

ELECTRONIC MOLDED CASE CIRCUIT BREAKER



A series



SHIHLIN ELECTRIC & ENGINEERING

1. OVERVIEW

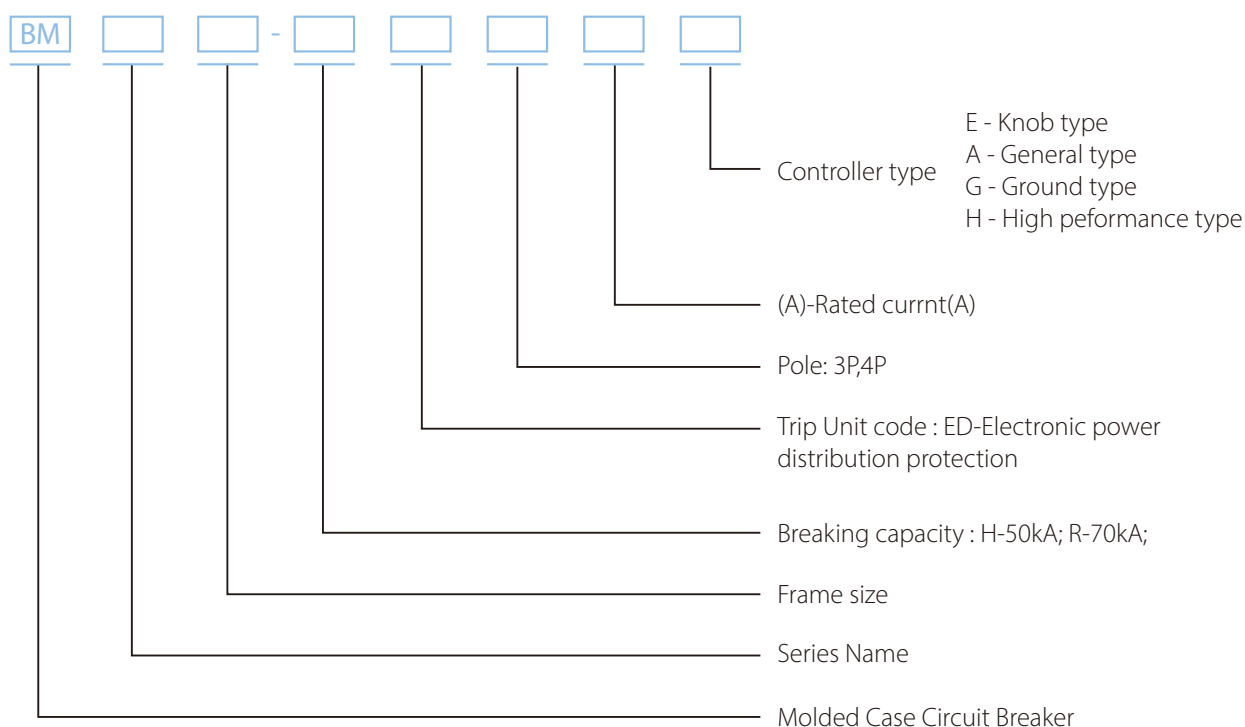
The BMA series electronic molded case circuit breakers are a new generation product developed by Shihlin with high breaking capacity, which has a short-circuit breaking capacity of $I_{cs}=100\% I_{cu}$. This series total have 6 frame levels, BMA100, BMA160, BMA250, BMA400, BMA630, BMA800. The rated current ranges from 40A to 800A, and the rated insulation voltage is 1000V. It can work in TN, TT, and IT distribution systems with a rated voltage of 50Hz and below 690V. It is mainly used to protect distribution lines and motors from overload, short circuit, and grounding faults.

This series of circuit breakers has various intelligent protection functions (such as long timedelay, short time delay, instantaneous, ground fault, locked rotor, blocking fault, and phase imbalance protection). Users can set protection parameters according to actual load conditions, with flexible protection and precise action, improving power supply reliability. This series of high-performance circuit breakers also have communication functions, which can achieve remotely control.

2. Working condition

- Temperature: $-30^{\circ}\text{C}\sim+70^{\circ}\text{C}$ E type (Over 40°C need to reduce capacity)
 $-25^{\circ}\text{C}\sim+70^{\circ}\text{C}$ A, G, H type (Over 40°C need to reduce capacity)
 Storage temperature: $-40^{\circ}\text{C}\sim+85^{\circ}\text{C}$
- The altitude of the installation generally does not exceed 2000M
- Atmospheric conditions: The relative humidity of the atmosphere does not exceed 50% when the ambient air temperature is $+40^{\circ}\text{C}$, and it can have a higher relative humidity at lower temperature. Special process should be taken for condensation by temperature changes
- Pollution degree is 3
- The installation level of the main circuit is III, and the installation category of other auxiliary circuits and control circuits
- Suitable for electromagnetic environment A
- It should be installed in a place where there is no explosion hazard, no conductive dust, dont have corrosion to metal or damage to insulation
- It should be installed in a place without rain and snow

3. Designation



4. Selection Table

BMA series electronic type circuit breaker

BMA	630	H					ED	3P	630A	H	AX
Model	Frame size	Rated breaking capacity (kA) Icu					Trip Unit	Pole(P)	Rated current In(A)	Controller type	Accessories
		Type	IEC60947-2				ED: Power distribution			E - Knob type A - General type G - Ground type H - High performance type	
			220V	380V	440V	500V					
BMA	100	H	85	50	42	30	ED	3, 4	40,100	E, A, G, H	AX, AL, SHT, UVT
		R	100	70	65	50					
BMA	160	H	85	50	42	30	ED	3, 4	160	E, A, G, H	AX, AL, SHT, UVT
		R	100	70	65	50					
BMA	250	H	85	50	42	30	ED	3, 4	250	E, A, G, H	AX, AL, SHT, UVT
		R	100	70	65	50					
BMA	400	H	85	50	42	30	ED	3, 4	400	E, A, G, H	AX, AL, SHT, UVT
		R	100	70	65	50					
BMA	630	H	85	50	42	30	ED	3, 4	630	E, A, G, H	AX, AL, SHT, UVT
		R	100	70	65	50					
BMA	800	H	85	50	42	30	ED	3, 4	800	E, A, G, H	AX, AL, SHT, UVT
		R	100	70	65	50					

5. Function feature

Function features table

Type		Electronic type			
		Power distribution			
		E - Knob type	A - General type	G - Ground type	H - High performance type
Protection	Overload long time delay	■	■	■	■
	Short circuit short time delay	■	■	■	■
	Instantaneous protection	■	■	■	■
	Neutral protection	■	■	■	■
	Ground fault protection			■	■
Other function	Over current pre-warning	■	■	■	■
	Current display		■	■	■
	Thermal memory functions		■	■	■
	Tripping records		■	■	■
	Alarm records		■	■	■
	Tripping times		■	■	■
	Contact wear indication		■	■	■
	Continuous operation time		■	■	■
	Cumulative operating time		■	■	■
	Testing	■	■	■	■
	ZSI*				■
	Communication*				■
Interactive	Button setting		■	■	■
	Knob setting	■	■	■	■
	LCD display		■	■	■
	LED indication	■	■	■	■

*Note: Needs to be used with ZC accessories.

Electronic power distribution type(knob)

Rated current	In	40	100	160	250	400	630	800
Circuit breaker	BMA100HED	■	■					
	BMA160HED			■				
	BMA250HED				■			
	BMA400HED					■		
	BMA630HED						■	
	BMA800HED							■

Overload long time protection																
Tripping current setting	$I_r=I_n \times \cdots$	Knob setting		0.4	0.44	0.48	0.52	0.56	0.6	0.64	0.68					
				0.72	0.76	0.8	0.9	0.95	1							
Delay time(s)	$T_r=\cdots$	Knob setting		20	80	160	Can't trip within 2h Should trip within 2h									
Accuracy $\pm 20\%$			$1.05 \times I_r$ $1.3 \times I_r$ $2 \times I_r$													
Neutral prtction (only for 4P)	$N_f=\cdots$	Non adj.	$I_n \geq 100A$ $I_n=40A$	50% I_r /100% I_r /OFF (Selection) 100% I_r /OFF (Selection)												

Short circuit short time protection													
Tripping current setting Accuracy $\pm 15\%$	$I_{sd}=I_r \times \cdots$	Knob setting		2	3	4	5	6	7	8	9	10	Off
Delay time(s) Accuracy $\pm 20\%$ or $\pm 0.03s$	$T_{sd}=\cdots$	Knob setting	I^2t Off	0	0.1	0.2					0.3		0.4
	$I_n\geq 400A$		I^2t On	-	0.1	0.2					0.3		0.4
	$I_n\leq 250A$	Non adj.		0.2s	I^2t Off								

Instantaneous protection												
Tripping current setting	$I_i = I_n \times \dots$	Knob setting		1.5	2	3	4	6	8	10	12	Off
Accuracy $\pm 15\%$	$I_n \geq 400A$ $I_n \leq 250A$	Non adj.									12	

Electronic power distribution type (General, Ground, High performance)

