fault type.
⑦ Self diagnostic fault status: In this state, it indicates that the controller has detected a self diagnostic fault.
⑧ Parameter storage status: In this state, it indicates that the controller is storing the modified parameters.

7.3.3 Controller function table display
The menu window displays the same content in any state, with two display methods:
1. Reset status display: In the reset state, it displays active power, power factor, frequency, three-phase line voltage (Uab, Ubc, Uca), and three-phase phase voltage (Ua, Ub, Uc) cyclically.
2. Manual positioning display: Press the "▲" or "▼" button during reset status to manually position and display the above parameters; press the "▲" or "▼" button every time to replace the parameter positioning display. press the "Return" button to exit the manual positioning display; if no key is pressed within five minutes, the system will exit the manual positioning display and return to the reset state.

The parameter descriptions displayed in the menu are as follows:
① When only the "kW" light remains on, the displayed value is active power, in kW.
② When only the "COSΦ" light is on, the displayed value is the power factor.
③ When only the "Hz" light is on, the displayed value is frequency, in Hz
④ When the two lights "1" and "V" are on simultaneously, the displayed value is the line voltage Uab of the A and B phases; when the two lights "2" and "V" are on simultaneously, the displayed value is the line voltage Ubc of the B and C phases; when the two lights "3" and "V" are on simultaneously, the displayed value is the line voltage Uca of the C and A phases, all with unit of V.
⑤ When the three lights "1", "N", and "V" are on simultaneously, the displayed value is the A-phase voltage Ua; when the three lights "2", "N", and "V" are on simultaneously, the displayed value is the B-phase voltage Ub; when the three lights "3", "N", and "V" are on simultaneously, the displayed value is the C-phase voltage Uc, all with unit of V;
⑥ When all indicator lights are off, the displayed value is the internal temperature of the controller
Note: The menu function is inherent for the 2H model and optional for the 2M model.

7.3.4 Controller ammeter window display
The content displayed in the ammeter window varies under different states. The reset status display, manual positioning display, automatic positioning display and fault action display are as follows:
1. Reset status display:
When in the reset state, it displays three-phase current cyclically. When both "L1" and "A/kA" lights are on simultaneously, the displayed value is the A-phase current; when both "L2" and "A/kA" lights are on simultaneously, the displayed value is B-phase current; when both "L3" and "A/kA" lights are on simultaneously, the displayed value is C-phase current.
2. Manual positioning display:
When in the reset state, press the "▲" or "▼" button to manually locate and display the relevant parameters. The display content includes: main contact wear rate, number of closing and opening operations, grounding or residual current, A-phase current unbalance rate, B-phase current unbalance rate, C-phase current unbalance rate, A-phase current, B-phase current, C-phase current, and N-phase current (if it is a three-pole circuit breaker, this item is not available).

The manual positioning display parameters are described as follows:
① When only the "%" light is on, the displayed value represents the wear rate of the circuit breaker main contact, which is 100% at the factory. When the wear rate is less than 60%, the system sends a self diagnostic fault message. After the circuit breaker main contact is replaced, this parameter needs to be changed to 100% with a special method.
② Only when the "×10/1" light is on, the displayed value represents the number of opening and closing operations of the current circuit breaker. When it is constantly on, the value displayed ×10 is the number of operations; when flashing, the value displayed ×1 is the number of operations. This parameter can be modified with special methods. "×10" or "×1" display mode can be switched with special methods, and the default supply is "×10" display mode.
③ When the three lights "εi", "%", and "L1" are on simultaneously, the displayed value is the current unbalance rate of phase A; when the three lights "εi", "%", and "L2" are on simultaneously, the displayed value is the current unbalance rate of phase B; when the three lights "εi", "%", and "L3" are on simultaneously, the displayed value is the current unbalance rate of phase C.
④ When both "L1" and "A/kA" lights are on simultaneously, the displayed value is A-phase current; when both "L2" and "A/kA" lights are on simultaneously, the displayed value is B-phase current; When both "L3" and "A/kA" lights are on simultaneously, the displayed value is the C-phase current; when both "N" and "A/kA" lights are on simultaneously, the displayed value is N-phase current (only available for 4P controllers).
Note: When the "A/kA" light flashes, it indicates that the displayed current value is in kiloamperes, and when it remains on, it indicates that the displayed current value is in amperes, the same below.

3. Automatic positioning display:
In the fault alarm state, the system automatically locates and displays the current value of one phase or the grounding or residual current value that caused the fault.
4. Fault action display:
After the controller malfunctions and trips, the ammeter window alternately displays the fault action current value and fault delay time value. The protection category indication area indicates the fault category, and the working status indication area indicates that the controller is in the fault indication state (the "Fault" light is on). The menu window display does not change, but still displays normally. The fault action current value here is the maximum phase current value or grounding or remaining current value detected by the system
Note: After the fault trip, when the working power supply is normal, the fault action display state at the time of trip is maintained until the "Return" button is pressed before exiting. If you need to view other relevant fault parameters during the fault at this time, you can press the "▲" and "▼" keys to view it, which is the same as the fault query method.

7.3.5 Controller setting method:
7.3.5.1 The parameter setting method is as follows:
1. Authority confirmation: For the 2H type controller, the digital position lock must be set to the "Set" position, otherwise although it can enter the parameter setting state, the parameter cannot be modified.
2. Confirm that the controller is in a reset state. If the controller is in another state, you can press the "Return" button until the ammeter window is in a cyclic display state.
3. Press the "Function" button until the "Set" light flashes rapidly (once per second).
4. Press the "OK" button, and the "Set" light will change from fast flashing to slow flashing (flashing once every two seconds), indicating entering the parameter selection state. The ammeter window will display the action current setting value of load monitoring 1.
5. Press the "▲" or "▼" key to select the desired setting parameter.
6. Press the "Enter" button, and the "Set" light will change from flashing slowly to constantly on, indicating that it has entered the parameter adjustment state. Press the "▲" or "▼" button to adjust the value to the desired value.
7. Press the "Enter" button, and the "Store" light will flash once to indicate that the parameters have been stored (if the parameters have not changed, the "Store" light will not flash), and the system will automatically return to the parameter selection state. If you do not want to store it, you can directly press the "Return" button. At this time, the parameters will remain unchanged and the system will return to the parameter selection state.
8. If other parameters need to be adjusted, repeat steps 5,6 and 7. If not needed, press the "Return" button until the "Set" light goes out, and the system exits the parameter setting state and returns to the reset state.
Note: If the controller is in fault alarm state, the parameter setting function is blocked and cannot be performed; If fault occurs during the parameter setting process, the system will automatically exit the parameter setting state and enter the fault state; When adjusting parameters, the longer the time you press the"▲" or "▼" keys, the faster the rate of increase or decrease.

7.3.5.2 Controller fault query method
The fault query method is as follows:
1. Confirm that the controller is in a reset state. If the controller is in another state, you can press the "Return" button until the ammeter window is in a cyclic display state.
2. Press the "Function" button until the "Check" light flashes. Press the "Enter" button, and the "Check" light will change from flashing to constantly on, indicating that it has entered the fault query state. The ammeter window will alternately display the fault action current value and delay time value.
3. Press the "▲" or "▼" key to query the relevant parameter during the fault.
4. Press the "Return" button to display the fault action current value and delay time value alternately again.
5. Press the "Return" button again until the "Query" light turns off, and the system exits the fault query state and returns to the reset state.
Note: If the controller is in fault alarm state, the fault query function is blocked and cannot be performed; If fault occurs during the fault inquiry process, the system will automatically exit the fault query state and enter the fault state.

7.3.5.3 Controller simulation test method
There are two types of simulation tests for controllers:
One type is the instantaneous trip simulation test, which aims to check the coordination between the controller and the circuit breaker;
The other type is the non trip simulation test, which aims to test the protection characteristics of the controller.

① Instantaneous release simulation test method:
1. Authority confirmation: For the 2H type controller (M type corresponding digital position lock), the dial position lock must be set to the "set" position, otherwise simulation test cannot be conducted.
2. Confirm that the controller is in reset state. If the controller is in another state, you can press the "Return" button until the ammeter window is in cyclic display state.
3. Press the "Function" button until the "Test" light fast flashes (once per second).
4. Press the "Enter" button, and the "Test" light will change from flashing quickly to flashing slowly (every two seconds), indicating that it has entered the test ready condition.
5. Press the "Enter" button again, and the "Test" light will change from slow flashing to constant on. The system will generate instantaneous trip action, the circuit breaker will open and the ammeter window will display the action time.
6. Close the circuit breaker again, press the "Enter" button, and the system will once again generate instantaneous trip action to open the circuit breaker. The ammeter window once again displays the action time.
7. Press the "Return" button once, and the "Test" light will change from constantly on to flashing quickly. Press the "Return" button again, and the "Test" light will turn off, and the system will exit the test state.

② Non release simulation test method:
1~4. Same as the instantaneous trip simulation test.
5. Press the "▲" or "▼" key to select the test current value. When pressing the "▲" key, the test current starts to progressively increase from 0.2In, and when pressing the "▼" key, the test current starts to progressively decrease from 50.00kA. During the process, you can press the "▲" or "▼" key to increase or decrease to adjust to the desired test current value.
6. Press the "Enter" button, the "Test" light changes from slow flashing to constant on, and the system begins the delay process of the simulation test without tripping, which is similar to the actual fault protection process. If the test current is too low or both protection and monitoring have exited, the ammeter window will display "nodo", indicating that the test has not been conducted.
7. After the test is completed, the ammeter window alternately displays the test current value and the delay time value at the test current.
8. Press the "Return" button once, and the "Test" light will change from constantly on to flashing quickly. Press the "Return" button again, and the "Test" light will turn off, and the system will exit the test state.
Note: The non trip simulation test can test all protections and monitoring except for current imbalance protection.

