YCW9X Integrated Circuit Breaker

General

Integrated circuit breaker is one of the new circuit breakers developed by advanced technology, the product is suitable for general distribution system, new energy distribution system, multi-energy distribution network, inverter and distributed power rotary motor power supply grid-connected operation and protection and other occasions, it has isolation function and small size, high breaking capacity, and other multi-functional characteristics.

Standards: IEC60947-1 ,IEC60947-2

Operating Conditions

The ambient air temperature is -5 °C ~ +40 °C(beyond the range can be reduced capacity use), and the average value of 24h does not exceed +35°C ;

The elevation of the installation site does not exceed 2000m, more than 2000m capacity reduction use;

The relative humidity of the air at the installation site does not exceed 50% when the maximum temperature is +40°C , and can have a higher relative humidity at lower temperatures, such as 90% at 20°C .Special measures should be taken for condensation occasionally caused by temperature changes;

Pollution level is level 3;

Circuit breaker main circuit installation category IV, the rest of the auxiliary circuit and control circuit installation category III;

The circuit breaker should be installed in a place where there is no explosion risk, no conductive dust,no rain and snow attack, and no enough to corrode metal and destroy insulation.

Type designation

YC W9X - 1600 / □ □ □ □

Company Code	Design code	Frame grade current	Number of poles	Rated current	Controller type	Control voltage
YC	W9X	- 1600	/ □	□	□	□
CNC	Plastic frame integrated circuit breaker	1600A	3P,4P	200, 400,630,800 1000,1250,1600A	M(default),F,3M,3H	AC220V;AC380V

YCW9X Integrated Circuit Breaker

Technical data

Type	YCW9X-1600	
Bracket rating Current Inm(A)	1600	
Rated current In(A)	200,400,630,800,1000,1250,1600	
Rated operating voltage Ue(V)	AC400V,AC800V	
Rated insulation voltage Ui(V)	1000	
Rated impulse withstand voltage Uimp(kV)	12	
Power frequency withstand voltage U(V)1min	3500	
Number of poles	3,4	
N-pole rated current In(A)	100%In	
Rated limit short-circuit breaking capacity Icu(kA)(valid value)	AC400V	60
	AC800V	32
Rated operating short-circuit breaking capacity Ics(kA)(valid value)	AC400V	50
	AC800V	20
Rated short-circuit ability Icm(kA) (Peak)	AC400V	143
	AC800V	105
Rated short-time withstand current Icw(kA)/1s(valid value)	AC400V	50
	AC800V	20
Total breaking time (no additional delay)(ms)		25
Closing time(ms)		Max70
Electrical life (s)	AC400V	maintenance-free 1500
		maintenance-free 4500
	AC800V	maintenance-free 1200
		Be maintained 3500
Mechanical life (second)	Maintenance-free	4500
	Be maintained	8500

Overload long delayprotection

The overload and long delay protection function generally protects the cable from overload.

Overload long delay protection parameter setting

Overload protection parameter setting table

Parameter name	Adjustment range	Remark
Action current set value Ir	=(0.2 ~ 1.0)In+OFF,Adjust the step =1A.	
Protection curve type	Curve 1: Standard inverse time Curve 2: Fast inverse time Curve 3: Express inverse time (general distribution protection) Curve 4: Express inverse time limit (for motor protection) Curve 5: High voltage fuse compatibility Curve 6: Universal inverse time (I^2t)	For distribution protection, the upper limit of Ir is 1.0In. For generator protection, the upper limit of Ir is 1.25In. "OFF" indicates that the function is out.
Delay time set Tr	C01~C16	
Cooling time setting	Instantaneous,10min,20min,30min,45min,1h,2h	

Peculiarity	Current multiple(n=I/Ir)	Action characteristic	Delay error
Inactive characteristic	n ≤ 1.05	>2h No action	
Action characteristic	n>1.2	< 1h action	
Delay characteristic	n>1.2	Characteristic curve, factory default characteristic curve 3 EI(G)	±10%

peculiarity	Current multiple(n=I/Ir)	Action characteristic	Delay error
Inactive characteristic	n ≤ 0.95	>2h No action	
Action characteristic	n>1.05	< 1h action	
Action delay	n>1.05	Characteristic curve 6, generator protection characteristic curve: $t=tr\cdot(\frac{1.2}{n})^2$	±10%

The controller provides 6 overload protection characteristic curves, which are expressed as follows:

Curve 1. Standard inverse time (SI): $t=\frac{1.2}{n^{0.02}-1}$

Curve 2, Fast inverse time (VI): $t=\frac{1.2}{n-1}$

Curve 3, Express inverse time (general purpose)EI(G): $t=\frac{1.2}{n^2-1}$

Curve 4, Express inverse time (motor use)EI(M): $t=\frac{K}{1.15}\cdot\ln\frac{N^2}{N^2-1.15}$

Curve 5, High Voltage fuse Compatibility (HV): $t=\frac{1.2}{n^4-1}$

Curve 6, universal inverse time (I^2t): $t=\frac{K}{n^2}$

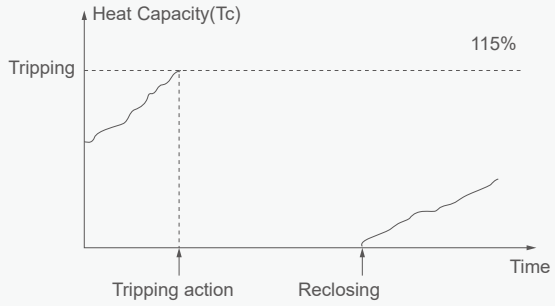
In the above 6 formulas: t: inverse time delay action time (seconds, s)

K: curve rate;

n: The multiple of the actual fault current relative to the long delay protection setting, that is, $n=\frac{1}{Ir}$

tr: The delay time when n is equal to some eigenvalue (seconds, s)

B



The controller loses power. The Tc increases from zero Figure 2(A) Heat capacity variation diagram without auxiliary power supply

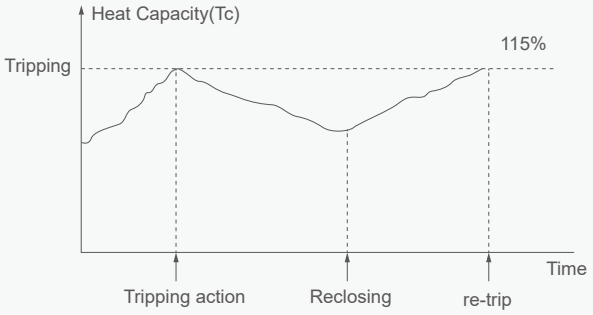


Figure 2(B) Heat capacity variation diagram with auxiliary power supply

Protection function

Thermal memory function

In order to prevent repeated or periodic overload, the controller tracks andrecords the thermal effect of the load current. When the thermal effect of theoverload accumulates to a predetermined level, the trip will be caused. The waythe heat capacity changes is determined by the curve chosen.

The heat capacity increases when the measured current value is greater than1.1Ir. When the circuit breaker returns from overload state to non-overload stateafter tripping due to overload long delay fault or inverse time short circuit fault,the heat capacity decreases exponentially. Users can set the heat capacitycooling time: instantaneous, 10 minutes, 20 minutes, 30 minutes, 45 minutes, 1hour, 2 hours. When the controller does not use the auxiliary power supply, theheat capacity is cleared to zero after the circuit breaker is broken, and the heatcapacity accumulation is shown in Figure 2(A).

When the controller uses auxiliary power supply, the heat capacity decreasesaccording to the heat dissipation law after the breaker is broken, and the heatcapacity continues to change according to the current at this time on the basisof the original after re-closing. The change of heat capacity is shown in Figure 2(B).

Short circuit delay protection

Short circuit delay protection is set for Class B circuit breaker to achieve selectiveprotection, for medium strength short circuit fault. Users can choose either fixedtime mode or inverse time mode according to their needs.

3H type controller short delay protection can be optional area interlock function,when the short circuit fault occurs in the circuit breaker outlet side, short circuitdelay will jump the circuit breaker instantaneously; When the short-circuit faultoccurs on the outgoing side of the next level circuit breaker, the short-circuitdelay is tripped after the agreed delay time. The implementation of this functionneeds to be combined with the use of programmable IO ports (DI and DO),DI is used to detect the area interlock signal of the next level circuit breaker, and DO is used to send the interlock signal of the upper level circuit breaker.

