M-PACT Air Circuit Breaker

Compact Air Circuit Breaker 400-1600A

USER MANUAL

AEG

Catalogue

1 MPACT Compact air circuit breaker

1.1 Type and meaning

MP
Product series
M-PACT Air circuit breaker

N		
Breaking capacity		
N	Icu	65kA
	Ics	55kA
	Icw	50kA

3	
Poles	
3	3P
4	4P

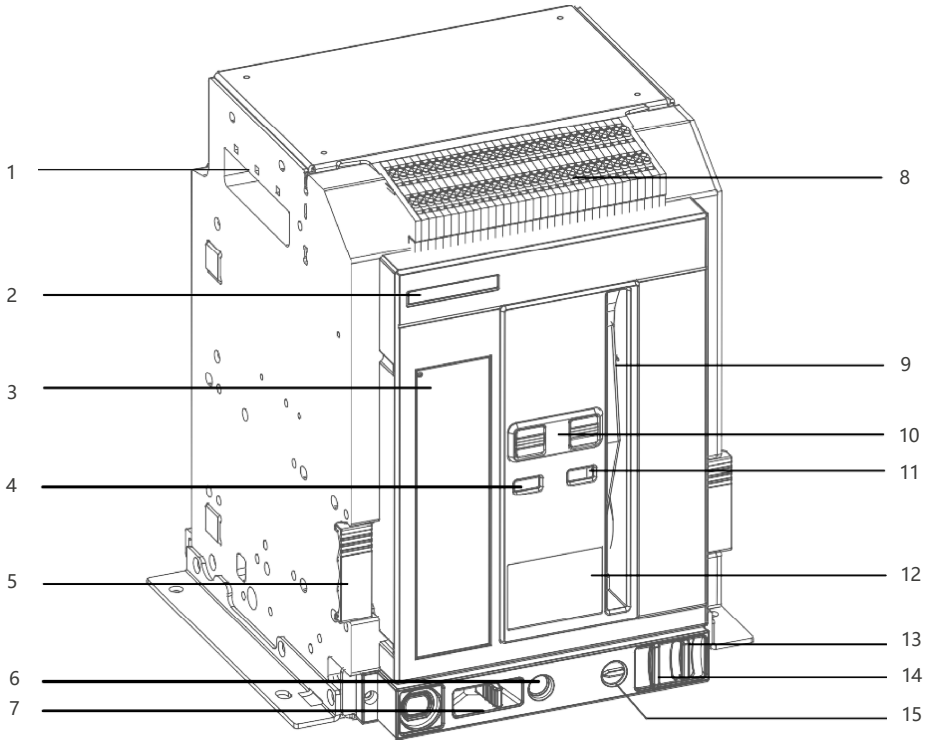
0	
Frame	
0	Frame 0

W	
Installations	
W	Withdrawable
F	Fixed

10	
Rated current	
04	400A
06	630A
08	800A
10	1000A
12	1250A

Mpro2M
control unit
Mpro2M

1.2 MPACT compact circuit breaker Appearance display



1) Lifting hole
2) Product order code
3) Mpro cotrol unit
4) Indication window of opening and closing position
5) Cassette handle
6) Operating hole
7) Position locking switch
8) Secondary terminal
9) Manual charging handle
10) Switch button of manual
11) Indicator window of charging
12) Nameplate label
13) Shake handle
14) Pull rack position padlock buckle
15) Breaker position indication

1.3 Air circuit breaker technical parameters

Basic parameters			
Frame grade	Inm	A	1600A
Rated current	In	A	400, 630, 800, 1000, 1250, 1600
Rated operating voltage	Ue	V	AC 415
Rated operating frequency		Hz	50/60
Rated insulation voltage	Ui	V	1000
Rated impulse withstand voltage	Uimp	kV	12
Power frequency withstand voltage	1min	V	3500
Number of Poles	Poles		3P/4P
Neutral pole current rating			100%*In
Selective categories			B
Whether it has an isolation function			YES
Breaking ability			
Rated limit short-circuit breaking capacity (Icu)	AC 415V	kA	65
Rated operating Short Circuit Breaking Capacity (Ics)	AC 415V	kA	55
Rated short-circuit Withstand current (Icw)	AC 415V	kA/1s	50
Rated short circuit Closing capacity (Icm)	AC 415V	kA	143
Open and close time			
Full break time		ms	≤30
Closing time		ms	≤70
Protective unit			
Basic protection unit	Mpro		Mpro2M
Operating performance			
Mechanical life	Maintenance available	time	20000
	No Maintenance	time	15000
Electrical life	AC 415V	time	10000
Installations			
Fixed(W*H*D)	3P	mm	281x321x198
	4P	mm	351x321x198
Withdrable (W*H*D)	3P	mm	308x354x286
	4P	mm	378x354x286
Weight			
Fixed	3P	kg	25
	4P	kg	32
Withdrable	3P	kg	40
	4P	kg	50
Main loop wiring			
Wiring methods			Up/down incoming
enforce standards			
Standard			GB/T 14048.2, IEC60947-2

1.4 Application Guide

- **Work (ambient temperature +40 ° C) :**

Type	consumption (w)	
	fixed	withdrable
Rating current Inm=1600A	≤130	≤345

- **Temperature reduction coefficient:**

When the working environment temperature is more than +40℃, the continuous carrying power capacity can be corrected by referring to the following table

(coefficient ×Inm) :

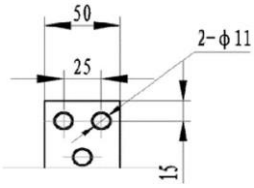
Rated current	Ambient temperature				
Inm(A)	40 ℃	45 ℃	50 ℃	55 ℃	60 ℃
400-800	1	1	1	1	1
1000	1	1	0.95	0.89	0.85
1250	1	1	1	0.95	0.89
1600	1	0.95	0.89	0.85	0.78

- **elevation reduction coefficient:**

When the altitude is ≥2000m, the electrical performance of the circuit breaker can be corrected with reference to the following table:

Altitude	2000m	3000m	4000m	5000m
Power frequency withstand voltage (V)	3500	3150	2500	2200
Short-circuit breaking capacity correction factor	1	0.89	0.85	0.8
Working current correction factor	1	0.89	0.85	0.8

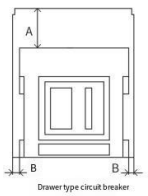
- **Circuit breaker main circuit wiring copper bar specification table:**

Rated current	Copper bar specifications		Connection form
Inm (A)	Number of roots	Measurements	
400	1	50 * 5	
630	2	50 * 5	
800	2	50 * 5	
1000	3	50 * 5	
1250/1600	4	50 * 5	

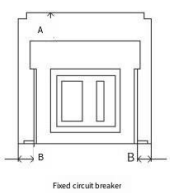
- **Power connection:**

The correct fixing of the busbar depends on the appropriate torque of the bolt and nut, the torque is too large or too small is not allowed, for the circuit breaker busbar connection, tightening torque see the following table: these values are suitable for copper busbar and steel bolts and nuts.

- **Safe distance:**



Drawer type circuit breaker



Fixed circuit breaker

Circuit breaker terminals, busbars, bolts, gaskets, nuts.

tightening torque			
tightening		torque	
Nominal (mm)	Borehole (mm)	With a spring washer or Flat washer	Use contact washers or ripples Washers
10	11	37.5	50

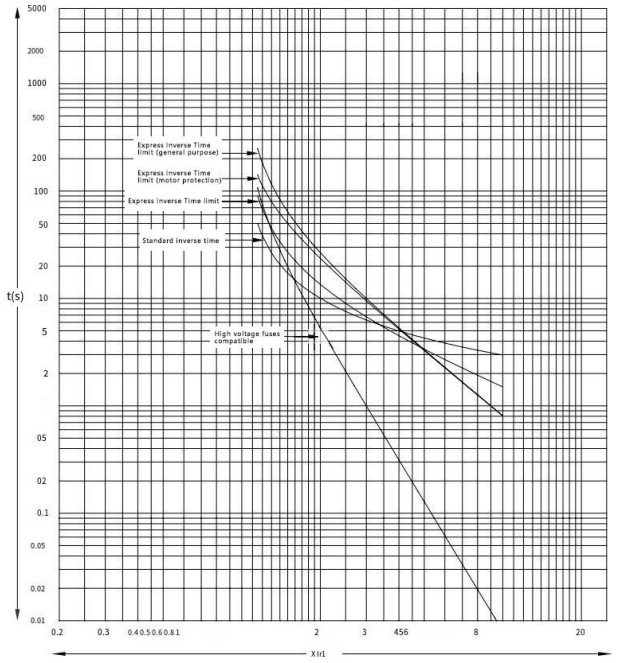
	to insulator		to metal	
	A	B	A	B
Withdrawable type	0	0	0	0
Fixed type	0	30	0	70

2.1 Function

Overload long delay protection feature

Overload long delay protection function is generally used to protect the cable overload. This function is based on RMS (true RMS of current) measurement.