7.3.5.4 Controller self-diagnosis fault query method
The self-diagnosis fault query method is as follows:
1. Confirm that the self-diagnosis fault status "T" light is on (indicating the presence of self-diagnosis fault information) and the controller is in reset state.
2. Press the "Enter" button, and the ammeter window will display self-diagnosis fault code. The specific meaning is shown in the table below.
3. If there are multiple self-diagnosis faults, press "▼" or "▲" key to cyclically check through each self-diagnosis fault code item by item.
4. Press the "Enter" button again to confirm that the self-diagnosis fault information has been checked (for partial self-diagnosis fault information, it will be automatically removed after exiting, such as circuit breaker refusal, E^2PROM error, etc.). For only single self-diagnosis fault, the self-diagnosis query status will be exited
5. Press the "Return" button to exit the self-diagnosis fault query status.

E-01	E-02	E-03	E-12	E-13	E-80
Program memory ROM error	A/D conversion error	Memory E^2PROM error	Circuit breaker refuses to operate	Circuit brekaer main contact maintenance	Environmental over temperature

(Note: An error in the program memory ROM is a serious system error. The system automatically flashes "E-01" at high speed in the ammeter window and continuously checks itself. If it keeps flashing "E-01" at high speed, it indicates a physical error in the program memory ROM and the controller should be replaced!)

7.3.5.5 Controller digital position lock setting method

1. When the controller is in the reset state and there is no self-diagnosis fault (i.e. "T" does not light up), press the "Return" button once, and then press the "Function" button and "Enter" button simultaneously. The ammeter window displays "0.00", indicating that the user password confirmation status for this function has been entered. Press the "▲" or "▼" button to enter the user password (the user password for this function is 12.03), and press the "Enter" button to enter this function.
2. The digital display on the ammeter window shows "LoCK", "L1" (or "L2" or "L3"). The ON light indicates the current position of the digital position lock, "L1" indicates that the digital position lock is in the "Remote control" position, "L2" indicates that the digital position lock is in the "Local" position, and "L3" indicates that the digital position lock is in the "Set" position; the three positions are mutually exclusive.
3. Press the "▲" or "▼" key to switch and display the three positions of the digital lock. Press the "Enter" button, the "Store" light will be on, and the system will store the setting result (if the "Store" light is not on, it means the original value has not changed).
4. Press the "Return" button to return the system to the reset state

7.3.5.6 Other parameter setting methods for controller

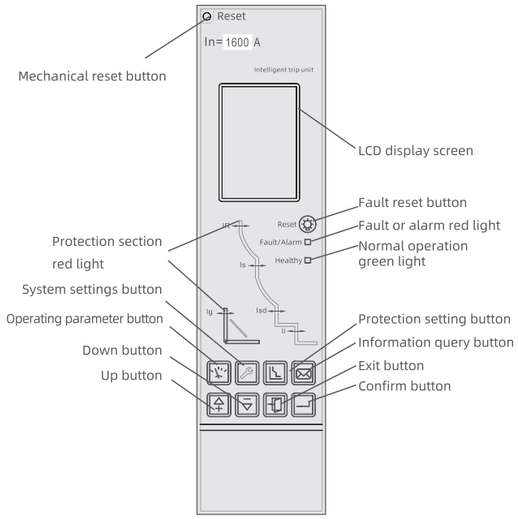
The setting of other parameters of the controller (such as protection characteristic curve type, thermal memory, programmable signal contact output, communication protocol, communication address, communication baud rate, function locking, voltage wiring method, etc.) can be achieved through communication or special operation methods. These parameters are already set by the manufacturer according to default values when leaving the factory, and users generally do not need to change them except for communication networking, If users have special requirements, they can declare to the manufacturer for special orders

7.3.7 Controller communication status indication

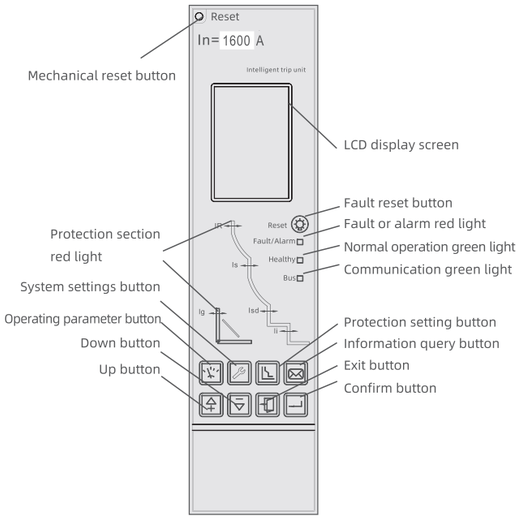
When the 2H type controller is in the "remote" communication process, the "R×D" light is on if it is in the data receiving state, and the "T×D" light is on if it is in the data sending state.

7.4 M/3H type intelligent controller panel schematic diagram

7.4.1 Control panel schematic diagram



3M type controller



3H type controller

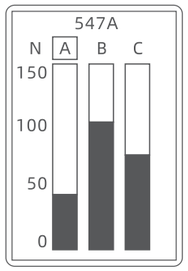
① Indication

1. LCD interface display: English interface
2. Fault and alarm reset button: it clears the fault or alarm indicator light
3. "Fault/Alarm" LED: When working normally, the LED does not light up; in case of fault trip, the red LED will quickly flash; and the red LED remains on during alarm.
4. "Healthy" LED: As long as it is powered on and working normally, the green LED will always flash.
5. Bus indicator light: Modbus goes off when there is no communication, and flashes when communicating.
6. Curve LED: There is red LED indicator hidden within the curve. During fault trip, the corresponding LED light flashes to indicate the type of fault; when setting protection parameters, the LED remains on to indicate the current set item.
7. Reset button: This button pops up in case of fault trip or test trip, and the circuit breaker cannot be closed without being pressed; after the button is pressed, the fault indicator is also reset.

② Keyboard

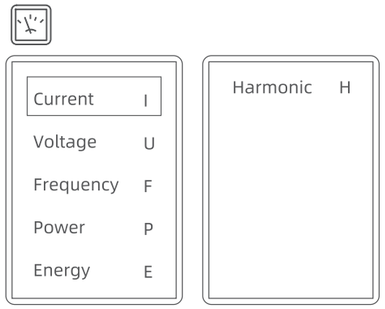
1. Measurement information -function key 1, it switches to the default measurement theme menu ("Left" key in the password input interface)
2. System settings - function ley 2, it switches to the parameter setting theme menu ("Right" key in the password input interface)
3. Protection settings -function key 3, it switches to the protection parameter setting theme menu
4. History maintenance - function key 4, it switches to the history and maintenance theme menu
5. Up -It moves the menu content up at the current level used, or changes the selected parameter up
6. Down -it moves menu content down at the current level used, or changes selected parameters down
7. Exit-it exits the current level used to enter the previous menu, or cancel the selection of the current parameter
8. Select -it enters the next level menu pointed to by the current item, or selects the current parameters to store the modification made.

③ Theme menu operation
Default interface



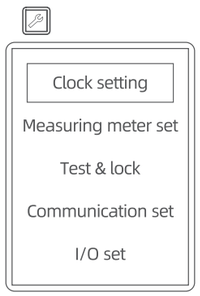
1. It displays the default interface when the controller is powered on
Press the button or corresponding theme key under each theme menu to return to the default interface
If there is no key operation within 10 minutes, the box cursor will automatically indicate the current maximum phase in the non fault pop-up interface. If there is no key operation within the 5 minutes, it will automatically return to the default interface

Measurement menu



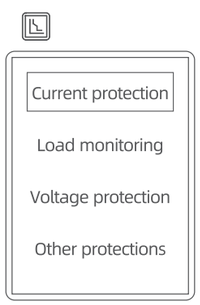
2. Press the or button to return to the default interface
On other non fault interfaces, press to the measurement menu

"System parameter setting" menu



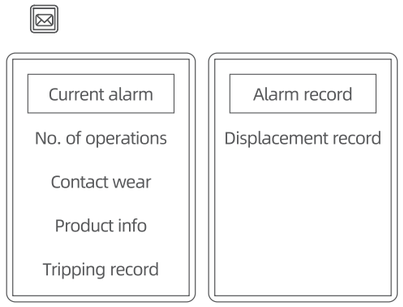
3. Press the or button to return to the default interface
On other non fault interfaces, press to to the system parameter setting menu

"Protection parameter setting" menu



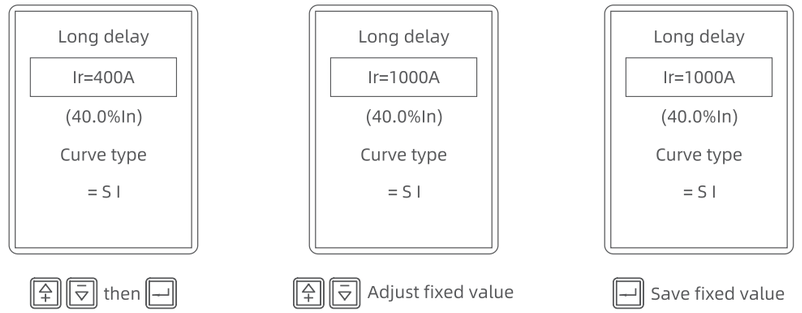
4.Press the or button to return to the default interface
On other non fault interfaces, press to the protection parameter setting menu

