W1-2000 Series

Intelligent Air Circuit Breaker

◇Featured with complete intelligence, high breaking capacity and zero arc;
◇AC rated current 200A -6300A, short circuit breaking capacity 85kA~120kA;
◇It has 3 and 4 poles, draw-out type and fixed type, and can be installed with inverted wires;
◇With multiple intelligent controllers, providing different functions; intelligent function, display function
◇Setting function, monitoring function, fault memory function, available for communication interface for remote measurement, remote adjustment, remote control and remote communication;
◇With complete protection features, convenient setting and high accuracy, it has instantaneous, short delay, long delay, single-phase grounding and other protection characteristics.

Safe Energy-saving Intelligent Eco-friendly

—— —— The capable are infinite
Intelligence creates the future —— ——

Purpose and scope of use

The W1 series intelligent low-voltage air circuit breaker (hereinafter referred to as circuit breaker) is suitable for distribution networks with frequency of AC 50Hz, rated voltage up to 660V (690V) and below and rated current ranging from 200A to 6300A. It's used to distribute electrical energy and protect lines and power equipment from overload, undervoltage, short circuit, single-phase grounding and other faults. The circuit breaker has intelligent protection function and precise selective protection, can improve power supply reliability and avoid unnecessary power outages. Meanwhile, it has open type communication interface and can be used for four remote operations to meet the requirements of the control center and automation system. The circuit breaker has pulse withstand voltage of 8000V at altitude of 2000 meters (corrected according to standards for different altitudes, with maximum voltage not exceeding 12000V). The circuit breaker without intelligent controller and sensor can be used as isolator, marked as —/I×—

The circuit breaker complies with standards such as GB 14048.2 Low-voltage switchgear and controlgear-Part 2: Circuit-breakers and IEC60947-2 Low-voltage switchgear and controlgear-Part 2: Circuit-breakers.

Model and meaning and classification

◎Model and meaning

W 1 - □ / □
- Number of poles (4 for four poles, it's not marked for three poles)
- Rated frame current
- Design code
- Air circuit breaker

◎Classification

1. Classification by installation method
a. Fixed type
b. Draw-out type
2. Classification by the number of poles: three poles, four poles
3. Classification by operation method
a. Electric operation
b. Manual operation (for maintenance and repair)

◎Type of release

Intelligent controller, undervoltage instantaneous (or delayed) tripping

◎ Intelligent controller performance

a. The intelligent controller is classified into H type (communication type), M type (ordinary intelligent type), and L type (economic type);
b. Equipped with overload long delay inverse time limit, short delay inverse time limit, definite time limit and instantaneous functions. The required protection characteristics can be set by the user;
c. Single phase grounding protection function;
d. Display function: setting current display, action current display and voltage display of each line (voltage display should be proposed when ordering);
e. Alarm function: overload alarm;
f. Self inspection function: overheating self inspection, microcomputer self-diagnosis;
g. Test function: It can test the action characteristics of the controller.

Normal working and installation condition

◎Ambient air humidity

The upper limit value shall not exceed +40℃, the lower limit value shall not be less than -5℃, and the 24-hour average value shall not exceed +35℃:
Note: For working condition with lower limit of -10℃ or -25℃, the user should declare to our factory;
For working condition where the upper limit value exceeds +40℃ or the lower limit value is below -10℃ or -25℃, the user should consult with our factory.
◎ The altitude of the installation site shall not exceed 2000m
◎ Atmospheric condition
The relative humidity of the atmosphere does not exceed 50% when the ambient air temperature is +40℃. At lower temperature, there can be higher relative humidity. The average maximum relative humidity in the wettest month is 90%, and the average minimum temperature in that month is +25℃, and the condensation on the product surface due to temperature change should be considered. The user should consult with our factory for condition beyond the regulation.
◎ Protection level: IP30
◎ Utilization category: Category A or B
◎ Installation category
For the circuit breaker and undervoltage release with rated working voltage of 660V (690V) and below, the installation category of primary coil of power transformer is IV; and the installation category of auxiliary and control circuit is III.
◎ Installation condition
The circuit breaker should be installed according to the requirement of this manual, and the vertical inclination of the circuit breaker should not exceed 5° (the inclination of mining circuit breaker should not exceed 15°).

Technical data and performance

◎ 1. The rated current of the circuit breaker is shown in Table 1

Table 1

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

◎ 2. The rated short-circuit breaking capacity and short-term withstand current of the circuit breaker are shown in Table 2, and the arc distance of the circuit breaker is "zero" (i.e. there is no arc outside the circuit breaker)

Table 2

Rated frame current Inm A		2000	3200	4000	6300
Rated ultimate short-circuit breaking capacity Icu(KA)O-CO	400V	80	100	100	120
	690V	50	65	65	85
Rated short-time making capacity n×Icu(KA)/-cosΦ	400V	176/0.2	220/0.2	220/0.2	264/0.2
	690V	105/0.25	143/0.2	143/0.2	187/0.2
Rated service short-circuit breaking capacity Ics(KA)O-CO-CO	400V	65	80	80	100
	690V	50	50	65	75
Rated short-time withstand current Icw (KA) 1s, delay 0.4s, O-CO	400V	50	65	65/80(MCR)	85/100(MCR)
	690V	40	50	50/65(MCR)	65/75(MCR)

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

◎ 3. The maximum power consumption of the circuit breaker is 360W. The variation of the rated continuous current of the circuit breaker under different ambient temperatures is shown in Table 3

Table 3

Ambient temp. ℃ \ W1	400A	630A	800A	1000A	1250A	1600A	2000A
40	400A	630A	800A	1000A	1250A	1600A	2000A
50	400A	630A	800A	1000A	1250A	1550A	1900A
60	400A	630A	800A	1000A	1250A	1550A	1800A

W1-2000 Series
Intelligent Air Circuit Breaker
Green energy Grid system Industrial power Rail traffic

◎ 4. Intelligent overcurrent controller protection characteristic and function

4.1 Overcurrent controller protection characteristic
4.1.1 The setting value Ir (I/In) and error of the controller are shown in Table 4

Table 4

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

Note: When simultaneously having three–section protection(required), the setting value cannot cross.

4.1.2 For long delay overcurrent protection inverse time limit action characteristic I2TL=(1.5Irl)2tL, the action time of (1.05–2.0)Ir1 is shown in Table 5, with time error of ± 15%.

Note: tL-Setting time for long delay of 1.51r1, TL -Action time for long delay

Table 5

1.05Ir1	1.3Ir1	1.5Ir1 setting time s	15	30	60	120	240	480
>2h non action	<1 h non action	2.0Ir1 f action time s	8.4	16.9	33.7	67.5	135	270

4.1.3 Short delay overcurrent protection characteristic

The short delay overcurrent protection is of definite time limit. If the low multiple is required to be the inverse time limit, its characteristic is as follows: I2Ts=(8Ir1)2ts, ts is the generally designed delay time; when the overload current is greater than 8Ir1, it automatically switches to definite time limit characteristic, which is shown in Table 6. The time limit error is ±15%.

Table 6

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

4.1.4 The overcurrent tripping protection characteristic is shown in Figure 1, and the ground fault protection characteristic is shown in Figure 2

4.2 M type intelligent controller function

a. Ammeter function

It displays the operating current and ground leakage current of each phase, normally displays the maximum phase current, and also displays the current or time value of setting, testing and fault.

b. Voltmeter function

It displays the voltage of each line, and normally displays the maximum value.

c. Remote monitoring and self-diagnosis function

① The controller has local fault self-diagnosis function

When the computer malfunctions, error "E" display or alarm can be sent, and the computer can be restarted. If the user needs it, the circuit breaker can also be opened.

② When the local ambient temperature reaches 80℃, alarm can be sent and the circuit breaker can be opened at low current (when required by the user).

③ The intelligent controller has overload, grounding, short circuit, load monitoring, pre-alarm, and trip indication (OCR) signals output through contact or optocoupler, making it easy for users to use for external remote control. The contact capacity is DC28V, 3A; AC125V, 3A.

d. Setting function

Various parameters of the controller can be adjusted with the four buttons: Set, +, -, and Store. Press the Set to the desired state (indicated by the status indicator light), then press the + or - to adjust the parameter to the desired value, and then press the Store button again. The store light illuminates once to indicate that the setting value has been locked. The protection parameter of the controller shall not be set across. After the controller is powered off and reset, press the Set button again to check the various parameters set circularly.

e. Test function

By using buttons such as Set, +, -, Trip, Non-trip and Reset, various protection characteristics of the controller can be checked. Use the Set, +, and - buttons to adjust simulated fault test current (note: do not store and lock), and then press the Trip or Non-trip button to test. The controller can enter fault handling. When pressing the Trip button, the circuit breaker breaks, when pressing the Non-trip button, the circuit breaker doesn't break, and the controller's various indicating states are normal. After the test, you need to press the Reset or Clear light button once before proceeding with other tests.

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

f. Load monitoring function

Set two setting values: ILC1 setting range (0.2-1) In and ILc2 setting range (0.2-1) In, ILc1 delay characteristic is inverse time limit characteristic, and its time setting value is 1/2 of the long delay setting value; there are two types of ILc2 delay characteristics. The first is the inverse time limit characteristic, with time setting value of 1/4 of the long delay setting value. The second is the fixed time limit characteristic, with delay time of 60 seconds. For these two delay functions, the former is used to cut off the unimportant load when the current approaches the overload setting value, while the latter is used when the current exceeds the setting value of ILc1, causing a delay of cutting off the unimportant load at the lower level, causing the current to decrease and maintain power supply for the main circuit and important load circuit. When the current drops to ILc2, after a certain delay, a command is sent to reconnect the cut off circuit at the lower level, restoring power supply of the entire system. The user can choose either of the two types of monitoring protection mentioned above, and the monitoring characteristic is shown in Figure 3 and Figure 4.

g. MCR tripping and simulated tripping protection can be turned off according to user requirement, and generally need to be turned off when conducting short delay breaking test

① MCR on/off protection is mainly used when the line is in fault state (when the controller is powered on), and the controller has the function of breaking the circuit breaker at low short-circuit current. The factory setting is 10kA with error of ±20%, and the set current can be determined according to the protection requirement.

② The controller has the function of directly sending trip signal without processing the signal by the host chip when there is an extremely large short-circuit current.

h. Thermal memory function

After the controller is overloaded or has a short circuit delay trip, it has memory function that simulates the characteristic of bimetallic sheets before the controller is powered off. The overload energy is released after 30 minutes, and the short delay energy is released after 15 minutes. During this period, if overload and short delay faults occur, the tripping time will become shorter, the controller will power off, and the energy will automatically reset.

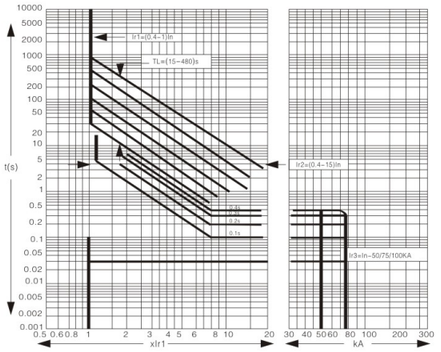


Figure 1

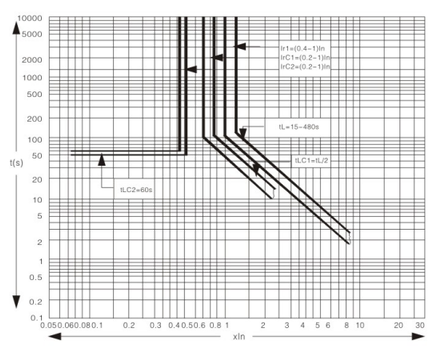


Figure3

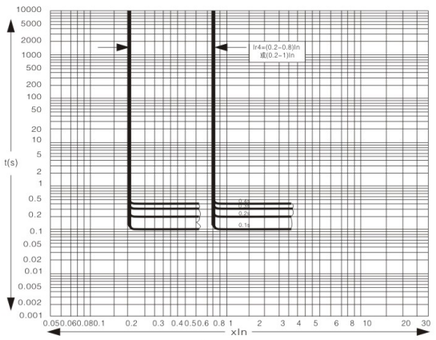


Figure 2

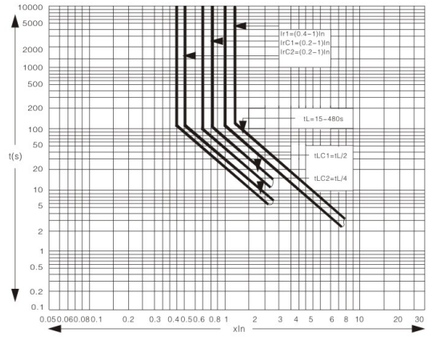


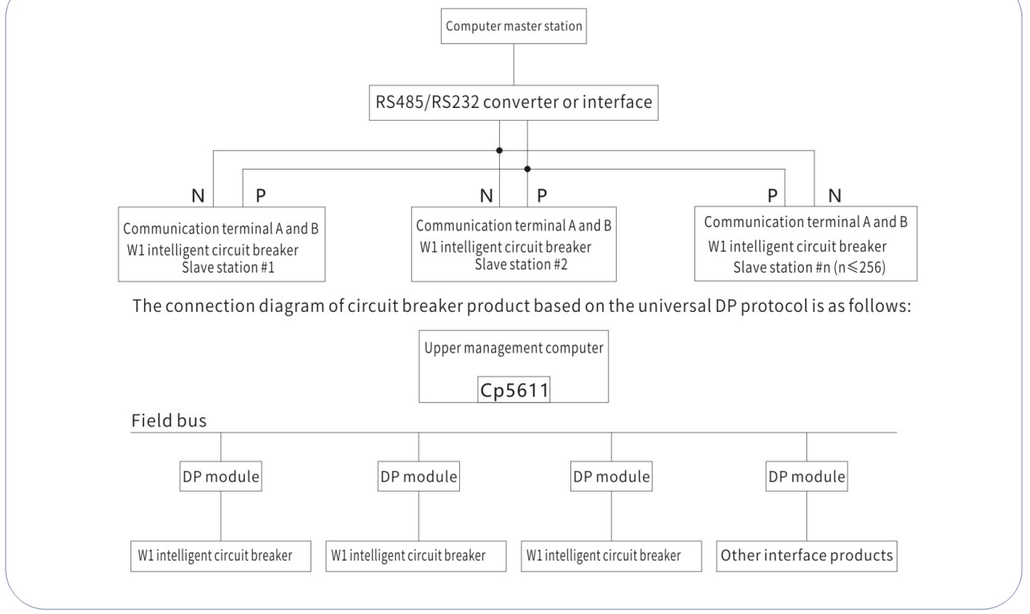
Figure4

4.3 H type intelligent controller

In addition to having all the functions of the M type, it also has serial communication interface. Through the communication interface, a local area network system (hereinafter referred to as the system) with a master-slave structure can be formed, with 1-2 computers as the master station. If the intelligent circuit breaker or other communicable components are used as the slave station, the system network structure is shown in the following figure.

