TeM7E

Series Moulded Case Circuit Breaker

TeM7E Series Moulded Case Circuit Breaker

1 Overview

TeM7E series moulded case circuit breaker (hereinafter referred to as circuit breaker) is the fourth generation of circuit breaker products developed and created by the outstanding designers in our company using the simulation design platform introduced and the series of advanced technologies such as international advanced rotary double break point technology, contact repulsion and locking technology, energy rapid tripping technology, and air blowing and magnetic blowing technology.

The product features with a high degree of modularity and its accessories are box mounted. It has the characteristics of small size, high breaking capacity, high current limiting, zero flashover, full selectivity, and green environmental protection.

High performance: High-performance electronic moulded case circuit breaker TeM7E- 125/250/400/630

- Coordinated trip system, used to quickly break the extremely large short circuit current within 10ms;
- Double-coil transformer, used to ensure the current, voltage, and power accuracy within Grade 1.5;
- Convenient communication, used to realize remote signaling, remote control, remote regulation, and remote metering.

High breaking capacity: Each model of circuit breaker has multiple breaking capacities up to 150kA to meet various protection needs required by customers:

- Standard application: Standard type (L)
- Applications with high performance requirements: (High breaking type: M and H)
- Special application: Current limiting type (S)

The circuit breaker is used in the AC 50/60Hz circuit with the rated voltage up to 690V and the rated current up to 630A for making, breaking and carrying the rated current under the normal circuit conditions, and it can provide reliable protection for lines and electrical equipment in the event of overload, short circuit, and undervoltage situations, and can be used as overload, short circuit and undervoltage protection for the motor with infrequent start.

1.1 Product Features

- The international advanced rotary double break point technology, contact repulsion and locking technology, energy rapid tripping technology, and air blowing and magnetic blowing technology are used, with high breaking capacity and high current limiting coefficient;

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● The full series of products has zero flashover and the accessories are box mounted;
● The circuit breaker has the functions of overload long delay, short circuit short delay, short circuit instantaneous, earthing protection, and neutral pole protection;
● With isolation function;
● With high environmental protection, the shell is made of recyclable material.

1.2 Standards:
● IEC 60947-1
● IEC 60947-2

1.3 Working Environment
● Ambient air temperature: -40°C ~+70°C; the mean temperature within 24h does not exceed +50°C;
Note: When the circuit breaker works in ambient air temperatures above +70°C or below -40°C, please contact the manufacturer for negotiation.
● Altitude: The altitude of the installation site does not exceed 2000m. If the altitude exceeds 2000m, please refer to the altitude and derating factor table;
● Atmospheric conditions: The relative humidity of the atmosphere air does not exceed 50% at the maximum ambient temperature of +55°C; higher humidity is allowed at lower temperatures; when the monthly mean minimum temperature is +25°C in the wettest month, the monthly mean maximum relative humidity of that month is 90% by considering the condensation occasionally occurred on the product surface due to temperature changes.
● The circuit breaker should be installed in a place where there is no explosion hazard and no abnormal electric dust enough without causing metal corrosion and insulation damage;
● Pollution degree: Level 3; Level 2 if the accessories are installed in the moulded case circuit breaker;
● Installation category: The installation category of main circuit of the moulded case circuit breaker is Class III, and of the auxiliary circuit and control circuit is Class II.

1.4 Installation Method
The circuit breaker can be installed vertically (that is vertical mounted) and horizontally (that is horizontal mounted), and adopts the lower wire inlet.

2 Type Designation

Te	M	7	E	-	□	□	□	/	□	□	□	□	□	□	□	□	□	□
①	②	③	④		⑤	⑥	⑦		⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰

①	Enterprise code	
②	Product code	Moluded Case Circuit Breaker
③	Design code	
④	Derived code	Electronic type

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⑤	Frame grade code	Refer to the Basic Parameters Table
⑥	Breaking capacity level	L - Standard type; M - Middle breaking capacity; H - High breaking capacity; S - Super-high breaking capacity
⑦	Operation mode code	By default: Operation directly via handle; P: Operation via motor; Z: Operation via rotary handle
⑧	Number of poles	3 - three-pole; 4 - four-pole
⑨	Release model and accessory code,	refer to the internal accessory code table 2
⑩	Usage code	By default: Power distribution; 2: Motor protection
⑪	N pole code	The code is available for 4 poles only rather than other poles; Type B 4300B Type C 4300C
⑫	Rated current	Refer to the Basic Parameters Table 1
⑬	Controller type	Refer to the controller types E2 and E4; by default: E2
⑭	Accessory voltage	Refer to the accessory parameter table 15
⑮	Installation code	By default: Fixed type front-panel; B: Fixed type back-panel; F: Plug-in type front-panel; C: Plug-in type back-panel; D: Drawer type back-panel; Q: Drawer type frontpanel
⑯	Application code	By default: Conventional type; GY: Plateau; SR: Damp heat; HB: Environmental protection; YW: Salt spray; GW: High temperature; DW: Low temperature
⑰	Special requirements	According to the description by customer

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3 Technical Parameters

Table 1

Modelel			TeM7E-125				TeM7E-250			
Frame current Inm (A)			125				250			
Number of poles			3P, 4P				3P, 4P			
Rated operating voltage Ue (V)			AC380/400/415, AC500/550, AC660/690				AC380/400/415, AC500/550, AC660/690			
Rated insulation voltage Ui (V)			800				800			
Rated impulse withstand voltage Uimp (kV)			8				8			
Rated frequency Hz			50/60				50/60			
Rated current In (A)			50, 56, 63, 70, 75, 80, 90, 100, 112, 125				100, 112, 125, 140, 150, 160, 180, 200, 225, 250			
Breaking capacity level			L	M	H	S	L	M	H	S
Icu	AC380/400/415V		50	85	100	150	50	85	100	150
	AC500/550V		50	50	70	70	50	50	70	70
	AC660/690		20	20	40	40	20	20	40	40
Ics (%Icu) (kA)	AC380/400/415V		100%				100%			
	AC500/550V		100%				100%			
	AC660/690		100%				100%			
Isolation function			Yes				Yes			
Usage category			A				A			
Operation performance (times)	Mechanical life		20000				20000			
	Electrical life	AC380/400/415V	18000				10000			
		AC500/550V	/				/			
		AC660/690V	8000				4000			
Flashover distance (mm)			0				0			
Accessory information										
Operation directly via handle			■ Standard				■ Standard			
Extended rotary handle			□ Optional				□ Optional			
Motor mechanism			□ Optional				□ Optional			
Fixed type front-panel			■ Standard				■ Standard			
Plug-in type front-panel			□ Optional				□ Optional			
Plug-in type back-panel			□ Optional				□ Optional			
Drawer type			- No				- No			
Phase partition			■ Standard				■ Standard			

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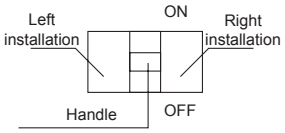
Table 1, continued

Model			TeM7E-400				TeM7E-630			
Frame current Inm (A)			400				630			
Number of poles			3P, 4P				3P, 4P			
Rated operating voltage Ue (V)			AC380/400/415, AC500/550, AC660/690				AC380/400/415, AC500/550, AC660/690			
Rated insulation voltage Ui (V)			1000				1000			
Rated impulse withstand voltage Uimp (kV)			12				12			
Short time withstand current ICW (kA/s)			6kA 1s				8kA 1s			
Rated frequency Hz			50/60				50/60			
Rated current In (A)			160, 180, 200, 225, 250, 280, 315, 350, 375, 400				250, 280, 315, 350, 375, 400, 450, 500, 560, 630			
Breaking capacity level			L	M	H	S	L	M	H	S
Icu	AC380/400/415V		50	85	100	150	50	85	100	150
	AC500/550V		50	50	70	70	50	50	70	70
	AC660/690		20	20	40	40	20	20	40	40
Ics (%Icu) (kA)	AC380/400/415V		100%				100%			
	AC500/550V		100%				100%			
	AC660/690		100%				100%			
Isolation function			Yes				Yes			
Usage category			B				B			
Operation performance (times)	Mechanical life		15000				15000			
	Electrical life	AC380/400/415V	7500				7500			
		AC500/550V	5000				3500			
		AC660/690V	3000				2000			
Flashover distance (mm)			0				0			
Accessory information										
Operation directly via handle			■ Standard				■ Standard			
Extended rotary handle			□ Optional				□ Optional			
Motor mechanism			□ Optional				□ Optional			
Fixed type front-panel			■ Standard				■ Standard			
Plug-in type front-panel			□ Optional				□ Optional			
Plug-in type back-panel			□ Optional				□ Optional			
Drawer type			□ Optional				□ Optional			
Phase partition			■ Standard				■ Standard			