The Mpro control unit offers 6 selectable overload curve formulas:



(1) Standard inverse time SI, $t = \frac{C}{(N\ 0.02\text{-}1)}$

(2) Fast inverse time limit VI, $t = \frac{C}{N\text{-}1}$

(3) Express inverse Time limit (general purpose) EI (G), $t = \frac{C}{N^2\ \text{-}1}$

(4) Express inverse Time limit (motor protection) EI (M)

$$t = \frac{C}{1.15} \times log_e \left(\frac{N2}{N^2\text{-}1.15} \right)$$

(5) High voltage fuses are HV compatible, $t = \frac{C}{N^4\text{-}1}$

(6) I squared t curve, $t = (\frac{1.5}{N})^2$ x $t\ r = (1.5\ \text{x}\ \frac{I_r}{I})^2$ x $t\ r$ (distribution)

In the above formula, N=I/Ir, where I is the actual overload current and Ir is the overload setting current

C coefficient technical parameter table corresponding to different characteristic curves

Serial number	Standard inverse time limit	Fast inverse time	Express reverse time general purpose and motor	High voltage fuse compatible
1	0. 005	1	10	10
2	0. 008	1.6	16	16
3	0.012	2.4	24	24
4	0.02	4	40	40
5	0.03	6	60	60
6	0.04	8	80	80
7	0.05	10	100	100
8	0.0675	13. 5	135	135
9	0. 09	18	180	180
10	0. 14	28	280	280
11	0. 2	40	400	400
12	0. 3	60	600	600
13	0.4	80	800	800
14	0. 5	100	1000	1000
15	0. 6	120	1200	1200
16	0. 7	140	1300	1300

Mpro control unit overload long delay protection current Ir and protection time tr Default Settings:

When the circuit breaker is factory, the default curve type of Mpro controller is I^2t curve, the default protection current setting value Ir= 1.0×In, and the default protection time setting value tr=480s.

Overload long delay protection time tr setting range and action time technical parameter table:

Curve type		Precision	Action time							
SI			**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**
Time delay	tr at 1.5XIr	Plus or minus 10%	0.614	0.983	1.47	2.46	3. 68	4.91	6. 14	8. 29
(s)	tr at 6XIr	Plus or minus 10%	0.014	0.022	0.033	0.055	0.082	0.11	0.137	0.206
			C9	**C10**	**C11**	**C12**	**C13**	**C14**	**C15**	**C16**
	tr at 1.5XIr	Plus or minus 10%	11. 1	17.2	24.6	36.8	49. 1	61.4	73.7	86.6. 0
	tr at 6XIr	Plus or minus 10%	0.247	0.384	0.548	0.822	1.1	1.37	1.64	1.92
VI			**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**
Time delay	tr at 1.5XIr	Plus or minus 10%	2	3.2	4.80	8	12. 0	16	20	27. 0
(s)	tr at 6XIr	Plus or minus 10%	0.02	0.032	0.048	0.08	0.12	0.16	0.2	0.27
			C9	**C10**	**C11**	**C12**	**C13**	**C14**	**C15**	**C16**
	tr in L 5XIr	Plus or minus 10%	36	56	80	120	160	200	240	280
	tr at 6XIr	Plus or minus 10%	0.36	0.56	0.8	1.2	1.6	2.0	2.4	2.8
EI (G)			**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**
Time delay	tr at 1.5XIr	Plus or minus 10%	8. 00	12. 8	19.2	32. 0	48	64	80	108
(s)	tr at 6XIr	Plus or minus 10%	0.029	0.046	0.069	0.114	0.171	0.229	0.286	0.386
			C9	**C10**	**C11**	**C12**	**C13**	**C14**	**C15**	**C16**
	tr at 1.5XIr	Plus or minus 10%	144	224	320	480	640	800	960	1120
	tr at 6XIr	Plus or minus 10%	0.514	0.8	1114	1.71	2.29	2.86	3.43	4.0
EI(M)			**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**
Time delay	tr at 1.5XIr	Plus or minus 10%	6. 22	9. 96	14.9	24. 9	37.3	49.8	62.2	84
(S)	tr in 6XIr	Plus or minus 10%	0.028	0.045	0.068	0.113	0.169	0.226	0.282	0.381
			C9	**C10**	**C11**	**C12**	**C13**	**C14**	**C15**	**C16**
	tr at 1.5XIr	Plus or minus 10%	112	174	249	373	498	622	747	871
	tr at 6XIr	Plus or minus 10%	0.508	0.79	1.13	1.69	2.26	2.82	3.39	3.95
HV			**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**
Time delay	tr at 1.5XIr	Plus or minus 10%	2.46	3.94	5. 90	9. 85	14. 8	19.7	24.6	33.2
(S)	tr in 6XIr	Plus or minus 10%	0	0	0	0	0	0	0	0
			C9	**C10**	**C11**	**C12**	**C13**	**C14**	**C15**	**C16**
	tr at 1.5XIr	Plus or minus 10%	44.3	68.9	98.5	147	197	246	295	344
	tr in 6XIr	Plus or minus 10%	0.014	0.022	0.031	0.046	0.062	0.077	0.093	0.108
I^2t			**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**
Time delay	tr at 1.5XIr	Plus or minus 10%	15	30	60	120	240	360	480	600
(s)	tr in 6XIr	Plus or minus 10%	0.1	0.19	0.38	0.75	1.5	2.25	3	3.75
			C9	**C10**	**C11**	-	-	-	-	-
	tr at 1.5XIr	Plus or minus 10%	720	840	960	-	-	-	-	-
	tr at 6XIr	Plus or minus 10%	4.5	5.25	6.0	-	-	-	-	-

Short-circuit short delay protection feature

The trip delay of short circuit delay is to achieve selective protection.

There are two ways of short-circuit delay protection, one is the inverse time protection, when the fault current exceeds the inverse time limit set a certain value, the control unit according to the same curve as the overload delay protection, only the protection speed is 10 times faster (that is, according to the overload curve function of the fault delay time); The other is the fixed time limit protection, when the fault current exceeds the fixed time limit set a fixed value, the controller according to the fixed time delay protection.

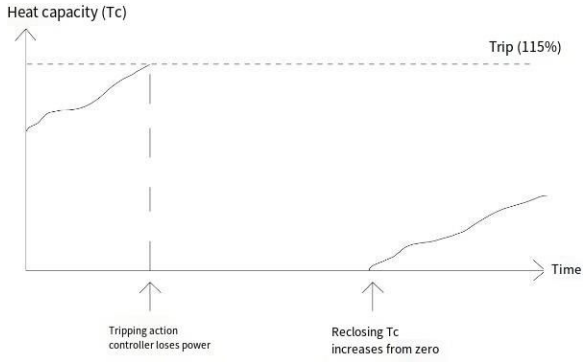
Note that when the inverse time limit current value is set in the "OFF" position or the fixed time limit current value is set less than or equal to the inverse time limit current value, the control unit is protected by the fixed time limit, and the inverse time limit function automatically fails. When the fixed time limit protection is invested, regardless of the fixed time limit or the inverse time limit, the time of the short delay action is not less than the setting time of the fixed time limit; However, when the fixed time limit protection exits, the delay action time of the inverse time limit protection is not limited by the set value of the fixed time limit delay time (but not less than 20ms).

Short delay protection to prevent the impedance short circuit of the distribution system, such protection is generally due to the local short circuit fault of the line, the current is generally beyond the range of overload, but the short circuit current is not very large.

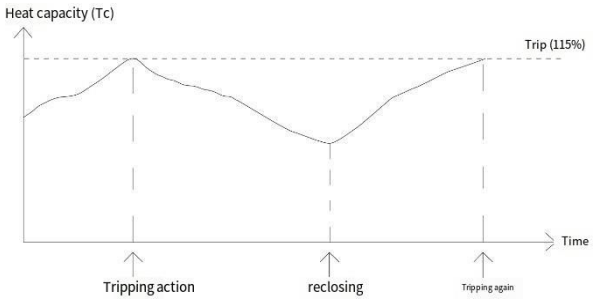
- Short delay tripping delay can ensure the cooperation with the lower circuit breaker.
- This function is based on RMS (true RMS of current) measurement.
- There are two ways of short circuit delay protection, one is inverse time protection, the other is fixed time protection, the choice of inverse time and fixed time increases the cooperation with the lower protection device.
- Area Selective Interlocking (ZSI)
- The short delay and ground fault protection features ensure time matching and provide lower switch elimination for upper switch delay
- Time of failure. Zone selective interlocking allows a complete fit between circuit breakers through external wiring.

Thermal memory protection features

To prevent unacceptable repeated or periodic overloads, the control unit tracks and records the thermal effect of the load current. When the accumulated thermal effect of the overload reaches a predetermined level, the circuit breaker is activated to trip. When the control unit is not connected to the auxiliary power supply, the heat capacity generated by the previous current is ignored if the circuit breaker is closed immediately after operation. That is, the reclosing makes the controller re-power on and reset, and the heat capacity restores to zero. As shown in the picture:



When the control unit is connected to the auxiliary power supply, the heat capacity continues to decrease after the circuit breaker is operated, and the heat capacity generated by the previous current after the circuit breaker is immediately closed is remembered. That is, the heat capacity is reduced after the action of opening, and the heat capacity continues to change according to the current at this time after re-closing. As shown in the figure:



Note:

Before the circuit breaker is delivered, the control unit thermal memory protection is enabled for long delay and the thermal memory time is set to 30 minutes by default. Short circuit short delay thermal memory protection is turned off. The Mpro control unit defaults to thermal memory off and the cooling time is set to "instantaneous" by default.

Short Circuit Instantaneous Protection

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

■ Protection according to RMS (true RMS of current).

When the circuit breaker is delivered, the control unit defaults to the protection current setting Ii= 10×In.

Instantaneous protection characteristics

MCR/HSISC features. Fault current signal sends action command directly through hardware circuit. MCR protection to the circuit breaker on the ability to protect, to prevent the circuit breaker on more than the limit of the current caused by switch damage, protection in the opening and closing of the circuit breaker instant

(about 100ms) work; HSISC protection protects the limit carrying capacity of the circuit breaker, prevents the switch from carrying the current that exceeds the breaking capacity of the stage limit, and works after closing for 100ms. Its accuracy is 0 ~ -20% of the set value.

■ MCR Protection

MCR protection is to prevent the power grid from being in a fault state before the circuit breaker is closed, and the current greater than the MCR set value is generated at the closing moment, and the control unit breaks the circuit breaker in an instantaneous manner. The default MCR action value is 50kA, which can be adjusted internally if necessary. The adjustable range is 30 ~ 80kA, the step size is 5kA, but the minimum is not less than 13 times the rated current.

