Circuit breaker internal accessories

◇ The inverse time limit action characteristic of the long time delay overcurrent protection is IT=(1.5Ir1) tL. The action time of (1.05~2.0) Ir1 is shown in Table 5, and the time error is ± 15%.

1.05Ir1	1.3Ir1	L.5Irl setting time s	15	30	60	120	240	480
> 2h no action	< lh action	2.0Irl setting time s	8.4	16.9	33.7	67.5	135	270

Note: tL- setting time of long delay of 1.5Ir1 t action time of long delay.

◇ short time delay overcurrent protection characteristics
The short time delay overcurrent protection is a definite time limit. If the low multiple is required to be an inverse time limit, its characteristics shall be I ts = (4Ir1) ts, and ts is the general delay design time. Ts is the short time delay action time. When the overload current is greater than 4ir1, it is automatically converted to a definite time limit characteristic.. See Table 6 for its definite time limit characteristics. The error is 15%.

Delay time (s)				Shell return time (s)			
0.1	0.2	0.3	0.4	0.03	0.14	0.23	0.35

See Figure 1 for overcurrent tripping protection characteristics and Figure 2 for grounding fault protection characteristics.

characteristic curve

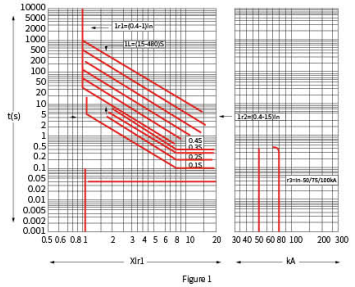

Figure 1

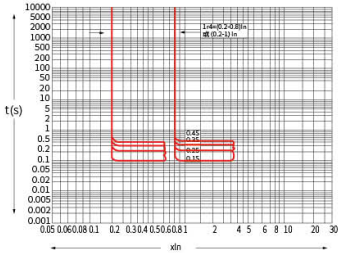

Figure 2

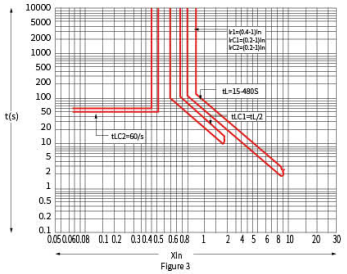

Figure 3

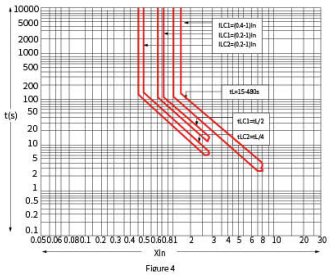

Figure 4

The function of M intelligent overcurrent controller

a. Ammeter function: it can display the running current and ground leakage current of each phase, normally display the maximum phase current, and also display the current value or time value of setting, test and fault.
b. Voltmeter function: it displays the voltage of each line, and normally displays the maximum value.
c. Remote monitoring and diagnosis function
The controller has the function of local fault diagnosis, can send out the error "E" display or alarm, when the computer fails,and restart the computer at the same time, and disconnect the circuit breaker when the user needs it. When the local ambient temperature reaches 80℃ ,an alarm can be given and the circuit breaker can be disconnected when the current is small (when the user needs it).
The intelligent controller has the functions of overload, grounding, short circuit, load monitoring, pre-alarm, tripping indication (OCR) and other signals output through contacts or optical couplers to facilitate the user's external remote control contact capacity DC28V1 and AC125V1.
d. Setting function
Use the four buttons of Set+Store to set various parameters of the controller. Set it to the desired setting state (indicated by the status indicator), then press the+or key to adjust the parameter size to the required value, and then press the storage button. If the storage button lights up once, the setting value is locked. The protection parameters of the controller shall not be cross set. After the controller is powered off and reset, press the setting key again to check the set parameters circularly.
e. test function
Using the set+trip and no trip reset keys,various protection characteristics of the controller can be checked. Use the set+key to adjust the test current of a simulated fault (be careful not to press the storage lock) and then press the trip or non-trip key to test the controller for fault handling. Press the tripping key to disconnect the circuit breaker. Press the non-tripping key not to break the circuit breaker, and the various indicating states of the controller are normal. After the test, press the reset or clear button to conduct other tests
Note: For the convenience of the test, whether the grounding leakage is set at the tripping or alarm position,the tripping treatment shall be carried out, and the priority is lower than the overload protection. Once a fault occurs during the test, the controller will automatically stop all tests and enter intoo fault treatment.
f. Load monitoring function (load 1, load 2)
Set two setting values, ILC1 setting range(0.2-1) In and ILC2 setting range(0.2-1) In. ILC1 delay characteristic is an inverse time characteristic, and its time setting value is 1/2 of the long delay setting value. There are two types of 1/2 ILC2 delay characteristics: the first type is an inverse time characteristic, its time setting value is 1/4 of the long delay setting value, and the second type is a fixed time characteristic,and its delay time is 60S. The former is used to disconnect unimportant loads at lower level when the current is close to the overload setting value, and the latter is used to cut off unimportant loads at lower level and thenthe current drops to keep the msin circuit and important load circuit powered When the current drops to ILc2, the command is issued after a certain delay to connect the cut off circuit at lower level again to restore the power supply of the whole system. Users of the above two types of monitoring protectioncan choose one of their monitoring characteristics as shown in Figure 3 and Figure 4.
g. description of MCR on-off and off-limit tripping functions (optional)
The controller can choose MC daily on-off and off-limit tripping protection as backup protection functions. Both modes are instantaneous actions, and MCR current values are generally 40kA in frame I, 60kA in frame II and 80kA in frame III. The out of limit tripping current is generally 50kA in frame I, 75kA in frame II and 125kA in frame III. The fault current signal directly instructs the MC to turn on and break the protection on a daily basis through the hardware comparison circuit ,which only works during the closing time)abouttection only in the closing time (about 125ms) of the circuith breaker,while the out of limit tripping function always works iduring operation.
h. Thermal memory function
After the controller overload or short-circuit delay tripping, it has the memory function of simulating bimetallic characteristics before the controller is powered off. The overload energy is released for 30min, and the short-circuit delay energy is released for 15min. During this period, overload, short-circuit delay fault, tripping time will be shortened, the controller is powered off, and the energy will be reset automatically .

H intelligent controller

In addition to all M-type functions, it also has a serial communication interface. through which a local area network system (hereinafter referred to as the system) with a master-slave structure can be composed. One or two computers are used as the master station and some intelligent circuit breakers or other communication interface components are used as the network structure of the slave station system ias shown in the following figure. The circuit breaker unit system, can realize remote"four remotes" functions to monitor various power grid parameters and operation parameters, monitor the adjustmentand download of various protection limit parameters under the current operation state of intelligent circuit breaker, and control the on-off operation of intelligent circuit breaker. The system is suitable for the construction and transformation of distribution monitoring systems in various power stations, small and medium-sized substations, industrial and mining enterprises, buildings, etc. Connection diagram of special communication protocol interface.

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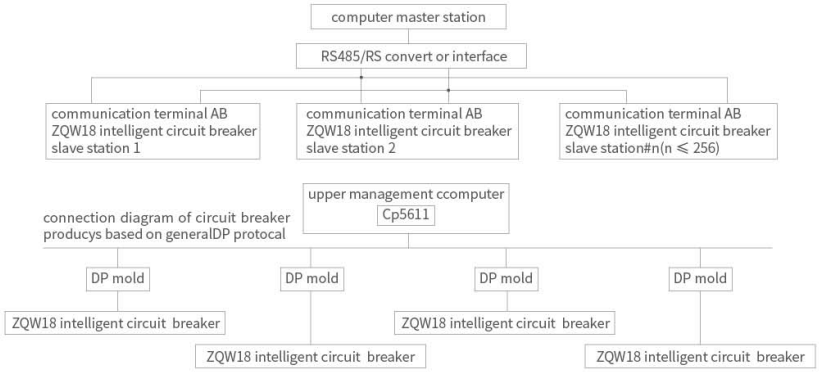
Intelligent universal circuit breaker



◆ Composition of the system

a.hardware structure of data communication network system

The intelligent circuit breaker provides standard RS 485 communication interface,which is led out from No.10 and No.11 outgoing lines of the citcuit breaker;

Catagory A shielded twisted pair of communicationn medium connected to the system

b.Main characteristics of the network

Two way serial data transmission, the product can provide a variety of communication protocols, such as PROFIBUS-DP MODE BUS, etc.

The strict master-slave mode, that is, the master station is the initiator and controller of communication, and the slave station can only communicate with the master station, but can not directly communicate with other slave stations.

The communication baud rate is 9600bit/s, the 4communication distance is 1.2km, and the typical application of PROFIBUS-DP communication baud rate can reach 187.5 kbit/s.

c.Monitoring software

YS2000 configuration software can realize the configuration application of the monitoring and management software required according to different engineering requirements, and can realize operation monitoring and various daily management functions for intelligent circuit breakers.

◆ System function

a. Remote control

Remote control is the operation control of energy storage, closing and opening of each slave circuit breaker in the system through the master computer. The operator selects the corresponding object from the system interface and clicks the remote control button with the mouse to provide the current running state of the corresponding object. After the operator inputs the operation password, he can issue the remote control "close" or "open" command. The system willtransmit the command to the corresponding circuit breaker slave station, and after receiving the instruction, the slave station performs the operation of breaking, closing and storing energy and other operations according to the established time sequence, and reports the remote control results to the master station.

b. Remote adjustment

Remote adjustment refers to the setting of the protection setting of the slave station through the master station computer. All the protection settings of slave stations are stored in the master station computer. The operator selects the corresponding object from the system interface, and clicks the remote adjustment button with the mouse. The system will provide the current settings of all the protection settings of the corresponding object and the protection settings table of this object. After the operator inputs the operation password, he can select the required parameters from the parameter table and click the corresponding button. The master station will download the parameters to the corresponding slave stations and report the remote adjustment results. The slave stations will modify their own protection settings after receiving the instructions.

c. Telemetry

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

◆ Fault record can record the following fault parameters
A, B,C, Nphase current value in case of fault: voltage value of UAB, UBC ,UCA, fault type, fault action time, and record the fault in the fault database.

◆ The computer displays the current real-time current and voltage of each substation in bar graph ,absolute value table, etc.,and displays the running status of each node by real-time curve.

d.Telecommunication

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

e.other functions of the system

In addition to the four remote operation control functions, the system can also perform a variety of management functions, such as accident alarm (information screen, picture push, event printing, accident dialing, sound alarm), event recording, maintenance and listing, shift management, load trend analysis, and various report forms printing.

L type intelligent controller

◇ The L-type controller adopts the setting mode of coded switch and toggle switch .It has the characteristics of overload long time delay, short circuit short time delay, instantaneous and earth leakage, as well as the functions of fault states and load current light column indication etc.,, but its digital display function is not as complete as M-type and (H)-type, which is availabe for users to choose in general occasions.

◇ The operating performance of circuit breaker, the operating performance of circuit breaker is expressed by the number of operating cycles, as shown in the table.

Rated current Inm(A) of rack rating	Operation loop counting
2000	12500
3200/4000	12500
5000/6300	8000

Attachment introduction

◆ Undervoltae release

Undervoltage release consists of the release coil and the control unit;

Undervoltage release action can be divided into instantaneous action and delayed action;

The delay time of undervoltage delay release is divided into 1s, 3s, 5s. The delay time is more than 5s until 9s for special specification ;

The circuit breaker will not open when the power supply voltage of the main circuit recovers to 85% Ue or above within 2/1 delay time.

Rated working voltage Ue	AC380	AC220
Action voltage	(0.35-0.7) Ue	
Reliable closing voltage	(0.85-1.1) Ue	
Reliable non-closing voltage	<0.35Ue	
power consumption	36VA	24VA

◆ shunt tripping device

Optional distance manipulation opens the circuit breaker.

Rated control voltage (V)	AC380	AC220	AC110
Action voltage (V)	(0.7-1.1)Ue		
Instantaneous current (A)	0.7	1.3	1.3
break-time	No more than 30ms		
power consumption	36VA	24VA	24VA

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Intelligent universal circuit breaker

◆ Closing electromagnet

After the energy storage is finished, the closing electromagnet can instantly release the energy storage spring of the operating mechanism so that the circuit breaker can be closed quickly.

Rated control voltage (V)	AC380	AC220	AC110
Action voltage (V)	(0.85-1.1)Ue		
Instantaneous current (A)	0.7	1.3	1.3
break-time	No more than 70ms		
power consumption	36VA	24VA	24VA

◆ Electric operating mechanism

The circuit breaker has motor storage room and automatic restorage function
The circuit breaker can also store energy manually.

Rated control power supply voltage (V)	AC380	AC220	AC220
Action voltage (V)	(0.85-1.1)Ue		
power consumption	85W/110W/150W I / II / III		⩽ 200W
Energy storage time	No more than 5s		

◆ Auxiliary switch

Rated voltage (v)		Ith(A) of agreed heat generation	Rated control capacity
AC	220	6	300VA
	380		
DC	220		60W

Note: The standard type of auxiliary swItch is 4 groups of changeover contacts for users, and the special type is 3 normally open 3 normally closed 5 groups of changeover contacts 4 normally open 4 normally closed.

◇ Key lock;
◇ The breaking button of the circuit breaker can be locked at the pressed position. At this time, the circuit breaker cannot be closed;
◇ The factory will provide locks and keys after the users choose to install them;
◇ A circuit breaker is equipped with an independent lock and a key (one lock and one key)
◇ Two circuit breakers are equipped with two identical locks and one key (two locks and one key)
◇ Three circuit breakers are equipped with three identical pins and two identical keys (three locks and two keys).