4 Release Mode and Accessory Code



Alarm contact ● Aux. contact ○

Shunt release ■ Undervoltage release ▲

Table 2

Accessory name	Accessory code	Accessory installation and wire leading mode	
		TeM7E-125/250	TeM7E-400/430
		3P，4P	3P，4P
No accessory	00		
Alarm contact	08		
Shunt release	10		
Undervoltage release	30		
Aux. contact	20		
Dual aux. contacts	21		
Three aux. contacts	22	——	
Four aux. contacts	23	——	
Alarm contact + Shunt release	18		
Alarm contact + Undervoltage release	38		
Alarm contact + Aux. contact	28		
Alarm contact + Dual aux. contacts	68		
Alarm contact + Three aux. contacts	67	——	
Alarm contact + Four aux. contacts	66	——	
Shunt release + Aux. contact	40		
Shunt release + Dual aux. contacts	41		
Shunt release + Three aux. contacts	42	——	
Shunt release + Four aux. contacts	43	——	
Undervoltage release + Aux. contact	70		
Undervoltage release + Dual aux. contacts	71		
Undervoltage release + Three aux. contacts	72	——	
Undervoltage release + Four aux. contacts	73	——	
Alarm contact + Shunt release + Aux. contact	48		
Alarm contact + Shunt release + Dual aux. contact	47		
Alarm contact + Shunt release + Three aux. contact	46	——	
Alarm contact + Shunt release + Four aux. contact	45	——	
Alarm contact + Undervoltage release + Aux. contact	78		
Alarm contact + Undervoltage release + Dual aux. contact	77		
Alarm contact + Undervoltage release + Three aux. contact	76	——	
Alarm contact + Undervoltage release + Four aux. contact	75	——	

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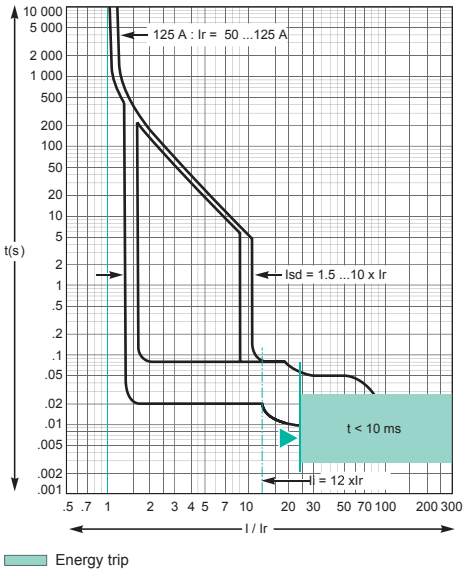
5 Trip Characteristic Curve

5.1 TeM7E electronic trip unit

TeM7E-125



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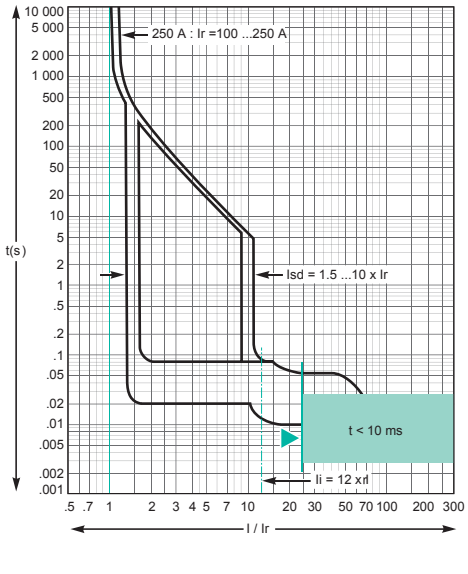

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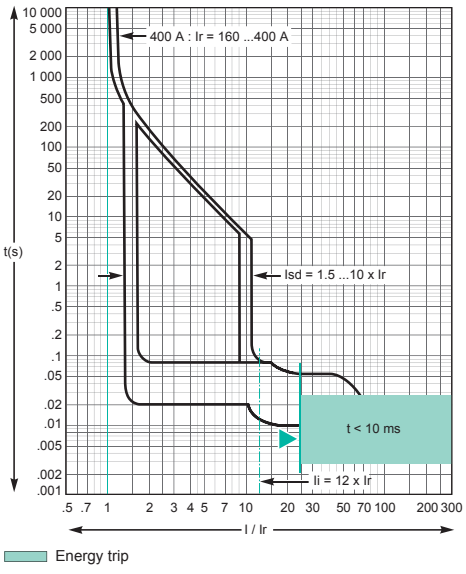

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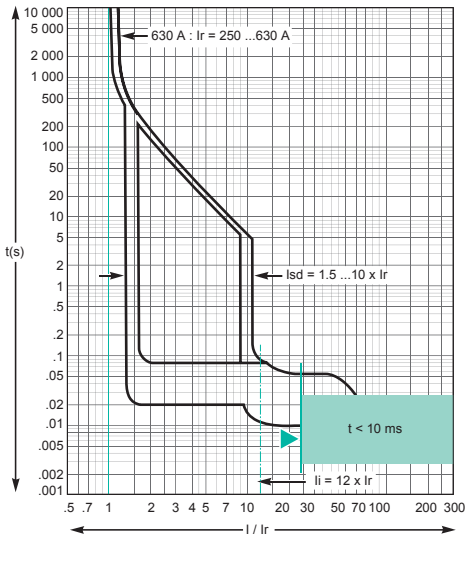

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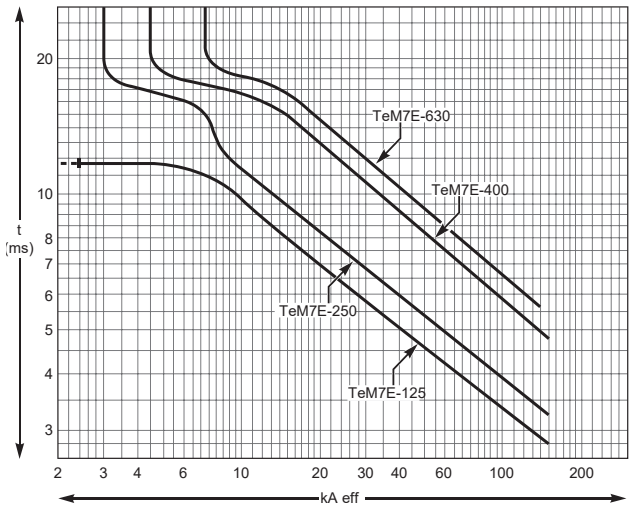
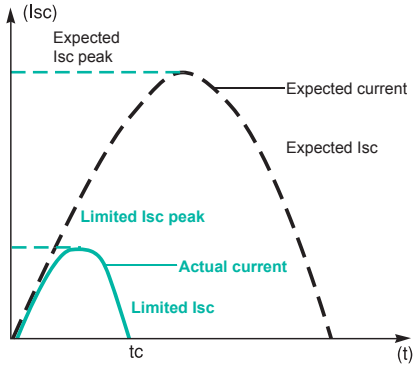
5.2 TeM7E Energy Trip Curve

The TeM7E-125 ~ 630 circuit breaker has an energy trip system. This system is a self-contained system that can generate a high gas pressure in the event of a short-circuit fault to apply this pressure on a piston mechanism making the circuit breaker trip to break the extremely large short circuit current.
With the huge pressure, the system can be disconnected quickly and reliably to realize the full selective protection.



5.3 TeM7E Current Limiting Capacity

The current limiting capacity of the circuit breaker refers to that the circuit breaker has the short circuit current limiting capacity in the event of short circuit, and the permissible current that passes through is lower than the expected value of the short circuit current.



The TeM7E series has excellent current limiting capability as the dual rotary breaking technology is used (the contacts are quickly and naturally rejected, and the arc voltage is divided into two arc voltages connected in series with a steep wavefront).