"History record and maintenance" menu



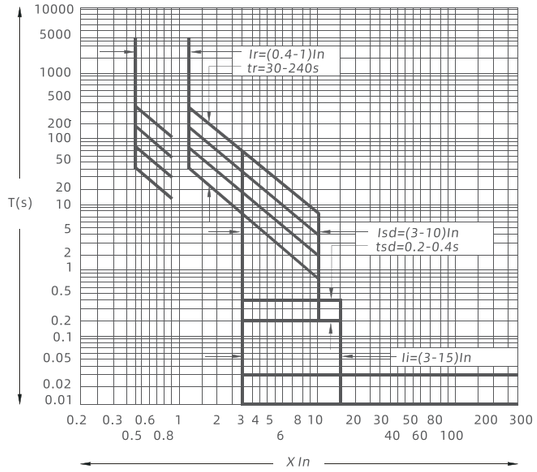
5. Press the or button to return to the default interface
On other non fault interfaces, press to to the history record and maintenance menu

Example of submenu operation: Overload long delay protection setting

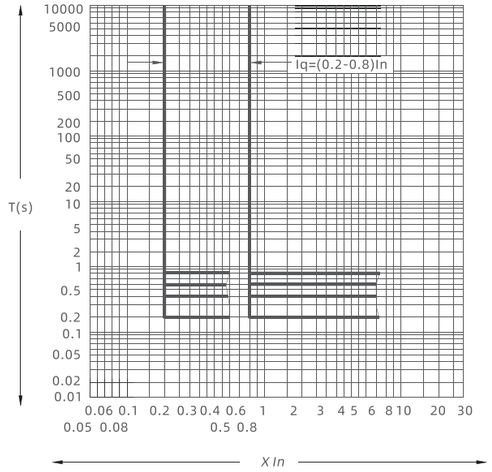


8. Overcurrent protection characteristic

8.1 Protection characteristic curve of 2L type intelligent controller

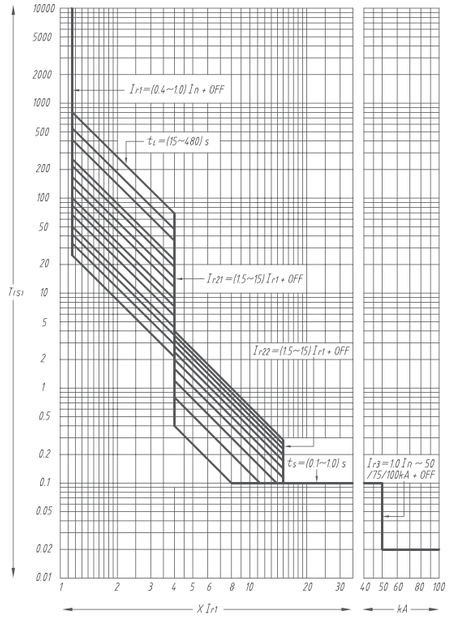


Overcurrent protection characteristic of L3 and L4 type intelligent controllers

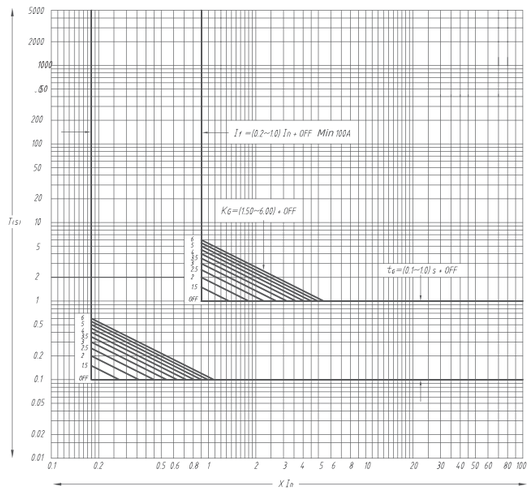


Asymmetric grounding (neutral) fault protection characteristic of L4 type intelligent controller

8.2 Protection characteristic curve of 2 type intelligent controller



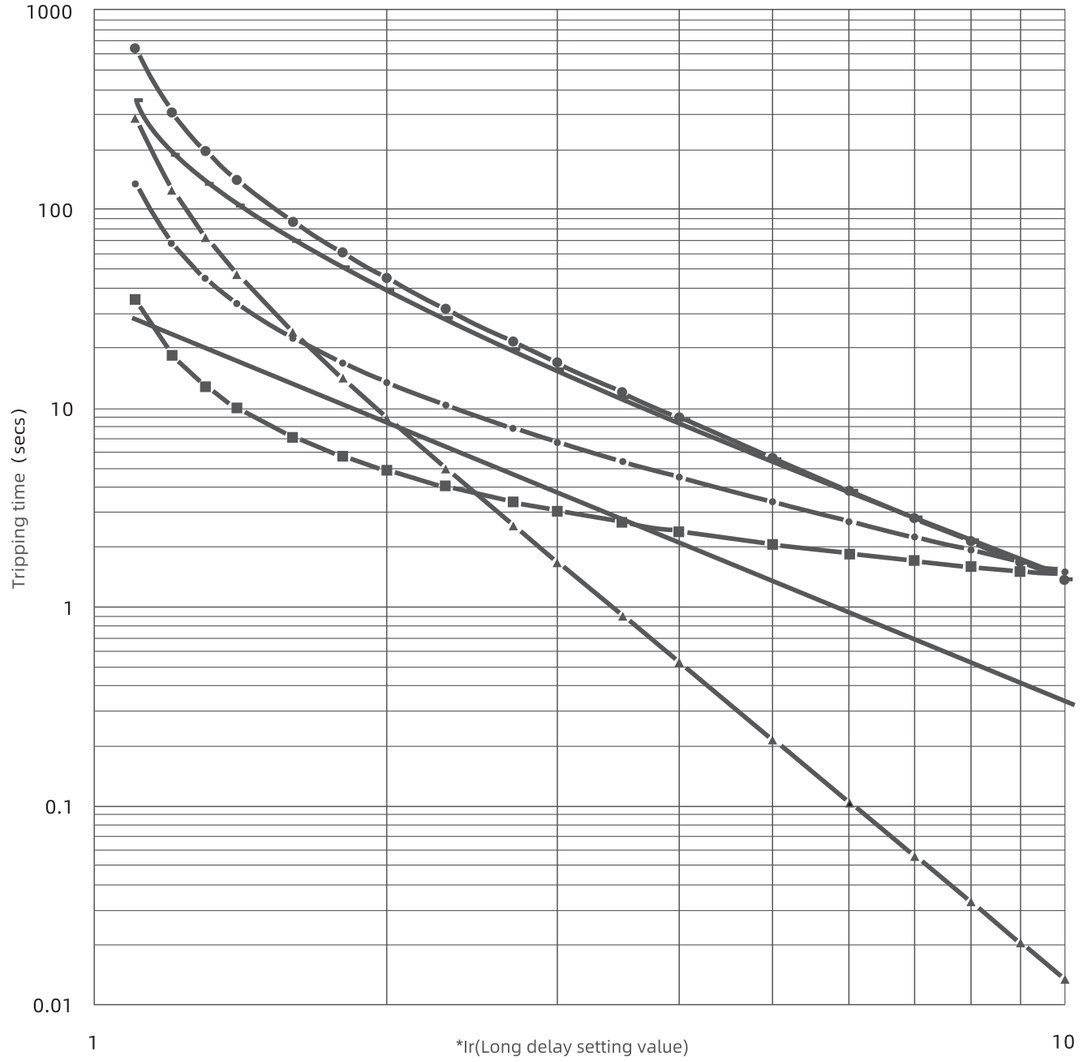
Characteristic curve 6: Ultrafast inverse time limit 2/ (general purpose/factory default)



Asymmetric grounding protection characteristic curve

8.3 Protection characteristic curve of 3 type intelligent controller

Figure A1-Comparison of different curve types (curve rate: C8)



8.4 Overload long delay protection characteristics

The overload long delay protection function is generally used to protect cables from overload, based on the true effective value (RMS) of current.

8.4.1 Setting current value (IR) and action characteristics of overload long delay overcurrent protection

Controller model	Setting current (IR)		Action characteristics	Accuracy
2L type	(0.4~1)In+OFF		≤1.05IR, >2 hours non action; > 1.3IR,<1h action	±10%
2M/2H type	Power distribution protection	(0.4~1)In+OFF		
	Generator protection	(0.4~1.25)In+OFF		
3M/3H type	Power distribution protection	(0.4~1)In+OFF (Lower limit options: 0.2, 0.3, and 0.4)	<1.05IR, non action; > 1.2IR,<2h action	
	Generator protection	(0.4~1.25)In+OFF		

8.4.2 Overload long delay overcurrent protection delay setting time (tR) and actual action time (T)

Controller model	Delay setting time (tR)				Actual action time T (S)					Accuracy
2L type	30	60	120	240	1.5IR	30	60	120	240	±10%
					2.0IR	16.9	33.8	67.5	135	
					7.2IR	1.3	2.6	5.2	10.4	
2M/2H type	The delay setting time t of 2 type controller is shown in Attached Table 1				SI,T=0. 01396t/ ($N^{0.02}$-1).					
					VI,T=t/ (N-1).					
					EI(G),T =3t/ (N^2-1).					
					EI (M), T=2.95t*In(N^2/N^2-1.15).					
					HV, T=15t/ (N^4-1).					
					I^2t, T=2.25t/N^2=t*(1.5IR/I)^2.					
3M/3H type	The delay setting time t of 3 type controller is shown in Attached Table 2				SI, T =0.00814t/ ($N^{0.02}$ -1)					
					VI, T=0.5t/ (N-1).					
					EI (G), T =1.25t/ (N^2-1).					
					EI (M), T=1. 3974t*In (N^2/N^2-1.15).					
					HV, T=4.0625t/ (N^4-1).					
					I^2t, T=2.25t/N^2=t*(1.5IR/I)^2.					