■ HSISC protection

HSISC protection is protection against the circuit breaker from passing a large current greater than a certain value (generally the limit breaking current of the circuit breaker) for a long period of time.

Neutral line protection

The controller has overload long delay, short-circuit short delay and short-circuit instantaneous protection for N phase and other three phases, and the protection characteristics are the same as those of other three phases.

When the circuit breaker is delivered, the default N phase protection of the controller is 100%In.

When the neutral line is thin, it can be protected by half fixed value method, and it can be protected by all fixed value method when it is the same as others.

Mpro controller neutral line protection Settings

Setting range:	50%N	100%N	OFF
Neutral wire Type of protection	Instructions		
50%N	**Half neutral line protection** - Neutral line long delay current set Ir equal to half of set value - Neutral short delay trip Isd is equal to half of the set value - Instantaneous neutral Trip Ii is equal to the set value - For ground fault protection, neutral trip Ig is equal to the set value		
100%N	**Full center line protection** - Neutral line long delay current set Ir equal to set value - Neutral short delay trip Isd is equal to set value - Instantaneous neutral Trip Ii is equal to the set value - For ground fault protection, neutral trip Ig is equal to the set value		
OFF	No neutral wire protection function		

Ground protection (optional)

The Mpro has optional ground protection.

- The grounding function is to protect the single-phase metallic grounding fault, and the principle of its realization is differential type and ground current type;
- Difference type is to take four phase (3 phase 4 wire system) or three phase (3 phase 3 wire system) current vector and protection, its characteristics are suitable for the ground current is relatively large occasions;
- Ground current type is directly to the transformer to take the ground terminal signal for protection and sampling accuracy is high, anti-interference ability is strong;
- The action accuracy is 0 ~ -20% of the set value.

Ground protection type table

type	explaination
Differetial type	Detects zero sequence current, which is the vector sum of phase current and neutral line current (Depending on device type)
Grand current type	-through a special external transformer, the function directly measures the gound current fed back to the transformer through the grounding cable Also detect the faults of the superior and lower circuit breakers The maximum distance between the transformer and the circuit breaker is 10 meters

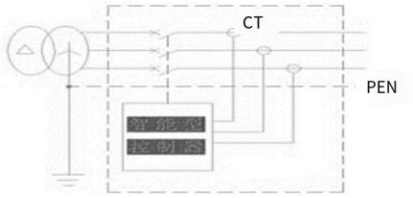
- The ground fault and neutral line protection are independent of each other and can also be used in combination.
- Grounding allows inverse time limit protection, and the operating time varies with the grounding fault current; When the fault current is greater than the set value (K×Ig) or when K is set to OFF, the protection will act after the specified time delay; When the fault current is below K times, press down action:

$$t = t_g \times K \times \frac{I_g}{I}$$

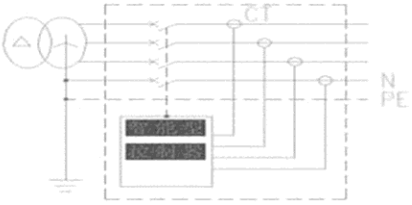
Note, in the above formula:

t	: Action time
tg	: Set delay time
K	: shear coefficient
Ig	: Set action current
I	: ground measurement current

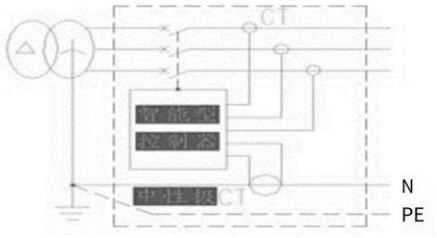
Differential type



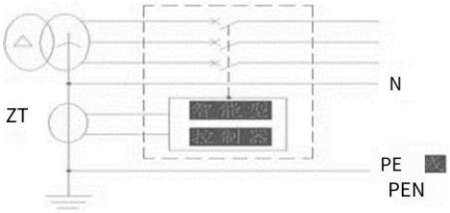
3PT



Differential type 4PT



Differential type 3P+N



Ground current type

Measuring function

Measuring instantaneous current value (RMS) including: IA, IB, IC and IN, ground fault current Ig, automatic tracking frequency change, suitable for 50/60Hz power grid.

Test & Lock

- Test

The test trip has three test methods of protection, ground fault, and operation time.

Three-stage protection test: Input simulated fault current to simulate the protection of the controller when overload, short circuit and instantaneous fault occur.

Ground fault test: Input the simulated ground fault current to simulate the protection of the controller when the ground fault occurs. Used to check the setting values of the operating characteristics.

Action time test: Force the flux converter action to test the inherent mechanical time of the controller trip.

- Lock

Parameter lock:

Lock: While in the "locked" state, the user cannot modify the parameters. Unlock: When in the "locked" state, the user can modify parameters.

Note: Before entering the "Parameter Lock" interface, you need to enter the correct user password

2.2 Protection features

Overload long time protection							
Current setting range	Ir	0.4-1xIn, OFF, set step size 1A					
Long time protection characteristics							
	Current , I/Ir			Tripping time			
Inaction characteristic	<1.05			Inaction			
Action characteristics	≥1.2			Action within 2 hours			
Inverse time delay time T (s) , ≤ $T=\frac{(1.5Ir)^2}{I^2}tr$	Tr (s)	15	30	60	120	240	480
	1.5Ir	15	30	60	120	240	480
	2.0Ir	8.4	16.9	33.7	67.5	135	270
	7.2Ir	0.65	1.3	2.6	5.2	10.4	20.8
	Accuracy	± 10% (fixed absolute error ± 40ms)					
	Thermal memory	Release within 30 minutes, can be cleared after power failure					

Short circuit short delay protection		
Setting range	Isd	1.5-15Ir, OFF
Time setting	Timed delay	0.1-0.4s (0.1 level difference), OFF, accuracy ± 10%
	Inverse time delay	Curve same as overload long time
	Inverse time thermal memory	Release within 15 minutes, can be cleared after power outage. If you need to open the thermal memory, please indicate it when placing an order
Short circuit instantaneous protection		
Setting range	Ii	1-20In, OFF; accuracy ± 15%

Grounding protection (optional)		
Setting range	Ig	0.2-1In, OFF (minimum 160A)
	Action characteristics	≤ 0.8Ig, no action;> 1.0Ig, action; Accuracy ± 10%
Time setting	tg	0.1-0.4s, OFF (0.1s level difference), accuracy ± 10%
	Inverse time shear coefficient	1.5-6, OFF (level difference of 0.5)

Current imbalance	
Description	Iavg=(Ia+Ib+Ic)/3; Iunbal=|Emax|/Iavg*100%
Start value	5% -60%, level difference of 1%
Delay Time	0.1-120s, level difference of 0.1s
Return value	5% - Start value, level difference of 1%
Return time	10-200s, level difference of 1s

MCR (making and breaking current) and HSISC (trip over limit) protection	
Setting current	30-100kA, set step size 1kA,<40ms

2.3 Default values for Mpro control unit parameters

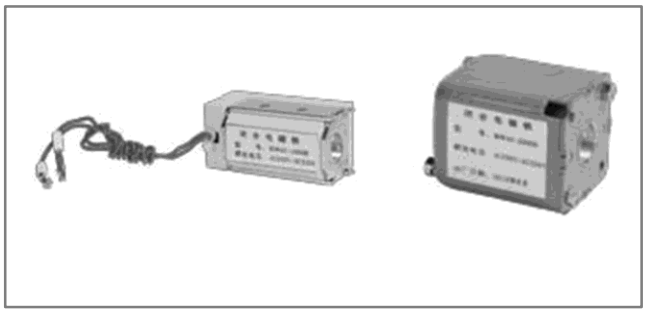
Items		Adjustable range	Factory Settings
Overload long delay protection	Protection Curve Types	I^2t	
	Setting current Ir	(0.4 to 1.0) x In +OFF	1.0 x In
	Set the time tr	15s, 30s, 60s, 120s, 240s, 360s, 480s, 600s, 720s, 840s, 960s	120s
Short circuit short delay protection	Fixed time setting current Isd	(1.5 ~ 15) x Ir+OFF	1.5 by Ir
	Set time limit Set time tsd	0.1 ~ 0.4s	0.2 s
	Inverse time setting current Is	(1.5 to 15) x Ir+OFF	OFF
Short circuit instantaneous protection	Setting current Ii	(1.0 to 15.0) x In+OFF	2×In
Ground protection	Set current Ig	(0.2 to 1.0) x In+OFF	OFF
	Set the time	0.1 ~ 0.4s+OFF	OFF
	Inverse time-bound shear coefficient K	1.5 to 6+OFF	OFF
Neutral phase protection	Set the current value	50% In, 100% In, OFF	100% In
Ground alarm			Off
MCR			ON, 30In
HSISC			ON, 50kA

3 Circuit breaker accessories

3.1 Closing coil

After the electric energy storage is over, the closing electromagnet releases the energy storage spring force of the operating mechanism instantly, making the circuit breaker close quickly.

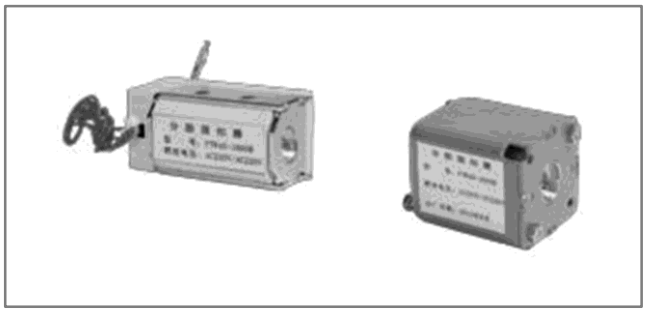
The closing electromagnetic block is instantaneous type.