With excellent current limiting capability, the TeM7E series can greatly reduce the electrodynamic force generated by the fault current, thus greatly increasing the breaking capacity of the circuit breaker. Furthermore, the breaking capacity Ics of TeM7E is equal to the limit breaking capacity Icu.
ICS values are specified in GB/T 14048.2 standard, and are guaranteed through testing;

- After continuously breaking the fault current 3 times, breaking current = 100% Icu.
- Check whether the equipment meets the requirements of normal operation; that is:
  - The protection function is enabled within the range specified in the standard
  - The isolation function is absolutely safe and is not affected.

Extend the life of electrical equipment

The current limiting technology used in the circuit breaker greatly reduces the damage to the equipment caused by the short-circuit current.

Heat effects

Reduce the temperature rise, and improve the service life of the cable.

Mechanical effects

The decreasing of electrodynamic force greatly reduces the risk of deformation or damage to the contact and busbar.

Electromagnetic effects

Greatly reduce the interference with accessory measuring devices

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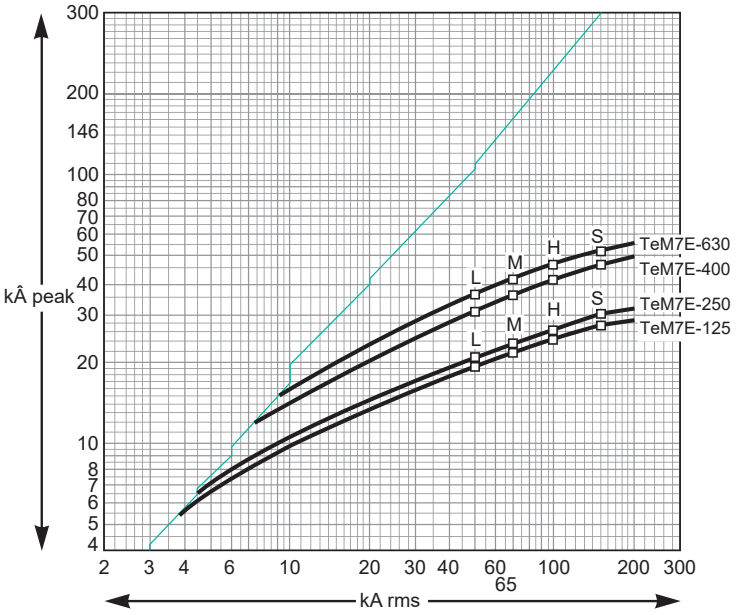
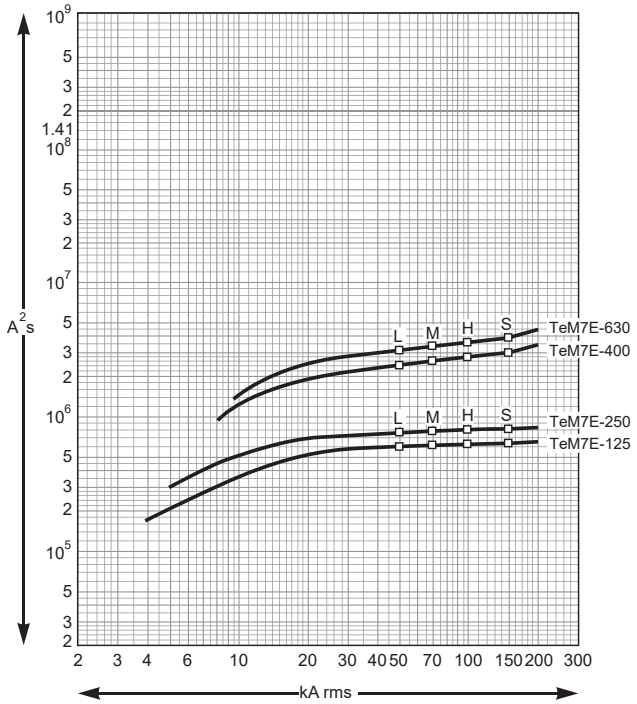
5.4 TeM7E Current Limiting Curve



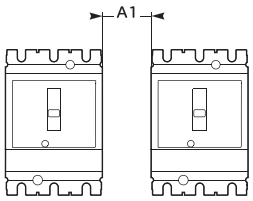
5.5 TeM7E Thermal Stress Curve



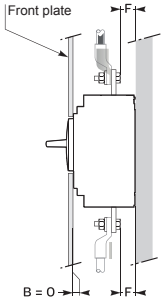
6 Installation Safety Spacing and Minimum Distance of Circuit Breaker

6.1 Safety Spacing

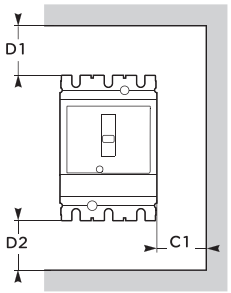
Minimum spacing between two adjacent circuit breakers



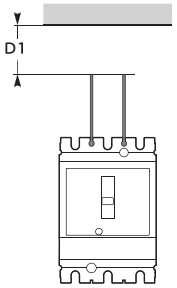
Minimum spacing between the circuit breaker and the front or rear plate



Minimum spacing between the circuit breaker and the top, base, or side plate



Circuit breaker without accessories



Circuit breaker with phase partition or terminal cover

Exposed or painted metal parts

Note: If F< 8mm: an insulating baffle must be used

Minimum safety distance of TeM7E-125 ~ 630

Table 3

Operating voltage	Spacing (mm)						
	Between circuit breakers	Between the circuit breaker and the painted metal part			Exposed metal part		
	A1	C1	D1	D2	C1	D1	D2
U ≤ 440V, used for the circuit breaker equipping with the following accessories:							
No accessory	0	0	30	30	5	40	40
Phase partition	0	0	0	0	5	0	0
440V < U ≤ 690V, used for the circuit breaker equipping with the following accessories:							
Phase partition	0	0	0	0	20	10	10

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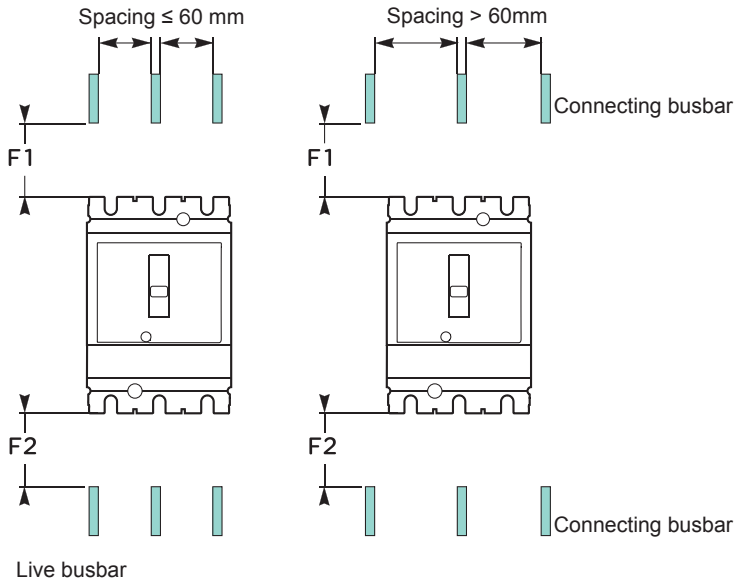
6.2 Relevant Spacing with Live Bare busbar

Minimum safety distance of TeM7E-125 ~ 630

Table 4

Operating voltage	Relevant spacing of live bare busbar			
	Spacing ≤ 60 mm		Spacing >60 mm	
	F1	F2	F1	F2
U<440V	350	350	80	80
U≤440V≤600V	350	350	120	120
U>600 V	Prohibited: Insulating baffle between the circuit breaker and the busbar			

Only when the configuration scheme passes the test, the spacing of special installations can be reduced.