Note 1: The calculation formula for the actual action time T of the 2L type controller overload long delay overcurrent protection is $T=\frac{(1.5IR)^2.}{I^2.}$ *tR

Note 2: In the table formula, T represents the actual protection delay action time, t represents the delay setting value. Refer to Attached Table 1 for 2 type controllers, and refer to Attached Table 2 for 3 type controllers. N represents the ratio of the actual working current to the set current value of the overload long delay protection, i.e. N=I/IR.

Note 3: When the short circuit short delay definite time limit protection is put into operation, the delay action time of the overload long delay shall not be less than the set value of the short circuit short delay definite time limit delay; If the short-circuit short delay definite time limit protection is in the exit state, the delay action time of the overload long delay is not limited by this limit (but not less than 20ms).

Note 4: The inverse time limit delay setting values of the six overload protection characteristic curves of the 2 type controller are shown in the following table: Attached Table 1; The inverse time limit delay setting values of the six overload protection characteristic curves of the 3 type controller are shown in the following table: Attached Table 2

Attached Table 1

No.	Inverse time limit delay setting value t (s) of overload protection characteristic curve					
	Delay action time corresponding to 2 IR					Delay action time corresponding to 1.5IR
	Standard inverse time limit curve 1	Fast inverse time limit curve 2	Ultrafast inverse time limit (general purpose) curve 3	Ultrafast inverse time limit (motor protection) curve 4	High voltage fuse compatibility curve 5	Ultrafast inverse time limit 2 (general purpose) curve 6
1	0.36	1.00	3.34	2.96	0.68	15
2	0.58	1.60	5.34	4.74	1.08	20
3	0.86	2.40	8.00	7.10	1.60	25
4	1.44	4.00	13.34	11.82	2.68	30
5	2.14	6.00	20.00	17.74	4.00	40
6	2.86	8.00	26.68	23.64	5.34	50
7	3.56	10.00	33.34	29.54	6.68	60
8	5.34	13.50	45.00	39.88	9.00	80
9	6.40	18.00	60.00	53.18	12.00	100
10	9.96	28.00	93.34	82.72	18.68	120
11	14.22	40.00	133	118	26.68	160
12	21.34	60.00	200	177	40.00	200
13	28.44	80.00	266	236	53.34	240
14	35.56	100	333	295	66.68	320
15	42.66	120	400	354	80.00	400
16	49.76	140	433	384	86.68	480

Attached Table 2

Curve type	Fault current	Delay time s															
		C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16
SI standard inverse time limit	1.5xIr	0.61	0.98	1.47	2.46	3.68	4.91	6.14	9.21	11.05	17.19	24.56	36.84	49.13	61.41	73.69	85.97
	2xIr	0.36	0.57	0.86	1.43	2.15	2.87	3.58	5.37	6.45	10.03	14.33	21.49	28.65	35.82	42.98	50.15
	6xIr	0.14	0.22	0.33	0.55	0.82	1.10	1.37	2.06	2.47	3.84	5.48	8.22	10.96	13.70	16.45	19.19
	7.2xIr	0.12	0.20	0.30	0.50	0.74	0.99	1.24	1.86	2.23	3.48	4.97	7.45	9.93	12.42	14.90	17.38
VI fast inverse time limit	1.5xIr	2.00	3.20	4.80	8.00	12.00	16.00	20.00	27.00	36.60	56.00	80.00	120.00	160.00	200.00	240.00	280.00
	2xIr	1.00	1.60	2.40	4.00	6.00	8.00	10.00	13.50	18.00	28.00	40.00	60.00	80.00	100.00	120.00	140.00
	6xIr	0.20	0.32	0.48	0.80	1.20	1.60	2.00	2.70	3.60	5.60	8.00	12.00	16.00	20.00	24.00	28.00
	7.2xIr	0.16	0.26	0.39	0.65	0.97	1.29	1.61	2.18	2.90	4.52	6.45	9.68	12.90	16.13	19.35	22.58
EI (G) ultrafast inverse time limit (general distribution protection)	1.5xIr	8.00	12.80	19.20	32.00	48.00	64.00	80.00	108.00	144.00	224.00	320.00	480.00	640.00	800.00	960.00	1000.00
	2xIr	3.33	5.33	8.00	13.33	20.00	26.67	33.33	45.00	60.00	93.33	133.33	200.00	266.67	333.33	400.00	433.33
	6xIr	0.29	0.46	0.69	1.14	1.71	2.29	2.86	3.86	5.14	8.00	11.43	17.14	22.86	28.57	34.29	37.14
	7.2xIr	0.20	0.31	0.47	0.79	1.18	1.57	1.97	2.66	3.58	5.51	7.87	11.80	15.74	19.67	23.60	25.57
EI (M) ultrafast inverse time limit (motor protection)	1.5xIr	6.22	9.96	14.93	24.89	37.34	49.78	62.23	84.01	112.01	174.24	248.91	373.37	497.82	622.28	746.73	208.96
	2xIr	2.95	4.72	7.07	11.79	17.69	23.58	29.48	39.79	53.06	82.53	117.90	176.86	235.81	294.76	353.71	383.19
	6xIr	0.28	0.45	0.68	1.13	1.69	2.26	2.82	3.81	5.08	7.90	11.29	16.94	22.58	28.23	33.88	36.70
	7.2xIr	0.20	0.31	0.47	0.78	1.17	1.56	1.95	2.63	3.51	5.46	7.80	11.70	15.61	19.51	23.41	25.36
HV high-voltage fuse compatibility	1.5xIr	2.46	3.94	5.91	9.85	14.77	19.69	24.62	33.23	44.31	68.92	98.46	147.69	196.92	246.15	295.38	320.00
	2xIr	0.67	1.07	1.60	2.67	4.00	5.33	6.67	9.00	12.00	18.67	26.67	40.00	53.33	66.67	80.00	86.67
	6xIr	0.01	0.01	0.02	0.03	0.05	0.06	0.08	0.10	0.14	0.22	0.31	0.46	0.62	0.77	0.93	1.00
	7.2xIr	0.00	0.01	0.01	0.01	0.02	0.03	0.04	0.05	0.07	0.10	0.15	0.22	0.30	0.37	0.45	0.48
I^2T universal inverse time limit protection	1.5xIr	15.0	30.00	60.00	120.0	240.00	360.00	480.00	600.00	720.00	840.00	960.00					
	2xIr	8.44	16.88	33.75	67.50	135.00	202.50	270.00	337.50	405.00	472.50	540.00					
	6xIr	0.94	1.88	3.75	7.50	15.00	22.50	30.00	37.50	45.00	52.50	60.00					
	7.2xIr	0.65	1.30	2.60	5.21	10.42	15.63	20.83	26.04	31.25	36.46	41.67					

8.5 Short circuit short delay protection characteristic

- Short time delay protection prevents impedance short circuits in the distribution system. This type of short circuit is usually caused by local short circuit faults on the line, and the current generally exceeds the overload range, but the short circuit current is not very large.
- The tripping delay of short circuit short delay is to achieve selective protection.
- Short circuit delay protection is based on the true effective value (RMS) of current, divided into two sections: inverse time limit section and definite time limit section; further strengthening cooperation with lower level protection devices.
- Short delay protection can be optionally equipped with zone interlock function
  When a short circuit fault occurs on the outgoing line side of the circuit breaker, the short circuit delay will momentarily trip the circuit breaker; when a short circuit fault occurs on the outgoing line side of the next level circuit breaker of the current level circuit breaker, the short circuit short delay will trip the circuit breaker after the set delay time. The implementation of this function requires the use of digital input (DI) and digital output (DO). DI is used to detect the zone interlock signal of the next level circuit breaker, and DO is used to send interlocking signals to the upper level circuit breaker.

