24h Hotline 19278

ISO 9001:2015 ISO 14001:2015 ISO 45001:2018

TVET

2M Circuit Breakers Catalogue

2M Electric for industries

24h Hotline 19278

CB rating up to 3200 A

2M ELECTRIC FOR INDUSRIES

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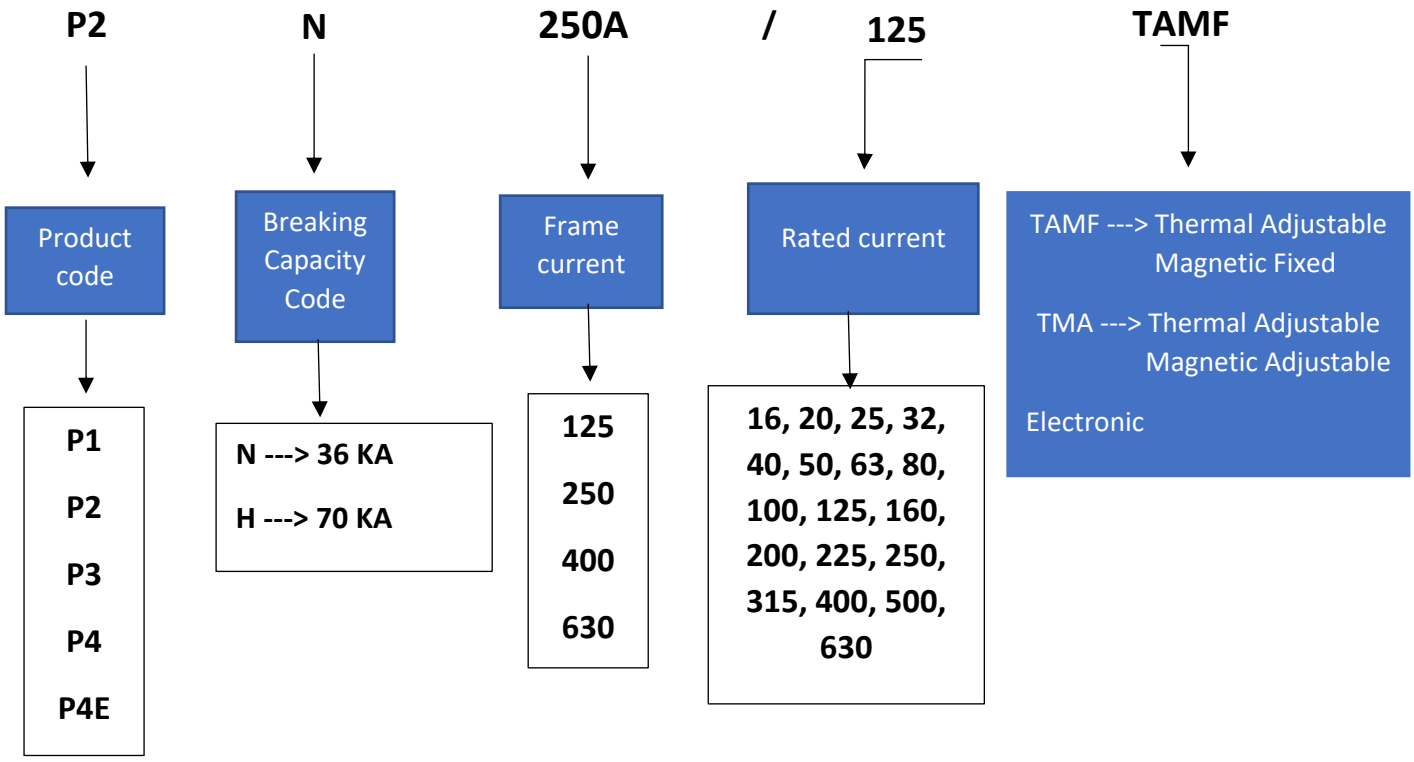
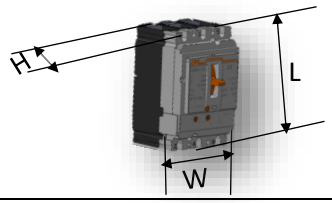
Model definition and description for Phenomena series product

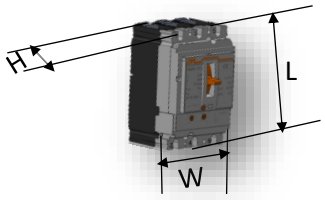


Moulded Case Circuit Breakers | Phenomena

1. Technical data

1.1 Parameters

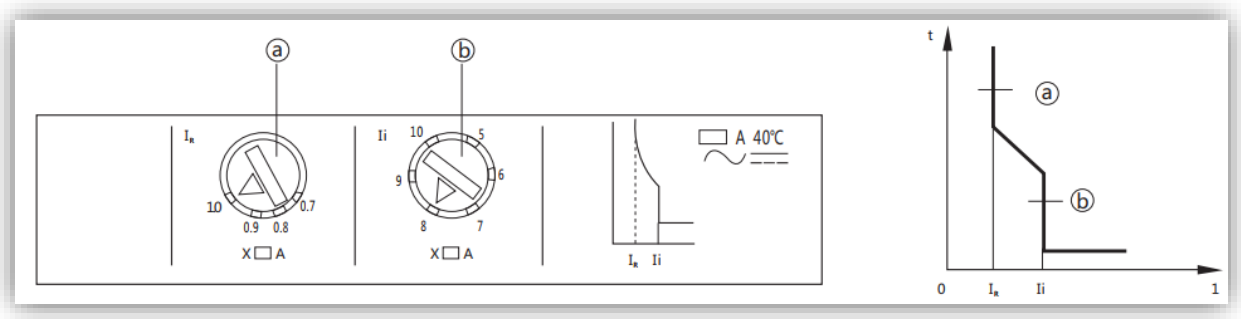
Phenomena CB Thermal-magnetic type		P1 125A	P2 250A		P3 400A	
Electric characteristics as per IEC 60947-2 and EN60947-2						
Rated current (A) In		16,20,25,32,40,50,63,80,100,125	100,125,160,200,225,250		200,250,315,400	
Rated Insulation Voltage (V) Ui		800	800		800	
Rated impulse withstand voltage (kV) Uimp		8	8		8	
Rated Operation Voltage (V) Ue	AC 50/60Hz	690	690		690	
Number of poles		3	3		3	
Breaking capacity code		N	N	H	N	H
Rated ultimate short circuit Breaking capacity (KA) Icu	AC 380V/400V/415V	36	36	70	36	70
	AC 660V/690V	2	10		10	
Rated service breaking capacity Ics= (% Icu)		100	100		100	
Suitability for isolation		■	■		■	
Utilization category		A	A		A	
Safety of insulation		■	■		■	
Life(CO recycle)	Mechanical	20,000	20,000		20,000	
	Electrical	10,000	10,000		10,000	
Protection		Thermal (Adj) – Magnetic (Fixed)	Thermal (Adj) – Magnetic (Adj)		Thermal (Adj) – Magnetic (Adj)	
Release units		■	■		■	
Over-load protection		■	■		■	
Short-circuit protection		■	■		■	
Dimension(mm) L*W*H 		155*90*64	157*103*88		257*140*111	
Weight (kg)		1.2	2.1		7.5	

Phenomena CB		P4 630A	P4E 630A
Electric characteristics as per IEC 60947-2 and EN60947-2			
Rated current (A) In		250,315,400,500,630	250,315,400,500,630
Rated Insulation Voltage (V) Ui		800	800
Rated impulse withstand voltage (kV) Uimp		8	8
Rated Operation Voltage (V) Ue	AC 50/60Hz	690	690
Number of poles		3	3
Breaking capacity code		H	H
Rated ultimate short circuit Breaking capacity (KA) Icu	AC 380V/400V/415V	70	70
	AC 660V/690V	15	15
Rated service breaking capacity Ics= (% Icu)		100	100
Suitability for isolation		■	■
Utilization category		A	A
Safety of insulation		■	■
Life(CO recycle)	Mechanical	20,000	20,000
	Electrical	10,000	10,000
Protection		Thermal (Adj) – Magnetic (Adj)	Electronics
Release units		■	■
Over-load protection		■	■
Short-circuit protection		■	■
Dimension(mm) L*W*H 		257*140*111	257*140*111
Weight (kg)		8	8

2. Release

2.1 Thermo-magnetic release

2.1.1 Thermo-magnetic release of Phenomena-P2 250, P3 400, and P4 630 breakers can be set to meet protection requirements



Thermo-magnetic release	P1 125A	P2 250A	P3 400A	P4 630A
Rated Value (A) in 40 °C	16,20,25,32,40,50, 63,80,100,125	100,125,160,200, 225,250	200,250,315,400	250,315,400,500,630
Over-load Protection	Thermo Protection			
Tripping Current IR (A)	Adjustable range (0.7~1) XIn	Adjustable range (0.7~1) XIn	Adjustable range (0.7~1) XIn	Adjustable range (0.7~1) XIn
N-pole protection (A)	Without protection 1.0XIn	Without protection 1.0XIn	Without protection 1.0XIn	Without protection 1.0XIn
Short-circuit protection	Magnetic Protection			
Tripping Current Ii (A)	5In&10In	Adjustable range (5~10) XIn	Adjustable range (5~10) XIn	Adjustable range (5~10) XIn

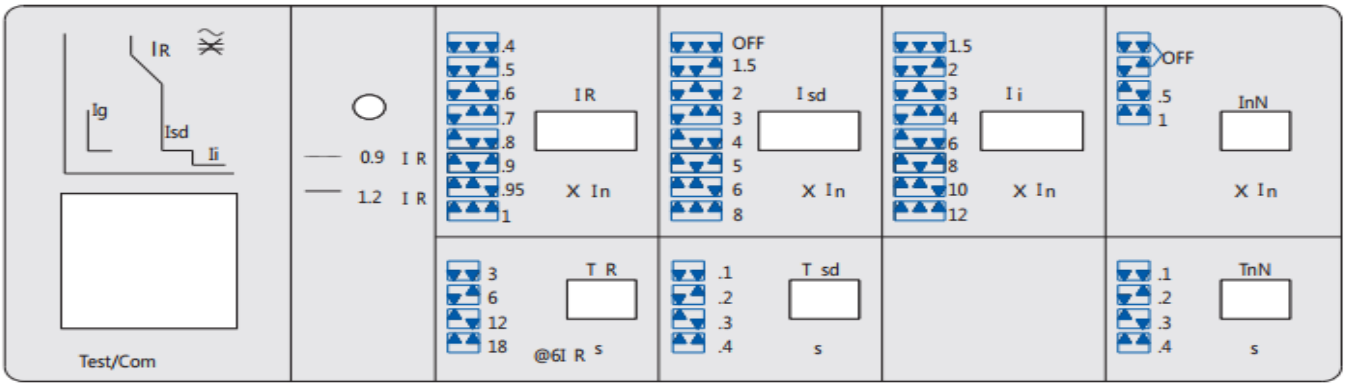
(a) Adjustable setting of over-load protection

(b) Adjustable setting of short-circuit protection or fixed

2.2 Electronic Release

2.2.2 P4 630 electronic release is a universal module.

It is of 5 current specifications: 250A, 315A, 400A, 500A, and 630A to adjust setting values and to meet protection requirements



Tripping current I_R, I_{sd}, I_i should be set with three-digit switch or rotary knob as per current.

- I_R setting of over-load protection
  I_R could be adjusted as per customers' requirements,
  and TR, tripping time at the status of $6I_R$ can be set as per customers' requirements

Model	1.05 I_R	1.3 I_R	1.5 I_R (S)	2 I_R	6 I
P4 630A	＞2h non-tripping	＜1h tripping	48,96, 192, 288	27, 54, 108, 162	3, 6, 12, 18

- I_r indicator light for over-load status indication
  The indicator light flashes, when single-phase operational current is ＜90% IR
  The indicator light is always lit, when single-phase operational current is ≥120% IR
- I_{sd} setting of short-circuit protection and tripping time
  Setting value of current I_{sd} could be adjusted as per customers' requirements and OFF stands for status without ST protection;
  T_{sd}, the tripping time could be adjusted as per customers' requirements.
- I_i, setting of short-circuit protection
  Value of setting current could be adjusted as per customers' requirements
- I_{nN}, setting of protection operations
  As a 4P circuit breaker with N-line protection, setting value of current Ig could be adjusted as per customers' requirements and OFF stands for status without protection of N-pole; T, the operating time of N-pole could be adjusted as per customers' requirements.

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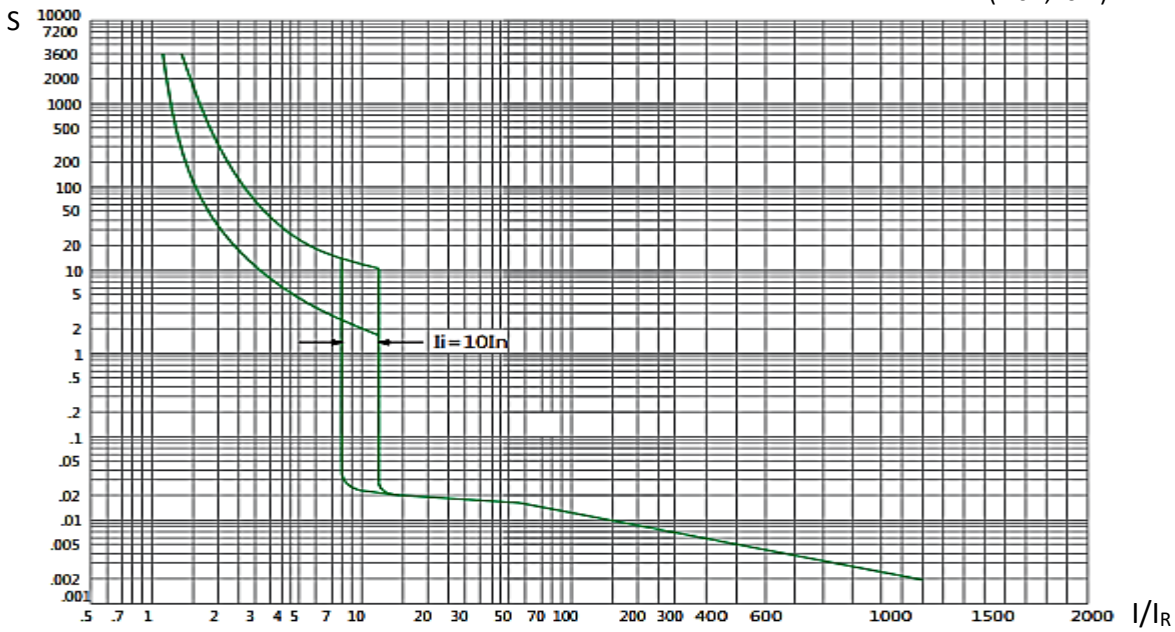
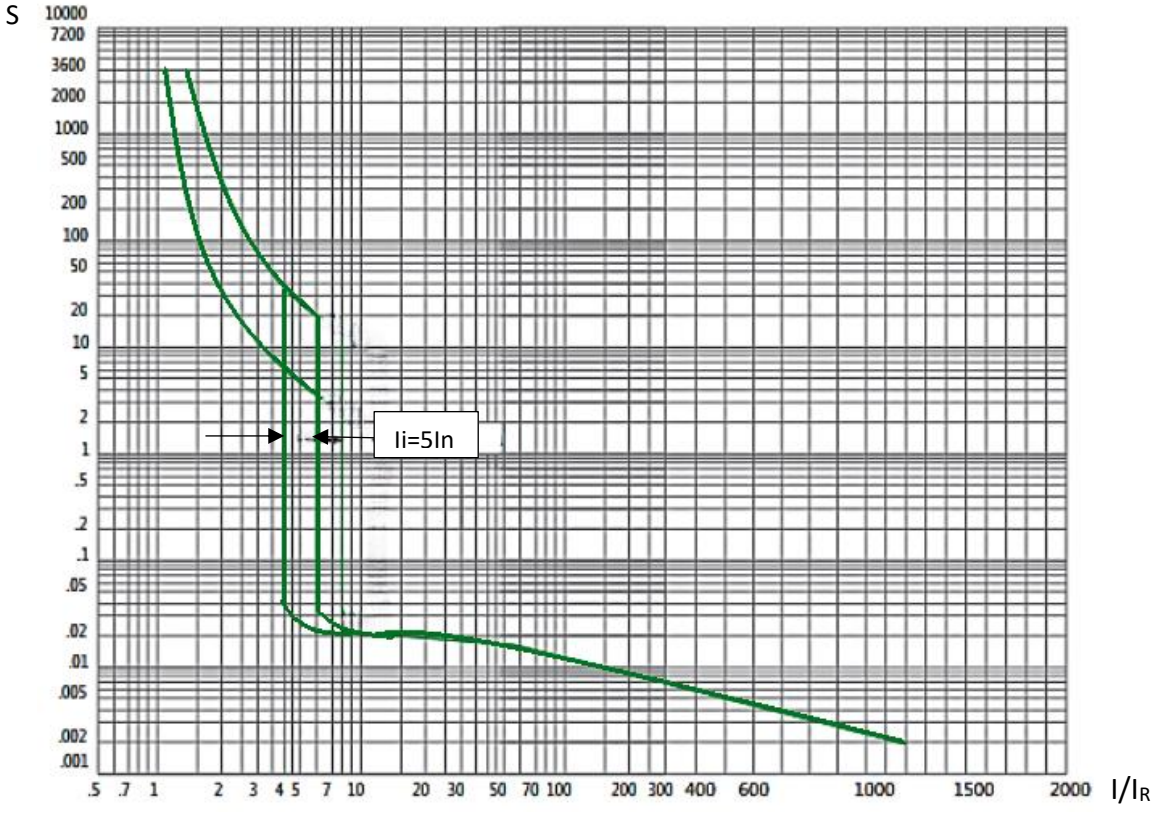
Electronic release	P4EH 630A
Rated value A In 20~70℃	250,315,400,500,630
long time-delay over-load protection (thermal protection)	
Tripping Current I_R (A)	Adjustable range (0.4~1) XIn
Tripping time 6I (s)	Adjustable range 3, 6, 12, 18
short time-delay short-circuit protection	
Tripping current I (A)	Adjustable range OFF, 1.5, 2, 3, 4, 5, 6, 8XIn
Tripping time T (s)	Adjustable range 0.1, 0.2, 0.3, 0.4
(Instantaneous) short-circuit protection	
Tripping current I (A)	Adjustable range 1.5, 2, 3, 4, 6, 8, 10, 12XIn

3. Curves

3.1 Tripping curve (ambient temperature +40°C)

P1 125A
(16A,20A)