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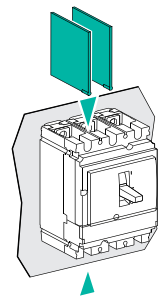
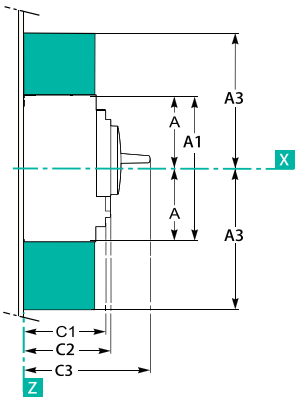
7 Outline and Installation Dimensions of Circuit Breaker

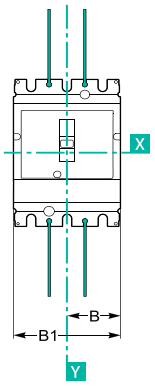
7.1 Outline and Installation Dimensions of TeM7E Fixed Type Front-Panel

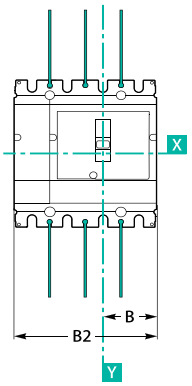
Dimensions	3P	4P

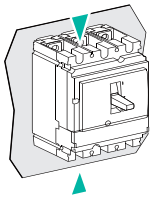


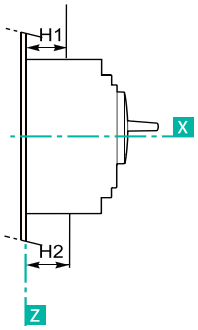
Phase partition

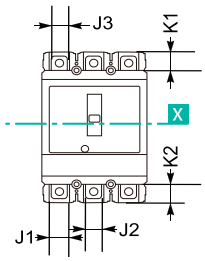


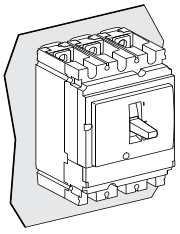






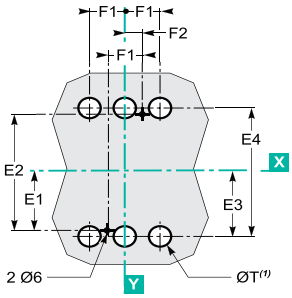


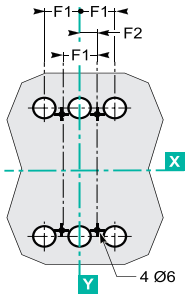


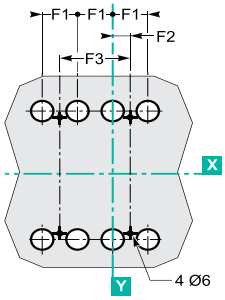


Install base plate

TeM7E-125/250 3P	TeM7E-400/630 3P	TeM7E-125~630 4P







(1) ØT is used only for rear connection (for 3P2T circuit braker, the intermediate pole is not required)

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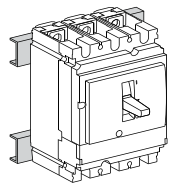
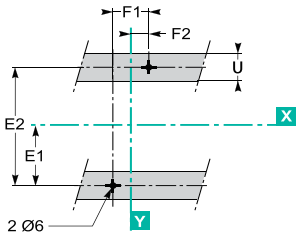
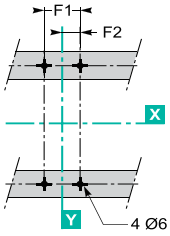
TeM7E-125/250 3P	TeM7E-400/630 3P	TeM7E-125~630 4P



Install rail





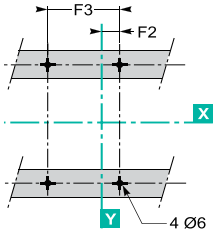


Table 5

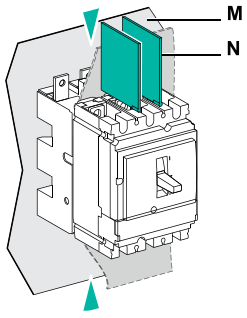
Model	A	A1	A3	B	B1	B2	C1	C2
TeM7E-125/250	81	162	172.5	52.5	105	140	84.8	89.3
TeM7E-400/630	127.5	255	237.5	70	140	185	112	116.5

Model	C3	E1	E2	E3	E4	F1	F2	F3
TeM7E-125/250	126.7	62.5	125	70.7	141.4	35	17.5	70
TeM7E-400/630	172.5	100	200	113.5	227	45	22.5	90

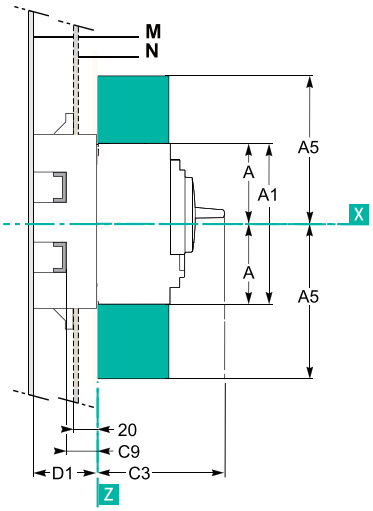
Model	φT	U	H1	H2	J1	J2	J3	K1	K2
TeM7E-125/250	24	≤32	22.5	20.1	25	18	18	20	16.75
TeM7E-400	24	≤32	25.3	26.4	33.8	30	30.5	30.5	28.4
TeM7E-630	24	≤32	27.3	26.4	33.8	30	30.5	30.5	28.4

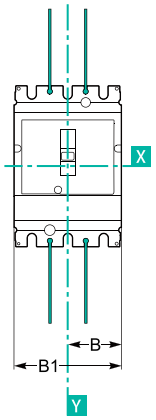
7.2 Outline and Installation Dimensions of TeM7E plug-in type

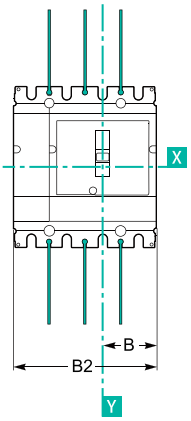
Dimensions	3P	4P



Phase partition

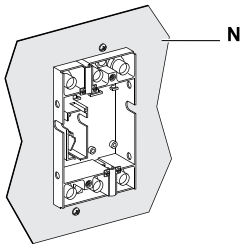




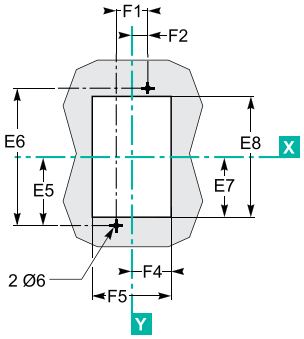


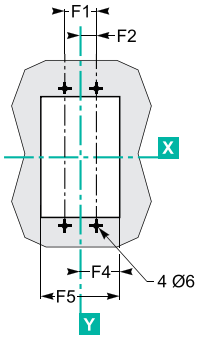
TeM7E Series Moulded Case Circuit Breaker

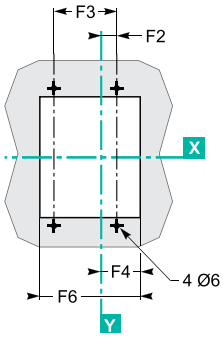
TeM7E-125~250 3P	TeM7E-400/630 3P	TeM7E-125~630 4P



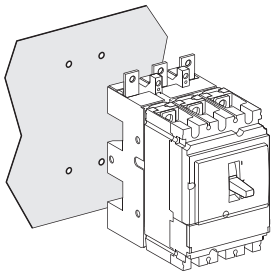
Install the through-plate



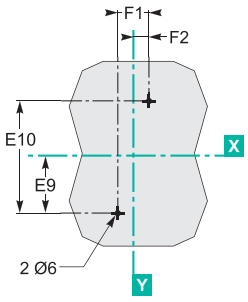


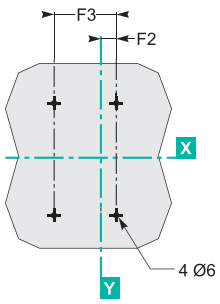


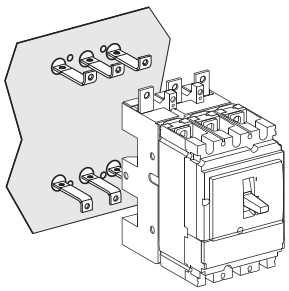
Installation dimensions of base plate	3P	4P