Technical parameter	
Rated voltage (V)	AC230/400 DC110/220
Action voltage (V)	(0.85-1.1)Us
Closing time	≤60ms

3.2 Opening coil

Can be operated remotely to disconnect the circuit

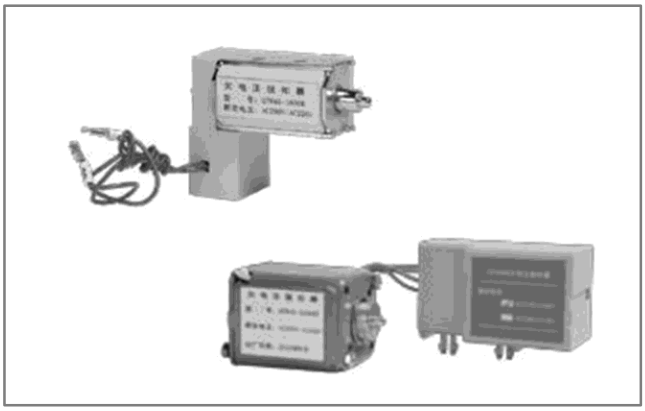


Technical parameter	
instantaneous type.	
Rated voltage(V)	AC230/400 DC110/220
Action voltage (V)	(0.7-1.1)Us
Disconnect time	≤40ms

3.3 Undervoltage coil (optional)

Note: In thunderstorm-prone areas or in power grids where the supply voltage is unstable, an undervoltage release with delay is recommended to prevent the circuit breaker from tripping due to a short voltage drop.

Trip method: Instantaneous trip/delay trip



Technical parameter	
Rated control power supply voltage Ue (V)AC230 AC400 Operating voltage (V)	
(0.35-0.7) Ue	
Reliable closing voltage (V)	(0.85-1.1) Ue
Reliable non-closing voltage (V)	≤0.35Ue
Delay time	1s, 3s, 5s

3.4 Auxiliary contacts

Indicates the break or close position of the circuit breaker.

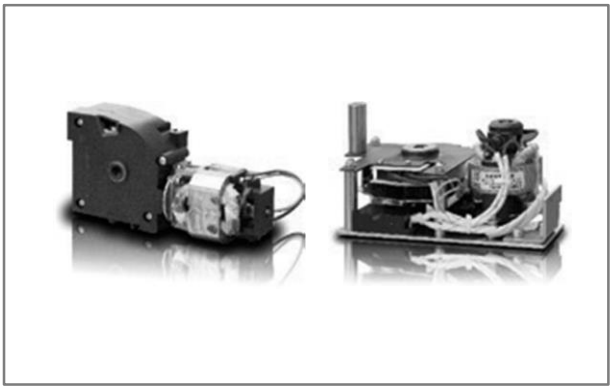
Contact capacity:	16A	AC 400V
Rated operating voltage ue(V)	1.5ADC AC-15: AC 400V; DC-13: DC 250V	250V
Conventional heating current (A)	6	
Rated control capacity	300VA, 60w	

3.5 Motor

For circuit breaker electric energy storage and automatic reenergy storage function.

-

Rated operating voltage Ue (V)	AC230/400 DC110/220
Reliable range of action	Ue (0.85 1.1)
Rated control capacity	Inm=1600 75VA 75W

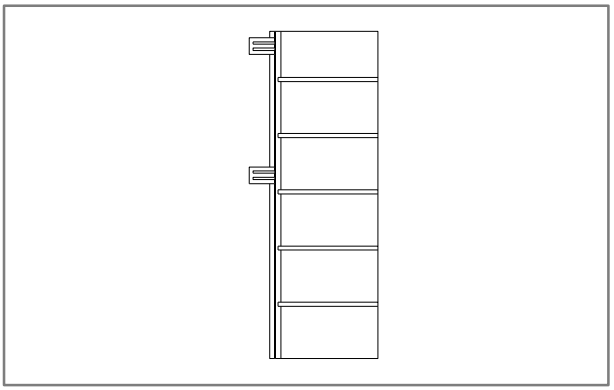


3.6 Phase barrier

Mandatory, made of insulation, installed vertically between the patch panels of the fixed section of the drawer circuit breaker.

Strengthen the busbar joints.

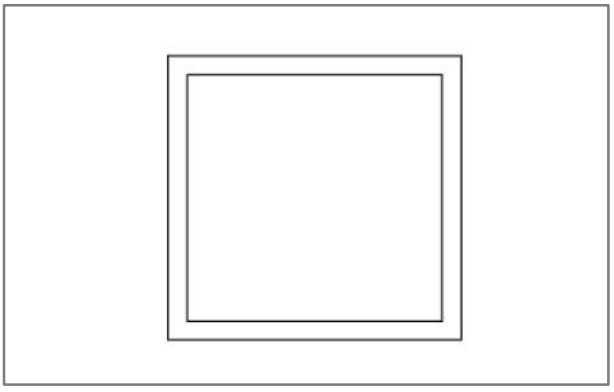
Prevent arc from spreading inside the circuit breaker.



3.7 Doorcase

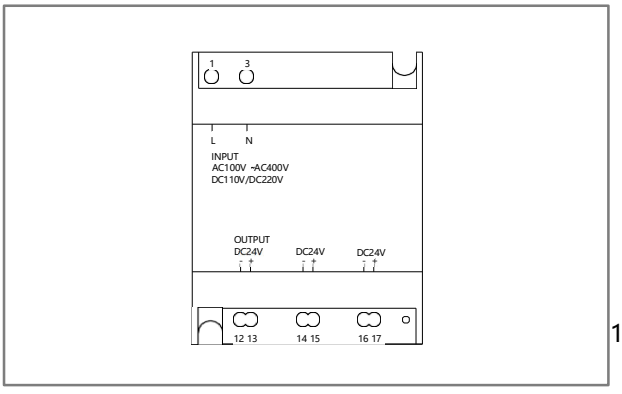
Fixed on the door cabinet plays a sealing role, and the protection level reaches IP40;

Divided drawer type door frame, fixed door frame two kinds



3.8 Auxiliary power unit

Power conversion modules are used to convert external auxiliary power to DC 24V. Under normal circumstances, the external power supply can be directly connected to the 1, 2 terminals, without the need to pass the power conversion module, the type and voltage level of the external power supply access must be consistent with the requirements of the order specification.



3.9 Switch position lock (optional)

The prevent closure lock locks the breaker's opening probe in the pressed position. We install and configure the key after the user has selected it.

A circuit breaker is equipped with a lock and a key. The circuit breaker is not allowed to close when it is locked. Two circuit breakers with two of the same lock and a key, only allow a single circuit breaker to close; Three circuit breakers with three identical locks and two keys, only two circuit breakers are allowed to close; Note: To prevent the use of closed locks, you must first press the opening button before you can turn the key.

3.10 Carriage switch (optional)

Drawer seat machinery indicates body "connect/test/disconnect" position, and "Connect/test/disconnect" contacts may also indicate body position.

- **Connect position travel switch**

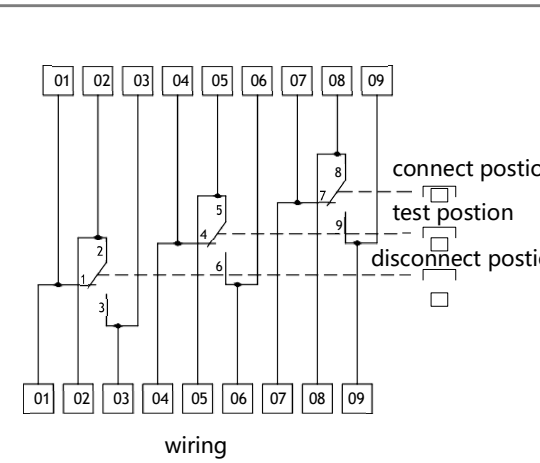
Toggle switches that only operate when the main circuit and controll circuit are connected.

- **Test with the position travel switch**

Toggle switches that only operate when the main circuit is isolated, the safety plate is closed, and the controlll circuit is connected.

- **Disconnect position travel switch**

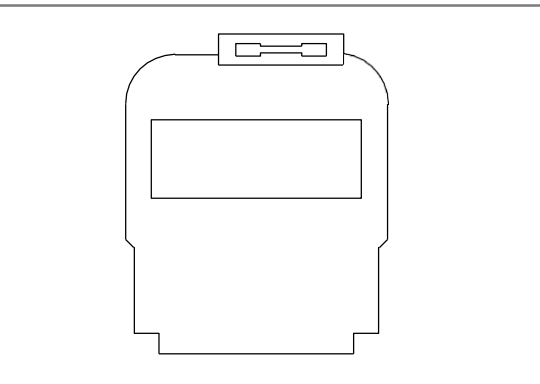
Switch, only when the main circuit isolation is reached, the controllol circuit isolation is operated.



3.11 Current transformer (optional)

- **N phase transformer**

When the ground protection mode is 3P+N, use the N transformer. When a 3-pole circuit breaker is used in a 3-phase 4-wire system, the neutral pole current transformer is used for ground fault protection and should be used with an intelligent trip device.



4 Operation of breaker

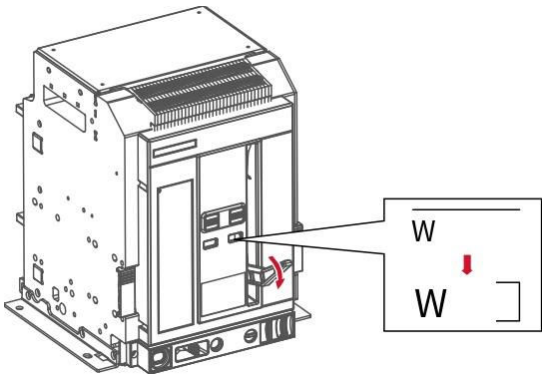
4.1 Operation of charging

- **Manual charging**

1. When storing energy, turn the handle up and down repeatedly until you hear a "click" sound, appropriate times
   After a number (about 7 times), the energy storage is completed when the hand does not feel the reaction.
2. After the energy storage is complete, the "energy storage, energy release" indicator is in the "energy storage" position.