Rated current	In	40	100	160	250	400	630	800
Circuit breaker	BMA100HED	■	■					
	BMA160HED			■				
	BMA250HED				■			
	BMA400HED					■		
	BMA630HED						■	
	BMA800HED							■

Overload long time protection

Tripping current setting	$I_r = I_n \times \dots$	Knob setting		0.4 0.72	0.44 0.76	0.48 0.8	0.52 0.85	0.56 0.9	0.6 0.95	0.64 1.0	0.68
Delay time(s) Accuracy $\pm 20\%$	$T_r = \dots$	Button setting	1.05 x I_r 1.3 x I_r 2 x I_r	20 20	40 40	60 60	80 80	160 160	Can't trip within 2h Should trip within 2h		
Neutral protection (4P)	$N_f = \dots$	Button setting		50% I_r /100% I_r /Off							

Short circuit short time protection

Tripping current setting Accuracy $\pm 15\%$	$I_{sd} = I_r \times \dots$	Knob setting		2	3	4	5	6	7	8	9	10	Off
Delay time(s) Accuracy $\pm 20\%$ or $\pm 0.03s$	$T_{sd} = \dots$	Button setting	I^2t Off I^2t On	0.1	0.2	0.3	0.4	0.1	0.2	0.3	0.4		

Instantaneous protection

Tripping current setting Accuracy $\pm 15\%$	$I_i = I_n \times \dots$	Button setting		1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
				6.5	7	7.5	8	8.5	9	9.5	10	11	12 Off

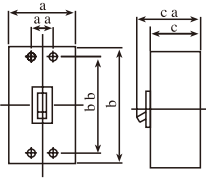
Ground fault protection

Tripping current setting Accuracy $\pm 10\%$	$I_g = I_n \times \dots$	Button setting		0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	Off
Delay time(s) Accuracy $\pm 20\%$ or $\pm 0.03s$	$T_g = \dots$	Button setting	I^2t Off I^2t On	0.1	0.2	0.3	0.4	0.1	0.2	0.3	0.4		

*Note: Only (G type) & (H type) have this function.

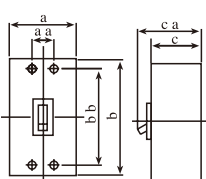
6. Specification

BMA series MCCB (Electronic type)

Frame size (AF)			100				160			
Model			BMA100-HED		BMA100-RED		BMA160-HED		BMA160-RED	
Rated current (A)			40,100		40,100		160		160	
Rated temperature (°C)			40		40		40		40	
Pole (P)			3	4	3	4	3	4	3	4
Rated insulation voltage Ui (V)			AC1000		AC1000		AC1000		AC1000	
Dimensions (mm)		a	105	140	105	140	105	140	105	140
		b	165		165		165		165	
		c	86		86		86		86	
		ca	110		110		110		110	
		bb	126		126		126		126	
		aa	35		35		35		35	
Weight (kg)			1.8	2.4	1.8	2.4	1.8	2.4	1.8	2.4
Breaking capacity (kA), Ics=Icu IEC 60947-2		AC220V	85		100		85		100	
		AC380V	50		70		50		70	
		AC440V	42		65		42		65	
		AC500V	30		50		30		50	
Wiring			Clamp terminal							
Optional accessories	Alarm switch(AL)		●	●	●	●	●	●	●	●
	Auxiliary switch(AX)		●	●	●	●	●	●	●	●
	Shunt trip(SHT)		●	●	●	●	●	●	●	●
	Under-voltage trip(UVT)		●	●	●	●	●	●	●	●
	Rotary handle(EH)		●	●	●	●	●	●	●	●
	Extended rotary handle(MA)		-	-	-	-	-	-	-	-
	Motor Operation Device(MT)		●	●	●	●	●	●	●	●
	Locking Device(FHL)		○	○	○	○	○	○	○	○
	Terminal cover		●	●	●	●	●	●	●	●
Trip unit			Electronic							
Trip button			Equipped							

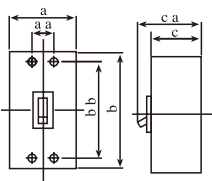
*Note: "●" which can be installed by client, "○" which have to installed by manufacturer.

BMA series MCCB (Electronic type)

Frame size (AF)			250				400			
Model			BMA250-HED		BMA250-RED		BMA400-HED		BMA400-RED	
Rated current (A)			250		250		400		400	
Rated temperature (°C)			40		40		40		40	
Pole (P)			3	4	3	4	3	4	3	4
Rated insulation voltage Ui (V)			AC1000		AC1000		AC1000		AC1000	
Dimensions (mm)		a	105	140	105	140	140	185	140	185
		b	165		165		257		257	
		c	86		86		103		103	
		ca	110		110		155		155	
		bb	126		126		194		194	
		aa	35		35		44		44	
Weight (kg)			1.8	2.4	1.8	2.4	5.7	7.5	5.7	7.5
Breaking capacity (kA), Ics=Icu IEC 60947-2		AC220V	85		100		85		100	
		AC380V	50		70		50		70	
		AC440V	42		65		42		65	
		AC500V	30		50		30		50	
Wiring			Clamp terminal				Busbar			
Optional accessories	Alarm switch(AL)		●	●	●	●	●	●	●	●
	Auxiliary switch(AX)		●	●	●	●	●	●	●	●
	Shunt trip(SHT)		●	●	●	●	●	●	●	●
	Under-voltage trip(UVT)		●	●	●	●	●	●	●	●
	Rotary handle(EH)		●	●	●	●	●	●	●	●
	Extended rotary handle(MA)		—	—	—	—	●	●	●	●
	Motor Operation Device(MT)		●	●	●	●	●	●	●	●
	Locking Device(FHL)		○	○	○	○	●	●	●	●
	Terminal cover		●	●	●	●	●	●	●	●
Trip unit			Electronic							
Trip button			Equipped							

*Note: "●" which can be installed by client, "○" which have to installed by manufacturer.

BMA series MCCB (Electronic type)

Frame size (AF)			630				800			
Model			BMA630-HED		BMA630-RED		BMA800-HED		BMA800-RED	
Rated current (A)			630		630		800		800	
Rated temperature (°C)			40		40		40		40	
Pole (P)			3	4	3	4	3	4	3	4
Rated insulation voltage Ui (V)			AC1000		AC1000		AC1000		AC1000	
Dimensions (mm)		a	210	280	210	280	210	280	210	280
		b	275		275		275		275	
		c	103		103		103		103	
		ca	155		155		155		155	
		bb	243		243		243		243	
		aa	70		70		70		70	
Weight (kg)			10	13	10	13	10.5	13.5	10.5	13.5
Breaking capacity (kA), Ics=Icu IEC 60947-2		AC220V	85		100		85		100	
		AC380V	50		70		50		70	
		AC440V	42		65		42		65	
		AC500V	30		50		30		50	
Wiring			Busbar				Busbar			
Optional accessories	Alarm switch(AL)		●	●	●	●	●	●	●	●
	Auxiliary switch(AX)		●	●	●	●	●	●	●	●
	Shunt trip(SHT)		●	●	●	●	●	●	●	●
	Under-voltage trip(UVT)		●	●	●	●	●	●	●	●
	Rotary handle(EH)		●	●	●	●	●	●	●	●
	Extended rotary handle(MA)		●	●	●	●	●	●	●	●
	Motor Operation Device(MT)		●	●	●	●	●	●	●	●
	Locking Device(FHL)		●	●	●	●	●	●	●	●
	Terminal cover		●	●	●	●	●	●	●	●
Trip unit			Electronic							
Trip button			Equipped							

*Note: "●" which can be installed by client, "○" which have to installed by manufacturer.

7. Accessories

Model	BMA1000-HED\RED BMA160-HED\RED BMA250-HED\RED	BMA400-HED/RED	BMA630-HED/RED BMA800-HED/RED
Poles (P)	3P/4P		
AL			
AX			
SHT or UVT			
ZC			
AL+AX			
AL+SHT or UVT	AL+SHT(external) 		or
AL+ZC	 ZC(external)		
AX+SHT or UVT		or	or
AX+ZC	 ZC(external)		
SHT or UVT + ZC	-		
AL+AX+SHT or UVT	AL+SHT(external) 		or

7. Accessories

Model	BMA100-HED\RED BMA160-HED\RED BMA250-HED\RED	BMA400-HED/RED	BMA630-HED/RED BMA800-HED/RED
Poles (P)	3P/4P		
AL+AX+ZC	 ZC(external)		
AL+ZC+SHT or UVT	 AL+ZC(external)+SHT(external)		
AX+ZC+SHT or UVT	 AX+ZC(external)+SHT(external)		
AL+AX+ZC+SHT or UVT	-	-	

Note:

1. ZC is an essential accessory for **H type controller**, including ZSI regional interlocking accessories and communication function accessories.
2. If ZC or SHT are external, they can only be shipped after installation by the factory.
3. AX position can be installed at AL.
4. symbolic
 - : AL ● : AX
 - ▮ : SHT or UVT ▮ : ZC
 - ▲ : AX(internal), only be installed by manufacturer
 - △ : AL+AX