Overview of structure

◇ Fixed circuit breaker is mainly composed of contact system, intelligent controller, manual operating mechanism, electric operating mechanism and mounting plate, while drawer circuit breaker is mainly composed of contact system, intelligent controller,Manual operating mechanism, electric operating mechanism and drawer base. The circuit breaker is arranged as main body, featuring compact structure and small volume. The contact system is enclosed in the insulating base plate, and each phase of the contact is also separated by an insulating plate, which is opened into small rooms. The intelligent controller, manual operating mechanism and electric operating mechanism are sequentially arranged in front of them to form their own independent units. If one of the units is broken, the whole unit can be removed and replaced with a new one.

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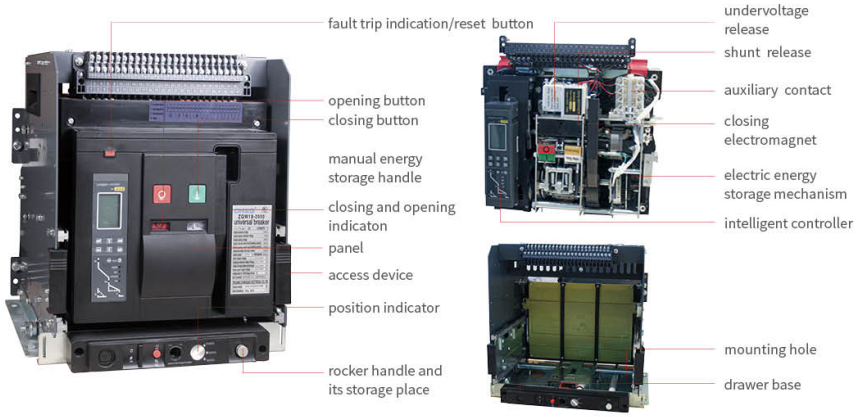
◇ Drawer circuit breaker is composed of plug-in circuit breaker and drawer base. The guide rail in the drawer seat can be pushed and pulled out. The inserted circuit breaker is located on the guide rail to enter and exit. The main circuit is connected through the insertion connection of the busbar and the bridge contact on the drawer base.

◇ The drawer-type circuit breaker has three working positions: the "connecting" position, the "testing" position and the "separating" position. The position change is realized by screwing the handle in or out. The indication of the three positions is displayed by the pointer on the beam of the drawer base.

◇ When it is in the "Connection" position, both the primary circuit and the secondary circuit are connected; when it is in the "Test" position, the primary circuit is disconnected and insulated. Only the secondary circuit is connected,.and some necessary action tests can be carried out.when it is in the "separation" position, the main circuit and the secondary circuit are all disconnected, and the drawer-type circuit breaker has a mechanical interlocking device. The circuit breaker can only be closed when it is in the connection position or the test position, while the circuit breaker cannot be closed at the middle position and test. See Figure 7 for the front indication of the circuit breaker.

Product mix



structural characteristics

◇ Use of circuit breaker

Operation of drawer circuit breaker

insertion operation of circuit breaker body

a. Pull out the guide rail

b. Place the circuit breaker body on the guide rail as shown in the figure,Note that the two protruding seats of the circuit breaker should be clamped into the groove of the guide rail;

c. Push the circuit breaker body inward until it can't be pushed.

d. Pull out the handle and insert the hexagonal head of the handle into the handle hole of the drawer base.
e. Turn the handle clockwise until the position indicator turns to the "Connect" position, and you can hear the two sides of the drawer base click twice then pull out the handle and put it in place.

◆ Withdrawal operation of circuit breaker body

a. First, move the breaker body from the "connection" position to the "separation" position (shake the handle counterclockwise).
b. After pulling lout the handle ,pull out the circuit breaker body as shown in the figure. Pay attention to prevent the circuit breaker from tipping and falling due to the forward movement j of the center of gravity when pulling out the circuit breaker body.
c. Take the breaker body out of the drawer as shown in the figure, and then push the extraction guide back to its original position.

◆ Locking of the "separation" position of the drawer circuit breaker (padlock is purchased by the user)

a.Pull out the locking rod as shown in the figure.
b.When the padlock is inserted the circuit breaker cannot be moved from "separation" to "test" or "connection" position.

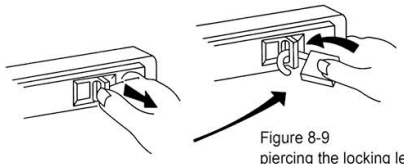


Figure 8-9
piercing the locking lever

Figure 8-8
pulling out the locking lever

◆ Energy storage operation-manual energy storage

a. During energystorage, pull the energy storage handle up and down repeatedlyfor 6-7 times until a "click" sound is heared.When the hand can't feel the counter force energy storage indication, the "energy storage" end is displayed.. Figure 8-10
b.After energy storage is completed, the indicator of "energy storage and energy release" is in the "energy storage" position.

◆ Energy storage operation-electric energy storage

The electric energy storage mechanism automatically stores energy immediately after the control circuit is powered on (when the control circuit has been connected to the automatic pre storage form).

ZQW18
Intelligent universal circuit breaker

◆ Opening and closing operation-manual opening and closing operation.

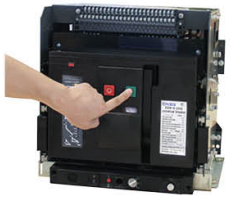
a. Closing: when the circuit breaker is in the state of energy storage and disconnection, push the green "I" button, and the indicator of "opening and closing" of the circuit breaker will change from "0" to "I", and the indicator of energy storage and energy release will change from "energy storage" to "energy release". Figure 8-11.

b. Switch-off: When the circuit breaker is in the closed state,, push the red "0" button, and the opening indication of the circuit breaker will change from "I" to "0". Figure 8-12.

◆ Opening and closing operation-electric opening and closing operation

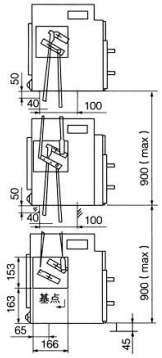
a. Closing: when the circuit breaker is in the state of energy storage disconnection,apply the rated voltage to the closing electromagnet to close the circuit breaker .

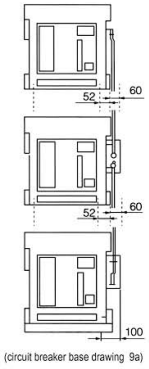
b. break-off: when the circuit breaker is in a closed state, the circuit breaker can be opened by applying the rated voltage to the shunt release.



◆ Interlocking mechanism of circuit breaker (applicable to drawer type and fixed type)

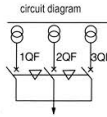
(see fig. 9a for lever interlocking)





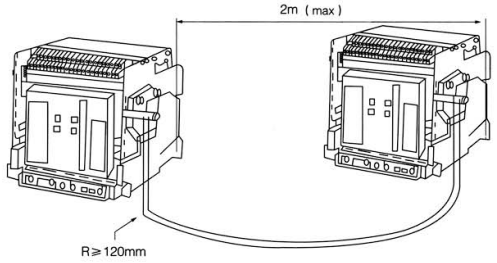
(circuit breaker base drawing 9a)

Note:
Three vertically installed circuit breakers with lever interlocking.
If two circuit breakers are interlocked, only the top circuit breaker should be removed.



circuit diagram	possible operation mode		
	1QF	2QF	3QF
	0	0	0
	0	0	1
	0	1	0
	1	0	0

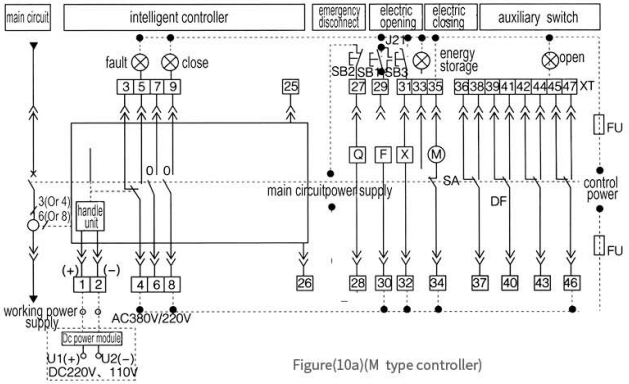
◆ Soft interlock (both horizontal and vertical) (see Figure 9b)



(Figure 9b)

◆ Wiring terminal

There are 47 wiring terminals of the overall circuit breaker, and 51 can be used for special requirements. The wiring is simple and convenient for users. See Figures 10a and 10b for wiring the diagrams.



Figure(10a)(M type controller)

Note:

◇ If the control power supply voltages of F X and M are different, they shuld be connected to different power supplies respectively;

◇ Terminal #35 can be directly connected to the power supply (automatic pre energy storage) or connected to the power supply after the closing button(manual pre energy storage) .

◇ If the user proposes that terminals #6 ~ #7 dynamic breaking contact can be output.

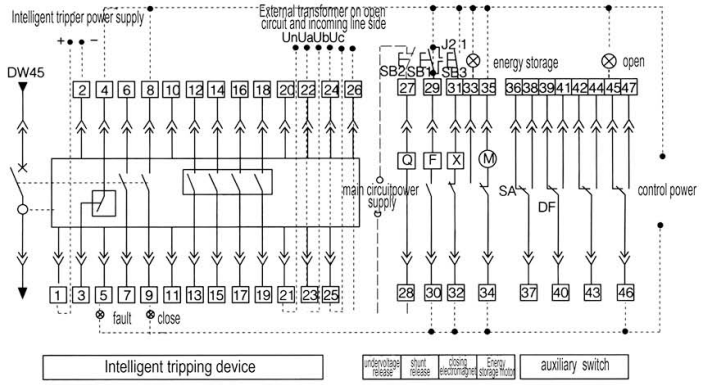
◇ Additional accessories are provided by users themselves;

◇ When the working power supply of the intelligent controller is DC current, the DC power supply module must be added (at this time #1#2 terminals can no longer be connected to the AC power supply). The secondary wiring is shown in the figure (DC 110V or 220V is connected to the secondary base terminals 1(+) and 2(-)respectively from the two output terminals of the U1(+) and U2(-) input power modules).

◇ Other wiring of intelligent controller.

#1, #2 AC working power input (input from DC power modules U1, U2 in case of DC);

#25 and #26 are external neutral or ground current transformer input;
SB1- shunt button (provided by the user) X- closing electromagnet DF- auxiliary contact Q- under-voltage release or under voltage delay release SB2- under-voltage button (provided by the user), M- energy storage motor, F- shunt release and O- moving contact (3a/ac380v);
SB3- Closing button (provided by the user), XT terminal, SA- motor microswitch and signal lamp (provided by the user)

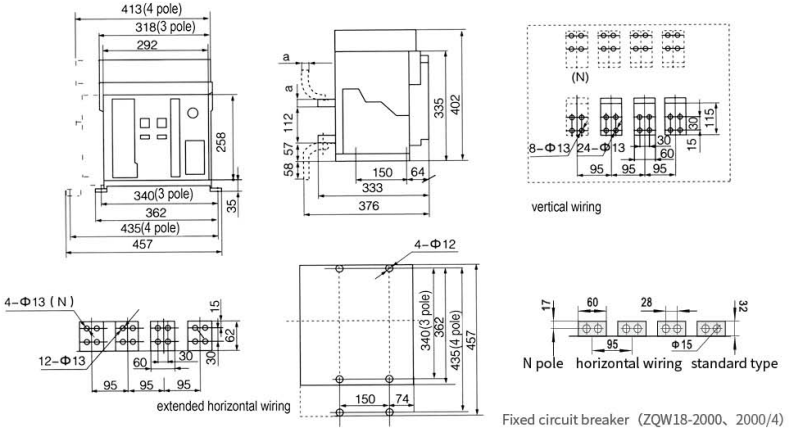


Figure(10a)(The controller is M type with additional functions or H type.)

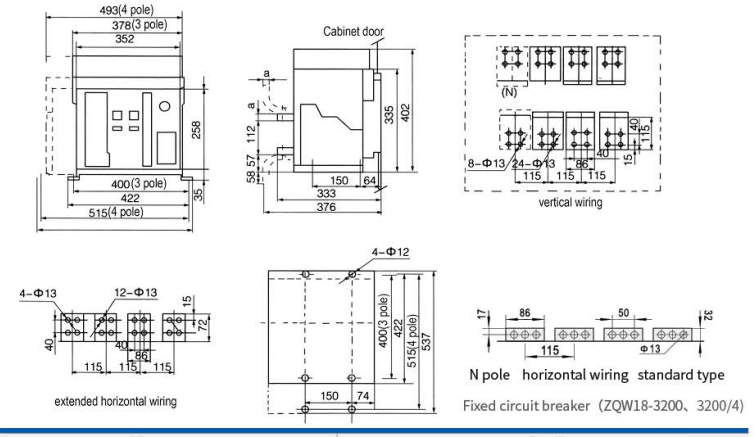
Note:
◇ If the control power supply voltages of F X and M are different, they shuld be connected to different power supplies respectively
◇ Terminal #35 can be directly connected to the power supply (automatic pre energy storage) or connected to the power supply after the closing button(manual pre energy storage) .
◇ If the user proposes that terminals #6 ~ #7 normally closed contacts can be output.
◇ Other wiring of the telligent controller
#1#2 working power input (input fromDC power module U1and U2 in case of DC)
#12 overload prediction alarm signal output
#14 Instantaneous short delay tripping signal output
#15 long delay tripping signal output
#16 grounding (or neutral) fault tripping signal output
#19 signal output common line
#20 Self-diagnosis signal output
#21 Tripping signal (or for shunt or undervoltage actuator)
#25, 26 External neutral pole or ground current transformer input
◇ Other wiring of intelligent controller
SB1- shunt button (provided by the user) X- closing electromagnet DF- auxiliary contact Q-undervoltage release or undervoltage delay release
SB2- Undervoltage button (provided by the user) M- Energy storage motor F- shunt tripping O-dynamic contact (3A/AC380V)
SB3- closing button (provided by the user) XT terminal SA- motor microswitch signal lamp (provided by user)
The dashed line part is wired by th users the above four groups of #12-#19 contact functions are the fault state of H type when leaving the factory.