For circuit breaker unit, the system can achieve long-distance "four remote" functions for monitoring of various power grid parameters and operating parameters, monitoring of the current operating status of intelligent circuit breaker, adjustment and download of various protection limit parameters and control of opening and closing operations of intelligent circuit breaker. The system is suitable for the construction and renovation of power distribution monitoring system in various power stations, power plants, small and medium-sized substations, industrial and mining enterprises, buildings, etc.

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



The connection diagram of circuit breaker product based on the universal DP protocol is as follows:

4.3.1 System composition

(a) Hardware structure of data communication network system

△ The intelligent circuit breaker provides standard RS485 communication interface, which is led out from the No. 10 and 11 outgoing lines of the circuit breaker;

△ The communication medium connected to the system: Class A shielded twisted pair.

(b) Main characteristic of the network

△ Bidirectional serial data transmission method, the product can provide multiple communication protocol modes: "Data Communication and Its Criteria for Low Voltage Apparatus V1.0", PROFIBUS-DP, MODEBUS, etc.

△ Strict master-slave mode, that means the master station is the initiator and controller of communication, and the slave station can only communicate with the master station and cannot directly communicate with other slave stations.

△ The communication baud rate is 9600bit/s, and the communication distance is 1.2km. For typical applications of PROFIBUS-DP communi cation baud rate, it can reach 187.5kbit/s.

(3) Monitoring software

YSS2000 configuration software can achieve the required configuration application of monitoring and management software according to different project requirements. For intelligent circuit breaker, it can achieve operation monitoring and various daily management functions.

4.3.2 System function

(a) Remote control

Remote control refers to the operation and control of energy storage, closing and opening of circuit breaker of each slave station in the system through the master station computer. The operator selects the corresponding object from the system interface, clicks the remote control button with the mouse, and the system provides the current operating status of the corresponding object. After the operator inputs the operation password, they can send remote control command for "closing" or "opening". The system passes the command to the corresponding circuit breaker slave station. After receiving the commands, the slave station performs operations such as breaking, closing and energy storage according to the established sequence, and reports the remote control result to the master station.

(b) Remote adjustment

Remote adjustment refers to setting the protection setting value of the slave station through the master station computer. In the master station computer, there are protection setting tables for all slave stations. The operator selects the corresponding object from the system interface, clicks the remote adjustment button with the mouse, and the system provides the current settings of all protection setting values for the corresponding object, as well as the protection setting table for that object. After the operator inputs the operation password, they can select the required parameter from the parameter table, and then click the corresponding button. The master station downloads the parameter to the corresponding slave station, and report the result of remote debugging. After receiving command, the slave station modifies its own protection setting value.

© Remote measurement

Remote measurement refers to the real-time monitoring of the power grid operating parameter of each slave station through the master station computer. The communication sub-station reports the working parameter to the upper computer as follows: real-time A, B, C, N phase current value of each sub-station, voltage value of UAB, UBC, UCA, etc.

△ The fault record can record the following fault parameters

The current value of A, B, C, and N phases during the fault, the voltage value of UAB, UBC and UCA, the fault type, and the fault action time, and it can also record the fault in the fault database.

△ The computer displays the current real-time current and voltage of each sub-station through bar chart, absolute value table and other methods, and displays the operating status of each node through real-time curves.

(d) Remote communication

Remote communication refers to viewing the model, closing and opening status, various protection setting values, as well as the operation and fault information status of the slave station through the master station computer. The parameters reported from the slave station circuit breaker to the upper computer mainly include: switch model, switch status (on/off), fault information, alarm information, various protection setting values, etc.

(e) Other system functions

In addition to the four remote operation control function, the system can also perform various management functions: accident alarm (information screen, screen pushing, event printing, accident dialing, sound alarm), event recording, maintenance listing, shift handover management, load trend analysis and various reports printing.

4.3.3 L type intelligent controller

The L type controller adopts code switch and toggle switch setting methods, and has overload long delay, short circuit short delay, instantaneous and ground leakage four-section protection characteristics. It also has functions such as fault status and load current light column indication, but there is no digital display, and its functions are not as complete as the M and H types. The user can choose it for general situations.

◎ 4.4 Operating performance of circuit breaker

The operating performance of the circuit breaker is represented by the number of operation cycles, as shown in Table 7

Table 7

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

◎ 4.5 The working voltage and required power of the shunt release, undervoltage release, motor operating mechanism, energy release (closing) electromagnet and intelligent controller of the circuit breaker are shown in Table 8

Table8

Required power / Rated working voltage / 项目			AC (50Hz)		DC	
			220V	380V	110V	220V
Shunt release			24VA	36VA	24W	24W
Undervoltage release			24VA	36VA	-	-
Closing electromagnet			24VA	36VA	24W	24W
Electric operating mechanism	Rated frame current of circuit breaker	2000A	85VA	85VA	85W	85W
		3200A、4000A	110VA	110VA	110W	110W
		6300A	150VA	150VA	150W	150W
Intelligent controller supply voltage			AC220V、AV380V、DC220V、DC110V			

Note: The reliable operating voltage range of the shunt release is 70%~110%, and that of the closing electromagnet and operating mechanism are 85%~110%

◎ 4.6 The performance of the undervoltage release of the circuit breaker is shown in Table 9

Table9

Category		Undervoltage delay release	Undervoltage instantaneous release
Release action time		1,3,5s delay	Instantaneous
Release action voltage value	35%~70%Ue	The circuit breaker can reliably open	
	≤35%Ue	The circuit breaker cannot close	
	(85~110%) Ue	The circuit breaker can reliably close	
If the supply voltage recovers to 85% Ue within 1/2 delay time		The circuit breaker doesn't open	-

Note: The accuracy of the delay time is ±10%

◎ 4.7 Performance of auxiliary contact

4.7.1 The conventional thermal current of the auxiliary contact is 6A

4.7.2 Auxiliary contact form: 4NO, 4NC.

4.7.3 Abnormal making and breaking capacity of auxiliary contact

The making and breaking capacity determined by the use of auxiliary contact under abnormal usage conditions is shown in Table 10

Table10

Utilization category	Making			Breaking			Number of making/breaking operation cycles and operation frequency		
	I/Ie	U/ Ue	COSΦ or T0.95	I/Ie	U/ Ue	COSΦ or T0.95	Number of operation cycles	Number of operation cycles per minute	Power-on time (s)
AC-15 DC-13	10 1.1	1.1 1.1	0.3 6Pe	10 1.1	1.1 1.1	0.3 6Pe	10	6 (or the same operating frequency as the main circuit)	0.05

Note: When Pe≥50W, the upper limit of T0.95=6Pe≤300ms

4.7.4 The making and breaking capacity of auxiliary contact under normal condition is shown in Table 11

Table11

Utilization category	Making			Breaking		
	I/Ie	U/ Ue	COSΦ or T0.95	I/Ie	U/ Ue	COSΦ or T0.95
AC-15	10	1	0.3	1	1	0.3
DC-13	1	1	6Pe	1	1	6Pe

◎ 4.8 Key lock in open position

The circuit breaker is equipped with an "open position key lock" accessory (supplied according to order requirement), which can lock the circuit breaker in the open position. At the moment, neither the closing button nor the release (closing) electromagnet can close the circuit breaker.

Structure overview

The fixed type circuit breaker mainly consists of contact system, intelligent controller, manual operating mechanism, electric operating mechanism and mounting plate;

The draw-out type circuit breaker mainly consists of contact system, intelligent controller, manual operating mechanism, electric operating mechanism and draw-out seat.

The circuit breaker is arranged in a three-dimensional form, with the characteristics of compact structure and small volume. The contact system is enclosed in insulated base plate, and the contact of each phase is also separated by insulated plate, forming small compartments. The intelligent controller, manual operating mechanism and electric operating mechanism are arranged in front of each other to form independent units. If one of the units is damaged, the entire unit can be removed and replaced with a new one.

The draw-out type circuit breaker consists of plug-in circuit breaker and a draw-out seat. The guide rail inside the draw-out seat can be pulled in and out, and the inserted circuit breaker is located on the guide rail to get in and out of the draw-out unit. The main circuit is connected through the insertion connection between the busbar on the inserted circuit breaker and the bridge contact on the draw-out seat.

The draw-out type circuit breaker has three working positions: "connection" position, "test" position, and "disconnection" position. The position change is achieved by turning the handle in or out. The indication of the three positions is displayed by the pointer on the draw-out seat crossbeam.

When in the "connection" position, both the main circuit and the secondary circuit are connected; when in the "test" position, the main circuit is disconnected and separated by insulation partition, and only the secondary circuit is connected for some necessary action tests; when in the "disconnection" position, both the main circuit and the secondary circuit are disconnected. The draw-out type circuit breaker has mechanical interlocking device, the circuit breaker can only be closed in the connection position or test position, and cannot be closed in the middle position between connection and test.

◎1. Interlocking mechanism of circuit breaker (suitable for draw-out type and fixed type). The user can use interlocking mechanism to switch two or three sets.

■ 1.1 Lever interlocking

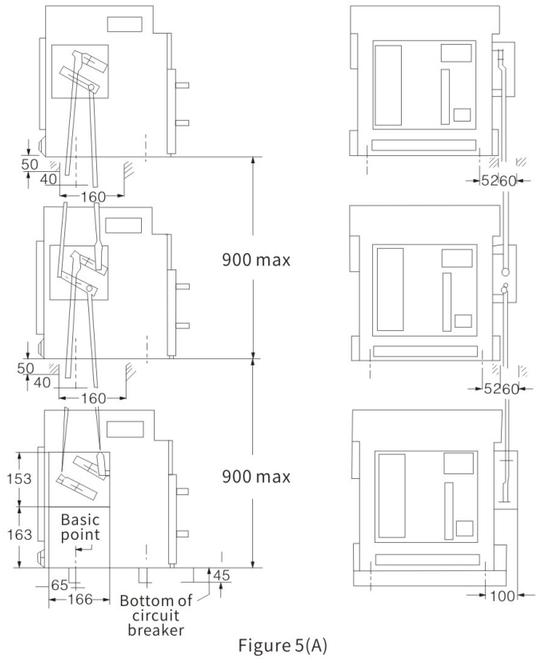


Figure 5(A)

Three vertically mounted circuit breakers interlocked with lever. If two circuit breakers are interlocked, only the top circuit breaker needs to be removed.

■ 1.2 Soft interlocking (both horizontal and vertical can be equipped)

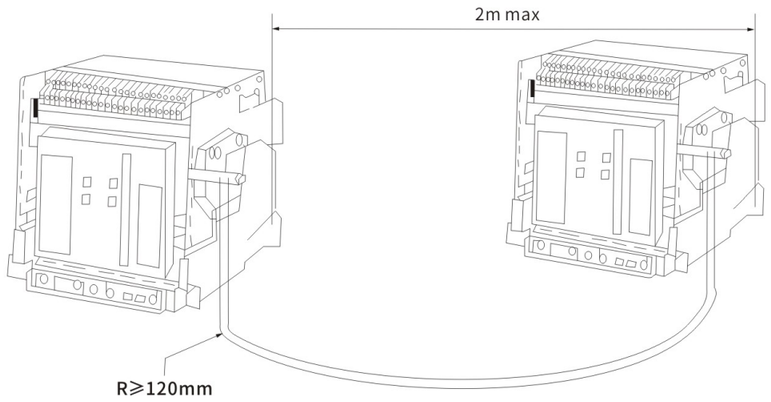
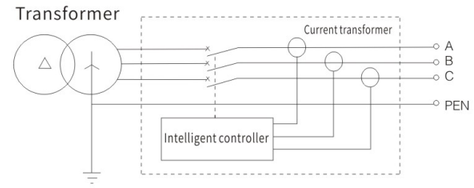


Figure 5(B)

■ Internal connection

1. Ground fault protection circuit

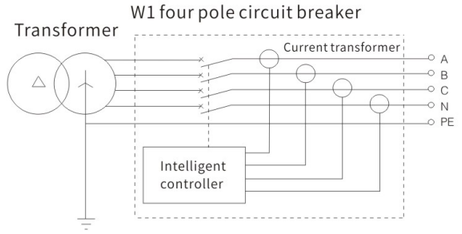
W1 three pole circuit breaker



3PT type

Differential type ground fault protection, where the signal only takes the vector sum of three-phase current (three-phase imbalance)

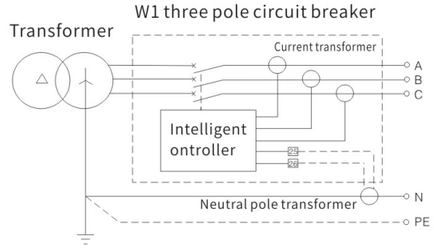
W1 four pole circuit breaker



4PT type

Differential type ground fault protection, where the signal only takes the vector sum of three-phase current and N-phase current

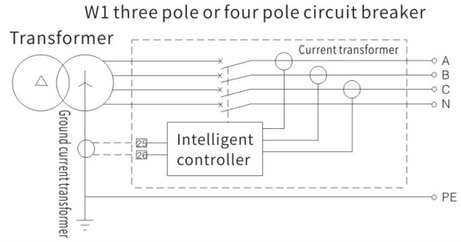
W1 three pole circuit breaker



(3P+N) T type external neutral pole current transformer

Differential type ground fault protection, with the signal taken as the vector sum of three-phase current and N-phase current

W1 three pole or four pole circuit breaker



(3P+N) W type external ground current transformer

Ground current type ground fault protection, with the signal directly taken between the neutral point of the main power supply and the ground

2. External single-phase ground protection function

External current transformer (neutral pole current transformer or ground current transformer) is provided as an accessory to user. The user shall insert it into the busbar and connect the wiring (with a length of 2m) to the secondary wiring terminals # 25 and # 26 of the circuit breaker.