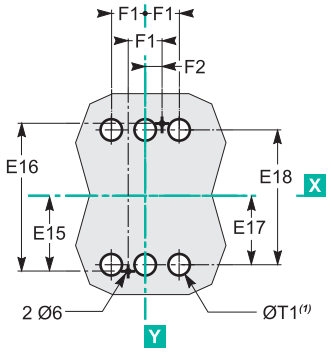
Front connection (install the insulating baffle between the mounting base plate and the circuit breaker base)

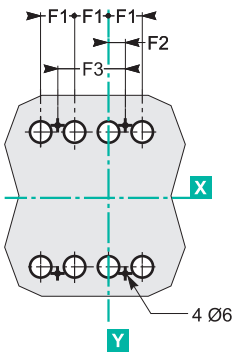






Rear connection

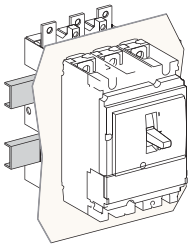




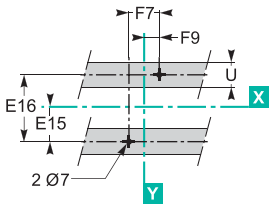
ØT1 is used only for rear connection (for 3P2T circuit braker, the intermediate pole is not required)

TeM7E Series Moulded Case Circuit Breaker

Dimensions	3P	4P



Install rail



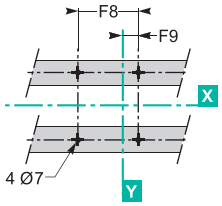


Table 6

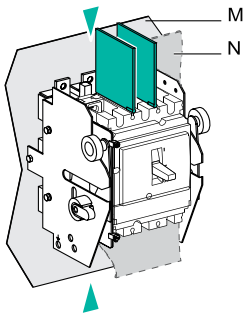
Model	A	A1	A5	B	B1	B2	C3	D1	E5	E6
TeM7E-125/250	81	162	172.5	52.5	105	140	126.7	67	94.5	189
TeM7E-400/630	127.5	255	237.5	70	140	185	172.5	111	149.5	299

Model	E7	E8	E9	E10	E15	E16	E17	E18	F1
TeM7E-125/250	86	172	73.5	147	37	74	61.8	123.6	35
TeM7E-400/630	137.5	275	125.5	251	71.5	143	100.5	201	45

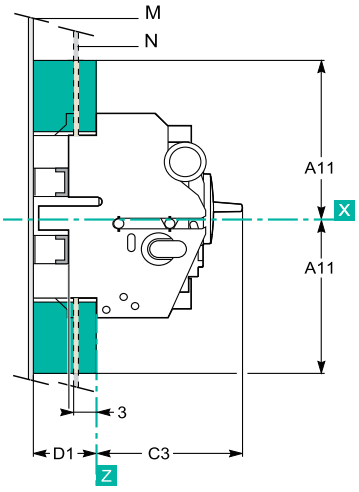
Model	F2	F3	F4	F5	F6	F7	F8	F9	φT1	U
TeM7E-125/250	17.5	70	53	107	141	50	85	25	22	≤32
TeM7E-400/630	22.5	90	68	136	181	90	135	45	33	≤35

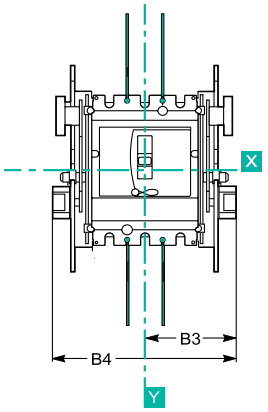
7.3 Outline and Installation Dimensions of TeM7E drawer type

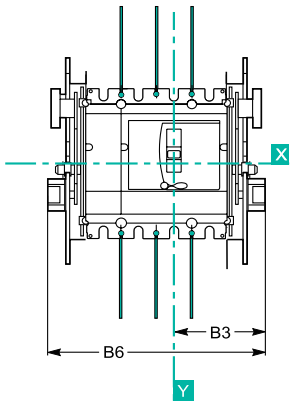
Dimensions	3P	4P



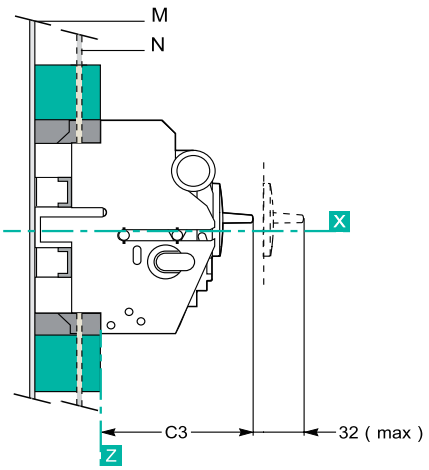
Phase partition



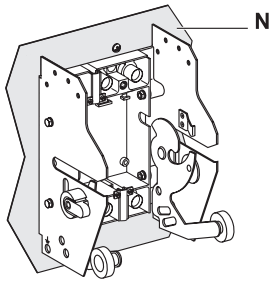




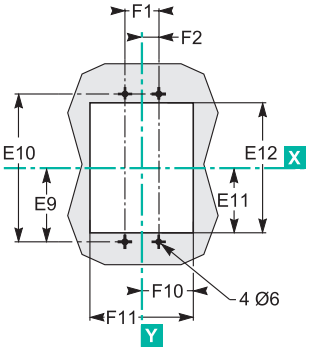
TeM7E Series Moulded Case Circuit Breaker

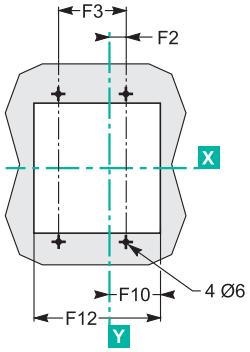


Dimensions	TeM7E-400/630 3P	TeM7E-400/630 4P

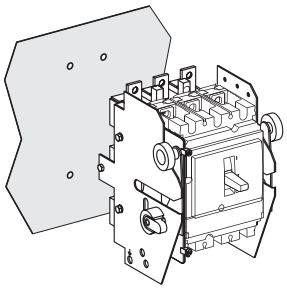


Install the through-plate for drawer type

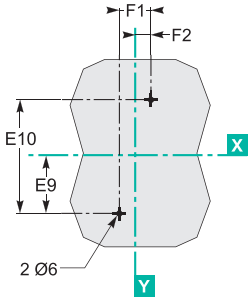


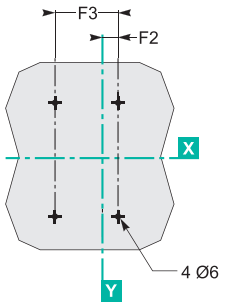


Installation dimensions of base plate	3P	4P

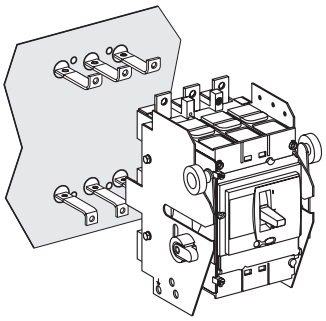


Front connection (install the insulating baffle between the mounting base plate and the circuit breaker base)

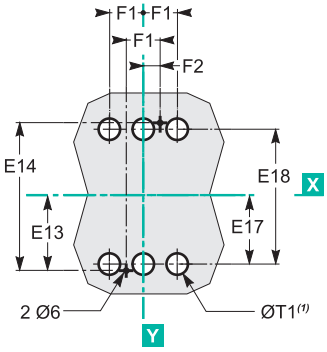


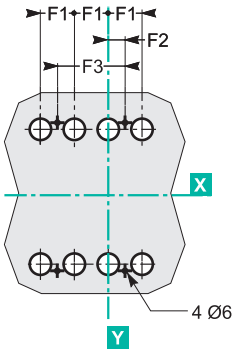


TeM7E Series Moulded Case Circuit Breaker



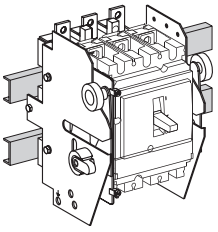
Rear connection



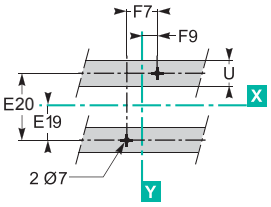


(1) ØT1 is used only for rear connection

Dimensions	3P	4P



Install rail



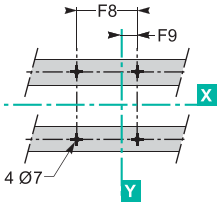


Table 7

Model	A11	B3	B4	B6	C3	D1	E9	E10	E11	E12
TeM7E-400/630	237.5	110	220	265	168	68.5	149.5	299	138	276