- **Electric charging**

After the controll circuit is energized, the electric energy storage is automatically carried out (when the controllcircuit has been connected to the automatic prestorage form).



4.2 Operation of close and open

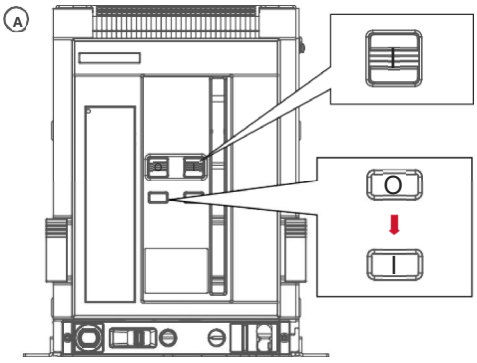
- **Manual opening and closing**

1. closing

When the circuit breaker is in the stored energy and disconnected state, press the green "I" button (see Figure A), the circuit breaker closes, and the indicator switches from red "O" to green "I".

2. opening

When the circuit breaker is in the closed state, press the red "O" button (see Figure B), the circuit breaker opens, and the indicator switches from green "I" to red "O".



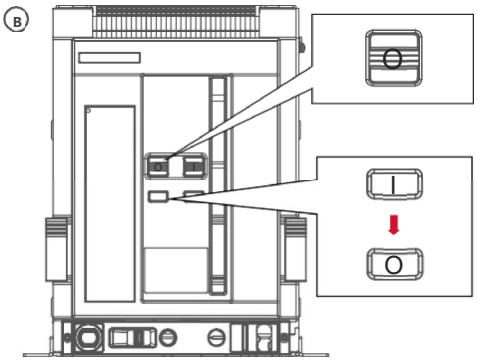
- **Open and close the breaker electrically**

1. closing

When the circuit breaker is in the state of stored energy and disconnected, the rated voltage is applied to the closing electromagnet to make the circuit breaker close.

2. opening

When the circuit breaker is in the closed state, the rated voltage is applied to the shunt trip to turn the circuit breaker off.



4.3 Operation of withdrabable breaker

- Circuit breaker body withdrawal operation

1. First take out the handle storage place and expand (A), insert the swing handle hole (B) shake it counterclockwise (C), when shaking to the "TEST" position (D) carriage switch will automatically spring to the left, you must move it to the right before continuing to shake out (E), shake the position to be locked after pulling out the handle and put it back;

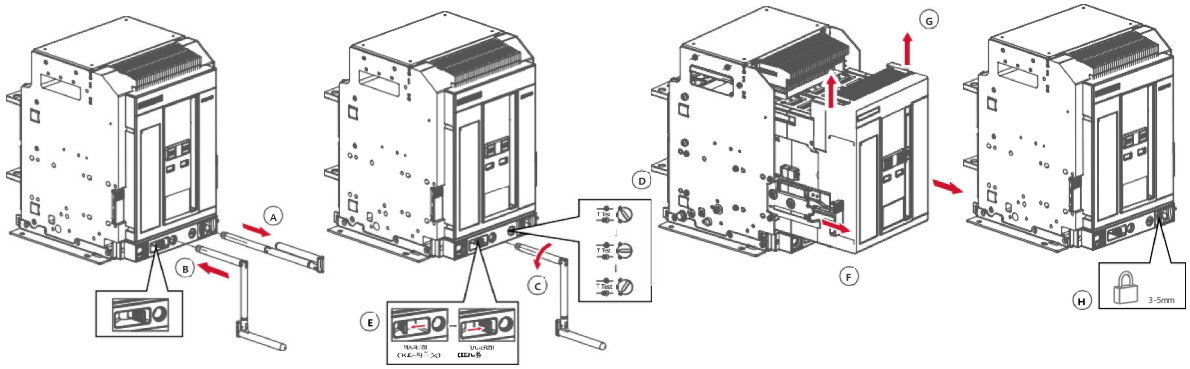
2. Pull out circuit breaker body (F) according to the figure, pay attention to pull out circuit breaker body, due to The center of gravity is moving forward, pay attention to prevent the circuit breaker from tipping and falling;

3. Take the circuit breaker body out of the drawer (G) according to the diagram, and push the extraction slide back to its original place.

The drawer circuit breaker uses a safety padlock device to lock the "separation" position, and the operation process is as follows:

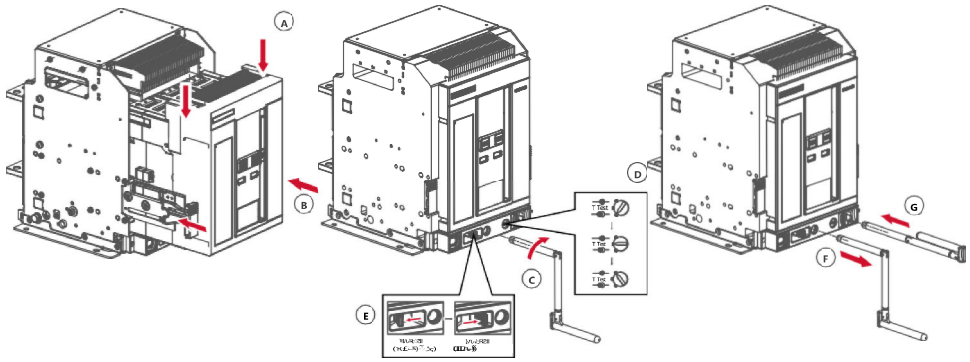
1. Press the position (H) shown to pull out the lock rod;
2. Thread into the padlock, at which point the circuit breaker cannot move from "TEST" or position.

Note: The padlock is purchased by the user.



- Circuit breaker body insertion operation

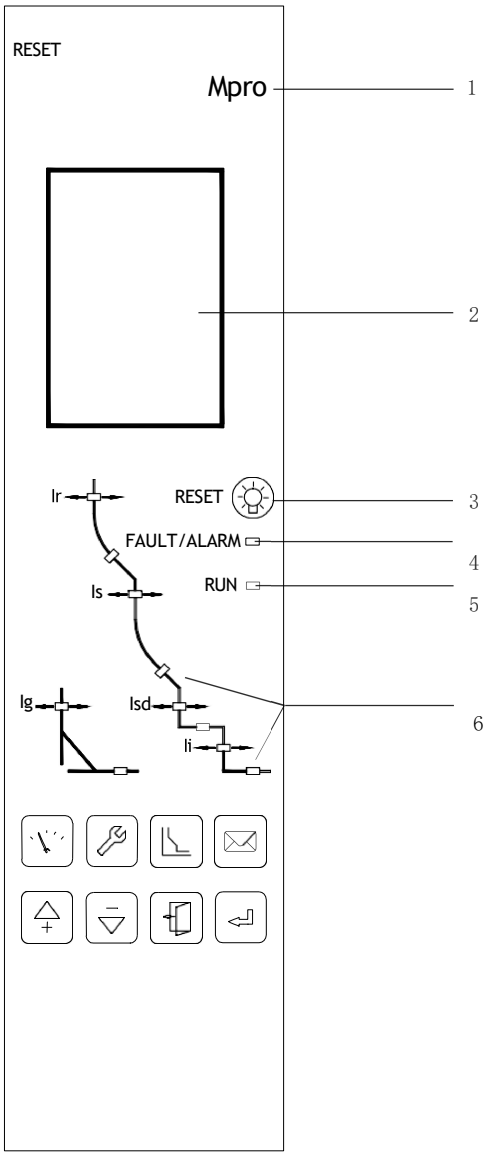
1. Press the lock with your thumb and pull out the slide until it cannot be pulled.
2. Place the circuit breaker body on the skateboard as shown in (A), taking care that the circuit breaker body should be properly stuck into the skateboard.
3. Push the circuit breaker body inward until it cannot be pushed and a "click" sound (B) can be heard.
4. Pull the handle out of the handle storage hole and fully insert the handle hex head into the drawer seat handle working hole;
5. Turn the handle clockwise (C), when the position indicator is changed from "TEST" position (D), the circuit breaker position switch is locked, can not be shaken, it must be moved to the right before continuing to shake in (E), continue to shake the handle clockwise, when the position indicator is position, the circuit breaker is automatically locked. The handle (F) can be pulled out and returned to the original position (G).


A
B
C
D
E
F
G

5 Operation of Mpro control unit

5.1 Human Machine interface

5.1.1 Operating keys with instructions



- **Instructions**

1. Model specifications
2. LCD interface display
3. Fault and alarm reset key
4. "Fault/Alarm" LED

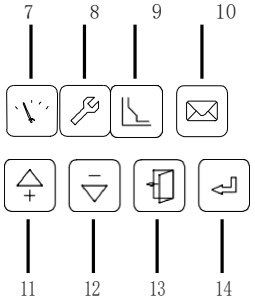
   When working normally, the LED does not light up; When fault tripping, the red LED will flash quickly;
   The red LED is always bright when there is an alarm.
5. "Normal" LED

   Powered on and in working order, the green LED is always flashing
6. Curved LED

   Red LED indicators hidden inside curves. The corresponding LED light flashes when the fault is tripped
   A flicker indicates the type of fault; When the protection parameter is set, the LED constant light indicates the current setting items.