Short circuit delay protection parameter

Setting current: Isd		Isd=1.25~15IR+OFF,OFF Indicates that the short delay protection is disabled	
Constant time-lag Inverse time lag	Setting time tsdSetting time tsd	tsd=d0.1s~d1.0s+OFF, A d before the time indicates a definite time limit	
	Action time (s)	T=tsd	
	Setting time tsd	tsd=0.1s~1.0s+OFF,OFF Indicates alarm only without tripping	
Inverse time lag	Action characteristic	Actions between 0.9 and 1.1 Isd	≤ 0.9: No action
	$T=\max\{Tsd,(\frac{s*IR}{I})^2\times Tsd\}$		>1.1: Delay action
precision		Accuracy ±10% (inherent error ±40ms)	
Thermal memory function		15min+OFF (Factory default OFF, only valid for inverse time limit)	

Note:IR=oFF when ,Isd=1.25~15In+OFF;

Type 2, type 3 short delay inverse time delay characteristic curve 1~6, with overload long delay, but the curve speed is 10 times faster;

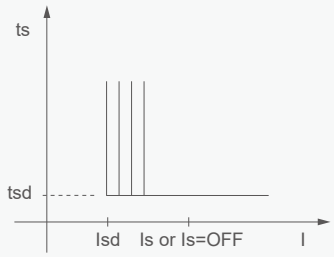


FIG.3(A) Short-circuit short-delay fixed time diagram

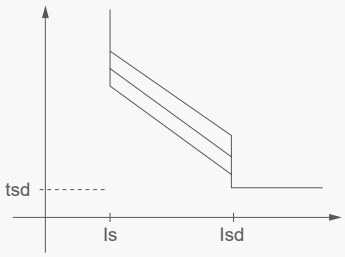


Figure 3(B)Inverse time diagram of short circuit delay

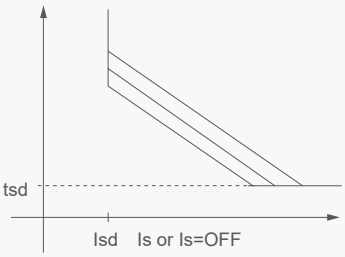


FIG.3(C)Inverse time diagram of short circuit delay when Isd=OFF

Use tips

1. type 2 and type 3 short delay inverse time delay characteristics are the same as overload long delay delay characteristics, only the action delay time is 1/10 of the long delay.
2. When the fault occurs, the protection is in a cold state (that is, the heat capacity =0), whether it is a long delay action or a short delay action, the action delay time is not less than the short delay time set value. In this case, the delay characteristic of short delay protection Is related to the Isd and IS setting values:

   1) When Isd<1s or 1s=OFF, the controller only has a time-limit function; See Figure 3(A).

   2) When Isd>1s, the controller has both inverse time limit and fixed time limit protection functions; See Figure 3(B).

   3) When Is ≠ OFF,Isd=OFF, the controller only has the inverse Time protection function, then the inverse time characteristic curve is called IDMT(InverseDefinite Minimum Time) inverse time characteristic. See Figure

   3(C). For IDMT inverse time feature, refer to GB14048.1-2006 for the note 2.4.27. 4) When Isd=Is=OFF, the short delay protection function is disabled.
3. When the fault occurs, the protection is in a hot state (that is, the heat capacity ≠ 0), then the action delay time is not limited by the set value of the short delay time limit time.

Short circuit instantaneous protection

The instantaneous protection function is to prevent the solid short circuit of the distribution system, such faults are generally phase faults, short circuit current is relatively large, need to be quickly disconnected.

Characteristic parameters of short circuit instantaneous protectio

Setting current Ii(A)	box I	1.0In~50kA+OFF
	box II	=1.0In~75kA+OFF
	box III	=1.0In~100kA+OFF
Action characteristic	0.85~1.15Ii In-between action	≤ 0.85 Inaction
		> 1.15 Instantaneous action (natural action time ≤ 50ms)

MCR and HSISC Protection

The on-off/off (MCR) and off-limit trip (HSISC) functions are instantaneous protection functions. MCR protection protects the switching ability of the circuit breaker to prevent the switch damage caused by exceeding the switching limit current when the circuit breaker is switched on. The protection works in the moment of opening and closing of the circuit breaker (within 100ms). HSISC protection protects the limit carrying capacity of the circuit breaker, prevents the switch from carrying more than the limit breaking current, and takes effect after closing 100ms.

MCR and HSISC Protection parameter setting table

Parameter name	Parameter name	Set the step size
MCR Operation current set value	30~100kA+OFF	1kA
HSISC Operation current set value	30~100kA+OFF	30~100kA+OFF 1kA

Use tips

1. MCR and HSISC setting values are generally set when the circuit breaker is delivered, according to thebreaking capacity of the circuit breaker, and are not adjustable by the end user.
2. M-type controller factory default MCR=OFF,HSISC=OFF; H type factory default MCR=30kA,HSISC=50KA.

B

Protection function

Neutral line protection

Neutral line protection is designed to adapt to the increasingly complex distribution system and the increasing number of neutral line faults. It is suitable for 3P+N or 4P circuit breaker configurations. The controller provides five neutral line protection modes: 50%N, 100%N, 160%N, 200%N and 0FF. When the neutral line is thin, it can be protected by 50%N method; When the neutral line is the same as other phase lines, it can be protected by 100%N. When the harmonics in the power grid are relatively serious, 160%N or 200%N can be used for protection. The neutral line protection characteristic is the same as the overload long delay action characteristic.

Neutral line protection parameter setting table

Protection mode	Long delay	Short time delay	Instantaneous movement	Ground connection	Scope of application
50%N	Ir/2	Isd/2	Ii	Ig	Distribution system where the cross-sectional area of the neutral line is equal to 1/2 of the cross-sectional area of the phase line
100%N	Ir	Isd	Ii	Ig	Distribution system in which the crosssectional area of the neutral line is equal to the cross-sectional area of the phase line
160%N	1.6Ir	1.6Isd	Ii	Ig	Distribution system where the crosssectional area of the neutral line is 1.6 times that of the phase line
200%N	2Ir	2Isd	Ii	Ig	Distribution system where the crosssectional area of the neutral line is twice the cross-sectional area of the phase line
OFF	/	/	/	/	The neutral protection function is disabled

Use tips

1. The 1/2N mode is used as an example to illustrate the actual situation of neutral line protection: If a circuit breaker sets Ir=2000A,Isd=8000A,Ii=24000A,Ig=600A, the neutral line Ir=1000A,1sd=4000A,Ii=24000A,Ig=600A. When the current of the neutral line is greater than 1200A(1.2Ir), the neutral line long delay protection is enabled.
2. The fundamental (50Hz) currents in the neutral line of the three-phase load balancing circuit cancel each other, but 3, 9, 15... Odd times of equal order third harmonic currents are not cancelled but superimposed, which is why neutral lines are often overloaded (1). Therefore, the neutral line protection plays an effective role in protecting the cable heating aging caused by the 3n harmonics of the neutral line. IEC60364 Neutral line protection is required in this case.
3. The use of neutral line protection in 3P+N structure should pay attention to the design requirements of the distribution system. If the design requirements of the distribution system cannot break the neutral line but still have specific requirements for the neutral line overcurrent protection, the protection function can be activated.
4. In the IEC60364 standard also stipulates that for TT, TN-S, IT systems, if the neutral line cross-sectional area is smaller than the phase line, neutral line overcurrent protection should be used; Neutral line protection should not be used in TN-C systems.

Earth fault protection

The IEC60364 grounding fault is defined as a short circuit fault between the phase line and the ground or grounded metal pipe structure or device shell. Ground fault protection applies to the TN system, that is, the power distribution system where the neutral point of the power supply is grounded and the device enclosure is connected to the neutral line. The ground fault current can reach kA level strength.

It varies according to the specific details of the TN system and the circuit breaker configuration. There are three main modes of ground fault protection:

First, NFPA/EGFP mode;

Second, limited (REF)/ unrestricted (UEF) grounding protection;

Third, standby ground protection (SEF).

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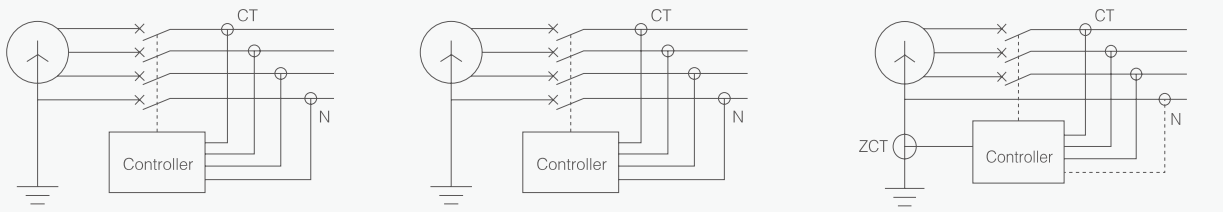

4(A), 4P circuit breaker ground protection　4(B)Grounding protection for 3P+N circuit breakers　4(C)Ground current type grounding protection

Figure 4, NFPA/EGFP ground fault protectionsystem schematic

Protection function

NFPA/EGFP Ground protection mode

1. This Protection mode is a protection policy developed by the National Fire Protection Association for TB systems in the NFPA70 standard, called Ground Fault Protection of Equipment (EFGP). It has the following points:
2. The neutral point of the distribution system must be directly Grounded (Solidly Grounded), and the grounding circuit cannot be strung into any resistance or reactance.
3. The maximum current setting value of the protection cannot exceed 1200A; When the fault current is greater than 1200A, neither the inverse time limit nor the fixed time limit delay shall exceed 1s.
4. There are two types of NFPA/EGFP ground fault protection:First, the vector sum mode (also known as residual current mode, type T), that is, the ground fault current is equal to the vector sum of the phase line and neutral line current. Figure 4(A) and 4(B) show the vector sum mode of the ground current of 4P and 3P+N respectively.Second, the Ground current mode (W type), that is, an independent current transformer detects the current of the Ground Return circuit of the power supply, and the current detected by other phase line transformers does not participate in the protection. As shown in Figure 4(C).