5. Left Right
 

8. Optional Accessories

1. Rotary Handle

Type	Poles (P)	Application models
EH-250A	3P/4P	BMA100-HED, BMA100-RED, BMA160-HED BMA160-RED, BMA250-HED, BMA250-RED
EH-400N	3P/4P	BMA400-HED, BMA400-RED
EH-800N	3P/4P	BMA630-HED, BMA630-RED, BMA800-HED, BMA800-RED

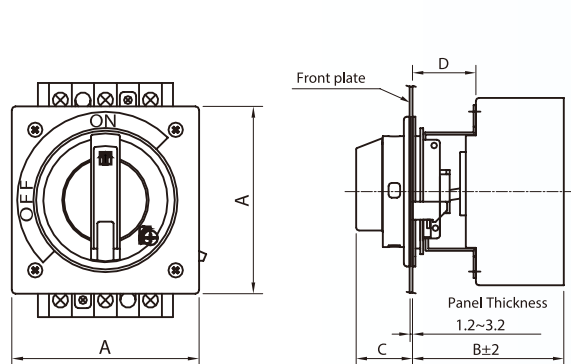


Fig.1 Dimension

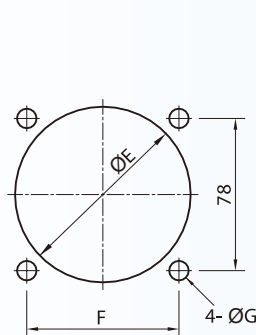


Fig.2 Panel drilling dimension

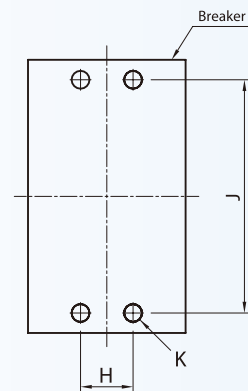
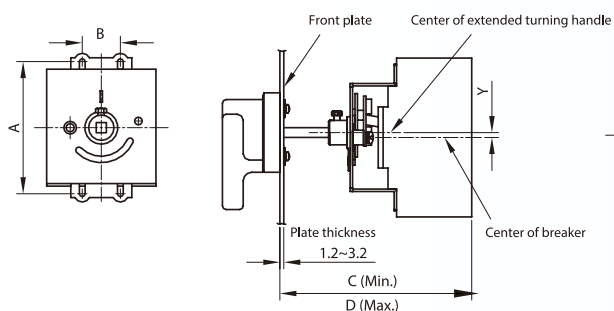


Fig.3 Breaker drilling

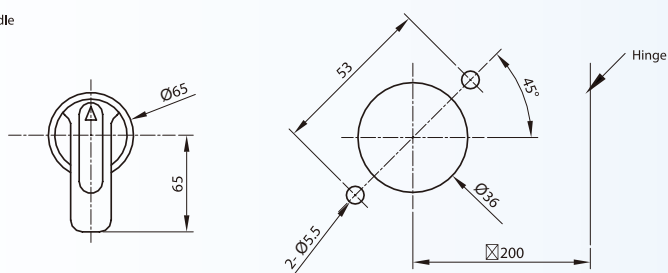
Type	Poles (P)	Dimension (Fig.1)				Dimension (Fig.2)			Dimension (Fig.3)		
		A	B	C	D	E	F	G	H	J	K
EH-250A	3P/4P	104	125	39	44	90	78	10	35	126	M4 screw or Ø 5
EH-400N	3P/4P	150	173	60	77	108	112	10	44	194	
EH-800N	3P/4P	150	173	60	77	108	112	10	70	243	

2. Extended Rotary Handle

Type	Poles (P)	Application models
MA-400N	3P/4P	BMA400-HED, BMA400-RED
MA-800N	3P/4P	BMA630-HED, BMA630-RED, BMA800-HED, BMA800-RED



Dimension



Panel drilling dimesnsion

Type	Poles (P)	Dimensions(mm)				
		A	B	C	D	Y
MA-400N	3P/4P	221	44	190	290	+10
MA-800N	3P/4P	242	70	190	290	+10

3. Motor Operation Device

Type	Poles (P)	Application models
MT-250A	3P/4P	BMA100-HED, BMA100-RED, BMA160-HED BMA160-RED, BMA250-HED, BMA250-RED
MT-400N	3P/4P	BMA400-HED, BMA400-RED
MT-800N	3P/4P	BMA630-HED, BMA630-RED, BMA800-HED, BMA800-RED

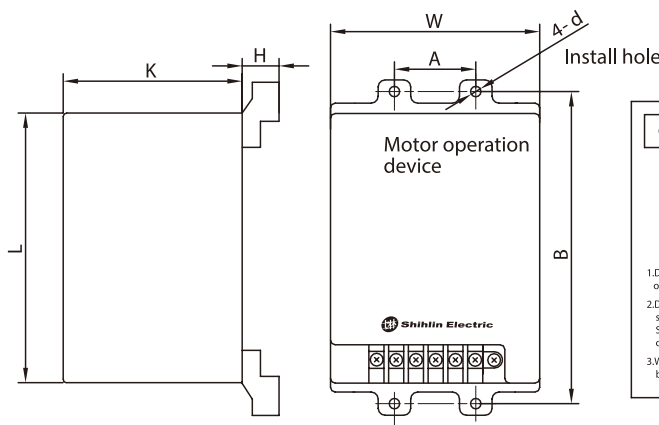


Fig.1 Dimension

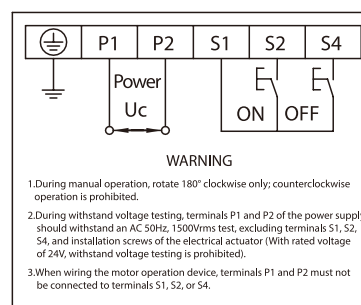


Fig.2 Wiring description

Type	Dimensions(mm)							Operating voltage
	A	B	d	H	K	L	W	
MT-250A	35	126	Ø4.5	15	77	116	90	①AC230V/DC220V ②AC110V/DC110V ③DC24V
MT-400N	44	194	Ø6.5	36	115	176	130	
MT-800N	70	243	Ø6.5	36	115	176	130	

4. Rear Connection

Type	Poles (P)	Application models
PGI-250MW	3P/4P	BMA100-HED, BMA100-RED, BMA160-HED BMA160-RED, BMA250-HED, BMA250-RED
PGI-400NW	3P/4P	BMA400-HED, BMA400-RED
PGI-800NW	3P/4P	BMA630-HED, BMA630-RED, BMA800-HED, BMA800-RED

Note: If MT-400N and PGI-400N install in the same time, please specify when ordering.

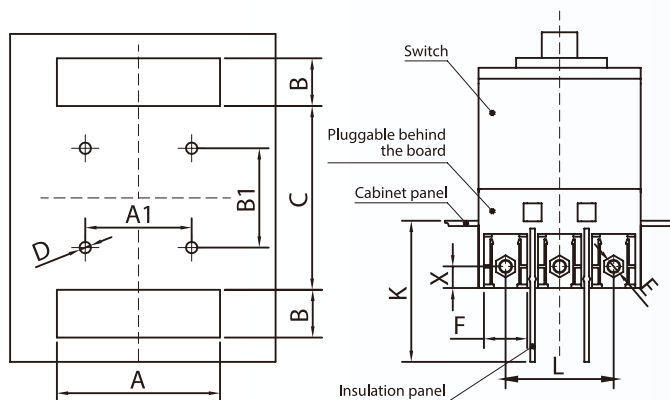


Fig1. Plug-in drilling dimension

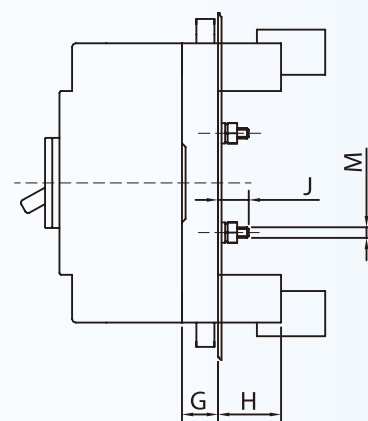


Fig2. Dimension

Type	Poles (P)	Dimensions(mm)															Wiring	
		A	A1	B	B1	C	D	E	F	G	H	J	K	L	M	X	Horizontal	Vertical
PGI-250MW	3P	107	70	38	64	107	Ø6	M8	29	27	45	20	102	70	M5	15	✓	-
	4P	142	105											105			✓	-
PGI-400NW	3P	132	88	48	141	183	Ø6	M10	35	43	42	26	115	88	M5	13	✓	-
	4P	176	132											132			✓	-
PGI-800NW	3P	212	140	65	143	185	Ø6	M12	45	50	75	26	140	140	M5	27	✓	-
	4P	282	210											210			✓	-

5. Front Plug-in type

Type	Poles (P)	Application models
PGIF-250M	3P	BMA100-HED, BMA100-RED, BMA160-HED BMA160-RED, BMA250-HED, BMA250-RED
PGIF-400N	3P	BMA400-HED, BMA400-RED