Outline and installation dimensions

◆ Installation dimensions and overall dimensions of fixed circuit breaker

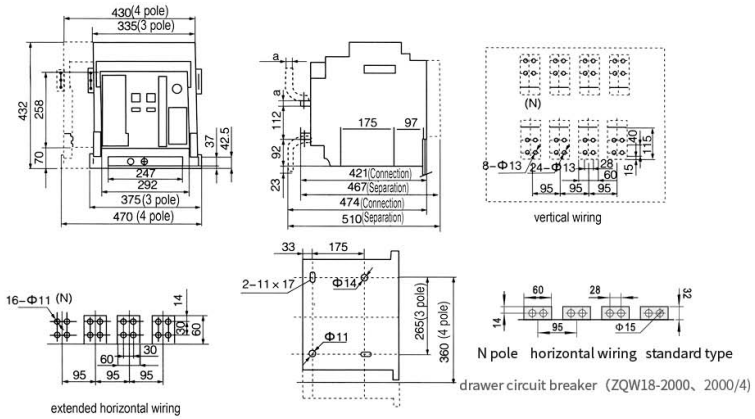


In(A)	a(mm)
400、800	10
1250、1600	15
2000	20



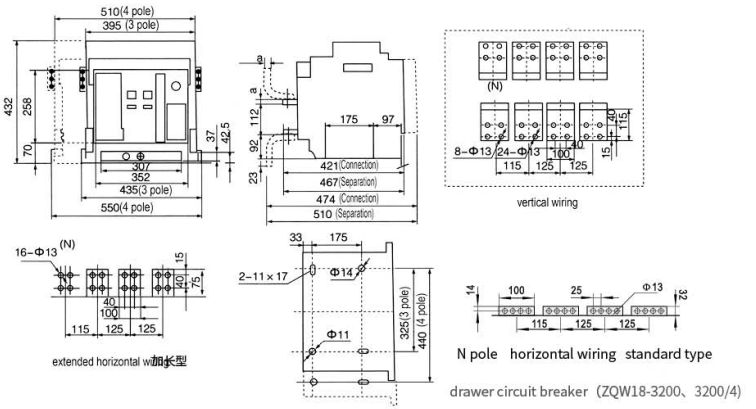
In(A)	a(mm)
2000、2500	20
2900、3200	30

◆ Installation dimensions and outline dimensions of drawer-type circuit breaker



In(A)	a(mm)
400、800	10
1250、1600	15
2000	20

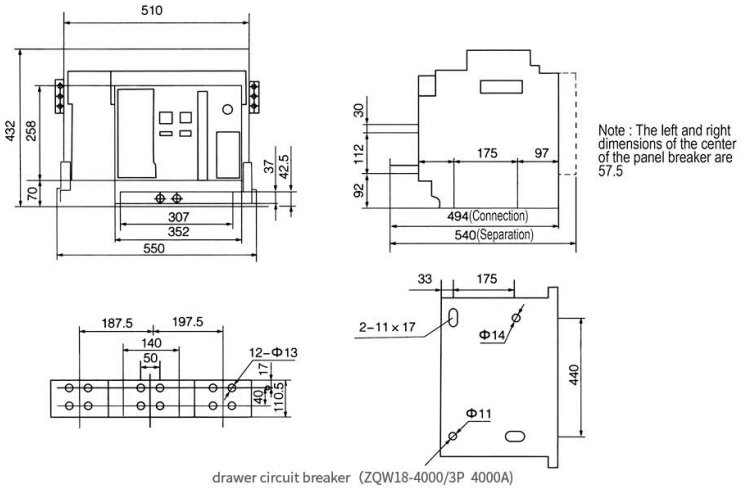
◆ Installation dimensions and outline dimensions of drawer-type circuit breaker



In(A)	a(mm)
2000、2500	20
2900、3200	30

ZQW18
Intelligent universal circuit breaker

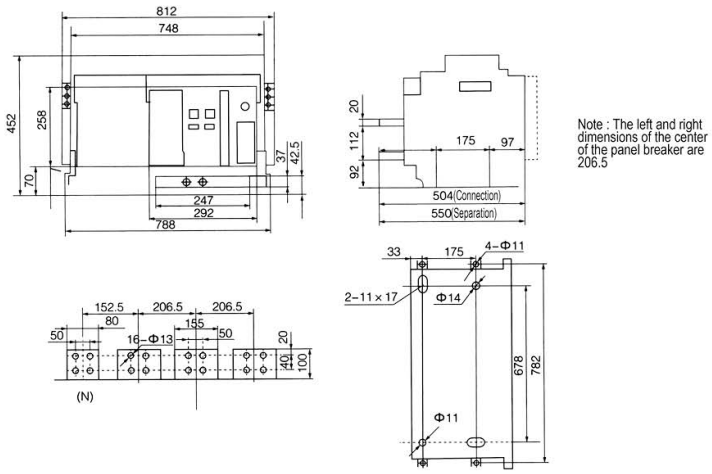
◆ Installation dimensions and outline dimensions of drawer-type circuit breaker



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

drawer circuit breaker (ZQW18-4000/3P 4000A)

◆ Installation dimensions and outline dimensions of drawer-type circuit breaker



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

drawer circuit breaker (ZQW18-4000/4P 4000A)

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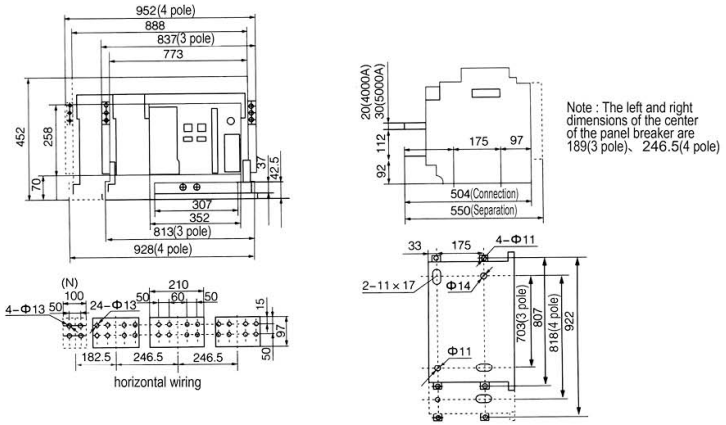
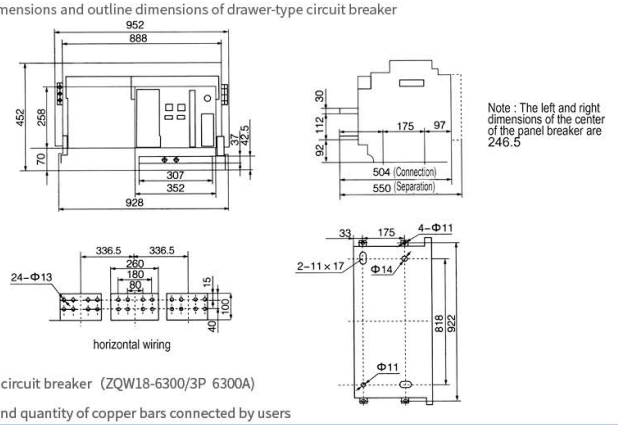
◆ Installation dimensions and outline dimensions of drawer-type circuit breaker



Note : The left and right dimensions of the center of the panel breaker are 189(3 pole)、246.5(4 pole)

drawer circuit breaker (ZQW18-6300/3P 4000A、5000A)

◆ Installation dimensions and outline dimensions of drawer-type circuit breaker



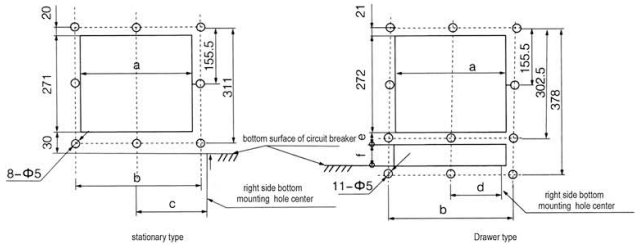
Note : The left and right dimensions of the center of the panel breaker are 246.5

drawer circuit breaker (ZQW18-6300/3P 6300A)

◆ Specification and quantity of copper bars connected by users

rated current	Specification of external copper bar	number per limit	rated current	Specification of external copper bar	number per limit
630A	40x5	2	2000A	125x5	3
800A	50x5	2	2500A	120x5	3
1000A	60x5	2	3600A	120x10	4
1250A	80x5	2	4000A	120x10	4
1600A	125x5	2	5000A	125x10	6
2000A	125x5	3	6300A	120x10	6
2500A	125x5	4			

Door frame size and installation hole spacin



In	a (mm)	b (mm)	c (mm)	e (mm)	f (mm)	d (mm)
2000	304	345	170	15	46.5	132.5
3200	365	405	211	21	48	162.5
4000/3	365	405		21	48	162.5
4000/4	365	405		21	48	132.5
6300	365	405		21	48	162.5

Installation and maintenance

◆ Installation
◇ Before installation check whether the specifications of the circuit breaker meet the requirements.
◇ Before installation, use a 500V tramegger to check that the insulation resistance of the circuit breaker should be no less than 10MQ when the ambient medium temperature is 20°C , ±5°C and the relative humidity is 50% and 70%, or it should be dried until the insulation resistance meets the requirements.
◇ When installing the circuit breaker , its base should be in a horizontal position and fixed with M10 screws.
◇ During installation, the circuit breaker shall be reliably grounded for protection, and there shall be obvious grounding marks at the grounding point.
◇ The upper incoming line or lower incoming line of the circuit breaker does not change its technical performance.
◆ Operation test
◇ After the circuit breaker is installed connect wires according to the relevant wiring diagram.
◇ Before the main circuit is energized (the indicator on the drawer seat of the drawer type circuit breaker is at the test position), the following operation tests shall be conducted
1.Check whether the voltage of the undervoltage, shunt release , energy release(closing) electromagnet and electric operating mechanism are consistent (the undervoltage release must be powered on before the circuit breaker is closed).
2.Pull the handle on the mask up and down. After seven times, the rear panel shows "energy storage" and the energy storage is finished with a click. Press the "1" button or the energy release (closing) electromagnet to power on the circuit breaker to reliably close (when the controller reset button is reliably reset), and the handle can be pulled to store energy again.
3.The motor is powered on and operated until the mask shows "energy storage" with a "click". Afterthe energy storage is finished, the motor will automatically power off, and pressthe "1" button or the energy release (closing) electromagnet iron power on circuit breaker is reliably closed.
4.After the circuit breaker is closed, whether the undervoltage, shunt release or the "O" button on the mask or the tripping test of the intelligent release can make the circuit breaker open.
◇ The panels of M-type and H-type intelligent release are shown in the figure.
◇ See Table 10 for the function description of keys and indicator lights of M and H intelligent releases.
◇ The setting can be adjusted online on the controller, but the load current should be less than the setting current. The power supply mode of the controller can use the auxiliary power supply (see Figure 10a and 10b for its wiring mode).
◇ The controller panel inputs DC24V.
◇ M-type. H-type intelligent release.
◇ Setting of M and H intelligent release.
◇ For the setting of the overload long delay current Ir1,first press the "Clear " key, and then press the "Set" key continuously until the yellow light of overload long delay current status indicator "Ir1" lights up.At this time ,the nixie tube displays the current setting value of Ir1(the factory setting value is In). Press the "+"and "-"key as needed by the user, and increase or decrease at an intervalsof ⩽ 2A every time until the displayed value is closest to the user's required setting current value. Then press the "storage" button once, and the storage green light turns on and off again, indicating that the new overload long delay current setting value has been stored and Ir1 setting is completed.

◇ To set the overload long time-delay action time tL Press the "Set" button until the yellow light "tL" of the overload long time-delayaction time status indicator lights up. At this time, the nixie tube displays the current setting value (factory setting value is 15 seconds) Press the "+"and "-" buttons to increase or decrease the action time according to the data in Table 5. After adjusting to the nearest required action time, press the "Storage" button once. When the green light turns on and off again, it means that the overload long delay action time has been set.

◇ The setting methods of action current and action time for protection and load monitoring such as short circuit short time delay, short circuit instantaneous, asymmetric grounding (neutral connection) are similar to those for overload long time delay, except that different protections correspond to different status indicators. For example ,the setting of short-circuit short time-delay protection current Ir2 corresponds to the yellow light of short-circuit short time-delay current status indicator "Ir2", the setting of its action time corresponds to the yellow light of its action time status indicator "ts", and so on.