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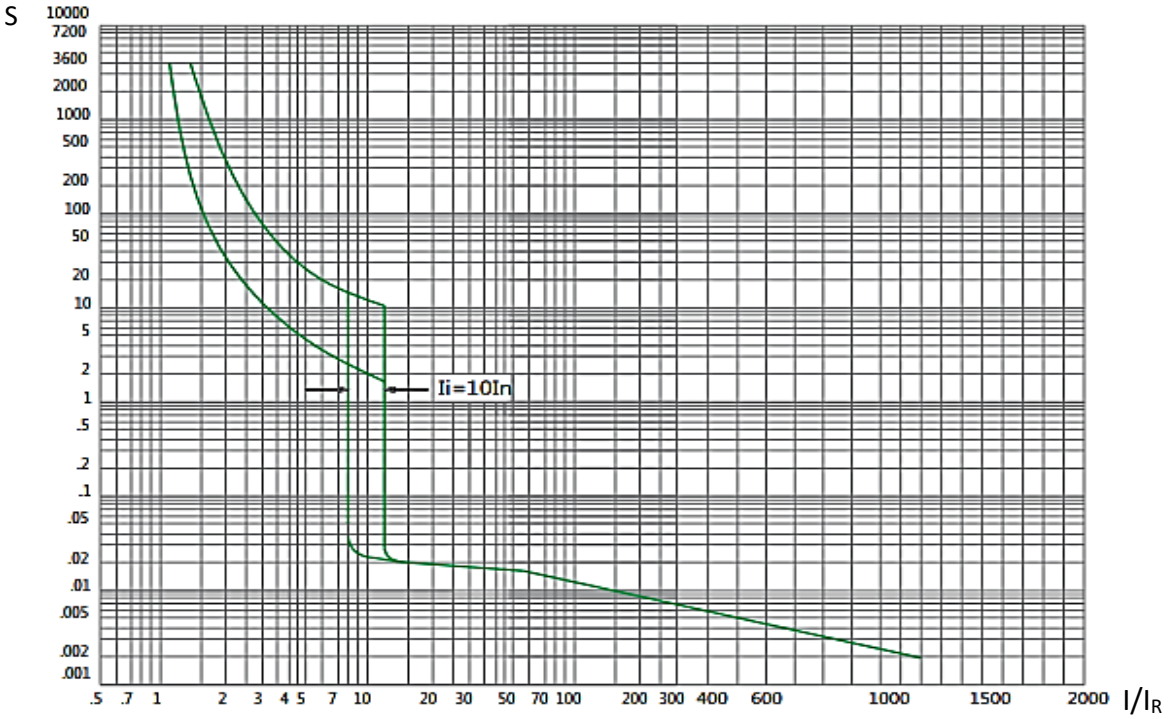
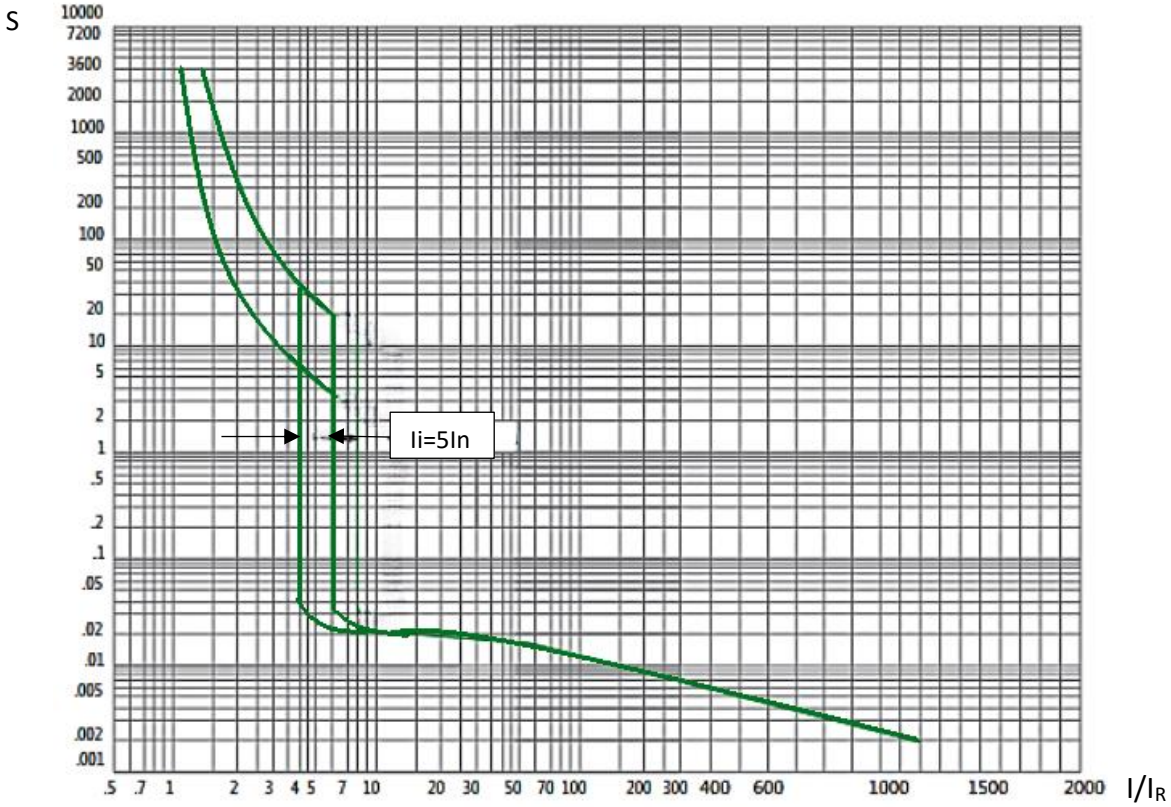
P1 125A
(25A,30A)





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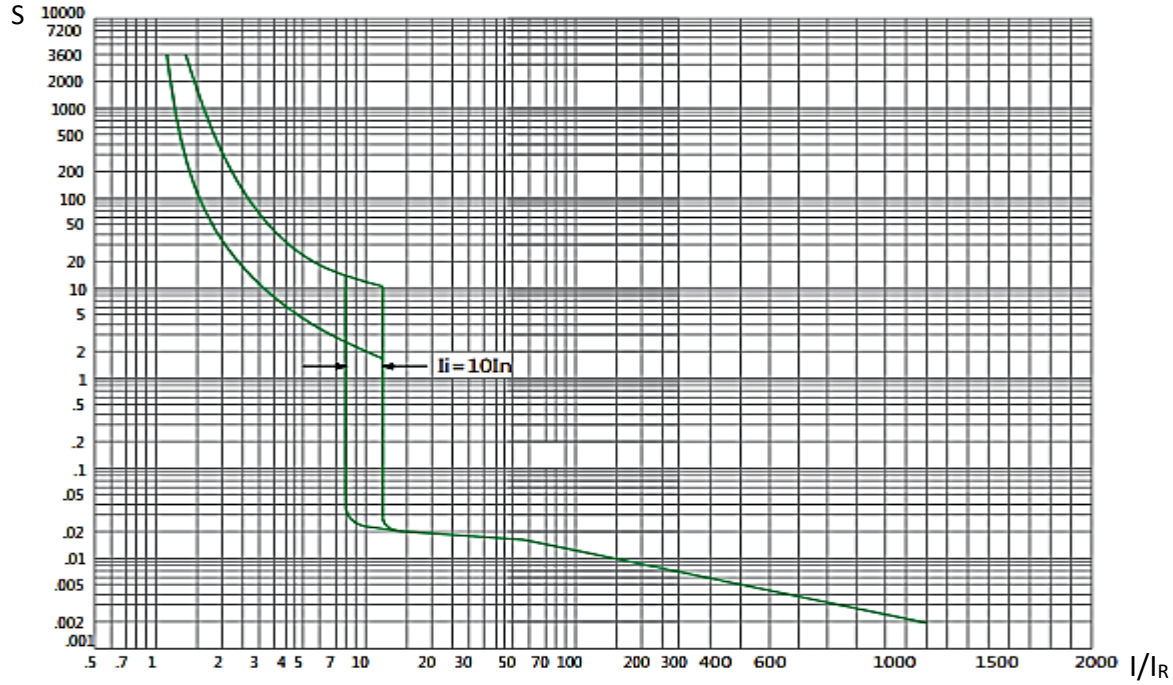
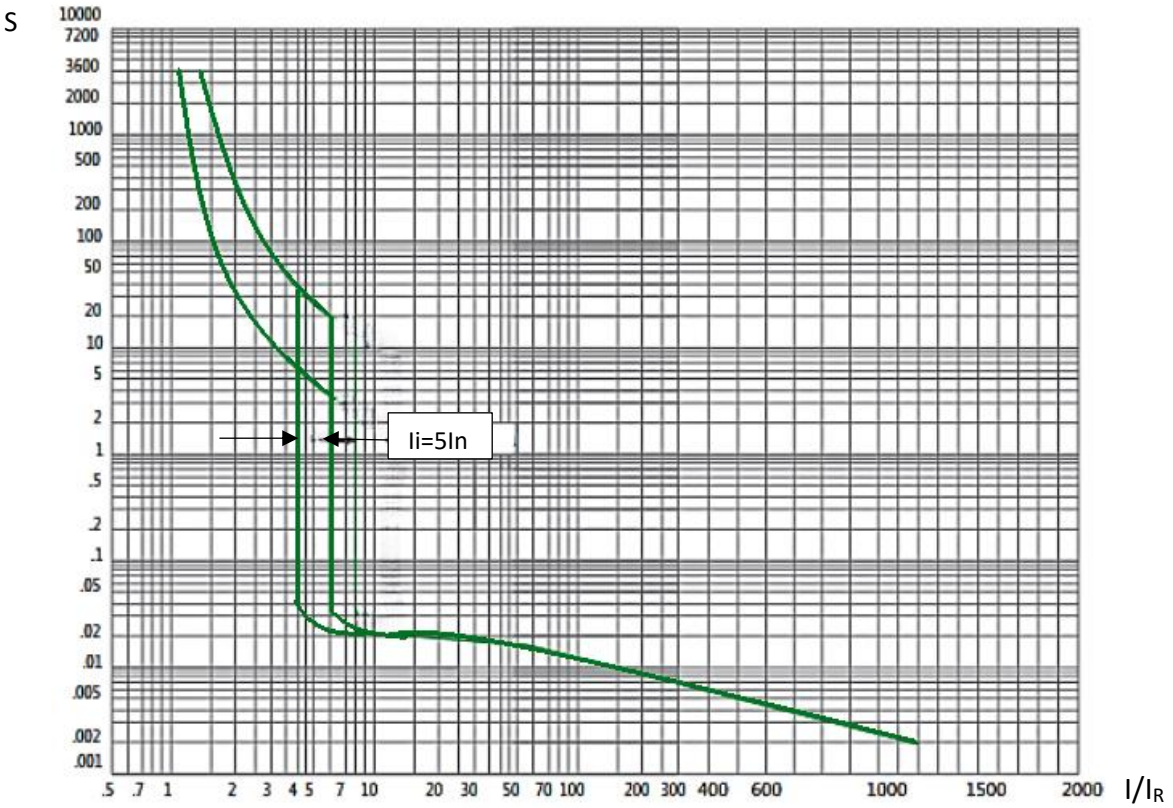
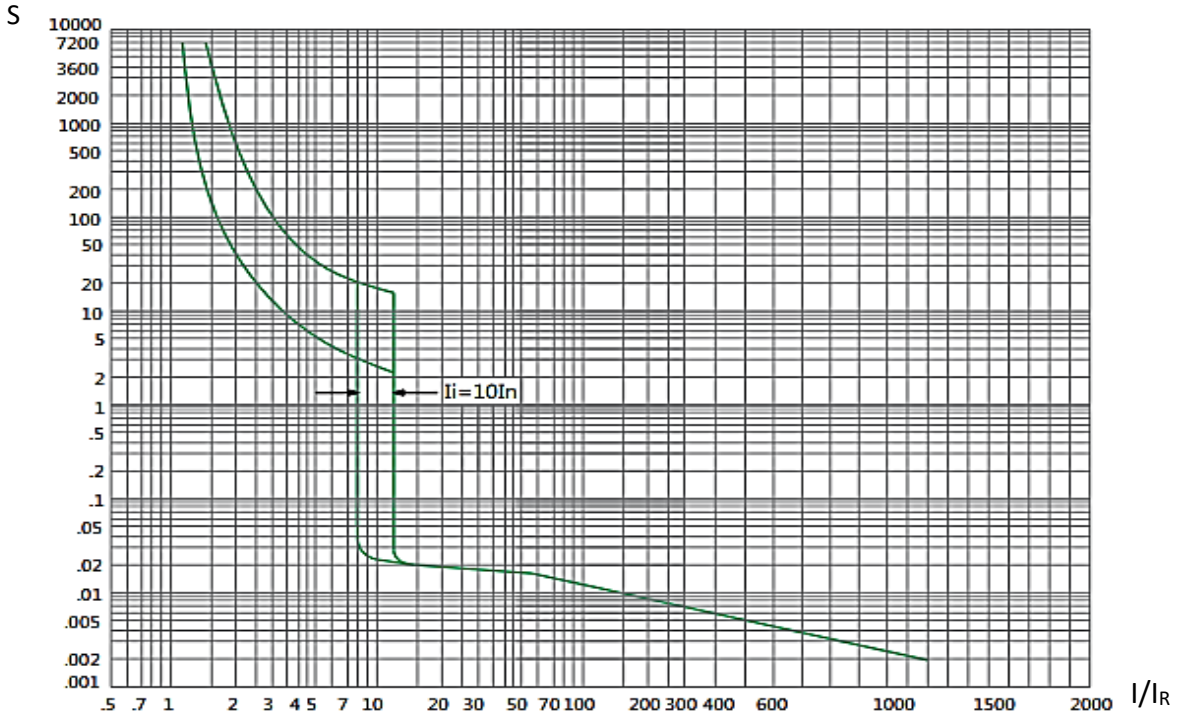
P1 125A
(40A,50A)

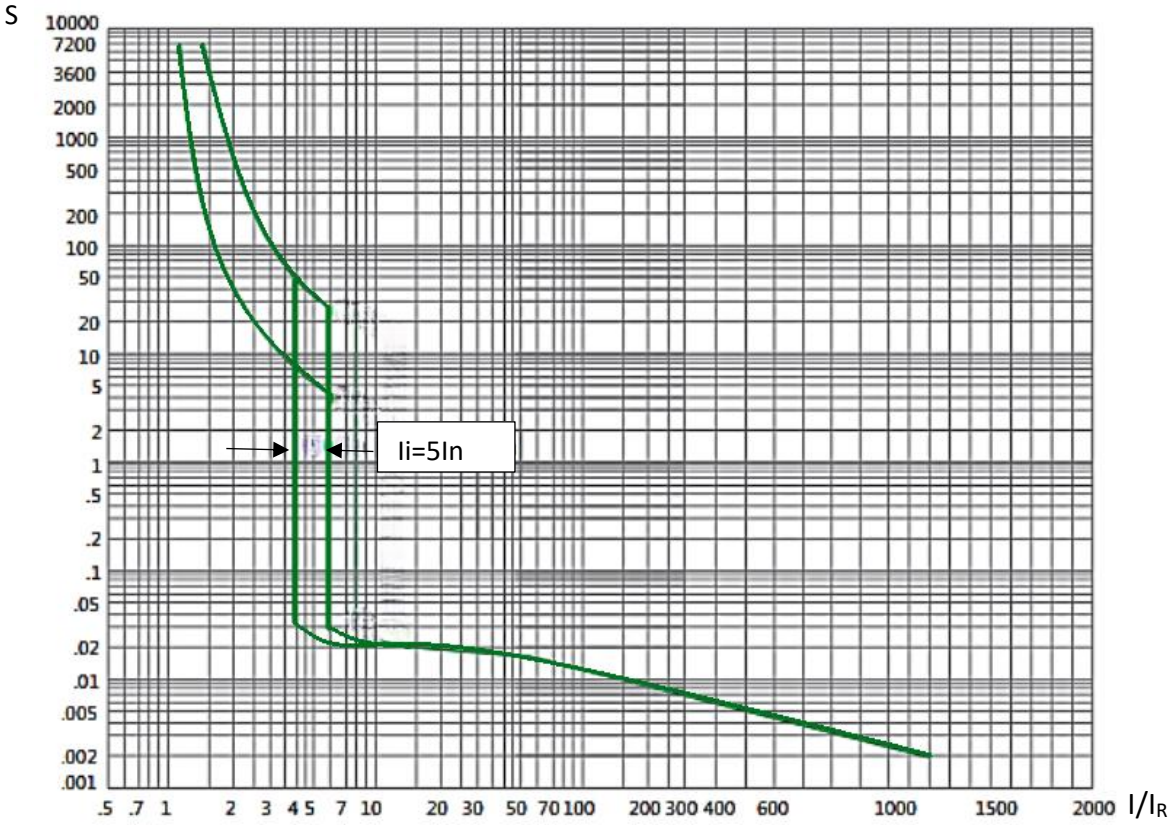




Moulded Case Circuit Breakers | Phenomena

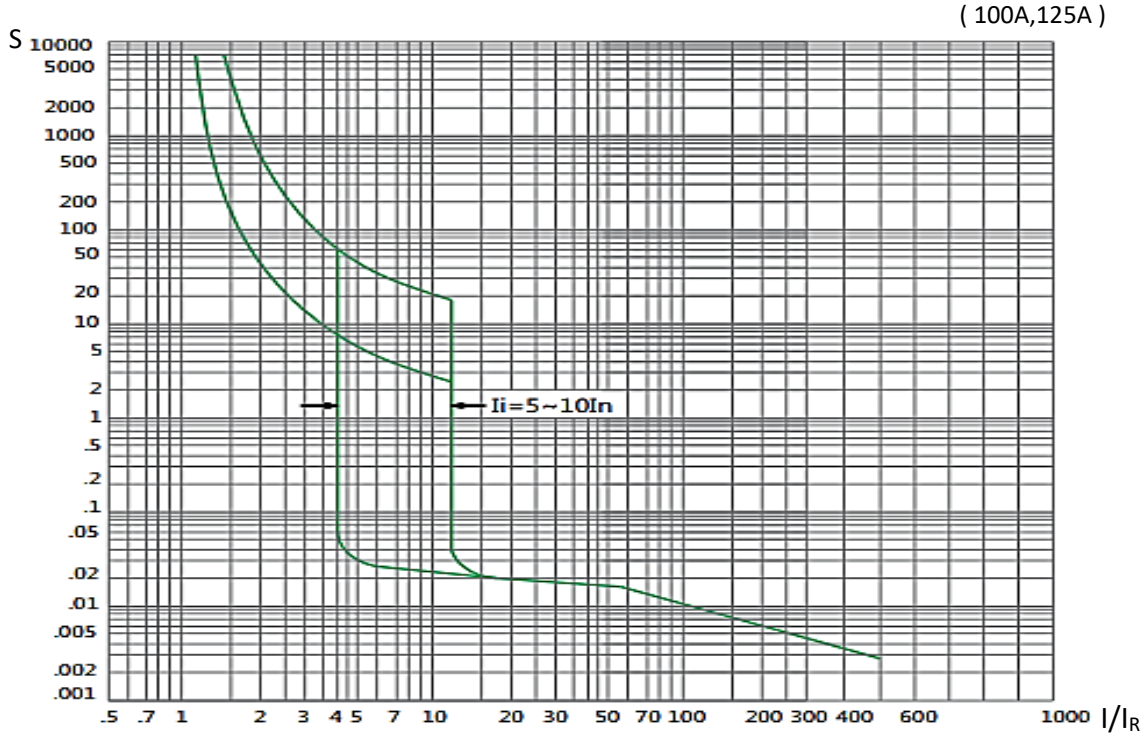
P1 125A
(63A,80A,100A,125A)



