M-SERIES

Technical catalogue

Air Circuit Breakers

BTB ELECTRIC

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MA3 Series

Air Circuit Breakers

BTB Electric's air circuit breakers have always been highly appreciated for their superior electrical performance, maximum modularity, and the standardization featured across all product ranges. Their exceptional safety, quality, and efficiency are the result of truly innovative design principles.

Content

General

BEST-SOLUTION

Various line-up and high fiexibility,
Current range 630A ~ 6300A

HIGH-RELIABILITY

Highest offered safety and reliability,
Impulse withstand voltage up to 12 kV

HIGH-PERFORMANCE

The highest breaking capacity:
135kA (6300A at 415V)

CUSTOMER FRIENDLY

3 ampere frame sizes 2000/4000/6300A,
Easy handling and retrofitted solution

Application scope

The MA3 series air circuit breaker is suitable for circuits with AC 50Hz/60Hz, rated service voltages of 400V and 690V, and rated service currents up to 6300A. Primarily, it distributes electric energy and safeguards circuits and electrical equipment from overloads, under-voltage, short-circuits, and single-phase earthing faults.

Equipped with intelligent and selective protection functions, the breaker enhances power supply reliability and prevents unnecessary power failures. It finds applications in power stations, factories, mines (690V), and modern high-rise buildings, particularly in intelligentized building distribution systems.

Applied Standards and Certifications

MA3 series air circuit breaker has acquired testing/certifications from IEC/EN 60947-1, 2 certified testing institute and can be installed and applied according to the usage environment and conditions permitted by the standards.

Compliance with Part No.: 1 General of IEC/EN 60947 Low Switch and Control Equipment.

Compliance with Part No.: 2 Low Voltage Switch Circuit Breaker of IEC/EN 60947 Low Switch and Control Equipment.

Our MA3 series air circuit breakers are tested by IECEE laboratories – IEC system of conformity assessment schemes for electrotechnical equipment and components.

Operating conditions

Ambient temperature

-5°C~+40°C (average value within 24h not exceeding +35°C, except in special situations)

Altitude

Below 2,000m above sea level.

Air conditions

Maximum temperature + 40°C (relative humidity below 85%)

Maximum temperature + 20°C (relative humidity below 90%)

Mounting conditions

Perpendicularity and angularity ≤5°

The air circuit breaker should be installed in conditions free from explosive, conductive dust, corrosion, and destructive insulation.

Note

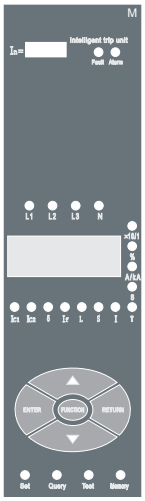
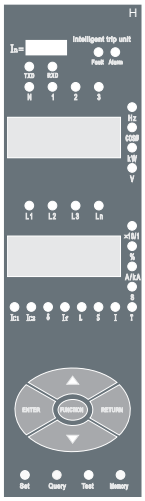
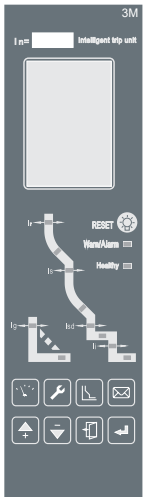
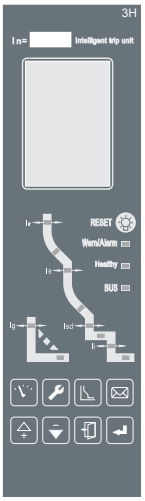
Without the intelligent controller, the breaker functions as a switch-disconnector.

As for the total harmonic distortion (THD) rate, it must be managed below 5% in the distribution system phase. In case it is not complied with, it may cause heating in the product.

General

Intelligent trip unit

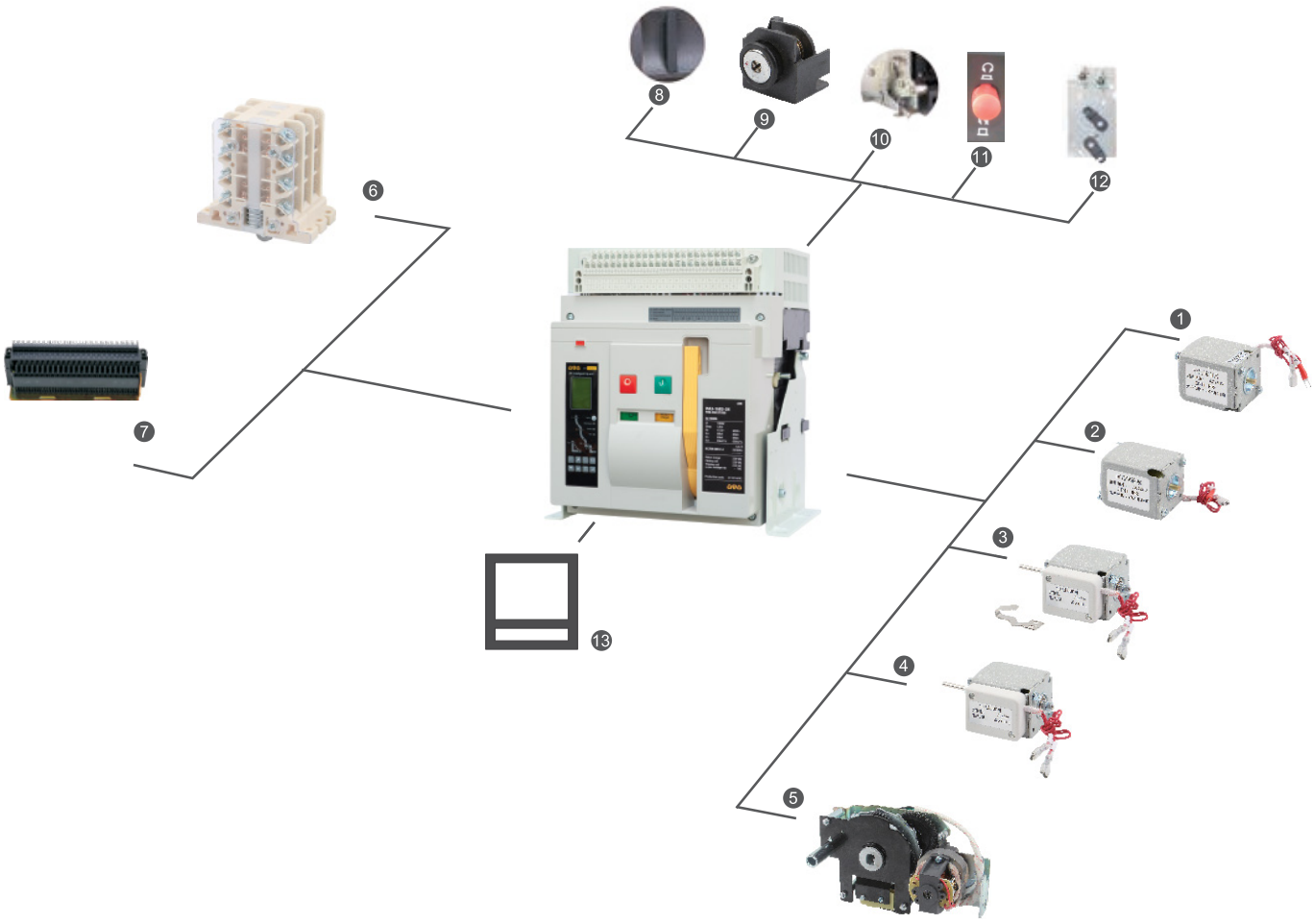
- The intelligent trip unit integrated into the MA3-Series Air Circuit Breaker features advanced power monitoring functions, including temperature monitoring and fault recording, in addition to its basic protection capabilities. These enhancements contribute to a stable power supply.
- The MA3-Series Air Circuit Breaker provides protection using power from internal CT.
- The trip relays in the MA3-Series Air Circuit Breaker are classified according to their functions as follows:

M type	H type	3M type	3H type
			
Protection: Ir/Isd/Ii/Ig Neutral protection Thermal	**Protection:** Ir/Isd/Ii/Ig Neutral protection Thermal Load monitor/alarm	**Protection:** Ir/Isd/Ii/Ig Neutral protection Thermal OV/UV/OF/UF/rP	**Protection:** Ir/Isd/Ii/Ig Neutral protection Thermal Load monitor/alarm OV/UV/OF/UF/rP
Measurement: LED A Fault status indicating Maintenance functions	**Measurement:** LED V/A/W/F/PF Fault status indicating Maintenance functions	**Measurement:** LCD V/A/W/Wh/F/PF Harmonics (31th) Fault status indicating Maintenance functions	**Measurement:** LCD V/A/W/Wh/F/PF Harmonics (31th) Fault status indicating Maintenance functions
Connect: Self Power 250VAC	**Connect:** Modbus/RS-485 Self Power 250VAC	**Connect:** Self Power 250VAC	**Connect:** Modbus/RS-485 Self Power 250/400VAC

External configuration

1. Arc extinguishing chamber
2. Control circuit terminal block
3. Intelligent trip relay
4. OFF button
5. ON button
6. Charging indicator
7. ON/OFF indicator
8. Manual reset button

Accessories



1	Shunt release
2	Closing electromagnet
3	Under-voltage release
4	Under-voltage release time-delay
5	Motor-driven charging device
6	Auxiliary contact
7	Secondary wiring terminal
8	Pad lock
9	Key lock
10	Door Interlock
11	Connected, disconnected, test position locking mechanism
12	Mechanical interlock
13	Door frame

Model definition

1	2	3	4	5	6	7	8	9	10	11
MA3	**16**	**B**	**3**	**3H**	**FH**	**D**	**M2**	**C2**	**T2**	**U0**

1. Series
2. Rated current (and CT)
3. Frame size
4. Pole
5. Intelligent trip unit
6. Terminal connection
7. Breaking Capacity
8. Motor-driven charging device
9. Closing electromagnet
10. Shunt release
11. Under-voltage release

1. Series	
MA2	Air Circuit Breakers / Design No. 2
MA3	Air Circuit Breakers / Design No. 3

2. Rated current	
06	630A
08	800A
10	1000A
12	1250A
16	1600A
20	2000A
25	2500A
32	3200A
40	4000A
50	5000A
63	6300A

3. Frame size	
B	2000A (630 ~ 2000A)
D	4000A (2000 ~ 4000A)
E	6300A (4000 ~ 6300)

4. Pole	
3	3 Pole
4	4 Pole

5. Intelligent trip relay	
M	Relay M type
H	Relay H type
3M	Relay 3M type
3H	Relay 3H type

6. Terminal connection	
Fixed type	
FH	Horizontal type
FV	Vertical type
FM	Mixed type (Horizontal Vertcal)
Draw-out type	
DH	Horizontal type
DV	Vertical type
DM	Mixed type; Horizontal; Vertcal

7. Breaking Capacity	
D	Ics ≠ Icu
E	Ics = Icu

8. Motor-driven charging device	
M0	Manual type
M1	110 VAC
M2	220 VAC
M3	380 VAC
M6	110 VDC
M7	220 VDC

9. Closing electromagnet	
C0	Manual type
C1	110 VAC
C2	220 VAC
C3	380 VAC
C6	110 VDC
C7	220 VDC

10. Shunt release	
T0	Manual type
T1	110 VAC
T2	220 VAC
T3	380 VAC
T6	110 VDC
T7	220 VDC

11. Under-voltage release	
U0	Without
U1	110 VAC
U2	220 VAC
U3	380 VAC
U4	690 VAC

Rating and Specification

Frame size (A) (In max)			**2000**
Type			MA3-06B, MA3-08B, MA3-10B, MA3-12B, MA3-16B, MA3-20B
Current setting Ir (A) and CT rating at (40˚C)			630, 800, 1000, 1250, 1600, 2000
Setting current (A) Control trip relay (... × In max)			0.4 ~ 1.0
Rated Operational Voltage, Ue			AC 415V/690V
Rated Insulation Voltage, Ui			1000V
Rated Impulse Withstand Voltage, Uimp			12kV
Rated Frequency			50/60Hz
No. of Poles			3, 4
Rated Current of N-pole IN (A)			100%In
Ultimate breaking capacity Icu (kA rms) IEC/EN 60947-2		400/415V	80 (65)*
		660V/690V	65 (50)*
Rated service breaking capacity Ics (kA rms) IEC/EN 60947-2		400/415V	65
		660V/690V	50
Rated short-time withstand current Icw (kA rms)		1s	65
		3s	50
Operating time (ms)	Maximum total breaking time		≤35
	Maximum closing time		≤75
Operating performance (cycles)	Electrical life		8000
	Mechanical life	Maintenance free	15000
		Maintenance required	30000
Terminal connection Horizontal / Vertical / Mixed		Fixed	● / ○ / ○
		Draw-out	● / ○ / ●
Weight (kg)	Fixed	3P	43
		4P	54
	Draw-out	3P	79
		4P	91
Dimensions (mm) W x D x H	Fixed	3P	362×323×401
		4P	457×323×401
	Draw-out	3P	375×419×432
		4P	470×419×432
Intelligent trip unit **M / H / 3M / 3H type**			● / ● / ● / ●
With front shield (closed cabinet)			IP54