◇ In addition, if the action time of short circuit short delay protection or overload long delay protection or asymmetric grounding (neutral connection) protection is set to the "OFF" position, it means that in case of short circuit short delay protection or overload long delayprotection or asymmetric grounding (neutral connection) fault , only the alarm will be givenwithout tripping. The setting of asymmetric grounding (neutral connection) protection or overload long time delay protection or short-circuit short time delay protection current or short-circuit instantaneous protection current at the "OFF" position indicates that the protection of the corresponding section does not work.

◇ In case of line fault during the setting process, the intelligent release will block the setting function and automatically enter the line fault processing state, and implement protection according to the stored setting value.

◇ After the protection parameters of the intelligent release are set, press the "Clear Light" key once again and the system will be in operation immediately. If the key is not pressed for 1 minute after the setting, the system will automatically return to the operation state.

Use of intelligent releases

◇ Test of M-type and H-type intelligent release.

◇ After setting the protection parameters of the intelligent releases, users can test variousprotections functions of intelligent releases as required before or during operation to check the operation status and protection accuracy of intelligent releases. The tests of intelligent release includes tripping test and non-tripping test. When the tripping test is done, press the "tripping" button .When the test is completed, the test result will be displayed and tripping action will be sent. When the circuit breaker is disconnected, press the "non-tripping" button .When the test is completed, only the test result will be displayed and the tripping action will not be sent. If the circuit breaker is running in the power grid, the non tripping test is usually carried out.

◇ Test method of intelligent release. Take the overload long delay test as an example. Press the "Set" key to the overload long delay setting state, and check the overload long delay setting values Ir1 and tL, and then continue to press. press the "Set" key to the short circuit short delay or short circuit instantaneous setting current state, and then press the "+"-"key to adjust the displayed current to a value greater than 1.3Ir1 (please note that do not press the" Store "key at this time, otherwise the original set parameters will be changed). Press the" Trip "or" No trip "key once , and the yellow light of" Test "will be on (indicating that it is in the test state), and the test of the overload long delay will start. The intelligent release operate in time delay according to the overload long time-delay inverse time rule, and the action time is calculated from the corresponding characeristic expression according to different protection characteristic curves. In the process of delay ,the yellow light of overload long delay current indicator "Ir1" flashes. When the action time is up, the red light of fault state "Ir1" lights up (if it is a tripping test, the tripping action is sent to make the circuit breaker open and the red light of tripping lights up ,indicating that it has been tripped). At this time, the digital tube alternately displays the delay action time and the test current. Other protection characteristic tests are similar, except that different status indicator yellow lights flash during the test and different fault status red lights turn on at the end of the test.

◇ Note that the test results of the intelligent release are not memorized!

◇ If only the "Test" yellow light is on during the test, and the yellow lights of other status indicators do not flashing, the ammeter window will display "nodo" indicating that the current value of the test is adjusted too low.If the test is not running, press the "Clear Light" key to return to the normal operation state. If it is a tripping test, press the red mechanical"reset " button to close the circuit breaker.

◇ In case of the line fault during the test, the intelligent release will automatically cancel the test and enter the fault handling state.

◇ Fault Inspection of M and H Intelligent releases

◇ Press the "fault inspection key after " light off" and the system will alternatively display the fault current and fault action time. At this time ,press the selection key to check the current value of each phase and the harmonic influence coefficient value under the last fault. Press the "Clear Light" key to exit the fault check and return to the running state.

◇ Display inspection of M and H intelligent releases

◇ After "light off", press and hold the "display inspection" key, and all light-emitting devices should light up.Release the "display inspection" key and the system wil return to the operating state immediately.

◇ Query the voltage parameters of M and H type intelligent releases(with voltage display)
Press the "Query" key after clear and the voltmeter window will display cyclically line voltage Vab, line voltage Vbc, line voltage Vca, phase voltage Va, phase voltage Vb, phase voltage Vc, frequency and maximum line voltage.

◇ Press the "Clear Light" key to exit the voltage parameter inquiry state and return to the operating state.
Protection priority of intelligent release
The protection priority of intelligent release is as follows: short circuit instantaneous > short jcircuit short delay > asymmetric grounding (zero connection) > overload long delay.
◇ Other instructions for use of intelligent release
Once the intelligent release enters the line fault processing state, all keys are blocked, and pressing any key at this time has no effect.
The intelligent release can automatically respond to the line fault and enter the line fault processing state under various functional states (except the line fault processing state).
Under various functional states (except the line fault handling state), the intelligent release can immediately return to the operating state if the "light off " key is pressed .If no key is pressed for 1 minute ,it will automatically return to the operating state.
After the intelligent release sends out the tripping action ,the circuit breaker can only be closed by pressing the "clear light " button and then the red mechanical reset button.

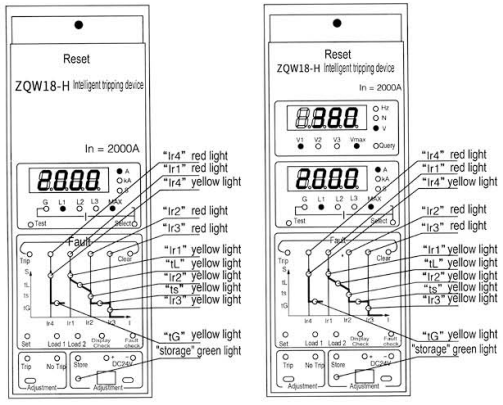
Maintenance of intelligent release

◇ The intelligent release shall be operated carefullyas required.
◇ M-type and H-type intelligent release shall be sealed with protective cover after setting or testing.
◇ Regularly check the fastening condition of each connection part , and timely tighten it in case of loosenesss .
◇ The ambient temperature and humidity at place of use must comply with relevant regulations.
◇ In order to ensure the accurate and reliable protection in case of line failure, the intelligent release shall be tested regularly. See 9.2.2 and 9.32 for the test methods.

Attention

① During installation and commissioning, please protect the controller against dust, moisture and mechanical damage.
② When resetting the parameters, the current setting values of the three sections of protection shall not be cross set.It is required thst Ir1<Ir2<Ir3,
③ Before putting into operation, professionals shall check whether the set parameters are correct, whether the controller has been reset with the light off, and whether the circuit breaker has entered the normal state, and coduct tests. During operation, the operator shall be diligent in observation, and timely handle any fault or abnormality found.
④ After the fault trip,the power grid fault can be put into operation again after the cause of the power grid fault is eliminated according to the information displayed on the panel.

Panel diagram of intelligent release and specific positions of various color indicators



Panel diagram of m-type and h-type intelligent release (without voltmeter display)

Panel diagram of m-type and h-type intelligent release (with voltmeter display)

Function description of keys and indicator lights of M-type intelligent release

Serial number	Name	Function
1	"Reset" red button	After tripping and breaking of the circuit breaker , it is necessary to press this button to close the circuit breaker again.
2	"Select" key	Select the displayed quantity in various states or categories such as setting, test and inspection.
3	"Clear l" key	Press this button to reset the intelligent release and to the operating state.
4	"Set" key	Press this key to cyclically display the setting current or delay action time of various protection characteristics.
5	"Display Check" key	This key is used for the inspection of light emitting devices. Press this key to light up all light emitting devices at the same time.
6	"Fault check" key	Press this key to display the previous line fault status and data memorized by the system.
7	"Trip "key Press this key	Conduct the tripping test ,and the tripping action will occur after the test.
8	"No Trip" key Press this key	Conduct non tripping test , and no tripping action will occur after the test.
9	"Store" key Press this key	Then the current setting current or action time is stored as the setting value of its operation.
10	"+""-"key	Used to increase or decreade the displayed value during setting.
11	"A" indicator lamp	When the displayed value is the current value and the unit is ampere (A), the green light will be on.
12	"kA" indicator lamp	When the displayed value is the current value and the unit is kiloampere(kA.), the green light is on
13	"S" indicator	When the displayed value is time value, the green light is on for seconds (s)
14	"L1","L2" and "L3" indicators	The green light of a phase indicates that the current displayed is the current value of the phase.
15	"MAX" indicator lamp	The green light indicates that the displayed current value of this phase is the maximum value of the three-phase.
16	"g" indicator lamp	1. When the green light is constantly on, it indicates that the displayed current is the actual current value of asymmetric grounding (neutral connection) fault protection. 2. When the green light flashes, it indicates that the displayed value is the measured value of harmonic influence coefficient K.
17	"Test" indicator lamp	The yellow light indicates that the intelligent release is in the test state.
18	"Trip" indicator lamp	The red light indicates that the intelligent release has generated tripping action to break the circuit breaker.
19	"Load 1" indicator lamp	1.During the setting process, the yellow light on indicates that the load I current ILc1 is being set. 2. During the test, the yellow light flashes indicating that the load I monitoring test is in the delay state. When the light changes from flashing to long light, indicateing that the test delay action time has expired. 3. In actual operation, the flashing yellow light indicates that the load 1 monitoring is in the delay state. When the flashing light changes to long light , it indicates that the delay action time has expired and the relay signal of cutting off load I has been sent.

Function description of keys and indicator lights of H-type intelligent release

Serial number	Name	Function
20	"Load 2" indicator	1. During the setting process, the yellow light indicates that the load 2 current c2 is being set. 2. During the test, the fyellow light flashing board indicates that the load 2 monitoring test is in the delay state. When the flashing changes to long light, it indicates that the test delay action time has expired. 3. In the actual operation, the yellow light flashing iindicates that the load 2 monitoring is in the delay, state .W hen the flash changes to long light, it indicates that delay action time has expired and the corresponding relay signal has been sent.
21	"Ir4" red ligh	This red light indicates that the actual (or test) protection action is caused by the asymmetric grounding (zero connection) fault.
22	"Ir1" red light	This red light indicates that the actual (or test) protection action is caused by the overload long time delay.
23	"Ir2" red light	This red light indicates that the actual (or test) protection action is caused by the short circuit short time delay.
24	"Ir3" yellow light	This red light indicates that the actual (or test) protection action is icaused by short circuit nstantaneously .
25	"Ir4" yellow light	1. During the setting process, the yellow light on indicates that the asymmetric grounding (zero connection) fault current Ird is being set. 2. In actual operation, the flashing yellow light indicates that the asymmetric grounding (neutral connection) fault protection is alarming (not tripping).
26	"tG" yellow light	1. When the yellow light flashes, it means that the harmonic influence coefficient K is being set. 2. When this yellow light is constantly on, it means that the action time tc of asymmetric grounding (zero connection) fault protection is being set.
27	"tL "yellow light	The yellow light on indicates that the action time tL of overload long time-delay protection is being set.
28	"Ir1" yellow light	1. During the setting process, the yellow light on indicates that the overload long time-delay protection current Ir1 is being set. 2. During the test, the yellow light flashs, indicating that the overload long-time delay protection test is in the time-delay state. 3. In actual operation, the flashing yellow light indicates that the overload long delay protection of the line being processed is still in the delaystate.
29	"Ir2" yellow light	1. During the setting process, the yellow light on indicates that the short-circuit short delay protection current Ir2 is being set. 2. During the test, the yellow light flashs, indicating that the short-circuit short delay protection test is in the delay state. 3. During the actual operation, the yellow light flashs , indicateing that the short-circuit and short delay protection of the line is being processed, and the protection is still in the delay state.
30	"ts" yellow light	The yellow light is on, indicating that the action time ts of short-circuit short time delay protection is being set.
31	"Ir3" yellow light	The yellow light is on, indicating that the short circuit instantaneous protection current Ir3 is being set.
32	"storage" green light	This green light is on and off again, indicating that the current adjusted current or action time value has been stored as the corresponding setting value.
33	"Query" key	Press this key to query the line voltage, phase voltage and frequency.
34	"V" indicator light	When this green light is on, it means that the value displayed in the voltmeter window is the voltage value in volts (V).
35	"N" indicator light	When this green light is on, it means that the value displayed in the voltmeter window is the phase voltage value.
36	"V1", "M2" and "V3" indicators	1. When a green light is on and the "V" green light is on, it means that the voltage displayed in the voltmeter window is the line voltage value 2.When a green light is on and the "V" green light and the "N" light are on at the same time, indicating that the voltage value displayed in the voltmeter window is the phase voltage value.
37	The Vmax indicator light	When this green light is on, it means that the line voltage displayed in the voltmeter window is the maximum value of the three line voltages.
38	"Hz" indicator lamp	When this green light is on, it means that the value displayed in the voltmeter window is the frequency value . The unit is Hz.

ZQW18
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Product introduction

ZW18-H intelligent controller (hereinafter referred to as "intelligent controller") is a new generation intelligent controller with LCD Chinese display interface newly developed by our company. Its hardware and software are improved and optimized on the basis of ZQW18-M intelligent controller. It inherits the mature and stable kernel of ZQW18-M intelligent controller, and has made a lot of improvements in the power supply and display parts, reducing the power consumption of the whole machine, further improving the reliability and increasing the voltage protection function.