8.5.1 Short circuit short time delay overcurrent protection setting current value (Isd) and action characteristics (definite time limit protection Isd for ≥8IR, inverse time limit protection for Isd<8IR)

Controller model	Setting current (Isd)	Action characteristics	Accuracy
2L type	(3~10)IR+OFF	≤0.9Isd, non action; ≥1.1Isd, delayed action	±10%
2M/2H type	(1.5~15)IR+OFF	≤0.9Isd, non action; >1.1Isd, delayed action	
3M/3H type		<0.9Isd, non action; >1.1Isd, delayed action	

8.5.2 Short circuit short delay overcurrent protection delay setting time (tsd) and actual action time (Tsd)

Controller model	Delay setting time (tsd)		Actual action time Tsd (S)			Accuracy
2L type	0.2	0.4	> 1.1 Isd	0.2	0.4	±15%
2M/2H type	0.1-1S (level difference 0.1)		SI, Tsd=0.01396t/ ($N^{0.02}$-1)			±10%
			VI, Tsd=t/ (N-1)			
			EI (G), Tsd=3t/ (N^2-1)			
			EI (M), Tsd=2.95t*In(N^2/N^2-1.15)			
			HV, Tsd=15t/ (N^4-1)			
			I^2t, Tsd=64tsd/N^2=tsd*(8IR/I)^2			
3M/3H type	0.1-0.4S (0.1-0. 4S customizable)		SI,T =0. 00814t/ ($N^{0.02}$-1)			
			VI, T=0.5t/ (N-1)			
			EI (G),T =1.25t/ (N^2-1)			
			EI (M) , T=1.3974t*1n(N^2/N^2-1.15)			
			HV, T=4.0625t/ (N^4-1)			
			I^2t , T=2.25t/N^2=t*(1.5Ir/I)^2			

Note 1: There are two methods for short circuit short time delay protection:
1. Inverse time limit protection: When the fault current exceeds the inverse time limit setting current value, for curve (1-5), the controller will perform delay protection according to the same curve (1-5) for the overload long delay, which is only 10 times faster than the protection speed (i.e. one tenth of the delay action time calculated according to the formula of the overload long delay curve); for curve 6, inverse time limit delay action time value is calculated according to the characteristic formula of short-circuit short delay curve 6.
2. Definite time limit protection: When the fault current exceeds the set current value of the definite time limit, the controller performs delay protection according to the set value of the definite time limit delay. Attention: When the inverse time limit setting current value is set to "OFF": position or definite limit setting current value is less than or equal to the inverse time limit setting current value, the controller will protect according to the definite time limit, and the inverse time limit function will automatically fail. When the definite time limit protection is put into operation, regardless of the definite time limit or inverse time limit protection, the delay action time of the short time delay protection is not less than the definite time limit delay setting value. If the definite time limit protection is in the exit state, the delay action time of the inverse time limit protection is not limited by the definite time limit delay setting value (but not less than 20ms)

8.6 Short circuit instantaneous protection characteristics

The instantaneous protection function prevents solid short circuit in the distribution system. This type of fault is generally phase-to-phase fault with high short-circuit current and requires quick disconnection. This protection is based on the true effective value (RMS) of current.

8.6.1 Short circuit instantaneous protection setting current (Ii) and action characteristics

Controller model	Setting current (Isd)		Action characteristics	Action time	Accuracy
2L type	L2	(3~10)In+OFF	≤0.85Ii non action; ≥1.15Ii action	T < 100ms (Including inherent breaking time of circuit breaker)	±10%
	L3,L4	(3~15)In+OFF			
2M/2H type	1.0In~50kA+OFF		≤0.85Ii non action; >1.15Ii action		
3M/3H type	1.0In~50kA+OFF		<0.85Ii non action; >1.15Ii action	T < 40ms (Including inherent breaking time of circuit breaker)	

8.7 Ground fault protection characteristic (Only one of the ground fault protection and residual current protection can be selected)

There are two protection methods for single-phase metallic ground fault protection: residual current (difference value) type (T) and ground current type (W). T-type detection of zero sequence current, it takes the vector sum of four phase (4-phase 4-wire system) or three phase (3-phase 3-wire system) current for protection. The ground current type directly detects the current on the grounding cable through a special external transformer, which can protect the upper and lower ground faults of the circuit breaker simultaneously. The maximum distance between the transformer and the circuit breaker does not exceed 10 meters. Zone interlock can be achieved for difference value ground faults.(The ground fault protection function of 3-pole products is turned off by factory default)

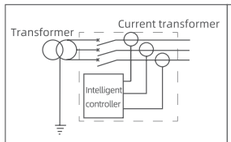
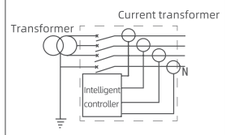
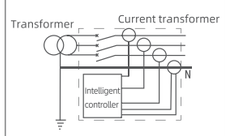
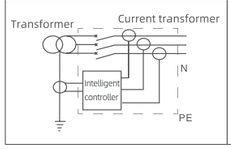
8.7.1 Setting current (Ig) and action characteristic of ground fault protection

Controller model	Setting current (Ig)	Action characteristic	Accuracy
2L type	(0.2~0.8)In+OFF (minimum 100A)	≤0.9Ig, non action; ≥1.1Ig, delayed action	±15%
2M/2H type	(0.2~1.0)In+OFF (minimum 100A)	<0.8Ig, non action; ≥1.0Ig, delayed action	±10%
3M/3H type	(0.2~1.0)In+OFF	<0.8Ig, non action; ≥1.0Ig, delayed action	

8.7.2 Ground fault protection delay setting time (tg) and actual action time (Tg)

Controller model	Delay setting time tg				Actual action time Tg					Accuracy
2L type	0.2	0.4	0.6	0.8	> 1.1 Ig	0.2	0.4	0.6	0.8	±15%
2M/2H type	Definite time limit		(0.1~1)+OFF (Level difference 0.1, OFF indicates only alarm without trip)		Tg=tg*(KG*Ig/I)					±10%
	Inverse time coefficient KG		(1.5~6)+OFF (Level difference 0.5, OFF indicates definite time limit for grounding)							
3M/3H type	Definite time limit		(0.1~1)+OFF (Level difference 0.1, OFF indicates only alarm without trip)		Tg=tg*(Cr*Ig/I) (Condition:I < Ig < Cr)					
	Inverse time limit coefficient Cr		(1.5~6)+OFF (Level difference 0.5, OFF indicates definite time limit for grounding)							

8.7.3 Ground fault protection method

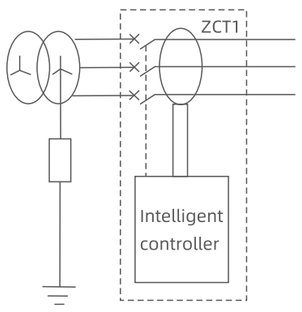
	In the three-phase three-wire system, HKKW3 three-pole circuit breaker is selected without external current transformer. The vector sum of three-phase current is taken as the ground fault protection signal, and the protection characteristic is definite time limit protection.
	In three-phase four-wire system, HKKW3 four-pole circuit breaker is selected. The ground fault protection signal takes the vector sum of A, B, C and N pole currents, and the protection characteristic is definite time limit protection.
	In three-phase four-wire system, HKKW3 three-pole circuit breaker is selected and the external neutral N-pole current transformer is used for ground fault protection (connected to terminal 26 and 27). The ground fault protection signal takes the vector sum of A, B, C three-pole and N-pole currents, and the protection characteristic is definite time limit protection.
	In the TN-S system, HKKW3 four-pole circuit breaker (economical type has no this function) is selected to directly take the output current signal of the external current transformer for ground fault protection (connected to terminal 26 and 27). The protection characteristic is definite time limit protection.

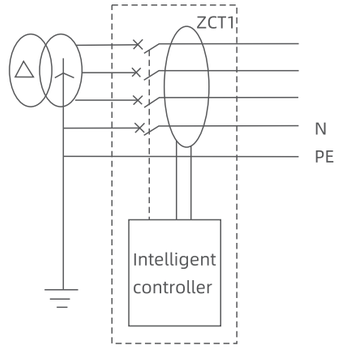
8.8 Residual current protection setting current (IΔn) and action characteristic

It's applicable to leakage faults caused by equipment insulation damage or human contact with exposed conductive parts. The leakage trip value IΔn is directly expressed in amperes and is independent of the rated current of the circuit breaker. The method of signal acquisition is zero sequence sampling, which requires an additional rectangular transformer; this sampling method has high accuracy and sensitivity, and is suitable for protection of low currents.

Controller model	Setting current (IΔn)	Delay setting time (t△n)	Action characteristics	Accuracy
2M/2H type	0.3A~30A+OFF	ON, 0.06, 0.08, 0.10~0.96, 0.98, 1.00, OFF (ON indicates instantaneous action, OFF indicates only alarm without trip, with level difference of 0.02s)	<0.8IΔn, non action; ≥1.0IΔn, delayed action	±10% (Inherent±40ms)
3M/3H type	0.3A~30A+OFF	ON, 0.06s, 0.08s, 0.17s, 0.25s, 0.33s, 0.42s, 0.5s, 0.58s, 0.67s, 0.75s, 0.83s	<0.8I△n, non action; ≥1.0IΔn, action	

8.8.1 Residual current protection detection principle





ZCT1: rectangle type leakage current transformer

8.9 Current unbalance protection characteristic

Current unbalance protection protects against phase failure and three-phase current unbalance, and takes protective actions based on the unbalance rate between three-phase currents. When the execution mode is alarm, its action principle is the same as that of ground protection.