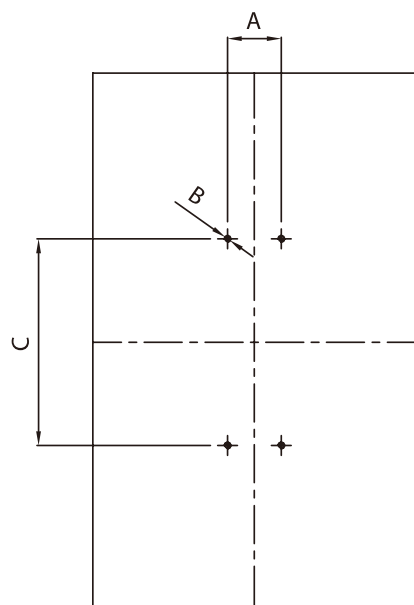


Fig1. Front Plug-in drilling dimension

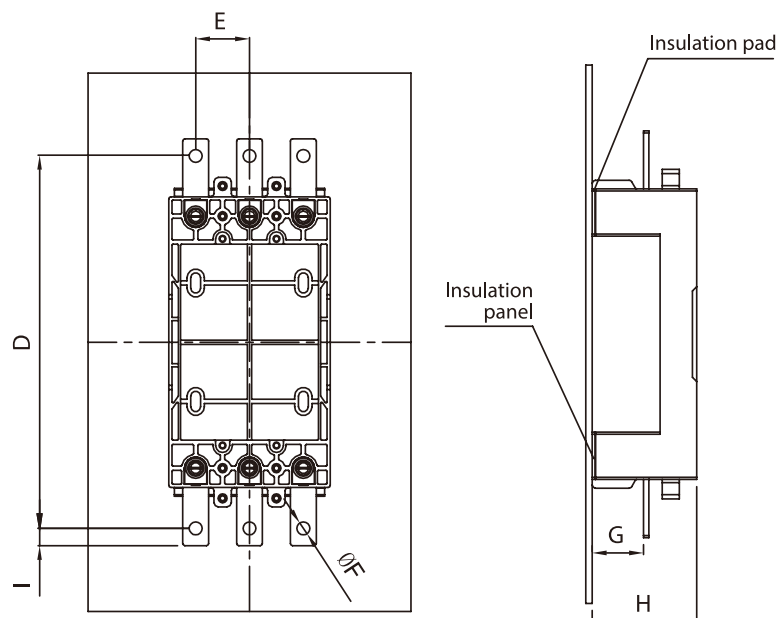


Fig2.Dimension

Type	Poles (P)	Dimensions(mm)									Wiring	
		A	B	C	D	E	F	G	H	I	Horizontal	Vertical
PGIF-250M	3P	35	M4	150	223	35	8.5	32	74	10	✓	-
PGIF-400N	3P	44	M5	244	326	44	10.5	36	85	13	✓	-

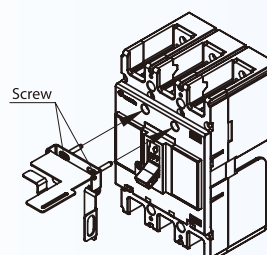
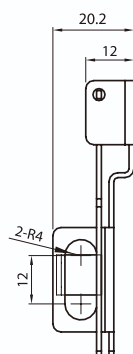
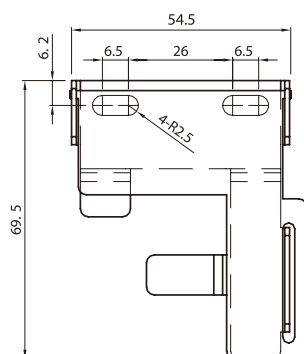
6. Locking Device

Type	Poles (P)	Application models
FHL-250M	3P/4P	BMA100-HED, BMA100-RED, BMA160-HED BMA160-RED, BMA250-HED, BMA250-RED
FHL-400M	3P/4P	BMA400-HED, BMA400-RED
FHL-800M	3P/4P	BMA630-HED, BMA630-RED, BMA800-HED, BMA800-RED

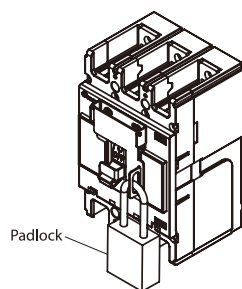
Note:

1. Handle padlock dimension $\varnothing 5 \sim 7 \text{ mm}$ (padlock is provided by the user)
2. FHL-250M have to install by factory.

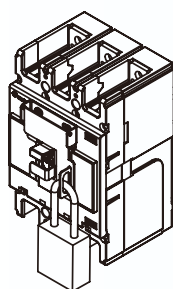
(1)FHL-250M



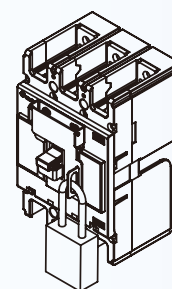
Installation diagram



Handle lock at the Off position

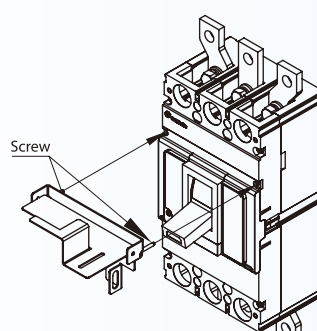
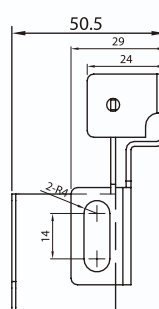
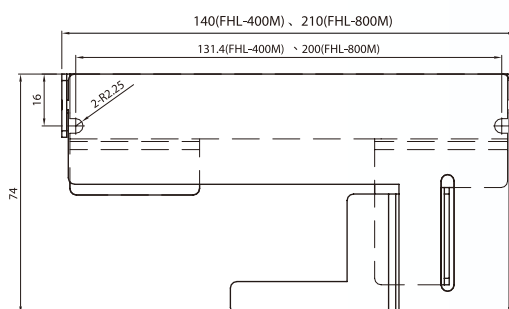