Use tips

1. The location of the ZCT configuration in the ground current mode is very important for the effectiveness of protection. It must be installed in the Ground Return circuit of the power supply (transformer). The ground return circuit refers to the neutral point of the transformer grounding wire, and the neutral line is the circuit between the point and the earth.
2. If the 3P circuit breaker is configured in a TN system and requires ground fault protection, it must be used in 3P+N mode (as shown in Figure 4(B)) or ground current mode (as shown in Figure 4(C)). Otherwise, disable the grounding fault protection function to prevent the controller from misoperating.
3. In the case of FIG. 4(B) and 4(C), the maximum distance between the neutral line CT or ZCT and the circuit breaker is less than 10 meters. Interference caused by excessively long signal transmission may lead to misoperation.

NFPA Ground protection mode characteristic parameters

Setting current (Ig)		In ≤ 1200A In>1200A	Ig=(0.2~1)In+OFF; Ig=240~1200A+OFF;	Step: 1A. OFF indicates that the function is disabled
Action characteristic		0.8~1.0Ig In-between action	≤ 0.8 Ig Inaction	
			≥ 1.0 Ig Delay action	
Setting time (tg)		0.1~1.0s		
Action time	Inverse time lag	$T=\max\{(\frac{1}{n})^2 Tg, Tg\}$;$n=\frac{1}{Igm}$;$Igm=\begin{cases}=In, In<1200A\\=1200A, In\geq 1200A\end{cases}$ Error: ±15%(inherent ±40ms)		
	Constant time-lag	T=Tg; Rrror: ±40ms≤ 0.9: No action		
Ground area interlock(ZSI)		The controller must be equipped with ZSI function to have this; One switch output (DO) is set to ZSI output; One switch input (DI) is set to ZSI input;		

Use tips

1. The factory default protection mode of the controller is NFPA. When current (Ig) is set to OFF, thefunction is turned off;
2. In order to facilitate switching between inverse time limit and fixed time limit mode, when setting Tg parameters, if 0.10~1.00 is displayed, it means that the current setting value is inverse time limit If the value d0.10 to d1.00 is displayed, the current value is a specified time limit.
3. For vector and form, transformer breakage will directly lead to serious deviation of current vector and sum, resulting in misoperation. Therefore, once the controller self-diagnosis function detects the fault of the transformer broken line, the protection mode will be automatically shielded and the self-diagnosis alarm will be started.

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Protection function

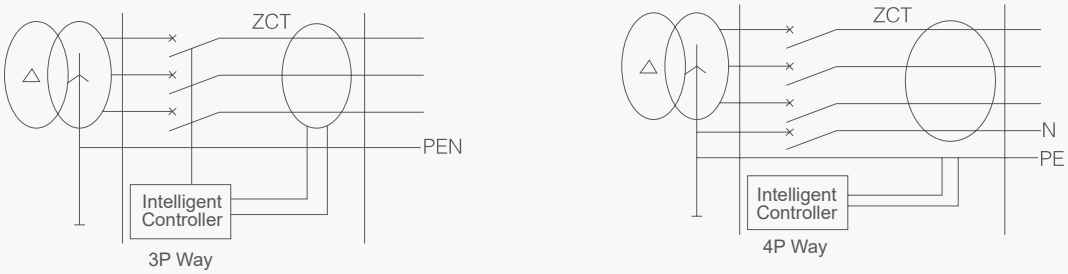

Figure 5.Schematic of leakage protection structure (Note: ZCT is leakage transformer)

Earth alarm

The ground alarm function and the ground protection function of the Type 3 controller are independent of each other, and exist at the same time, with different setting parameters.

Leakage protection

Leakage protection is applicable to the leakage fault caused by insulation damage or the leakage fault caused by human contact with the conductive part of the leakage. The leakage current I △ n is directly expressed in amperes and has nothing to do with the rated current of the circuit breaker. The zerosequence sampling method is adopted, and a zero-sequence current transformer is required. This kind of transformer has high sampling accuracy, high sensitivity and is suitable for small current protection.

Leakage protection characteristic parameters

Setting current (A)	I △ n	0.5~30A+OFF(Level difference 0.1A,OFF indicates exit)	
	Action characteristic	in (0.8~1.0)I △ n In-between action	≤ 0.8I △ ninaction
			>1.0I △ nDelay action
Delay (s)	Tg(s)	0.06,0.08,0.17,0.25,0.33,0.42,0.5,0.58,0.67,0.75,0.83,instantaneous	
	precision	±10%(Inherent 40ms)	

Setting value of leakage protection delay time

Setting time	0.06	0.08	0.17	0.25	0.33	0.42	0.5	0.58	0.67	0.75	0.83	Instantaneous
Multiple of fault current	Max disconnect time (s)											
I △n	0.36	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	0.02
2I △n	0.18	0.25	0.5	0.75	1	1.25	1.5	1.75	2	2.25	2.5	0.02
5I △n/10I △n	0.072	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	0.02

Leakage protection can also be divided into two sections, inverse time limit and fixed time limit; When I/ I △ n<5 is the inverse time limit, when I/ I △ n ≥ 5 is the fixed time limit; Leakage protection characteristic curve and protection conditions are as follows:

$$T=\begin{cases}(\frac{I_{\triangle n}}{I})\times 6\times Tg & (I/I_{\triangle n})\ n<5\\ (6\times Tg)/5 & (I/I_{\triangle n})\ n\geq 5\end{cases}$$

For example, if the leakage delay time is set to Tg=0.06s, when I=I △ n,t=0.36s; When I=2I △ n,t=0.18s; When I ≥ 5I △ n,t=0.072s;

Load monitoring

Load monitoring can be used to forecast alarms and control branch loads. Action basis can be based on power or current action, there are two modes of action: Mode 1: Two loads can be independently controlled. When the operating parameters exceed the setting value, the corresponding load monitors the DO delay action (the corresponding DO function needs to be set), and controls the load splitting of two branches to ensure power supply for the main system. Mode 2: Generally used to control the load of the same branch, when the operating parameter exceeds the starting value, "load one" DO delay action (the action form can be pulse mode or level mode) to break the branch load; If the running parameter value is lower than the return value after breaking, and after the delay setting time, "load 1" DO return, "load 2" DO action (the action form can be pulse mode or level mode), switch on the broken load, and restore the system power supply.

Measuring function

Current measurement

The controller can measure three line currents (Ia, Ib, Ic), neutral line current (IN), ground current (Ig) or leakage current (I □ n) in real time, suitable for 50Hz/60Hz power grids. Measurement method: true RMS value or fundamental RMS value; Measuring range :Ia, Ib, Ic, IN not less than 25 times In(circuit breaker rated current). Measurement accuracy: within the range of 2In, the measurement error is ±1.5%; ±5% above 2In;

(Use tip) : When the measured value is less than the lower limit of the range, 0 is displayed.

Voltage measurement

Real-time measurement of line voltages (Uab, Ubc, Uca, UMAx) and phase voltages (Uan, Ubn, Ucn) for 50/60Hz power grids. Voltage measurement depends on the grid structure and circuit breaker configuration.

Measurement method: true effective value;

Measuring range :30V ~ 1200V(when the voltage is lower than the lower limit, it is displayed as 0V);

Measurement accuracy :±1.5%.

Self-diagnostic information recording

The self-diagnosis function of the controller is mainly used for the inspection and maintenance of its own operating status. It can detect the transformer broken line, magnetic flux broken line, circuit breaker rejection, contact maintenance, AD fault, XT clock fault, E2ROM fault and other own faults in real time. When the self-diagnosis fault occurs, the current self-diagnosis fault information can be found in the “Current alarm” menu option A DO alarm signal can be sent, and the self-diagnostic information is recorded in the alarm record.