8.9.1 2M/2H type controller current unbalance protection characteristics

εi calculation formula	Current unbalance εi setting value	Action or alarm characteristics	Delay setting value tε	Accuracy
εi = | I-Iav | /Iav (Iav is the average value of three-phase current)	40%~100%+OFF (The level difference is 1%, and OFF represents the exit position)	≤ 0.9εi, non action; >1.1εi, delay action	0.1~1+OFF (The level difference is 0.1, and OFF indicates only alarm without trip)	±10%

8.9.2 3M/3H controller current unbalance protection characteristic

εi calculation formula	Action or alarm characteristics	Execution method
εi =(I-Iav)max/Iav (Iav is the average value of three-phase current)	<0.9εi, non action; >1.1εi, delay action	Alarm/Trip/OFF

8.9.3 3M/3H controller current unbalance protection characteristic

Protection start setting value	Action delay time setting value	Protection action return set value	Protection return delay time	Accuracy
5%~60% (Level difference 1%)	0.4~40.0s (Level difference 0.1s)	5%~start value (The level difference is 1%, which is only set when the execution method is alarm)	10~200s (The level difference is 1s, which is only set when the execution mode is alarm)	±10%

8.10 Load monitoring and protection characteristic

8.10.1 2M/2H controller load monitoring and protection characteristic

The technical parameters for load monitoring and protection characteristics of the 2M/2H controller are shown in Attached Table 3. The controller can program and output two passive signal contacts for load monitoring, and the output signal contacts can be used for monitoring alarms and controlling the load of the branch circuit to ensure the normal power supply of the main system. There are two load monitoring methods to choose from (users can choose one of them):

1. Method 1: It can control two branch loads. When the operating current exceeds 1.2 IC1 or 1.2 IC2, the controller outputs delay signal contacts according to the inverse time limit characteristic. The inverse time limit characteristic curve is the same as that of the overload long delay, but the curve rate and setting current value can be adjusted separately.
2. Method 2: It is generally used to control the branch load. When the operating current exceeds 1.2IC1, the controller outputs delay signal contact to break the branch load according to the inverse time limit characteristic curve. The inverse time limit characteristic curve is the same as the overload long delay curve, but the curve rate and setting current value can be adjusted separately, and the setting value IC1>IC2 is required; If the operating current returns to normal after breaking the branch load, and the current value is lower than the IC2 setting value and lasts for 60 seconds, the controller outputs another signal contact to connect the disconnected load and restore system power supply.

Attached table 3

Method 1	Setting current value	I_{C1}	(0.2~1) In+OFF (minimum 100A, OFF represents exit position)
		Output characteristic	≤1.05 I_{C1}: non pull-on
			>1.2 I_{C1}: delay relay pull-on
	Inverse time limit delay Setting value (s)	Characteristic curve	Same as the overload long delay characteristic curve
		Curve rate	Can be adjusted separately (setting parameters are the same as that of overload long delay)
	Setting current value	I_{C2}=In×...	0.2~1+OFF (minimum 100A, OFF indicates exit position)
		Output characteristic	≤1.05 I_{C2}: non pull-on
			>1.2 I_{C2}: delay relay pull-on
	Inverse time limit delay Setting value (s)	Characteristic curve	Same as the overload long delay characteristic curve
		Curve rate	Can be adjusted separately (setting parameters are the same as that of overload long delay)
Method 2	Setting current value	I_{C1}	(0.2~1) In+OFF (minimum 100A, OFF represents exit position)
		Output characteristic	≤ 1.05 I_{C1}: non pull-on
			>1.2 I_{C1}: delay relay pull-on
	Inverse time limit delay Setting value (s)	Characteristic curve	Same as the overload long delay characteristic curve
		Curve rate	Can be adjusted separately (setting parameters are the same as overload long delay)
	Setting current value	I_{C2}	(0.2~1) In+OFF (minimum 100A, OFF represents exit position)
		Output characteristic	<I_{C2}: delay relay pull-on
	Fixed delay (s)		Fixed 60 seconds
Accuracy			±10%
Thermal memory (30min, can be cleared after power outage)			Standard+OFF

8.10.2 3M/3H controller load monitoring and protection characteristic

Monitoring method	Unloading I action setting value	Unloading I action delay	Unloading II action setting value	Unloading II action delay
1. Current mode 1	Current mode 1/2 0.2~1.0Ir	Current mode 1/2 20%~80% Tr	Current mode 1 0.2~1.0Ir	Current mode 1 20%~80% Tr
2. Current mode 2	Power mode 1/2 200~10000kW	Power mode 1/2 10~3600S	Current mode 2 0.2~unloading I	Current mode 2 10~600S
3. Power mode 1			Power mode 1 200~10000kW	Power mode 1/2 10~3600S
4. Power mode 2			Power mode 2 100~unloading I	
5. Close				

9. Accessory

9.1 Undervoltage release

Undervoltage release can be classified into two types: instantaneous action and delayed action. When the undervoltage release is not powered, it cannot close the circuit breaker either electrically or manually. The undervoltage release time is (0-10)s, optional but not adjustable; when the power supply voltage recovers to 85% Ue or above within 1/2 of the delay time, the circuit breaker will not open.

Rated working voltage Ue (V)	AC230V/AC400V
Working voltage (V)	(0.35 ~ 0.7)Ue
Reliable closing voltage (V)	(0.85~ 1.1)Ue
Reliable non-closing voltage (V)	≤0.35Ue
Power loss	80VA/100VA

9.2 Shunt release

After energizing the shunt release, the circuit breaker can be disconnected instantaneously, which can be operated remotely.

Rated control supply voltage Us (V)	AC230/AC400	DC220/DC110
Working voltage (V)	(0.7~1.1)Us	
Instantaneous power loss	80VA/150VA	250W/225W
Breaking time (ms)	200	

9.3 Closing electromagnet

Rated control supply voltage Us (V)	AC230/AC400	DC220/DC110
Working voltage (V)	(0.85~1.1)Us	
Instantaneous power loss	80VA/150VA	250W/225W
Breaking time (ms)	200	

9.4 Electric operating mechanism

Rated control supply voltage Us (V)	AC230/AC400	DC220/DC110
Working voltage (V)	(0.85~1.1)Us	
Power loss	90VA	75W
Energy storage time (s)	4	
Operating cycle	Up to 3 times per minute	

9.5 Auxiliary contact

Rated voltage (V)		Rated thermal current Ith (A)	Rated control capacity
AC	230	230	300VA
	400	230	100VA
DC	220	230	60W

9.5 Door frame and lining

Installed on the cabinet door of the distribution room, it serves as a seal and has a protection level of IP40. There are two types: fixed type and draw-out type.

9.7 Phase partition

It's installed between phases in the terminal block to increase the insulation capacity of the circuit breaker.

9.8 Locking device disconnection

When the draw-out type circuit breaker is in the "disconnection" position, the locking rod can be pulled out and locked with a padlock. The circuit breaker cannot be turned to the "test" or "connection" position.

(Padlock provided by the user)

9.9 Key interlocking

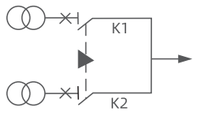
By holding the opening button in the pressed position, the circuit breaker can be locked in the OFF position, and multiple key interlocks between multiple circuit breakers can also be realized, which can be classified into the following forms:

1 lock 1 key:

One circuit breaker is equipped with a lock and a key. The key can be pulled out only when it is locked. At the same time, the circuit breaker fails to close.

2 locks 1 key:

Two circuit breakers are equipped with two identical locks and one key, so that only one of these two circuit breakers can be effectively closed in any case.



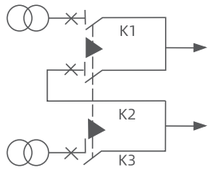
Circuit diagram

K1	K2
0	0
0	1
1	0
0: circuit breaker open	1: Circuit breaker closed

Possible operation mode

3 locks 2 keys:

Three circuit breakers (two power supplies and one bus coupler) are equipped with three identical locks and two keys. Only two circuit breakers can be effectively closed.



Circuit diagram

K1	K2	K3
0	0	0
1	0	0
0	1	0
0	0	1
1	1	0
0	1	1
1	0	1
0: circuit breaker open		1: Circuit breaker closed

Possible operation mode

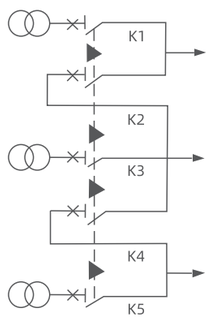
5 locks 3 keys:

It is used in the distribution system with three-circuit power supply and two bus couplers, and the circuit breaker is installed separately.

As shown in the figure below, the three power supply incoming circuit breakers are K1,K3, K5, two bus couplers are K2 and K4 respectively.

K1 and K2 circuit breakers are equipped with two identical locks, K3 circuit breaker is equipped with one lock, and K4 and K5 circuit breakers are equipped with two identical locks.

2 keys 1 key chain: one of the two keys is equipped with K1, K2 circuit breakers, the other is equipped with K4 and K5 circuit breakers, and the key chain is composed of three keys equipped with K1, K2 circuit breakers, K3 circuit breakers, and K4 and K5 circuit breakers respectively, which shall not be dispersed. When the key chain is inserted into any of the K2, K3, K4 three circuit breakers, the other two will fail to close.