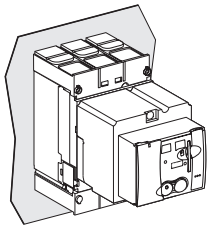
Model	E13	E14	E17	E18	E19	E20	F1	F2	F3	F7
TeM7E-400/630	125.5	251	100.5	201	71.5	143	45	22.5	90	90

Model	F8	F9	F10	F11	F12	U	φT1
TeM7E-400/630	135	45	68.5	137	182	≤35	33

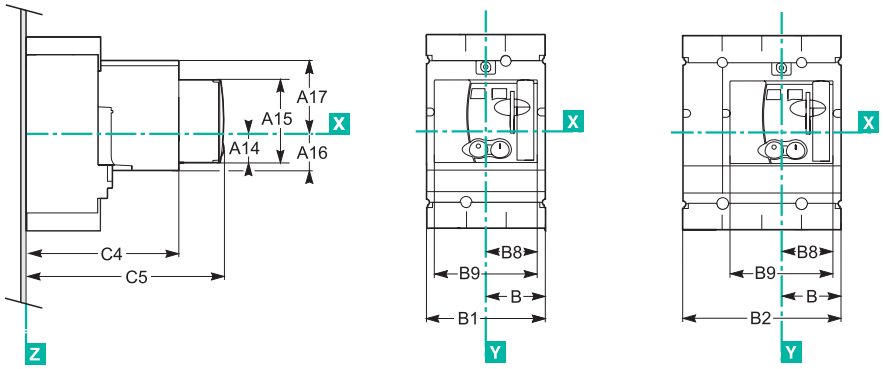
Note: No drawer type is available for 250 (inclusive) and below

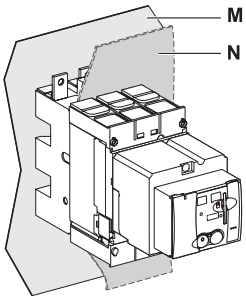
TeM7E Series Moulded Case Circuit Breaker

7.4 Outline and Installation Dimensions of TeM7E with motor mechanism

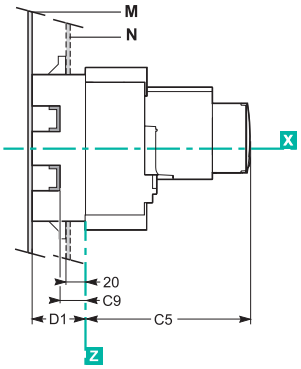


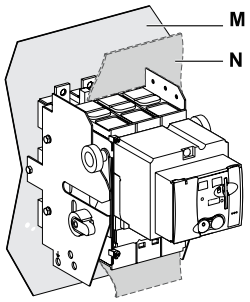
Fixed type





Plug-in type





Drawer type

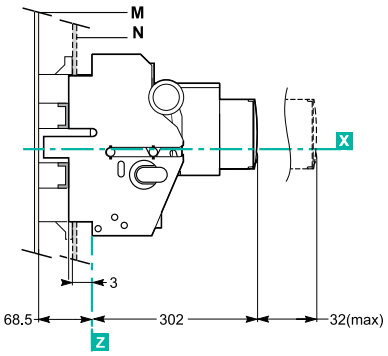


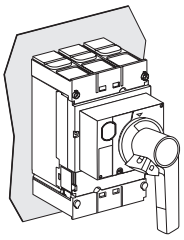
Table 8

Model	A14	A15	A16	A17	B	B1	B2	B8	B9	C4	C5	C9	D1
TeM7E-125/250	18.3	70.5	32.8	55.2	52.5	105	140	45	90	192.6	203.8	38	67
TeM7E-400/630	-	-	48.8	91.3	70	140	185	65	130	225	260	47	88

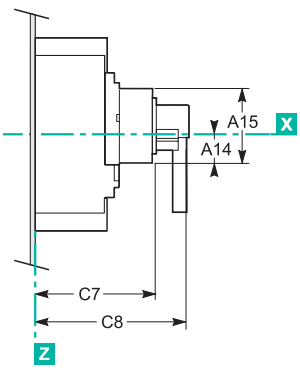
TeM7E Series Moulded Case Circuit Breaker

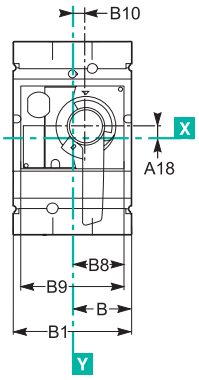
7.5 Outline and Dimensions of TeM7E with direct rotary handle

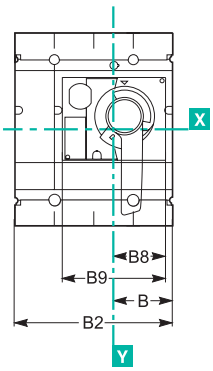
Dimensions	3P	4P

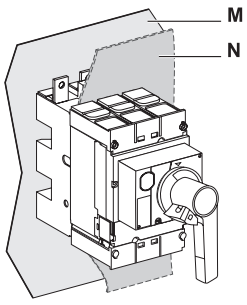


Fixed type

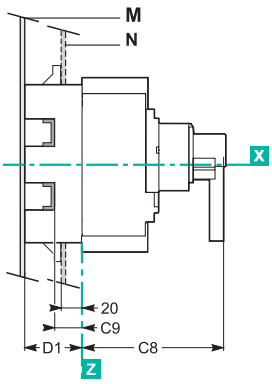


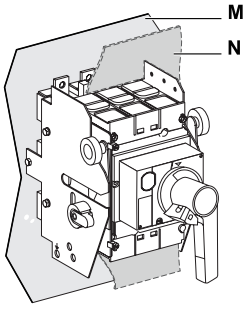






Plug-in type





Drawer type

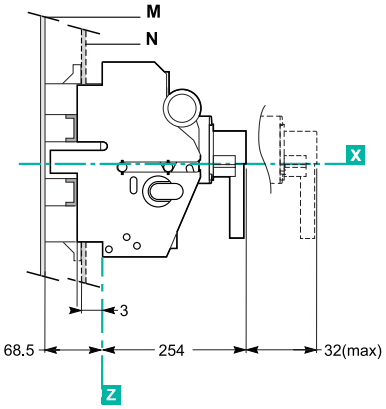
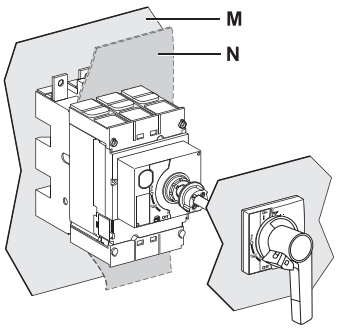


Table 9

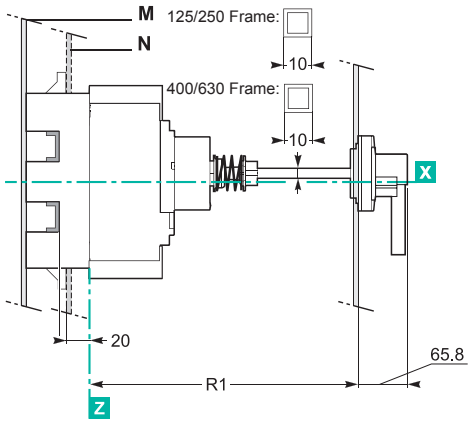
Model	A14	A15	A18	B	B1	B2	B8	B9	B10	C7	C8	C9	D1
TeM7E-125/250	32	82.8	12	52.5	105	140	45	90	15.5	128.3	176.7	38	67
TeM7E-400/630	42.4	131	19.2	70	140	185	60	120	18	162	208.7	47	88