Handle lock at the On position

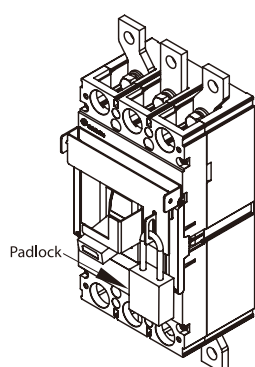


Breaker at Trip position

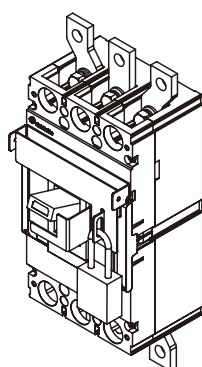
(2)FHL-400/800M



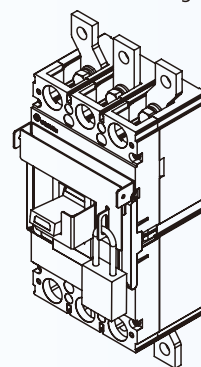
Installation diagram



Handle lock at the Off position



Handle lock at the On position



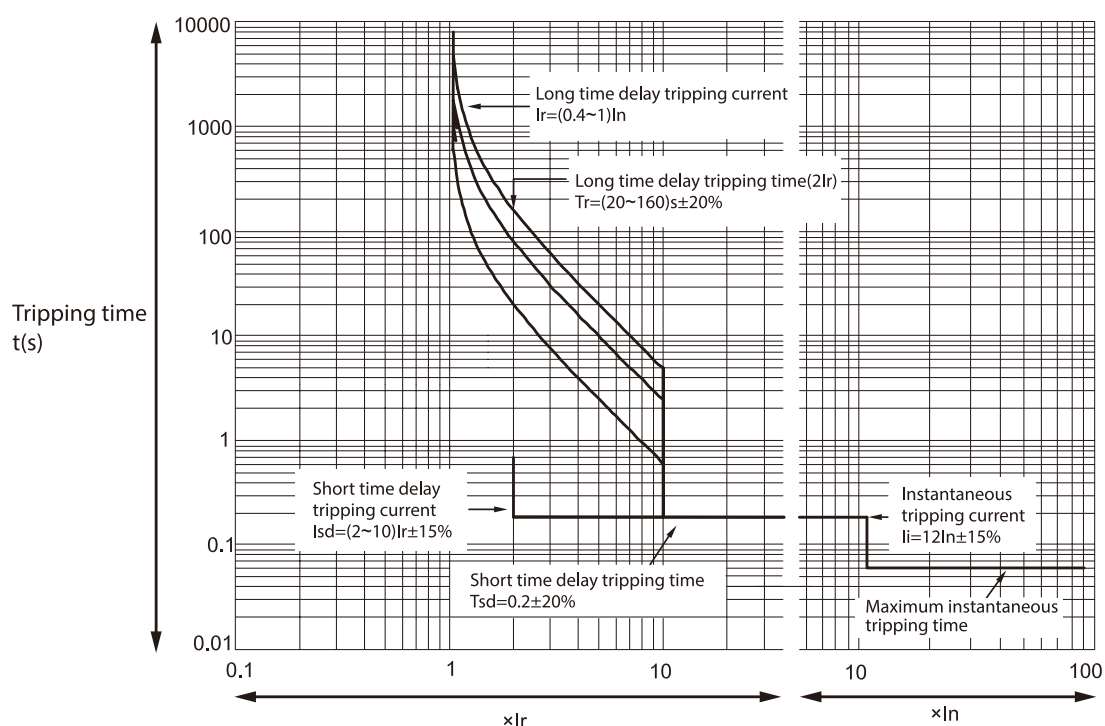
Breaker at Trip position

9. Tripping Characteristic Curve

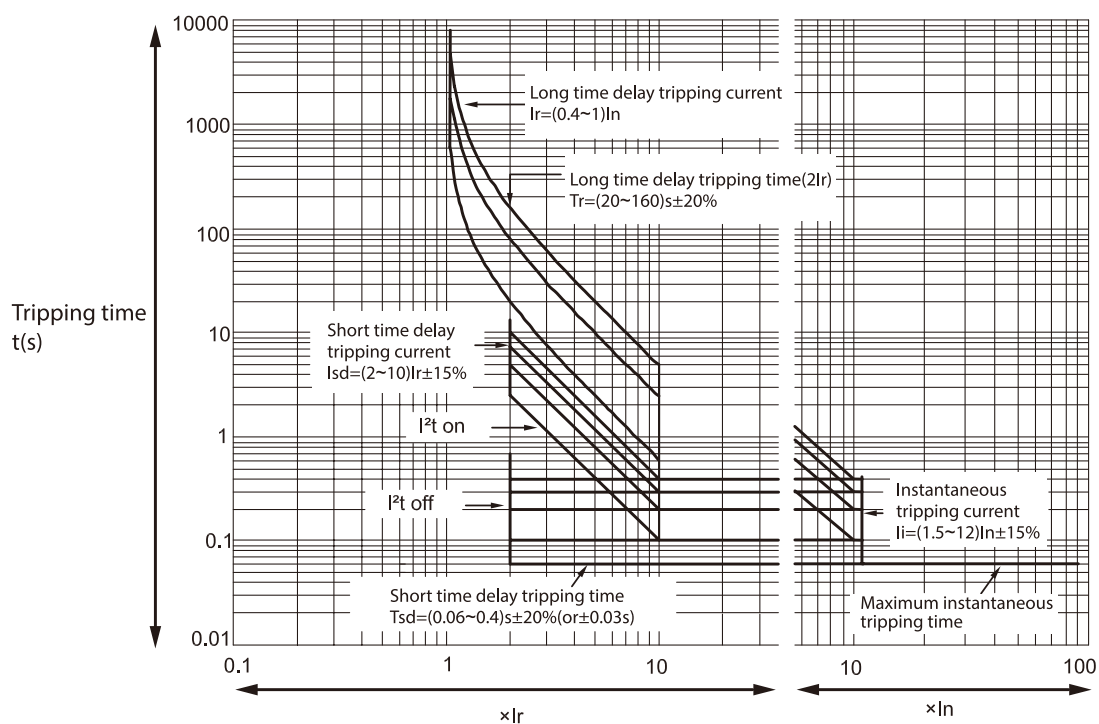
1. Overload, Short-circuit, Instantaneous, tripping characteristic curve of BMA electronic type

(1) Knob (E)

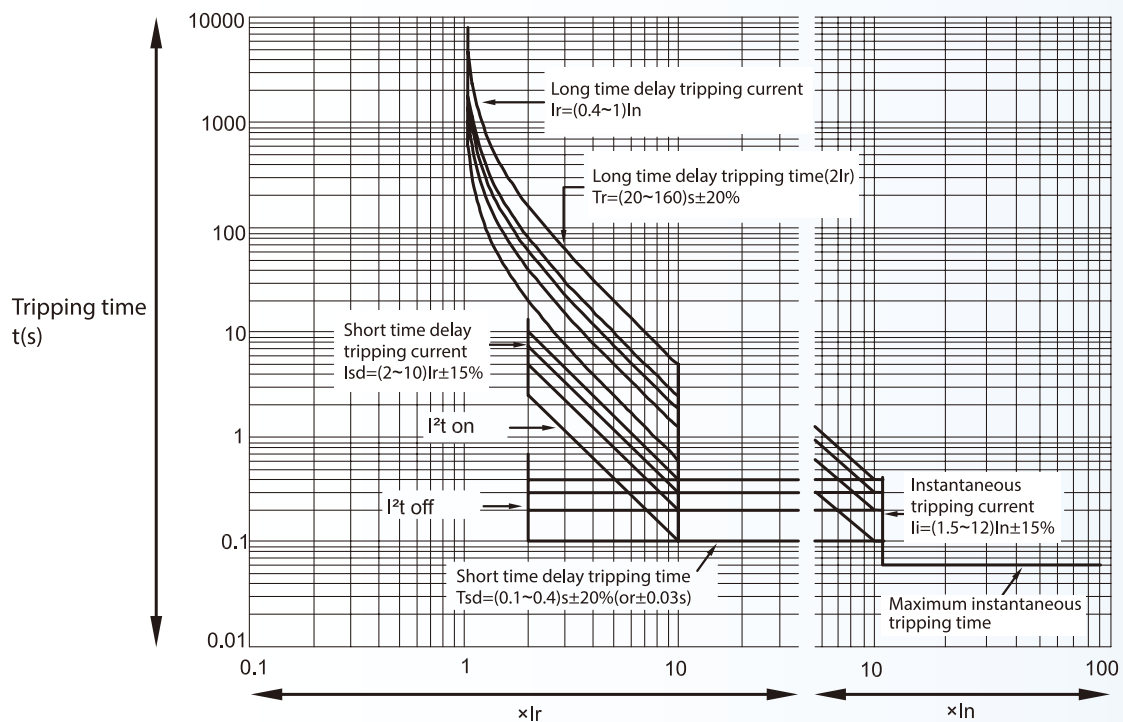
① BMA100-HED/RED, BMA160-HED/RED, BMA250-HED/RED



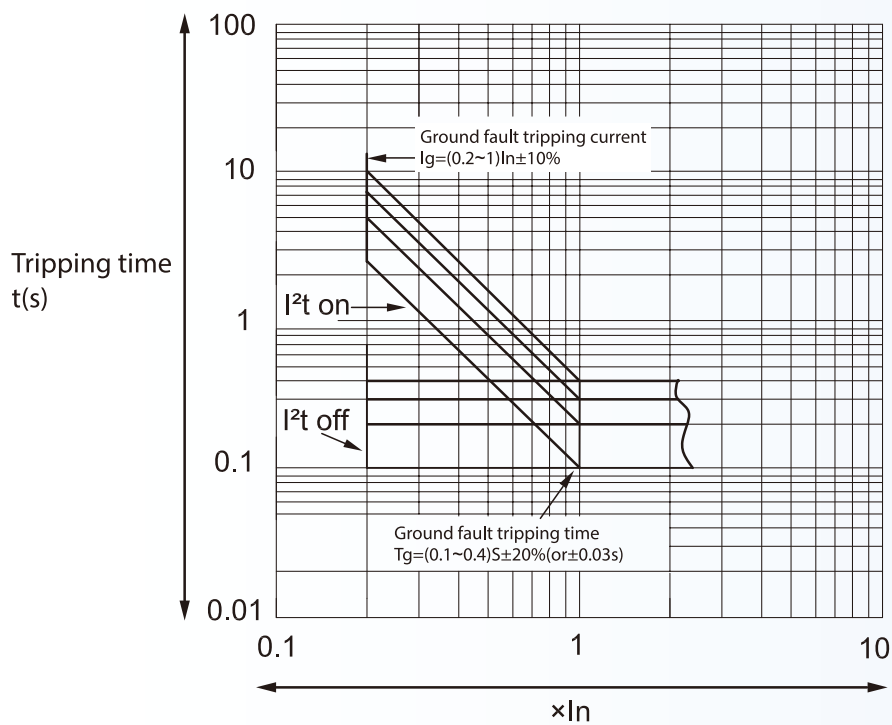
② BMA400-HED/RED, BMA630-HED/RED, BMA800-HED/RED



(2) General type (A), Ground type (G), High performance type (H)