Circuit diagram

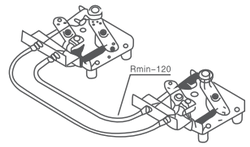
K1	K2	K3	K4	K5
0	0	0	0	0
1	0	0	0	0
0	1	0	0	0
0	0	1	0	0
0	0	0	1	0
0	0	0	0	1
1	1	0	0	0
1	0	1	0	0
1	0	0	1	0
1	0	0	0	1
0	1	1	0	0
0	1	0	1	0
0	1	0	0	1
0	0	1	1	0
0	0	1	0	1
0	0	0	1	1
1	1	0	1	0
1	1	0	0	1
1	0	1	0	1
1	0	0	1	1
0	1	1	1	0
0	1	0	1	1
0: circuit breaker open			1: Circuit breaker closed	

Possible operation mode

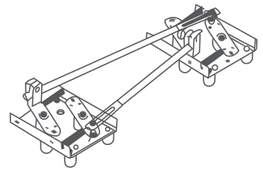
9.10 Mechanical interlocking

The mechanical interlocking mechanism is installed on the right side of the draw-out seat of the circuit breaker. When one of the circuit breakers is in the closing state, the interlocking circuit breaker fails to close, and the interlocking mechanism should be installed and debugged by the user.

Interlocking mechanism can be classified into the following types:

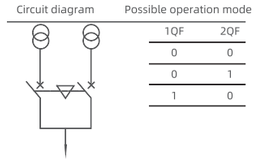


Mechanical interlocking (steel cable type)

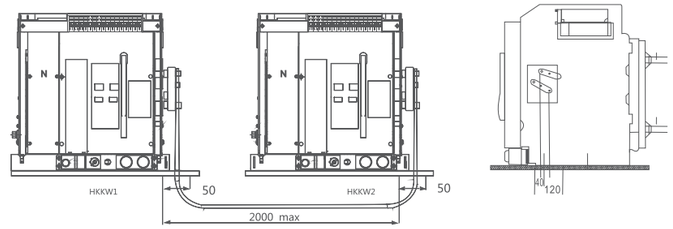


Mechanical interlocking (lever type)

Steel cable interlocking of two horizontal circuit breakers:



Circuit diagram	Possible operation mode	
	1QF	2QF
	0	0
	0	1
	1	0

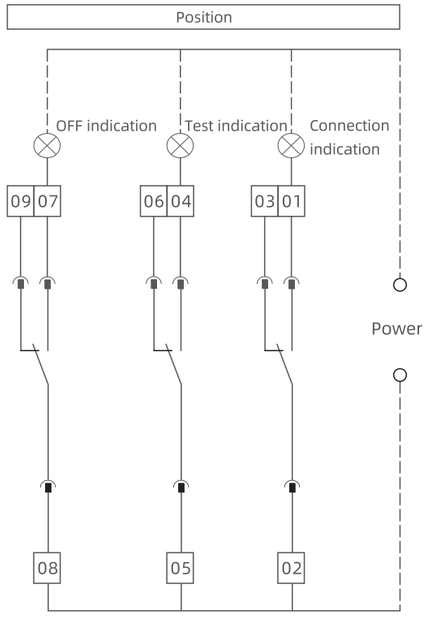


Note:

a When the steel cable needs to be bent, the excessive arc at the bending position is required to be greater than R120mm to ensure that the steel cable can move flexibly.

b Check the steel cable and ensure that there is enough lubricating oil in the cable to ensure the flexible movement of the steel cable.

9.11 Draw-out seat three-position indication instruciton



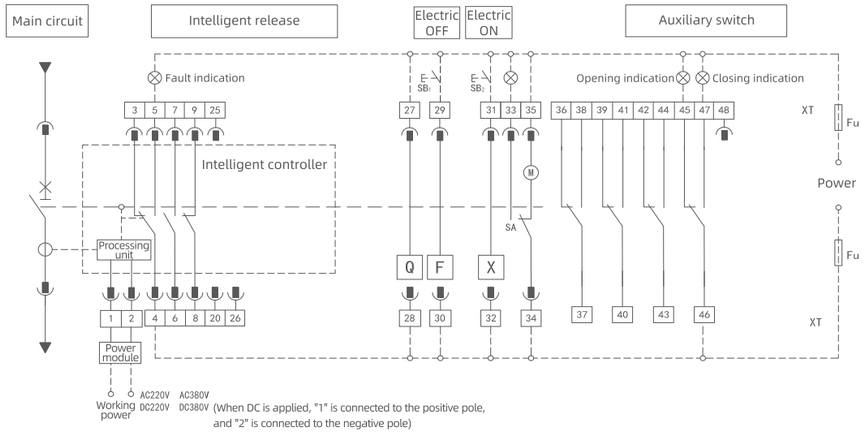
Operation requirement:

1. The draw-out seat position indication device can indicate positions such as "Open", "Test", and "Close", and can be all or partially used according to the order requirement.
2. When the draw-out type circuit breaker body is pushed from the "draw-out" position to the "disconnection" position, terminals #08 and #09 should be converted from connection to disconnection, and terminals #07 and #08 should be converted from disconnection to connection.
3. When the draw-out type circuit breaker body is turned from the "OFF" position to the "Test position", terminals # 06 and # 05 should be turned from ON to OFF and terminals #04 and #05 should be turned from OFF to ON. There is sufficient safety distance between the circuit breaker body busbar and the draw-out seat bridge contact, and the opening and closing operation can be reliably carried out.
4. When the draw-out type circuit breaker body is turned from the "Test" position to the "Connection" position, the draw-out seat emits a "click" sound and then continues to be turned forward. It is required to rotate the draw-out seat crank handle within 1.5 circles. Terminals #03 and #02 should be turned from ON to OFF, and terminals #01 and #02 should be turned from OFF to ON. It is required that the busbar of the circuit breaker body is reliably inserted into the bridge contact of the draw-out seat and can reliably carry the main circuit current for operation
5. When the draw-out type circuit breaker body is turned from the "Connection" position to the "Test" position, terminals #06 and #05 should be turned from ON to OFF, and terminals # 05 and #04 should be turned from OFF to ON. There is sufficient safety distance between the circuit breaker body busbar and the draw-out seat bridge contact, and reliable opening and closing operation can be carried out.
6. When the draw-out type circuit breaker body is turned from the "Test" position to the "Open" position, terminals #09 and #08 should be turned fromON to OFF, and terminals #07and #08 should be turned from OFF to ON. At this time, if the circuit breaker body cannot be drawn out, it needs to continue to be turned to "Disconnection" position until the handle cannot be moved, only then can the circuit breaker body be pulled out. After the draw-out type circuit breaker body is pulled out, terminals #09 and #08 should be turned from diconnection to connection. Terminals # 07 and # 08 should be turned from connection to disconnection.
7. During the draw-out seat position conversion operation, the pointer must be pointed to "Disconnection" , "Test" and "Connection" before stopping, otherwise the position indicator device will not be able to correctly indicate the position of the circuit breaker body in the draw-out seat.

9.12 Dual power controller for air circuit breaker (please refer to the manual of the dual power controller for air circuit breaker for details)

10. Circuit breaker secondary circuit wiring diagram

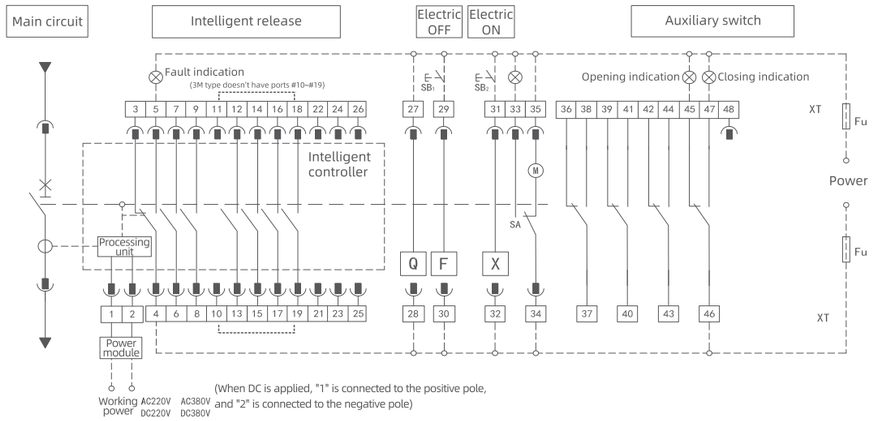
ARW1-1600 circuit breaker secondary circuit wiring diagram (2L/2M)



Note:
1) The dotted line is connected by the user;
2) Intelligent controller terminal function
Terminal 1, 2: intelligent controller voltage input
Terminals 3, 4, 5: controller auxiliary contact (contact capacity AC380V, 3A)
Terminal 20: protective ground wire
Terminals 34, 35: can be directly connected to the power supply (automatic pre-storage); the normally open button can be connected in series and then connected to the power supply (manual control pre-storage)
3) Optional functions:
Terminals 6, 7, 8 and 9: normally open contact
Terminals 25, 26: external transformer input terminal (not available for conventional products, but available for special orders requiring external transformer, and the cost is extra)

4) Symbol meaning of other terminals
SB1 shunt button SB2 closing button
Q undervoltage release (instantaneous or delayed)
F shunt release X closing electromagnet
M energy storage motor
SA motor microswitch
XT terminal
Fu fuse
DF circuit breaker auxiliary switch
5) Description
When the intelligent controller has an external power supply module, it must be input through the power supply module, and can not be directly involved in terminals 1 and 2.