The center cut-out dimension of the external current transformer (maximum allowable size of the perforated busbar) is as follows:

Model	Width	Height
W1-2000 W1-4000 / 4	61	21
W1-3200 and above (except for W1-4000/4)	87	31

3. Wiring terminal

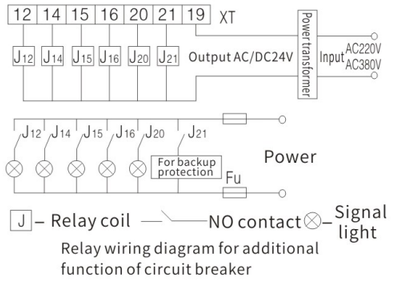
There are a total of 47 wiring terminals for the circuit breaker, which are simple and convenient for user to use. The wiring diagram is shown in Figures 7A and 7B

Figure 7A (M type or L type controller with basic function)

Other wirings of intelligent controller:

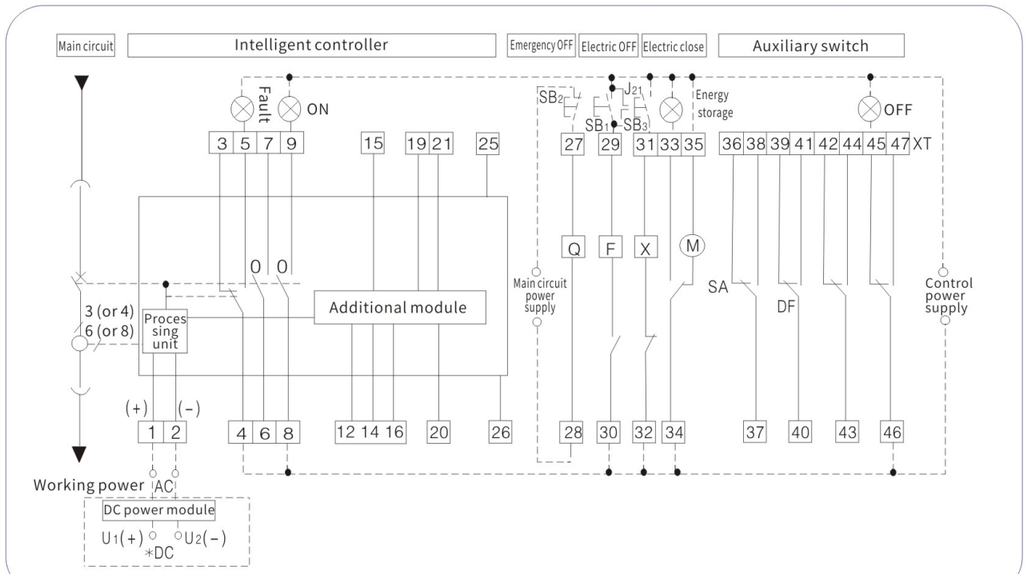
#1, #2 AC working power input (input from DC power modules U1 and U2 during DC)
#12 Overload pre-alarm signal output
#14 Instantaneous short delay trip signal output
#15 Long delay trip signal output
#16 Ground (or zero) fault trip signal output
#19 Signal output common line
#20 Self-diagnosis signal output
#21 Trip signal (available for shunt or undervoltage actuators)
#25, 26 External neutral pole or ground current transformer input

Figure 7A



Relay wiring diagram for additional function of circuit breaker

1) The controller signal output drives the external relay J to output contact action signal through terminals 12, 14-16, 20 and 21.
2) The power transformer (user needs to specify the input voltage value in the order specification) is provided by the manufacturer. The power transformer can be inserted into the standard guide rail together with the relay base, and installed by the user in the appropriate position of the switchgear.
3) Relay model: HH62P, AC/DC24V, provided by user.
4) Output conditions of self-diagnosis signal: a. The internal temperature of the controller is>80°C; b. The chip is not working properly; c. The controller loses power.
5) The user can choose to connect to J12, J14~J16, J20 and J21 according to actual needs



Note: (1) If the control supply voltage of F, X and M is different, they should be connected to different power supplies separately.
(2) Terminal #35 can be directly connected to the power supply (automatic energy pre-storage) or connected in series to the normally open button and then connected to the power supply (manual energy pre-storage).
(3) If requested by the user, terminals # 6~# 7 can output normally closed contact.
(4) Additional accessories are provided by the user.
(5)*When the working power of the intelligent controller is DC power, DC power module must be added (at this time, terminals #1 and #2 cannot be directly connected to AC power). The secondary wiring is shown in the figure (DC power supply DC110V or 220V is input from U1 (+) and U2(-), and the two output terminals of the DC power module are respectively connected to terminals 1(+) and 2(-) of the secondary wiring base).

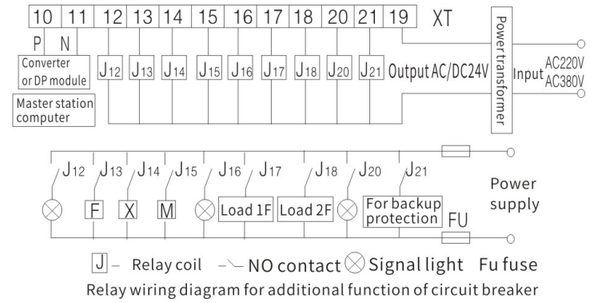
SB1 shunt button (provided by user)
SB2 undervoltage button (provided by user)
SB3 closing button (provided by user)
X closing electromagnet
M energy storage motor
XT wiring terminal
DF auxiliary contact
F shunt release
SA motor microswitch
Q undervoltage release or undervoltage delay release
O NO contact (3A/AC380V)
⊗ Signal light (provided by user)

Figure 7B (M type controller with additional function or H-type)

Other wirings of intelligent controller:

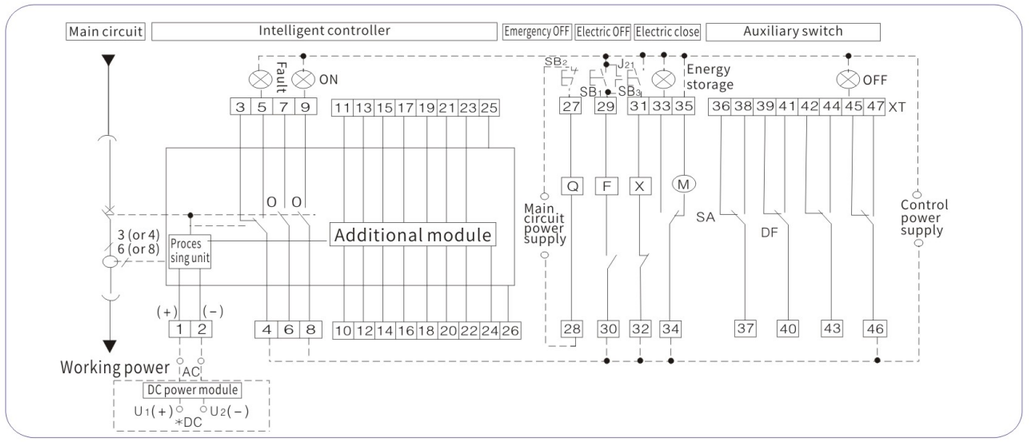
#1, #2 AC working power input (input from DC power modules U1 and U2 during DC)
#10 RS485 communication P terminal (simplex) remote adjustment and remote communication
#11 Rs485 communication N terminal (simplex) remote control and remote measurement, etc
#12 Overload pre-alarm signal output
#13 Communication remote control shunt trip output
#14 Instantaneous short delay trip signal output or communication remote control closing output
#15 Long delay trip signal output or communication remote control energy storage output
#16 Ground (or zero) fault trip signal output
#17 Unloading 1 signal output
#18 Unloading 2 signal output
#19 Signal output common line
#20 Self-diagnosis signal output
#21 Trip signal (available for shunt or undervoltage actuators)
#22 Voltage signal phase A
#23 Voltage signal phase B } Directly input from the main circuit
#24 Voltage signal phase C
#25, 26 External neutral pole or ground current transformer input

Figure 7B



Relay wiring diagram for additional function of circuit breaker

1) The controller signal output drives the external relay J to output contact action signal through terminals 12~18, 20 and 21.
2) The RS485y232 converter, DP module and power transformer (the user needs to specify the input voltage value in the order specification) are provided by the manufacturer. The power transformer can be inserted into the standard guide rail together with the relay base and installed by the user in the appropriate position of the switchgear.
3) Relay model: HH62P, AC/DC24V, provided by user.
4) Main station computer is provided by user.
5) Terminals 13~15 output can be used for opening, closing, and other functions of communication remote control. The trip signals of corresponding terminals 14 and 15 are no longer output at this time. The normally open contact of the corresponding relay can be connected in parallel with the corresponding manual control button, which can achieve both manual control and remote control. If remote control function is not required, terminals 14 and 15 can be connected to two signal lights in series through the normally open contacts of relays J14 and J15, and the corresponding signal can be remotely output. Please specify whether remote control function is required in the order specification, and the manufacturer will determine the corresponding function output by terminals 14 and 15 based on this. Terminal 21 output drives relay J21 for backup protection.
6) Output conditions of self-diagnosis signal: a. The internal temperature of the controller is>80°C; b. The chip is not working properly; c. The controller loses power.
7) The user can choose to connect to J12, J14~J16, J20 and J21 according to actual needs.

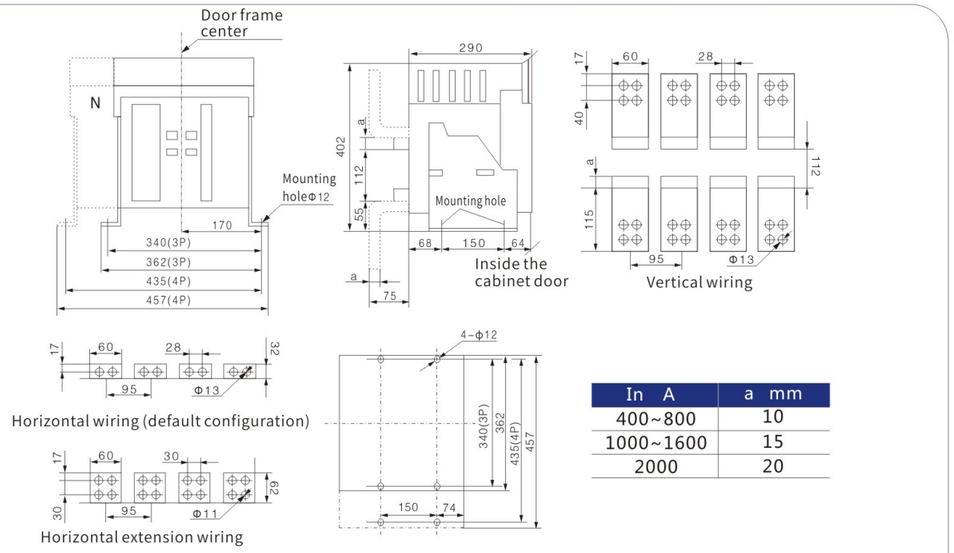


Note: (1) If the control supply voltage of F, X and M is different, they should be connected to different power supplies separately.
(2) Terminal #33 can be directly connected to the power supply (automatic energy pre-storage) or connected in series to the normally open button and then connected to the power supply (manual energy pre-storage).
(3) If requested by the user, terminals # 6~#7 can output normally closed contact.
(4) Additional accessories are provided by the user.
(5)*When the working power of the intelligent controller is DC power, DC power module must be added (at this time, terminals #1 and #2 cannot be directly connected to AC power). The secondary wiring is shown in the figure (DC power supply DC110V or 220V is input from U1(+) and U2(-), and the two output terminals of the DC power module are respectively connected to terminals 1(+) and 2(-) of the secondary wiring base).