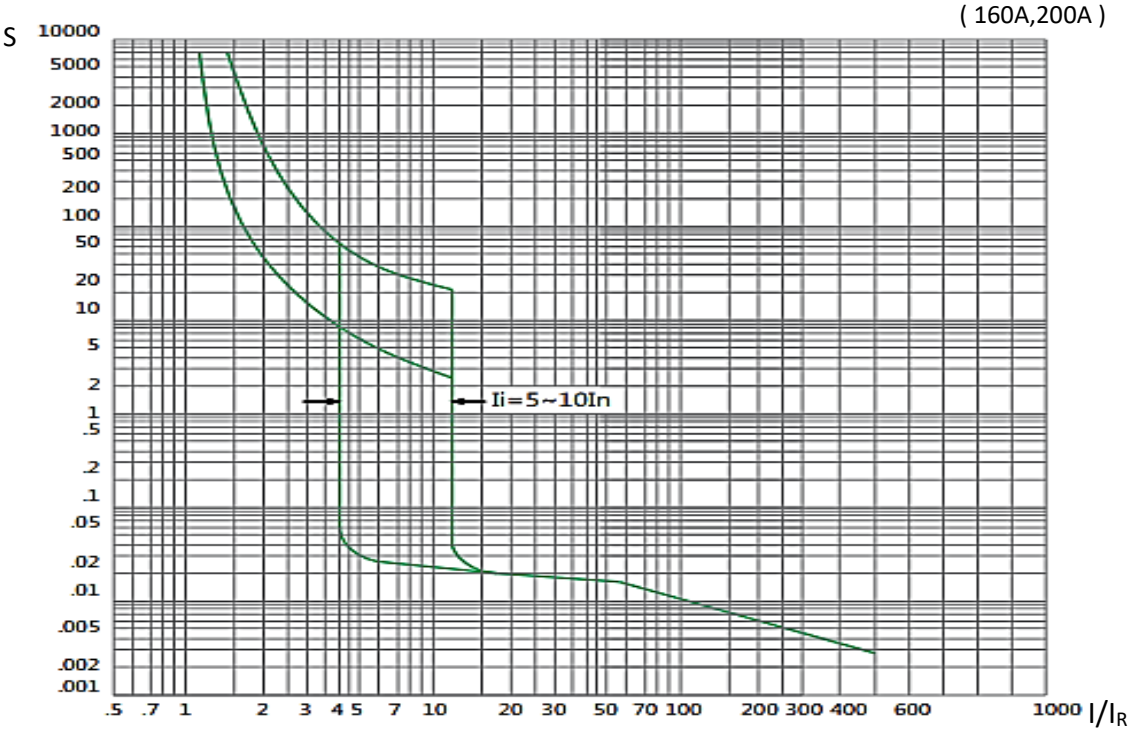


Moulded Case Circuit Breakers | Phenomena

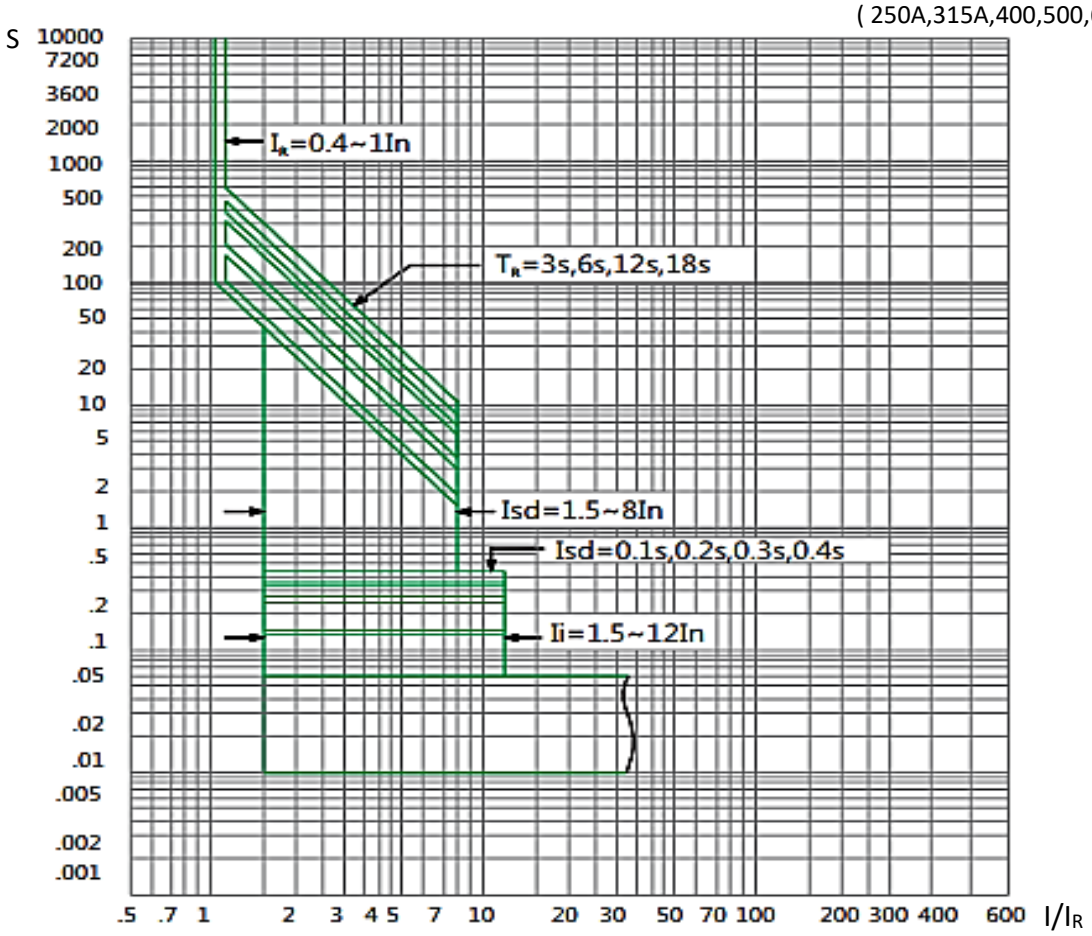
P2 250A
(100A,125A)



P2 250A
(160A,200A)



P4EH 630A
(250A,315A,400,500,630)



3.2 Temperature compensation

When the ambient temperature slightly changes, tripping characteristics will change as well, please refer to the table below for temperature compensation correction.

3.2.1 Temperature compensation coefficient of breaker with thermo-magnetic release as follows

Ambient temperature	0°C	5°C	10°C	15°C	20°C	25°C	30°C	35°C	40°C	45°C	50°C	55°C	60°C	65°C	70°C
Temperature compensation coefficient	1.2	1.175	1.5	1.125	1.1	1.075	1.05	1.025	1	0.975	0.95	0.925	0.9	0.875	0.85

Note: For reference only

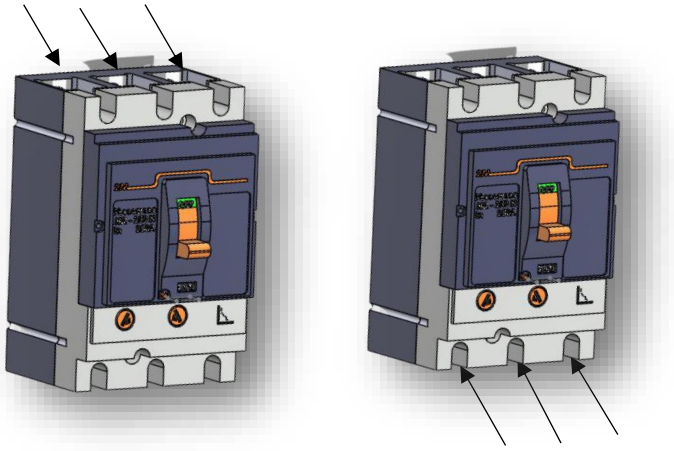
3.2.2 Temperature compensation coefficient of breaker with electronic release as follows

Frame level rated current	0°C	5°C	10°C	15°C	20°C	25°C	30°C	35°C	40°C	45°C	50°C	55°C	60°C	65°C	70°C
P4EH 630A (250~400)	1	1	1	1	1	1	1	1	1	1	1	0.98	0.95	0.93	0.90
P4EH 630A (500~630)	1	1	1	1	1	1	1	1	1	0.98	0.95	0.93	0.90	0.88	0.85

4. Mounting of circuit breaker

4.1 Modes of down-lead

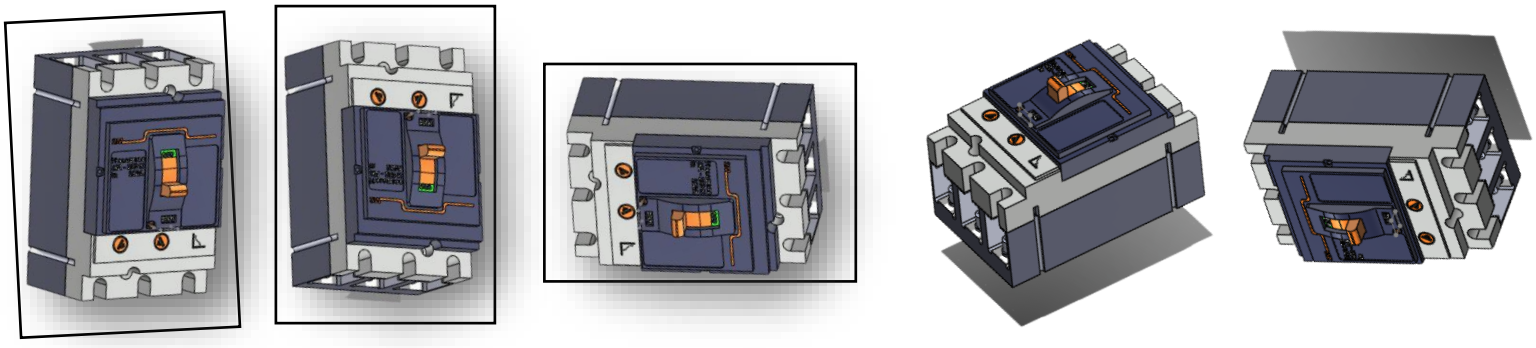
Two modes of upper and lower down-lead are available; adoption of different down-lead modes will not affect normal operation of breaker, in addition, it is no need for derating.



4.2 Modes of mounting

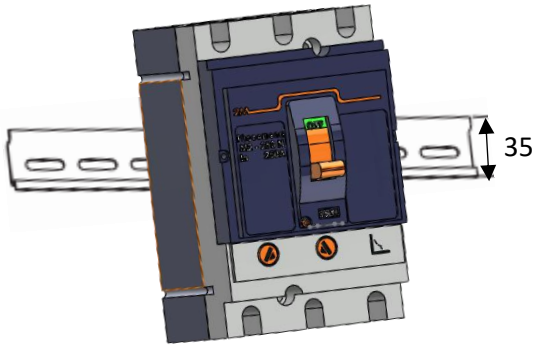
Mounting modes following are available for fixed and plug-in type breakers

A B C D E



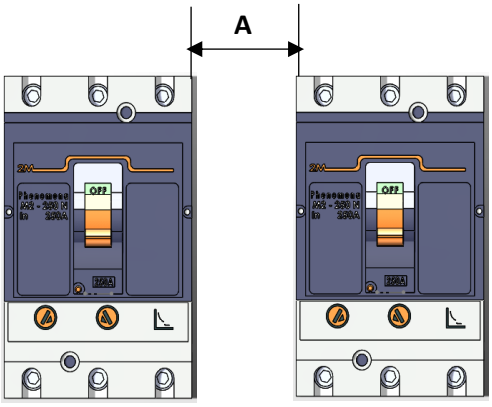
4.3 Modes of fixing

4.3.2 Fixing mode following is available for P1 125, P2 250 for fixed type breakers, which adopts DIN rail adaptor of front connection.



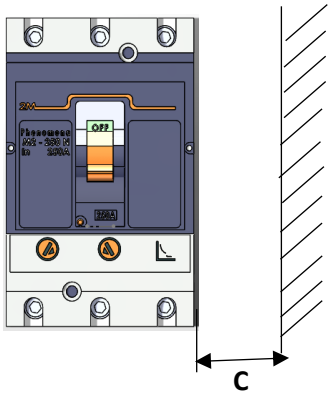
4.4 Secured distance

4.4.1 Min. Distance between breakers

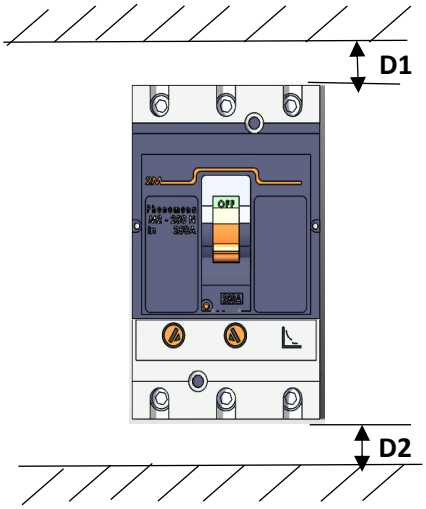


A = 0

4.4.3 Min. distance between breaker and side of switchgear



4.4.4 Min. distance between top and bottom of breaker



Phenomena Breakers	Ue	C	Insulation plate or insulation terminal (mm)		White or colored metal plate (mm)	
			D1	D2	D1	D2
P1 125A	Ue≤440V	10	30	30	35	35
	Ue<600V	20	30	30	35	35
	Ue≥600V	30	30	30	35	35
P2 250A	Ue≤440V	10	30	30	35	35
	Ue<600V	20	30	30	35	35
	Ue≥600V	30	30	30	35	35
P3 400A P4H 630A P4EH 630A	Ue≤440V	10	30	30	60	60
	Ue<600V	20	30	30	60	60
	Ue≥600V	30	30	30	100	100

Note: when voltage is ≥500V, extended terminal cover should be mounted

4.5 Modes of connection

4.5.1 Cable connection plug and Copper busbar

a. Screw is used to connect with copper (aluminum) cable connection plug or copper busbar

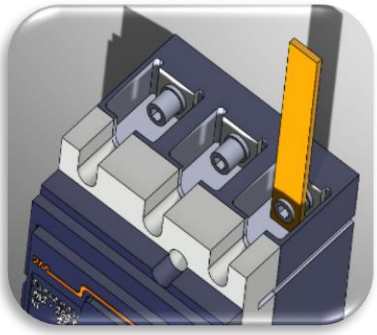
Size of connection screw

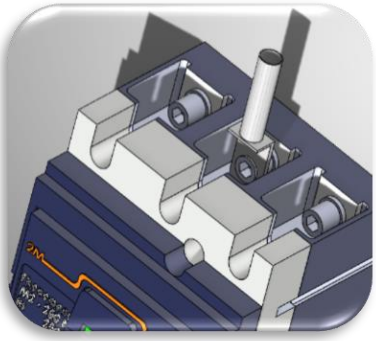
P1 125A: M6

P2 250A: M8

P3 400A: M10

P4H, P4EH 630A: M10





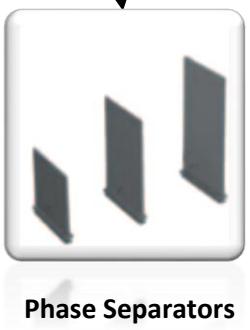
Dimension	P1 125A	P2 250A	P3 400A P4H 630A P4EH 630A
Distance between different poles (mm)	30	35	40
L(mm)	≤15	≤ 25	≤ 32
D(mm)	≤ 7	≤ 10	≤ 16
Φ(mm)	> 6	> 8	> 10

4.5.5 Standard CSA of copper cable or busbar used for connection

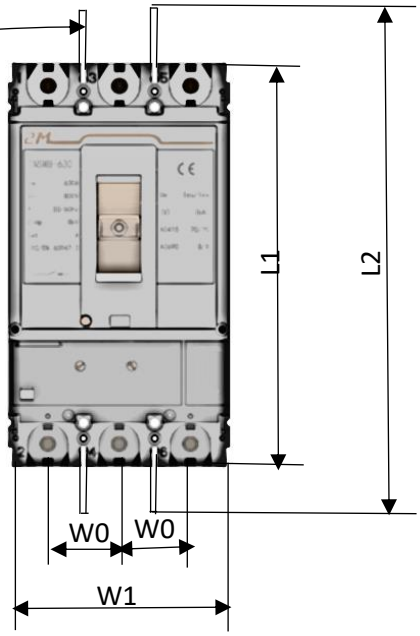
Rated Current (A)		16	20	25	32	40	50	63	80	100
Cross section area (mm^2)	Copper Cable	2.5	2.5	4	6	10	10	16	25	35
	Copper Busbar	-	-	-	-	-	-	-	-	-

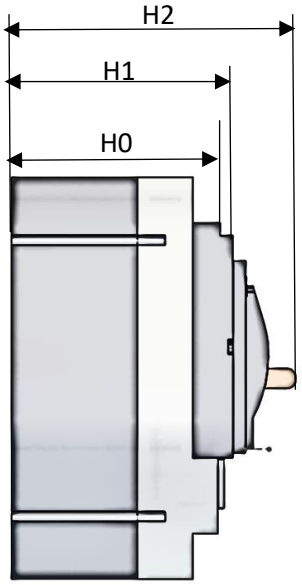
Rated Current (A)		125	160	200	225	250	315	400	500	630
Cross section area (mm^2)	Copper Cable	50	70	95	120	120	185	240	2*150	2*185
	Copper Busbar	-	-	-	-	-	-	2*30*5	2*30*5	2*40*5

4.6 Overall and Mounting Dimensions



Phase Separators





Model	L1	L2	H0	H1	H2	W0	W1
P1 125A	155	258	61	64	84	30	90
P2 250A	157	273	82	88	110	35	103
P3 400A P4H 630A P4EH 630A	257	484	105	111	154	43	140

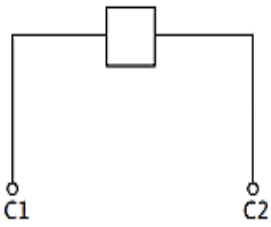
9. Accessories

9.1 Inner accessories

9.1.1 Shunt release

Us=70~110%Us, circuit breaker reliably operates
Long-time electrification is prohibited
Time of response: pulsive type≥20ms, ≤60ms

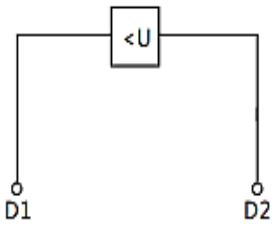
Shunt release Wiring diagram



9.1.2 Under-voltage release

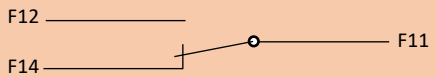
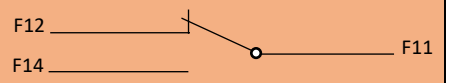
Us=35~70%Ue, circuit breaker reliably breaks
Us≥85%Ue, circuit breaker reliably closes
Us＜35%Ue, prevent circuit breaker from making
Note: With under-voltage release, Us≥85%Ue,
circuit breaker normally makes and breaks

Under-voltage release Wiring diagram

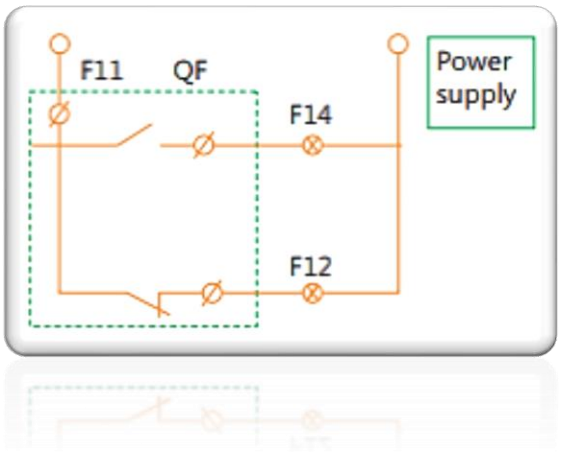


9.1.3 Auxiliary contact

Function: Indication of contacting status

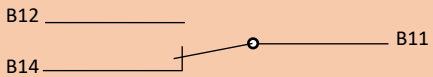
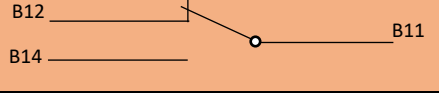
Circuit Breaker is at making status	
Circuit Breaker is at breaking status	