Remarks: “●” with this function; “○” function for selection; “-” without this function, “*” Breaking Capacity according to code E

4000		6300	
MA3-20D, MA3-25D, MA3-32D	MA3-40D	MA3-40E, MA3-50E	MA3-63E
2000, 2500, 3200, 4000		4000, 5000, 6300	
0.4 ~ 1.0		0.4 ~ 1.0	
AC 415V/690V		AC 415V/690V	
1000V		1000V	
12kV		12kV	
50/60Hz		50/60Hz	
3, 4		3, 4	3
100%In		50% / 100%In	
100		135	
85		100	
100		135	
85		100	
100		135	
75		85	
≤35		≤35	
≤75		≤75	
6000		1500	
10000		2500	
20000		5000	
● / ○ / ○		● / ○ / ○	
● / ○ / ●		● / ○ / ○	
54	62	105	130
67	81	131	-
90	126	212	228
119	157	231	-
426×325×401	426×367×401	807×396×401	922x396x401
537×325×401	537×367×401	922×396×401	-
435×419×432	435×489×432	813×492×432	928x492x432
550×419×432	550×489×432	928×492×432	-
● / ○ / ○ / ●		○ / ○ / ○ / ●	
IP54		IP54	

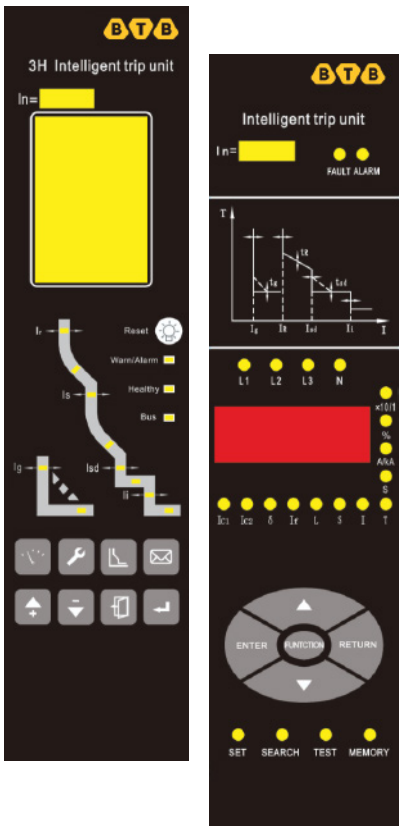
Intelligent trip unit

Protection with power from Internal CT

The overcurrent protection and ground module for display and communication fault protection can operate using power from the Internal CT, even in the absence of control power.

Intelligent trip unit are classified according to function

- Protection Features: overload, short circuit, ground fault, earth leakage, under voltage, over voltage, under frequency, over frequency, reverse power, unbalance, etc.
- Measurement Parameters: voltage, amperage, power, energy, frequency, power factor, Harmonics, etc.
- Event & Fault Recording: The system can record a maximum of 8 events and faults.
- Communication Interfaces: Modbus/RS-485 and Profibus-DP.



Select function

Function items	M type	H type	3M type	3H type
Display interface				
Digital tube display	●	●	-	-
LCD display	-	-	●	●
Protection functions				
Overload long delay protection	●	●	●	●
Overload thermal memory	●	●	●	●
Overload pre-alarm/alarm signaling operation	● / ○	● / ○	● / ○	● / ○
Short-circuit short delay protection	●	●	●	●
Short delay thermal memory	●	●	●	●
Short-circuit instantaneous protection	●	●	●	●
Grounding protection (Differential T)	●	●	●	●
Grounding alarm/ alarm signaling operation	● / ○	● / ○	● / ○	● / ○
Leakage protection /alarm/ alarm signaling operation (and grounding protection for selection)	○ / ○ / ○	○ / ○ / ○	○ / ○ / ○	○ / ○ / ○
Neutral solidly grounded protection	●	●	●	●
Current asymmetric protection/alarm/ alarm signaling operation	● / ● / ○	● / ● / ○	● / ● / ○	● / ● / ○
MCR / HSISC	○ / ○	○ / ○	○ / ○	○ / ○
Load monitor/ alarm/ alarm signaling operation	○ / ○ / ○	● / ● / ○	○ / ○ / ○	● / ● / ○

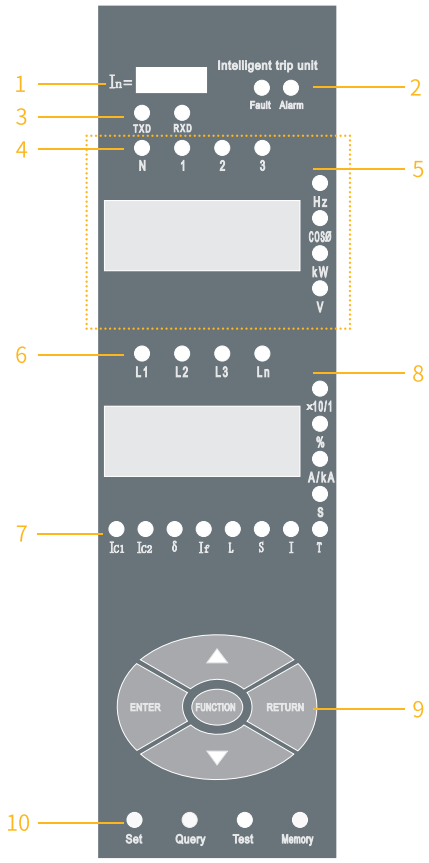
Select function

Function items	M type	H type	3M type	3H type
Display interface				
Over-voltage protection/ alarm/ alarm signaling operation	-	-	● / ● / ○	● / ● / ○
Voltage asymmetric protection / alarm/ alarm signaling operation	-	-	● / ● / ○	● / ● / ○
Phase sequence protection/ alarm/ alarm signaling operation	-	-	● / ● / ○	● / ● / ○
Under-frequency protection / alarm/ alarm signaling operation	-	-	● / ● / ○	● / ● / ○
Over-frequency protection / alarm/ alarm signaling operation	-	-	● / ● / ○	● / ● / ○
Current allowable-value protection/ alarm/ alarm signaling operation	-	-	● / ● / ○	● / ● / ○
Reverse-power protection / alarm/ alarm signaling operation	-	-	● / ● / ○	● / ● / ○
Testing functions				
Current testing (Phase-poles, N-pole and Grounding)	●	●	●	●
Voltage testing (Phase-voltage, Cable-voltage and Voltage asymmetric rate)	○	●	●	●
Phase sequence testing	-	-	●	●
Frequency testing	○	●	●	●
Allowable-value testing (Current)	-	-	●	●
Allowable-value testing (Power)	-	-	●	●
Power testing (Active & Reactive power)	○	●	●	●
Power factor testing	-	●	●	●
Power energy testing (Active & Reactive power energy)	-	-	●	●
Harmonics testing	-	-	●	●
Maintenance functions				
Fault status indicating	●	●	●	●
Fault record and query	●	●	●	●
Past record of peak current	-	-	●	●
Past record of alarm and query	-	-	●	●
Fault to trip signaling operation	●	●	●	●
Self-diagnostics function	●	●	●	●
Analog tripping test function	●	●	●	●
Contacts abrasion equivalent (alarm) query	●	●	●	●
Operation times query	●	●	●	●
Clock functions	○	○	●	●
Other				
Signal unit	○	●	○	●
Communication	-	●	-	●
Regional selective interlock	○	○	○	○

Remarks: “●” with this function; “○” function for selection; “-” without this function

Intelligent trip unit

M/H type



1. Rated current for nameplate
2. Sequence of fault & alarm indication
3. Sequence of communication emission & receiver indication *(for H type)*
4. Sequence of N phase, A phase, B phase, C phase voltage indicating *(for H type)*
5. Sequence of frequency, power factor, power, voltage indicating from top to bottom *(for H type)*
6. Sequence of A phase, B phase, C phase, N phase current indicating
7. Sequence:

   Ic1: load monitor1,

   Ic2: load monitor 2,

   δ: asymmetric current,

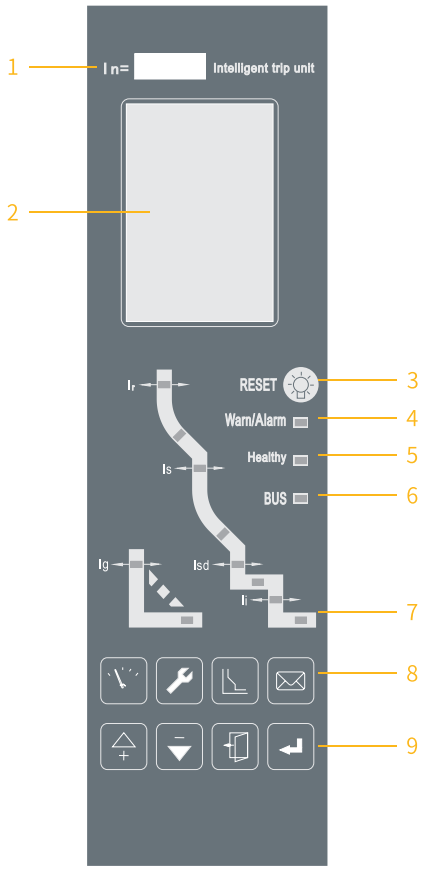
   If: grounding protection,

   L: overload long delay,

   S: short-circuit instantaneous indicating,

   I: short-circuit instantaneous indicating
8. Sequence of opening & closing time, main contacts abrasion rate, current unit, time, self-diagnostics fault status indicating from top to bottom
9. 5 operation buttons
10. Sequence of controller setting, query, testing, store service status indicating
11. Notes:
    - *The dashed box indicates a controller with voltage indicating function. Absence of indication if not present.*
    - *Serial no. 4 features a communication function controller. Absence of indication if not present.*
    - *For serial no. 9, A/KA light fixed indicates current A, while continuous blinking indicates kA.*
    - *For serial no. 6, kW light fixed indicates active power, while continuous blinking indicates reactive power.*

3M/3H type



1. Rated current for nameplate
2. LCD indicating interface
3. Fault/Alarm resetting button
4. Fault/Alarm LED Indicating (LED remains unlit during normal operation. LED blinks rapidly during fault trip. LED remains lit steadily during alarm.)
5. LED Continuously Blinks to Indicate Controller Power and Normal Working Status
6. Communication Indicating (Modbus: LED extinguishes without communication. LED blinks continuously during communication. Profibus: LED extinguishes without communication. LED remains steady during communication – for 3H type)
7. Curve LED (LED flashes corresponding to fault type during fault trip. LED remains steady to indicate present setting items during protective parameter setting)
8. Sequence of Testing Function, Setting Function, Protection Function, and Information Function Buttons, from Left to Right
9. Sequence of Upward, Downward, ESC, and Selection OK Buttons, from Left to Right

Remarks: Serial no. 7 features a communication function controller. No indication if no-communication function

Setting and Protective Characteristics

Over-load long delay protection M/H type & 3M/3H type			
Current setting Ir	(0.4 ~ 1.0 or 1.25) In or OFF (OFF-function close) Notes: Distribution protection set at 1.0In; Generator protection set at 1.25In		
6 categories protective curre	SI: Normal inverse time **t=0.01396 Tr/ (NO.02-1)** VI: Fast inverse time **t=Tr/ (N−1)** EI (G): Express inverse time for general distribution protection **t=3 Tr/ (N^2−1)** EI (M): Express inverse time for generator protection **t=2.95 Trx In [N^2/ (N^2-1.15)]** HV: High voltage fuse compatibility **t=15Tr/(N^4−1)** I2t: Normal distribution protection **t=2.25Tr/N^2** (factory default) N=I/Ir; I-fault current; t-long delay acting time; Ir-long delay setting current; Tr-long delay setting time Remarks: Only normal distribution protection I^2t for M/H type controllers. Other protective curves must be ordered. 3M/3H type controllers offer 6 categories of protective current for selection.		
Normal distribution protection I2t time setting Tr (1.5Ir)	M/H: 15, 20, 25, 30, 40, 50, 60, 80, 100, 120, 160, 200, 240, 320, 400, 480 (s)		
	3M/3H: 15, 30, 60, 120, 240, 360, 480, 600, 720, 840, 960 (s)		
Protective curre type	3M/3H: C1-C16 over-load long delay protective operating delay time in the drop-down list		
Protective characteristics (Accuracy ±10%)	Current (I/Ir)	Trip time	
	1.05	> 2h no-acting	
	1.3 (Distribution protection)	< 2h acting	
	1.2 (Motor protection)	< 2h acting	
	≥1.2Ir	Acting time as per 6 categories protection type formula calculator or current query	
Thermal memory time	M/H type: 30ms (ON) or power failure release 3M/3H type: instantaneous, 10ms, 20ms, 30ms, 45ms, 1hr, 2hrs, 3hrs or power failure release Remarks: connecting controller for auxiliary power supply with thermal memory function and auxiliary power supply failure results in thermal memory release		
Short-circuit short delay protection M/H type & 3M/3H type			
Current setting Isd	Adjustable range from (1.5 ~ 15)Ir; or OFF (function closed)		
Time setting Tsd (s) — Tsd1 inverse time Tsd2 definite time	M/H type: Range from 0.1 to 1.0 seconds 3M/3H type: Selection of 0.1, 0.2, 0.3, 0.4 seconds (user-selectable range from 0.1 to 1.0 seconds)		
	Current (I/Isd)	Trip time	
	≤0.9	No-acting	
	≥1.1	Inverse time Isd<I<8Ir	Current 1-5 and over-load long delay simultaneously, but curve speed is faster by 10 times. Formula: **t=64Tsd/N^2**
		Definite time I>8Ir (or I>Isd)	Delay protection as per definite time delay setting time Tsd
Thermal memory time	M/H type: 15min (ON) or power failure release 3M/3H type: instantaneous, 10ms, 20ms, 30ms, 45ms, 1hr, 2hrs, 3hrs or power failure release Remarks: Connecting controller for auxiliary power supply with thermal memory function and auxiliary power supply failure results in thermal memory release		
Short-circuit instantaneous protection M/H type & 3M/3H type			
Current setting Ii	M/H type: 1.0In ~ 50kA or OFF (OFF-function close) 3M/3H type: (1.0 ~ 20) In or OFF (OFF-function close)		
Protective characteristics (Accuracy ±10%)	Current (I/Ii)	Trip time	
	≤0.85	no-acting	
	>1.15	<40ms acting	