TeM7E Series Moulded Case Circuit Breaker

7.6 TeM7E with Extended Rotary Handle and Outline Dimensions



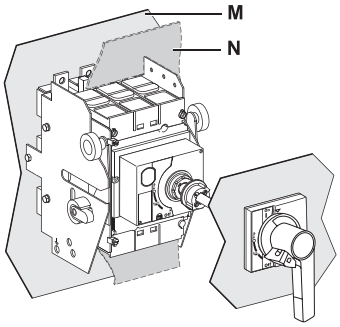
Fixed type or plug-in type circuit breaker



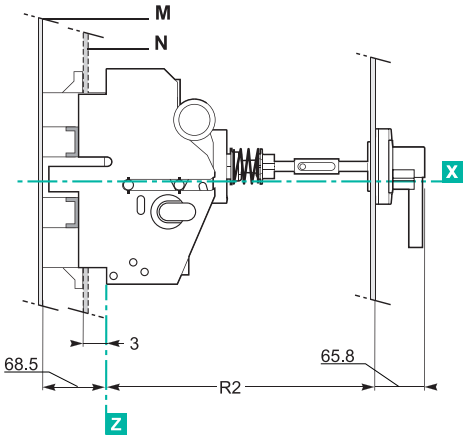
Rod length (mm): Standard 300
Customized by customer

Table 10

Model	R2
TeM7E-125/250	280
TeM7E-400/630	312



Drawer type circuit breaker

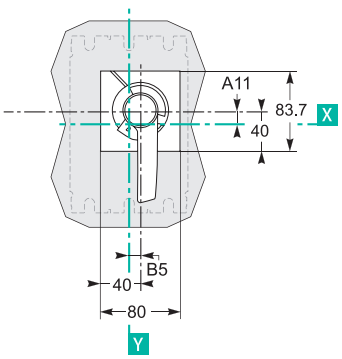


Rod length (mm): Standard 300
Customized by customer

Table 11

Model	R2
TeM7E-400/630	353.5

Dimensions and hole on door



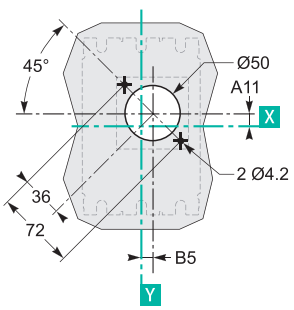


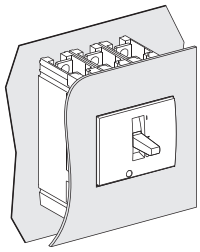
Table 12

Model	A11	B5
TeM7E-125/250	118	15.3
TeM7E-400/630	19.6	18.2

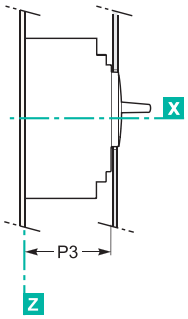
TeM7E Series Moulded Case Circuit Breaker

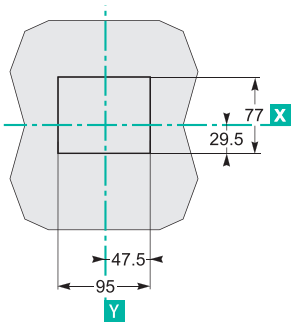
7.7 Size of Hole before Panel for TeM7E Fixed Type and Plug-in Type

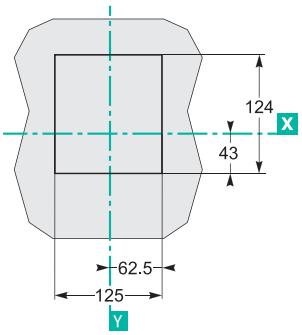
Size of hole on door	TeM7E-125/250	TeM7E-400/630

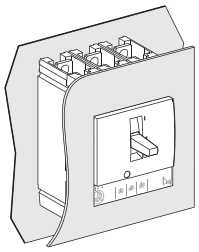


Toggle handle

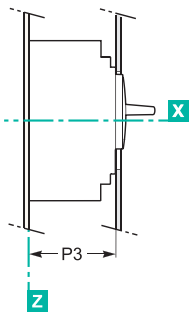


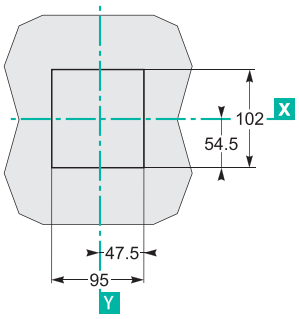






Toggle handle that can touch the trip unit





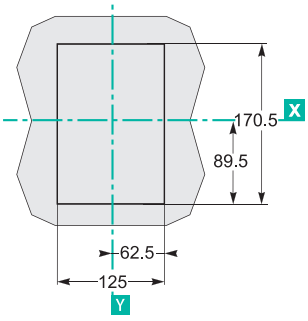


Table 13

Model	P3
TeM7E-125/250	88
TeM7E-400/630	117

TeM7E Series Moulded Case Circuit Breaker

8 Controller Function Configuration Table

8.1 Power Distribution Protection

Table 14

Release type Function				Knob basic type E2		Knob + LCD communication type E4	
				3P	4P	3P	4P
Power distribution protection	Basic protection		Overload long delay protection	√		√	
			Short circuit short delay protection	√		√	
			Short circuit instantaneous protection	√		√	
			MCR protection (enabled)	√		√	
	Additional protection		Earth fault protection	○		√	
			Neutral line protection	×	○	×	√
			Current three-phase unbalance protection	○		√	
			Overvoltage protection	×		√	
	Protection auxiliary function		Overload pre-warning	√		√	
			Thermal memory	×		√	
Measurement function	Current measurement		Current ABCN per pole	×		√	
			Earth current	×		√	
			Three-phase current unbalance	×		√	
	Voltage measurement		Line voltage UAB\UBC\UCA line voltage unbalance	×		√	
			Phase voltage UAB\UBC\UCA phase voltage unbalance	×		√	
	Power measurement		Active power, reactive power, apparent power, power factor	×		√	
History records	Historical max. value/min. value (communication output)		Historical max. and min. current	×		√	
			Historical max. and min. voltage	×		√	
			Max. and min. values of power factor	×		√	
	Fault memory		Latest 20 times	×		√	
Display function	LCD display includes but not limited those	Fault information display	Type of the last fault, fault current, operation time	×		√	
		Real-time current display	Same as current measurement information	×		√	
		Real-time voltage display	Same as voltage measurement information	×		√	
		Real-time power display	Same as power measurement information	×		√	
	LCD indicator	Run state	Green	√		√	
		Pre-warning state	Yellow	√		√	
		Alarm state	Red	√		√	
Communication function	Body isolation communication		MODBUS-RTU protocol	×		√	

1) √ Basic function ○ Optional function x No function;
2) Earthing protection: Difference type.

TeM7E Series Moulded Case Circuit Breaker

8.2 Motor Protection

Table 15

Release type Function				Knob basic type EM2		Knob + LCD communication type EM4	
				3P	4P	3P	4P
Motor protection	Basic protection		Overload long delay protection	√		√	
			Instantaneous protection	√		√	
			Motor shaft lock protection	√		√	
			MCR protection function	√		√	
	Additional protection		Current three-phase unbalance protection / phase loss	○		√	
			Startup timeout protection	○		√	
			Low load protection	○		√	
			Earth fault protection	○		√	
			Neutral line protection	×	○	×	√
			Overvoltage protection	×		√	
	Protection auxiliary function		Overload pre-warning	√		√	
			Thermal memory	×		√	
Measurement function	Current measurement		Current ABCN per pole	×		√	
			Earth current	×		√	
			Three-phase current unbalance	×		√	
	Voltage measurement		Line voltage UAB\UBC\UCA line voltage unbalance	×		√	
			Phase voltage UAB\UBC\UCA phase voltage unbalance	×		√	
	Power measurement		Active power, reactive power, apparent power, power factor	×		√	
History records	Historical max. value/min. value (communication output)		Historical max. and min. current	×		√	
			Historical max. and min. voltage	×		√	
			Max. and min. values of power factor	×		√	
	Fault memory		Latest 20 times	×		√	
Display function	LCD display includes but not limited those	Fault information display	Type of the last fault, fault current, operation time	×		√	
		Real-time current display	Same as current measurement information	×		√	
		Real-time voltage display	Same as voltage measurement information	×		√	
		Real-time power display	Same as power measurement information	×		√	
	LCD indicator	Run state	Green	√		√	
		Pre-warning state	Yellow	√		√	
		Alarm state	Red	√		√	
Communication function	Body isolation communication		MODBUS-RTU protocol	×		√	

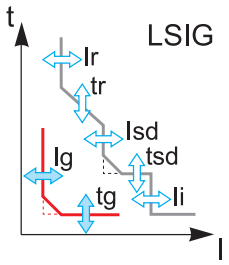
1) √ Basic function ○ Optional function x No function;
2) Earthing protection: Difference type.