- Keys

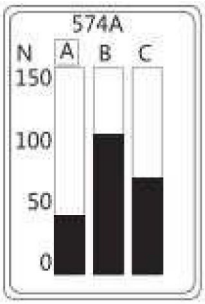
7. Measure: Function key 1, switch to the Measure Default theme menu (" Left "key under the password entry screen).
8. Settings: Function key 2, switch to the Measurement Default theme menu (" To the right "key under the password input interface).
9. Protection: Function key 3, switch to the Protection Parameter Setting theme menu.
10. Info: Function key 4, switch to History and Maintenance Theme menu.
11. Up: Move the menu contents up at the level currently used, or change the selected parameters up.
12. Down: Moves menu contents down at the current level, or changes selected parameters down.
13. Exit: Exit the current level to enter the previous menu, or deselect the current parameter.
14. Select: Enter the menu of the next level that the current item points to, or select the current parameter to save the changes made.



5.1.2 Default interface

- **No-operation display**

When no other functional action is displayed, the current column chart of each phase is displayed

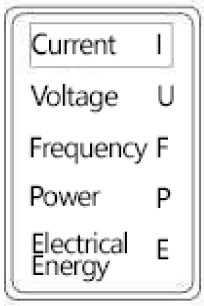


- "Measurement" menu

Press  or  button to return to the default screen

Press  in other non-fault interface to jump to the measurement menu

If there is no other operation, the system returns to the default interface after a few minutes

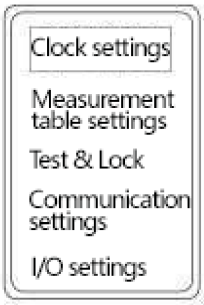


- **System Parameter Settings menu**

Press  or  button to return to the default interface

Press  in other non fault interfaceto jump to the measurement menu

If there is no other operation, the system returns to the default interface after a few minutes

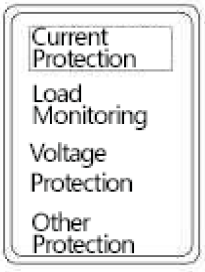


- **Protection Parameter Settings menu**

Press  or  button to return to the default interface

Press  in other non-fault interface to jump to the measurement menu

If there is no other operation, the system returns to the default interface after a few minutes



- **History and Maintenance menu**

Press or button to return to the default screen

Press in other non-fault screen to jump to the measureme

If there is no other operation, the system returns to the default in

- **Operation example: Overload long delay protection Settings**

Note:

- Parameter setting, inquiry, test and other states will automatically exit into the reset state if you do not press the button within 5 minutes.
- If a fault occurs in the setting state, the control unit will automatically exit the setting state and enter the fault state.

6 Maintenance and troubleshooting

6.1 Maintenance

To ensure the safety of maintenance work, be sure to do the following:

- Drawable type: Exit circuit breaker to separate position
- Fixed: Isolate circuit breaker

6.1.1 Arc-Chute maintenance

- Check the status of the Arc-Chute:

▪ Whether the outside shell of the arc extinguishing chamber is broken;

▪ Whether the arc plate is corroded, if necessary, replace the arc interrupter chamber;

▪ If the arc plate is attached to metal particles or is short-connected by metal particles, the metal particles should be eradicated.

6.1.2 Contact maintenance

- **Contact wear inspection**

Method 1: When there is no contact wear indication, the circuit breaker is closed, and an arc extinguishing chamber is removed to check the contact wear condition.

Method 2: When there is a contact wear indication, consider replacing the contact when the contact wear indication is below 60%.

If the contact is worn, please contact us to replace the contact system in time.

6.1.3 Check items regularly

Regular check-ups	Check, maintain content	Handling measures
Regular inspection should be carried out in the following cases: - After each short circuit break - Contact wear indicator reaches 60% or once every two years	■ The status of the Arc-Chute ■ Contact status ■ The status of the connector	
When the electrical life has been reached	Replacement of interrupter and main contact	After-sales service
When the life of the machine has been reached	Electric energy storage mechanism, main contact	After-sales service
Annual maintenance is recommended	■ Use different AIDS to open and close circuit breakers on site and at a distance ■ Test the instruction channel ■ Test the operation of the controll unit with a small test chamber or a full set of test chambers	

6.1.4 Failure and treatment methods

The following table enables you to determine the cause of the failure and how to troubleshoot it.
If no matter what you do, the fault persists, please contact us and we will advise you or troubleshoot for you.

Serial Number	Status	Probable cause	Exclusions
1	Breaker off (Fault trip indicator/reset button protruding)	■ Overload trip (the "fault" indicator is on) The Ir is on ■ Short-circuit trip (" Fault "indicator on)"Isd" on or "I" on ■ Ground fault trip (" Fault "indicator light) "Ig" light on	- Check the breaking current value on the ammeter (smart control unit). Re-close the circuit breaker (smart control unit waits half an hour due to thermal memory) - Check that the signal light is blinking - If the current value exceeds 1.05Ir in the maximum load phase, you can also use an ammeter to recheck for overload: * Then analyze the cause or improve the grid or modify the setting of the controll unit - Check the breaking current value on the ammeter (smart trip device) to find and troubleshoot the fault. Check the setpoint of your controll unit. Check the condition of the circuit breaker before putting it back into operation - Check the breaking current value on the ammeter (smart trip device) to find and troubleshoot, Check the setpoint of the controll unit
2	Breaker off (Fault trip indicator/reset button protruding)	■ Undervoltage trip device supply voltage is too low or none ■ The undervoltage release damaged the other circuit breaker sending the unload command ■ The shunt trip has an unexpected terminal voltage	- Check the voltage and restore it - Replace the damaged release - Check the load on the grid and modify the set value of the grid breaker if necessary - Look for the cause of the instruction
3	As soon as the circuit breaker is closed, disconnect it immediately (fault trip indicator)	■ Close when short circuited ■ The transient current when closing is too large ■ Smart control unit	- Troubleshoot and check the condition of the circuit breaker before reusing it - Improve the set value of the grid or controll unit before re-use, check the condition of the circuit breaker - Troubleshooting
4	You cannot close the circuit breaker remotely (But can be closed manually)	The closing electromagnet has insufficient or faulty power supply	- Check its power supply (voltage is greater than 0.85Us) : if the voltage is normal, take off the mask and press the moving core of the closing electromagnet to close the circuit breaker. If the circuit breaker can close, it indicates that the closing electromagnet coil is damaged; Replace the closing electromagnet

5	Non-electric storage (but can store energy manually)	Insufficient voltage of electric energy storage device (<0.85Us)	- Provide a voltage greater than 0.85Us to check the circuit of the electric energy storage mechanism: if the voltage is normal, try to start the energy storage, if there is a problem, the mechanical device failure, please contact our company. If it is good, it indicates that the electric energy storage device is faulty, will It replaces.
6	The handle cannot be inserted to exit or Insert body	■ A padlock for the "pull out" position is installed ■ The rail or body is not fully pushed in	- Padlock removed - Push the rail or body to the bottom
7	The right guide cannot be pulled out on the drawer Rail or body	■ Handle held in insert position ■ The circuit breaker is not fully disengaged	- Pull out handle and put it in place - Completely detach from the body

Serial number	Status	Probable cause	Solution s
9	You cannot disconnect the circuit breaker from a distance (but can be disconnected in the field)	■ The supply voltage of the shunt trip is too low (<0.7Us) ■ The circuit of the shunt release is faulty ■ Failure of the undervoltage release	- Check the supply voltage plus > 0.7Us voltage - If the voltage is normal, take the lower cover, close the circuit breaker, press the dynamic core of the shunt release, if the circuit breaker is disconnected, it indicates that the shunt coil is damaged, replace the shunt release. - Cut off the power supply of the undervoltage release device, the circuit breaker should be disconnected, otherwise replace the undervoltage release device. If it is disconnected, then after energizing the undervoltage release, re-close the circuit breaker and slowly reduce the voltage, checking that the circuit breaker should be at 0.35 and Disconnect between 0.7Us and replace the undervoltage trip breaker if there is a problem
10	The circuit breaker cannot be disconnected on-site	■ Mechanical failure or main circuit meltdown welding	- Contact to us
11	Circuit breakers cannot be closed remotely and on-site	■ Close the circuit breaker when short-circuiting ■ The fault trip indicator is not reset the circuit breaker is not fully in the connection position The circuit breaker is not stored ■ Mpro series intelligent control units have thermal storage ■ Shunt release has power undervoltage release has no power or malfunction ■ The circuit breaker is locked in the "off" position ■ Circuit breaker is interlocked	- Troubleshooting Check the status port of the circuit breaker to reset the fault trip indicator before reuse - Plug the circuit breaker fully into the connection position until a "click" sound occurs inside the circuit breaker - In sequence 5 Check the electric energy storage mechanism - In sequence 4 check the closing electromagnet - Power off to clear the thermal memory or wait for the thermal memory to end - Look for the reason why the shunt release is charged, cut off the power to the shunt release, and subsequently try to close it with a closing electromagnet. - Check the fault of the undervoltage tripper in sequence 9. - Uninterlock

7 Secondary wiring

7.1 Installation

Install according to the operating instructions, and check whether the specifications of the circuit breaker meet the requirements before installation.

- Before installation, use a 500V megohm meter to check the insulation resistance of the main circuit breaker. When the ambient air temperature is +20C±5℃ and the relative humidity is 50%-70%, it should not be less than 10MΩ. Otherwise, it needs to be dried until the insulation resistance meets the requirements.
- The circuit breaker should be installed vertically and fixed by bolts.
- It is strictly prohibited to leave any metal or non-metal objects in the drawer seat when installing it.

The following operating tests should be carried out before the main circuit is powered on (body in the "TEST" position) :

A) Check whether the undervoltage, shunt release, closing electromagnet and electric operating voltage are consistent (the undervoltage release is drawn, and the circuit breaker can be operated);

B) Pull the handle on the mask up and down, after seven times, the panel displays "energy storage", and hears a "click" sound, the storage energy is over, press the "I" button or close the electromagnet power, the circuit breaker is reliably closed, pull the handle can store energy again;

C) turn on the auxiliary power, the motor power operation to the mask display "energy storage", and with a "click" sound, the end of the storage energy, the motor automatically power off, press the "I" button or close the electromagnet power, the circuit breaker reliably closed, at this time the motor and power storage energy.