Self-diagnostic fault information table

Self-diagnosis fault display content	Self-diagnostic fault description	Troubleshooting method
E-L1 E-L2 E-L3 E-LN	Indicates that the current transformer L1, L2, L3, and Ln are disconnected	Check whether L1, L2, L3, Ln wires of the secondary end of the current transformer are broken or broken, or whether the connection between L1, L2, L3, Ln and the circuit board is loose.
E-CT E-11	The controller trip coil is disconnected	Check whether the tripping magnetic flux and the circuit board are properly connected;
E-JD E-12	The controller does not detect that the circuit breaker is successfully opened	Check whether the small switch detection mechanismworks normally;
E-13	Contact wear value >100%	The main contact needs to be maintained. After the maintenance is complete, manually reset the contact Contact wear value is restored to 0
E-02	The system A/D sampling circuit is faulty.	The controller cannot be used. Contact the manufacturer
E-01	The external memory chip is faulty	Power off and restart to see whether the fault disappears. If the fault still exists, it is required To replace the external E2ROM memory chip

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DO Feature

The controller has four sets of independent programmable I/O ports, which can be set according to the needs of the customer, and the internal relay contact output (contact capacity of 250VAC/5A,30VDC/5A). Relay definable functional states:

F and M controllers output DO parameter Settings				
Function setting	Short circuit instantaneous fault trip	Ground or leakage fault trip	Ground or leakage fault trip	Short circuit delay fault trip
	Overload long delay fault trip	Fault trip	Load monitoring 1 Unload the output	Load monitoring 2 Unload output
	The system self-diagnoses faults	Power grid fault state alarm	Remote switching	Remote closing
Execution mode	The fault trip switch signal, after the fault disappears, press the light clearing key to return		Others are 100ms pulse signal output	

3H controller output DO parameter setting				
Function setting	Be common	Give an alarm	Fault trip	Self-diagnostic alarm
	Load I unloading	Load II unloading	N-phase fault	Long delay trip
	Short delay trip	Instantaneous trip	MCR trip	HSISC trip
	Ground trip	Leakage trip	The Iunbal trip	A trip is required
	B trip is required	A C trip is required	N trip is required	Undervoltage trip
	Overvoltage trip	The Uunbal trips	Underfrequency trip	Overfrequency tripping
	Phase sequence trip	Reverse power trip	Overload warning	Earth alarm
	Leakage alarm	Iunbal call the police	Call the police with "A"	Call the "B" alarm
	Need to use C alarm	Need N alarm	Undervoltage alarm	Overvoltage alarm
	Uunbal, call the police	Underfrequency alarm	Overfrequency alarm	Reverse power alarm
	Phase sequence alarm	Communication failure	ZS1 Output	Remote switching
	Remote closing			
Execution mode	Normally open level	Normally closed level	Normally open pulse	Normally closed pulse

DI Input function Area Selective Interlocking (ZSI)

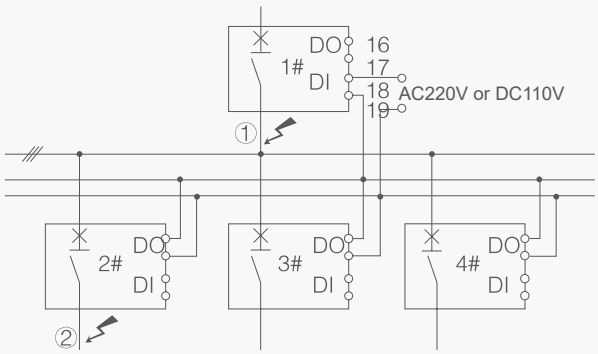


Figure 6 Schematic diagram of regional interlocking

Zone selective interlocking (ZSI) includes short circuit interlocking and ground interlocking, where two or more circuit breakers are connected as shown in Figure 15:

1. when the short circuit or ground fault occurs in the position of the lower circuit breaker (2# ~ #4circuit breaker) outlet side (such as position 2), the lower circuit breaker instantaneously trips, and sends a regional interlock trip signal to the upper circuit breaker (#1 circuit breaker); The upper circuit breaker receives the regional interlock trip signal and delays according to the parameters set by the short circuit or ground protection. If the fault current is cancelled during the delay of the upper circuit breaker, the protection returns and the upper circuit breaker does not operate. If the fault current does not cancel after the lower circuit breaker trips, the upper circuit breaker acts according to the set parameters of short circuit or ground protection to cut out the fault line.
2. When the short circuit or ground fault occurs between the upper circuit breaker (#1 circuit breaker) and the lower circuit breaker (2# ~ #4 circuit breaker) (such as position ①), the upper circuit breaker does not receive the regional interlock signal, and therefore the instantaneous trip, quickly cut the fault line.

Use tips

The ZSI function must be equipped with a set of DO(ZSI output in level mode) and a set of DI(ZSI input) as the electrical connection of the upper and lower circuit breakers; Please inform the manufacturer when ordering. Zone interlock is only available on 3H products.

Zonal selective interlocking (ZSI) is designed to reduce the fault stress that electrical distribution equipment suffers during short circuits or ground faults. The ZSI system works with a pre-collaborative(coordination of operating parameters between distribution devices) distribution system, which reduces the stress (damage) caused by faults by reducing fault clearance time, and maintains coordination between short-circuit or ground fault protection devices in the system.

B

Test function

The controller can simulate the instantaneous trip action for the trip test during field debugging, regular inspection or overhaul to check the cooperation between the controller and the circuit breaker. After the completion of the test, display the mechanism action time or test state.

Use tips

1. This function can only be used during field deb1 ugging or maintenance of the circuit breaker, do not use it at will during normal operation;
2. Before each closing, the red reset button on the control panel must be pressed to close the circuit breaker again and put into operation;

Fault record and query function

When a fault trip occurs, the controller automatically records the fault current and operation time. You can press “Search” to query the fault record.

Self-diagnostic function

The self-diagnosis function of the controller is mainly used for the inspection and maintenance of its own operating status, and can detect the transformer signal breakage, magnetic flux breakage, circuit breaker rejection, and self-fault in real time.

Indicator full display function

The controller can light up all the nixie tubes and indicators, this function is used to check whether all the light emitting devices are normal.

Real-time Clock (RTC) function (optional)

The controller provides the real-time clock function to display the current date and time and record the fault time when a fault occurs.

Voltmeter function (optional)

The controller can be equipped with voltmeter, voltmeter can display the current three-phase line voltage Uab, Ubc, Uca, phase voltage Uan, Ubn, Ucn, voltage frequency F in real time;

Temperature protection function (optional F)

Control can be optional circuit breaker bus temperature protection function, through the external temperature acquisition module of the company, each pole bus is installed with a temperature sensor, the module can collect 3 or 4 pole circuit breakers; The controller and the temperature acquisition module are connected by RS485, and the collected temperature is displayed on the controller. When the temperature is detected to reach the setting

Value initiates delay and trip action.

Temperature Start value =25 to 160 ° C +OFF. OFF indicates that the temperature protection function is disabled and the return difference is 5 ° C.

Protection start delay =1~1800s+OFF,OFF indicates only alarm but no action.

(Usage instructions) : When the temperature alarm only does not trip, the alarm starting value = the set temperature starting value, the starting delay of 1s, the return difference is 5 °C ; Alarm Lcd backlight yellow, self-diagnosis display E-03; If the relay output is required, the relay can be set to 11.09 system selfdiagnosis fault;

Pressure recloser function (F type optional)

According to the Notice of the State Grid Corporation on the issuance of distributed power grid-connected opinions and Specifications, the special switch should have the function of losing voltage opening and checking voltage closing, and the setting value of losing voltage opening should be adjusted to 20%UN, 10 seconds, and the setting value of detecting voltage should be adjusted to greater than 85%UN. According to the requirements of the code, the intelligent controller adds the function of “loss of pressure opening and detection of pressure closing”.

Loss of pressure opening function

When the minimum value of the three line voltages is less than the set value of the no-voltage start, after the set delay time, the switch control passive contact action, the output mode is 100ms pulse, and the window displays “U-F”.

If the failure of opening is caused by the abnormal control loop in the process of opening, “E-09” will be displayed in the self-detection information, and the opening pulse signal will not be output at this time.

After checking and eliminating the fault of the opening loop, press the reset key to recover

Pressure loss switching function parameter table				
Parameter name	Adjustment range	Adjust step size	Factory default	Remark
Protect startup settings	60V~1200V	1V	80V	80V=(20%×UN)=(20%×400V)
Delay time set value	0.2~60s	0.1s	3.0s	
Execution mode	Switch off/switch off		Off	
Output mode	Switching relay 100ms pulse output			

Pressure closing function

When the minimum value of the three line voltages is less than the set value of the no-voltage start, after the setting delay time, the closing control passive contact action, the output mode is 100ms pulse, and the window displays “U-H”.

If the closing failure is caused by the abnormal control loop during the closing process, “E-09” will be displayed in the self-detection information, and the closing pulse signal will not be output at this time. After checking and eliminating the fault of the closing loop, press the reset key to recover.

Pressure closing function parameter table				
Parameter name	Adjustment range	Adjust step size	Factory default	Remark
Protect startup settings	60V~1200V	1V	340V	340V=(85%×UN)=(85%×400V)
Delay time set value	0.2 ~ 60 s	0.1s	1.0s	
Execution mode	Turn off/turn off		Close	
Output mode	Closing relay 100ms pulse output			

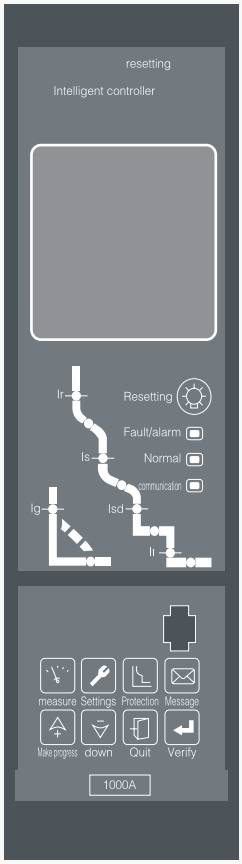
Communication function

H-type controller can realize telemetry, remote control, remote adjustment, remote communication and other functions by MODBUS protocol through communication port. The output of communication port adopts photoelectric isolation device, which is suitable for strong electrical interference environment. For details of the communication, see Type H Communication Protocol.