ARW1-1600 circuit breaker secondary circuit wiring diagram (2H/3M/3H)



Note:
1) The dotted line is connected by the user;
2) Intelligent controller terminal function
Terminal 1, 2: intelligent controller voltage input
Terminal 3, 4, 5: controller auxiliary contact (contact capacity AC380V, 3A)
Terminal 6, 7, 8 and 9: normally open contact
Terminal 10, 11: communication outgoing line
Terminal 12, 13: load monitoring 1 output (contact 1)
Terminal 14, 15: load monitoring 2 output (contact 2)
Terminal 16, 17: remote control opening (contact 3)
Terminal 18, 19: remote control closing (contact 4)
Terminal 20: protective ground wire
Terminal 21: Un neutral input
Terminal 22, 23, 24: connected to A, B and C three-phase voltage input terminals respectively
Terminal 25, 26: external transformer input terminal (not available for conventional products, but available for special orders requiring external transformer, and the cost is extra)
Terminal 34, 35: can be directly connected to the power supply (automatic pre-storage); the normally open button can be connected in series and then connected to the power supply (manual control pre-storage)

3) Symbol meaning of other terminals
SB1 shunt button
SB2 closing button
Q undervoltage release (instantaneous or delayed)
F shunt release
X closing electromagnet
M energy storage motor
SA motor microswitch
XT terminal
Fu fuse
DF circuit breaker auxiliary switch
4) Description
When the intelligent controller has an external power supply module, it must be input through the power supply module, and can not be directly involved in terminals 1 and 2.
3M has no communication, without #10~#19 ports

11. Common fault and troubleshooting method

Fault phenomenon	Cause		Solution
Circuit breaker tripps	Overload fault trip (IR indicator light on)		1. Check the action time of the breaking current value on the controller
			2. Analyze the load and power grid situation
			3. If overloaded, please remove the overload fault
			4. If the actual operating current does not match the set value of the long delay action current, please modify the set value of the long delay action current according to the actual operating current to match the protection appropriately
			5. Press the reset button to reclose the circuit breaker
			Note: Economical type starts from step 2
	Short circuit fault trip (Isd or Ii indicator light on)		1. Check the action time of the breaking current value on the controller
			2. Analyze the load and power grid situation
			3. If there is short circuit, please search for and troubleshoot the short circuit fault
			4. Check the short-circuit fault current setting value of the intelligent controller
			5. Check the integrity of the circuit breaker
			6. Press the reset button to reclose the circuit breaker
			Note: Economical type starts from step 2
	Ground fault trip (Ig indicator light on)		1. Check the action time of the breaking current value on the controller
			2. Analyze the load and power grid situation
			3. If there is grounding fault, please search for and troubleshoot the short circuit fault
			4. If there is no grounding fault, please check whether the fault current setting value matches the actual protection
			5. Modify the grounding fault current setting value of the intelligent controller
			6. Press the reset button to reclose the circuit breaker.
			Note: Economical type starts from step 2
	Mechanical interlocking action		Check the working status of two circuit breakers equipped with mechanical interlock
	Undervoltage release malfunctions	Rated working voltage<70%Ue	Check whether the power supply of the undervoltage release is connected
		Undervoltage release control unit malfunctions	Ensure that the supply voltage of the undervoltage release must be ≥ 85%Ue
	The intelligent controller reset button has not been reset		Press the reset button to reclose the circuit breaker
	Poor contact of the secondary circuit of the draw-out type circuit breaker		Turn the draw-out type circuit breaker to the "Connection" position
Circuit breaker doesn't close	Circuit breaker can not store the energy		1. Check if the secondary circuit is connected
			2. Ensure that the control supply voltage of the motor must be ≥ 85%Ue
			2. Check if the electric motor energy storage mechanism is running. If there is malfunction, please contact the manufacturer
	Closing electromagnet	Rated control voltage<85%Us	Check the working status of two circuit breakers equipped with mechanical interlock
		The closing electromagnet is damaged	Ensure that the supply voltage of the closing electromagnet must be ≥ 85% Us

Fault phenomenon	Cause		Solution
The circuit breaker trips after closing (the fault indicator light is on)	Instant trip: it closes the short-circuit current Delay trip: it closes the overload current		1. Check the action time of the breaking current value on the controller
			2. For short circuit, please find and troubleshoot the short circuit fault
			3. If it is overload, please find and remove the overload fault
			4. Check if the circuit breaker is intact
			5. Modify the current setting value of the intelligent controller
			6. Press the reset button to reclose the circuit breaker.
The circuit breaker cannot be disconnected	Unable to manually disconnect circuit breaker locally: mechanical operating mechanism failure		Press the red "○" button, if there is any jamming or no response, please contact the manufacturer
	Unable to remotely electrically disconnect circuit breaker	Mechanical operating mechanism malfunctions	Press the red "○" button, if there is any jamming or no response, please contact the manufacturer
		Shunt release: shunt release supply voltage<70% Us	Ensure that the supply voltage of the shunt release must be ≥70%Us
		Shunt release is damaged	Replace the shunt release
The circuit breaker cannot store energy	It cannot manually store the energy It cannot electrically store the energy		For mechanical failure of energy storage device, please contact the manufacturer
	Rated control electric energy storage device control voltage <70%Us		Ensure that the control voltage of the electric energy storage device must be ≥ 70%Us
For draw-out type circuit breaker, the crank handle cannot be inserted, turned in or out of the circuit breaker	There is a padlock in the open position		Unlock the padlock
	The circuit breaker body is not fully pushed into place		Push the circuit breaker body into place
It can not draw out the circuit breaker in "open" position of circuit breaker	The circuit breaker is not fully in the "open" position		Turn the circuit breaker completely to the "open" position
The draw-out type circuit breaker cannot be turned to the "Connection" position	Foreign objects falling into the draw-out seat and getting stuck in the mechanism, or malfunction such as jumping teeth in the mechanism		Check and remove the foreign objects, if it still cannot be turned in, please contact the manufacturer
	The rated frame current of the circuit breaker body and draw-out seat does not match		The circuit breaker body and draw-out seat with the same rated frame current should be selected
Intelligent controller screen has no display	The intelligent controller is not connected to power		Ensure that the intelligent control is connected to the power supply
	The intelligent controller is faulty		Cut off the control power of the intelligent controller and then connect it again. If the fault still exists, please contact the manufacturer
	Rated control supply voltage<85%Us		Ensure that the rated control supply voltage must be ≥ 85%Us
When the intelligent controller fault indicator light is on, it still lights up after pressing the "Clear" button	The intelligent controller is faulty		Cut off the control power of the intelligent controller and then connect it again. If the fault still exists, please contact the manufacturer

12. Ordering specification

Ordering instruction		Order quantity	Piece	Order date		Contact tel	

Structure	ARW1-1600 □- Fixed □- Draw-out □-3P □-4P □-3P+N (with external N current transformer)		
Rated current	In=_____ A	Rated voltage	□-AC400V □-AC690V
Intelligent controller	□-AC230V □-AC400V □-DC24V □-DC110V □-DC220V		
	Basic function	Optional feature	
ARW1-2L	Ir=_____ A tr=_____ S Ii=_____ A	□ - Short circuit short delay protection Isd=_____ A tsd=_____ S □ - Ground fault protection Ig=_____A tg=_____ S □ - Signal contact (DO/DI) function □ - MCR and HSISC	
ARW1-2M	Ir=_____A tr=_____ S Isd=_____ A tsd=_____ S Ii=_____ A	□ - Ground fault protection Ig=_____ A tg=_____ S □ - Current imbalance protection □ - MCR and HSISC □ - Signal contact (DO/DI) function □ - Voltage measurement (PTU4.1) □ - Power measurement □ - Energy measurement □ - Power factor measurement (PTU4.1) □ - Grid historical parameter measurement	
ARW1-3H	Ir=_____A tr=_____ S Isd=_____ A tsd=_____ S Ii=_____ A Ig=_____ A tg=_____ S	□ - Current imbalance protection □ - MCR and HSISC □ - Voltage protection □ - Signal contact (DO/DI) function □ - Voltage measurement □ - Power measurement □ - Energy measurement □ - Power factor measurement □ - Grid historical parameter □ - Harmonic measurement	
Required accessories	Shunt release	□-AC230V(default) □-AC400V □-DC24V □-DC110V □-DC220V	
	Closing electromagnet	□-AC230V(default) □-AC400V □-DC24V □-DC110V □-DC220V	
	Motor	□-AC230V(default) □-AC400V □-DC110V □-DC220V	
	Auxiliary contact	□- 4 sets of conversion (default) □- 6 sets of conversion	
	Connection method	□- Horizontal (default) □- Vertical	
	Undervoltage release	□- AC230V □- AC400V	
		□- Instant □- Delay □-1S □-2S □-3S □-4S □-5S □-6S □-10S (optional but unadjustable)	
Other optional accessories	Mechanical interlock	2 circuit breakers □ - Steel cable interlock □ - Connecting rod interlock	
	Electrical interlock	□ 1 lock 1 key □ 2 locks 1 key □–3 locks 2 keys □-5 locks 3 keys	
	Automatic power conversion device	□ - ARQW2B □ - ARQW2BH (Modbus communication)	
Instruciton		□ - Phase partition □ - Door frame	
		□ - If additional configuration is selected, please tick √ in □	
		The selection function of intelligent controller and special requirement for circuit breaker require additional fees.	
Remarks			

Configuration instruction:

I. General configuration

1. Electric operation: shunt release, closing electromagnet, four sets of conversion auxiliary contacts, electric motor, 2M type controller, main circuit horizontal wiring, door frame, operation manual, packaging box, main circuit installation bolt, phase partition.

II. Optional configuration (additional cost)

Undervoltage release, steel cable interlocking, key lock, external transformer grounding protection, vertical busbar, six sets of conversion auxiliary contacts.