D) After the circuit breaker is closed, no matter the undervoltage, shunt trip device or the "O" button on the mask or the trip test button of the intelligent control unit should be able to disconnect the circuit breaker.

7.2 Maintenance

When the release coil is found to have special noise in use, the working pole surface should be wiped with anti-rust oil and re-coated with clean anti-rust grease.

In the process of use, each rotating part should be regularly injected with lubricating oil. Dust should be cleaned regularly to keep the circuit breaker well insulated.

The contact system should be checked regularly, especially after each short circuit fault or when the maintenance instruction reaches 60%. Check contents:

A. Arc-Chute

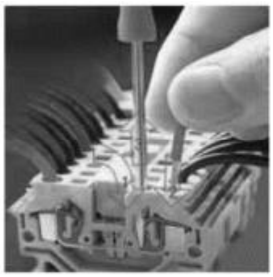
B. Contacts

C. Fasteners for the joint

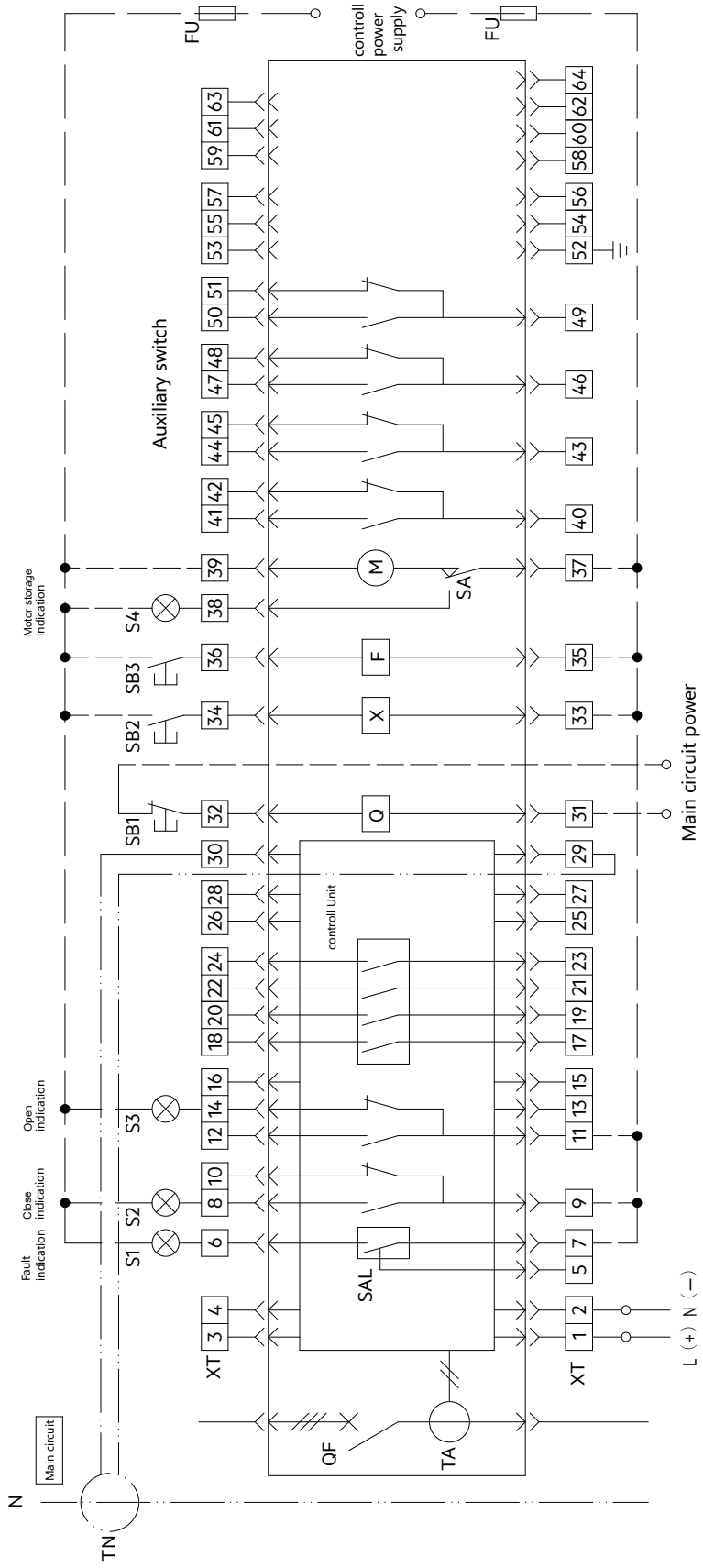
D. Flexible

It is recommended to check every two years.

The circuit breaker has not been used within half a year of the factory packaging. Please check the circuit resistance < 60MΩ before use. If there is any discrepancy, please contact us.



7.3 Secondary wiring of intelligent control unit



Note: The external power supply can be directly connected to terminals 1 and 2, and the type and voltage level of the external power supply must be consistent with the ordering specifications.

controll unit terminal function:

Terminal number	Terminal function	Terminal number	Terminal function
1 2	controll unit working power input terminal, 1 is L (+), 2 is N (-)	19 20	vacancy
3 4	vacancy	21 22	vacancy
5 6 7	output for fault tripping	23 24	vacancy
8 9 10	output for auxiliary switch	25 26 27 28	vacancy
11 12 14		29 30	External N-phase transformer input terminal, when 3P+N (optional function)
17 18	vacancy	52	protection grounding wire of controll unit

Code and description

Code	Description	Code	Description	Code	Description
X	Closing coil	QF	Circuit breaker	SB2	Closing button (user provided)
F	Shunt trip	S1~S4	Indicator light (user provided)	SB3	Opening button (user provided)
FU	Fuse (user provided)	SA	Signal switch of motor	TA	Current Transformer
M	Motor Operator	SAL	Alarm contact for Fault tripping	TN	External N-phase transformer
Q	Undervoltage release	SB1	Undervoltage button (user provided)	XT	controll circuit wiring terminal

Warning

The controll unit must be connected to the working power supply to ensure the normal operation of the circuit breaker!

controll unit circuit wiring instructions:

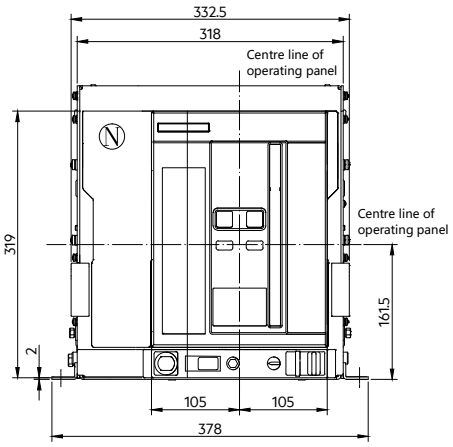
1. If the control unit voltages of X, F, and M are different, it should be connected to different power sources separately.

2. Terminal 39 can be directly connected to the power supply (automatic pre energy storage), or connected in series with a normally open button and then connected to the power supply (manual pre energy storage).