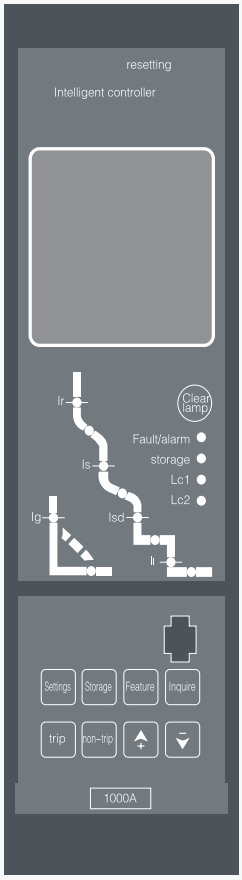
YCW9X Integrated Circuit Breaker

B

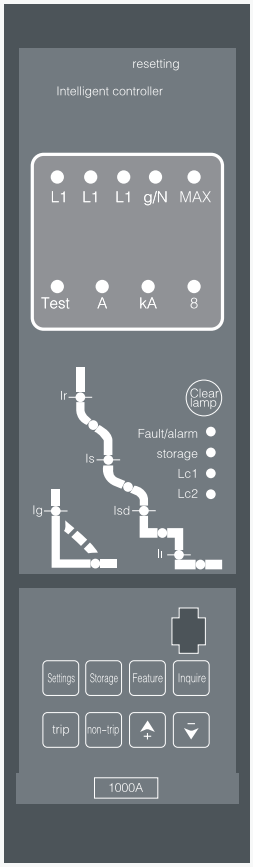
Controller panel diagram



3M,H Type controller panel diagram



F-type controller panel diagram



M Controller panel diagram

YCW9X Integrated Circuit Breaker

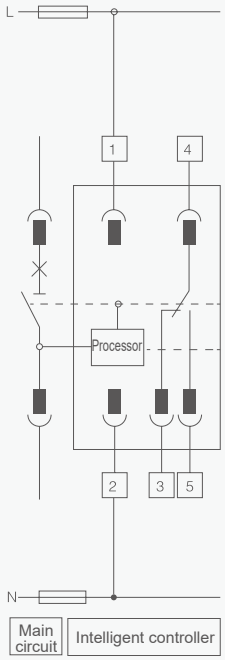
Controller selection function list

Type specification	M Type	F Type	3M Type	3H Type	Temperature controller
Panel feature	Nixie tube +LED+ button	Liquid crystal display +LED+ button	Liquid crystal display +LED+ button	Liquid crystal display +LED+ button	Nixie tube +LED+ button
Basic protection (four-stage protection)	LSIG	LSIG	LSIG	LSIG	Can cooperate with our company F Series intelligent controller Used in combination or independently Use to achieve temperature mining Set, overtemperature protection or alarm Alarm output, data remote And other functions.
Long delay protection curve selection	●	●	●	●	
Neutral line overcurrent protection	●	●	●	●	
Load monitoring	○	○	○	●	
Programmable relay output	○	○	○	●	
Protection for MCR/HSIOC	○	○	○	○	
Current imbalance protection			●	●	
Leakage protection	○	○	○	○	
It needs to be measured by electric current			●	●	
The maximum current protection is required			●	●	
Voltage measurement		○	○	●	
Voltage protection (over/ under voltage)			○	●	
Voltage unbalance protection			○	●	
Power/power factor measurement			○	●	
Reverse power protection			○	●	
Power protection is required			○	●	
System frequency measurement or protection		○	○	●	
Harmonics, waveform measurement			●	●	
The detection has the function of pressure coincidence		○			
Temperature protection		○			
485 Communication function		○		●	
Breaker contacts are worn			●	●	
Transformer broken line self-diagnosis	●	●	●	●	
Magnetic rupture self-diagnosis	●	●	●	●	

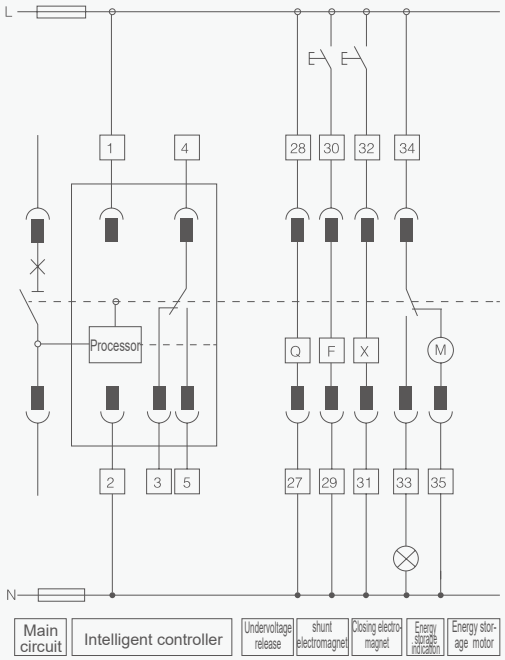
Note: ● - Basic function: ○ - co-option function;