Basic functions of products

Protection and monitoring functions	Measuring function	Maintenance function	Human machine interface
Short circuit instantaneous protection Short time-delay definite-time protection Multi-curve short time-delay inverse time protection Multi-curve long time-delay protection Current imbalance protection Asymmetric grounding protection (vector sum type) Neutral phase protection MCR and HSISC protection Load monitoring (mode 1) undervoltage protection Overvoltage protection Voltage imbalance protection	Three (four) phase current Asymmetric grounding current Long time delay thermalcapacity Internal temperature Phase and line voltage Voltage imbalance frequency phase sequence power power factor current waveform network harmonic influence coefficient	Eight fault records Eight alarm records Eight displacement records Main contact wear equivalent Operation times Tripping times System clock Fault self-diagnosis disconnection self-diagnosis	Chinese graphic LCD display LED status indication keyboard operation

Product co-selection function

Optional function	description of active energy	remarks
1. Communication function (H type)	The communication function is added, on the basis of M type intelligent controller ,which contains the Modbus-RTU communication protocol. Profibus-DP or DeviceNet protocol conversion module can be connected externally, and the module can realize the remote communication function under a variety of open communication protocols.	
2. Four group of contact output functions	The intelligent controller contains four groups of passive contacts and the contact function is programmable .	This function is a necessary function in case of H typ.
3. Use KST programmer	KST programmer can be used on DB9 interface of the panel.	
4. Leakage protection function	The electronic devices for leakage protection are added in the intelligent controller, and the leakage zero sequence transformer is added to protect or alarm the leakage current.Implement current protection or alarm.	The asymmetric grounding protection function is automatically canceled.
5. Other protection	There are under frequency, over frequency and phase sequence protection or alarm respectively.	
6. Required value measurement and protection	Measure the practical value of required current. The maximum value can protect the required current or alarm.	

Comparison table of symbols and their meanings

Serial number	Name	Function
1	Inm	Indicates the maximum rated current of the corresponding circuit breaker shell frame.
2	1△	Indicates the rated current of circuit breaker.
3	In	Represents the rated current of the external leakage transformer respectively
4	Ir Is ISD Ii	Respectively representing the long time delay, short time delay inverse time limit and fixed time limit and the instantaneous setting current value.
5	IG	represents the asymmetric grounding or leakage setting current value.
6	Iav Uav	Represents the three-phase current respectively , and the average value of the three line voltages.
7	Ic1 Ic2	Represents the load monitoring 1, load monitoring, 2 current setting value
8	8I 8V	Indicates current imbalance rate and voltage imbalance rate, respectively
9	tr ts tsD	Represents long time delay, short time delay inverse time limit and definite time limit setting time value.
10	tG t8	Represents asymmetric grounding or leakage respectively ,and unbalanced setting time value.
11	KG	represents asymmetric grounding or leakage protection inverse time limit coefficient 1
12	N	1. For 4-pole products, it represents N-phase setting value 2. Express 1/1r in the overload inverse time characteristic expression.
13	Uan Ubn Ucn	represent three phase voltages respectively
14	Uab Ubc Uca	represent three line voltages respectively
15	Ia Ib Ic IN	represent four phase currents of A . B. C. and N respectively.

Product introduction

The function description of ZQW18-h intelligent controller

◇Protection function

The protection function can record the tripping of a protection and the detailed parameters, date and time of tripping can be obtained through information inquiry.

◇Overload long time delay protection feature

power distribution or click protection	Setting current value	Ir=Inx …	0.4 ～ 1.0+OFF(exit position)
		Action characteristics	⩽ 1.05 Ir ＞ 2h no action
			＞ 1.30Ir ＜ Ih action
	Time delay Setting value tr (3) (corresponding to ＋51r)	characteristic curve	Curve 1 ~ Curve 6 (adjustable) is set as curve 3 when leaving the factory.
		Curve rate	IEC60255 standard has 80 adjustable points.
		precision	±10%
Generator protection	Setting current value	Ir=Inx …	0.4 ~ 1.0+OFF(exit position)
		Action characteristics	⩽ 1.05 Ir ＞ 2h no action
			＞ 1.30Ir ＜ 1h action
	Inverse time delay Setting value tr (3) Y (corresponding to ten 51r)	characteristic curve	Curve 1 ~ Curve 6 (adjustable) is set as curve 3 when leaving the factory.
		Curve rate	IEC60255 standard has 80 adjustable grade points.
		precision	±10%
N-phase protection	Setting coefficient (note)		25% or 50% (applicable to 3P+N or 4P products)
	Action characteristics		Same as A, B and C three-phase protection chaacteristics
Thermal memory (can be cleared after 30min power failure)			Standard +OFF (off)

Note: When the setting coefficient of N-phase protection is 50%, the setting value of N-phase protection is 50% of A, B and C phases. If the setting setting current value of overload long delay is 1600A, the setting current value of N-phase protection is 800A .

Inverse time delay setting value of six overload protection characteristic curves

The intelligent controller provides six kinds of overload protection characteristic curves, which are expressed as follows

-SI standard inverse time limit	T=0.00814t/(N-1)
-VI fast inverse time limit	T=0.5t/(N-1)
-EI(G) fast inverse time limit (general purpose)	T=1.25t/(N-1)
-EI(M) fast inverse time limit (motor protection)	T=1.3974 t*ln(N/(N-1.15))
-HV high-voltage fuse compatible	T=4.0625 t/(N-1)
-It fast inverse time limit 2 (general purpose)	T=2.25 t/
That is	T=t*(1.5Ir/r)

In which T is the actual protection delay action time value t is the inverse time delay setting value. The inverse time delay setting value of each characteristic curve is shown in table 15, N is the ratio of actual working current to the setting current value of overload long time delay protection ,that is,

number	The inverse time delay setting value t(s) of the overload protection characteristic curve corresponds to the delay action time at d 1.5Ir					
	SI standard inverse time curve 1	VI fast inverse time Curve 2	EI (G) super fast inverse time (general purpose) curve 3	EI(M) super fast inverse time (motor protection) curve 4	Hv high-voltage fuse compatibility Curve 5	I^2tsuper fast inverse time 2 (general purpose) curve 6
C01	0.62	2.00	8.00	6.24	2.48	15.00
C02	1.00	3.20	12.80	9.98	3.94	20.00
C03	1.48	4.80	19.20	14.96	5.92	25.00
C04	2.48	8.00	32.00	24.92	9.86	30.00
C05	3.70	12.00	•48.00	37.36	14.78	40.00
C06	4.94	16.00	64.00	49.82	19.70	50.00
C07	6.16	20.00	80.00	62.28	24.62	60.00
C08	9.24	27.00	108.00	84.06	33.24	80.00
C09	11.10	36.00	144.00	112.00	44.32	125.00
C10	17.26	56.00	224.00	174.30	68.94	120.00
C11	24.64	80.00	320.00	249.00	98.48	160.00
C12	36.96	120.00	480.00	373.60	147.70	200.00
C13	48.28	160.00	640.00	498.10	196.90	240.00
C14	61.60	200.00	800.00	622.60	246.10	320.00
C15	73.92	240.00	960.00	747.20	295.40	400.00
C16	86.24	280.00	1040.00	809.40	320.00	480.00

Technical parameters of short-circuit short time-7delay protection characteristics

Example of calculation

If the setting condition of the long delay protection of an intelligent controller is, the characteristic curve of overload long delay protection is curve 3, Ir is 2000A, and tr is 48.00s, calculate the overload long delay action time Tr when the actual fault current is 4000A.

N=I/Ir=4000/2000=2.0

Tr=1.25 tr/ (N2-1)=1.25*48/(2.02-1) =20 s

That is, the overload long delay action time under this condition is 20 seconds.

Note: When the short circuit short delay definite time protection is put into operation, the delay action time of the overload long delay is not less than the setting value of the short circuit short delay defonite time protection. If the short circuit short delay definite time protection is in the exit state, the delay action time of the overload long delay is not subject to this limit(but not less than 20ms).

Inverse time setting current value	Is=Irx ···	1.5~15+OFF (exit position)
	Action characteristics	⩽ 0.9Is does no action
		＞ 1.11s delay action
Definite time setting current value	Is=Irx ···	1.5~15+OFF(exit position)
	Action characteristics	< 0.9 Is does no action
		> 1.1 is delay action
Definite time delay setting value tsD	tsD (s)	0.1~1 (level difference 0.1)
	Accuracy	±10%
Inverse time protection characteristic		Curves 1~5 is the same as the curve with long overload delay but 10 times faster curve 6
		characteristic expression Ts=64tsD/N2, that is, Ts=tsD*(8Ir/I)^2
Inverse time thermal memory (15min power-off shell clearing)		Standard +OFF (close)

Technical parameters of short- circuit instantaneous protection characteristics

There are two modes of short-circuit delay protection:

1. Inverse time protection, when the fault current exceeds the inverse time setting current value, if it is curve (1~ 5), the intelligent controller will perform delay protection according to the same curve (1 ~ 5) as the overload long time delay.Only the speed of protection is 10 times faster (that is, one tenth of the delay action time calculated according to the overload long delay curve expression). If it is curve 6, the inverse time delay action time value is calculated according to the characteristic expression of short circuit short delay curve 6.
2. Definite time limit protection, when the fault current exceeds the set current value of the definite time limit, the intelligent controller will perform delay protection according to the setvalue of the definite time limit delay.

◆ Examples of calculation

If the setting condition of the long time delay protection of an intelligent controller is that the characterIstic curve of overload long time-delay protection is curve 3, Ir is 2000A, tr is 48.00s, and the setting conditions of the short time-delay protection is that IS 3000A, IsD is 5000A, and the actual fault current is 4000A, the intelligent controller will act in the short time-delay inverse time limit. At this time, Tr=20 s calculated by the formula then the action time Ts=Tr/10=2 seconds.

Note: when the inverse time setting current value is set at the "OFF" position or the definite time setting current value is less than or equal to the inverse time setting current value, the intelligent controller will protect according to the definite timelimit, and the inverse time function will automatically fail. When the definite time limit protection is put into operation, the delay action time of either the definite time limit protection or the inverse time limit protection and the short time delay protection will not be less than the definite time delay setting value. If the definite time limit protection is in the exit state. The delay action time of the inverse time protection is not limited by the setting value of definite time delay (but not less than 20ms)

Setting current value	Ii=	1.0In~50kA/75kA/125kA+OFF (exit position) (note)
	Action characteristic	⩽ 0.85Ii does not act
		＞ 1.15Ii acts
actuation time		＜ 125ms (including inherent analysis time of circuit breaker)

Note: when the intelligent controller is frame I, the setting current value of instantaneous protection is 1.0In~50kA+0FF; when the intelligent the controller is frame II, the setting current value of instantaneous protection is 1.0In~75kA+OFF; When the intelligent controller is frame III, the setting current value of instantaneous protection is 1.0In~125kA+OFF.

Technical parameters of asymmetric grounding or leakage protection characteristics

◇ Asymmetric grounding or leakage protection characteristics

◇ Asymmetric grounding protection of intelligent controller has two protection modes ,namely,vector sum (difference) type (T) and ground current type (W). T-type zero detects zero sequence current , that is, the vector sum of four-phase (three-phase four wire system) or three phase (three-phase three wire system) current is taken for protection. T ype W directly detects the current on the grounding cable through a special external transformer for protection.

◇ The leakage protection signal of the intelligent controller is directly taken from the external zero sequence transformer, and the actual current value of the leakage protection is directly represented by the secondary current of the zero sequence transformer, independent of the rated current of the circuit breaker.

Asymmetric grounding protection	Setting current value	IG=Inx…	O.2~1+OFF (minimum 125A OFF indicates the exit position)
		Action characteristic	＜0.8IG does not act
			⩾ 1.0IG delay action
	T-type harmonic influence coefficient setting value	Harmonic influence coefficient k	ON+10%~125%+OFF (level difference 1%) (Note)
	Delay setting value	definite time delay tG(s)	0.1~1+OFF (level difference of 0.1 OFF means that only the alarm is completed without tripping)
		Inverse time coefficient KG	1.5~6+OFF (level difference of 0.5 OFF indicates that grounding is a fixed time limit)
		Accuracy	±10%
leakage protection	Setting current value	IG=I△x…	O.2~1+OFF (minimum 125A OFF indicates the exit position)
		Action characteristic	＜0.8IG does not act.
			⩾ 1.01G delay action
	De lay setting value	definite time delay tG(s)	0.1~1+OFF (level difference of 0.1 OFF means that only the alarm is completed without tripping)
		Inverse time coefficient KG	1.5~6+OFF (step difference of 0.5 OFF indicates that grounding is a fixed time limit)
		Accuracy	±15%

Note: The setting term K of harmonic influence coefficient (i.e., the comprehensive coefficient of harmonic influence on the sum of three-phase analog current vectors) is added to the T-type asymmetric grounding protection. When K is set at "OFF", the asymmetric grounding protection adopts three-phase current analog vector sum value fot pretection. When K is set at on ,the asymmetriv grounding protection adopts three-phase current digital vector sum value for protection.When K is set at 10%~125%,the asymmetric grounding protection includes the harmonic influence program of this percentage as the actual grounding current value for protection.Three-phase current analog vector sum value is adopted for protection. When k is set to "ON", all asymmetric grounding protection is protected by digital vector sum value of three-phase current. When k is set to 10% ~ 125%, the percentage of harmonic influence program of asymmetric grounding protection is included as the actual grounding current value for protection.

Technical parameters of current imbalance protection characteristics

There is only one choice between asymmetric grounding protection and leakage protection.
There are two ways of asymmetric grounding protection or leakage protection.
the inverse time limit protection The expression of protection characteristic of inverse time-limit protection is TG = TG * kg * 7G8.
In the eighth formula , TG is the actual protection delay action time value.
tG is the definite time delay setting value
KG is the inverse time coefficient value
IG is the setting current value
I is the actual working current
The inverse time protection delay action time is calculated according to the above expression, but the inverse time protection delay action time is not less than the definite time delay setting value . If KG is OFF, it is time limit protection.Defint timelimit protection, the delay action time of definite time limit protection is the definite time delay setting value.
Current unbalance protection feature
The intelligent controller's current imbalance protection is to protect the open phase and three-phase current imbalance, and to perform protection action or alarm according to the imbalance rate between the three-phase currents.
The calculation formula of current unbalance rate is
8I=I-Iav/Iav
In the formula ,Iav is the average value of three-phase current
The current imbalance protection feature is time limit protection, and the delay setting value is t6. When ts is "OFF", it means that the current imbalance protection only gives an alarmsand does not trip.