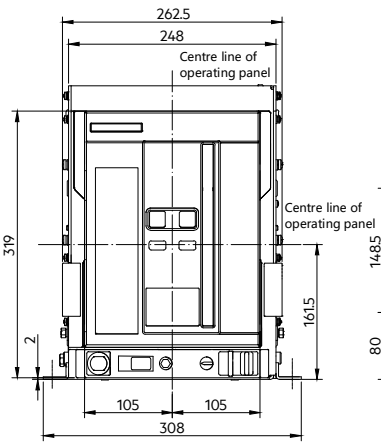
8 Profile and installing dimension

8.1 withdrawable

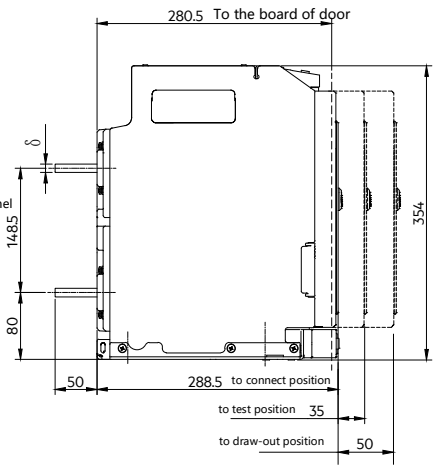
4P Front view



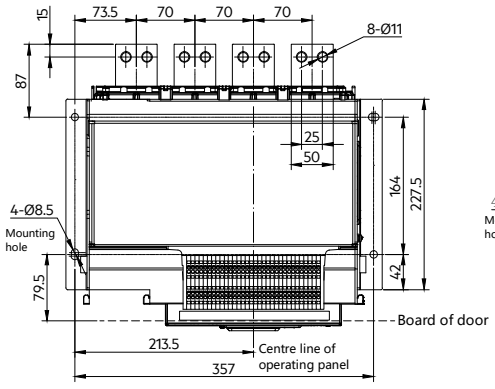
3P Front view



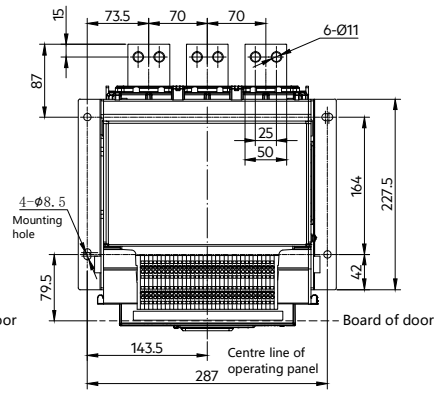
Slde view



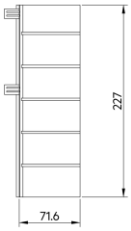
4P Top view



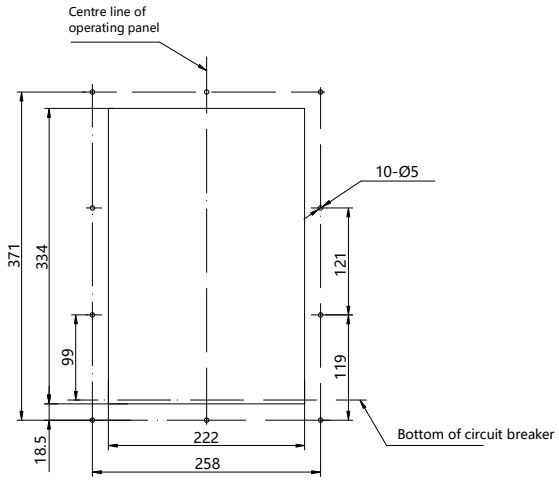
3P Top view



Phase separator



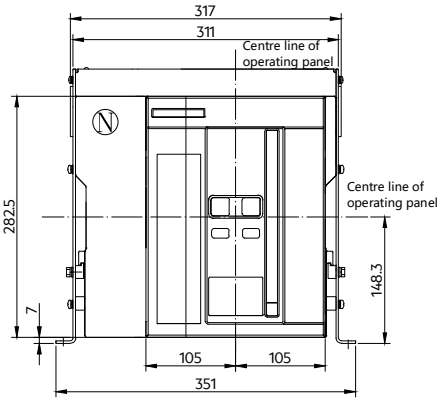
Door cut-outs



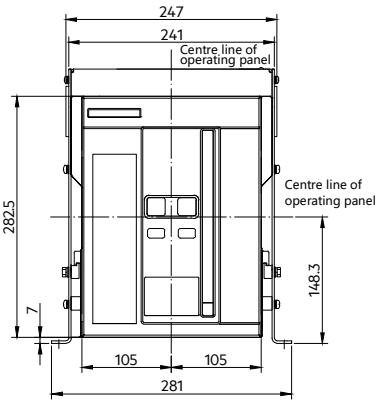
In (A)	δ
200～1250	10
1600	15

8.2 fixed

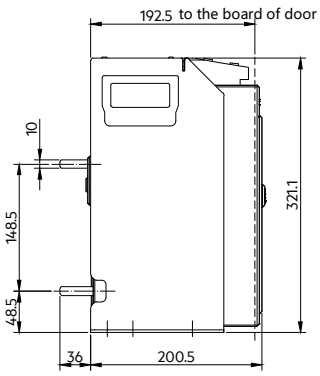
4P Front view



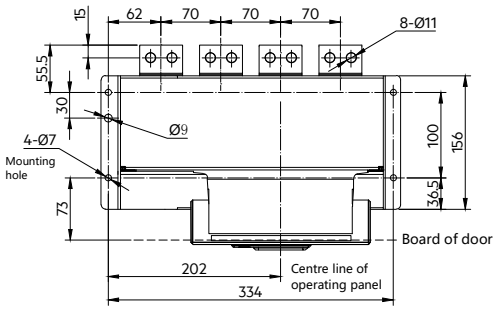
3P Front view



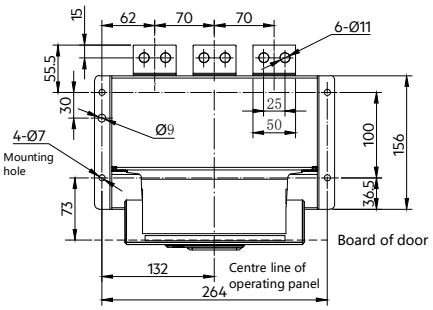
Side view



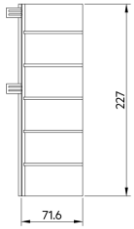
4P Top view



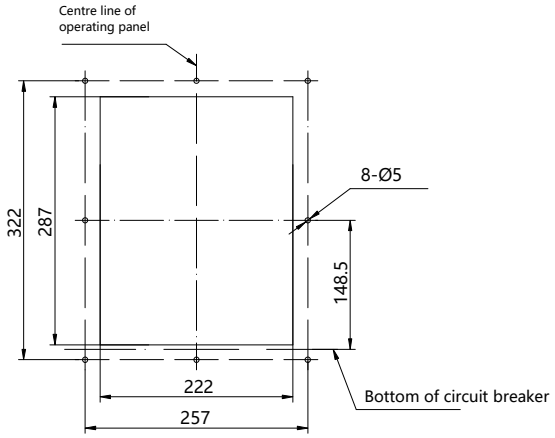
3P Top view



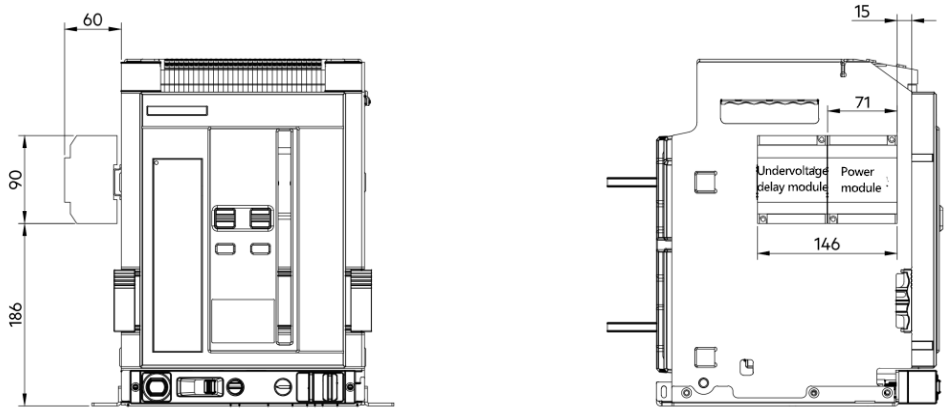
Phase separator



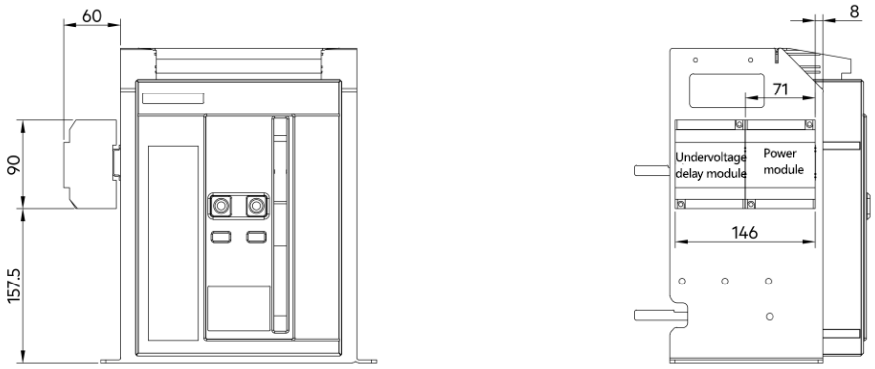
Door cut-outs



8.3 Power module, undervoltage delay module, installed on withdrawable circuit breaker

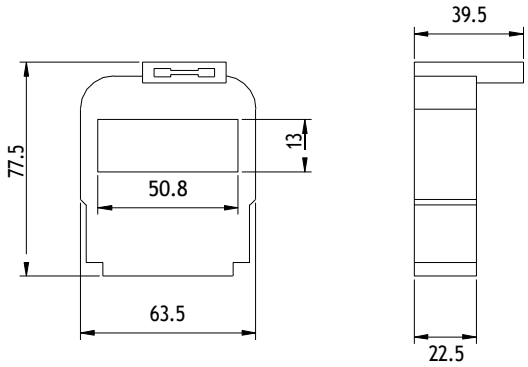


8.4 Power module, undervoltage delay module, installed on fixed circuit breaker

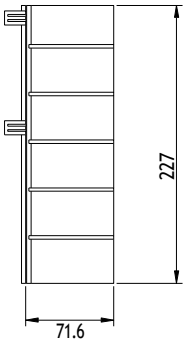


8.5 transformer , phase barrier and carriage switch

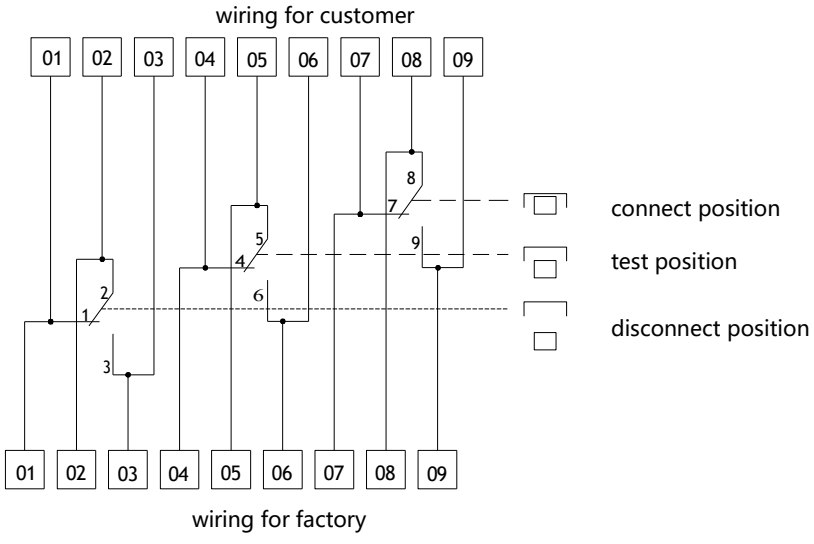
external transformer for N pole



phase barrier



carriage switch



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