SB1 shunt button (provided by user)
SB2 undervoltage button (provided by user)
SB3 closing button (provided by user)
X closing electromagnet
M energy storage motor
XT wiring terminal
DF auxiliary contact
F shunt release
SA motor microswitch
Q undervoltage release or undervoltage delay release
O NO contact (3A/AC380V)
⊗ Signal light (provided by user)

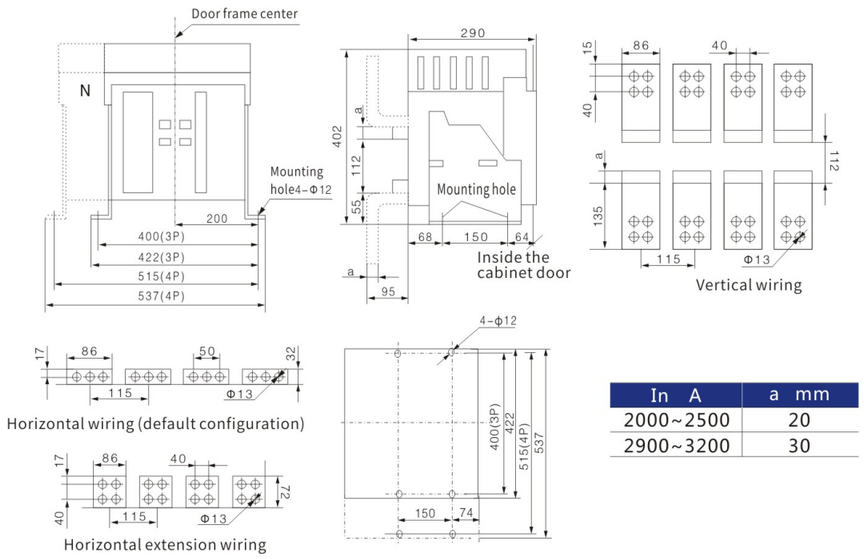
■ Outline and installation dimension

◎ 1. The outline and installation dimension of fixed type circuit breaker is shown in Figures 8 and 9



In A	a mm
400~800	10
1000~1600	15
2000	20

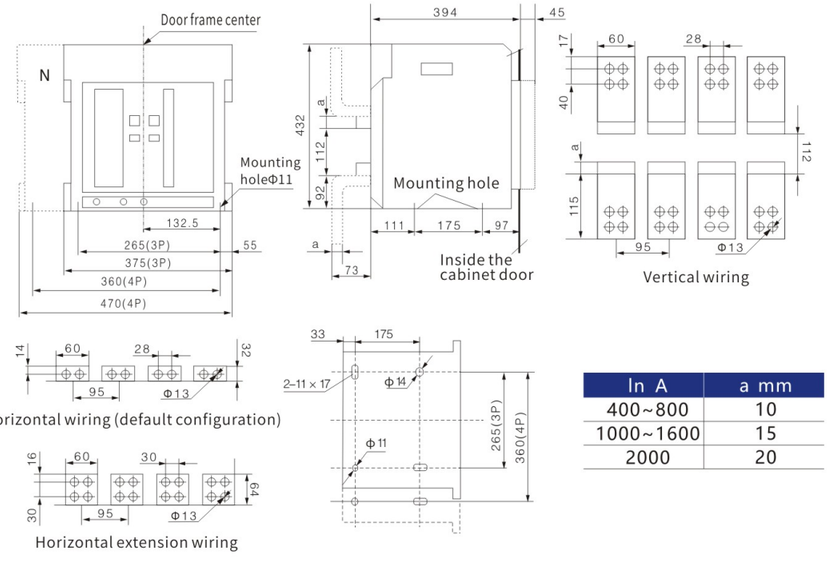
Figure 8 Outline and installation dimension of fixed type circuit breaker (W1-2000, 2000/4)



In A	a mm
2000~2500	20
2900~3200	30

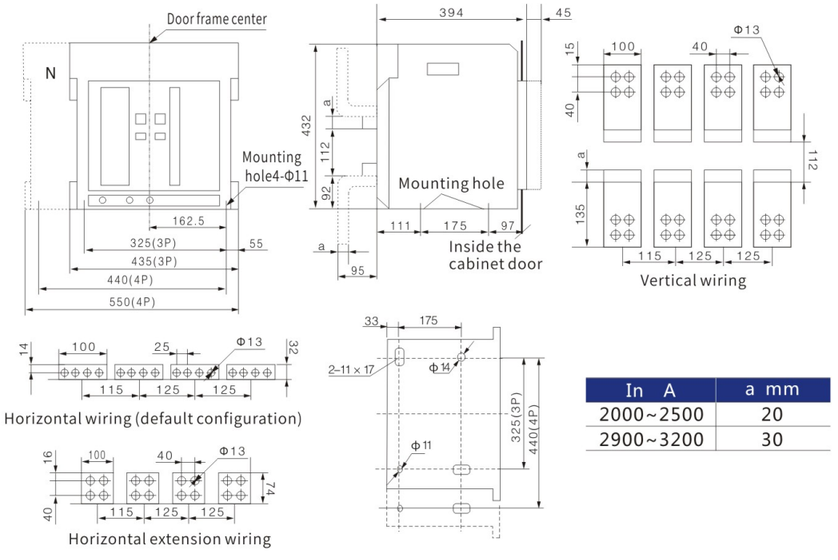
Figure 9 Outline and installation dimension of fixed type circuit breaker (W1-3200, 3200/4)

◎ 2. The outline and installation dimension of the draw-out type circuit breaker is shown in Figure 10, 11, 12, 13, 14, 15 and 16



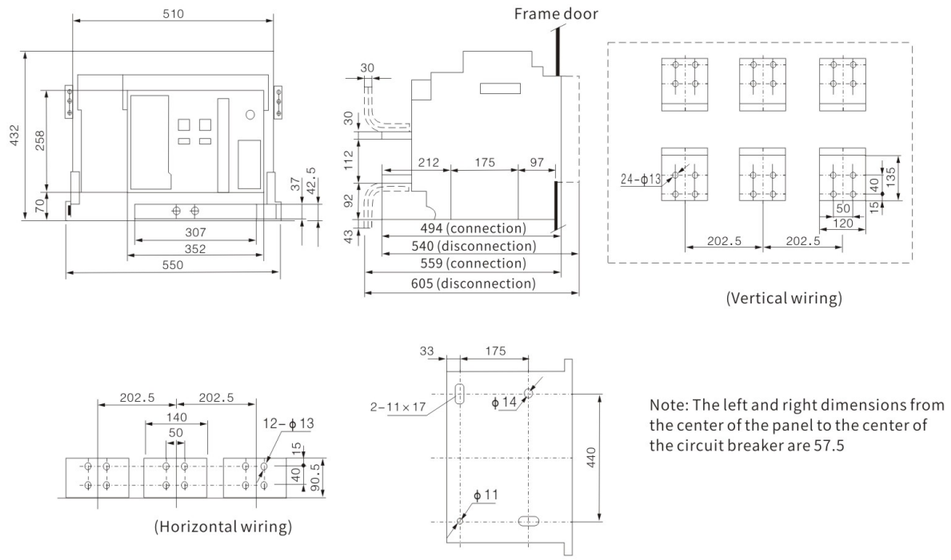
In A	a mm
400~800	10
1000~1600	15
2000	20

Figure 10 Outline and installation dimension of the draw-out type circuit breaker (W1-2000, 2000/4)



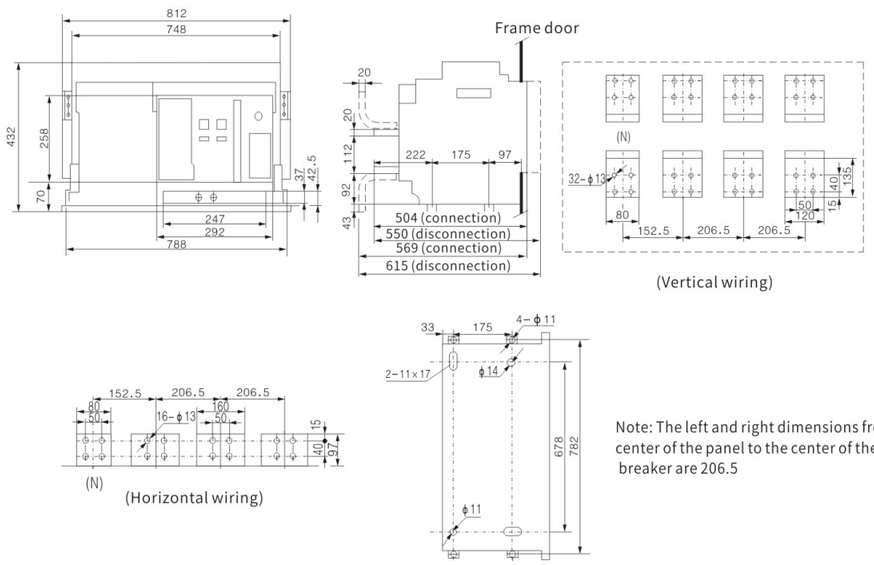
In A	a mm
2000~2500	20
2900~3200	30

Figure 11 Outline and installation dimension of the draw-out type circuit breaker (W1-3200, 3200/4)



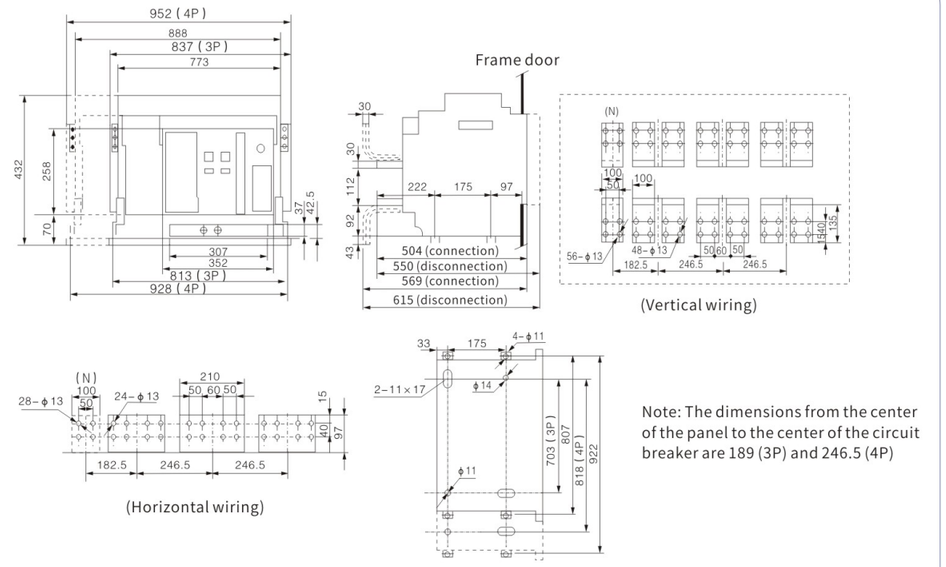
Note: The left and right dimensions from the center of the panel to the center of the circuit breaker are 57.5

Figure 12 Outline and installation dimension of the draw-out type circuit breaker (W1-4000/3)



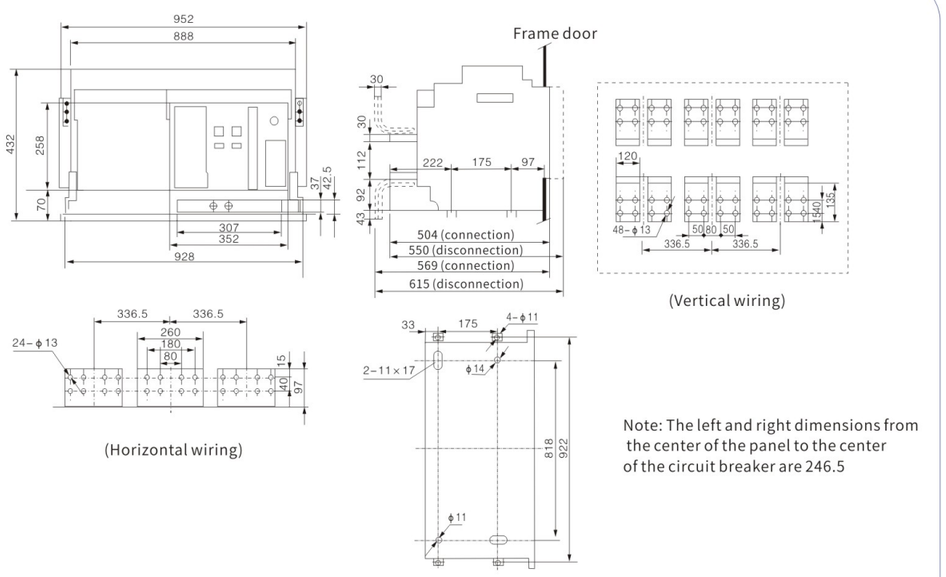
Note: The left and right dimensions from the center of the panel to the center of the circuit breaker are 206.5

Figure 13 Outline and installation dimension of the draw-out type circuit breaker (W1-4000/4)



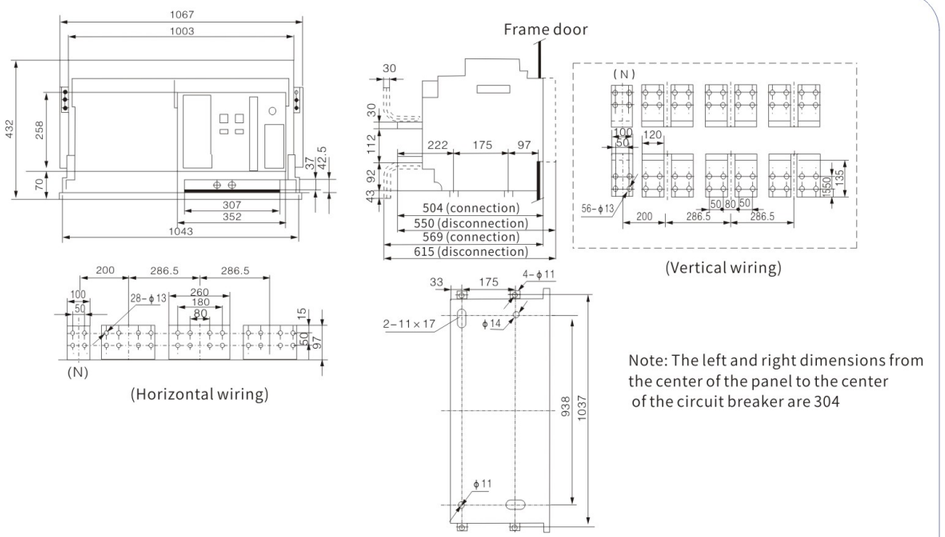
Note: The dimensions from the center of the panel to the center of the circuit breaker are 189 (3P) and 246.5 (4P)

Figure 14 Outline and installation dimension of the draw-out type circuit breaker (W1-6300/3, 6300/4 In=4000A.5000A)



Note: The left and right dimensions from the center of the panel to the center of the circuit breaker are 246.5

Figure 15 Outline and installation dimension of the draw-out type circuit breaker (W1-6300/3 In=6300A)

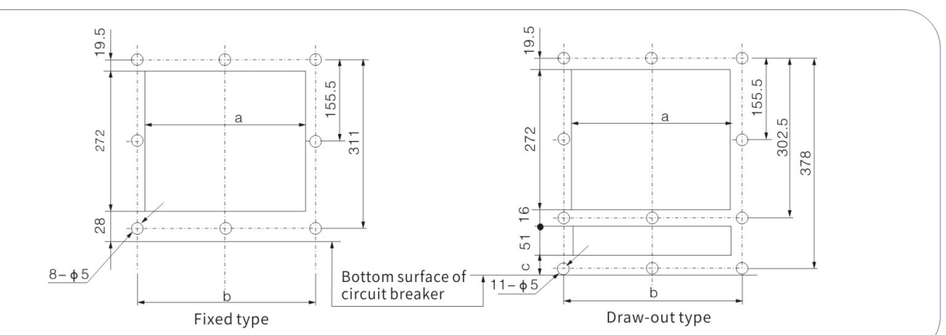


Note: The left and right dimensions from the center of the panel to the center of the circuit breaker are 304