Starting value of current unbalance rate	Ii=	40%~125%+OFF (level difference 1% OFF indicates the exit position)
	Action characteristic	⩽ 0.98 No action
		＞1.18 Delay action
Delay setting value	t (s)	0.1~1+0FF (level difference of 0.1 OFF means that only the alarm and no trip)
Accuracy	δ	±10%

Technical parameters of load monitoring protection characteristics

Load monitoring protection characteristics
See Table 20 for technical parameters of load monitoring protection characteristics of intelligent controller.
The intelligent controller can be programmed to output two passive signal contacts for load monitoring The output signal contacts can be used for monitoring and alarm, and can also be used to control the load of the breaking branch and ensure the normal power supply of the main system.
There are two load monitoring methods to choose from (users can choose one of them).
Mode 1: One is to control two branches loads. When the running current exceeds 1.2Ic1 or 1.2Ic2, the intelligent controller will delay the output of signal contacts according to the inverse time characteristic. The inverse time characteristic curve is the same as the overload long delay, but the curve rate and the setting current value can be set adjusted separately.
Mode 2: Generally, it is used to control the branch load. When the running current exceeds 1.2Ic1, the intelligent controller outputs a signal contact to break the branch load according to the inverse time characteristic delay.The inverse time characteristic curve is the same as the overload long delay, but the curve rate and setting current value can be set independently. The setting value Ic1 ＞ Ic2 is required. If the running current returns to normal after braking the branch load , when the current value is lower than the setting value Ic2 and lasts for 60s, the intelligent controllerwill outputs another signal contact to connect the power supply of the broken load recovery system.

Technical parameters of short-circuit delay protection characteristics

Mode 1	Setting current value	Ic1=Inx …	0.2~1+OFF (minimum 125A OFF indicates the exit position)
		Output characteristic	⩽ 1.05Ic1 relay does not close.
			> 1.2 Ic1 relay delay closing
	Inverse time delay setting value (s)	Characteristic curve	Same as the load length delay characteristic curve
		Curve rate	Independent setting (setting parameters are the same as overload long delay)
	Setting current value	Ic2=Inx …	O.2~1+OFF (minimum 125A OFF indicates the exit position)
		Output characteristic	⩽ 1.05Ic2 Relay does not close
			> 1. 2 Ic2 Relay delay closing
Mode 2	Inverse time delay setting value (s)	Characteristic curve	Same as the load length delay characteristic curve
		Curve rate	Independent setting (setting parameters are the same as overload and long delay)
	Setting current value	Ic1=Inx …	O.2~1+OFF (minimum 125A OFF indicates the exit position)
		Output characteristic	⩽ 1.05Ic1 relay does not close
			> 1.2 Ic1 relay delay closing
	Inverse time delay setting value (s)	Characteristic curve	Same as the load length delay characteristic curve
		Curve rate	Independent setting (setting parameters are the same as overload and long delay)
	Setting current value	Ic2=Inx …	O.2~1+OFF (minimum 125A OFF indicates the exit position)
		Output characteristic	＜ Ic2 relay delayed closing
	Fixed delay (s)		Fixed 60s
Precision			±10%
Thermal memory (can be cleared after 30min power failure)			Standard +0FF (off)

Technical parameters of undervoltage protection characteristics

The intelligent controller measures the true effective value of the primary circuit voltage. When the three line voltages are all less than the undervoltage starting value (that is, when the maximum value of the three line voltages is less than the undervoltage protection starting value), the undervoltage protection acts . When the maximum value of the three line voltages is greater than the return value, the alarm acts and returns .When the power failure instantaneous function is enabled ,the undervoltage protection will actuate the break in case of power failur.

Undervoltage protection starting value	Setting range (v)	25 ~ 1200 (level difference 1)
	Action or alarm feature	> 1.1× startup value does not act or alarm.
		⩽ 0.9× startup value delay action or alarm
Start delay time value	Setting range (v)	0.2 ~60 (level difference 0.1)
Undervoltage alarm return value	Setting range (v)	Start-up value ~ 1200 (level difference 1)
	Alarm characteristics	< 0.9× return value alarm does not return
		⩾ 1.1× return value alarm and return
Return delay time value	Setting range (v)	0.2 ~ 60 (level difference 0.1)
precision		±10%
Protection execution time		Alarm/Trip/Shutdown

Technical parameters of overvoltage protection characteristics

The intelligent controller measures the true effective value of the primary circuit voltage. When the three line voltages are all less than the undervoltage starting value (that is, when the maximum value of the three line voltages is less than the undervoltage protection starting value), the undervoltage protection acts . When the maximum value of the three line voltages is greater than the return value, the alarm acts and returns .When the power failure instantaneous function is enabled ,the undervoltage protection will actuate the break in case of power failur.

Undervoltage protection starting value	Setting range (v)	125 ~ 1200(level difference 1)
	Action or alarm feature	⩾ 0.9× startup value does not act or alarm
		⩽ 1.1× startup value delay action or alarm
Start delay time value	Setting range (s)	0.2 ~60 (level difference 0.1)
Undervoltage alarm return value	Setting range (v)	Start-up value ~ 1200 (level difference 1)
	Alarm characteristics	< 0.9× return value alarm does not return
		⩾ 1.1× return value alarm and return
Return delay time value	Setting range (s)	0.2 ~ 60 (level difference 0.1)
Precision		±10%
Protection execution time		Alarm/Trip/Shutdown

Technical parameters of voltage imbalance protection characteristics

Voltage imbalance protection characteristics
The voltage imbalance protection of intelligent controller is based on the imbalance rate of three line voltages for protect action ,and its action mechanism is similar to the overvoltage protection
The calculation formula of voltage imbalance is δv=U Uav/Uav.
In the formula ,Uav is the average of the three line voltages.

Voltage imbalance protection startup value	Setting range (v)	2%~30%(level difference 1%)
	action or alarm feature	⩽ 0.9× startup value does not act or alarm
		⩾ 1.1× startup value delay action or alarm
Startup delay time value	Setting range (s)	0.2 ~60(level difference 0.1)
Voltage imbalance alarm return value	Setting range (v)	2%~30%(level difference 1%)
	Alarm characteristics	⩾ 1.1 × return value alarm does not return
		⩽ 0.9× return value alarm returns
Return delay time value	Specified range (s)	0.2 ~ 60 (level difference 0.1)
Precision		±10%
Protection execution mode		Alarm/Trip/Shutdown

MCR (on/off) and TTSISC (out-of-limit tripping) protection functions
The make break and trip out of limit protection of the intelligent controller are backup protection functions .The two protection modes are instantaneous actions, and the action value is generally 40kA,60KA, 80KA ,and the making breaking current value related to the operation breaking and limit breaking ccapacity of the circuit breaker is generally 50kA, 75kA and 125kA (two current values are 40/50kA for frame I, 60/75 kA for frame II , 80/125kA for frame IIIwhen they leave the factory). The fault current signal sends the action command directly through the hardware comparison circuit. The switching on-off protection only works at the moment when the circuit breaker switched on (within about 125ms), while the out of limit tripping protection always works after 125ms of switch on.

Measurement function

Real-time value measurement
◇ Current value
Measurement method
Measure the true effective value (RMs) of each phase current. The measurement items include phase A current Ia, phase B current Ib, phase C current Ic, phase N current IN, ground fault current or leakage current Ig.
Measuring range
Phase A current Ia, phase B current Ib, phase C current Ic and phase N current In shall not be less than 25 times of the rated current IN, and ground fault current or leakage current Ig shall not be less than 10 times of rated value.
◇ Measurement accuracy
The error of 7nk within the range of 2 times of the rated current In is ±1.5%, and the error is i5% when the rated current In is more than 2 times.
◇ Column graph display of current
During operation, the intelligent controller displays the current values of phases A, B, C and (or N) in a column-figure, and displays the maximum phase current in figures. The height (percentage) of the column graph indicates the percentage between the current value of each phase and the setting current value of the overload long time-delay protection (the rated current value when the overload long time-delay protection is closed).
◇ Current imbalance rate value
The current imbalance rate is the percentage of imbalance between the measured three-phase currents. The calculation formula of current imbalance rate is 8I= I-I av/Iav.
Where Iav is the average value of three-phase current.
◇ Voltage value
Measurement method
Measure the true effective value (RMs) of each phase voltage
Measuring range
Line voltage (voltage between phase lines) 0V ~ 1200V
Phase voltage (voltage between phase line and neutral line) 0 V ~ 600 V.
◇ Measurement accuracy
±0.5%
◇ Phase sequence
Display three-phase voltage phase in the form of "A-B-C" and "A-C-B"
◇ Frequency
Measrement 3range
45Hz ~ 65Hz
Measurement accuracy
±0.05Hz。
Note: The frequency signal is taken from phase A voltage.
◇ Voltage unevenness value
The voltage imbalance rate is the percentage of imbalance between three line voltages. The calculation formula of voltage imbalance rate is 6V=U-Uav/UaV
WhereUav is the average of three line voltages.
◇ Active power
Measurement content
Phase A active power
Measurement accuracy
±2.5Hz
◇ Power factor
Measurement content
◇ Phase A power factor
Measurement accuracy
±0.02

ZQW18
Intelligent universal circuit breaker

Measurement function

◇ Harmonic influence coefficient measurement
Harmonic influence coefficient (i.e. the comprehensive coefficient of grid harmonics affecting the sum of three-phase current analog vectors) is the program that represents the impact of grid harmonics on T-type grounding protection.The calculation formula of measured value of harmonic influence coefficient is K=(IAG-IDG)/Iz×125%
In the formulaIAG is three-phase current analog vector and value
In the formula IDG is three-phase current analog vectors and value
In the formula Iz is asymmetric grounding comprehensive current value
◇ Internal temperature measurement
Internal temperature refers to the small ambient temperature value near the internal microcontroller (MCU) of the intelligent controller, which is measured in real time with a temperature chip.
When the temperature exceeds 85 ℃ +5 ℃ , "the system will give an alarm of internal environment over temperature"alarm.
◇ System setting function
◇ System clock function
The system clock function is the basic configuration function of ZQW18-3 intelligent controller. The intelligent controller is equipped with a 3V lithium battery. As long as the lithium battery is powered, the system clock will not reset due to external power failure.
◇ Meter setting function
◇ System type selection
There are three types of systems.
-3 ∮ 3W3CT
System type three phase three wire system
Number of poles of circuit breaker three poles(3P)-3 ∮ 4W3CT
System type three phase four wire system
Number of poles of circuit breaker three poles (3P)
-3 ∮ 4W4CT
System type three phase four wire system
Number of poles of circuit breaker four poles (4P) or three poles plus N poles (3P+N).
◇ Internal temperature calibration
The internal temperature calibration shall be carried out when the intelligent controller is cold, and the internal temperature is close to the external ambient temperature . The internal temperature has been calibrated when the intelligent controller leaves the factory, and users generally don't need to calibrate it.
◇ Communication switching
Model 3H intelligent controller or added the function of "using KST programmer" KsT can be used on the DB9 interface of panel of 3M intelligent controller programmer
There are two options for communication switching.
There are two options for communication switching.
Communication with upper computer.
Only when "Communication with Programmer" is selected can all the functions of KsT programmer be exerted.
The RS485 interface of 10# and 11# lines of 3H intelligent controller is the same as the RS485 interface of the panel.(i.e. interlinked).
◇ Test & lock function

Technical parameters of simulation test

◇ Simulation test
There are three types of simulation tests.
The three section protection test adjusts the test current (equivalent to the fault current) and starts the test to simulate the protection of the intelligent controller when the overload long delay, short circuit short delay and short circuit instantaneous faults occur. Grounding or leakage protection test, adjust the test current (equivalent to the grounding or leakage fault current) and start the test to simulate the protection of intelligent controller when grouding or leakage fault occurs.
Mechanism action time test: after the starup test, the system forces the magnetic flux converter to act to test the mechanical action time of the circuit breaker tripping.
There are two types of simulation tests.
No tripping test : w hen the test is completed, the intelligent controller displays the test result information without tripping. This test type is appliable to the on-site simulation test without power failure.
Tripping test: when the test is completed, the intelligent controller displays the test result information and trips. This test type is appliabe to the simulation test that can be powered of .

Test type	Three section protection	Grounding or leakage protection		Mechanism action time
		Asymmetric grounding protection	leakage protection	
Test form	No tripping/tripping			releasing
Test current	0A ~ 50kA (frame Ⅰ)/75kA (frame Ⅱ)/125a K (frame Ⅲ)		0A~99.99A	without
Test control	Start/stop			

Limitation of position locking on operation.

◇ Position locking
The position locking of the intelligent controller has three states: setting, local and remote control.