Setting and Protective Characteristics

Grounding protection/alarm M/H type & 3M/3H type				
Protection type		Differential type (T), Earth current type (W), alternative factory default is differential type (T)		
Current setting Ig		(0.2 ~ 1.0) In or OFF (OFF-function close)		
Time setting Tg	Definite time delay Tg (s)	0.1 ~ 1.0 or OFF (OFF-only alarm and no trip)		
	Inverse time factor KG	1.5 ~ 6 or OFF (OFF-grounding protection is definite time)		
Protective characteristics (Accuracy ± 10%)		Current (I/Ig)	Trip time	
		≤0.8	No-acting (no alarm)	
		≥1.0	(I/Ig) <KG	Inverse time delay acting (or alarm) t=Tg x KG x Ig/I
			(I/Ig) ≥KG	Definite time delay acting (or alarm) as per time setting
Grounding alarm 3M/3H type				
Performance mode		Alarm / Close		
Alarm operating current setting		(0.2 ~ 1.0) In		
Alarm operating delay time setting		0.1 ~ 1.0 (s)		
Alarm return current setting		(0.2 ~ 1.0) In		
Alarm return delay time setting		0.1 ~ 1.0 (s)		
Alarm operating characteristics (Accuracy ±10%)		Multiple of current (I/I setting)	Acting time	
		<0.8	No-alarm	
		≥1.0	Alarm (time as per alarm operating time setting)	
Alarm return characteristics (Accuracy ± 10%)		≥1.0	Alarm without return	
		≤0.9	Alarm return (time as per alarm return time setting)	
Neutral protection M/H type & 3M/3H type				
Neutral protective setting		M/H type: 50%In, 100%In or OFF 3M/3H type: 50%In, 100%In, 160%In, 200%In or OFF OFF- close N phase protective function		
Protective characteristics		Same as phases and poles over-load long delay protection, short-circuit short delay protection, short-circuit instantaneous protection, and grounding protection		
Current asymmetric protection/Alarm M/H type & 3M/3H type				
M/H type		Current asymmetric rate setting δ	(40% ~ 100%) or OFF (OFF-function close)	
		Acting delay time setting Tδ	0.1 ~ 1.0 (s) or OFF (OFF-alarm no trip)	
3M/3H type		Performance mode	Alarm /Trip /Close	
		Protective start setting	5%-60%	
		Acting delay time setting Tδ	0.1 ~ 40 (s)	
		Alarm acting return setting	5%~Start setting	Performance mode is alarm for setting this item
		Alarm return delay time	10 ~ 200 (s)	
Protective characteristics (Accuracy ±10%)		Actual current asymmetric rate / setting	Trip time	
		<0.9	No-acting (No-alarm)	
		≥1.1	Acting (or alarm) as per setting delay time	
Alarm return characteristics (Accuracy ± 10%)		Actual current asymmetric rate / setting	Acting time	
		≥1.1	No return	
		≤0.9	Return as per alarm return delay time	

Setting and Protective Characteristics

Under-voltage protection/Alarm 3M/3H type		
Performance mode	Close / Trip / Alarm	
Protection/Alarm start setting	100 (V) ~ Return value	
Protection acting delay time setting	0.2 ~ 60 (s)	
Alarm acting return setting	Start value ~1200 (V)	Performance mode is alarm for setting this item. Return value ≥ start value
Alarm return delay time	0.2 ~ 60 (s)	
Protective characteristics (Accuracy ±10%)	Multiple of voltage (Umin /Acting setting)	Trip time
	>1.1	No-acting (No-alarm)
	≤0.9	Acting (or alarm) as per setting delay time
Alarm return characteristics (Accuracy ± 10%)	Multiple of voltage (Umin /Operating setting)	Acting time
	<0.9	No return
	≥1.1	Return as per alarm return delay time
Over-voltage protection/Alarm 3M/3H type		
Performance mode	Close / Trip / Alarm	
Protection/Alarm start setting	Return value ~1200 (V)	
Protection acting delay time setting	0.2 ~ 60 (s)	
Alarm acting return setting	100 (v) ~ Start value	Performance mode is alarm for setting this item. Return value ≥ start value
Alarm return delay time	0.2 ~ 60 (s)	
Protective characteristics (Accuracy ±10%)	Multiple of voltage (U min / Acting setting)	Trip time
	<0.9	No-acting (No-alarm)
	≥1.1	Acting (or alarm) as per setting delay time
Alarm return characteristics (Accuracy ± 10%)	Multiple of voltage (U min / Return setting)	Acting time
	≥1.1	No return
	≤0.9	Return as per alarm return delay time
Voltage asymmetric protection/Alarm 3M/3H type		
Performance mode	Close / Trip / Alarm	
Protection/Alarm start setting	2% ~ 30%	
Protection acting delay time setting	0.2 ~ 60 (s)	
Alarm acting return setting	2% ~ Start value	Performance mode is alarm for setting this item. Return value ≥ start value
Alarm return delay time	0.2 ~ 60 (s)	
Protective characteristics (Accuracy ±10%)	Actual voltage asymmetric rate / setting	Trip time
	<0.9	No-acting (No-alarm)
	≥1.1	Acting (or alarm) as per setting delay time
Alarm return characteristics (Accuracy ± 10%)	Actual voltage asymmetric rate / setting	Acting time
	>1.1	No return
	≤0.9	Return as per alarm return delay time
Reverse power protection/Alarm 3M/3H type		
Performance mode	Close / Trip / Alarm	
Protection/Alarm start setting	5 ~ 500(kW)	
Protection acting delay time setting	0.2 ~ 20 (s)	
Alarm acting return setting	5(kW) ~ Start value	Setting this item while only performance mode is alarm. Return value ≥ start value
Alarm return delay time	1.0 ~ 360 (s)	
Protection/Alarm operating characteristics	Same as over-voltage protection / Alarm	

Setting and Protective Characteristics

Phase sequence /Alarm 3M/3H type					
Performance mode			Close / Trip / Alarm		
Acting sequence setting range			Δ Φ: A, B, C / Δ Φ: A, C, B		
Acting/Alarm characteristics			Instantaneous		
Under-frequency, Over-frequency/Alarm_3M/3H type					
Performance mode			Close / Trip / Alarm		
Under-frequency			Protection / Alarm start setting	45 (Hz) ~ Return value	
			Acting delay time setting	0.2 ~ 5.0 (s)	
			Alarm acting return setting	Start value ~65 (Hz)	Performance mode is alarm for setting this item. Return value ≥ start value
			Alarm return delay time setting	0.2 ~ 36 (s)	
Over-frequency			Protection / Alarm start setting	Return value ~65 (Hz)	
			Acting delay time setting	0.2 ~ 5.0 (s)	
			Alarm acting return setting	45 (Hz) ~Start value	Performance mode is alarm for setting this item. Return value ≥ start value
			Alarm return delay time setting	0.2 ~ 36 (s)	
Protection/Alarm acting characteristics			Same as under-voltage, over-voltage protection/Alarm		
Load monitor M/H type & 3M/3H type					
M/H type	Current setting Ic1, Ic2		(0.2 ~ 1) In or OFF (OFF-function close)		
	Time setting		15, 20, 25, 30, 40, 50, 60, 80, 100, 120, 160, 200, 240, 320, 400, 480 (s)		
	Output characteristics (Accuracy ± 10%)		Load monitor mode	Multiple of current	Acting time
			Mode 1 (Independent control two branches load)	≤1.05 Ic1 or Ic2	No operation
				>1.2 Ic1 or Ic2	Delay replay operating (same as over-load long delay characteristics curve)
			Mode 2 (Control the same branch load, require Ic1 > Ic2)	≤1.05 Ic1	No operation
				>1.2 Ic1	Delay replay operating (same as over-load long delay characteristics curve)
				<Ic2	Delay relay operating (delay fixed 60s)
	Thermal memory time		30min (OFF) or power failure release		
3M/3H type	Operating mode		Current setting	Time setting	
	Discharge I	Current mode 1	(0.2 ~ 1.0) In	(20% ~ 80%) TR (TR: over-load long delay acting time)	
		Current mode 2			
		Power mode 1	200 ~ 10000 (kW)	10 ~ 3600(s)	
		Power mode 2			
	Discharge II	Current mode 1	(0.2~1.0) In	(20% ~ 80%) TR (TR: over-load long delay acting time)	
		Current mode 2	0.2In ~ Discharge I	10 ~ 600(s)	
		Power mode 1	200 ~ 10000 (kW)	10 ~ 3600(s)	
		Power mode 2	100 (kW) ~ Discharge I		