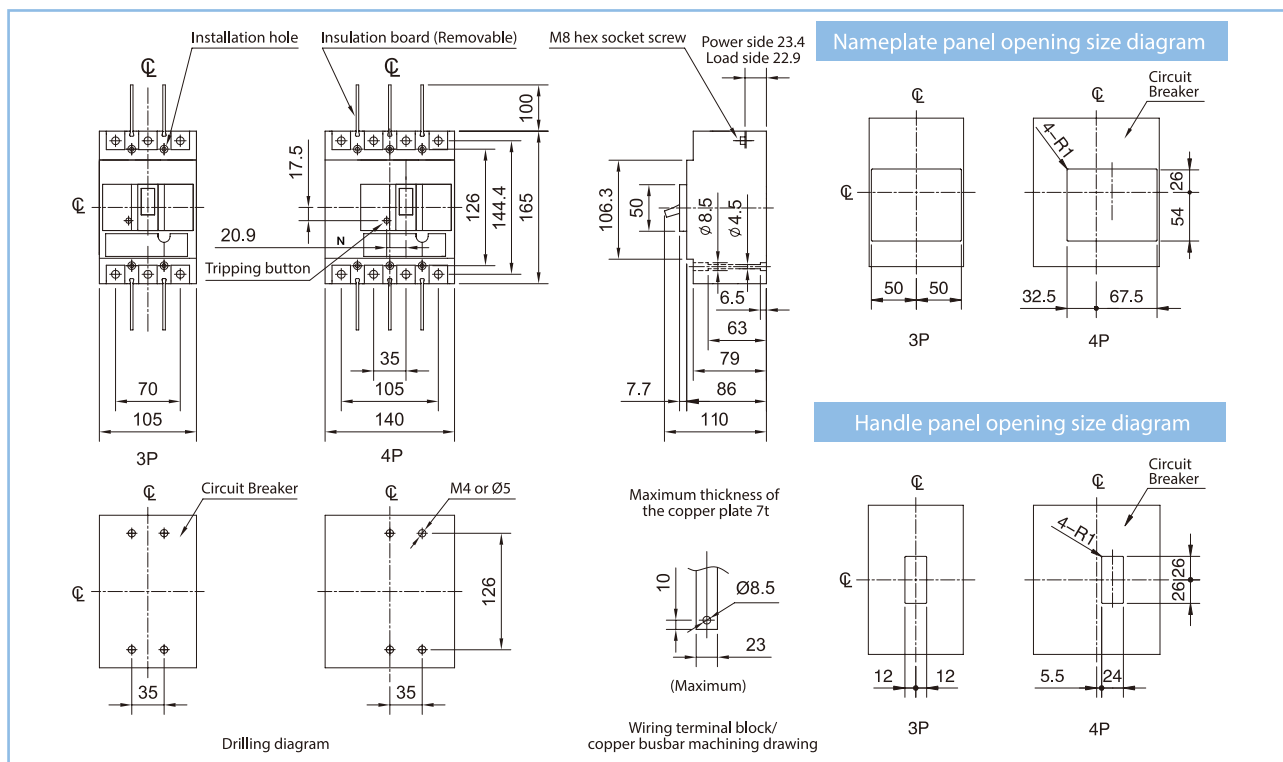


2. Ground protection curve

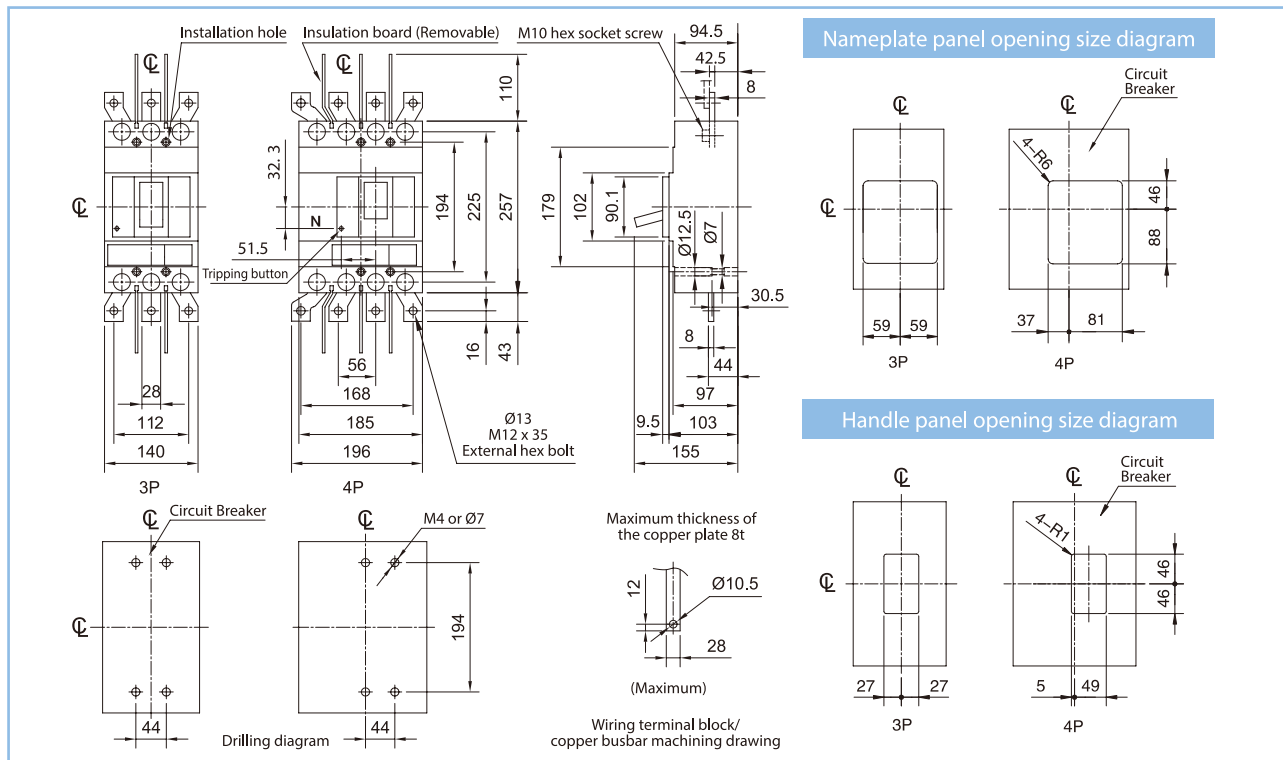


10. Appearance and Installation Dimensions

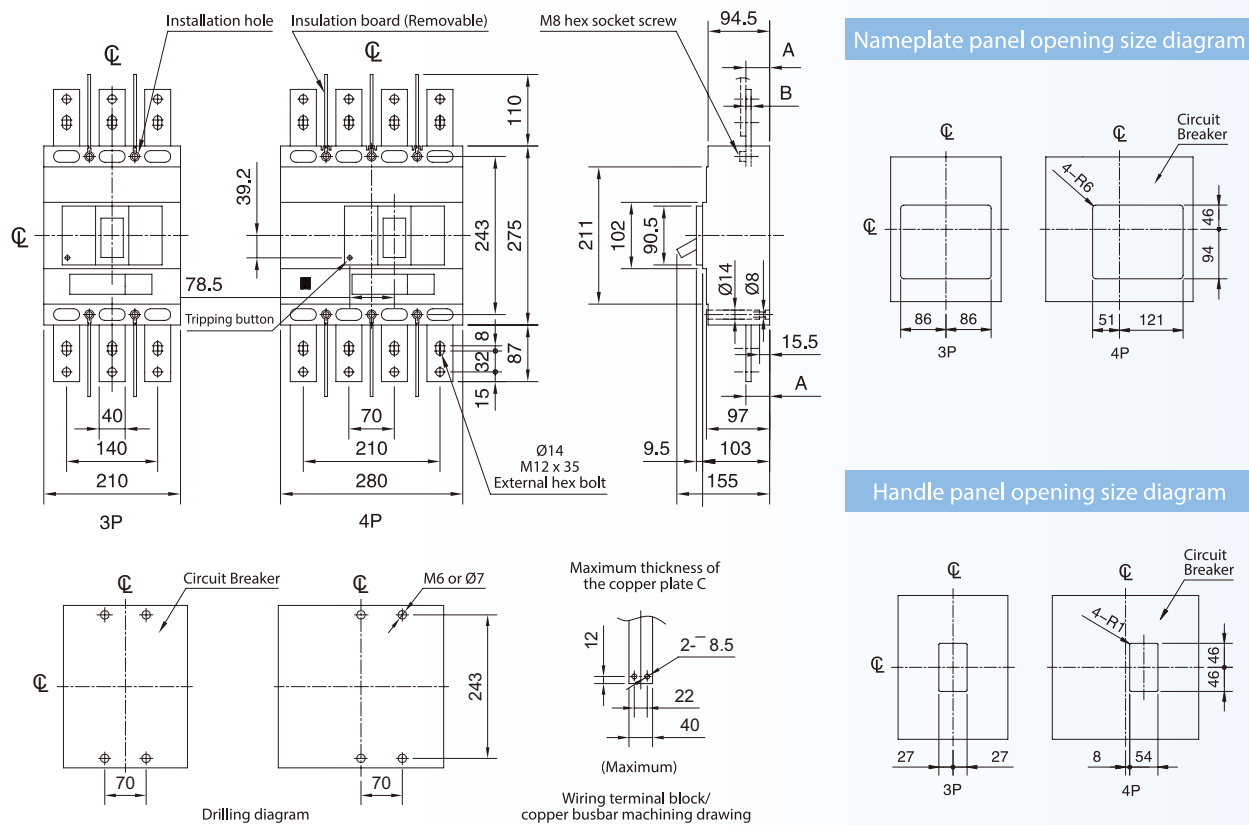
BMA100-RED/REM/HED/HEM, BMA160-RED/REM/HED/HEM, BMA250-RED/REM /HED/HEM Figure of Appearance and Installation Dimensions



BMA400-RED/REM/HED/HEM Figure of Appearance and Installation Dimensions



BMA630-RED/REM/HED/HEM,BMA800-RED/HED Figure of Appearance and Installation Dimensions