Starting value of voltage unbalance protection	Position locked state		
	set up	local	remote control
Remote control and remote adjustment	cannot	cannot	can
Local parameter adjustment	can	cannot	cannot
Local test	can	cannot	cannot
Programmer operation	can	can	can

Technical parameters of communication settings

◇ Parameter locking
There are two states for parameter locking of intelligent controller.
When the parameter is locked in this state, the user can only query the parameterand can not modify it.
When the parameteris unlocked in this state,the users can query and modify the parameters
Note: In order to prevent all parameters of the intelligent controller from being modified without authorization and ensure reliable operation of the system, the parameter locking function implements user password management. When entering this function, you need to correctly enter the user password .
◇ Communication setting function
The model 3H intelligent controller can realize the "four remote" functions such as remote measurement, remote control, remote adjustment and remote signaling through the Rs485 interface (10# , 11# lines or DB9 interface on the panel). The communication interface adopts photoelectric isolation and is suitable for the environment with strong electrical interference.

Communication protocol	Modbus-RTU	Profibus-DP	DeviceNet
Communication module	Built -in	Appearance	
Communication address	0-255	3-126	0~63
Baud rate	9、6k、19、2k	Self-adaption	125k、250k、500k

Signal contact output function and output schedule of intelligent controller

◇ 1/0 setting function
The 3H intelligent controller and the 3M intelligent controller added with "four groups of contact output functions" have four independent signal contact outputs, and their output functions can be set.

Function number	Signal contact output function	Signal contact output time
0	Underdefined	No output
1	Short circuit instantaneous fault trip alarm	Output when short circuit transient fault trips
2	Grounding or leakage fault trip alarm	Output when grounding or leakage fault trips (or alarms)
3	Current imbalance fault trip alarm	Output when current imbalance fault trips (or alarms)
4	Short circuit short delay fault trip alarm	Output when short circuit short time delay fault trips
5	Overload long delay fault trip alarm	Output when loverload long delay fault trips
6	Fault trip alarm	Output when any fault trips
7	Load monitoring -unloading output	Output when the load monitoring time I expires
8	load monitoring II unloading output	Output when the load monitoring time II expires
9	System self-diagnosis fault alarm	Output when system self-diagnosis failure
10(A)	Power grid fault pre-alarm	Output at the beginning of protection or monitoring delay
11(B)	Undervoltage fault alarm	Output when the start time of undervoltage fault alarm expires
12(C)	Overvoltage fault alarm	Output when the start time of overvoltage fault alarm expires
13(D)	Voltage imbalance fault alarm	Output when starting time of voltage imbalance fault alarm expires

Limitation of position locking on operation

Contact number / Controller type	Contact No.1	Contact No.2	Contact No.3	Contact No.4
Type 3M	Load monitoring I unloading output	Load monitoring II unloading output	System self-diagnosis fault alarm	Fault trip alarm
Type 3H	Load monitoring I unloading output	Load monitoring II unloading output	Remote opening	Remote closing

Note: The contact 3 and contact 4 of the 3H intelligent controller are fixed for remote opening and closing, which cannot be set to other functions.

All alarm information that can be displayed

◇ The query function

◇ Current report

When the "Fault/Alarm" red light flashes slowly, it means that the intelligent controller has alarm information. You can query the "Current Alarm" to display the current alarm information.

Category	Reported information
Self-diagnosis fault alarm	External memory error
	Analog digital conversion error
	Internal environment overtemperature
	A phase transformer disconnection
	B phase transformer disconnection
	C phase transformer disconnection
	N-phase transformer disconnection
	Flux converter disconnection
	Main contact wear
	Opening mechanism refuses to operate
Self-diagnosis serious fault alarm	program memory error (note)
Protection alarm	Grounding or leakage fault
	Current imbalance fault
	Undervoltage fault
	Overvoltage fault
	Voltage imbalance fault
	Fault pre-alarm

Note: When the intelligent controller displays the alarm of "program memory error", it means that the MCU of the intelligent controller has a serious fault.If the intelligent controller cannot work normally, it should be replaced in time.

◇ Number of operations

Cumulate the opening and closing times of the circuit breaker. This number will increase by 1 for one operation of the opening and closing. This value can be modified and cleared by special methods.

◇ Main contact worn

The intelligent controller simulates and calculates the wear rate of the main contact of the circuit breaker according to the fault current when tripping ,the structure of main contact and other data.The display value of the intelligent controller when leaving the factory is 0%, indicating that the main contact is not worn. After each fault tripping, the intelligent controller automatically deducts the corresponding wear rate equivalent. When the display value of the wear rate is ⩾ 40%, the system will send out a self diagnostic fault alarm signal to remind the users to take timely maintenance measures.

After the main contact is replaced, the initial wear rate value may be restored to 0% through programmer or special method.

◇ Product information

Displays the manufacturer information of the intelligent controller.

◇ Trip record
Record the fault information and measurement parameters at the time of the last 8 fault trips.
Record the total number of fault trips. This value can be cleared in a special way.
The specific information of each fault trip record includes the fault time
(year, month, day, hour, minute, second)
Fault catagory(i.e. cause)
Fault source values (such as fault current value, fault voltage value, fault unbalance value, etc.)
Fault delay time
Fault phase
Total number of failures/this number
Measurement parameters at the time of failure

◇ Alarm record
Record the alarm information of the last 8 fault alarms.
The specific alarm information of each fault alarm record includes
Alarm reason
Alarm time (year, month, day, hour, minute, second)
Alarm source value (some alarm information do not have this item)

◇ Change record
Record the information of the last 8 times of the breaker mechanism opening and closing.
The specific information of each change is
Change type
Reason of change
Change time (year, month, day, hour, minute, second)

◇ Other functions

◇ Display inspection function
This function can check the working conditions of all light-emitting devices, ensure that the light-emitting devices indicate accutately,and display product information.

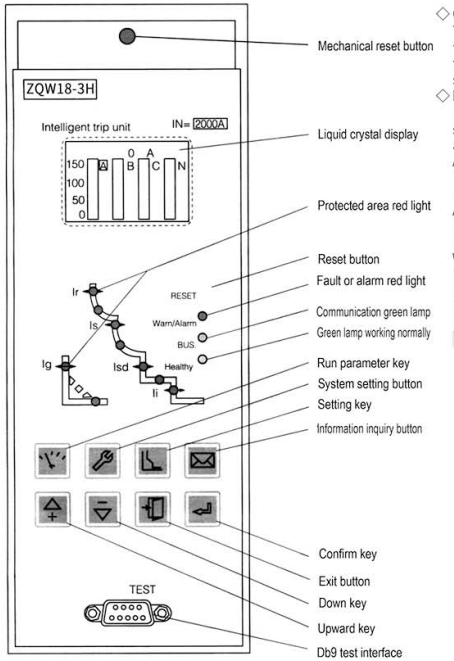
◇ Disconnection self diagnosis function
The intelligent controller can self diagnose three (four) phase air core transformer disconnection and magnetic flux coverter disconnection faults.

◇ Thermal memory function
Repeated overloads may cause heating of conductors or equipment .The intelligent controller simulates the heating condition, and has a thermal effect (simulating bimetallic characteristics) after the overload long delay and short circuit short delay and other fault delay actions.The overload long time delay thermal effect is released 30 minutes after the fault is removed, and the short circuit short time delay thermal effect energy is released 15 minutes after the fault is removed. During this period, if the overload long time delay ,short circuit short time delay and other fault occur when the circuit breaker is closed again, the delay action time will be shortened, which can enable the line or equipment to get more appropriate protection. (The thermal memory characteristics of load monitoring is the same as that of overload long time delay protection)
The overload long delay thermal memory is displayed through the "current heat capacity" . When the "current heat capacity" reaches 125%, the overload long-delay protection acts.
For example if the intelligent controller is powered off once and then powered on, the accumulated thermal effect is completely eliminated.
This feature defaults to on when leaving the factory, which means it has the thermal memory function. Users can set this function by themselves.

◇ Programming interface function
The 3H intelligent controller and the 3M intelligent controller added with the function of "using KST programmer" have the function of communicating with the programmer on Db9 and interface of the panel. Some internal parameters of the system can be set through the programmer, such as theselection of overload protection characteristic curve category， the opening and closing of thermal memory function, the setting of signal contact output function ,the selection of communication protocol ,the setting of communication address ,the selection of communication baud rate ,the calibration of system clock ,the locking and unlocking of setting function,the selection of voltage wiring mode , etc. There are also functions such as testing opening and closing, viewing historical data and copying setting values.
For the use of the programmer,refer to the User Manual of the Programmer.

Usage of ZQW18-3 intelligent controller

◇Panel structure



Panel diagram

◇Overview of panel composition, display and operation

The panel of ZW18-3 intelligent controller consists of five parts: LCD , LED indicator group, keyboard, DB9 test interface and red mechanical reset button. See the schematic diagram of the panel.

◇LCD screen

LCD displays all measurement parameters, system setting parameters, protection setting parameters and all information in Chinese.

A When there is " ↓ " in the upper right corner of the LCD ,it indicates there is a next display interface.

Press the ▽ key to go to the next interface.

A When thete is " ↑ " in the upper right corner of the LCD ,it indicates there is a next display interface.

Press the △ key to go to the previous interface.

When there is an " ↕ " upper and lower display interface in the upper right corner of the LCD screen, it means that there are display interfaces at the top and bottom.

Press the △ key to go to the previous interface and the ▽ key to go to the next interface.

Meaning of the flashing form of fault or alarm red light

◇LED indicator group

Protection section red light

When setting the current protection , the red light of this section is always on， indicateing that the protection current value or delay time value of the corresponding section is being set.

In case of fault delay or alarm, the red light in this section flashes at a constant speed (once a second), indicating that the corresponding section is in fault delay or alarm.

After the fault protection trips, the red light in this section flashes rapidly.(once every 0.4 seconds) , indicating the corresponding section is tripped due to fault.

Fault or alarm red light

Function of fault or alarm red light.

ZW18-3 "fault or alarm red light" integrates "fault pre-alarm", "fault trip" and "self-diagnosis fault alarm", and distinguishes fault information from alarm information by different flashing modes.

During normal operation , the fault or alarm red light does not light up, which means that as long as the "fault or alarm red light" flashes, there must be abnormal conditions in the system.

Serial number	Red light status	Meaning
1	Slow flashing (once every 2 seconds)	The system alarm or self diagnosis fault information.
2	Constant speed flashing (once every second)	The protection is in the fault delay (pre-alarm) state.
3	Rapid flashing (once every 0.4 seconds)	The protection is in fault tripping state.

◇ Communication green light
The green communication light indicates the communication data transmission. The light is on when the communication data is transmitted, and off when no communication data is transmitted.

◇ Normal operation green light
The "notmal working green light " always flashes when the intelligent controller is powered on. If the light doesn't light or remains on after power on, it means that the intelligent controller is not working properly and should be replaced immediately.

◇ Keyboard
The intelligent controller keyboard has four shortcut keys (operation parameter key), (system setting key), (protection setting key) and (information inquiry key), which can be quickly switched between the four main menus.
There are also five operation keys.
Specifically
Quickly switch to the main menu of "Operating Parameters" ("Left key" when the system clock is calibrated).
Quickly switch to the main menu of "System Settings" (it is the "Right key" when the system clock is calibrated).
Quickly switch to the "Protection Settings" main menu.
Quickly switch to the main menu of "Information Inquiry".
(Up) Move the cursor upward, or change the selected parameter upward, or position the display to the left.
(Down) Move the cursor down, or change the selected parameter down, or position the display to the right.
(Exit) Exit the current menu to enter the previous menu, or cancel the modification of the current parameters.
(Confirm) Enter the next menu of the item indicated by the current cursor, or select the current parameter, or store the modification.
(Reset) Reset to enter the reset (running) state in case of fault tripping or alarm.

◇ DB9 test interface
The test interface on the intelligent controller panel has three functions.
DC24V 电源输入口
It can be directly input into DC24V power supply, which can be used as an auxiliary power supply of intelligent controller. Among them, the 4 and 5 terminals of the Db9 interface are connected to the anode 2 and 9 terminals of DC power supply and connected to its cathode (i.e. power ground).
Analog signal input port
It can directly input the analog signal of three-phase current and test the current protection characteristics of the intelligent controller. Among them, terminal 7 of Db9 interface is connected to analog signal of phase A current, terminal 6 is connected to analog signal of phase B current, 1 terminal is connected to analog signal of phase C current, and terminals 2 and 9 are connected to the common ground of analog signal.

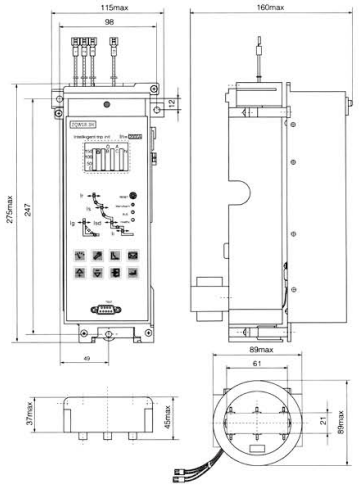
◇ Programming and communication interface
Type 3H intelligent controller or 3M intelligent controller added with the function of "using ZQW18 programmer" can use ZQW18 programmer on the Db9 interface ,and can also communicate with the upper computer through this interface. Among them, terminal 3 of Db9 interface is connected to RS485-A terminal (equivalent to line 10#) and terminal 8 is connected to RS485-B terminal (equivalent to line11# l).

◇ Red mechanical reset button
This button will pop up in case of fault trip or test trip, and the circuit breaker can be closed only after pressing the button is pressed.

◇ Backlight of LCD screen
The intelligent controller is designed to have no backlight when it is powered on, so as to improve the working stability of the intelligent controller under low current without auxiliary power supply.
Press any key to lturn on the backlight, press both and keys at any interface to turn off the backlight. The backlight will turn off automatically 5 minutes after no key is pressed.