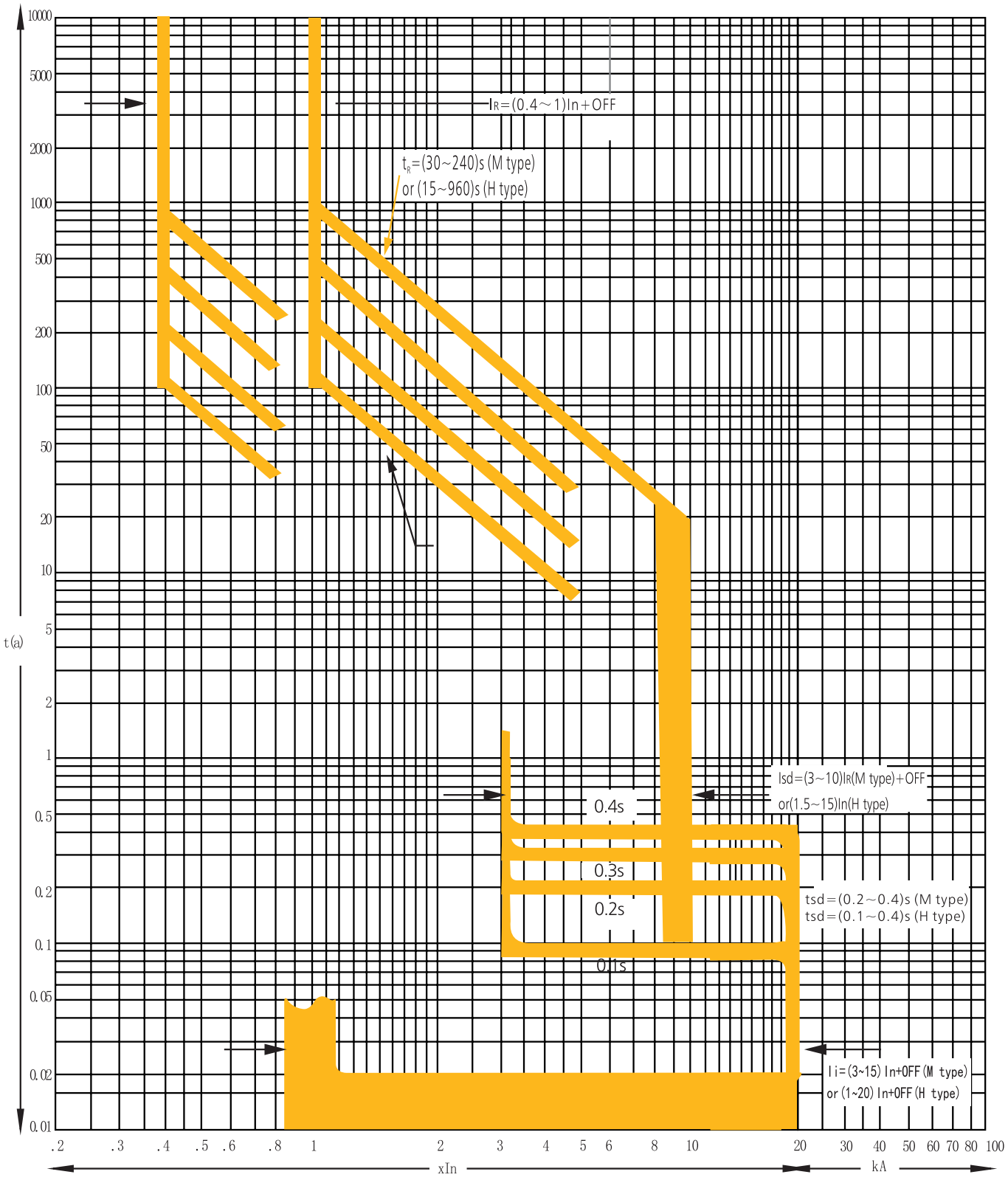
Setting and Protective Characteristics

Over-load long delay protective operating delay table C1-C16																	
Current type	Fault current	Delay time (s)															
		C1	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**C9**	**C10**	**C11**	**C12**	**C13**	**C14**	**C15**	**C16**
SI	1.5Ir	0.61	0.98	1.47	2.46	3.68	4.91	6.14	8.29	11.1	17.2	24.6	36.8	49.1	61.4	73.7	86
	6Ir	0.14	0.22	0.33	0.55	0.82	1.1	1.39	2.06	2.47	3.84	5.48	8.22	10	13.7	16.4	19.2
VI	1.5Ir	2	3.2	4.8	8	12	16	20	27	36	56	80	120	160	200	240	280
	6Ir	0.2	0.32	0.48	0.8	1.2	1.6	2	2.7	3.6	5.6	8	12	16	20	24	28
EI(G)	1.5Ir	8	12.8	19.2	32	48	64	80	108	144	224	320	480	640	800	960	1120
	6Ir	0.29	0.46	0.69	1.14	1.71	2.29	2.86	3.86	5.14	8	11.4	17.1	22.9	28.6	34.3	37.1
EI(M)	1.5Ir	6.22	9.96	14.9	24.9	37.3	49.8	62.2	84	112	174	249	373	498	622	747	871
	6Ir	0.28	0.45	0.68	1.13	1.69	2.26	2.82	3.81	5.08	7.9	11.3	16.9	22.6	28.2	33.9	36.7
HV	1.5Ir	2.46	3.94	5.9	9.85	14.8	19.7	24.6	33.2	44.3	68.9	98.5	147	197	246	295	344
	6Ir	0.01	0.01	0.02	0.03	0.05	0.06	0.08	0.1	0.14	0.22	0.31	0.46	0.62	0.77	0.93	1
I^2t	1.5Ir	15	20	25	30	40	60	80	120	160	240	360	480	600	720	840	960
	6Ir	0.94	1.25	1.56	1.88	2.5	3.75	5	7.5	10	15	22.5	30	37.5	45	52.5	60

Factory Setting (Approval)

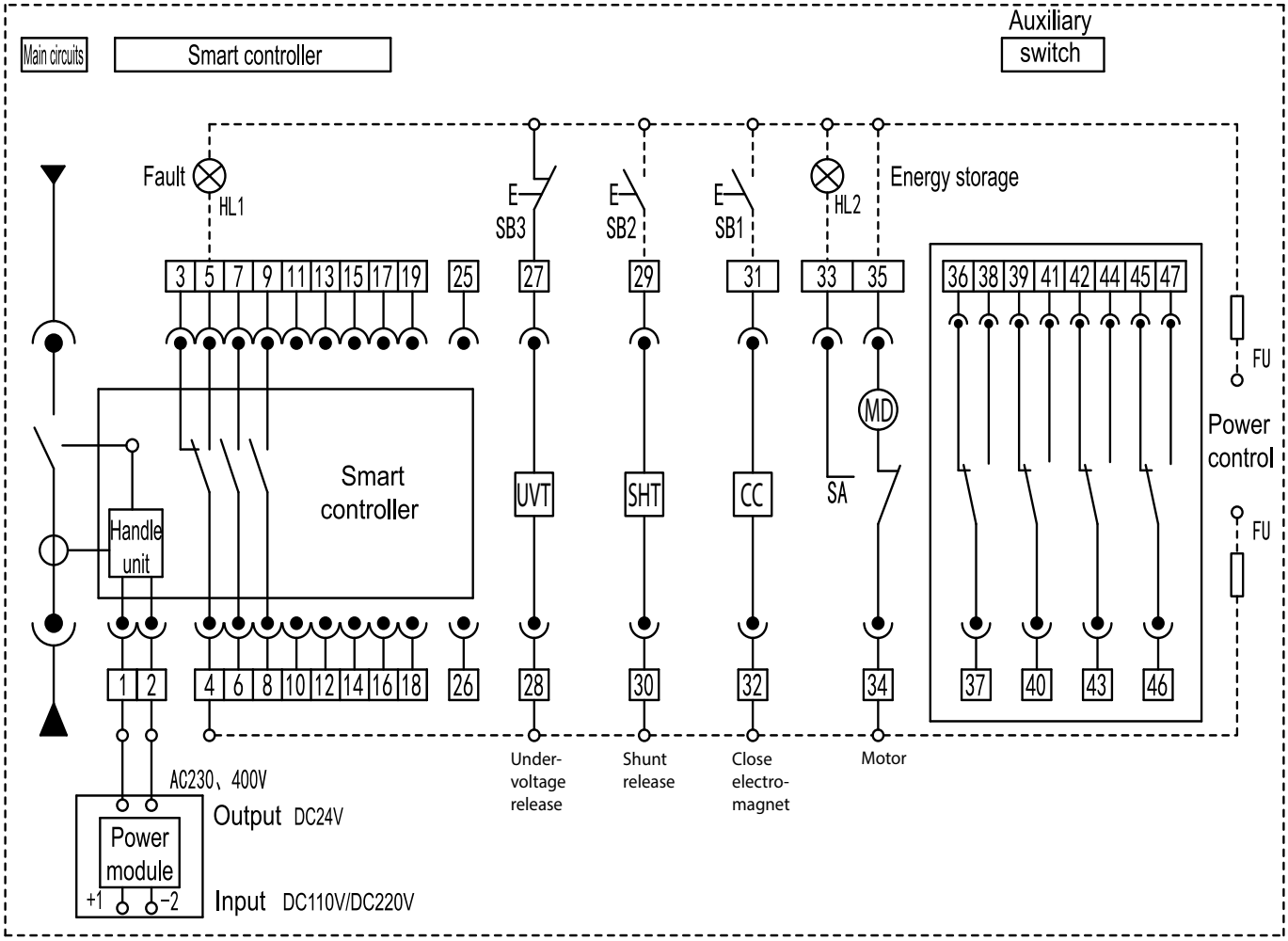
Protection characteristics		Setting current	Setting time	Remarks
Over-load long delay		1.0In	30s	Thermal memory (ON-30ms)
Short-circuit short delay	Inverse time	6Ir	0.2s	-
	Definite time	8Ir	0.2s	
Short-circuit instantaneous		12In	-	-
Neutral protection		100%In	-	-
Grounding protection	In ≤ 1250A	0.8In	Alarm no trip	-
	In 1600A	1200A		
Asymmetry current		OFF	-	The user open by themselves according to their request
Load monitor		OFF	-	-

Over current protection characteristic



Electrical diagram

M type connections



1, 2: Auxiliary Power Supply Incoming for Smart Controller: The auxiliary power supply is DC, which supplements the power module.

3, 4, 5: Signal Contacts for Fault-to-Trip Indicating Release: Contact 4 is for the common terminal.

6, 7 & 8, 9: Two Sets of Auxiliary Open Contacts for Circuit Breakers (for selection)

10, 11: /

12, 13: Group 1 controller signal outgoing (for selection)

14, 15: Group 2 controller signal outgoing (for selection)

16, 17: Group 3 controller signal outgoing (for selection)

18, 19: Group 4 controller signal outgoing (for selection)

20: Controller grounding

21, 22, 23, 24: N, A, B, C phase voltage signal incoming (for selection)

25, 26: External connection N pole or incoming of earth current transformer

27, 28: Under-voltage release

29, 30: Shunt release

31, 32: Closing electromagnet

33, 34, 35: Motor operation mechanism, 34 for common terminal

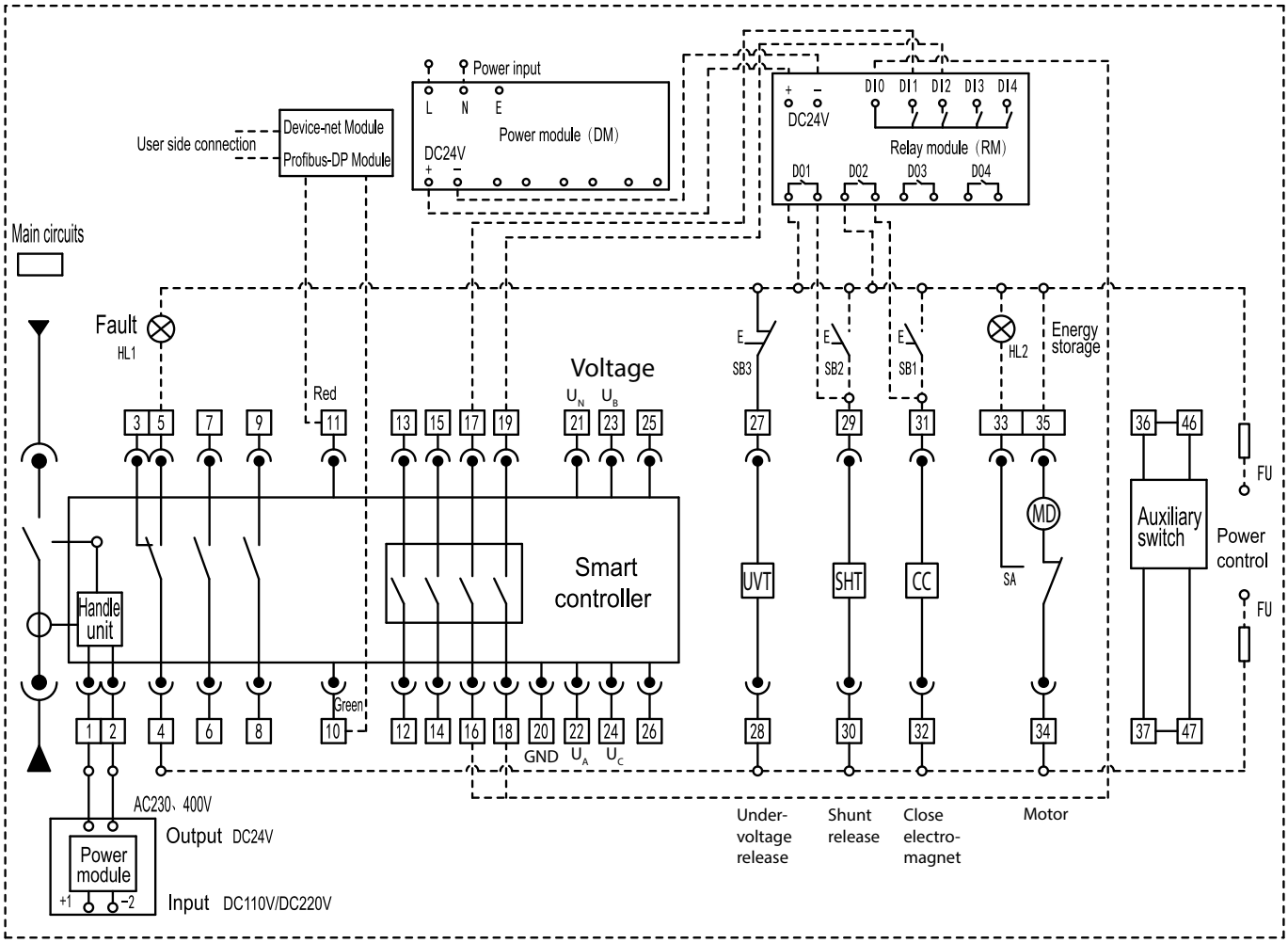
UVT, SHT, CC, MD: Under-voltage release, shunt release, closing electromagnet, motor operation mechanism

HL1, HL2: Fault to trip indicating, motor energy storage fulfill indicating (provide by the user)

SB1, SB2, SB3: Close, open, under-voltage button (provide by the user/under-voltage shall be short connection)

SA, FU: Motor travel switch (with motor), fuse (provide by the user)

H type connections



1,2: Auxiliary power supply incoming for smart controller. auxiliary power supply is DC, which add the power module

3, 4, 5: Signal contacts for release fault to trip indicating, 4 for common terminal

6, 7 & 8, 9: Two sets of auxiliary open contacts for circuit breakers

10, 11: Communication interface

12, 13: Load monitor 1 (default)

14, 15: Load monitor 2 (default)

16, 17: Opening signal output

18, 19: Closing signal output

20: Controller grounding

21, 22, 23, 24: N, A, B, C phase voltage signal incoming

25, 26: External connection N pole or earth current transformer incoming

27, 28: Under-voltage release or no-voltage release

29, 30: Shunt release

31, 32: Close electromagnet

33, 34, 35: Motor operation mechanism (34 for common terminal)

36 – 47: Auxiliary switch

UVT, SHT: Under-voltage release and shunt release

CC, MD: Close electromagnet and operation mechanism

HL1, HL2: Fault to trip indicating and motor energy storage finish indicating (provide by the user)