Wiring diagram

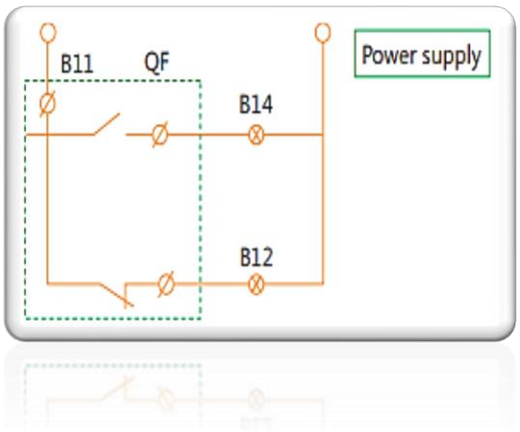


9.1.4 Alarm contact

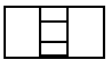
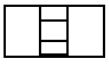
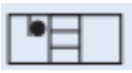
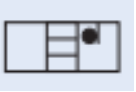
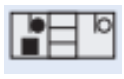
Function: indication of reason for circuit breaker releasing;
* Over-load
* Short-circuit
* Grounding fault
* Operation of under-voltage releasing or free tripping
When circuit breaker normally makes and breaks,
alarm contact not operates.
After free tripping (or tripping due to failure),
alarm contact operates and after the circuit breaker again
normally operates, alarm contact recovers original status

Circuit Breaker is at making status	
Circuit Breaker is at breaking status	

Wiring diagram



Moulded Case Circuit Breakers | Phenomena

Accessories	Left / Handle / Right	
	P1 125A , P2 250A	P3 400A , P4 630A
No accessory		
Alarm contact		
Shunt release		
Auxiliary contact		
Under voltage release		
Shunt release Auxiliary contact		
Two groups of auxiliary contact		
Auxiliary contact Under voltage release		
Shunt release Alarm contact		
Auxiliary contact Alarm contact		
Under voltage release Alarm contact		
Shunt release Auxiliary, Alarm contact		
Two groups of Auxiliary contact		
Alarm contact , Auxiliary contact , Alarm contact, Under voltage release		

■ Shunt release ▲ Under voltage release ○ Auxiliary contact ● Alarm contact

Note: 1: For P1 – P4, under-voltage and shunt release couldn't be simultaneously equipped on one breaker

9.2 External accessories

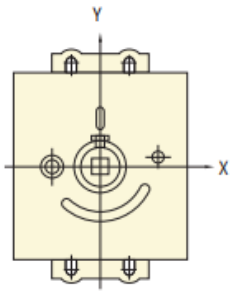
9.2.1 Economic extended rotary handle

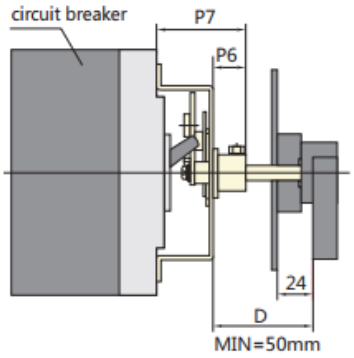
Protection degree: IP30

Functions: Isolation function indication;

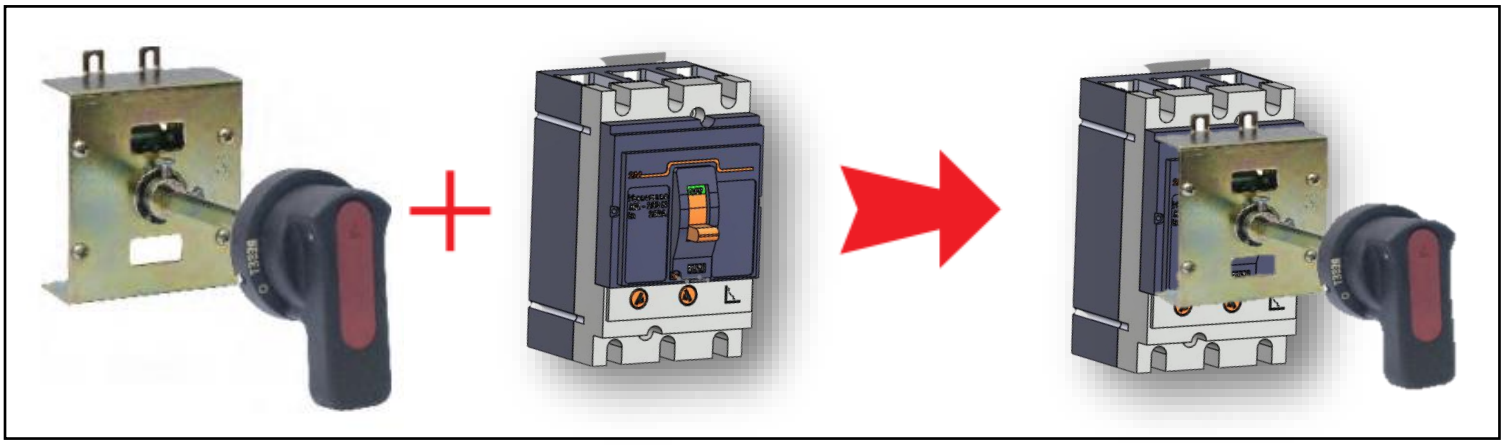
0 (breaking), 1 (making) and free tripping indication;

At "OFF" status, the breaker can be fitted with 1-3 padlocks with a diameter of 5-8mm (by customer), This prevents the door of switchgear being opened unwantedly.

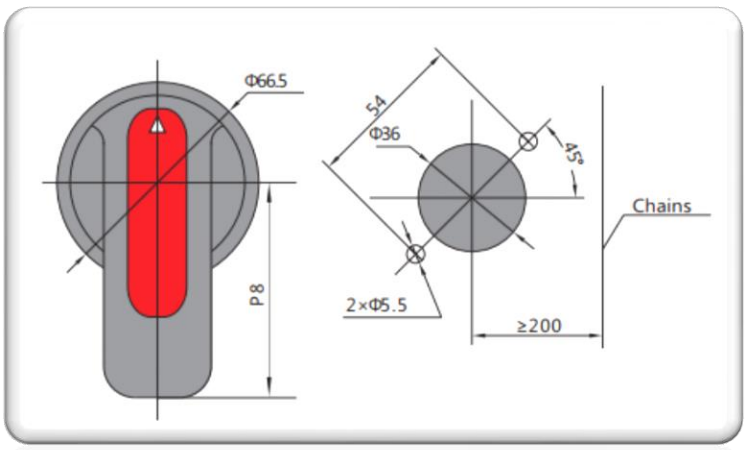




Dimension	P1 125A	P2 250A	P3 400A	P4H,P4EH 630A
P6	18	18	18	18
P7	55	55	72	72
P8	65	65	126	126



Handle Mounting (mm)



9.2.2 Direct rotary handle

Protection degree ：IP40
Functions:
Reliable insulation;
Isolation function indication;
0(breaking), 1(making) and free tripping indication;
Realize free tripping of circuit breaker;
At "OFF" status, the breaker can be fitted with 1-3 padlocks with a diameter of
5~8mm (by customer)

9.2.3 Extended rotary handle

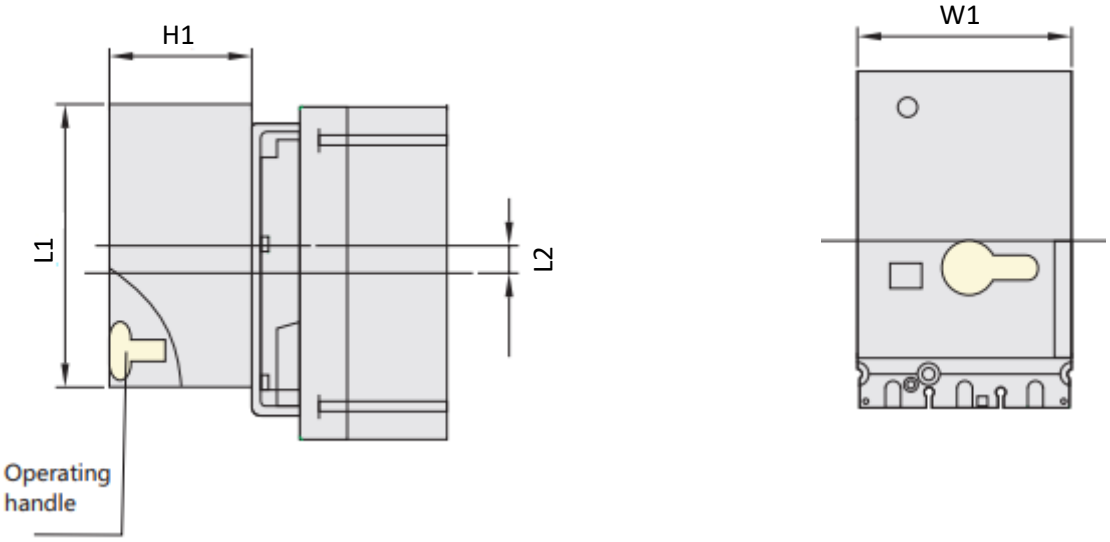
Protection degree: IP55
Functions:
Reliable insulation;
Isolation function indication;
0(breaking), 1(making) and free tripping indication;
When the door is open, the release can be set and the breaker will not make;
At "OFF" status, the breaker can be fitted with 1~3 padlocks with a diameter of 5~8mm (by customer).
Then door of the switchgear can be opened

9.2.4 Motor-driven mechanism

Protection degree: IP40
Functions:
Reliable insulation;
Isolation function indication;
0(breaking), 1(making) and free tripping indication;
Free releasing of circuit breaker;
Making and breaking the breaker manually or automatically
Manual operation
Turn "manual/auto" switch to "auto" position and then turn the handle to make and break the breaker.
Automatic operation:
Turn "manual/auto" switch to "manual" position and then push the button to make and break the breaker remotely.
The make/break operation is carried out via pulse or self-retaining type signal control.
Operational range: 85%Un~110%Un.

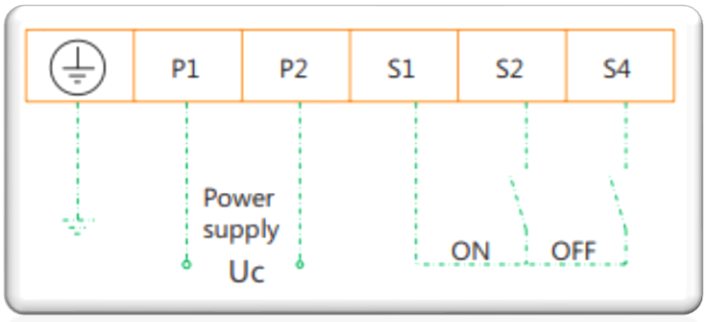
Moulded Case Circuit Breakers | Phenomena

Phenomena Circuit Breaker	Rated Control voltage	Electrical life	Operation current	Power consumption
P1 125A	AC 230/DC 220V AC 380V	10,000 operations	≤ 0.5 A	14VA 14W
P2 250A	AC 230/DC 220V AC 380V	10,000 operations	≤ 0.5 A	14VA 14W
P3 400A	AC 230/DC 220V AC 380V	5,000 operations	≤ 2 A	35VA 35W
P4H 630A P4EH 630A				



Model	W1	H1	L1	L2
P1 125A	90	77	117	17.3
P2 250A	90	77	117	14.5
P3 400A P4H 630A P4EH 630A	130	115	175	19

Wiring Diagram



9.3 Locking system

Locking the breaker at status of making or breaking.
The system can be fitted with 1~3 padlocks with a diameter of 5~8mm (by customer).

9.4 Terminal cover

Protection degree: IP40
Protect from being contacted with main circuit.
Selection of terminal cover:
Fixed breaker (front connection): Long terminal cover; Fixed breaker (rear connection): Short terminal cover;
Plug-in breaker: short terminal cover; When voltage is ≥500V, terminal cover selected for definite connection mode

Locking system

Long terminal cover

Short terminal cover

5. Complementary technical information

5.1 Isolation function

Isolation functions of all the circuit breakers as per IEC60947/EN60947-2; Isolating position of contactors is at 0 (OFF) status. The operating handle will correctly indicate the status of 0(OFF), only if the contactor breaks. Padlocks could be mounted after the contacts breaks;
Operation of isolation functions will realize following points:

- Contacts operation correctly indicates: operating reliability of interior mechanism;
- No residual current;
- Higher impulse withstands voltage for terminals at the power supply side and on-load side

5.2 Current-limiting

5.2.1 Current-limiting capacity

The current-limiting capacity of a circuit breaker is its aptitude to limit short-circuits current. By occurring of short-circuit, the breaker is able to limit I^2t in time so as to protect circuits and switchgear at downstream.
The exceptional limiting capacity of Phenomena series is due to the rotating double-break technique, which is characterized by very rapid natural repulsion of contacts and the appearance of two arc voltages in series with a very steep wave front

a. Exceptional current-limiting capacity is able to greatly reduce power caused by fault current so as to enhance breaking capacity of breaker to Ics=100%Icu;

b. The capacity has greatly released damages, which short current lay to apparatus;

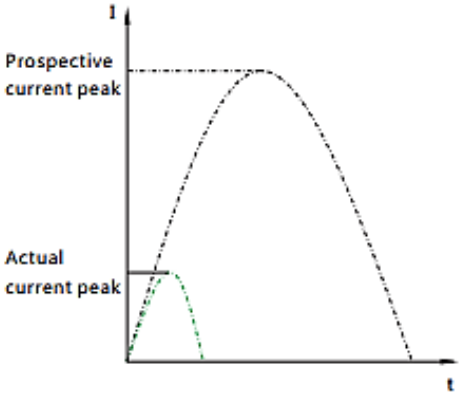
c. The capacity has greatly lowered temperature-rise so as to lengthen service life of the cable;

d. The capacity has greatly reduced power so as to lessen distortion of contacts and bus bar;

e. The capacity has greatly decreased interruptions to apparatus nearby

5.2.2 Current-limiting curves

The current-limiting capacity of a circuit breaker is expressed by two curves which are the prospective current and the actual short-circuit current.
Thermal stress (A^2S), i.e. the energy dissipated by the short-circuit current in a conductor with a resistance of 1Ω.
The table below indicates the maximum permissible thermal stresses for cables depending on their insulation, conductor (Cu or Al) and cross section area (CSA).
CSA values are given in mm and thermal stresses in A^2S



Moulded Case Circuit Breakers | Phenomena

CSA (mm^2)		1.5	2.5	4	6	10	16	25	35
PVC	Cu K=								
	Al K=								
Butyl	Cu K=								
	Al K=								
EPR	Cu K=								
	Al K=								

CSA (mm^2)		50	70	95	120	150	185	240
PVC	Cu K=							
	Al K=							
Butyl	Cu K=							
	Al K=							
EPR	Cu K=							
	Al K=							

5.3 Power loss per pole

Resistance / power loss mΩ/W	P1 125A	P2 250A	P3 400A	P4H 630A	P4EH 630A
16	7.1/1.8				
20	6.2/2.5				
25	4.8/3				
32	3.7/3.8				
40	2.6/4.2				
50	2.7/6.8				
63	1.7/6.7				
80	1.3/8.3				
100	0.85/8.5	1.0/10			
125	0.71/11.1	1.0/15.6			
160		0.55/14			
200		0.55/22	0.36/15.1		
225		0.55/27.8			
250		0.55/34.4	0.3/18.8	0.3/18.8	0.13/8.1
315			0.28/27.8	0.28/27.8	0.13/12.9
400			0.24/38.4	0.28/34.3	0.13/20.8
500				0.24/38.4	0.13/32.5
630				0.2/50	0.13/51.6

5.4 Influences which altitude lay to tripping characteristics

To tripping characteristics of circuit breaker, it is no obvious influence, when the altitude does not exceed 2000m. Once the altitude exceeds the level of 2000m, factors of dielectric stress lowering and cooled air should be taken into consideration.

Altitude (m)	2000	3000	4000	5000
Dielectric stress (V)	3000	2500	2100	1800
Max. operational voltage (V)	690	550	480	420
Ratings at 40℃ (A)	1In	0.96In	0.93In	0.9In

5.5 Cascading

Definition of Cascading

Current-limiting technique has been adopted for cascading to install downstream circuit breaker with lower breaking capacity (cheaper circuit breakers) at the given point of circuit,
and upstream (Phenomena P4EH) circuit breaker operates to limit short-circuit current.
Under the operation of cascading network, circuit breaker with lower breaking capacity compared with prospective short-circuit current at the given point could operate under normal short-circuit status.
As the short-circuit current will be limited by upstream circuit breaker with current-limiting operation, cascading network is applicable to all the power distribution apparatus protection at downstream.
In addition, cascading operation is not restricted to operation of two switches in serial, but is applicable in various electric networks, as well

Application of cascading

Through the application of cascading, connected apparatuses could be installed in different switchgears to realize normal operation. Therefore, cascading, in common, refers to various combination of circuit breakers installed at the given point of which the breaking capacity is lower than prospective short-circuit current. And breaking capacity of upstream circuit breakers should be equal to or higher than prospective short-circuit current at the installed point to protect apparatus at downstream. Cascading application is in conformity with IEC60947-2 standards

Cascading (380/400/415V)
Upstream: P1 125A , P2 250A , P3 400A , P4 630A
Downstream: P1 125A , P2 250A , P3 400A , P4 630A

Upstream → **Breaking capacity (KA rms)**	P1N 125A 36	P2N 250A 36	P2H 250A 70	P3N 400A 36	P3H 400A 70	P4H 630A 70	P4EH 630A 70
Downstream ↓	Breaking capacity (KA rms)						
P1N 125A			70	36	70		70
P2N 250A			70	36	70		70
P2H 250A						70	70
P3N 400A							70
P3H400A						70	70
P4H 630A							
P4EH 630A							

5.6 Protection discrimination (selectivity)

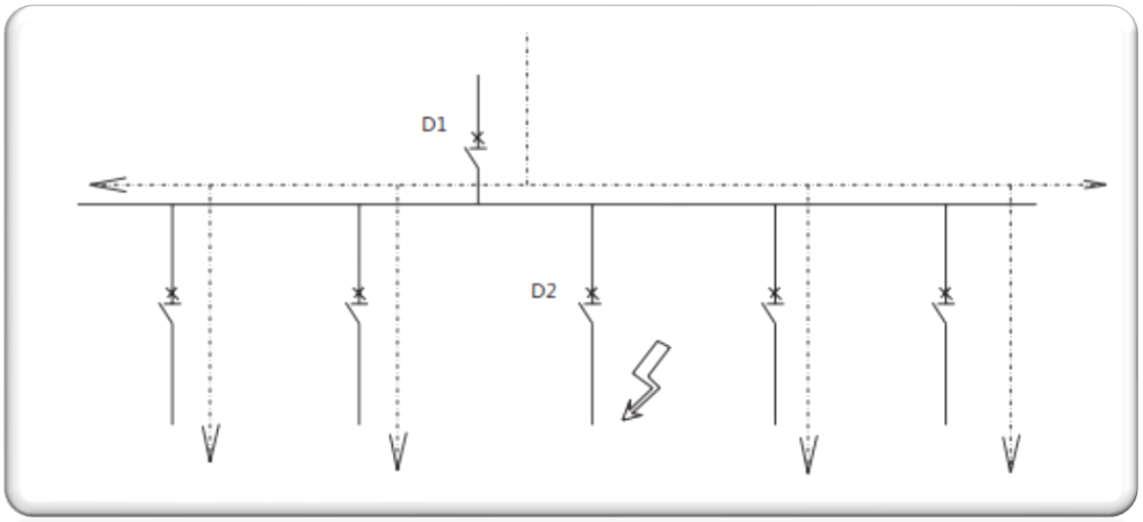
Protection discrimination is a must factor in low-voltage power distribution design so as to ensure reliability and continuity for users' electricity utilization.