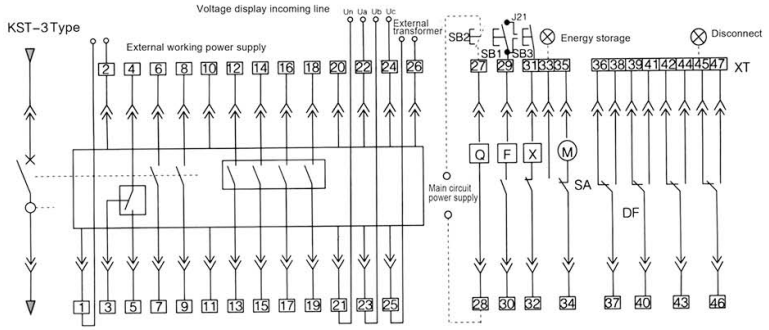
◇ Full display status of LED indicator
When the and keys are pressed at the same time under the reset (operation) interface, the system will enter the LED indicator full display state. In this state, the LED indicators are all on, and the LCD screen will display product information. When pressing the key under the LED indicator light status, the system will return to the reset (running) interface immediately.The system will return to the reset (running) interface automatically after 5 minutes without pressing any key.

ZQW18
Intelligent universal circuit breaker



Wiring between intelligent controller and circuit breaker

◇ When the intelligent controller is connected with the circuit breaker, the number of each lead and the number of the socket must correspond one by one. See the following figure.



Function description of lead wire
1#, 2# line auxiliary power input
Output terminal of the first group of auxiliary contacts in circuit breaker status of line 6# and 7#.
Outgoing line A and B of RS485 communication interface of line 10# and 11#.
Output terminal of the second group of signal contacts of intelligent controller of line 14# and 15#.
Output terminal of the fourth group of signal contact of 18 19 # intelligent controller
21#、22#、23#、24# line voltage display input terminal
3#, 4#, 5# line output trrminal of fault trip contact (of which 4# line is the common terminal)
Output terminal of the second group of auxiliary contacts in circuit breaker status of line 8# and 9#.
Output terminal of groupl signal contact of intelligent controller of line 2 # and 13#.
Output terminal of the third group of signal contact of intelligent controller of line 16# and 17#.
20# line protective grounding wire
25# and 26# lines are externally connected to the input end of transformer.

Common fault causes and solutions

Question	Cause	Solution
Self-diagnosis fault alarm	Overload tripping (Ir1 indicator lights up)	1. Check the action time of breaking current value on the intelligent controller . 2. Analyze the load and power grid. 3. If the overloade occurs,please eliminate the overload fault. 4. If the actual running current does not match the setting value of the long-delay action current, please modify the setting value of the long-delay action current according to the actual running current to properly match the protection. 5. Press the Reset button to reclose the circuit breaker.
	Short circuit tripping (Ir2 or Ir3 indicator lights up)	1. Check the breaking current value and action time on the intelligent controller. 2. If it is short-circuited, please find and eliminate the short-circuit fault. 3. Check the setting value of the intelligent controller. 4. Check the integrity of the circuit breaker . 5. Press the Reset button to reclose the circuit breaker.
	Grounding trip (Ird indicator lights up))	1. Check the breaking current value and action time on the intelligent controller. 2. If there is a grounding fault, please find and eliminate it. 3. Modify the setting value of grounding fault current of intelligent controller. 4. If there is no grounding fault, please check whether the setting value of fault current matches the actual protection. 5. Press the Reset button to reclose the circuit breaker.
	Mechanical interlocking action	Check the working status of two circuit breakers equipped with mechanical interlocking.
	Under-voltage tripper fault: the rated working voltage is less than 70%. UE under-voltage tripper control unit fault	1. whether the power supply of the undervoltage release is connected. 2. Check that the power supply voltage of the undervoltage release must be ⩾ 85% Ue. 3. Replace the control unit of undervoltage release.
Circuit breaker can not close	The Reset on the intelligent controller is not reset (protruding panel)	Press the Reset button to reclose the circuit breaker
	The secondary circuit contactor of the drawer type circuit breaker is poor	Swing the drawer-type circuit breaker to the "on" position (hear click twice).
	The circuit breaker failes to store energy	Check whether the secondary circuit is connected. 1. Check that the power supply voltage of the motor controller must be ⩾ 85% Us. 2. Check the motor energy storage mechanism. If there is any fault, please contact the manufacturer to replace the motor operating mechanism.
	The mechanical interlocking action circuit breaker has been locked	Check the working status of two circuit breakers equipped with mechanical interlocking.
	The rated control voltage of the closing electromagnet is less than 85%. The closing electromagnet is damaged due to fault	1. Check that the power supply voltage of the closed electromagnet must be ⩾ 85% Us. 2. Replace the closed electromagnet
	Undervoltage release voltage is less than 85%. Ue release without voltage release is damaged and does not work	The voltage must be ⩾ 5% Ue connect the power supply and replace the release.
	Improper wiring of shunt release causes release action	Check the circuit and correct it (the opening button is wrongly connected in normally closed position)

Question	Cause	Solution
The circuit breaker is closed and tripped in hour (the fault indicator is on)	Immediate tripping closes the short-circuit current Delayed tripping closes the overload current	1. Check the breaking current value and action time on the intelligent controller. 2. If it is short-circuited, please find and eliminate the short-circuit fault. 3. If it is overloaded, please find and eliminate the overload fault. 4. Check the integrityof the circuit breaker . 5. Modify the current setting value of the intelligent controller. 6. Press the Reset button to reclose the circuit breaker.
Thecircuit breaker can not be disconnected	The circuit breaker can not be manually disconnected locally Mechanical operating mechanism failure The circuit breaker cannot be electrically disconnected at a long distance Mechanical operating mechanism failure The power supply voltage of shunt release is less than 70% Us The shunt release is damaged	1. Check the mechanical operating mechanism. Please contact the manufacturer in case of jamming and other fault . 2. Check whether the power supply voltage of shunt releaseis less than 70% Us. 3. Replace shunt release
The circuit breaker can not store energy	No manual energy storage, no electric energy storage The control power supply voltage of the rated control electric energy storage device is less than 85% Us, and the mechanical failure of the energy storage device	Mechanical failure of energy storage device,contact the manufacturer. 1. check that the control power supply voltage of electric energy storage device is ⩾ 85% US. 2. Check energy storage device and contact the manufacturer.
The handle of drawer type circuit breaker can not be inserted into and out of the circuit breaker	There is a padlock plug guide rail at the disconnection position or the breaker body is not fully pushed in	Remove the padlock and push the guide rail or breaker body to the bottom.
The drawer-type circuit breaker can not be pulled out at the "off" position	The h andle is not pulled out of circuit breaker. The "off" position is not completely reached	Pull out the rocker handle and fully swing the circuit breaker to the "off" position .
The drawer-type circuit breaker can not be swung to the "on" position	There are foreign matter falling into the drawer base and blocking the swing in mechanism or gear trpping of the swing in mechanism and other fault circuit breakers. The body of the circuit breaker does not match the rated current of the shell frame of the drawer base.	Check and remove foreign matter. If they can't be shaken in, contact the manufacturer to select the circuit breaker body and drawer base with the same frame level and rated current .
No display on intelligent controller screen	The intelligent controller is not connected to the power supply.	The user should check whether the intelligent release is connected to the power supply. If not, please connect the power supply immediately, cut off the control power supply of the intelligent controller and then power on again . If the fault still exists, please contact the manufacturer.
The fault indicator of the intelligent controller is on It is still on after pressing the clear button	Thentelligent controller is faulty.	Cut off the control power supply of the intelligent controller, and then send the power supply. If the fault still exists, please contact the manufacturer.

Order specification

User unit		Order sum		Date of order	

Model ☐ ZQW18-2000 (Ⅰ Frame)
☐ ZQW18-3200 (Ⅱ Frame)
☐ ZQW18-4000 (Ⅱ Frame)
☐ ZQW18-6300 (Ⅱ Frame)

☐ Fixed ☐ 3-pole
☐ Drawer ☐ 4-pole
In ⩾ 4000A without fixed type

Three-pole rated current In=A
Four-pole rated voltage
☐ AC380(400)V
☐ AC660(690)V

Intelligent controller	Fundamental function				Additional functions or accessories can be added
Intelligent controller	M type	☐ M	Long-delay, short-delay, instantaneous and single-phase grounding fault protection	1. Various status indication and numerical display 2. Ammeter 3. Fault memory 4. Thermal memory 5 experiment	☐ 1. Load monitoring ☐ 2. Voltmeter ☐ 3. M Acknowledge the on/off and simulated release ☐ 4. Signal unit for pre-alarm and self-diagnosis OCR tripping alarm
	H type	☐ H	1. Long delay, short delay, instantaneous and responsible for monitoring. 2. Single-phase grounding fault protection, 3. Various status indicators and numerical displays, 4. Ammeter 5. Voltmeter 6. Fault memory 7. Thermal memory 8. Experiment 9.RS485 single-line interface 10. Alarm fault status		☐ MCR on/off and analog tripping ☐ RS485/232 converter ☐ Power transformer ☐ -220V ☐ -380V ☐ -220V ☐ -110V ☐ DP module
	Controller power supply		☐ AC220V ☐ AC380V		
Attachment	☐ Undervoltage release		☐ AC220V ☐ AC380V		
			☐ Undervoltage comfortable release ☐ Undervoltage delay release ☐ 1s ☐ 2s ☐ 3s		
	☐ Shunt release		☐ AC220V ☐ AC380V ☐ DC220V ☐ DC110V		
	☐ Energy release (closing) electromagnet		☐ AC220V ☐ AC380V ☐ DC220V ☐ DC110V		
	☐ Motor operating mechanism		☐ AC220V ☐ AC380V ☐ DC220V ☐ DC110V		
	☐ Mechanical interlock		☐ Horizontal interlocking ☐ Vertical interlocking ☐ Door interlocking		
	☐ Position key lock				
	☐ Door frame				
	☐ External single-phase grounding transformer		☐ Difference type (vector sum) ☐ Ground current type		
Connect	☐ Horizontal connection ☐ Vertical connection				
Remarks					

Note
If the user selects the controller, additional functions or accessories can be added, which requires additional costs.
The settlng value of the long delay of L-type controller is 10% of in, decreasing in each gear.
The conventional factory setting (M, H type) the long delay current 1.0In and the action time of 1.5In is 15s, the short delay current 8Ir1, delay 0.4s the instantaneous 12In, ground fault current 0.8s and the action time OFF. The 6300A has no four poles.

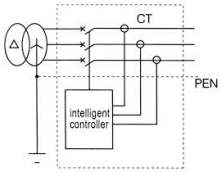
Appendix

◇Grounding and leakage protection

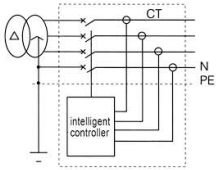
Single-phase grounding protection refers to the metallic grounding protection with fault current over several hundred amperes ,which is generally used in the neutral point direct grounding system. The controller has two different protection modes.

One is the vector sum mode (grounding protection) of internal transformer, which performs protection according to the vector sum of three-phase current and neutral current. According to the number of breaker poles, it is divided into three forms: 3PT 4PT (3P+N)T (see the figure below).

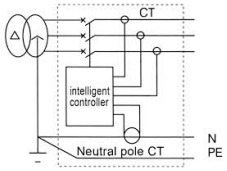
This method is generally suitable for balancing load, unbalanced load or motor load. Generally, it only gives an alarm without tripping.



3PT

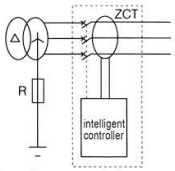


4PT Mode

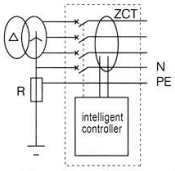


(3P+N) Mode

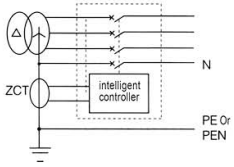
The other is the external leakage transformer mode (leakage protection). The controller directly takes the output current signal of an external current transformer for protection. Generally, the secondary output of the transformer is 5A/1A (when the primary current of the transformer is less than or equal to 400A, the secondary is 5A when the secondary current is more than 1A 400A). This scheme has high sensitivity and is especially suitable for the protection of small grounding current starting from several amperes.



External transformer mode 1
Transformer adopts (ZCT1)

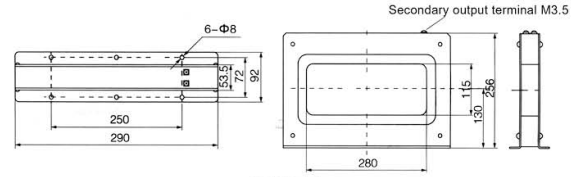


External transformer mode 2
Transformer adopts (ZCT1)

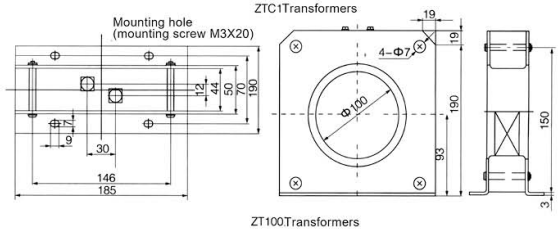


External transformer mode 3
Transformer (ZT125)

Structural dimensions of external leakage transformer



ZTC1Transformers



ZT100Transformers