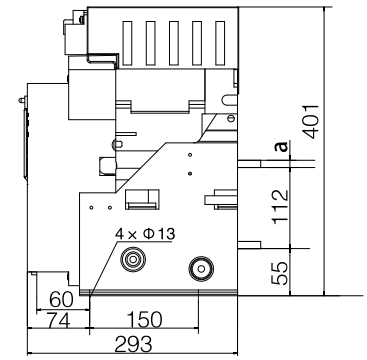
SB1, SB2, SB3: Opening, closing and under-voltage button (provide by the user)

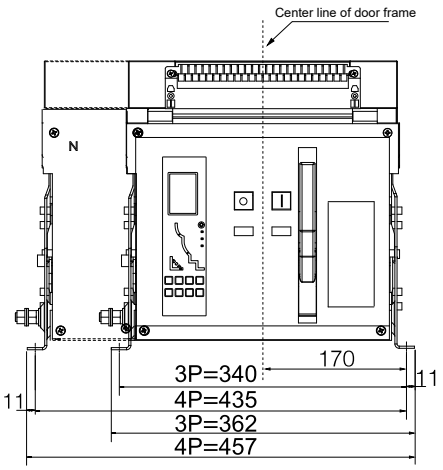
SA: Motor travel switch with the motor

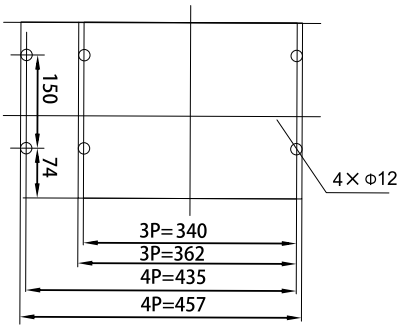
FU: Fuse (provide by the user)

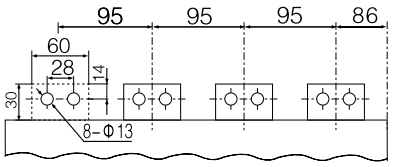
Dimensions

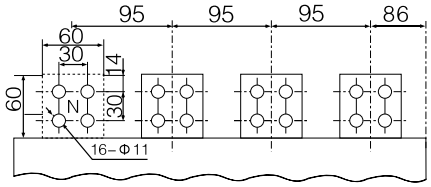
ACB Fixed type – Frame 2000A 3P/4P (630A ~ 2000A)





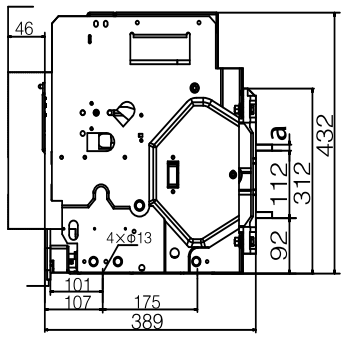


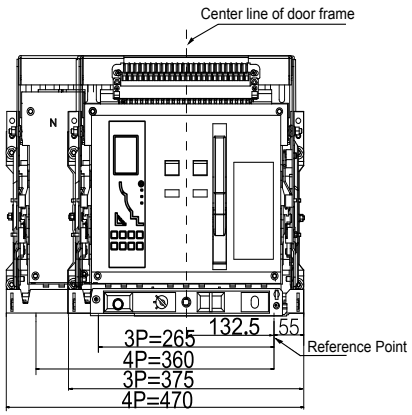


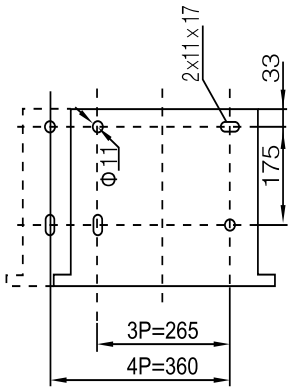


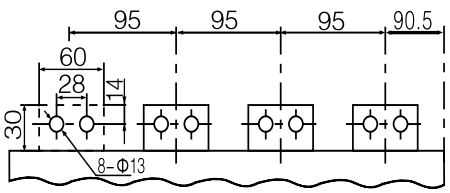
In(A)	a(mm)
630 - 800	10
1000 - 1600	15
2000	20

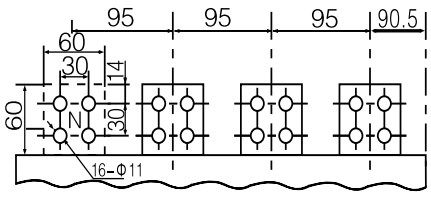
ACB Drawout type – Frame 2000A 3P/4P (630A ~ 2000A)





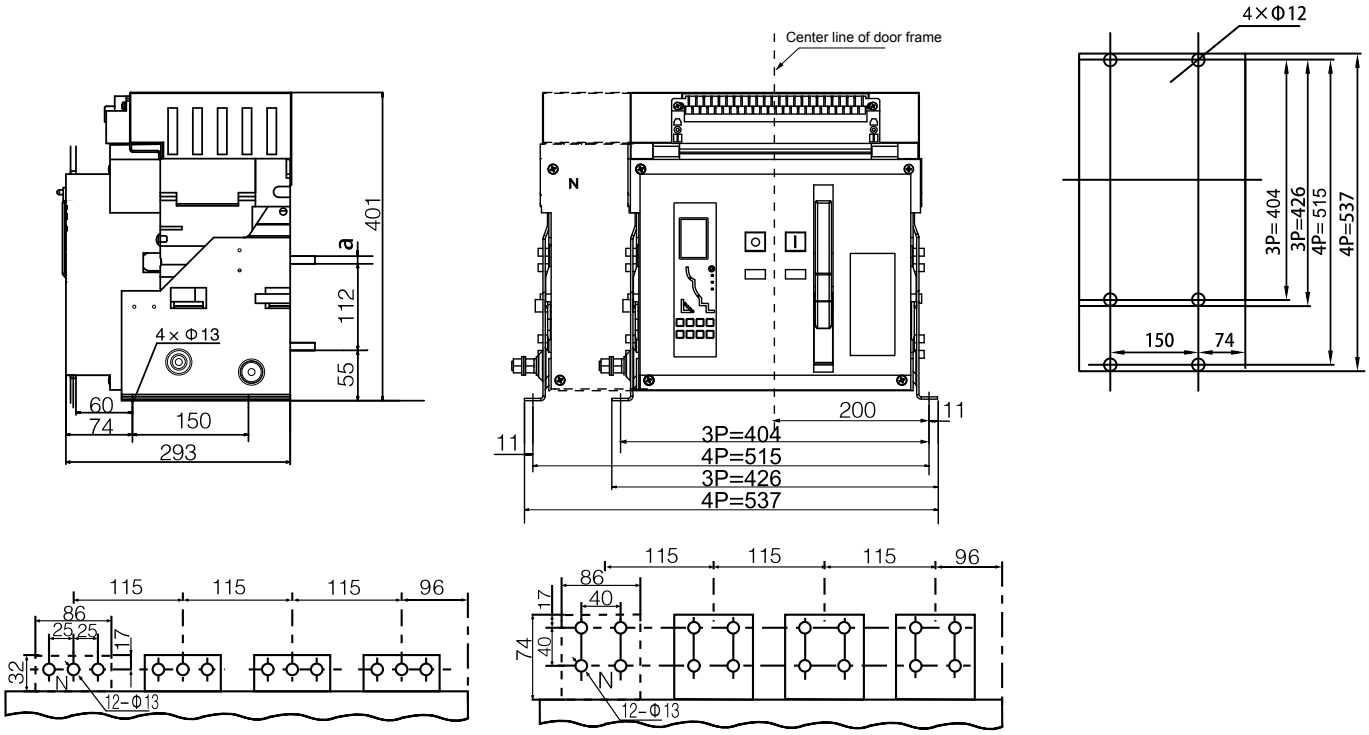






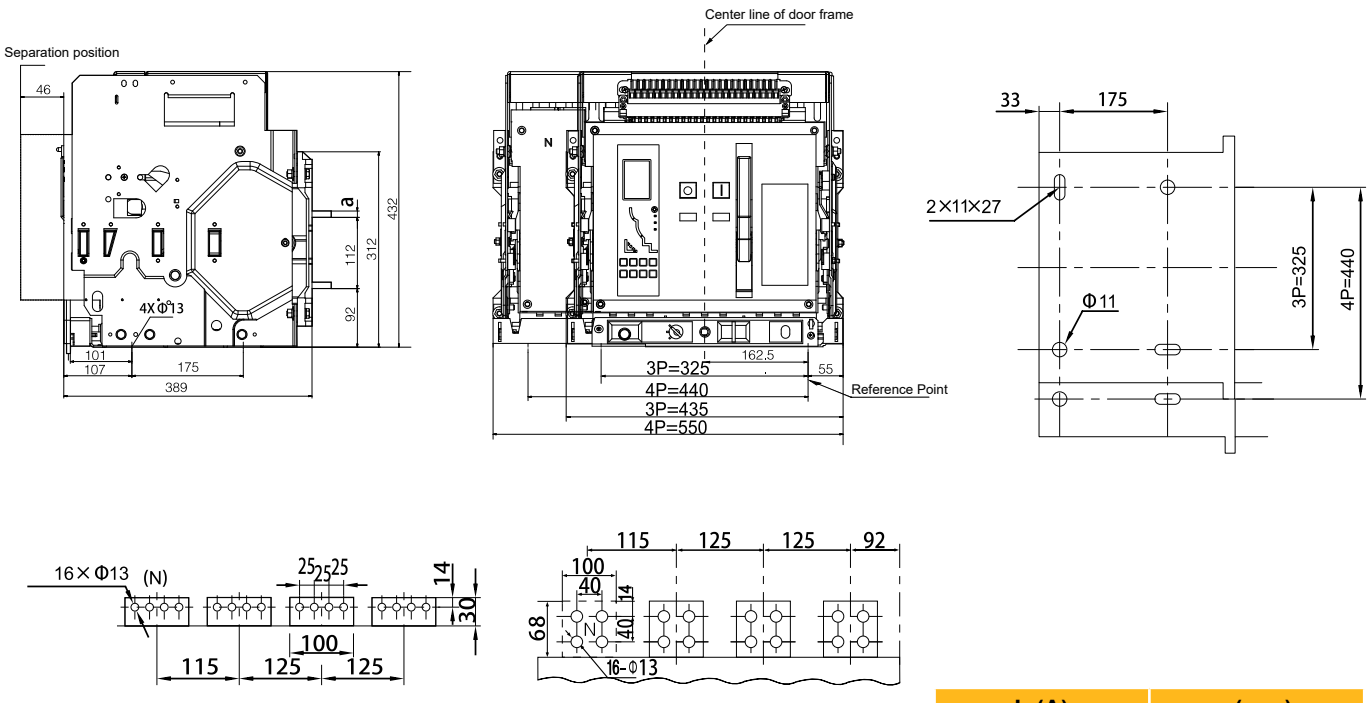
In(A)	a(mm)
630 - 800	10
1000 - 1600	15
2000	20

ACB Fixed type – Frame 4000A 3P/4P (2500A, 3200A)



In(A)	a(mm)
2500	20
3200	30

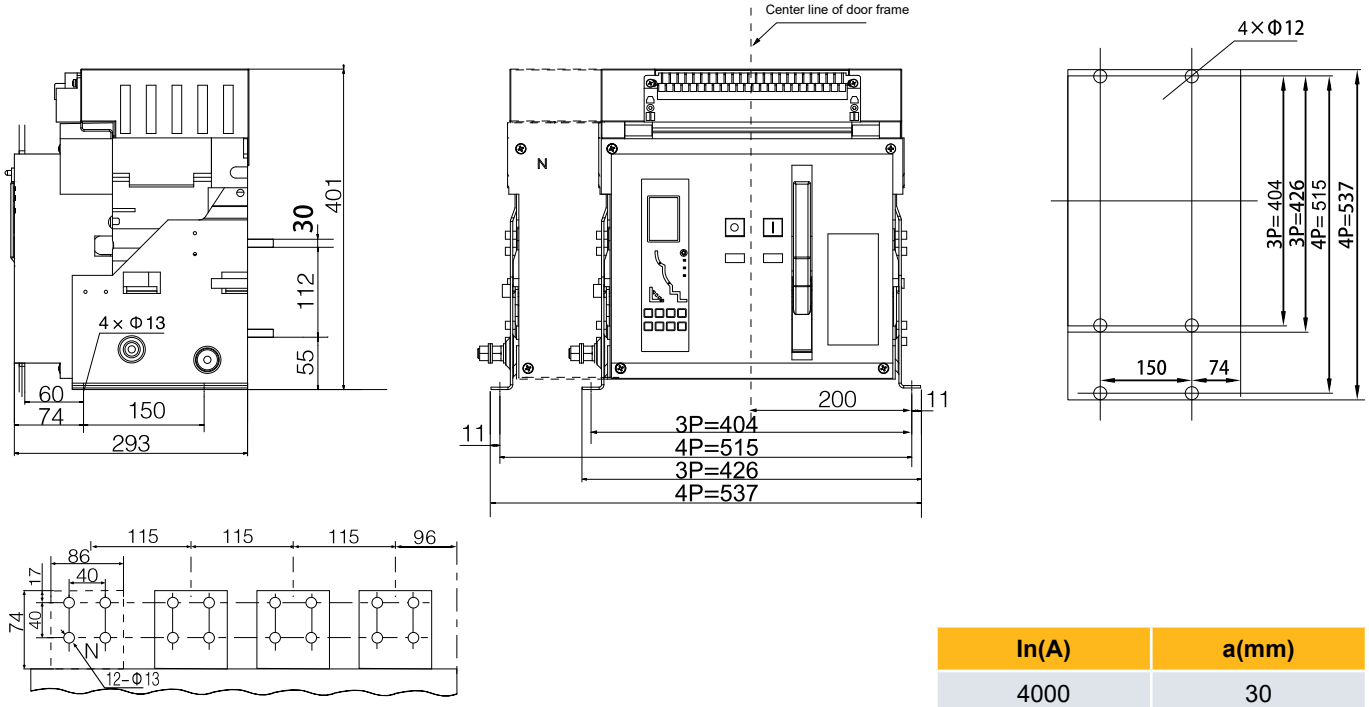
ACB Drawout type – Frame 4000A 3P/4P (2500A, 3200A)