Figure 16 Outline and installation dimension of the draw-out type circuit breaker (W1-6300/4 In=6300A)

◎ 3. The specification and quantity of copper bar to be connected by users is shown in the table below

Rated current	Specification of external copper busbar	Qty. per pole	Rated current	Specification of external copper busbar	Qty. per pole
630A	40×5	2	2900A	100×10	3
800A	50×5	2	3200A	120×10	3
1000A	60×5	2	3600A	120×10	4
1250A	80×5	2	4000A	120×10	4
1600A	100×5	2	5000A	120×10	5
2000A	100 x5	3	6300A	120×10	6
2500A	100×5	4			



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

■ Installation, use and maintenance

◎ Installation

1. Before installation, check whether the specification of the circuit breaker meets the requirement.
2. Before installation, check the insulation resistance of the circuit breaker with a 500V megohmmeter. When the ambient medium temperature is 20±5°C and the relative humidity is 50%~70%, it should not be less than 10MΩ. Otherwise, it should be dried until the insulation resistance meets the requirement before use.
3. When installing the circuit breaker, its base should be in a horizontal position and fixed with M10 screw.
4. Reliable protective grounding should be provided for the circuit breaker during installation, with obvious grounding marking at the grounding point.
5. The upper or lower incoming lines of the circuit breaker do not change its technical performance.
6. After the circuit breaker is installed and wired according to the relevant wiring diagram, the following operation tests should be conducted before the main circuit is powered on (the indication on the draw-out seat of the draw-out type circuit breaker is in the test position):

a. Check if the voltage of the undervoltage and shunt release, release (closing) electromagnet and electric operating mechanism match (the undervoltage release must be energized before the circuit breaker is closed).

b. Pull the handle on the face guard up and down seven times, and the panel will display "energy storage" and a "click" sound will be heard, indicating the end of energy storage. Press the "I" button or release (closing) electromagnet to power on, and the circuit breaker can be reliably closed (under the reliable reset of the controller reset button). Pulling the handle can store energy again.

c. The electric motor is powered on until the face guard displays "energy storage", accompanied by a "click" sound. The energy storage ends, and the electric motor automatically powers off. Press the "I" button or release (closing) electromagnet to power on, and the circuit breaker can be reliably closed.

d. After the circuit breaker is closed, whether using undervoltage and shunt release, or the "0" button on the face guard, or the tripping test of the intelligent controller, the circuit breaker should be able to open.

◎Application of intelligent controller

1. Controller tuning

Controller long delay current setting: After pressing the "Clear light" button, press the "Set" button until the long delay status indicator light is on, displaying the long delay factory current setting value, it's usually In, with current setting range of (0.4~1.0) In. Press the "+" and "-" buttons as needed to increase or decrease until the closest required current is reached. Then, press the "Store" button once, and the storage indicator light will turn on and off again, indicating that the long delay current setting value has been stored.

Long delay time setting: After the long delay current setting is completed, press the "Set" button again. The long delay time status indicator light will light up and the factory setting value of the long delay time will be displayed. Press the "+" button to double the time for each press. If the time is too long You can press the "-" button again, and each time you press it, the time is reduced by twice until it is closest to the desired time. Then, press the "Store" button again, and the storage indicator light will light up and go out again, indicating the end of the long delay time setting. The method for setting the action value and time of load monitoring, short delay, instantaneous, grounding and other protection actions is the same, but corresponding to different status indications. The grounding time set at the "OFF" position indicates the fault status, and the grounding only alarms without tripping. The instantaneous setting at the "OFF" position indicates that the protection is cancelled. During the setting process, if there is a fault signal, the controller will automatically block the function and enter the fault handling state.

2. Controller test

After setting the controller parameter, the user can check various protection functions of the controller as needed before the circuit breaker runs. The controller test has trip/non trip options. When the "trip" button is connected for testing, the circuit breaker will break. When the "non trip" button is connected for testing, no trip signal will be sent, and the circuit breaker will not break. (Note: L type product only has tripping test. when pressing the "Test" button once, the controller will send out a transient signal and the circuit breaker will break.)

For overload test, press the "Set" button to the long delay state, check the overload setting value, and then switch to other current states. Press the "+" and "-" buttons to adjust the current to>1.3Ir1. Press the test button once to enter the overload test state. The controller will delay action according to the inverse time limit rule and indicate the fault category and test status. Similar to other characteristic tests, after the test is completed, press the "Clear light" button once to enter the normal operation state. At the same time, the red mechanical "Reset" button must be pressed once to close the circuit breaker.

3. Other usage rules for controller

If the button is not pressed within 1 minute in setting and checking the status of controller, it will automatically clear the button and enter the running state. At the same time, if a fault occurs, the button function will be automatically blocked to enter the fault handling state.

a. Setting check

After pushing the controller "Clear light", continuously press the "Set" button in the absence of any fault to cycle through various states and corresponding set current and time value. After checking, please press the "Clear light" button once (it will automatically enter normal operation mode without pressing the button within 1 minute).

b. Check of operating current and voltage of the power grid

After pushing the controller "Clear light", in the absence of any fault, continuously press the "Option 1" ("Option") button to cycle the operating current and grounding current value of each phase, and the maximum phase current will be displayed normally. Continuously press the "Option 2" button to cycle the voltage of each line, and the maximum line voltage will be displayed normally.

After pushing the controller "Clear light", press the "Fault check" button once to display the previous fault status and faul t current. After the test or fault trip, press the "Option 1" ("Option")button to cycle through the current or time value of the test or fault. The test state is not remembered.

C. Reset

Before closing the circuit breaker, you must first press the "Clear light" button of the controller to put it into normal operation, and then press the red mechanical "Reset" button again to close the circuit breaker.

2.4 When the user has specific requirement for product characteristic based on Tables 4, 5 and 6, it can be specified during ordering and be adjusted according to the ordering requirement when leaving the factory.

2.5 If there is no specific requirement for user when ordering, the controller should be M type and factory value set at:

a. The long delay Ir1 is set to 1.0In, and the action time of 1.5Ir1 is set to 15s.

b. The short delay Ir2 is set to a value slightly greater than 8Ir1, with definite time limit of 0.4s. (In=4000A and above, Ir2=5In)

C. Instantaneous Ir3 is set at 12In. (In=4000A and above, Ir3=8In)

d. Ground fault Ir4 is set at 0.4In, and the action time is set at 0.2s.

2.6 If the user needs to make change to the factory setting value during use, after fully understanding this product, the user is allowed to set through the controller according to Table 4.

M type or H type controller

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

2- Current (voltage) and time display: it's capable of displaying current (voltage) or time value.

3-"Option" button. The normal operating state can display various current (voltage) values in a cyclic manner, while the fault state or fault inspection state can display fault current or time value in a cyclic manner.

4-LED indicator light, it's capable of indicating various states and categories.

5-"Clear light" button, it must be pressed once after the controller is set, tested for fault, or before the circuit breaker is closed, so as to keep the release in normal operation condition.

6-"Set" button. Check or set various protective characteristics for current or time. Press this button to cycle through various states.

7-"Fault check" button. After pushing the controller "Clear light", pressing this button can display and indicate the status of the last fault and the fault current or time value. The fault current or time can be checked cyclically by pressing the "Option" button.

8- "Trip" and "Non trip" buttons are used for testing functions.

9- "Store", "+" buttons are used for the current or time setting.

IR4- Setting value of ground protection current

Ir1- Long delay current setting value

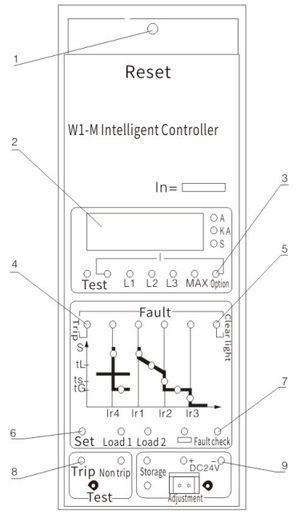
IR2- Short delay current setting value

Ir3- Instantaneous current setting value

TG -Ground protection time setting value

tL-Long delay time setting value

tS -Short delay time setting value



L type controller

1. Reset button

After the circuit breaker malfunctions or trips during the test, press this button to close the circuit breaker again.

2. Load display

It displays overload long delay current

3. The current setting values for long delay, short delay, instantaneous and ground protection are set according to the scale values on the knob.

4. Fault indicator light

It indicates the fault category.

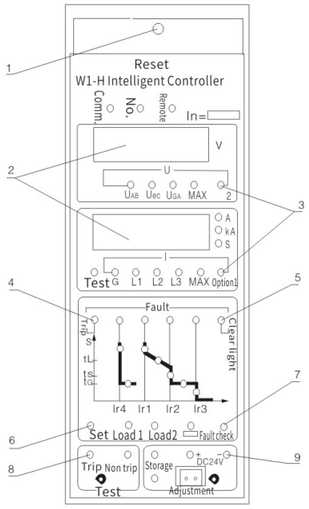
5. Long delay overload protection time setting, it adjusts the time by turning the switch position.

6. The short delay protection time setting, it adjusts the time by turning the switch position.

7. The ground fault protection time setting, it adjusts the time by turning the switch position.

8. Clear light button

After controller setting, testing and malfunction, this button must be pressed to put the controller into normal operation.



9. Fault check button

Press this button after the circuit breaker trips due to fault to indicate the cause of the fault trip. It still has fault memory function after power outage.

10. Test button

This button checks the good coordination between the controller and the circuit breaker.

L type setting method:

1. Long delay setting

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

b. Press the tL button to set the time to 30s, 60s, 120s and 240s;

C. If the Ir1 switch is turned to the OFF position, it means exiting this function.

2. Short delay setting

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

b. Press the ts button to set the time to 0.2s and 0.4s;

c. Rotating the Ir2 switch to the OFF position indicates exiting some functions.

3. Instantaneous setting

a. Rotate the Ir3 switch to set the current (3-10) In or (10-20) In or (7-14) In;

b. If the Ir3 switch is turned to the OFF position, it means exiting this function.

4. Ground fault protection setting

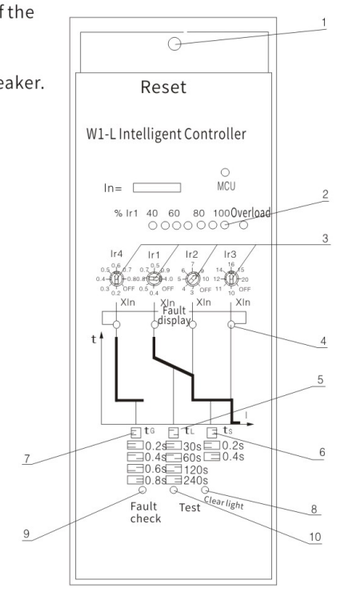
a. Rotating Ir4 switch setting current (0.2~0.88) In;

b. Press the tG button to set the time to 0.2s, 0.4s, 0.6s and 0.8s;

c. If the Ir4 switch is turned to the OFF position, it means exiting this function.

5. The controller enters the running state

Press the Clear light button after all controller parameters have been adjusted.



◎ 3 Common fault and troubleshooting

No.	Fault phenomenon	Cause	Troubleshooting
1	The circuit breaker cannot be closed	●The undervoltage release has no supply voltage and is not connected. ●After the intelligent controller acts, the red button on the upper part of the controller panel does not reset. ●The operating mechanism has not stored energy. ●Draw-out type body in "connection" or " test" position ●The "open position key lock" is in the locked state	●Check the circuit and connect the po wer supply of the undervoltage release. ●Press the reset button. ●Manually or electrically store the energy of the mechanism ●Use the handle to swing the circuit breaker body to the "connection" or "test" position. ●Use a dedicated key to open the keylock.
2	The circuit breaker cannot store energy electrically	●The power supply of the electric operating mechanism is not connected. ● Insufficient power capacity	●Check the circuit and turn on the power supply. ●Check that the operating voltage should be greater than 85% Ue.
3	The electromagnet can't make the circuit breaker close.	● No supply voltage ● Insufficient power capacity	● Check the circuit and turn on the power supply. ● Check that the operating voltage should be greater than 85% Ue.
4	The shunt release cannot disconnect the circuit breaker	●No supply voltage ● Insufficient power capacity	● Check the circuit and turn on the power supply. ● Check that the operating voltage should be greater than 85% Ue.
5	The fault current exceeds the long delay, short delay and instantaneou s setting value, and only instantaneous actions occurs, no short delay or long delay actions.	●The setting value of long delay, short delay and instantaneous setting is unreasonable, and the setting is within the same current value range.	● According to the principle of Ir1<Ir2<Ir3 and considering its action range, reset it.
6	Frequent tripping of circuit breaker	●The overload operation on site causes the overload protection to trip. Due to the failure of timely power cutoff and clearing of the overl oad thermal memory function, the circuit breaker recloses.	●Power off the controller once, or close the circuit breaker after 30 minutes
7	The crank handle of the draw-out type circuit breaker cannot be inserted into the circuit breaker	●The draw-out type guide rail or circuit breaker body is not fully pushed in.	●Push the guide rail or circuit breaker body to the bottom
8	The draw-out type circuit breaker body cannot be pulled out when in the disconnected position	●The crank handle is not pulled out. ●The circuit breaker has not fully reached the "disconnection" position.	●Pull out the crank handle. ●Fully swing the circuit breaker to the " disconnection" position.