YCW9X Integrated Circuit Breaker

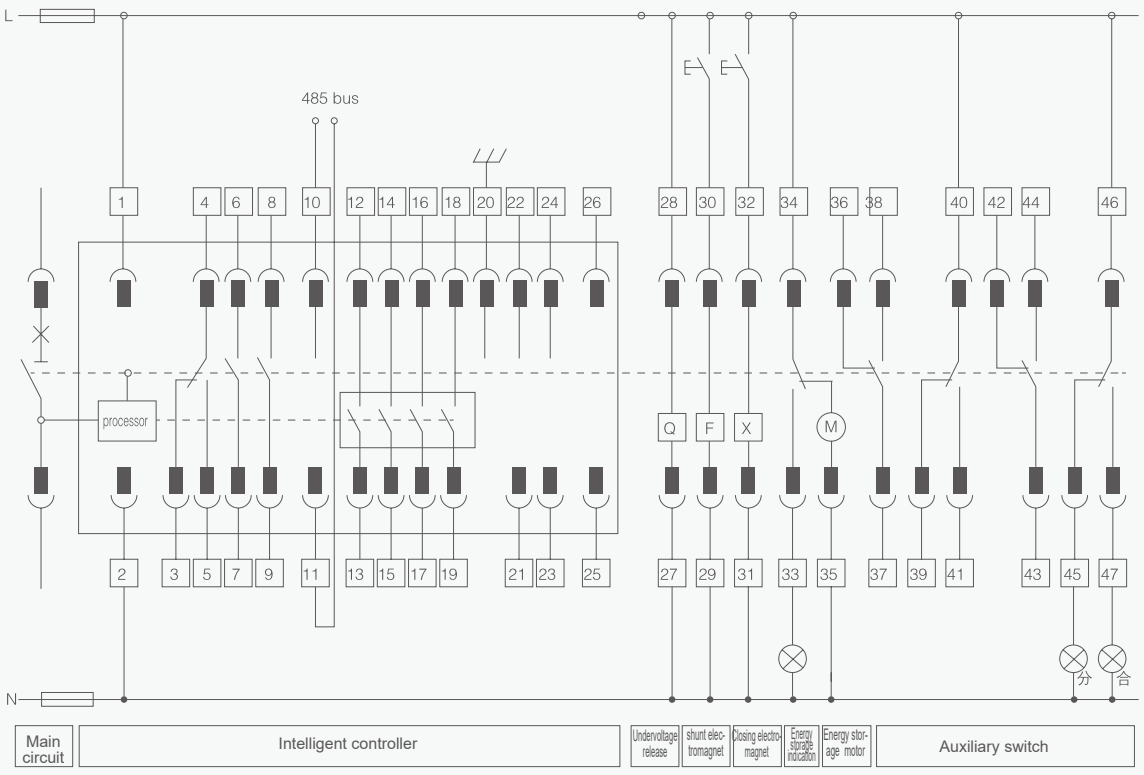
Wiring diagram



Manual secondary wiring diagram



Electric secondary wiring diagram



Fully functional secondary wiring diagram

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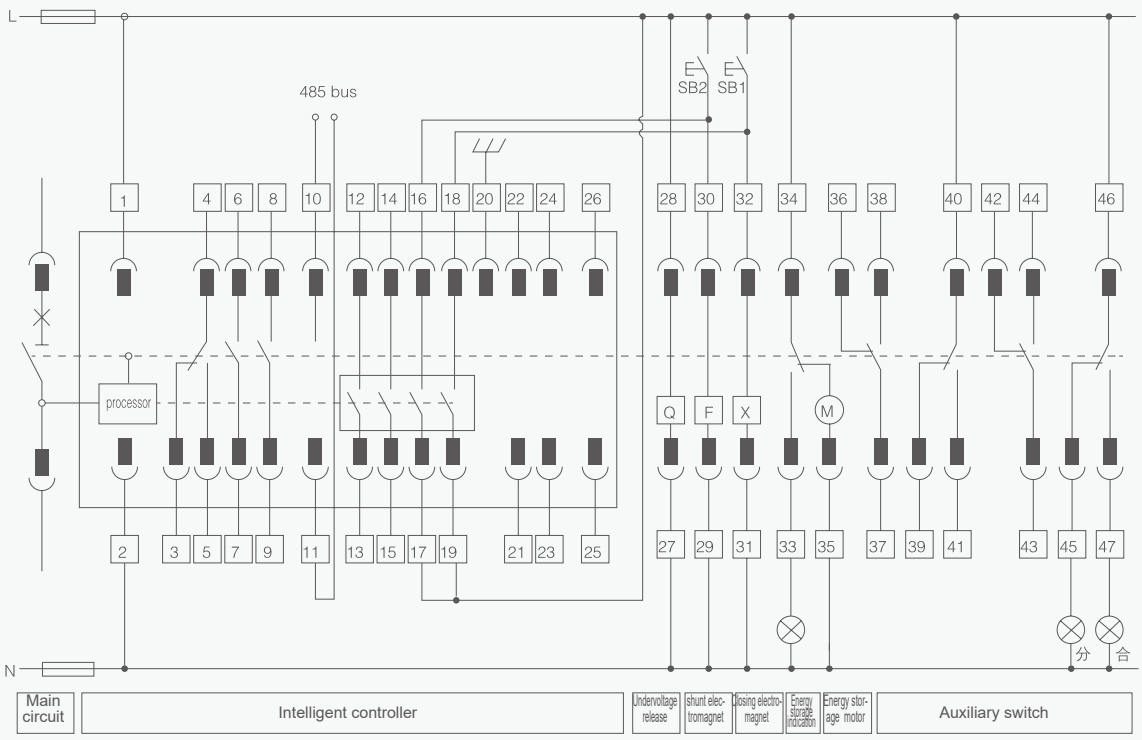


Check voltage reclosing secondary wiring diagram

Controller terminal definition			
Serial number	Wire number	Function description	Remark
1	1,2	Auxiliary power input	M type factory default (serial number 1-5) H type factory default (serial number 1-11)
2	3,4,5	Fault trip contact output (4# is the common end)	
3	6,7	Circuit breaker status auxiliary contact 1 Output	
4	8,9	Circuit breaker status auxiliary contact 2 output	
5	20	Protected area (PE)	
6	10,11	RS485 communication port leads terminals A and B	
7	12,13	Relay (D01) contact output	
8	14,15	Relay (D02) contact output	
9	16,17	Remote control tripping relay contact Output (D03)	
10	18,19	Remote closing relay contact output (D04)	
11	21,22,23,24	Voltage measurement input: N, A, B, C	
12	25,26	3P+N structure is connected to the neutral line transformer; Connect the leakage transformer ZCT1 for leakage protection	Order specification

Use tips

Q- undervoltage release device (can be connected to the “emergency stop” button when in use); X-closed electromagnet (normally closed auxiliary contact can be connected in series when in use); SB2- manual switch button; F-shunt trip device (normally open auxiliary contact can be connected in series when in use);M- motor; SB1- Manual closing button;

Communication network

For details about the communication network of the controller, see the Communication Network Description of the Controller 3.

YCW9X Integrated Circuit Breaker

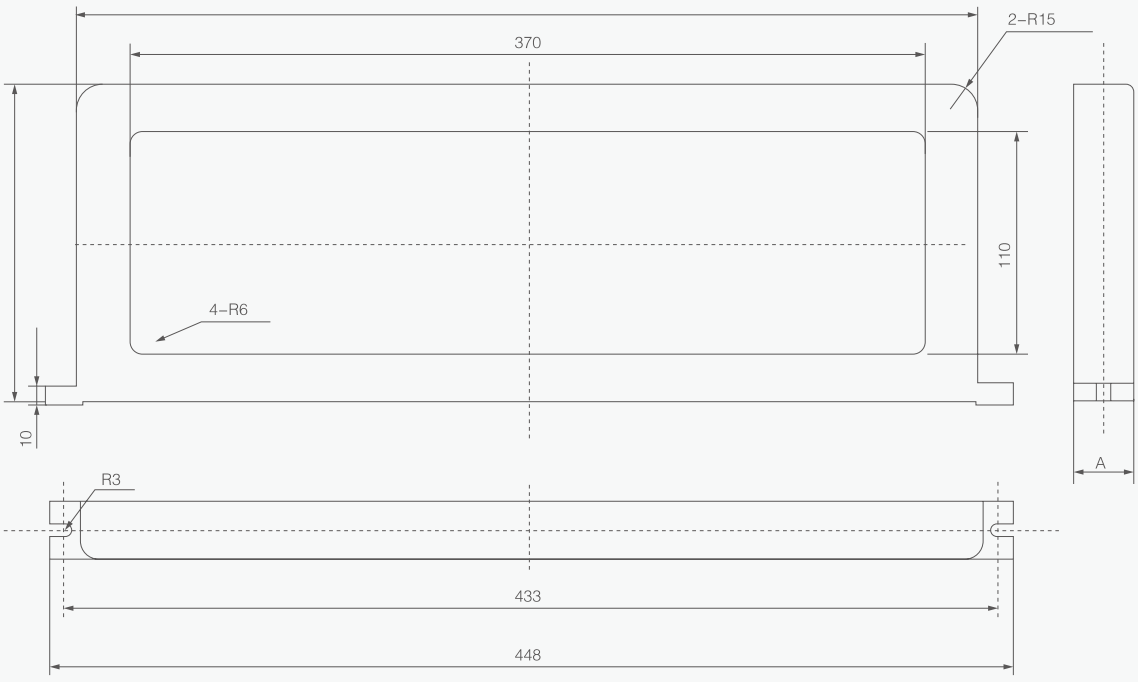
Precautions for operation and maintenance of the controller are as follows:

1. The controller shall be operated carefully according to the requirements of this Manual.
2. After assembling with the circuit breaker, the protective cover should be sealed during normal operation to prevent panel damage.
3. the normal operation should often check the controller system self-diagnosis information or alarm information, found problems should be analyzed and processed in time.
4. Should regularly check the fastening of the connection parts, if loose should be tightened in time.
5. After the fault trip, the cause of the fault should be carefully analyzed, and the red mechanical reset button on the panel can be put into use again after the fault is removed.

Attachments

Leakage transformer

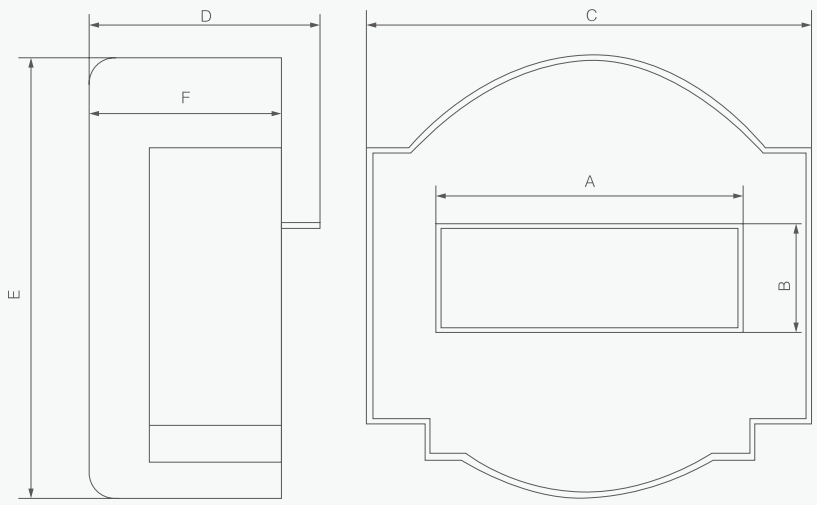
When the earth protection selects the leakage type, it is necessary to add the leakage transformer (ZCT), and its installation size is shown in the figure:



B

3P+N Configured neutral line transformer

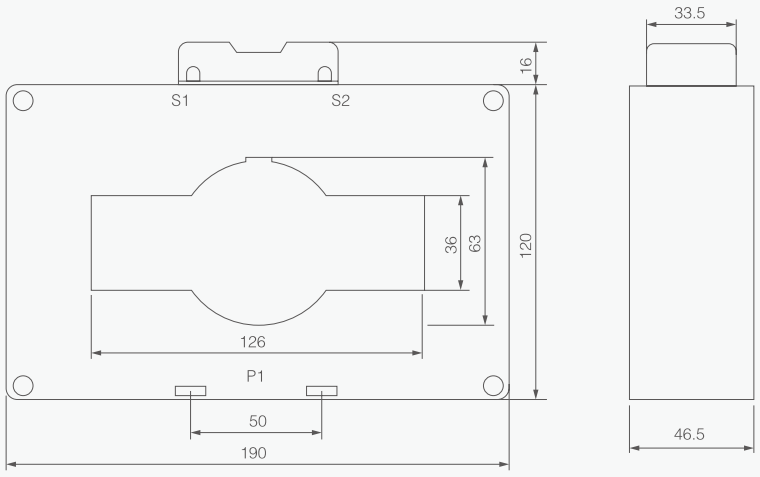
When the controller is 3P+N, the external neutral transformer installation dimensions are shown in the following figure.