In(A)	a(mm)
2500	20
3200	30

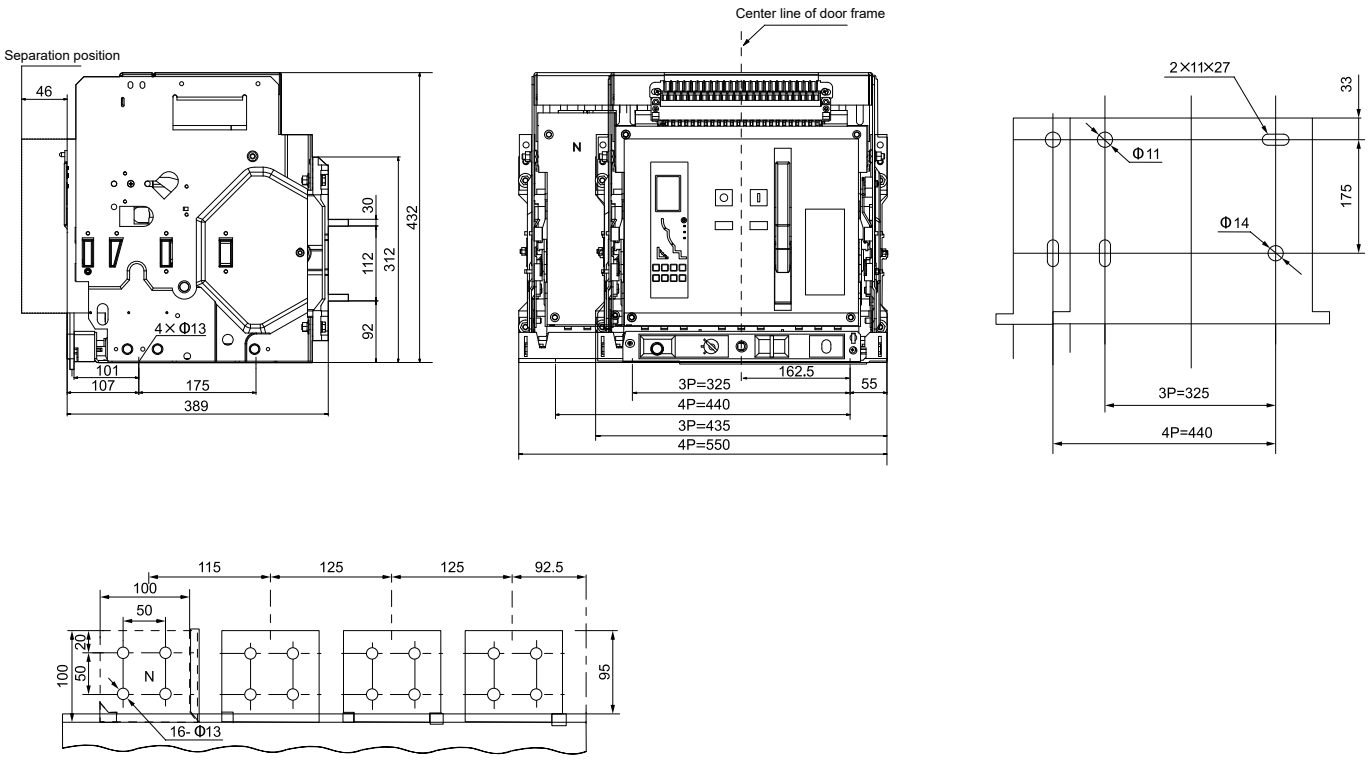
Dimensions

ACB Fixed type – Frame 4000A 3P/4P (4000A)



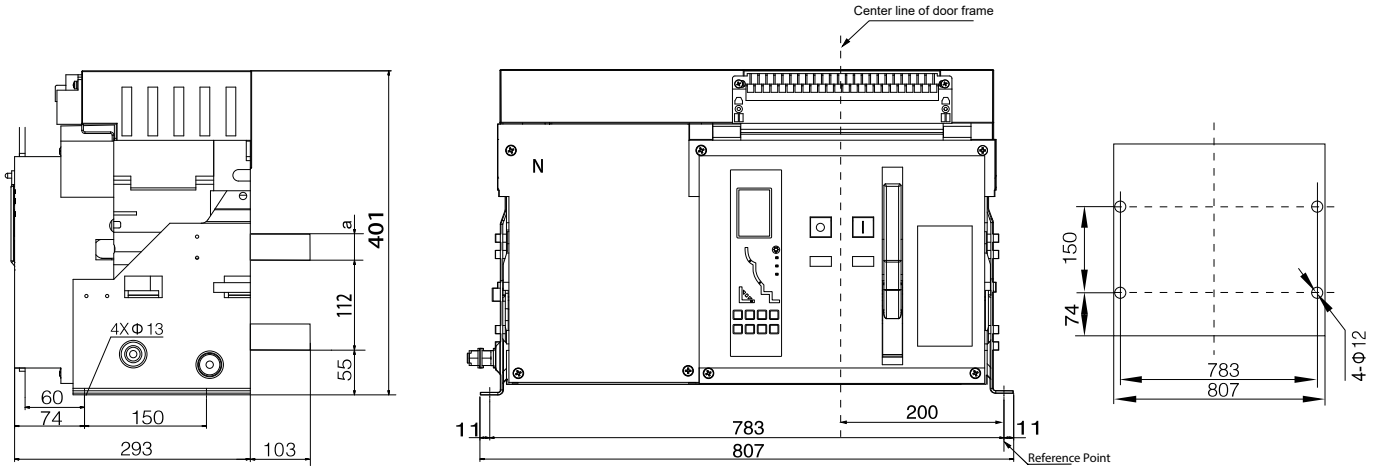
In(A)	a(mm)
4000	30

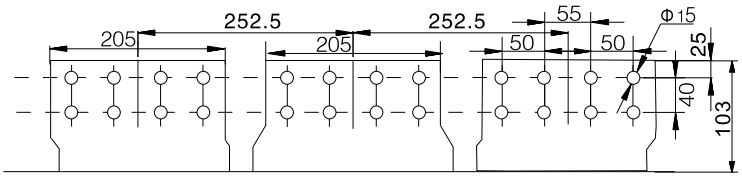
ACB Drawout type – Frame 4000A 3P/4P (4000A)



In(A)	a(mm)
4000	30

ACB Fixed type – Frame 6300A 3P (4000A, 5000A/3P)

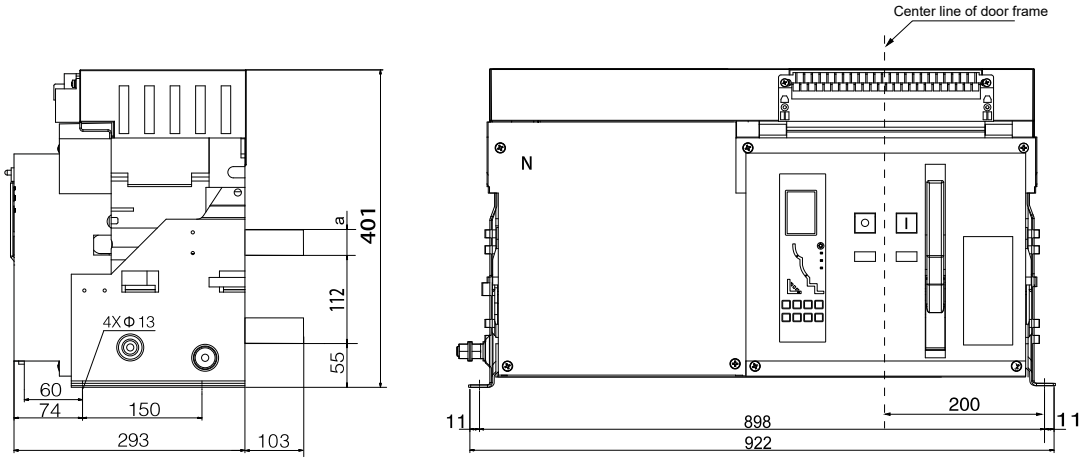


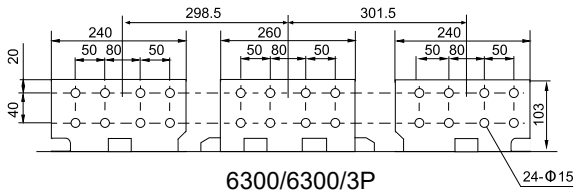


6300/4000A, 5000A/3P

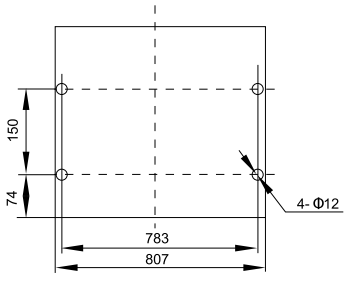
In(A)	a(mm)
4000	20
5000	30

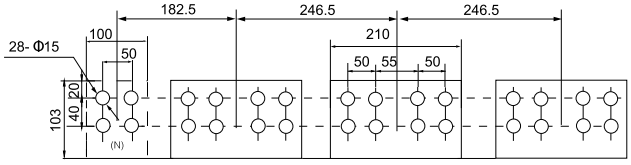
ACB Fixed type – Frame 6300A (4000A, 5000A/4P, 6300A/3P)





6300/6300/3P



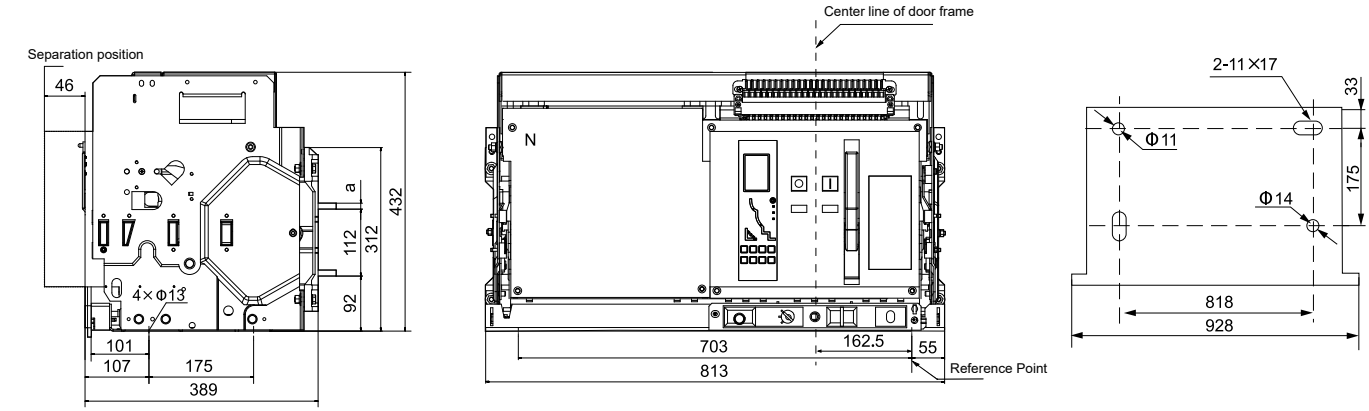


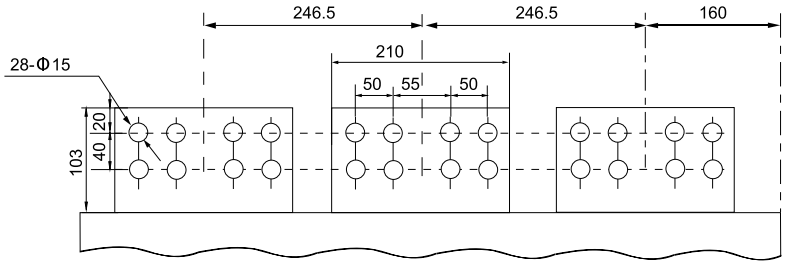
6300/4000A, 5000A/4P

In(A)	a(mm)
4000	20
5000, 6300	30

Dimensions

ACB Drawout type – Frame 6300A 3P (4000A, 5000A/3P)