Green energy Grid system Industrial power Rail traffic

■ Ordering specification (please tick √ or fill the number in□)

Client		Order quantity			Order date	
Model	□W1-2000 [I frame] □W1-3200 [II frame] □W1-4000 [III frame] □W1-6300[IV frame]	□ Fixed type □ Draw-out type	□ 3P □ 4P	Rated current In=	□ A □AC380 (4100) V □AC660 (690) V	

	Model("F" indicates generator protection)		Basic function		Optional additional functions or accessories
Intelligent controller	L type	□L2	Long delay, instantaneous (3~10) In	1. Load light column indication 2. MCU operation monitoring 3. Fault status indi cation 4. Fault memory 5. Instantaneous test function	□ 1. MCR ON/OFF and analog trip □ 2.Signal unit for pre-alarm, self-diagnosis and OCR trip alarm
		□L3	Long delay, short delay (3~10) In Instantaneous (10~20)In [I frame] (7~14)In [II frame]		
		□L4	Long delay, short delay (3~10)In Instantaneous (10~20)In [I frame] (7~14)In [II frame] Single-phase ground fault protection		
	M type	□M	Long time delay, short time delay, instantaneous, single-phase ground fault protection	1. Various off state indications and numerical display 2. Ammeter 3. Fault memory 4. Thermal memory 5. Test	□ 1. Load monitoring, mode 1 □ 2. Voltmeter, mode 2 □ 3. MCR ON/OFF and analog trip □ 4. Signal unit for pre-alarm, self-diagnosis and OCR trip alarm
		□M/F	Long delay, short delay, instantaneous, pre-alarm		
	M type	□H	1. Long delay, short delay, instantaneous, load monitoring; 2. Single-phase ground fault protection; 3. Various status indications and numerical display 4. Ammeter;5. Voltmeter;6. Fault memory; 7. Thermal memory 8. Test; 9. RS485 serial interface; 10. Alarm fault statusControl power supply		□ MCR ON/OFF and analog trip □ RS485/232 converter □ DP module
		□H/F			
		Control power supply	□AC220V □AC380V		□DC110 □DC220
Acce ssory	□ Undervoltage release		□AC220V □AC380V □ Undervoltage instantaneous release □ Undervoltage delay release □1s □3s □5s □ Undervoltage delay release □ Undervoltage delay release		
	□ Shunt release		□AC220V □AC380V □DC220V □DC110V		
	□ Energy release(closing) electromagnet		□AC220V □AC380V □DC220V □DC110V		
	□Electric operating mechanism		□AC220V □AC380V □DC220V □DC110V		
	□Mechanical interlock		□Horizontal interlock □ Vertical interlock □ Door interlock		
	□Open position key lock		□Lock □Key (please fill in the quantity)		
	□Door frame				
	□External single-phase ground current transformer		□ Differential type (3P+N) T □ Ground current type (3P+N) W		
	□Power transformer (for relay)		Input□~220V□~380V□-220V□-110V Output□~24V□-24V		
Connection	□ Horizontal connection (regular supply) □ Vertical connection				
Remark					

Note: 1) If the user selects the controller, additional functions or accessories can be added, and additional fees will be required.
2) The long delay setting value of the L type controller is 10% of In, with each gear decreasing.
3) When selecting H type controller, please indicate which communication protocol it is based on.
①Dedicated communication protocol
②DP protocol
③Modbus protocol

W2-1600 Series

Intelligent Air Circuit Breaker

- ◇ Featured with complete intelligence, high breaking capacity and zero arc;
- ◇ AC rated current 200A -1600A, short circuit breaking capacity 20kA~42kA; It has 3 and 4 poles, draw-out type and fixed type, and can be installed with inverted wires;
- ◇ With multiple intelligent controllers, providing different functions; intelligent function, display function
- ◇ Setting function, monitoring function, fault memory function, available for communication interface for remote measurement, remote adjustment, remote control and remote communication;
- ◇ With complete protection features, convenient setting and high accuracy, it has instantaneous, short delay, long delay, single-phase grounding and other protection characteristics.

Safe Energy-saving Intelligent Eco-friendly

—— The capable are infinite
Intelligence creates the future ——

Purpose and scope of use

The W2-1 600 Series intelligent air circuit breaker (hereinafter referred to as circuit breaker) is suitable for distribution networks with frequency of AC 50Hz, rated working voltage up to 690V and rated current ranging from 200A to 1600A. It's used to distribute electrical energy and protect lines and power equipment from overload, short circuit, undervoltage, single-phase grounding(leakage) and other faults. The circuit breaker has intelligent protection function and precise selective protection, can improve power supply reliability and avoid unnecessary power outages. Meanwhile, it has open type communication interface, which is convenient for fieldbus connection, and can be used for four remote operations to meet the requirements of the control center and automation system. Equipped with corresponding leakage transformer and intelligent controller, leakage protection can be achieved.

The circuit breaker has isolation function and is represented by symbol "—⟋|—"

The circuit breaker with rated working current of 630A and below can also be used for overload, short circuit, phase loss, undervoltage and ground protection of motor in AC 50 (60) Hz, 400V distribution network. Under normal condition, the circuit breaker can also serve for infrequent switching of circuit and infrequent starting of motor.

The circuit breaker complies with GB14048.1-2012 Low-voltage switchgear and controlgear-Part 1: General rules; And GB 14048.2-2008 Low-voltage switchgear and controlgear-Part 2: Circuit breakers; GB14048.4-2020 Low-voltage switchgear and controlgear-Part 4-1:Contactors and motor-starters-Electromechanical contactors and motor-starters(Including motor protector)

Model and meaning and classification

W 2 - □ / □ / □

- Rated current
- Number of circuit breaker poles (3P, 4P)
- Rated frame current
- Design code
- Air circuit breaker

◎ Classification by utilization category:

Main circuit: category A (non selective), category B (selective), and AC-3 (direct operation motor)
Auxiliary circuit: AC-15, DC-13;

◎ Installation method: fixed type, draw-out type;
◎ Transmission method: electric motor transmission, manual;
◎ Number of poles: three poles, four poles;
◎ Type of release: intelligent controller, shunt release, undervoltage instantaneous (or delayed) release;
◎ Classification of intelligent controller:

2M type: economic type (basic function)
3M type: basic type (basic function+ intelligent function)
3H type: advanced type (basic function+ intelligent function +communication interface).

Normal working and installation condition

◎ Ambient air humidity: The upper limit shall not exceed +40°C; the lower limit shall not be less than -5°C; the average value within 24 hours shall not exceed +35°C;
◎ Note: For working condition where the upper limit value of the ambient air used exceeds +40°C or the lower limit value is below -25°C, the user should consult with the manufacturer.
◎ Altitude: The altitude of the installation site shall not exceed 2000m.
◎ Atmospheric condition: When the maximum temperature is +40°C, the relative humidity of the air does not exceed 50%.
◎ At lower temperatures, there can be higher relative humidity, such as 90% at 20°C. Special measures should be taken for occasional condensation caused by temperature change.
◎ Pollution level: level 3
◎ The circuit breaker is installed inside the cabinet and equipped with door frame, with protection level of IP40.
◎ Te installation category of main circuit of circuit breaker, coil of undervoltage release, primary coil of power transformer is IV; and the installation category of auxiliary and control circuit is III.
◎ Utilization category: category B.
◎ Transportation and storage condition for circuit breaker: -25°C to 55°C, up to 70°C in a short period of time (within 24 hours).
◎ The circuit breaker should be installed in place without explosion hazard and conductive dust sufficient to corrode metal and damage insulation, and the vertical inclination of the circuit breaker should not exceed 5°.

Technical data and performance

1. The rated current of the circuit breaker is shown in Table 1

Table 1

Rated frame current Inm (A)	Rated current In (A)
1600	200、400、630、800、1000、1250、1600

2. Rated insulation voltage Ui of circuit breaker: 690V; Rated working voltage Ue: 400V, 690V.
3. The rated short-circuit making and breaking capacity of the circuit breaker should not be less than 2.1 Icu.
4. The rated short-circuit breaking capacity and short-term withstand current of the circuit breaker are shown in Table 2.
5. Intelligent controller protection characteristic
5.1 The characteristic curve of overcurrent release protection is shown in Figure 1, and the characteristic curve of ground fault protection is shown in Figure 2.
5.2 The setting value and error of the intelligent controller are shown in Table 3.

Table2

Rated frame current Inm (A)	1600		Incoming method	Arc distance
Rated ultimate short-circuit breaking capacity Icu (kA) O-CO	AC400V	≥ 55	Upper or lower incoming line	Zero arc
	AC690V	≥ 40		
Rated service short-circuit breaking capacity Ics (kA) 0-CO	AC400V	≥ 50		
	AC690V	≥ 35		
Rated short time withstand current Icw (kA) Is O-CO	AC400V	≥ 42		
	AC690V	≥ 35		

Table3

Overcurrent tripping characteristic	Setting value range		Factory setting value
	2M/2H	3M/32H	
Long delay Ir	(0.4~1)In+OFF	(0.4~1)In+OFF	1In、120s
Short delay Isd	(1.5 ~ 15)In+OFF	(1.5 ~ 15)In+OFF	6In、20s
Instantaneous Ii	1In ~ 50kA+OFF	1In ~ 50kA+OFF	10In
Ground fault Ig	(0.2~1)In+OFF	(0.2~1)In+OFF	0.4In、0.2s

Note: 1. OFF indicates that the overcurrent release protection characteristic is in the off state.
2. Unless otherwise specified by the customer, the product is set to the factory setting value when leaving the factory. If the customer needs to set the value, please refer to the intelligent controller user's manual.

5.3 Intelligent controller long delay overcurrent protection inverse time limit action characteristic

Intelligent controller long delay overcurrent protection inverse time limit action characteristic: $I^2T_R = (1.5I_R)^2 t_R$ (where t_R: time setting time for long delay $1.5I_R$, I_R: long delay set current, T_R: long delay action time), see table 4 for action time, with return coefficient of not less than 0.9, and return current of $0.9I_R$.

Table 4

Current setting value	Action time										Accuracy
	2M/2H				3M/3H						
1.05I_R	>2h non action				>2h non action						±15%
1.3I_R	⩽ 1h action				⩽ 1h action						
1.5I_R	30s	60s	120s	240s	15s	30s	60s	120s	240s	480s	
2.0I_R	16.9s	33.7s	67.5s	135s	8.4s	16.9s	33.7s	67.5s	135s	270s	
7.2I_R	1.3s	2.6s	5.2s	10.4s	0.65s	1.3s	2.6s	5.2s	10.4s	21s	
Tripping level	-	10A	10	20	-	-	10A	10	20	30	

Note: The above is the setting time for distribution and motor protection. The setting time for generator protection can be negotiated between the user and the company.

5.4 Intelligent controller short circuit short delay action characteristic:

Short circuit short delay overcurrent protection is generally of definite time limit. If low multiple is required as the inverse time limit, its characteristic is as follows: $I^2T_s = (8I_R)^2$tsd (Ts is the short delay setting time, tsd is the short delay action time). When the overload current is $8I_R$, it automatically switches to the definite time limit characteristic, and its action characteristic is shown in Table 5.

5.5 Intelligent controller short-circuit instantaneous action characteristic:

The instantaneous action time of the short circuit (including the inherent breaking time of the circuit breaker) should be less than 30ms, and its action characteristic is: 0.85Ii non-action, >1.15Ii action.

Table 5

Protection method		Action time				Accuracy
		2M/2H		3M/3H		
Definite time limit	Tripping time setting value tsd	200ms	400ms	0.1s~1s (0.1s differential)		±10%
	Maximum breaking time	230ms	460ms			
	Non-tripping duration	140ms	330ms			
Inverse time limit characteristic		None		The curve is the same as that of the overload delay, but the curve speed is 10 times faster		
Action characteristic		⩽ 0.9Isd non action				
		>1.1 Isd delay action				

5.6 The action characteristic of ground fault protection is of definite time limit, and it delay characteristic complies with Table 6.

Table 6

Protection method		Action time					Accuracy
		2M/2H				3M/3H	
Definite time limit	Tripping time setting value tsd	200ms	400ms	600ms	800ms	0.1s~1sOFF (0.1s differential, OFF position only alarms without trip)	±10%
	Maximum breaking time	230ms	460ms	650ms	850ms		
	Returnable time	140ms	330ms	560ms	760ms		
Action characteristic		⩽ 0.8Isd non action					
		>1.0 Isd delay action					

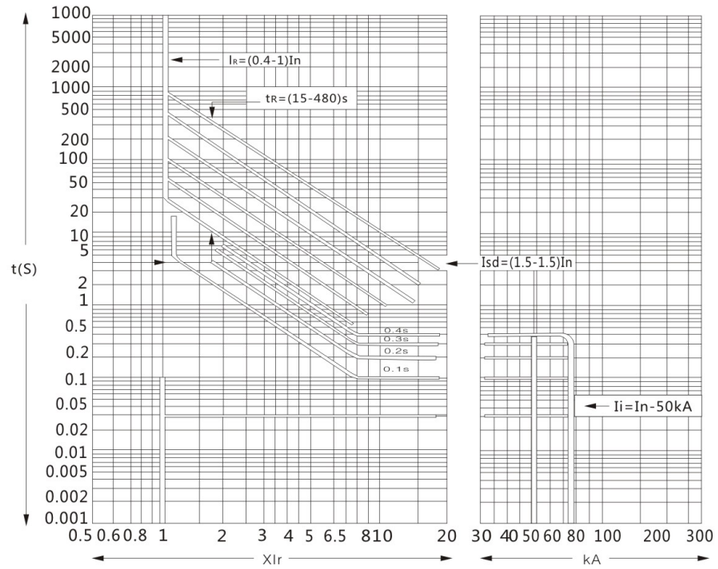


Figure 1 Overcurrent release protection characteristic curve

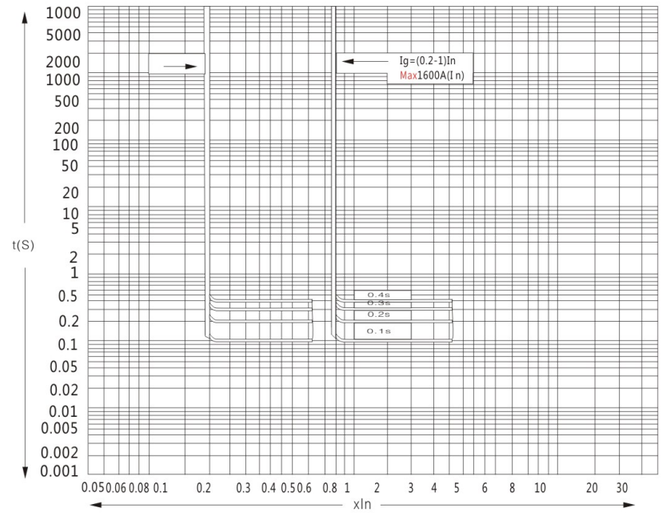


Figure 2 Ground fault protection characteristic curve

5.7. Residual current protection is achieved by connecting external leakage transformer for detecting residual current signal, with delayed action characteristic. Its delay characteristic complies with Table 7 (excluding the inherent working time of 20ms).