Whenever there is fault occurring in the electric network, the upstream breaker where the fault is occurring breaks. Protection discrimination could be clarified into 3 kinds: Total protection discrimination, partial protection discrimination and no protection discrimination(refer to fig aside):

Total protection discrimination: For all kinds of current where the faults occurred, including the overload current and nonresistance current, breaker D2 breaks and breaker D1 keeps making status.

Partial protection discrimination: For a much lower current compared with where the fault occurred (the limit value of protection discrimination), breaker D2 breaks and breaker D1 keeps making status (total protection discrimination).

When the fault current is lower than limit value of protection discrimination, the upstream and downstream breakers are applicable to protection discrimination; when the fault current exceeds limit value of protection discrimination, the upstream and downstream breakers are not applicable to protection discrimination (no protection discrimination). And both of the breakers of D1 and D2 break



Moulded Case Circuit Breakers | Phenomena

Upstream → / Downstream ↓ In (A) Ii (KA)		P1 125A										P2 250A						P3 400A				P4 630A				
		16	20	25	32	40	50	63	80	100	125	100	125	160	200	225	250	200	250	315	400	250	315	400	500	630
P1 125A	16				0.4	0.5	2	0.5	0.63	0.8	1	2	2	T	T	T	T	T	T	T	T	T	T	T	T	T
	20					0.5	0.5	2	0.63	0.8	1	2	2	T	T	T	T	T	T	T	T	T	T	T	T	T
	25						0.5	0.5	2	0.8	1	2	2	T	T	T	T	T	T	T	T	T	T	T	T	T
	32							0.5	0.63	2	1	2	2	T	T	T	T	T	T	T	T	T	T	T	T	T
	40								0.63	0.8	2	2	2	T	T	T	T	T	T	T	T	T	T	T	T	T
	50									0.8	1	2	2	T	T	T	T	T	T	T	T	T	T	T	T	T
	63										1	2	2	T	T	T	T	T	T	T	T	T	T	T	T	T
	80												1	1.25	T	T	T	T	T	T	T	T	T	T	T	T
	100													1.25	T	T	T	T	T	T	T	T	T	T	T	T
	125																T	T	T	T	T	T	T	T	T	T
P2N/H 250A	100																3 / 3		5 / 5	T / -	T / T	3 / 3	T / T	T / T	T / T	T / T
	125																			5 / -	T / T		T / T	T / T	T / T	T / T
	160																				T / T		5 / 5	T / T	T / T	T / T
	200																				T / T			T / T	T / T	T / T
	225																				T / T			T / T	T / T	T / T
	250																				5 / 5			5 / 5	T / T	T / T

Moulded Case Circuit Breakers | Phenomena

Upstream → / Downstream ↓ In (A) Ii (KA)		P1 125A										P2 250A						P3 400A				P4 630A				
		16	20	25	32	40	50	63	80	100	125	100	125	160	200	225	250	200	250	315	400	250	315	400	500	630
P3 400A	200																							8	8	8
	250																								8	8
	315																									
	400																									
P4H 630A	250																							8	8	8
	315																								8	8
	400																									
	500																									
	630																									
P4EH 630A	250																									
	315																									
	400																									
	500																									
	630																									

Note:

a. The area with T indication clarifies total protection discrimination between upstream and downstream circuit breakers;

b. The area with numbers clarifies partial protection discrimination between upstream and downstream circuit breakers;

c. For partial protection discrimination, the Max. Fault current values to ensure time discrimination performance are given in the table; when fault current exceeds this value, upstream and downstream circuit breakers may operate at the same time

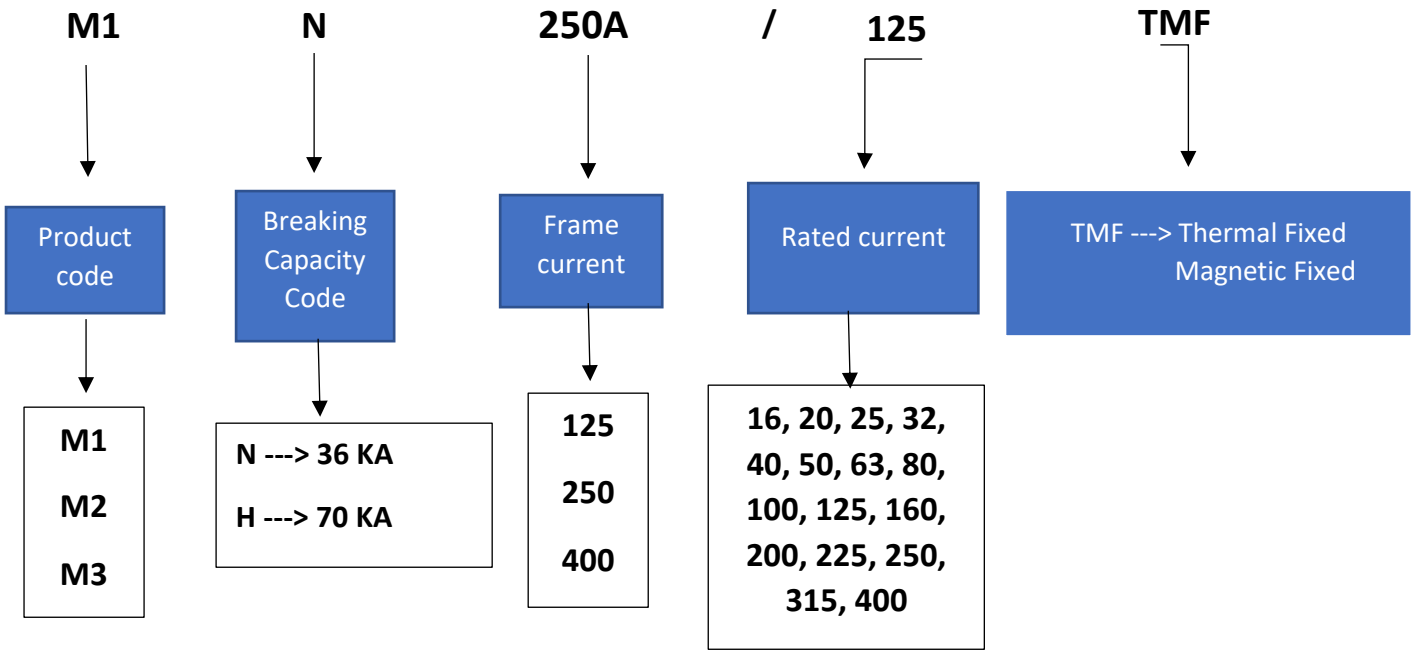
5.7 Selection table of components for motor control or protection

400V, 50kA, type2, MCCB normal & heavy load start-up

Motor Parameters		Circuit Breaker Parameters	
Rated Power (KW)	Rated current (A)	Model	Setting of magnetic protection (A)
5.5	10.9	P1N 125A / 16	192
7.5	14.4	P1N 125A / 20	240
11	20.9	P1N 125A / 25	300
15	28	P1N 125A / 32	384
18.5	34.1	P1N 125A / 40	480
22	39.4	P1N 125A / 50	600
30	53.4	P1N 125A / 63	756
37	67.9	P1N 125A / 80	960
45	80.5	P1N 125A / 100	1200
55	98.5	P1N 125A / 125	1500
75	133	P2N 250A / 160	1920
90	158.7	P2N 250A / 200	2400
110	192	P2N 250A / 250	3000
132	229	P3N 400A / 250	3780
160	275	P3N 400A / 315	4200
200	343	P3N 400A / 400	4800
250	445	P4H 630A / 500	6000
290	520	P4EH 630A / 630	7560
315	560	P4EH 630A / 630	7560

Moulded Case Circuit Breakers | Power M

1. Type designation



2. Operation conditions

2.1 Temperature condition:

-5℃~40℃; the average value within 24h shall not exceed +35℃

2.2 Altitude: ≤2000m;

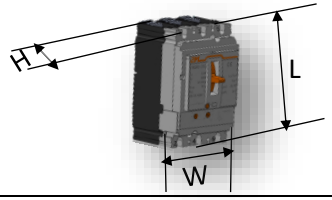
2.3 Pollution grade: Grade 3;

2.4 Air conditions:

At mounting site, relative humidity not exceed 50% at the max temperature of +40℃, higher relative humidity is allowable under lower temperature, RH could be 90% at +20℃, special measures should be taken to occurrence of dews;

2.5 IP grade: IP30

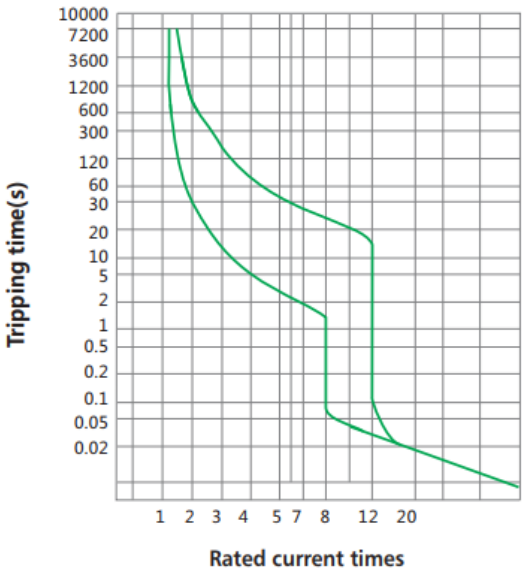
3. Technical data

Phenomena CB Thermal-magnetic type			M1 125A	M2 250A	M3 400A
Electric characteristics as per IEC 60947-2 and EN60947-2					
Rated current (A) In			16,20,25,32,40,50,63,80,100,125	100,125,160,200,225,250	200,250,315,400
Rated Insulation Voltage (V) Ui			800	800	800
Rated impulse withstand voltage (kV) Uimp			8	8	8
Rated Operation Voltage (V) Ue		AC 50/60Hz	690	690	690
Number of poles			3	3	3
Breaking capacity code			N	N	H
Rated ultimate short circuit Breaking capacity (KA) Icu	AC 380V/400V/415V		36	36	70
	AC 660V/690V		3	3	3
Rated service breaking capacity Ics= (% Icu)			100	100	100
Suitability for isolation			■	■	■
Utilization category			A	A	A
Safety of insulation			■	■	■
Protection			Thermal (Fixed) – Magnetic (Fixed)	Thermal (Fixed) – Magnetic (Fixed)	Thermal (Fixed) –Magnetic (Fixed)
Release units			■	■	■
Over-load protection			■	■	■
Short-circuit protection			■	■	■
Dimension(mm) L*W*H 			155*90*64	157*103*88	257*140*111
Weight (kg)			1.2	2.1	7.5

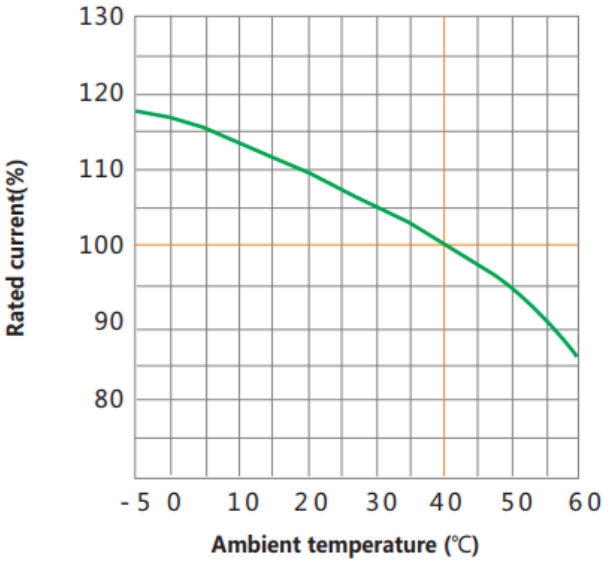
4. Curves (for power distribution, calibrated at 40℃)

M1 125A (16-32)

Characteristic curve

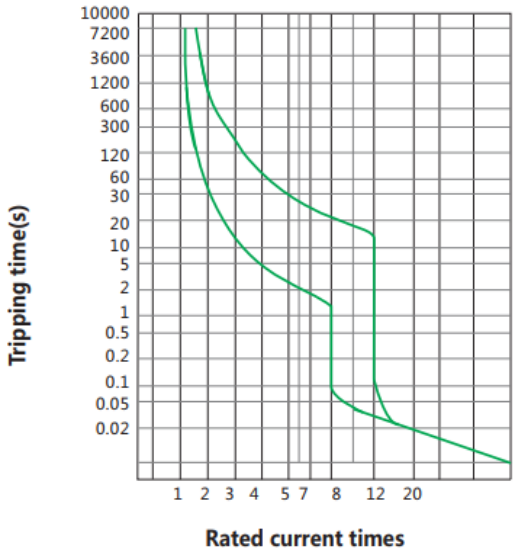


Adjustment curve of temperature

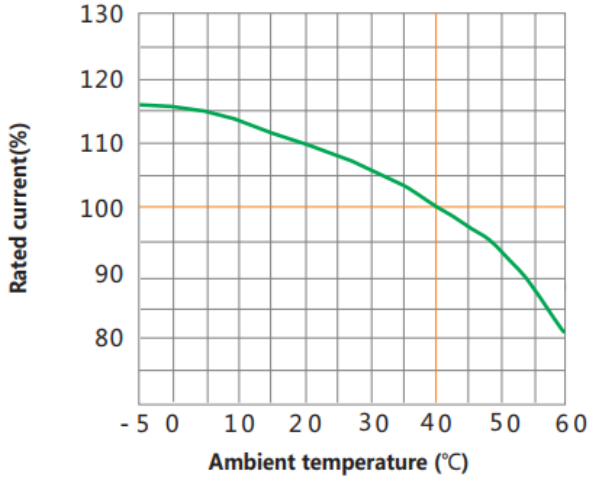


M1 125A (40-125)