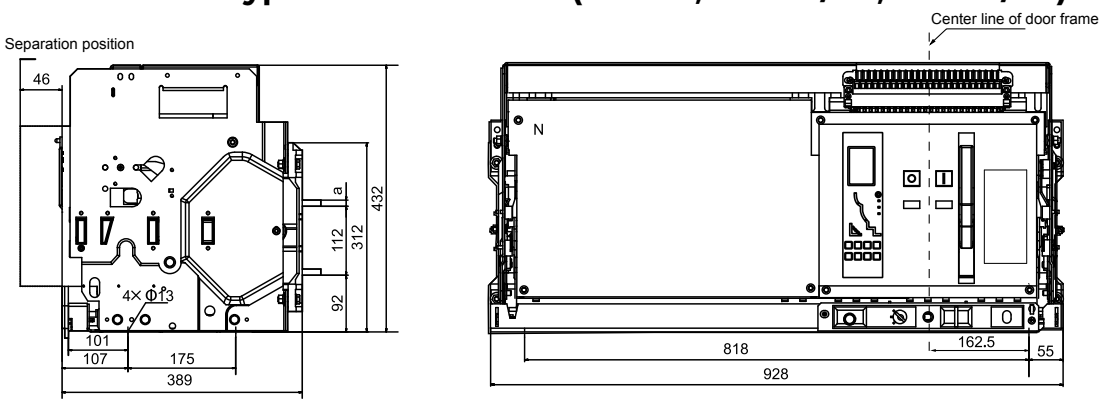


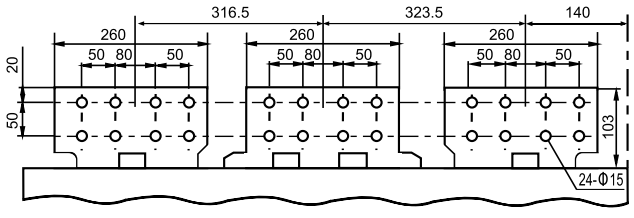


6300/4000, 5000/3P

In(A)	a(mm)
4000	20
5000	30

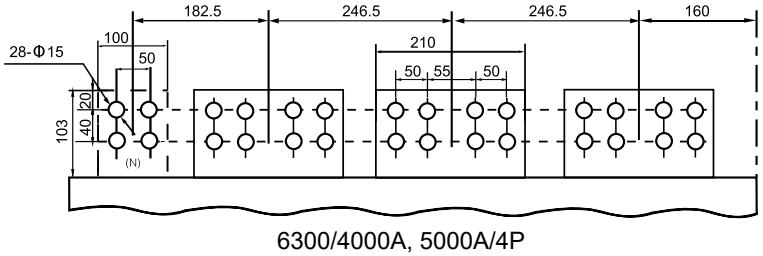
ACB Drawout type – Frame 6300A (4000A, 5000A/4P, 6300A/3P)



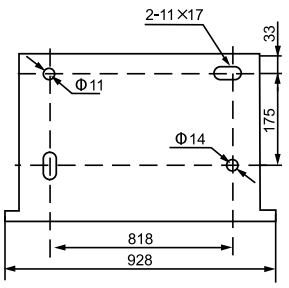


6300/6300/3P

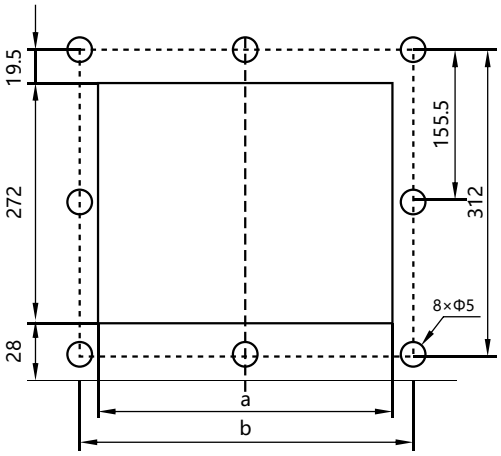
In(A)	a(mm)
4000	20
5000, 6300	30



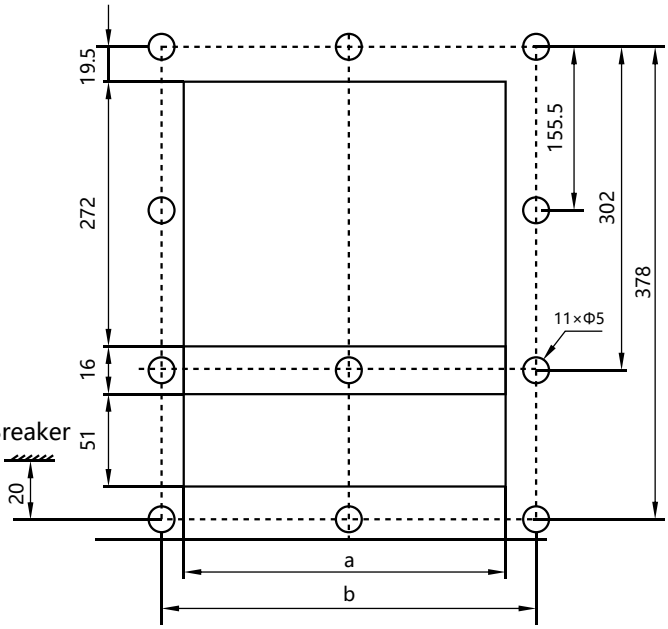
6300/4000A, 5000A/4P



Installation size for panel drilling



Fixed-type



Drawout-type

Frame	a	b
2000A	306	346
4000/6300A	366	406

Accessories

Shunt release

The Shunt release instantaneously opens the circuit breaker when energised.

- Operating voltage: (0.7~1.1) Us
- Breaking time: (50±10) ms

	Voltage	Model
AC	220VAC	SHTT2MA3
	380VAC	SHTT3MA3
DC	110VDC	SHTT6MA3
	220VDC	SHTT7MA3

Warning: Do not keep the power on for an extended period to avoid damaging the shunt release.

Closing electromagnet

The closing electromagnet will close the circuit breaker remotely if the spring mechanism is charged.

- Work voltage: (0.85~1.1) Us
- Closing time: (55±10) ms

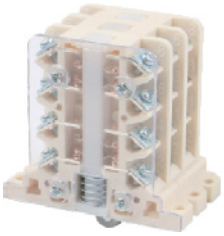
	Voltage	Model
AC	220VAC	CCC2MA3
	380VAC	CCC3MA3
DC	110VDC	CCC6MA3
	220VDC	CCC7MA3

Warning: Forbid making the power for long time to avoid the closing release being damaged.

Auxiliary contact

- Standard model: 4NO/4NC
- Options: 4NO+4NC, 2NO+6NC, 3NO+3NC
- Breaking capacity: 10A at 220/380VAC; 3A at 125/250VDC

Auxiliary contact	Model
4NO4NC	AUX44MA3
2NO6NC	AUX26MA3
3NO3NC	AUX33MA3
2NO4NC	AUX24MA3



Under-voltage release

Without power supply, under-voltage release can't close. It is classified into instantaneous and time-delay type.

After closing the circuit breaker, under-voltage release can break the circuit breaker when the voltage drops to (70%~35%) Us. The circuit breaker can be closed again when power voltage recovers and exceeds 85%Us.

- Action voltage: (0.35~0.7) Us
- Reliable making voltage: (0.85~1.1)Us
- Reliable non-making voltage: ≤0.35Us
- Delay time: 0.5s, 1s, 3s

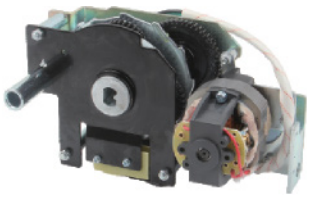
	Voltage	Model
0s	220VAC	UVTU2MA3
	380VAC	UVTU3MA3
0.5s	220VAC	UVTU205MA3
	380VAC	UVTU305MA3
1.0s	220VAC	UVTU210MA3
	380VAC	UVTU310MA3
3.0s	220VAC	UVTU230MA3
	380VAC	UVTU330MA3

Note: Make sure there is power supply on the under-voltage release, before making the circuit breaker.

Motor-driven charging device

With the function of motor-driven storing and auto restoring energy after closing the circuit breaker, the mechanism can ensure closing the circuit breaker instantly after breaking the circuit breaker.

- Work voltage: (0.85~1.1) Us
- Power loss: Max 150W
- Energy-storage time: <5s



	Voltage	Model
AC	110VAC	MDM1MA3
	220VAC	MDM2MA3
	380VAC	MDM3MA3
DC	110VDC	MDM6MA3
	220VDC	MDM7MA3

"Disconnected" position locking device for the draw-out type

For the "disconnected" position of the draw-out circuit breaker, a lock rod can be pulled out to lock the matter, and the breaker locked will be unable to be turned towards the TEST or CONNECTION position, Padlocks have to be provided by users themselves.

Accessories

Door Frame

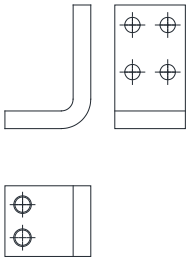
Installed on the door of the distribution cubicle, for sealing the distribution cubicle and making the protection class to IP40.

Terminal connection	Frame	Model
Fixed type	2000	DF20FMA3
	4000 & 6300	DF40FMA3
Draw-out type	2000	DF20DMA3
	4000 & 6300	DF40DMA3

Terminal extension

Terminal extension is used to extend the connection point.

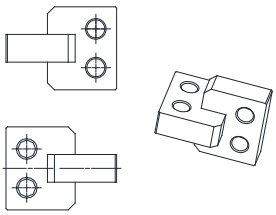
Frame	In (A)	Model
2000	630 ~ 1250	TE0612MA3
	1600 ~ 2000	TE1620MA3



Spreaders

Spreaders extend the terminals of the ACB to connect with busbars or connectors.

Frame	In (A)	Model
2000	630 ~ 800	SP0608MA3
	1000 ~ 1600	SP1016MA3
	2000	SP2020MA3



Intelligent trip unit

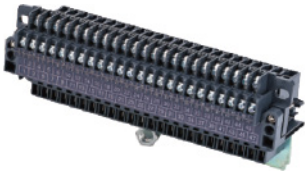
Select the “Intelligent trip unit” to meet the correct protection functions as well as measurement.

Protection	Model
LSIG	M type
LSIG and LM	H type
LSIG and OV/UV/OF/UF/rP	3M type
LSIG, OV/UV/OF/UF/rP and LM	3H type

Secondary wiring terminal

It is a device that enables the main unit to be operated independently by separating the automatic connection type of main unit from the cradle. As an optional separate product.

Model: SWTACB



Key lock

The OFF push-button of the breaker can be locked in the position of depress, and at this time, the breaker can not be closed for operation.

When the user selects the option, the factory provides locks and keys; One breaker is provided with one lock and one key for the lock; two breakers are provided with two locks and one key for the locks; three breakers are provided with three same locks and two same keys for the locks.

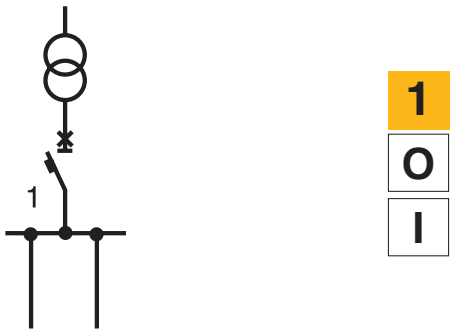
After the user chooses to install, the factory provides locks and keys. The user buys the key locks separately. When installing, the panel needs to be perforated with a hole opener. The diameter of the hole opener is 28 mm. The hole opener is provided by the user.

Number of locks and keys	Model
1 lock and 1 key	KeyK1MA3
2 lock and 1 key	KeyK2MA3
3 lock and 2 key	KeyK3MA3
3 lock and 1 key	KeyK4MA3

Note: the air circuit breaker with key lock, when the key has to be pulled out, it is necessary to first press the OFF key, turn the key anticlockwise, and then pull out the key.

K1 - 1 lock and 1 key

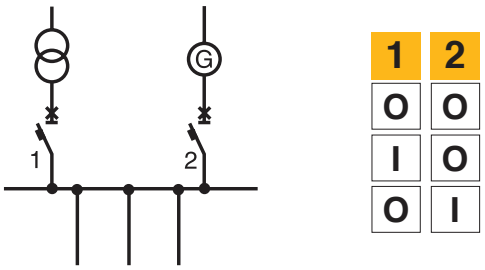
A circuit breaker is equipped with a separate lock and a key.



O = Circuit-breaker open
I = Circuit-breaker closed

K2 - 2 lock and 1 key

Two circuit breakers are equipped with two identical locks and a key.

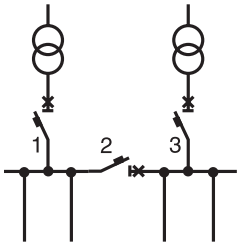


O = Circuit-breaker open
I = Circuit-breaker closed

Accessories

K3 - 3 lock and 2 key

Three circuit breakers are equipped with three identical locks and two identical keys.