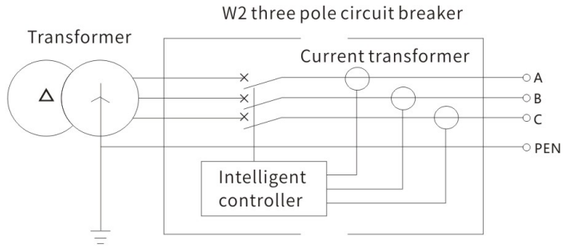
Rated residual operating current IΔn: 3A, 10A, 20A, 30A.

The minimum value of rated residual non-operating current (IΔno) is 0.51ΔN.

Ultimate non driving time (at 2IΔn)	0.06s	0.1s	0.2s	0.3s	0.4s	0.5s	1s
Residual current	Maximum breaking time (s)						
I△n	0.36	0.50	1.00	1.50	2.00	2.50	5.00
2I△n	0.18	0.25	0.50	0.75	1.00	1.25	2.50
5I△n、5I△n	0.07	0.10	0.20	0.30	0.40	0.50	1.00

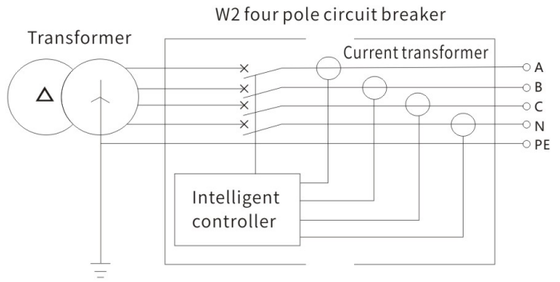
5.8 Ground or residual current protection methods

It is a protective function of the equipment due to the residual current to the ground. According to the magnitude of leakage current, it is classified into ground protection and residual current protection. Ground protection is the protection provided by the controller based on the vector sum of three-phase current and neutral current. According to the number of poles in the circuit breaker, there are three protection methods: 3PT, 4PT and (3P+N) T (see Figure 3). Residual current protection refers to the controller directly taking the output current signal of the external current transformer for protection. With high protection sensitivity, it's especially suitable for protection of low ground currents of tens of amperes. There are two methods for sampling grounding signal, one is rectangular transformer (ZCT1) sampling and the other is circular transformer (ZT100) sampling with a diameter of 100mm.



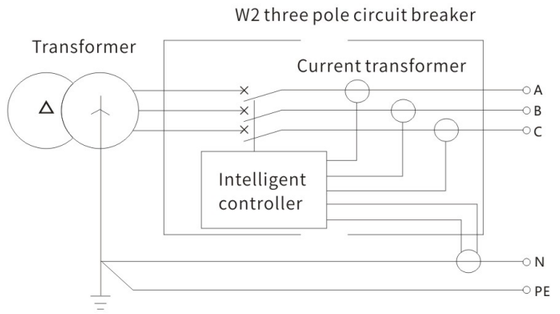
3PT type

Differential type ground fault protection, where the signal only takes the vector sum of three-phase current (three-phase imbalance)



4PT type

Differential type ground fault protection, where the signal only takes the vector sum of three-phase current and N-phase current



(3P+N) T type

External neutral pole transformer

Differential type ground fault protection, with the signal taken as the vector sum of three-phase current and – phase current

Figure 3 Ground protection method

6. The working voltage and required power consumption of the circuit breaker's shunt release, undervoltage release, electric operating mechanism, energy release (closing) electromagnet and intelligent controller are shown in Table 8.

Table 8

Item	AC (50Hz)		DC	
	220V	380V	110V	220V
Shunt release	24VA	36VA	24W	24W
Undervoltage release	24VA	36VA	-	-
Closing electromagnet	24VA	36VA	24W	24W
Electric operating mechanism	85VA	85VA	85W	85W
Intelligent controller supply voltage	AC220V、AC380V、DC220V、DC110V、DC24V			

Note: 1. The working voltage of the controller is DC24V, and the primary side of the transformer or power module can provide voltages of AC380V, 220V (50Hz) or DC220V, 110V.

2. The reliable operating voltage range of the shunt release is 70%~110%, and that of the closing electromagnet and operating mechanism are 85%~110%

7. The performance of the undervoltage release of the circuit breaker is shown in Table 9

Table 9

Category		Undervoltage delay release	Undervoltage instantaneous release
Release action time		1,3,5s delay	Instantaneous
Release action voltage value	35%~70%	The circuit breaker can reliably open	
	≤35%Ue	The circuit breaker cannot close	
	(85~110%) Ue	The circuit breaker can reliably close	
If the supply voltage recovers to 85% Ue within 1/2 delay time		The circuit breaker doesn't open	-

Note: The accuracy of the delay time is ±10%

8. Performance of auxiliary contact

8.1 The conventional thermal current of the auxiliary contact is 6A, the rated working voltage is 127V, 220V, 380V for AC and 110V, 220V for DC, and the control capacity is 300VA/Ue (AC) and 60W/Ue (DC);

8.2 Auxiliary contact form:4NO,4NC. Special forms should be specified when ordering.

9 Open position key lock (optional)

The circuit breaker is equipped with an "open position key lock" accessory (supplied according to order requirement), which can lock the circuit breaker in the open position. At the moment, neither the closing button nor the release (closing) electromagnet can close the circuit breaker. It's suitable for interlocking between long-distance circuit breakers.

10. Steel cable mechanical interlocking or linkage type mechanical interlocking (optional) can achieve interlocking of two or three circuit breakers installed horizontally or vertically in different states.

11. Door interlocking (optional)

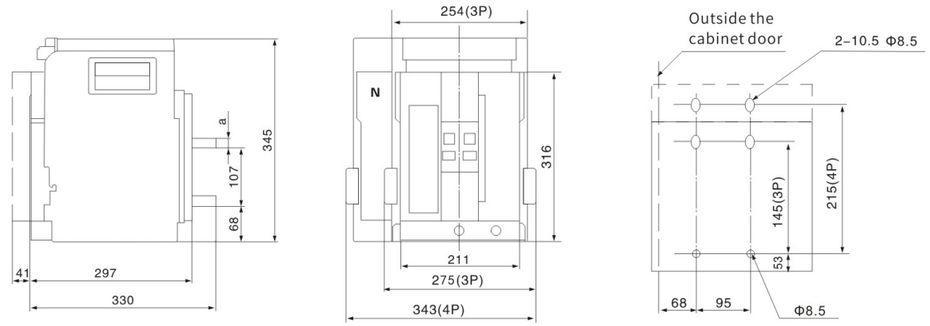
When the circuit breaker is in the "connection" or "disconnection" position, it is prohibited to open the cabinet door. If the cabinet door is opened, and the circuit breaker is in the "test" position, the cabinet door can be closed without disconnecting the circuit breaker.

Intelligent controller function list

Table 10

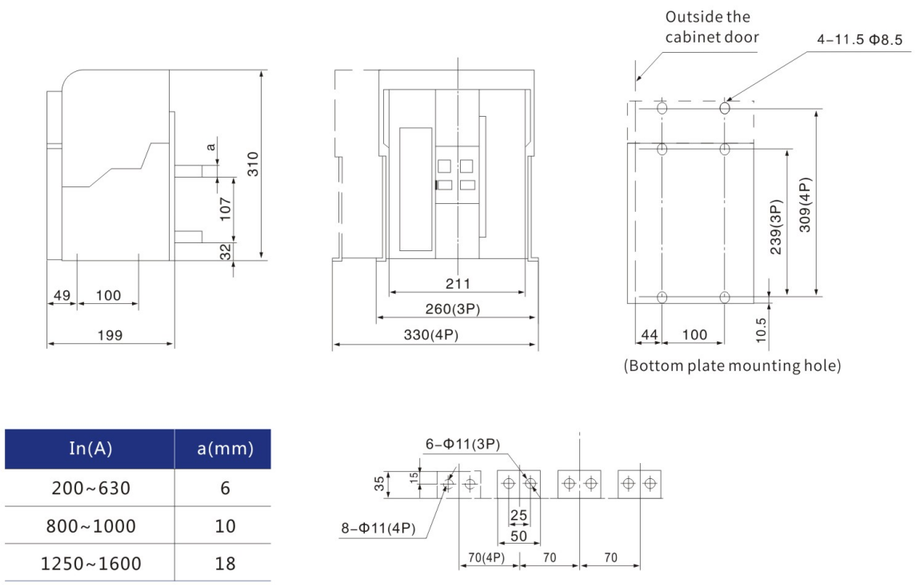
Controller model	2M/2H	3M	3H
Overload long delay protection	√	√	√
Short circuit short delay protection	0	√	√
Short circuit instantaneous protection	√	√	√
Ground imbalance protection	0	√	√
Current imbalance protection	-	0	0
Leakage protection	-	0	0
Function test	√	√	√
Fault memory	√	√	√
Signal contact output	0	0	0
Thermal memory	√	√	√
Self-diagnosis	√	√	√
MCU working indication	√	-	-
Current column display	√	-	-
Ammeter	-	√	√
Making and breaking, out-of-limit adjustment	0	0	0
Load monitoring	-	0	0
Fault status indication and numerical display	-	√	√
Physical measurement	-	√	√
Communication	-	-	√
Contact wear indication	-	0	0
Zone interlock	-	√	0
Harmonic measurement	-	√	0
Voltage protection	-	√	0
Historical memory of grid parameter	-	√	0

(Draw-out type) installation dimension



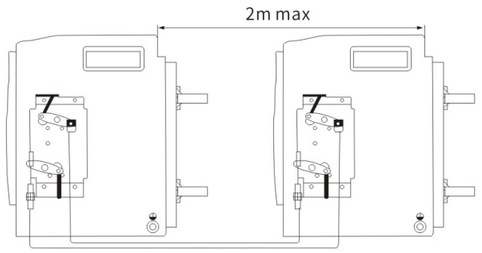
In(A)	a(mm)
200~630	6
800~1000	10
1250~1600	18

(Fixed type) installation dimension

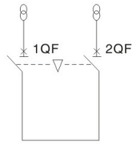


In(A)	a(mm)
200~630	6
800~1000	10
1250~1600	18

Steel cable interlocking of two horizontally placed or stacked circuit breakers



Circuit diagram Possible operating mode

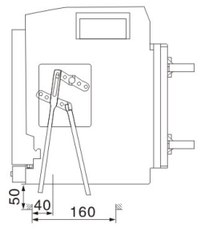


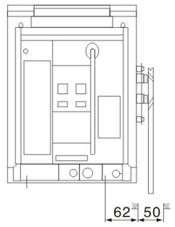
1QF	2QF
0	0
0	1
1	0

Linkage interlocking of two stacked circuit breakers

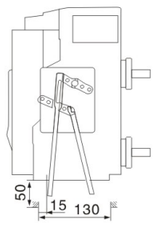
Note: The length of the steel cable for steel cable interlocking is usually 2.5m, and 1.5m steel cable can also be provided, but the user needs to indicate when ordering.

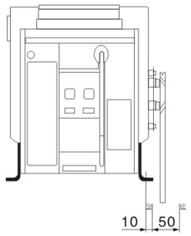
Draw-out type





Fixed type

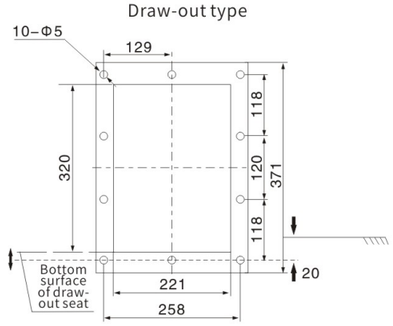




Note: The spacing between the upper and lower mounting plates is 0.6m~0.7m.
"The "opening" locking device: it can lock the opening button of the circuit breaker in the pressed position. At this time, the circuit breaker will not be able to close. After the user chooses to install it, the factory provides lock and key; three circuit breakers are equipped with three identical locks and two keys.

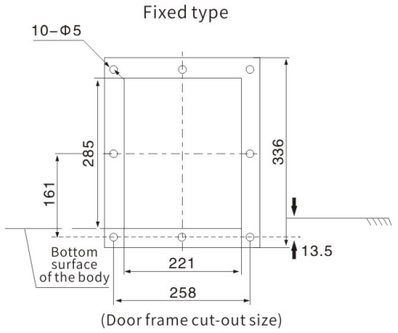
Cut-out and installation dimension of circuit breaker door frame

Draw-out type



(Door frame cut-out size)

Fixed type



(Door frame cut-out size)

Tips: This product is a draw-out type with "disconnection", "test" and "connection" three position locking device to prevent user from misoperation. When in the corresponding indication position, if the red button pops up, it cannot proceed to the next step without resetting.