Standard 3P+N pole transformer appearance diagram

3P+N External neutral wire transformer installation size table (size unit mm)						
	A	B	C	D	E	F
Box I transformer	60	20	90	44	90	37
Box II & III transformer	90	30	108	44	105	37

Special custom external N-pole transformer



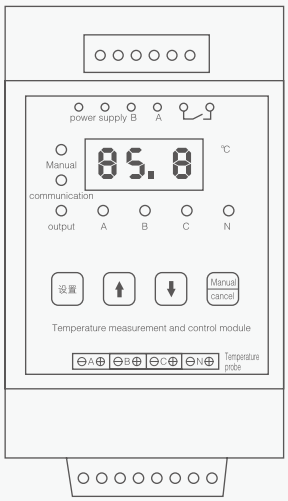
Hint

1. N pole transformer only hollow transformer, no speed saturation transformer; The cable length between the controller and the controller is less than 10m.
2. If you have any other size requirements, please contact us.

YCW9X Integrated Circuit Breaker

B

Temperature protection module



WK-200
Product appearance drawing

WK-200 temperature acquisition module is a newly developed module for circuit breaker temperature measurement and control. Its characteristics are as follows:

1. Can be used with the company's series of intelligent controller or independent use, to achieve temperature collection, overtemperature protection or alarm output, data remote and other functions.
2. With the temperature sensor, the temperature of up to 4 busbars can be collected (with 3-pole or 4-pole switch).
3. Equipped with one RS485(using MODBUS protocol) interface, you can achieve data communication with the company's controller or other equipment.
4. This module can set temperature protection parameters independently, equipped with 1 relay output contact; According to user requirements can be used for over-temperature alarm/start cooling/overtemperature
5. switch and other functions.

Hint

1. N pole transformer only hollow transformer, no speed saturation transformer; The cable length between the controller and the controller is less than 10m.
2. If you have any other size requirements, please contact us.

Product parameter

1. Working power supply :AC220V or DC24V, ≤ 2W, error ±20%(instructions when ordering)
2. Input specif ications :1~4 temperature probes (instructions when or dering)
3. Relay capacity :AC250V/10A or DC30V/10A
4. Measuring range :0~200°C , error ±1%
5. Communication: one RS485 communication (support Modbus communication protocol)
6. Overall size :L102×W55×H45mm

YCW9X Integrated Circuit Breaker

Set parameters

item	Set range	Initial value	remarks
Temperature protection start value	10°C ~160°C	150°C	If the current temperature is higher than the start value, control the output
Temperature protection returned value	9C~159C	145°C	If the current temperature is lower than the returned value, the output stops
Correspondence address	1~255	1	
Communication baud rate	/	9.6 k	1.2k,2.4k,4.8k,9.6k,19.2k

Operation instruction

1. Temperature query: The main screen displays the current maximum temperature of TA,TB,TC,TN. Press (up) or (Down) to switch the temperature of TA,TB,TC,TN.
2. Parameter modification: click (Setting) to enter parameter setting; If the digital tube is blinking and A is steady on, it indicates that the parameters are being set.

   Press (Up) or (Down) to modify the current parameter. Click (Settings) to save the current parameter and switch to the next parameter.

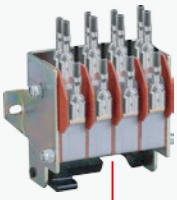
   Tip: Click (Settings) when A,B,C,N cycle light,A represents the start value,B represents the return value,Crepresents the communication address,N represents the communication baud rate); Click the (Manual/Cancel) key to cancel the current setting and exit the setting state.
3. Relay manual output: in the main interface, click (manual/cancel) key to switch manual/automatic relay output; 【 Manual 】, 【 Output 】 light is lit to manual output mode; (Manual) When the lamp is off, it is in automatic working mode, and the output is automatically controlled according to the temperature parameter set by the module. When there is (output), the lamp is on.
4. Temperature sensor disconnected detection: When a phase temperature sensor is disconnected or not connected, (--) is displayed when querying the phase temperature, please remove the exception in time.

YCW9X Integrated Circuit Breaker

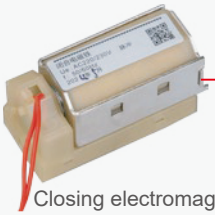
Frame/plastic integrated circuit breaker structure diagram

Secondary terminal

Opening mechanical lock

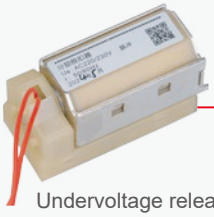


Auxiliary contact



Closing electromagnet

Shunt release



Undervoltage release

Circuit breaker body

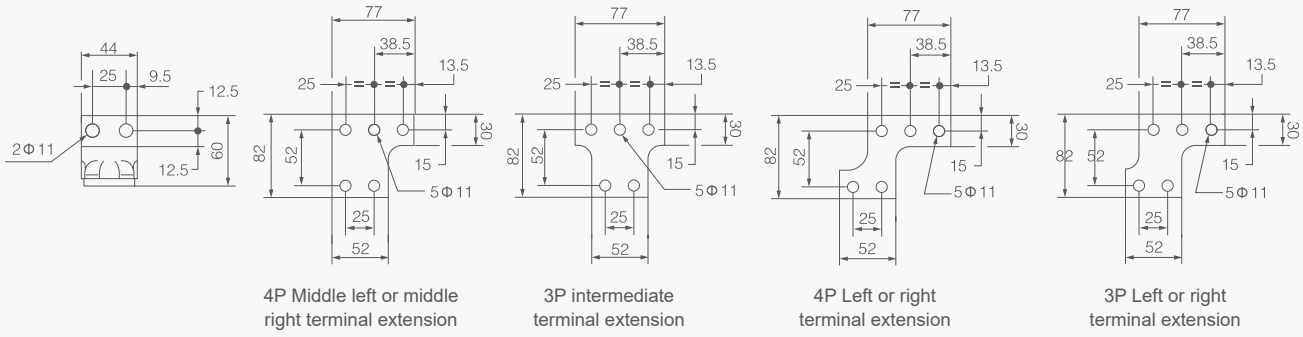
Special motor
for energy storage

Intelligent controller

Circuit breaker panel

YCW9X Integrated Circuit Breaker

Adapter bar Size (optional)