Characteristic curve

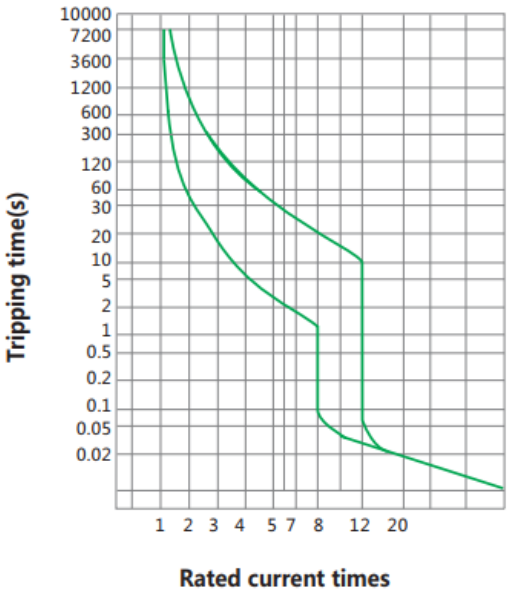


Adjustment curve of temperature

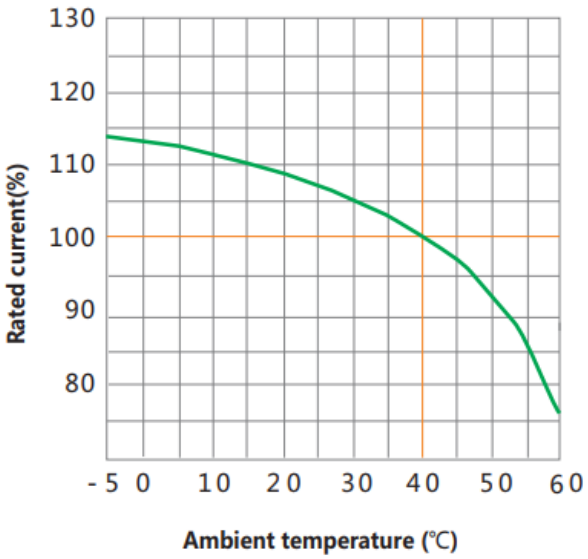


M2 250A

Characteristic curve

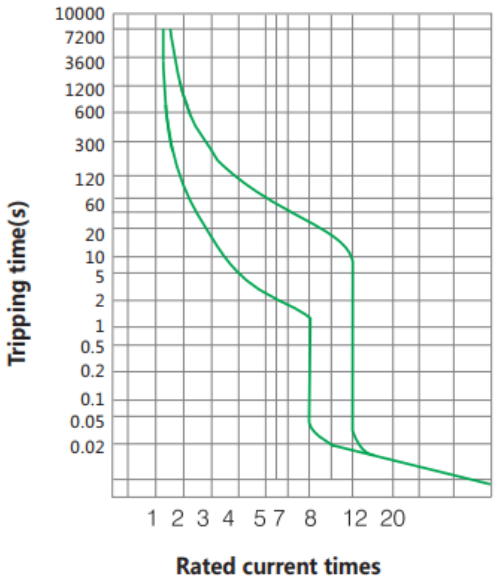


Adjustment curve of temperature

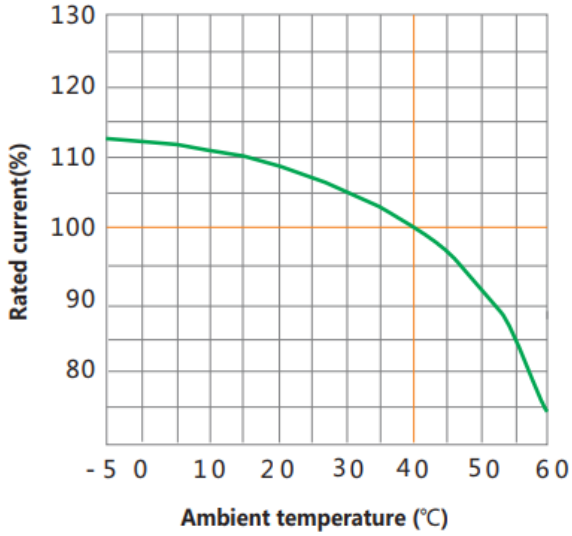


M3 400A

Characteristic curve

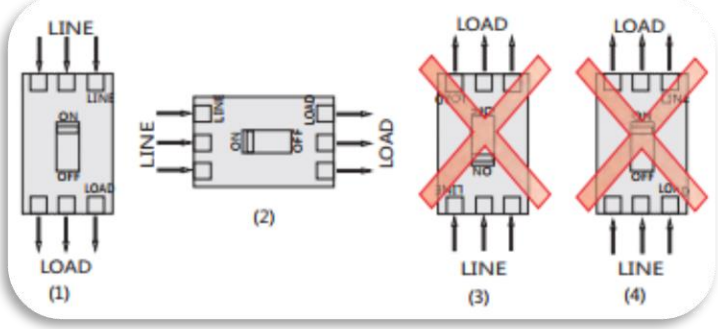


Adjustment curve of temperature



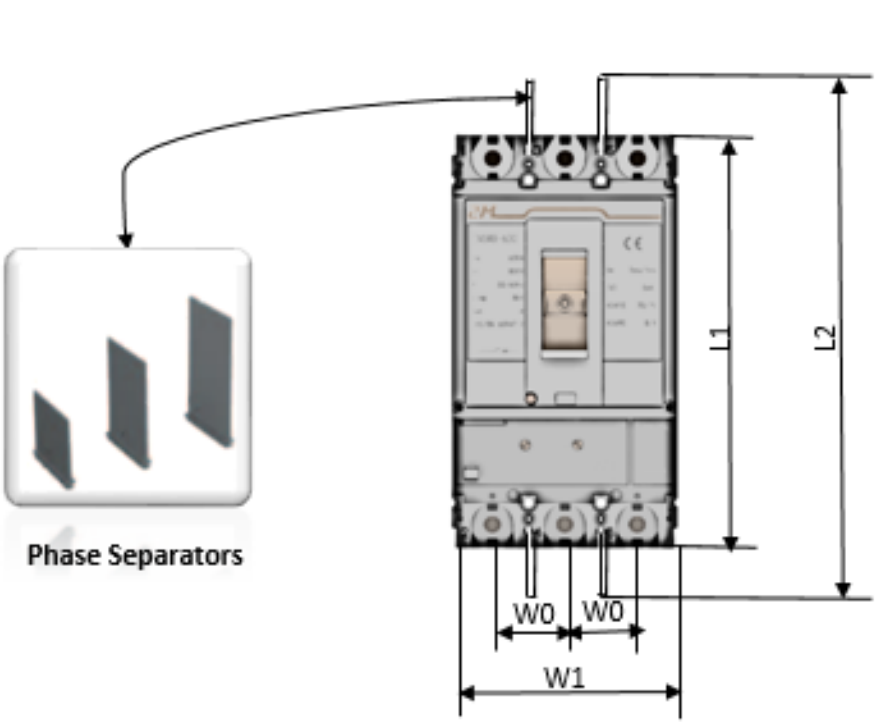
5. Wiring

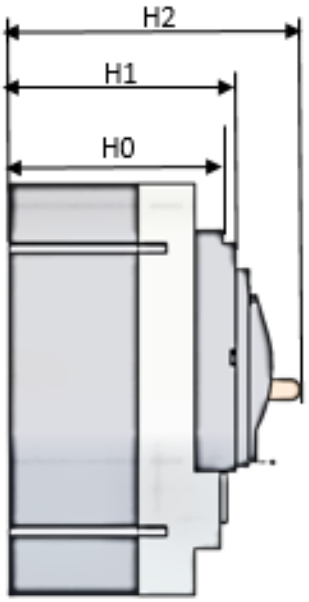
Frame level	Current (A)	Breaking capacity code	Front connection screw	
			Hexagonal socket screw (A)	Cross screw (B)
M1 125A	16	N	■	
	20	N	■	
	25	N	■	■
	32	N	■	■
	40	N	■	■
	50	N	■	■
	63	N	■	■
	80	N	■	■
	100	N	■	■
	125	N	■	■
M2 250A	100	N	■	
	125	N	■	
	160	N	■	
	200	N	■	
	225	N	■	
	250	N	■	
M3 400A	200	H	■	■
	250	H	■	■
	315	H	■	■
	400	H	■	■



Modes of down-lead (1) and (2) illustrated in the figure are available for your wiring operation. For its breaking capacity may be affected, mode of down-lead (3) is not recommended, before reception of any authorized announcement from the manufacturer; the mode of down-lead (4) is prohibited for your wiring.

6. Overall and Mounting Dimensions





6. Cascading

Cascading (380/400/415V)

Upstream → **Breaking capacity (KA rms)**	M1N 125A 36	M2N 250A 36	M3H 400A 70
Downstream ↓			
M1N 125A			70
M2N 250A			70
M3H 400A			

1. General

1.1 Application scope

Charisma series air circuit breaker is suitable for the circuit of AC 50Hz/60Hz with rated service voltage 400V, 690V and rated service current up to 6300A. It is mainly used to distribute electric energy and protect circuits and electric equipment against over-load, under-voltage, short-circuit and single-phase earthing fault.

With intelligentized and selective protection functions, the breaker can improve the reliability of power supply, and avoid unnecessary power failure. The breaker is applicable for power stations, factories, mines (for 690V) and modern high buildings, especially for the distribution system of intelligentized building.

2. Operating conditions

2.1 Temperature condition:

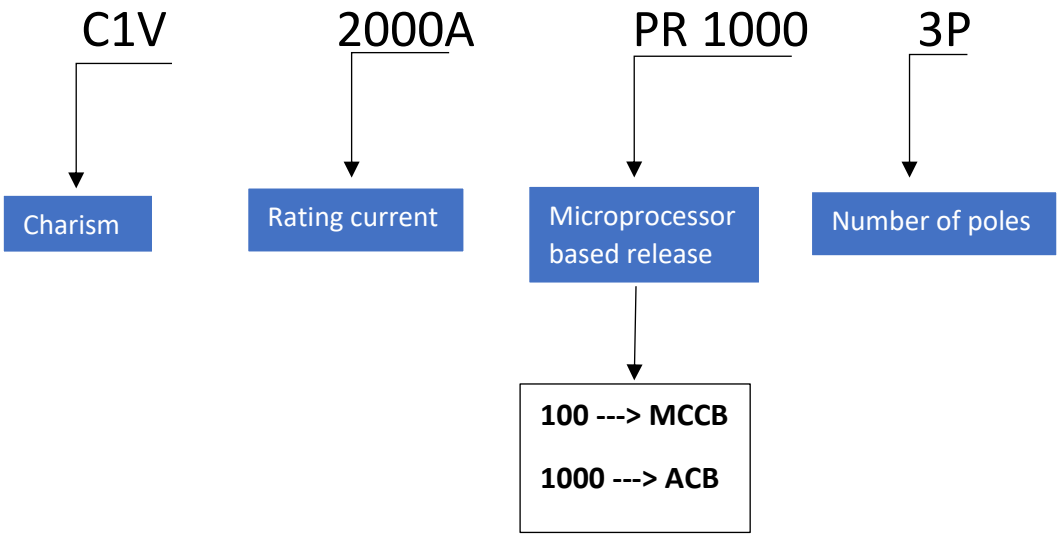
-5℃~40℃; the average value within 24h shall not exceed +35℃ (special situation excluded);

2.2 Altitude: ≤2000m;

2.3 Pollution grade: Grade 3;

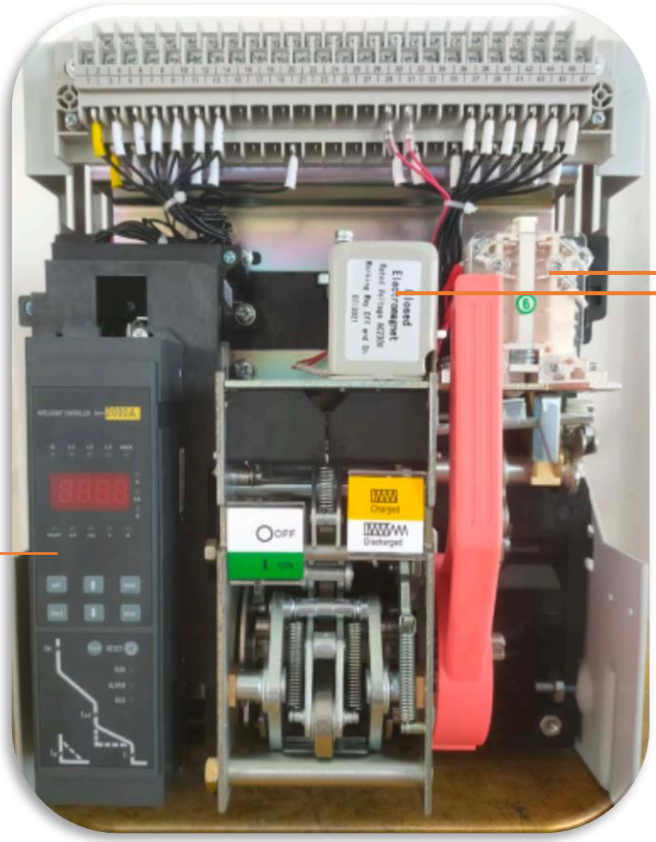
2.4 Air conditions:

At mounting site, relative humidity not exceed 50% at the max temperature of +40℃, higher relative humidity is allowable under lower temperature, RH could be 90% at +20℃, special measures should be taken to occurrence of dews;



3. Structure


Secondary wiring terminals
Fault-breaking indicator reset button
Breaking button
Making button
Breaking & Making indicator
Energy storage & release indicator
Name plate
2M
ACB

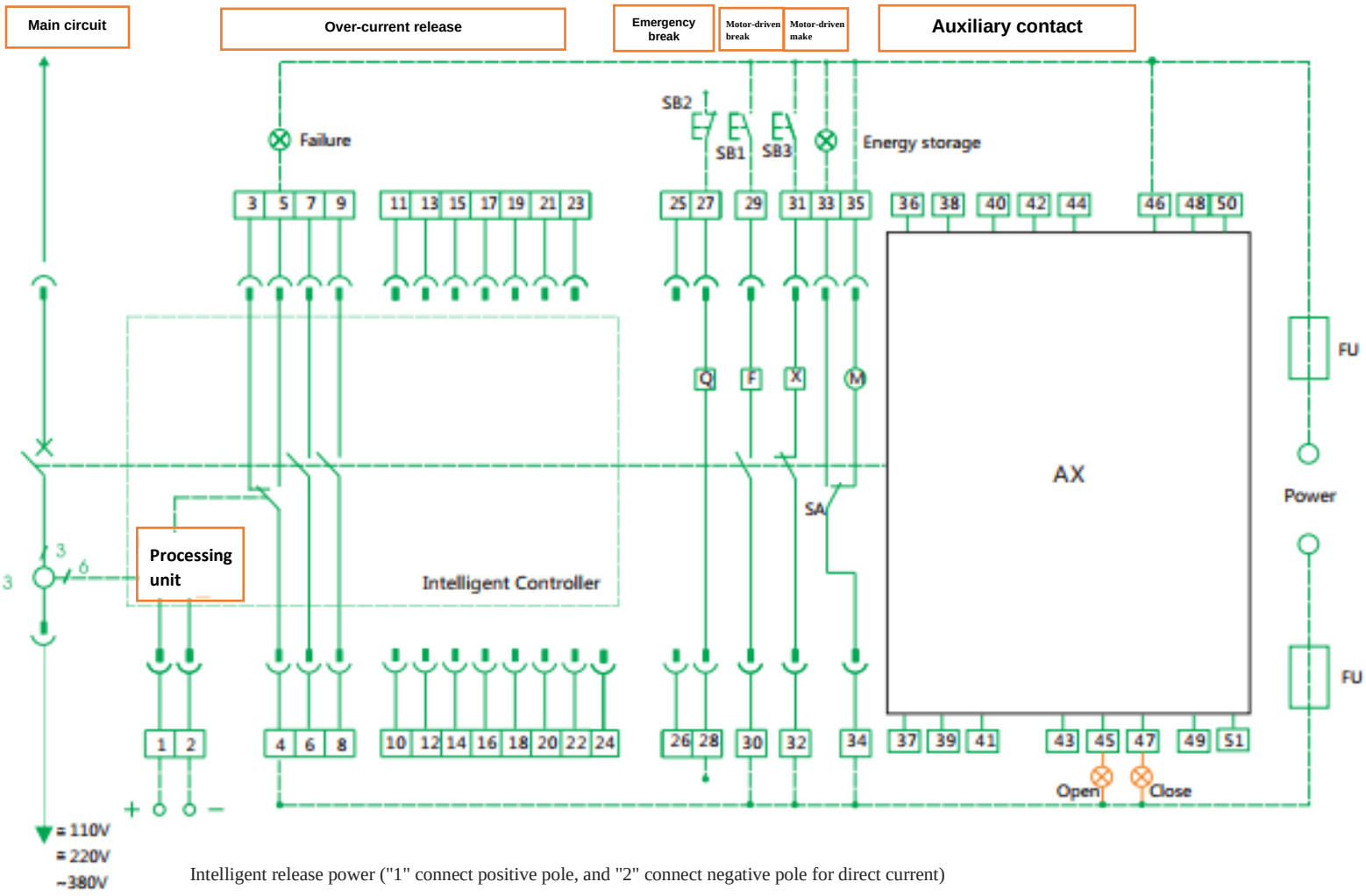

Auxiliary contact
Closing electromagnet
Intelligent controller
OFF
Charged
Discharged

Charisma CB Electronic type		C1V 2000A	C2V 3200A
Electric characteristics as per IEC 60947-2 and EN60947-2			
Rated current (A) In		630, 800, 1000, 1250, 1600, 2000	2000, 2500, 3200
Rated Insulation Voltage (V) Ui		1000	1000
Rated impulse withstand voltage (kV) Uimp		12	12
Rated Operation Voltage (V) Ue	AC 50/60Hz	380 415 / 690 V	380 415 / 690 V
Number of poles		3	3
Breaking capacity code		N	N
Rated ultimate short circuit Breaking capacity (KA) Icu	AC 380V/415V	80	80
	AC 660V/690V	50	65
Rated service breaking capacity (KA) Ics	AC 380V/415V	65	65
	AC 660V/690V	40	65
Fixed disconnection time (ms)		23 ~ 32	23 ~ 32
Utilization category		B	B
Intelligent controller	Standard type (M)	■	■
	Communication type (H)		
Life(CO recycle)	Mechanical	Non-maintenance 15,000	Non-maintenance 10,000
		Maintenance 30,000	Maintenance 20,000
	Electrical	AC 400V: 6500 AC 690V: 3000	AC 400V: 3000 AC 690V: 2000
Connection pattern		Horizontal , Vertical	Horizontal , Vertical
Release units		■	■
Over-load protection		■	■
Short-circuit protection		■	■

4. Overall Dimensions

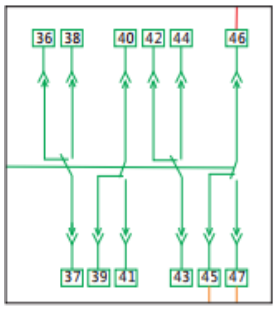
5. Secondary circuit wiring

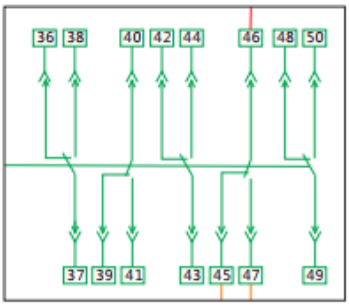
5.1 C1V 2000A PR1000 3P



Intelligent release power ("1" connect positive pole, and "2" connect negative pole for direct current)

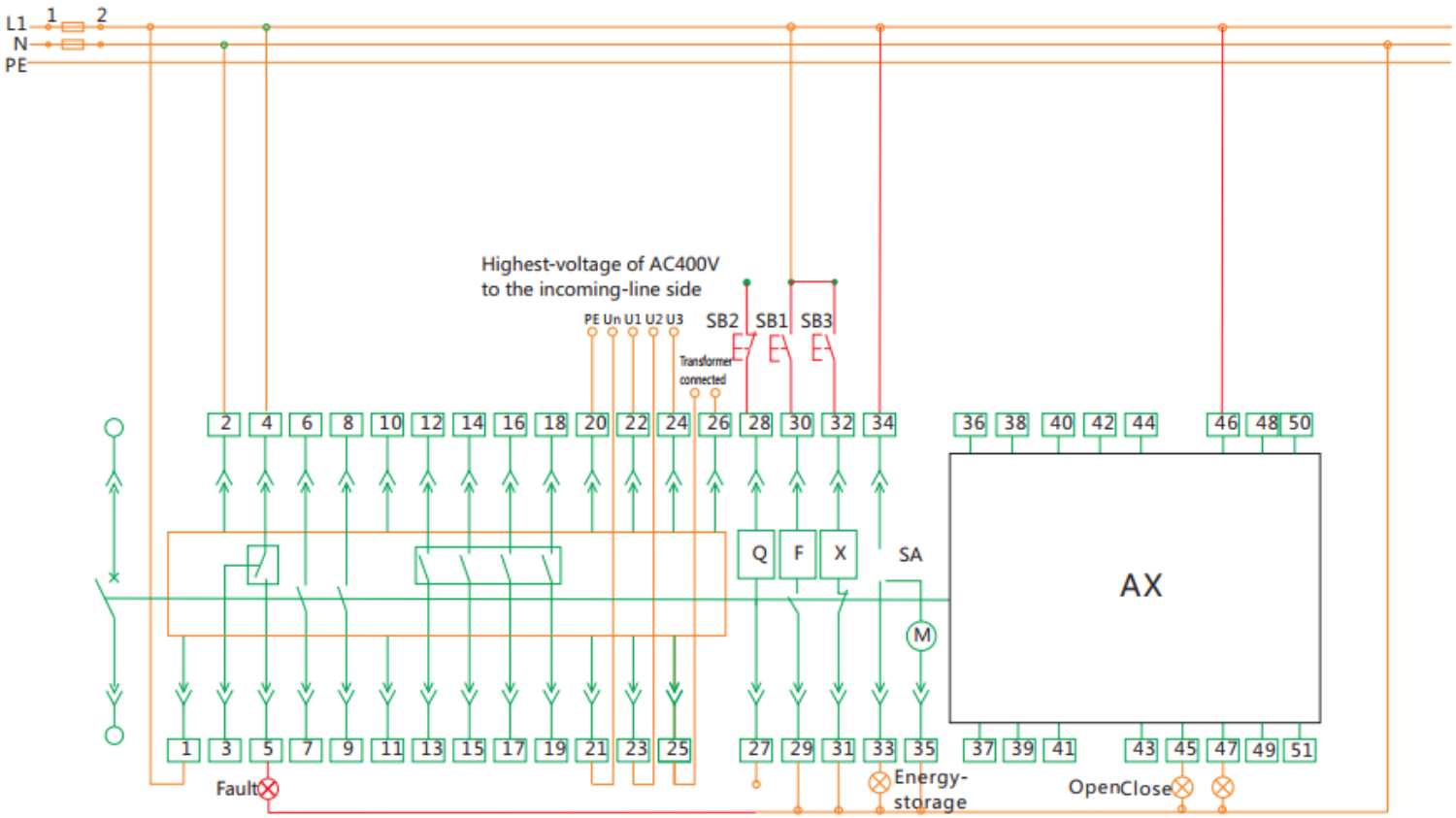
The auxiliary contact modes for customer use





Circuit explanation for signal output:
a. Broken-line parts shall be provided by customers.
b. Terminals 6 ,7 can output NC (normal close) contact if that is required by users.
c. Terminal 35 can be directly connected to power (automatic pre-storing energy), alternatively connect power after connecting NO button (manual-controlled pre-storing energy).
d. Terminals 21 ~24 is only for wiring with function meter display.
(excluding the special wiring)

SB1: Shunt button
SB2: Under-voltage button
SB3: Making button
Q: Under-voltage release
F: Shunt release
X: Closing electromagnet
M: Energy storage motor
XT: Connection terminal
SA: Position switch
Note: If control voltage of Q, F, X is different from each other, they can be connected to different power.
1 ,2 : Auxiliary power input
3 ,4 ,5 : Fault trip contact output(4# common terminal)
6 ,7 ,8 ,9 : Auxiliary contact, normal open,
10 ~24 : empty
25 ,26 : to be connected with current transformer(selective)
27 ,28 : Under-voltage release(Connected to the main circuit)
29 ,30 : Shunt release
31 ,32 : Closing release
33 ,34 : Energy storage indicator
34 ,35 : Energy storage motor
36 ,51 : Auxiliary contact

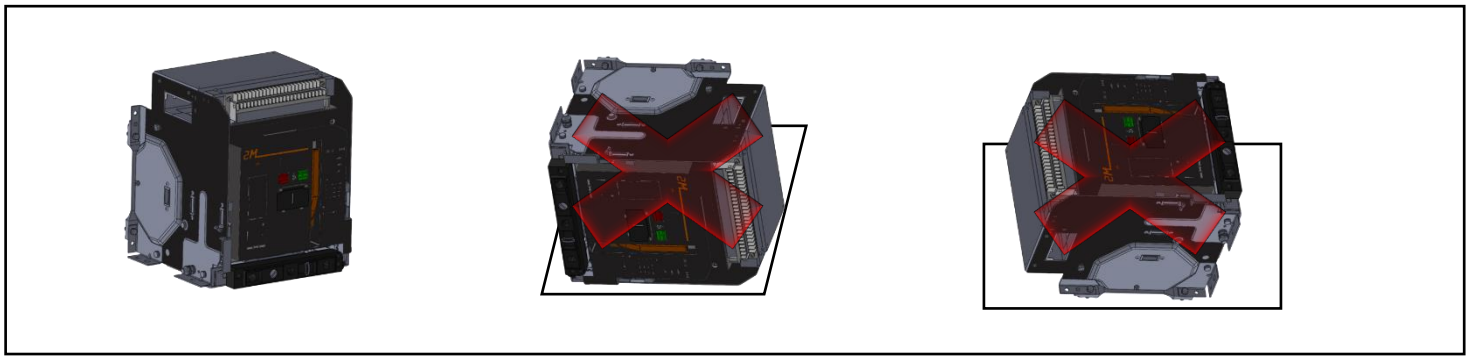

L1
N
PE
1
2
Highest-voltage of AC400V
to the incoming-line side
PE Un U1 U2 U3
SB2
SB1
SB3
Transformer connected
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34
36 38 40 42 44 46 48 50
Q
F
X
SA
M
AX
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51
Fault
Energy-storage
OpenClose

6. Installation

6.1 Unload the breaker from the soleplate of package. If it is draw out type, firstly pull out the handle under the drawer-base of breaker, and plug it into the hole on central part of plastic cover under the drawer-base crossbeam, anticlockwise turns the handle, the body will slowly slide along the outside of drawer-base.