Circuit breaker control circuit wiring diagram

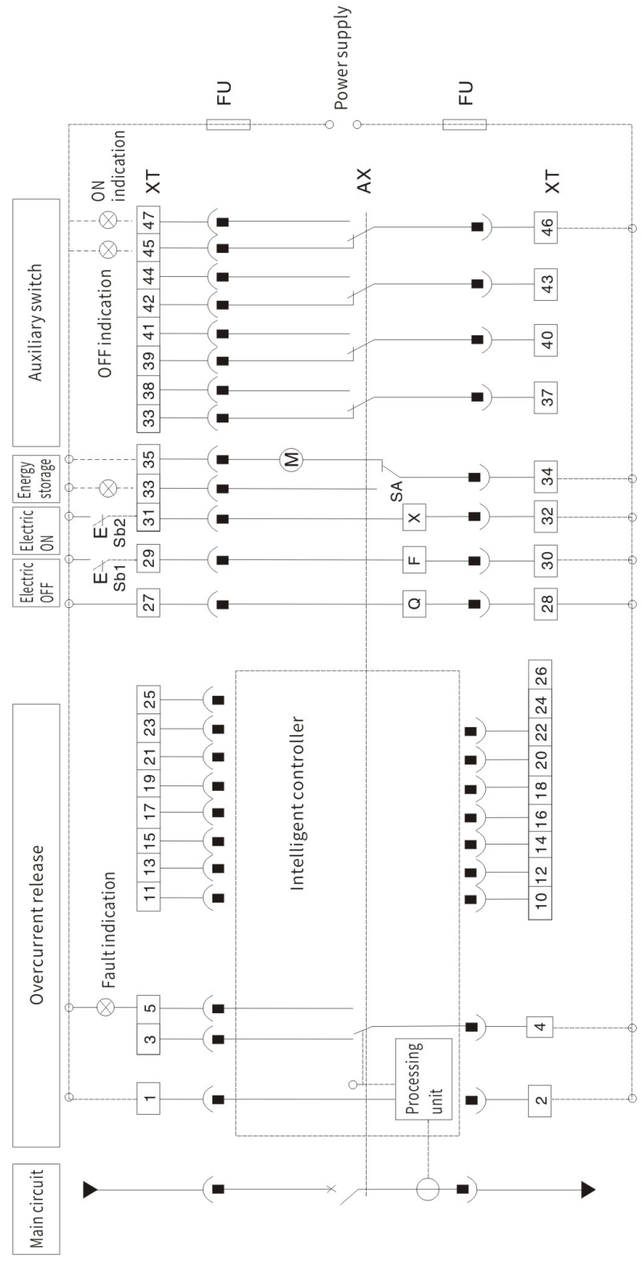
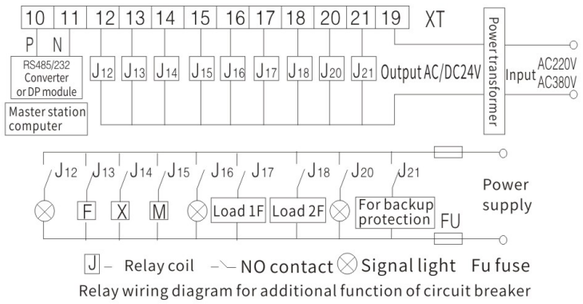


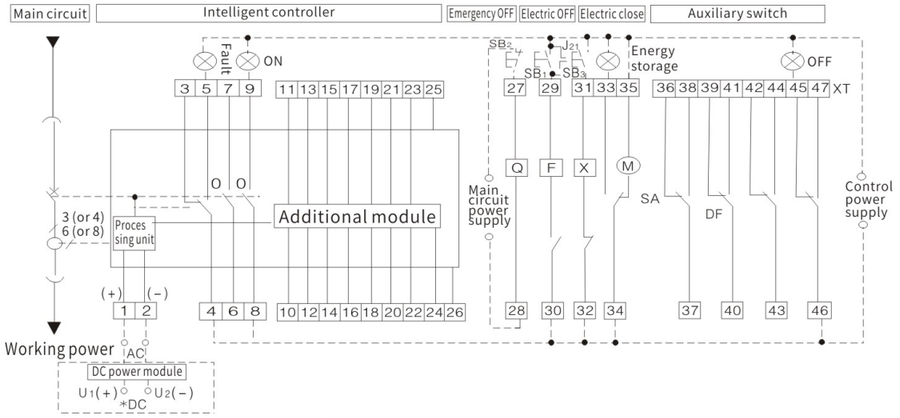
Figure 7W2-1600 intelligent release secondary wiring diagram

Other wirings of intelligent controller:
#1, #2 AC working power input (input from DC power modules U1 and U2 during DC)
#10 RS485 communication P terminal (simplex) remote adjustment and remote communication
#11 Rs485 communication N terminal (simplex) remote control
and remote measurement, etc
#12 Overload pre-alarm signal output
#13 Communication remote control shunt trip output
#14 Instantaneous short delay trip signal output or communication remote control closing output
#15 Long delay trip signal output or communication remote control energy storage output
#16 Ground (or zero) fault trip signal output
#17 Unloading 1 signal output
#18 Unloading 2 signal output
#19 Signal output common line
#20 Self-diagnosis signal output
#21 Trip signal (available for shunt or undervoltage actuators)
#22 Voltage signal phase A
#23 Voltage signal phase B } Directly input from the main circuit
#24 Voltage signal phase C
#25, 26 External neutral pole or ground current transformer input



Relay wiring diagram for additional function of circuit breaker

1) The controller signal output drives the external relay J to output contact action signal through terminals 12~18, 20 and 21.
2) The RS485y232 converter, DP module and power transformer (the user needs to specify the input voltage value in the order specification) are provided by the manufacturer. The power transformer can be inserted into the standard guide rail together with the relay base and installed by the user in the appropriate position of the switchgear.
3) Relay model: HH62P, AC/DC24V, provided by user.
4) Main station computer is provided by user.
5) Terminals 13~15 output can be used for opening, closing, and other functions of communication remote control. The trip signals of corresponding terminals 14 and 15 are no longer output at this time. The normally open contact of the corresponding relay can be connected in parallel with the corresponding manual control button, which can achieve both manual control and remote control. If remote control function is not required, terminals 14 and 15 can be connected to two signal lights in series through the normally open contacts of relays J14 and J15, and the corresponding signal can be remotely output. Please specify whether remote control function is required in the order specification, and the manufacturer will determine the corresponding function output by terminals 14 and 15 based on this. Terminal 21 output drives relay J21 for backup protection.
6) Output conditions of self-diagnosis signal: a. The internal temperature of the controller is>80°C; b. The chip is not working properly; c. The controller loses power.
7) The user can choose to connect to J12, J14~J16, J20 and J21 according to actual needs.



Note: (1) If the control supply voltage of F, X and M is different, they should be connected to different power supplies separately.
(2) Terminal #33 can be directly connected to the power supply (automatic energy pre-storage) or connected in series to the normally open button and then connected to the power supply (manual energy pre-storage).
(3) If requested by the user, terminals # 6~#7 can output normally closed contact.
(4) Additional accessories are provided by the user.
(5) *When the working power of the intelligent controller is DC power, DC power module must be added (at this time, terminals #1 and #2 cannot be directly connected to AC power). The secondary wiring is shown in the figure (DC power supply DC110V or 220V is input from U1(+) and U2(-), and the two output terminals of the DC power module are respectively connected to terminals 1(+) and 2(-) of the secondary wiring base).

SB1 shunt button (provided by user)
SB2 undervoltage button (provided by user)
SB3 closing button (provided by user)
X closing electromagnet
M energy storage motor
XT wiring terminal
DF auxiliary contact
F shunt release
SA motor microswitch
Q undervoltage release or undervoltage delay release
O NO contact (3A/AC380V)
⊗ Signal light (provided by user)

Figure 8 W2-1600H intelligent release (LCD display type) secondary wiring diagram

1. Controller user wiring diagram

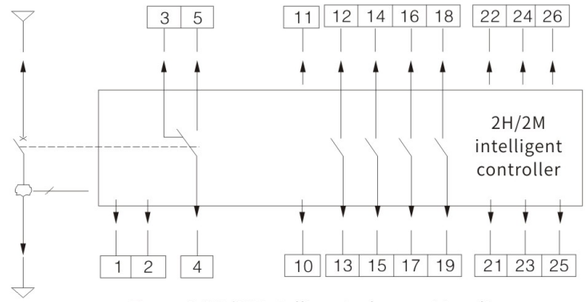


Figure 9 2M/2H intelligent release wiring diagram

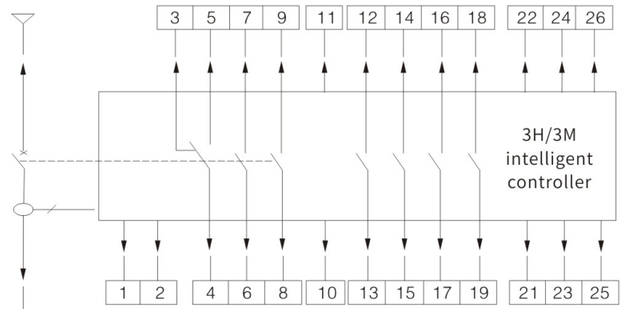


Figure 10 3M/3H intelligent release wiring diagram

Pin definition (relay in default state)

Wire number	Function	Note
1#、2#	Auxiliary power input terminal, regardless of polarity	
3#、4#、5#	Controller status output	
6#、7#	Normally open node	
8#、9#	Normally open node	
10#	Communication outgoing line for 2H type networking	485A
11#	Communication outgoing line for 2H type networking	485B
12#、13#	Load monitoring 1 output (relay contact signal)	Relay 1 contact output
14#、15#	Load monitoring 2 output (relay contact signal)	Relay 2 contact output
16#、17#	2H remote control opening (2M pre-alarm)	Relay 3 contact output
18#、19#	2H remote control closing (2M tripping)	Relay 4 contact output
20#	Ground wire	
21#	UN neutral line input	
22#、23#、24#	Three phase voltage input terminals A, B and C respectively	
25#、26#	External N-phase transformer input terminal	

Note: The four relay contact functions can be programmed as instantaneous fault alarm, grounding alarm, imbalance alarm, short delay alarm, overload fault alarm, fault trip alarm, load 1 alarm, load 2 alarm, self-diagnosis alarm, power grid fault alarm, remote opening and closing.

Ordering specification

(Please tick √ or fill in the number in , one specification one sheet)

Client		Order quantity (set)		Order date / Delivery date	
Model	W2-1600	Number of poles	□3P □4P	Installation method	□ Fixed type □ Draw-out type
Rated working voltage	□AC400V □AC690V	Rated current In=	A		

Intelligent controller	Type	□ 3H type	□ 3M type	□ 2M/2H type
	Basic function	□ Overload long delay protection □ Grounding or residual current protection	□ Short circuit delay protection □ Fault memory function	□ Short circuit instantaneous protection □ Test function
	Optional function	□ Ammeter function □ Load monitoring function	□ Thermal simulation function □ MCR function	□ Communication function □ Self-diagnosis function
	Grounding method	□3PT	□4PT	□ (3P+N) T (additional transformer required) ★
	Controller power supply	□AC400V		
		□AC230V		
Standard accessory	Shunt release	□AC400V	□AC230V	
	Closing electromagnet	□AC400V	□AC230V	
	Electric operating mechanism	□AC400V	□AC230V	
	Auxiliary switch	□ Standard type (4 sets of conversion contacts)		
Optional accessory	Undervoltage release	□AC400V	□ Undervoltage instantaneous release	
		□AC230V	□ Undervoltage delay release	□1S □2S □3S
	Opening position lock	□ 1 lock 1 key	□ 2 locks1 key	□ 3 locks 2 keys
	Mechanical interlock	□ Steel cable interlock (2 sets)	□ 2 lever interlocked switches	
	Other accessories	□ Door interlock □ Extended bar	□ Draw-out seat three position lock □ Others	
	Connection	□ Horizontal wiring	□ Vertical wiring	□ Special wiring

Note: When the user chooses the optional function with "★", additional fees will be required. If the user has any other special requirement for ordering, please consult with the manufacturer.

Dual power automatic conversion system

Structure Introduction

Two mechanically interlocked W1 circuit breakers equipped with automatic transfer controller can form dual power automatic transfer system. The controller has complete plastic shell installed on the box or cabinet door, and reliable electronic components, relays and integrated circuits are used inside the controller.

The power conversion system is an intelligent dual power switching module that integrates programmable function, automated measurement, LCD display and digital communication. It integrates digitization, intelligence and networking, achieving automation in the measurement and control process and reducing human operational error, and is an ideal product for dual power switching. The dual power automatic switching controller is composed of microprocessor as the core, which can accurately detect three-phase voltage of two circuits, make accurate judgment and handle voltage abnormality (overvoltage, undervoltage, phase loss, overfrequency, underfrequency), and after the adjustable delay (0-9999s), the command relay sends closing or opening command to the circuit breaker to complete the conversion between power supplies, ensuring the continuity and safety of power supply.

Performance and characteristic

◎The system type can be set to #1 mains supply #2 mains supply, #1 mains supply #2 power generation, # 1 power generation #2 mains supply, #1 power generation #2 power generation;
◎The LCD is 128x64 with backlight, displayed in two languages (Simplified Chinese and English), and it can be operated with touch of button;
◎It collects and displays three-phase voltage and frequency parameter of two circuits;
◎It owns protection functions for overvoltage, undervoltage, phase loss, reverse phase sequence, overfrequency and underfrequency;
◎Equipped with automatic/manual state switching, the switch can be forced to close and open in manual mode;
◎All parameters can be programmed on site, secondary password is used to prevent non professional personnel from misoperation;
◎On site, it can be set to loaded/unloaded mode for the trial operation of the generator set;
◎Equipped with switch reclosing and power outage retrip function;
◎Real time clock display;
◎It has the ability to start and stop the generator set at a fixed time, it can be set for single operation, once a month or once a week, and can also be set to operate with or without load.
◎It can control the cyclic operation of two generator sets, and the operating time and interval shutdown of the generator set can be set.
◎The equipped RS-485 isolated communication interface applies ModBus communication protocol, it has remote control, remote signaling, and remote measurement functions. It can remotely control the start and stop of the generator set, as well as the opening and closing functions of the ATS;
◎It can query the current controller status (including internal switching value such as input port, overvoltage, undervoltage, etc.);
◎It's suitable for various wiring types (three-phase four-wire, three-phase three-wire, single-phase two-wire, two-phase three-wire types).

Parameter configuration

The parameter that the controller can set includes: normal voltage delay of one circuit, abnormal voltage delay of one circuit, normal voltage delay of two circuits, abnormal voltage delay of two circuits, switch conversion interval, on/off time, generator startup delay, generator shutdown delay, over voltage threshold, undervoltage threshold, over/under frequency threshold, power switching priority, system type, time and date, programmable input/output port function and communication parameter, etc. It can also be equipped with current display (The current transformer needs to be provided by user) and current overload alarm function.

The user can adjust and program on site through the controller manual according to the on-site operation needs to meet the electricity demand.