4P Middle left or middle right terminal extension

3P intermediate terminal extension

4P Left or right terminal extension

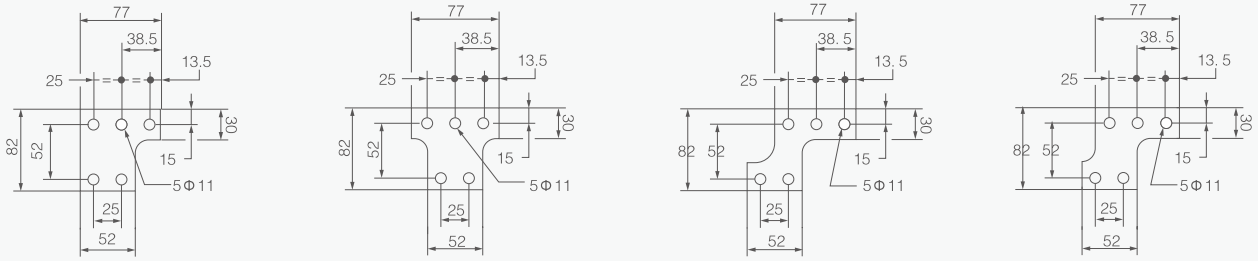
3P Left or right terminal extension

Middle left or right expander for 4 poles

Middle expander for 3 poles

Left or right expander for 4 poles

Left or right expander for 3 poles



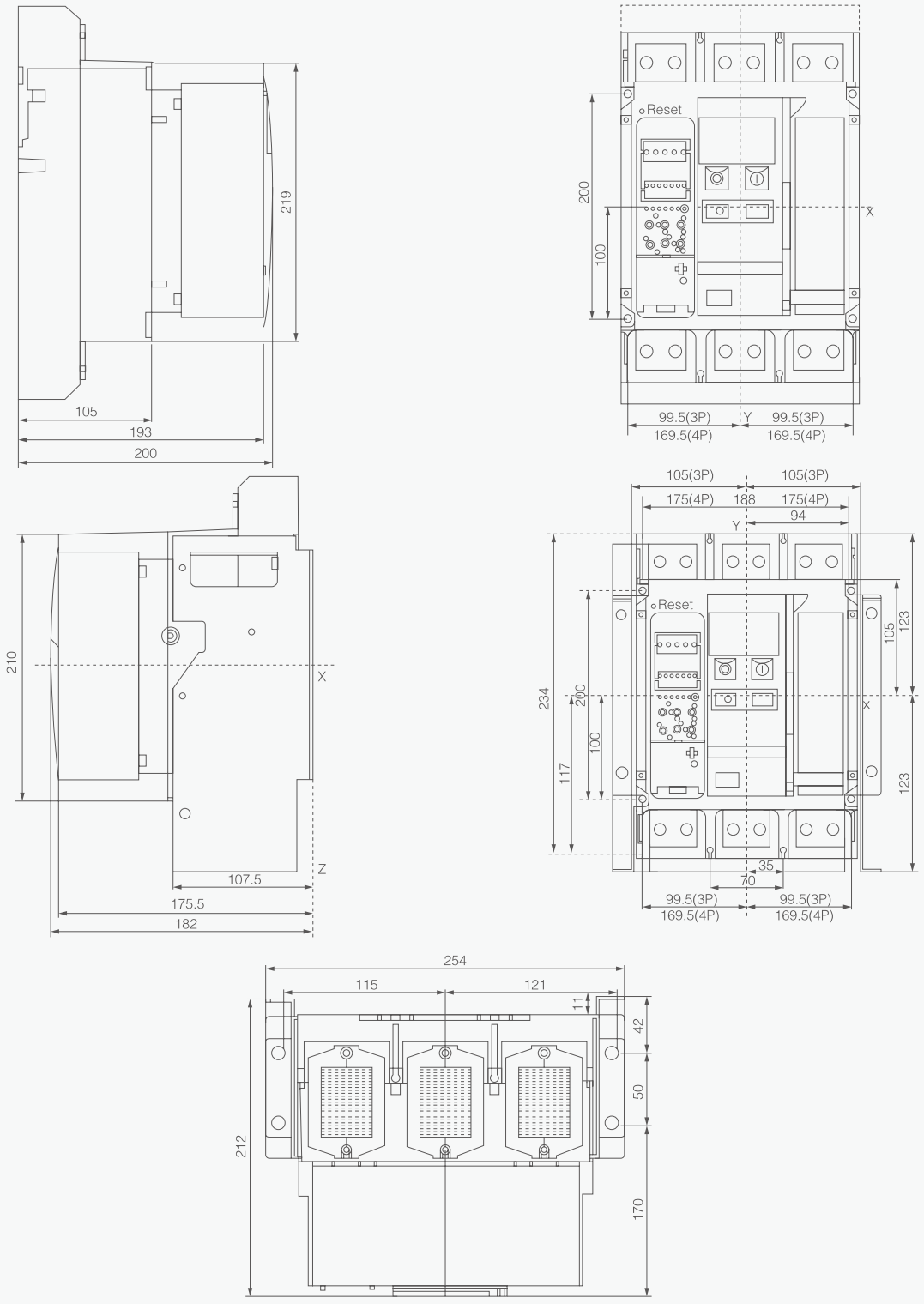
A Sectionalized view

Recommended size and quantity of external bronze plate							
Model number	Maximum working current	T:40°C Number of busbars		T:50°C Number of busbars		T:60°C Number of busbars	
		5mm thickness	10mm thickness	5mm thickness	10 mm thickness	5mm thickness	10mm thickness
NV-800	800	2b.50×5	1b.50×10	2b.50×5	1b.50×10	2b.50×5	1b.50×10
NV-1000~1250	1000~1250	3b.50×5	1b.50×10	3b.50×5	2b.50×10	3b.50×5	2b.50×10
NV-1600	1600	3b.50×5	2b.40×10	3b.50×5	2b.50×10	4b.50×5	2b.50×10

YCW9X Integrated Circuit Breaker

B

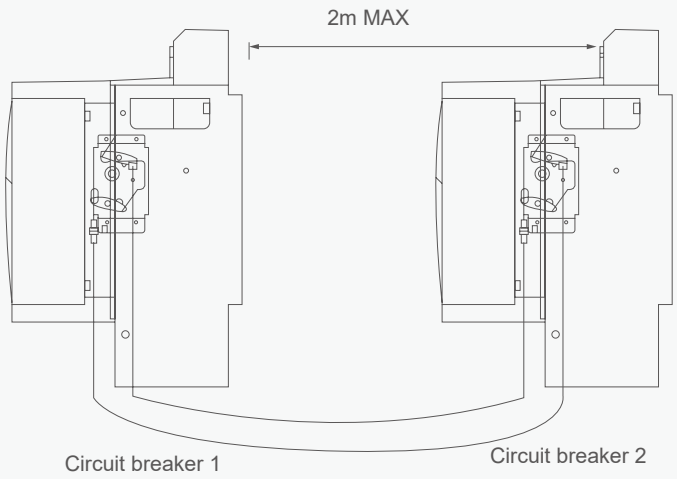
Installation dimensions of the frame-plastic integrated circuit breaker



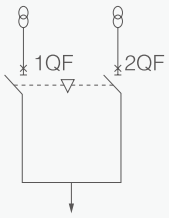
YCW9X Integrated Circuit Breaker

Installation dimensions of the frame-plastic integrated circuit breaker

Interlocking of two flat or stacked circuit breakers



Circuit diagram

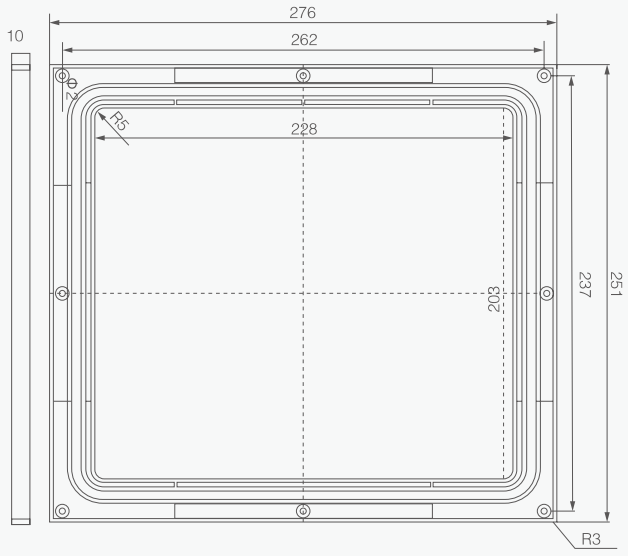


Possible modes of operation

1QF	2QF
0	0
0	1
1	0

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

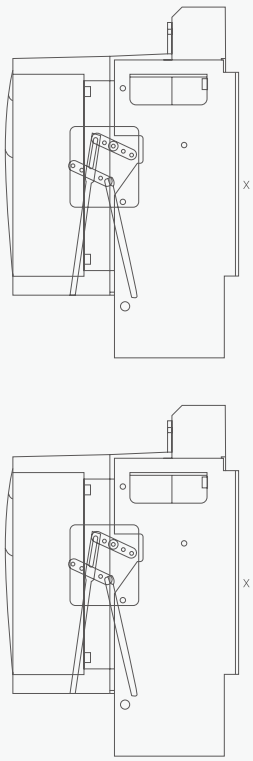
Door frame size



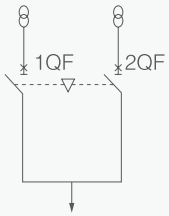
B

Installation dimensions of the frame-plastic integrated circuit breaker

Two bar interlocks for stacked circuit breakers



Circuit diagram



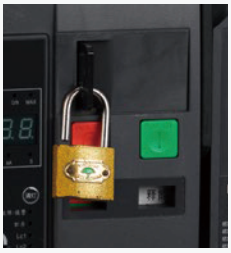
Possible modes of operation

1QF	2QF
0	0
0	1
1	0

“Break” locking device

The “off” lock device locks the off button of the circuit breaker in the pressed position, at which time the circuit breaker will not close.
After the user chooses the installation, the factory provides the lock and key; Three circuit breakers with three identical locks and two keys

When optional, the manufacturer will install the circuit breaker.



Optional (lock should be brought by the user)
When the lock is damaged, the user can replace it by himself.

YCW9X Integrated Circuit Breaker

Order specification					(Please make a √ in your
User unit		Number of units ordered		Order date /	
Type specification	YCW9X-1600	Number of poles	□ 3P □ 4P	Installation mode	□ Fixed □ Fixed (with mounting bracket)
Rated operating voltage	□ AC400V □ AC800V	Rated current In= A			
Intelligent controller	Type	□ M □ 3M □ 3H □ F(pressure reclosing)			
	Basic function	□ Overload long delay protection □ Short circuit instantaneous protection □ Fault memory function □ Short circuit delay protection □ Grounding or leakage protection □ Test function			
	Co-option function	□ Ammeter function □ Thermal simulation function □ Communication function □ Load monitoring □ MCR function □ Area lock function □ Self-diagnosis function			
	Grounding mode	□ 3PT □ 4PT □ (3P+N)T Need external transformer ★			
	Controller power supply	□ AC400V □ AC230V			
Optional Accessories	Shunt release	□ AC400V □ AC230V			
	Closing electromagnet	□ AC400V □ AC230V			
	Electric operating mechanism	□ AC400V □ AC230V (include Shunt release and Closing electromagnet)			
	Auxiliary switch	□ Normal form □ 4 sets of conversion+47 bit terminal blocks			
	Undervoltage release	□ AC400V		□ Undervoltage transient trip device	
		□ AC230V		□ Undervoltage delay release □ 1s □ 2s □ 3s	
	Break position lock	□ One lock one key(manufacturer installed) □ Two locks and one key (manufacturer installed) □ Three locks two keys (manufacturer installed) □ One lock and one key(own) □ Two locks and one key(brought by oneself) □ Three locks two keys (self)			
	Mechanical interlocking	□ Steel cable interlock (two sets) □ Lever interlock two switches			
	Other accessories	□ Expansion row		□ Other	

Note: If the customer has other special requirements, please negotiate with the manufacturer.