When the guide rod points to separated position and handle can't be rotated any longer, pull out the handle and firmly grasp the aluminum handle on drawer-base, pull out the breaker body and remove it form the base, then move the base from the sole plate and clean up the dirty things inside the drawer-base.

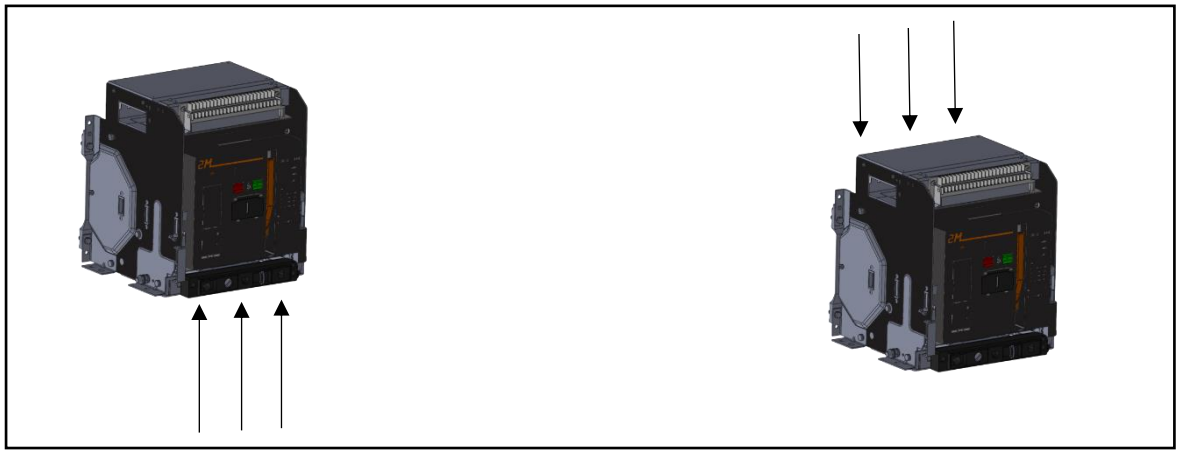
Possible positions



6.1.1 Check the insulation resistance with a 500V megger, resistance should not be less than 20MΩ when ambient temperature is 20℃±5℃ and relative humidity is 50%~70%. Otherwise dry it.

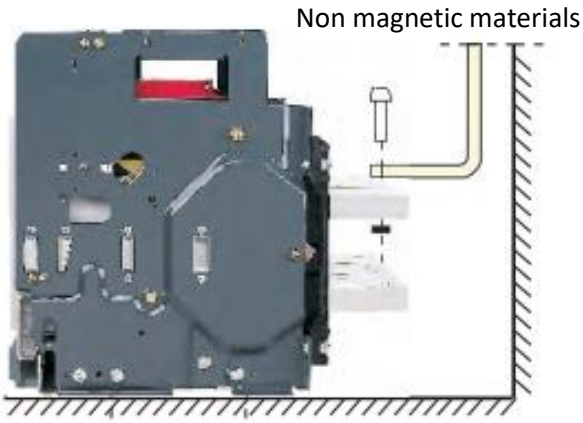
6.1.2 **Power supply**

Charisma devices can be supplied either from the top or from the bottom without reduction in performance, in order to facilitate connection when installed in a switchboard.

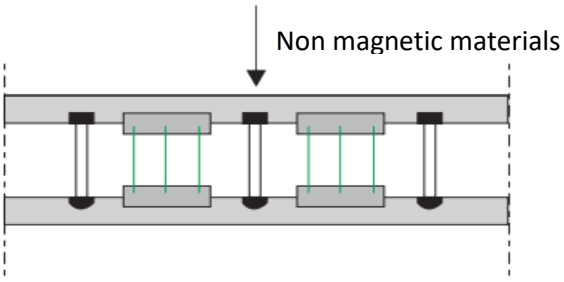


6.1.3 Partitions

Sufficient openings must be provided in partitions to ensure good air circulation around the circuit breaker;
Any partition between upstream and downstream connections of the device must be made of nonmagnetic material.
For high-currents, of 2500 A and upwards, the metal supports or barriers in the immediate vicinity of a conductor; Metal barriers through which a conductor passes must not form a magnetic loop.

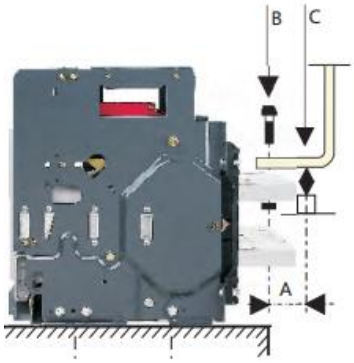


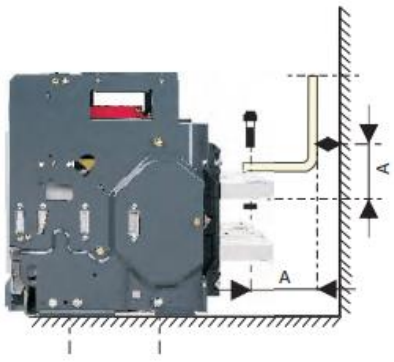
Busbars
The mechanical connection must be exclude the possibility of formation of a magnetic loop around a conductor

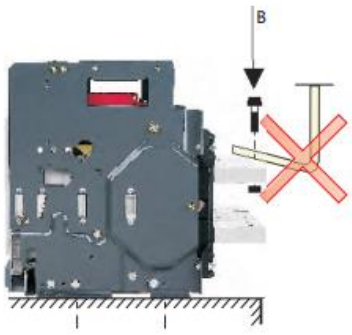


6.1.4 Busbar connections

The busbars should be suitably adjusted to ensure the connection points are positioned on the terminals before the bolts B are inserted. The connections are held by the supporter which is fixed to the framework of the switchboard, in this way the circuit breaker terminals do not have to support its weight C.
(This support should be placed close to the terminals).

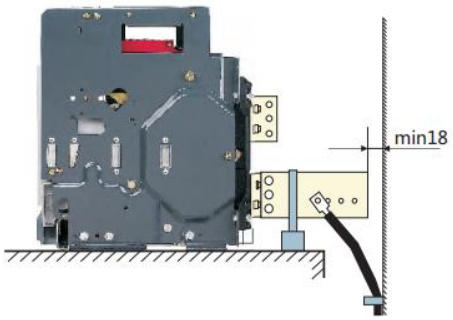


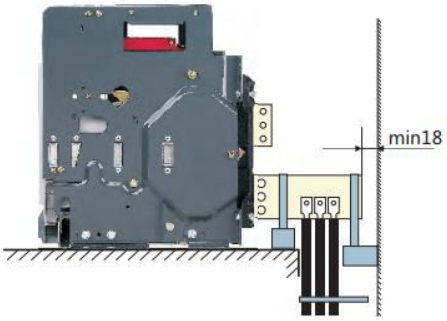




6.1.5 Main circuit adopts cable connection

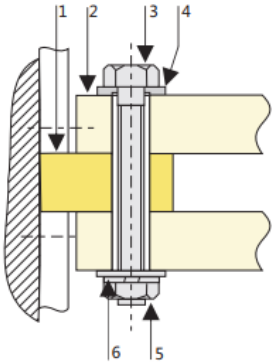
Users should not apply too strong mechanical strength on the terminals of Air Circuit Breaker. Extend the bus-bar of circuit breaker with connecting bus-bar, position the wiring piece of cable before inserting bolts; the cable should be fixed on the frame of distributing cabinet firmly.





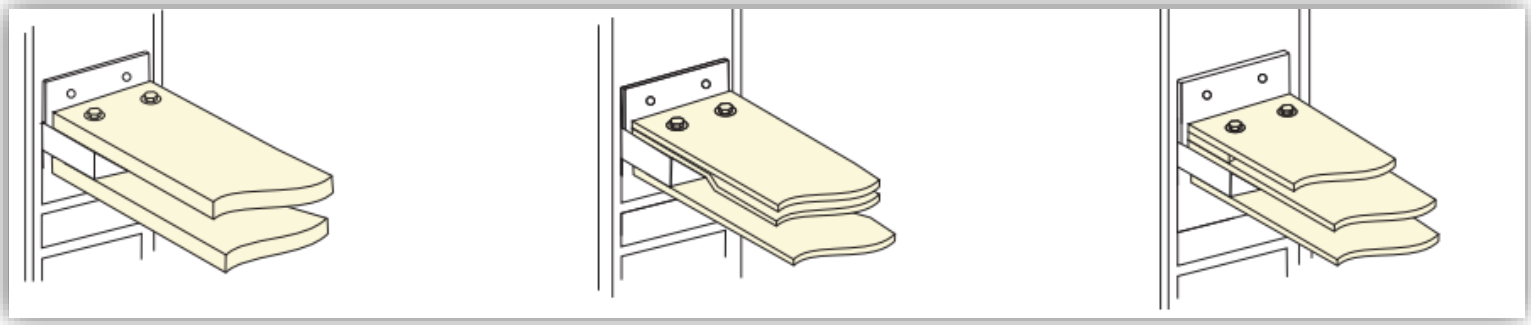
6.7 Clamping

Correct clamping of busbars depends on the tightening torques used for the nuts and bolts, etc. Over-tightening may have the same consequences as under-tightening.
For connecting busbars to the circuit breaker, the tightening torques to be used are shown in the table below. These values are for use with copper busbars and steel nuts and bolts, class ≥8.8.



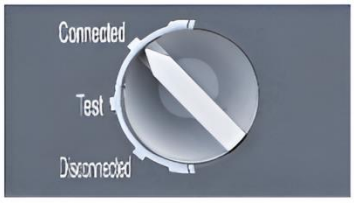
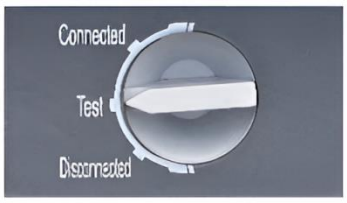
1 breaker terminal
2 busbar
3 bolt
4 washer
5 nut
6 spring washer

Examples



Preferred tightening torque for Charisma's tightening components

Type of screw	Application	Preferred tightening torque
M3	Screw for secondary terminals	0.5 ~ 0.7 N · m
M10	Installing bolts of Air Circuit Breaker	38 ~ 55 N · m
M12	Connection terminals	61 ~ 94 N · m

Connected position	Test position	Disconnected position	Drawout position
			
			
1. Both main circuit and control circuit are connected. 2. Normal application conditions	1. The main circuit is disconnected, and the control circuit is connected. 2. Test application conditions	Neither the main circuit nor the control circuit is connected	Main body is out of the drawer seat

7.1 Wiring the secondary circuit according to electric principle diagram.

Note: Bolts, nuts, gaskets shouldn't be left inside the drawer seat to avoid being blocked.

7.2 **Operation**

Check the rated voltage of the following components whether conforms to the power voltage. Such as under voltage release, shunt release, closing electromagnet, motor-driven mechanism and intelligent controller.

7.3 **Maintenance**

Check the technical parameters in time or add some lubricating oil, etc.

This breaker structure is arranged vertically and modularized composition with each function cell separated, which make the maintenance easy.

It has compact structure, reliable operation and strong free maintenance capability. Please check the technical parameters on the nameplate in accordance with the requirements of order before installation.

Making the secondary circuit power, the motor-driven mechanism can store energy automatically until hearing the click and energy stored indicating on the panel.

Otherwise press the storage handle for 6 times until hearing the click and the indicator display energy stored and the closing operation can be realized either by closing electromagnet or manual button.

Shake with the manual energy-storage handle up and down about six times to "click"

7. Recommendation for user's connecting bus-bar

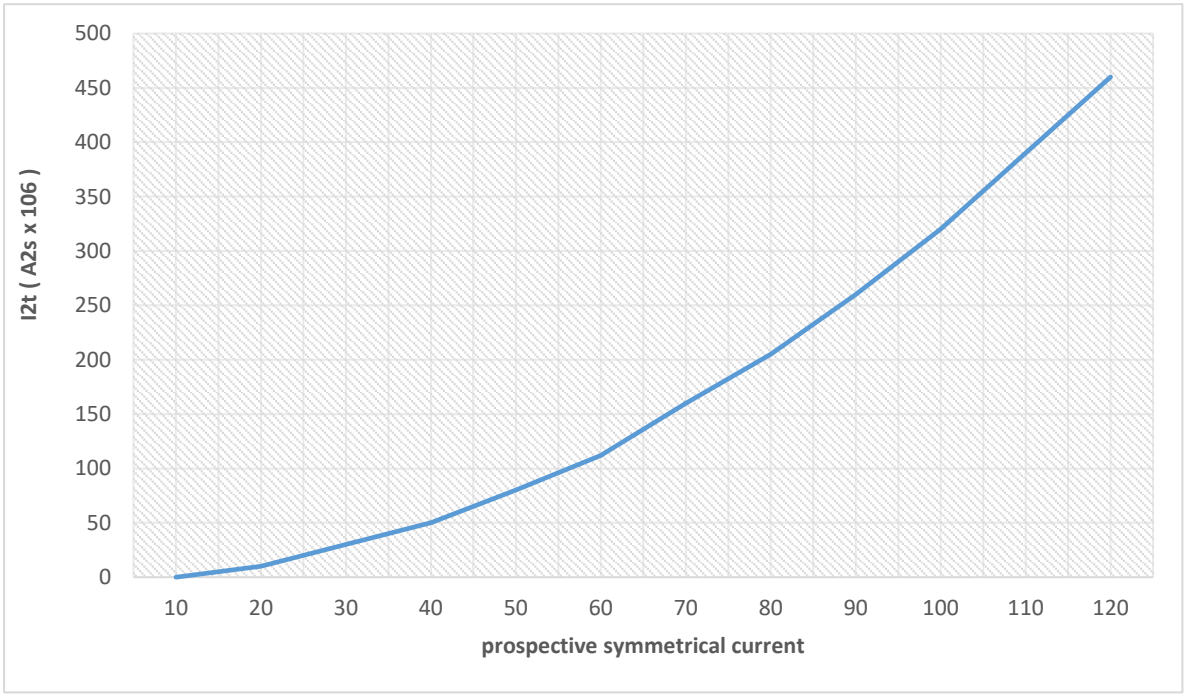
Inm (A)		C1V 2000A PR1000 3P						C2V 3200A PR1000 3P		
In (A)		630	800	1000	1250	1600	2000	2000	2500	3200
Busbar	Thickness (mm)	5	6	8	10	12	10	8	10	10
	Width (mm)	60	60	60	60	60	60	100	100	100
	Number	2	2	2	2	2	3	2	2	4

Note: the specifications in the table is obtained as the ambient temperature of air circuit breaker is 40℃, with open installation; this is in compliance with the specification of copper busbars adopted under the heating conditions regulated in IEC/EN60947-2

8. Power loss

Inm (A)		C1V 2000A PR1000 3P						C2V 3200A PR1000 3P		
In (A)		630	800	1000	1250	1600	2000	2000	2500	3200
Power loss (w)	Drawer type	60	110	172	268	440	530	384	600	737
	Fixed type	34.4	50	78	122	200	262	200	312	307

9. A^2S curve



10. Temperature compensation correction

Ambient temperature	C1V 2000A PR1000 3P						C2V 3200A PR1000 3P		
40 °C	630	800	1000	1250	1600	2000	2000	2500	3200
45 °C	630	800	1000	1250	1600	2000	2000	2500	3200
50 °C	630	800	1000	1250	1600	2000	2000	2500	3200
55 °C	630	800	1000	1250	1500	1900	2000	2300	3000
60 °C	610	800	1000	1250	1300	1800	2000	2200	2800
65 °C	610	800	1000	1250	1300	1650	2000	2200	2600
70 °C	473	800	1000	1200	1200	1400	2000	2000	2200

11. Selectivity protection

11.1. Select protection between phenomena and charisma

Upstream	Circuit breaker	C1V 2000A PR1000 3P					
	Rated current	630	800	1000	1250	1600	2000
	Default setting ratings of short time-delay 8In (kA)	5.04	6.4	8	10	12.8	16
	Setting range (kA)	0.63～9.45	0.8~12	1~15	1.25~18.75	1.6~24	2~30
	Delayed tripping time (s)	0.1, 0.2, 0.3, 0.4					
	Returnable time	0.06, 0.14, 0.23, 0.35					

Upstream	Circuit breaker	C2V 3200A PR1000 3P		
	Rated current	2000	2500	3200
	Default setting ratings of short time-delay 8In (kA)	16	20	25.6
	Setting range (kA)	2~30	2.5~37.7	3.2~48
	Delayed tripping time (s)	0.1, 0.2, 0.3, 0.4		
	Returnable time	0.06, 0.14, 0.23, 0.35		