Model	A	B	C
BMA630-RED/HED	36.5	8	8
BMA630-REM/HEM	36.5	10	10
BMA800-RED/HED	38.5	10	10

11. Communication Function Description

1. Communication module

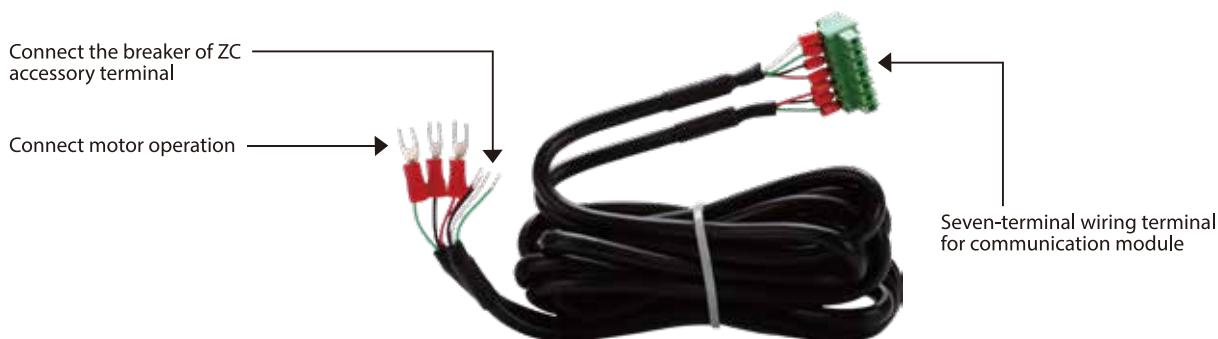
The communication module AETU-COM is used to connect the BMA-E series molded case circuit breaker with communication function and the PC monitoring system, acting as a communication bridge in the middle. Through the communication module, the PC monitoring system can realize the "four remote" functions of the BMA-E series molded case circuit breaker: remote signaling, telemetry, remote adjustment, and remote control.



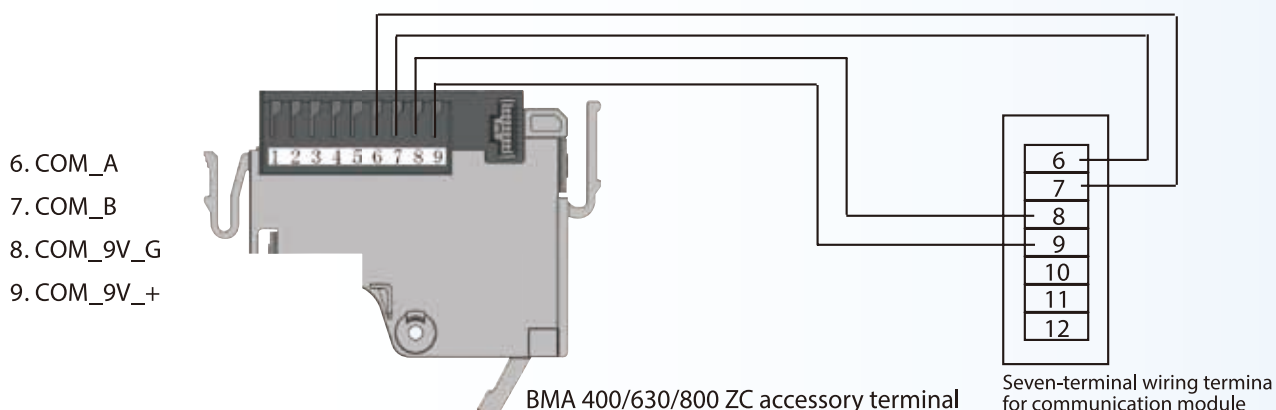
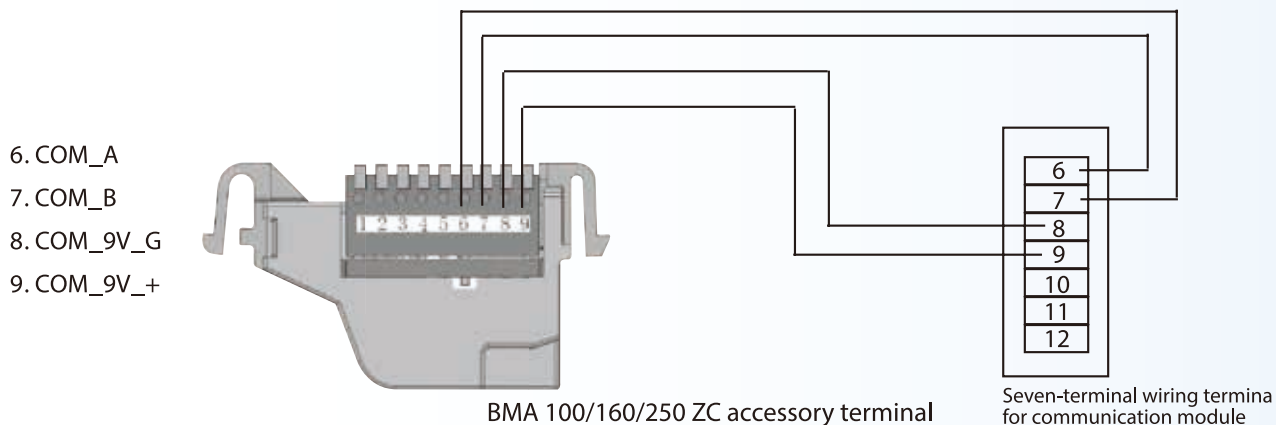
AETU-COM Communicate Module

2. Connection between communication module and circuit breaker

The communication module and the circuit breaker achieve a one-to-one connection, and the connecting line between them is a dedicated connecting line. When connecting to the network, connect the two terminals of the connecting line to the circuit breaker and the communication module respectively.

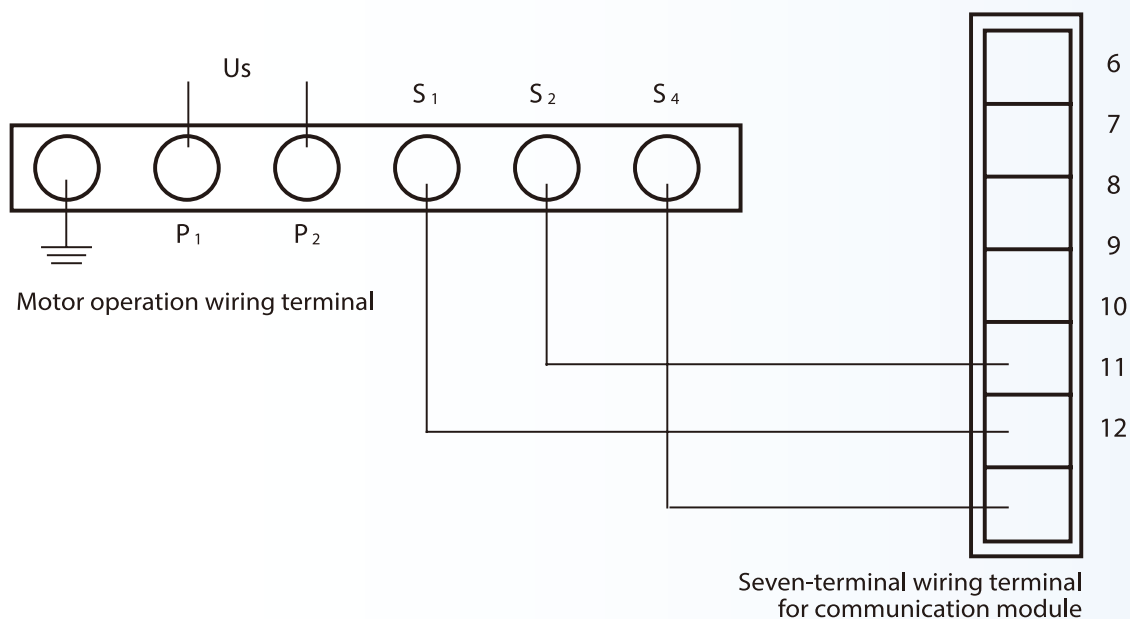


3. ZC Accessory Terminals



4. Connection between communication module and electric operating mechanism

The communication module is connected to the electric operating mechanism through three connecting lines, respectively connecting the S1 terminal, S2 terminal and S4 terminal of the electric operating mechanism to realize the host computer controlling the electric operating action to complete the remote closing and remote opening of the circuit breaker.



5. Connection between communication module and communication bus

In order for the communication module to connect to the communication bus more effectively and reliably, users need to be equipped with a communication hub(ETU-HUB).