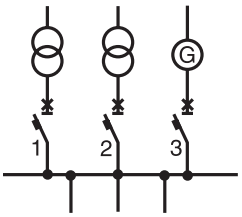


1	2	3
O	O	O
I	O	O
O	I	O
O	O	I
O	I	I
I	I	O
I	O	I

O = Circuit-breaker open
I = Circuit-breaker closed

K4 - 3 lock and 1 key

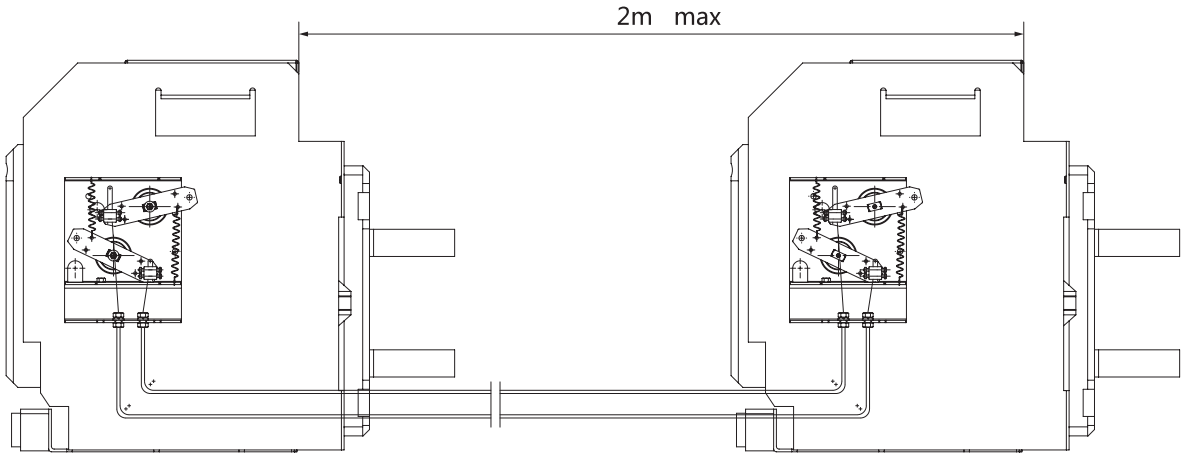
Three circuit breakers are equipped with three identical locks and a key.



1	2	3
O	O	O
I	O	O
O	I	O
O	O	I

O = Circuit-breaker open
I = Circuit-breaker closed

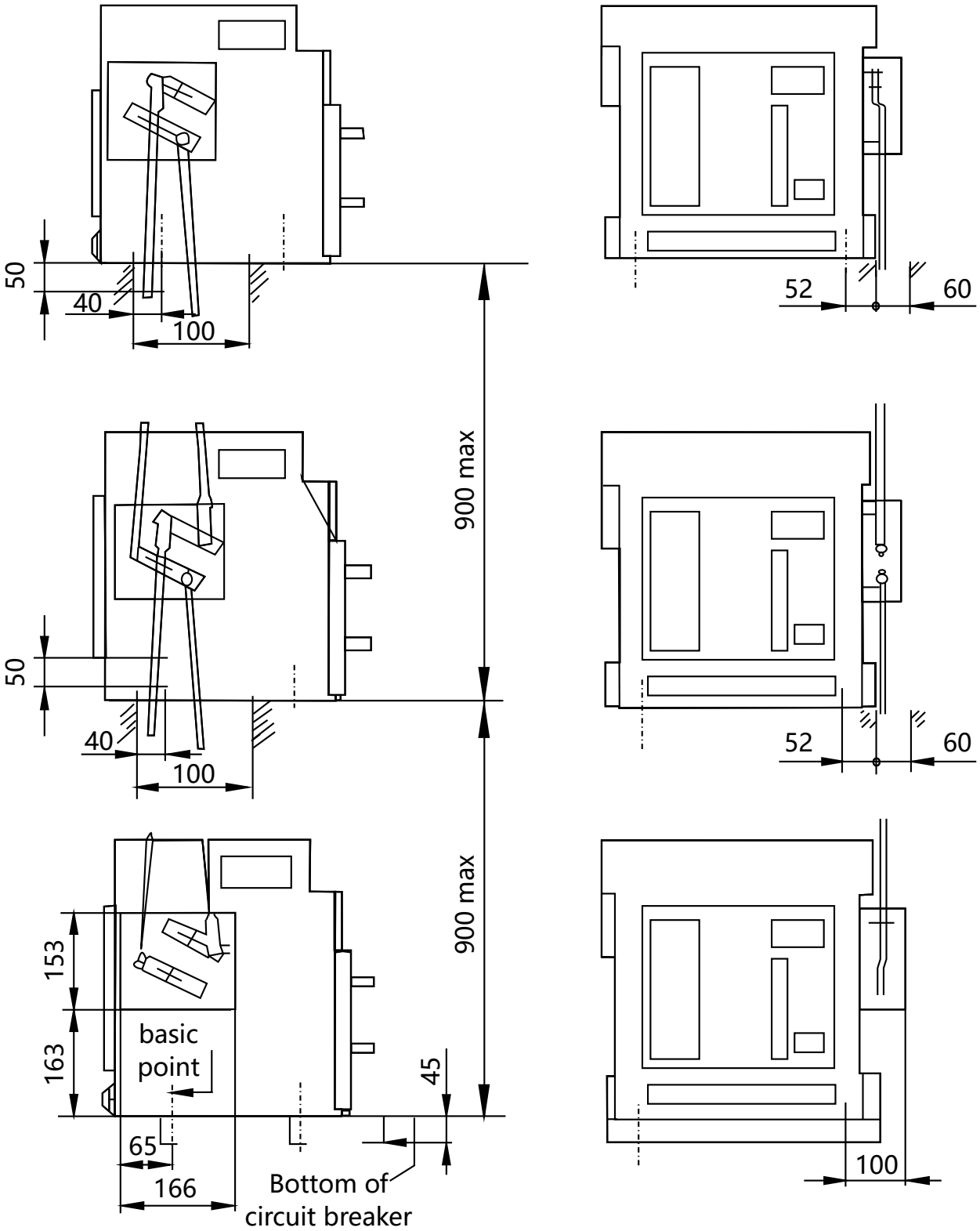
Horizontal-installed mechanical interlock



Circuit breaker 1 Circuit breaker 2

Feature	Model
Interlocking of 2 devices using cables	2WAYMA3
Interlocking of 3 devices using cables	3WAYMA3

Vertical-installed mechanical interlock



Feature	Model
Interlock the 2 devices with a hard bar	2WAYBMA3
Interlock the 3 devices with a hard bar	3WAYBMA3

Note: 3 pcs of circuit breaker vertical-installed with connecting-rod type mechanical interlock.

If need 2 pcs of circuit breaker interlocked, just remove the top one.

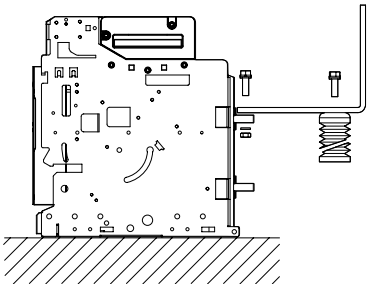
Temperature derating

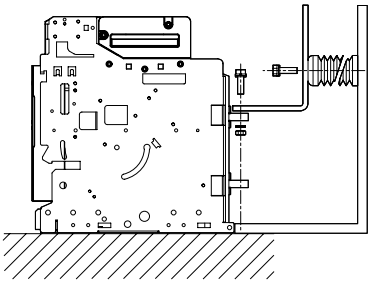
The ambient temperature range for operation is -5°C to +40°C, with the average value not exceeding +35°C within a 24-hour period. If temperatures exceed +40°C, the user should derate the capacity according to the provided guidelines.

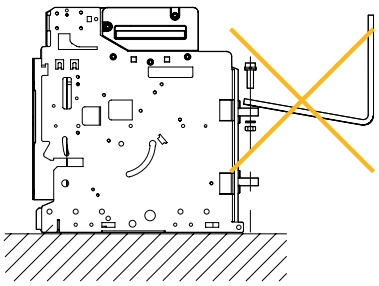
Ambient temperature		+40°C	+50°C	+60°C
Frame 2000	630A	630A	630A	630A
	800A	800A	800A	800A
	1000A	1000A	1000A	1000A
	1250A	1250A	1250A	1250A
	1600A	1600A	1550A	1500A
	2000A	2000A	1900A	1750A
Frame 4000A	2000A	2000A	2000A	2000A
	2500A	2500A	2500A	2500A
	3200A	3200A	3100A	2900A
	4000A	4000A	3550A	3200A
Frame 6300A	4000A	4000A	4000A	4000A
	5000A	5000A	5000A	5000A
	6300A	6300A	5500A	4800A

Installation recommendation BUS-BAR Connection

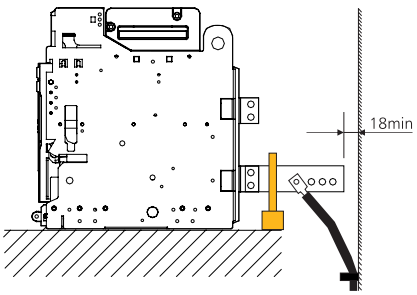
Bus-bar connection

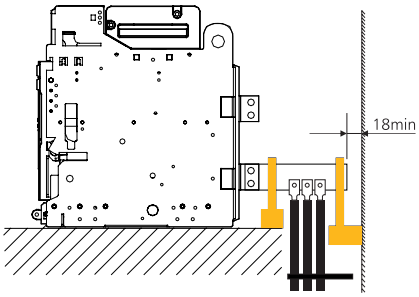


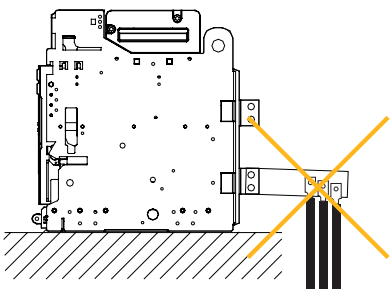




Cables connections







Maintenance procedures

Regular inspection required

Regular inspection required	
Interval time	**Operation mode**
Annually	Turn on and off local and remote devices, and use various auxiliaries
	Successively
	Test operator column
	Small test suite for control unit test
Every two years or when the maintenance index of the controller unit reaches 100	Check the arc extinguishing chamber
	Check contact system
	Check the tightness of the connection
Parts need to be replaced according to the number of business cycles	
Accessory	**Intervening entity**
Arc extinguishing chamber	User
Electric operating mechanism	User
Mechanical interlock	User
Link spring	User
Shunt coil / closing coil / undervoltage coil	User

Maintenance operations

1. Each rotating part should be regularly lubricated during operation
2. Regular maintenance should be performed to remove dust in order to maintain the insulation level of the circuit breaker
3. The contact system shall be inspected regularly, especially after each short circuit breaking. The inspection contents are as follows:

- The flame marks on the two walls of the arc extinguishing chamber are clear, whether the arc extinguishing wall is broken or not, and whether the arc extinguishing grid is seriously burned, which needs to be replaced in time according to the situation
- Whether the contact is in good contact and the contact thickness is ≤ 1mm, it needs to be sent to the manufacturer for replacement
- Whether the connecting parts are loose
- After the breaker fault is broken, the controller can light up to indicate the cause of the fault. After the power is cut off, it still has the memory function. After the power is turned on again, press the “fault check” key on the control panel to indicate the information of the last fault trip. If a new fault occurs, clear the past fault memory and keep the new fault memory

Note: the simulated power-off of the test state is not memorized. Press the “reset” key once after the inspection to make the controller enter the normal state.

Troubleshooting

Fault phenomenon	Cause analysis	Exclusion scheme	Remarks
Motor cannot store energy or abnormal	The voltage specification is inconsistent with the circuit breaker	Check whether the data label on the circuit breaker conforms to the ordering requirements, or it will be replaced	The external power supply must meet the requirements and the wiring must be correct
	Incorrect wiring of the circuit breaker or external line	Check the circuit with the universal meter against the wiring diagram	
	Motor burnt out	Replace the motor	
	After energy storage, the motor continues to operate	The travel switch in the mechanism is broken. Replace the travel switch	
The circuit breaker cannot be closed	Undervoltage coil not engaged	Supply power to the undervoltage coil, replace if burnt out	
	Load short circuit or controller reset button not reset	Reset the reset button of the controller after eliminating the short circuit fault	
	Shunt coil energized for a long time	The shunt coil cannot be energized or checked for a long time. If it is burnt out, replace it	
The circuit breaker cannot be opened	No action of shunt coil and undervoltage coil	Supply power to shunt coil, replace if burnt out	
		Make the undervoltage coil lose power, and replace the undervoltage coil if it does not act	
	No action of flux converter	If there is no signal from the ETU, replace the ETU	
		Adjust the position of the flux converter	
Frequent tripping of circuit breaker	Controller red reset button pops up	Check what protection indicator is on and eliminate the cause of the fault	
		If there is no fault in the circuit, the controller shall be replaced	
	Undervoltage coil protection function starts	Check if the grid voltage fluctuates	
		Check whether the power supply of undervoltage coil is loose	
		Can the fault be eliminated after the undervoltage coil is removed	

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