Downstream	Frame size	Rated current	Instantaneous setting ratings (kA)	Circuit breaker	630	800	1000	1250	1600	2000
	Phenomena P1 125A	16	0.16 0.19 (motor)	Setting range (kA)	0.63~9.45	0.8~12	1~15	1.25~18.75	1.6~24	2~30
		20	0.2 0.24 (motor)		0.63~9.45	0.8~12	1~15	1.25~18.75	1.6~24	2~30
		25	0.25 0.3 (motor)		0.63~9.45	0.8~12	1~15	1.25~18.75	1.6~24	2~30
		32	0.32 0.38 (motor)		0.63~9.45	0.8~12	1~15	1.25~18.75	1.6~24	2~30
		40	0.40 0.48 (motor)		0.63~9.45 0.6624~9.45	0.8~12	1~15	1.25~18.75	1.6~24	2~30
		50	0.50 0.60 (motor)		0.69~9.45 0.828~9.45	0.8~12 0.828~12	1~15	1.25~18.75	1.6~24	2~30
		63	0.63 0.75 (motor)		0.8694~9.45 1.035~9.45	0.8694~12 1.035~12	1~15 1.035~15	1.25~18.75	1.6~24	2~30
		80	0.80 0.96 (motor)		1.104~9.45 1.325~9.45	1.104~12 1.325~12	1.104~15 1.325~15	1.25~18.75 1.325~18.75	1.6~24	2~30
		100	1 1.2 (motor)		1.38~9.45 1.656~9.45	1.38~12 1.656~12	1.38~15 1.656~15	1.38~18.75 1.656~18.75	1.6~24 1.656~24	2~30
		125	1.25 1.5 (motor)		1.725~9.45 2.07~9.45	1.725~12 2.07~12	1.725~15 2.07~15	1.725~18.75 2.07~18.75	1.725~24 2.07~24	1.725~30 2.07~30

Downstream	Frame size	Rated current	Instantaneous setting ratings (kA)	Circuit breaker	630	800	1000	1250	1600	2000
	Phenomena P2 250A	100	1 1.2 (motor)	Setting range (kA)	1.38~9.45 1.656~9.45	1.38~12 1.656~12	1.38~15 1.656~15	1.38~18.75 1.656~18.75	1.6~24 1.656~24	2~30
		125	1.25 1.5 (motor)		1.725~9.45 2.07~9.45	1.725~12 2.07~12	1.725~15 2.07~15	1.725~18.75 2.07~18.75	1.725~24 2.07~24	1.725~30 2.07~30
		160	1.6 1.92(motor)		2.208~9.45 2.65~9.45	2.208~12 2.65~12	2.208~15 2.65~15	2.208~18.75 2.65~18.75	2.208~24 2.65~24	2.208~30 2.65~30
		200	2.0 2.4(motor)		2.76~9.45 3.312~9.45	2.76~12 3.312~12	2.76~15 3.312~15	2.76~18.75 3.312~18.75	2.76~24 3.312~24	2.76~30 3.312~30
		225	2.25 2.7(motor)		3.105~9.45 3.726~9.45	3.105~12 3.726~12	3.105~15 3.726~15	3.105~18.75 3.726~18.75	3.105~24 3.726~24	3.105~30 3.726~30
		250	2.5 3.0(motor)		3.45~9.45 4.14~9.45	3.45~12 4.14~12	3.45~15 4.14~15	3.45~18.75 4.14~18.75	3.45~24 4.14~24	3.45~30 4.14~30
	Phenomena P3 400A	200	2.0 2.4(motor)		2.76~9.45 3.312~9.45	2.76~12 3.312~12	2.76~15 3.312~15	2.76~18.75 3.312~18.75	2.76~24 3.312~24	2.76~30 3.312~30
		250	2.5 3.0(motor)		3.45~9.45 4.14~9.45	3.45~12 4.14~12	3.45~15 4.14~15	3.45~18.75 4.14~18.75	3.45~24 4.14~24	3.45~30 4.14~30
		315	3.15 3.78(motor)		4.347~9.45 5.216~9.45	4.347~12 5.216~12	4.347~15 5.216~15	4.347~18.75 5.216~18.75	4.347~24 5.216~24	4.347~30 5.216~30
		400	4 4.8(motor)		5.52~9.45 6.624~9.45	5.52~12 6.624~12	5.52~15 6.624~15	5.52~18.75 6.624~18.75	5.52~24 6.624~24	5.52~30 6.624~30
	Phenomena P4 630A	250	2.5 3.0(motor)		3.45~9.45 4.14~9.45	3.45~12 4.14~12	3.45~15 4.14~15	3.45~18.75 4.14~18.75	3.45~24 4.14~24	3.45~30 4.14~30
		315	3.15 3.78(motor)		4.347~9.45 5.216~9.45	4.347~12 5.216~12	4.347~15 5.216~15	4.347~18.75 5.216~18.75	4.347~24 5.216~24	4.347~30 5.216~30
		400	4 4.8(motor)		5.52~9.45 6.624~9.45	5.52~12 6.624~12	5.52~15 6.624~15	5.52~18.75 6.624~18.75	5.52~24 6.624~24	5.52~30 6.624~30
		500	5 6.0(motor)		6.9~9.45 8.28~9.45	6.9~12 8.28~12	6.9~15 8.28~15	6.9~18.75 8.28~18.75	6.9~24 8.28~24	6.9~30 8.28~30
		630	6.3 7.45(motor)		8.694~9.45	8.694~12 10.44~12	8.694~15 10.44~15	8.694~18.75 10.44~18.75	8.694~24 10.44~24	8.694~30 10.44~30

11.1. Select protection in charisma

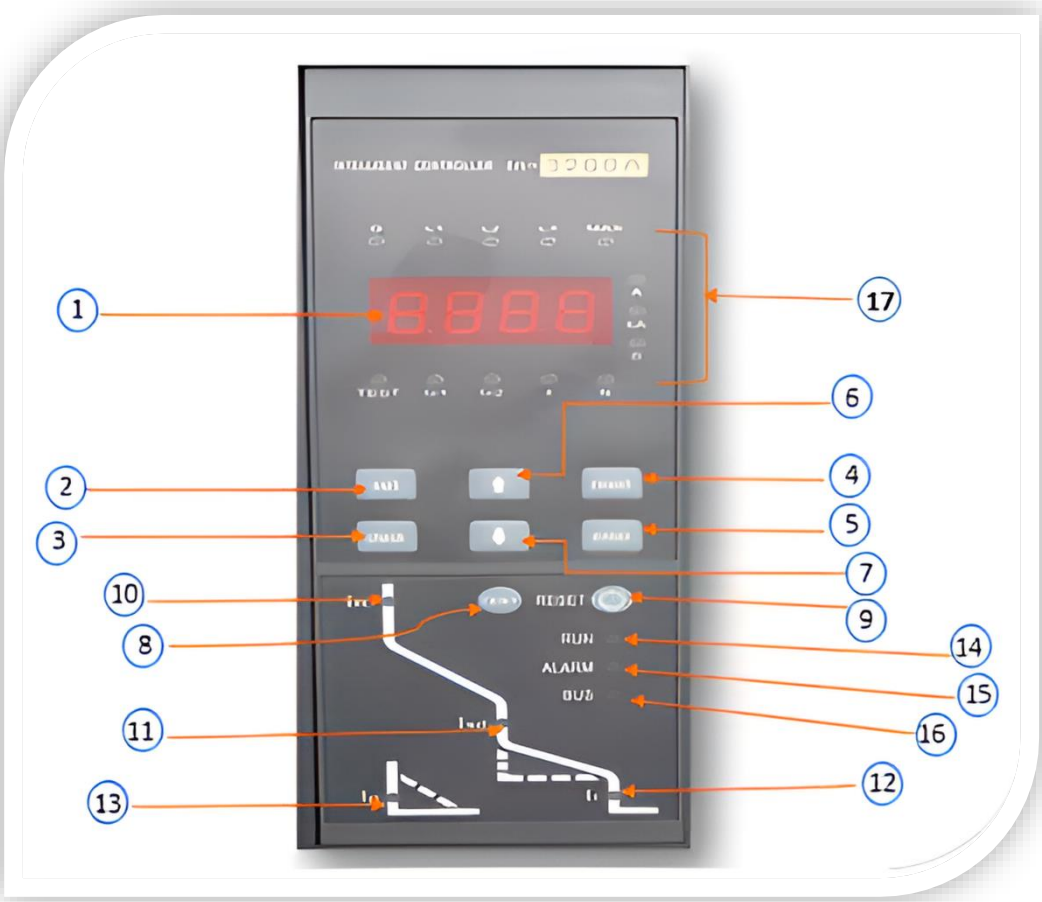
Upstream	Circuit breaker	C1V 2000A PR1000 3P					
	Rated current	630	800	1000	1250	1600	2000
	Default setting ratings of short time-delay 8In (kA)	5.04	6.4	8	10	12.8	16
	Setting range (kA)	0.63~9.45	0.8~12	1~15	1.25~18.75	1.6~24	2~30
	Delayed tripping time (s)	0.1, 0.2, 0.3, 0.4					
	Returnable time	0.06, 0.14, 0.23, 0.35					

Upstream	Circuit breaker	C2V 3200A PR1000 3P		
	Rated current	2000	2500	3200
	Default setting ratings of short time-delay 8In (kA)	16	20	25.6
	Setting range (kA)	2~30	2.5~37.7	3.2~48
	Delayed tripping time (s)	0.1, 0.2, 0.3, 0.4		
	Returnable time	0.06, 0.14, 0.23, 0.35		

Downstream	Frame size	Rated current	Default instantaneous setting ratings 12In (kA)	Circuit breaker	630	800	1000	1250	1600	2000
	C1V 2000A PR1000 3P	630	7.56	Setting range (kA)		9.998~12	9.998~15	9.998~18.75	9.998~24	9.998~30
		800	9.6				12.696~15	12.696~18.75	12.696~24	12.696~30
		1000	12					15.87~18.75	15.87~24	15.87~30
		1250	15						19.837~24	19.837~30
		1600	19.2							25.392~30
		2000	24							

12. Intelligent Controller of Charisma series

12.1. Parameter setting



1. Display Window
   Display current value, setting value, tripping time and so on

2. “Set“
   Switch to setting menu

3. “Check”
   Switch to query menu

4. “Reset”
   Escape from this grade and return to upper menu or cancel the current selected parameter

5. “Enter”
   Enter into the next menu directed by the current item, or select current parameter and store modifications

6. “UP”
   Change the marquee or the selected parameter

7. “Down”
   Change the marquee or the selected parameter

8. “Test”
   Trip test button

9. “Reset”
   Escape from test to normal condition

10. “IR” light
    Overload long delay fault indication

11. “Isd” light
    Short-circuit short delay indication

12. “Ii” light
    Instantaneous Short-circuit fault indication

13. “Ig” light
    Asymmetric grounding or neutral line fault indication

14. Run light

15. Alarm light

16. Communication light

17. Indicators light

(**G**) Grounding or leakage current indicator

(**L1,L2,L3**) Phase A,B,C current indicator

(**Max**) A. B, C three-phase maximum current indicator

(**A,KA**) Ampere unit (**S**) Second unit

(**TEST**) Test indicator / self-diagnosis alarm (slow flashing)

(Ic1, Ic2) Load monitoring 1,2 protection indicator

12.2 Parameter setting

Set various parameters of the controller through the buttons on the controller panel. The operation steps are as follows:
1. Press the [set] key continuously to check all the setting parameters of the controller. The corresponding setting parameter indicator
lights up and the current setting value of the parameter is displayed on the display screen. If this parameter is not modified, continue to press the [set] key.
2. To modify the setting value of the current display parameter, press the [up] or [down] button continuously until the screen displays the value you need.
3. Press [OK] to save the new parameters currently set, and the green light of [run] will light up once. If it is not necessary to set other parameter items, press [return] to exit the parameter setting state. If you need to continue setting parameters, repeat step 1.
4. After the parameter setting is completed, press the [return] key to exit the setting state

12.3 Test operation

The controller can conduct grounding, long delay, short delay and transient characteristic tests. In case of overload or short circuit during the test, the system will automatically terminate the test state and transfer to the delayed action state.
The basic steps of test operation are as follows:
1. Continuously press the [set] key to the setting value of the test item.
2. Press [up] or [down] to adjust the action current value to be tested (note that the OK key cannot be pressed at this time, otherwise the setting parameter will be modified) so that the displayed current value is not less than the set setting value.
3. Press the [test] key, and the [tes] light will be on. After the delay, the display screen will display the tripping current and delay time in a cycle.
4. Press the reset key to return the controller to the working state.

[note]: during a test, if the setting value of the item is already the maximum value of the value range and the current required by the test is greater than the value, you can press the setting key to set the test current on the item with a wider parameter range. For example, the controller has in = 1000A, IR = 1000A, TR = 15s, and ISD = 8000A. If you want to conduct a long-time delay test with a test current of 2000a, you should press the setting key continuously until the display screen displays the setting value of ISD, then press the down key to adjust the displayed current value to 2000a, and then press the test key.

12.4 Current calibration

The controller current (i_A, i_B, i_C, i_N) can be calibrated. The calibration method and steps of the ammeter are as follows:
1. Confirm that the controller is in reset state and there is no fault at present. If the controller is in other states, press the [return] key until the ammeter window is in cyclic display state.
2. Press the [return] key, and then press the [OK] key for 5 consecutive times. After three seconds, the "L1 light" in the ammeter window flashes. It indicates that the controller enters the ammeter calibration state, and the current is L1 phase current calibration.
3. Press the [set] key to switch to the current option to be calibrated. The switching sequence is "L1, L2, L3, N, Ig".
(Note: if the controller is in "3P" mode, there is no n calibration item; if the controller selects (T-type) grounding protection, there is no Ig calibration option.)
4. Press [up] or [down] to increase or decrease the value and adjust the current value to match the actual current.
5. Press [OK] to save the value after the current calibration. A green light in [run] indicates successful saving.
6. Press the [return] key to exit the calibration state of the ammeter and enter the reset state.

[note]: in the calibration state of the ammeter, if there is no key response for 1 minute, the calibration state will be automatically exited.

12.5 Communication indication display description

The setting method of digital position lock is as follows ：

Step 1: when the controller is in the reset state, press the "function" key and the "confirm" key at the same time. The display content of the ammeter window is "0000", indicating that the user password confirmation state of this function has been entered. Press "▲" or "▼" to enter the user password (the user password of this function is 0003), and press "OK" to enter this function.

Step 2: the digital tube in the ammeter window displays "lock", "L1" (or "L2" or "L3") lights on; L1 means "remote control", L2 means "local", L3 means "setting";

Operation category:	Position of position lock		
	Set (L3)	Local (L2)	elecontrol (L1)
Remote control and remote adjustment	NO	NO	YES
Local parameter adjustment	YES	NO	NO
Local test	YES	NO	NO
Programmer operation	YES	YES	YES

Step 3. Press "▲" or "▼" to switch the three positions of the digital lock.

Step 4: press the "confirm" key to store, and press the "return" key to return the system to the reset state

12.6 Product installation and wiring

12.6.1 Install

The following matters must be paid attention to during the installation of the controller:
1. Before installing the controller, confirm whether its model and specification meet the requirements.
2. During installation, the base shall be aligned with the corresponding position of the circuit breaker, and the screws shall be reliably fixed.
3. After the controller is installed, it shall be wired according to the user's wiring diagram. See Section 5.2 for details.
4. Before putting into use, check whether the setting parameters are correct.
5. During installation, the user shall pay attention to the protection of the controller to prevent damage due to improper operation.

12.6.2 Communication networking

For the communication networking of the controller, please refer to the mdc60k controller communication networking manual。

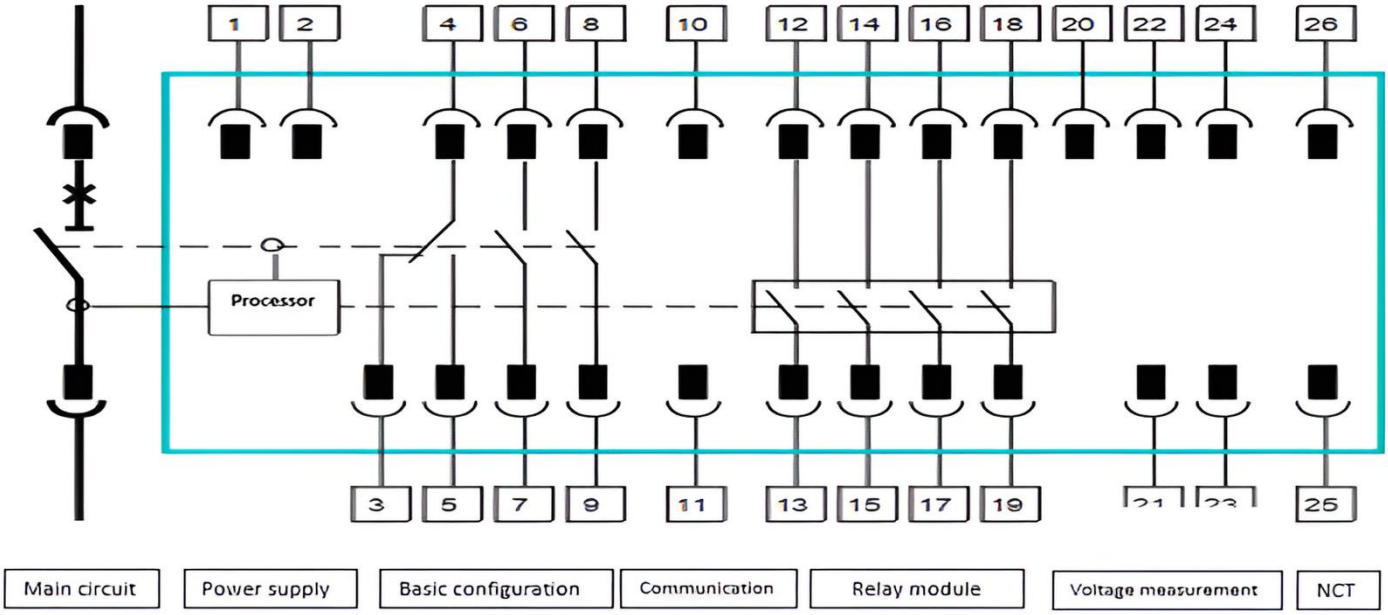
12.7 Operation, maintenance and precautions

The operation, maintenance and precautions of the controller are as follows:
1. The controller shall be operated carefully according to the requirements of this manual.
2. After assembly with the circuit breaker, the protective cover shall be sealed in normal operation to prevent the panel from being damaged.
3. During normal operation, the system self diagnosis information or alarm information of the controller shall be checked frequently, and problems shall be analyzed and handled in time.
4. The fastening condition of each connecting part shall be checked regularly, and if it is loose, it shall be fastened in time.
5. After the fault trips, the fault causes shall be carefully analyzed. After the fault is eliminated, the red mechanical reset button on the lower panel can be put into use again.

12.8 Secondary wiring of controller

7.1 Secondary wiring of non-communication controller

note: (supporting dw50 and DW450 circuit breakers, contacts 6 # - 7 # are normally closed, and contacts 8 # - 9 # are normally open)



Schematic diagram of external terminals of controller

Wire number	Function description	Remarks
1 , 2	Auxiliary power input	Basic configuration (factory default)
3 , 4 , 5	Fault trip contact output (4 # is the common terminal)	
6 , 7	Circuit breaker status auxiliary contact 1 output	
8 , 9	Circuit breaker status auxiliary contact 2 output	
20	Protected area (PE)	
10 , 11	RS485 Communication bus	Optional function
12 , 13	Relay (DO1) contact output	
14 , 15	Relay (DO2) contact output	
16 , 17	Relay (DO3) contact output	
18 , 19	Relay (DO4) contact output	
25 , 26	Connection of neutral line transformer in 3P + N structure ; Connect leakage transformer ZCT1 during leakage protection	