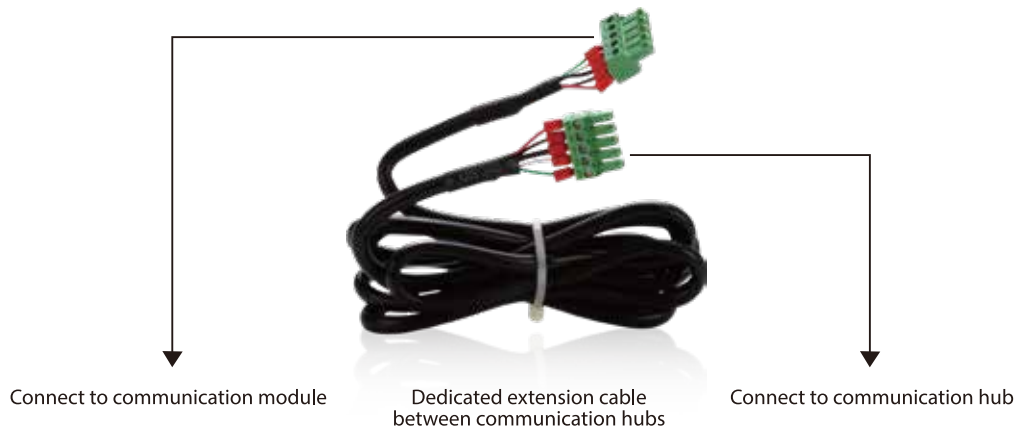
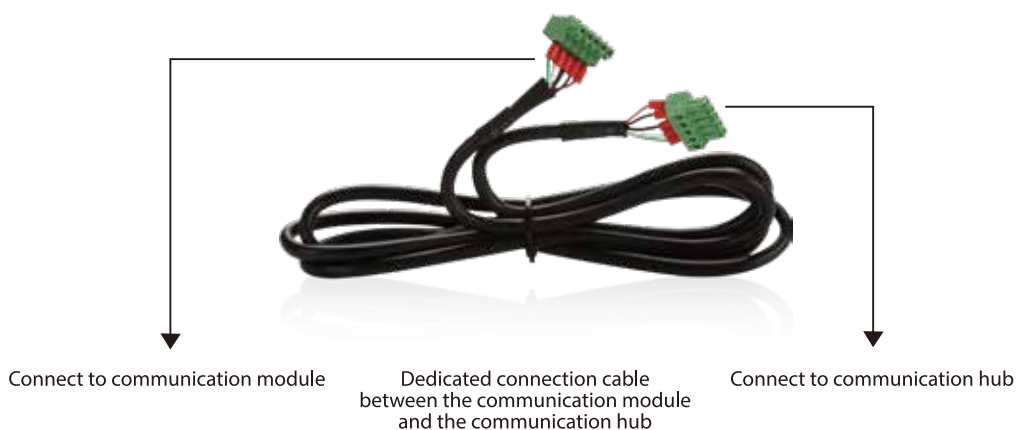


Communication hub

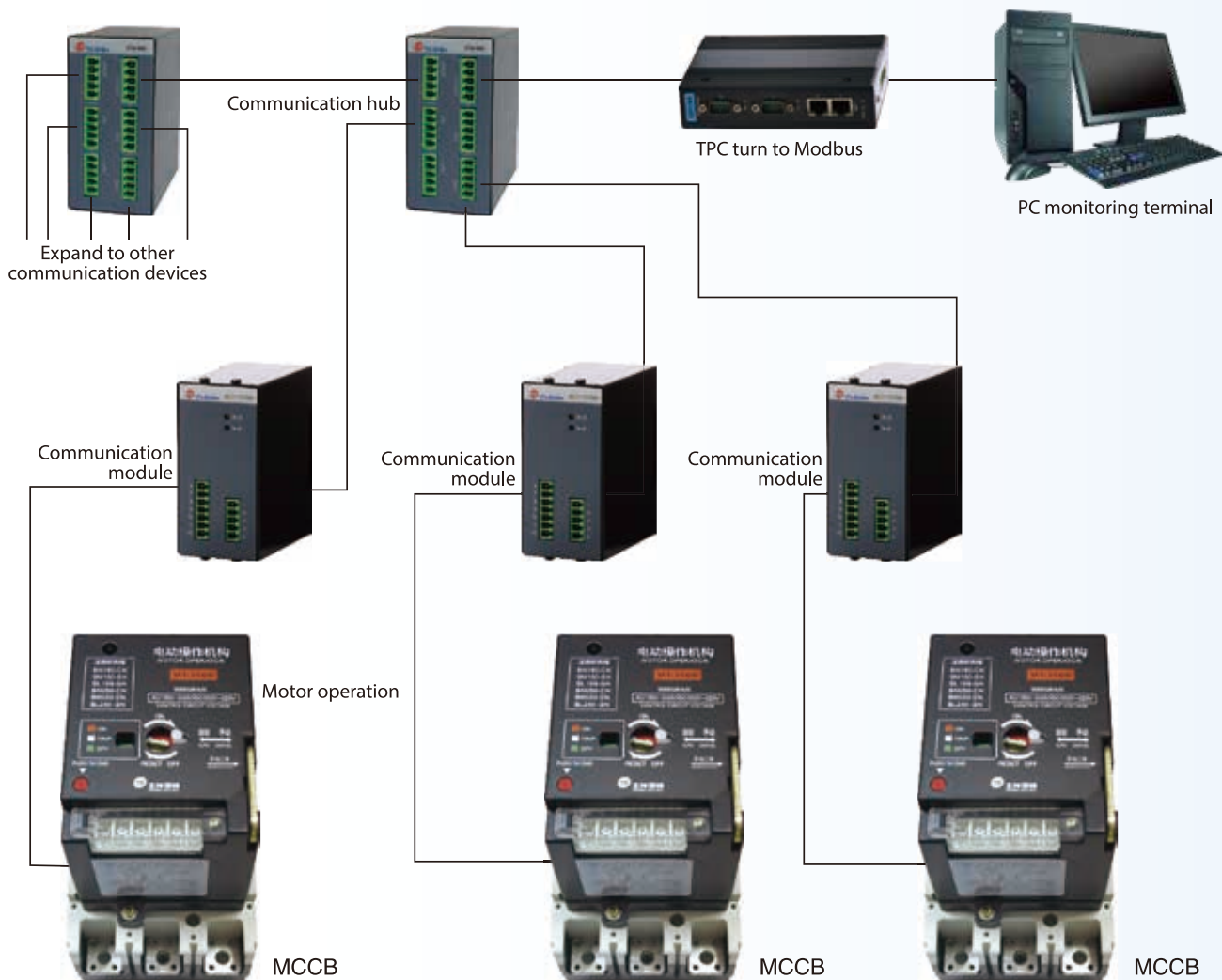
Communication hubs have the following characteristics:

- (1) Mechanical characteristics: Iron casing, dimensions 85x42x75.
- (2) Provides 6 RS485 interfaces, which can connect up to 5 communication devices.
- (3) Multiple hubs can be interconnected to expand the bus connection.
- (4) Can be installed directly on standard 35mm rails.

The connection between the communication module and the communication hub requires a dedicated cable. When connecting, connect the two terminals of the connection cable to the communication module and communication hub respectively.



6. Circuit breaker system connection diagram





CIRCUIT BREAKER (MCCB / ELCB / EMCCB / MCB)

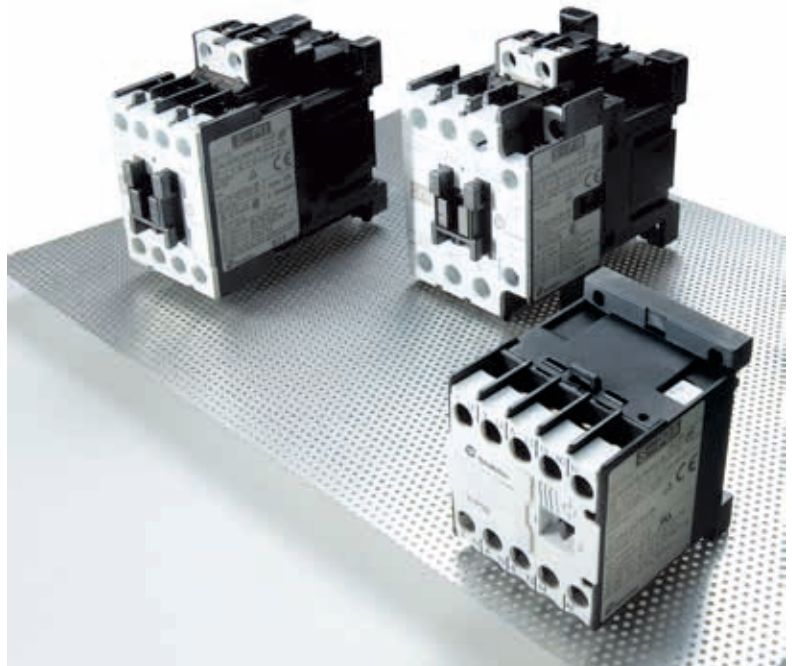
Breaker & Switchgear System



AIR CIRCUIT BREAKER



AUTOMATIC TRANSFER SWITCHES



MAGNETIC CONTACTOR / SWITCH (CONTACTOR / MS / MMS)



SURGE PROTECTIVE
DEVICE



SMART METER



INVERTER



LOW VOLTAGE
POWER CAPACITORS

SHIHLIN ELECTRIC & ENGINEERING

MOTOR CONTROL (CONTACTOR/ MS/ MMS), CIRCUIT BREAKER (MCCB/ ELCB/ EMCCB/ MCB), AIR CIRCUIT BREAKER, AUTOMATIC TRANSFER SWITCHES (Panel Board Type/ Residential Unit Use), SURGE PROTECTIVE DEVICE, LOW VOLTAGE POWER CAPACITORS, SMART METER, INVERTER



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