9 TeM7E Trip Unit

9.1 E type Electronic Trip Unit

The TeM7E provides a series of interchangeable electronic trip units. The E4 type electronic trip unit provides power parameter measurement and communication functions to manage power parameters and optimize usage of the power.

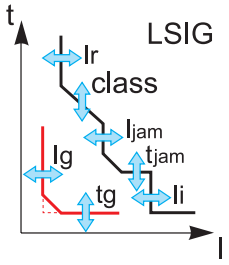
E2/E4



Distribution protection

The G protection of the E2 type electronic trip unit is optional

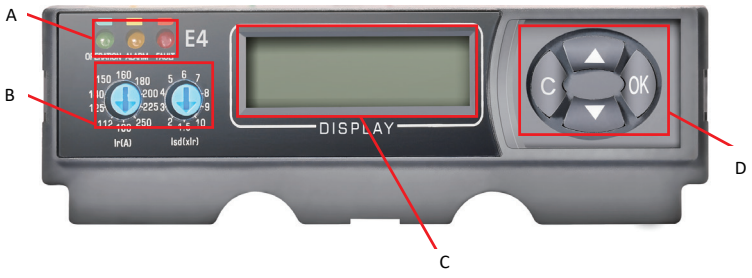
EM2/EM4

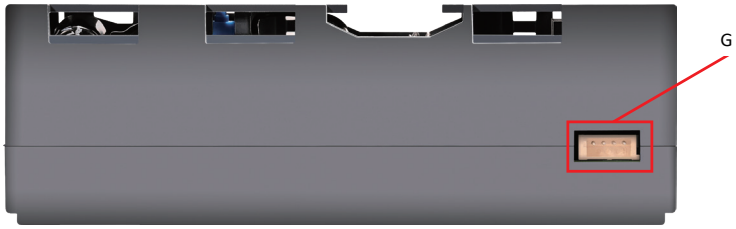


Motor protection

The G protection of the E2 type electronic trip unit is optional

9.1.1 Front side of trip unit





A: LED indicator
B: Knob for presetting protection function
C: LCD display
D: Navigation keyboard
E: Communication and test port
F: USB programmer interface
G: Trip wiring port

9.1.2 Navigation keyboard

4-key keyboard is used to navigation
“C” key (Return key): Return to the previous menu in the unedited state; exit the edit state in the edit state.
“▲” key (UP key): Change the interface upwards in the unedited state; add the current data in the edit state.
“▼” key (DOWN key): Change the interface downwards in the unedited state; minus the current data in the edit state.
“OK” key (Enter key): Enter the next menu or enter the edit state in the unedited state; save the current data and exit the edit state in the edit state.

9.2 Communication and Test Ports

9.2.1 Communication ports

It supports RS485 communication with isolation function, and can realize remote metering, remote control, and remote communication data transmission functions. With special motor mechanism, the remote control function can be realized, and the remote control output adopts optocoupler output. The communication adopts the Modbus-RTU protocol format.

Table 16

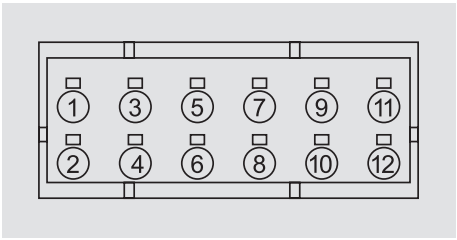
Communication protocols	Modbus
Communication address	1~ 255, 0 is the broadcast address
Baud rate (bit/S)	2.4k, 4.8k, 9.6k, 19.2k, 38.4k, 57.6k, 76.8k, 115.2k

The E series trip units have test ports dedicated for maintenance operations.
The test port can be used to connect a handheld programmer to perform many operations of the E series trip unit such as local test, fault query, parameter setting, and power parameter calibration.

9.2.2 Communication port of circuit breaker

9.2.2.1 Communication port

Communication and test port diagram



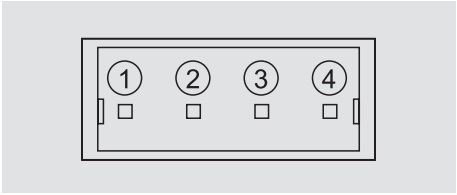
Communication and test port

Table 17

Terminal	Function
1	Programmer communication
2	For internal use
3	Programmer communication
4	For internal use
5	External connection DC24V (+)
6	Programmer input +5V
7	Breaking contact
8	External connection DC24V (-)
9	Closed contact
10	RS485B
11	Breaking closed common terminal
12	RS485A

9.2.2.2 Trip wiring port

Trip wiring port diagram



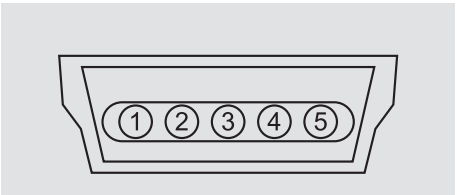
Trip alarm terminal

Table 18

Terminal	Function
1	Switch State input + (Dry contact)
2	Switch status input - (Dry contact)
3	Trip +
4	Trip -

9.2.2.3 USB programmer communication port

USB programmer communication port diagram



Communication terminal function

Table 19

Terminal	Function
1	+5V
2	TXD
3	RXD
4	Empty
5	GND

TeM7E Series Moulded Case Circuit Breaker

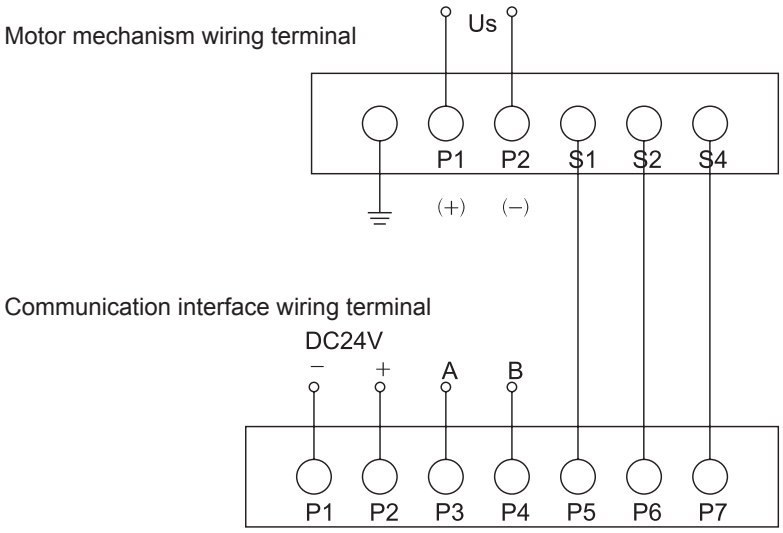
9.2.2.4 Special communication line

The standard length of the special is 0.5m, and the length can be customized.

Body port (for circuit breaker connection)

Note: The communication type circuit breaker should be connected to an external DC24V power supply, and check the polarity, otherwise the communication cannot be available. No short circuit is allowed between the terminals, otherwise it will cause damage.

9.2.3 Connection between the communication interface and the motor mechanism



9.2.4 Circuit breaker communication interface

When the E series trip unit is powered by an external DC24V power supply, the backlight of the trip unit display is white, and the backlight: will lights up for 1 minute when one key on the keyboard is pressed or the DC24V power supply works.

9.2.5 Power supply for E series trip units

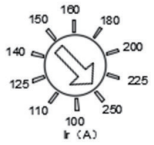
External DC 24V power supply
The DC24V power supply maintains the functions of the E series trip units in all conditions, including low load conditions (load less than 20%).

10 Example of Using a Knob to Set the Protection Function

Long delay protection current, short delay protection current, and earthing protection current shall be set via knob; the key can be used to fine-tune the current intelligently.

The keys are used for fine-tuning of the current step of 1A from the maximum value defined by the knob setting to the adjacent lower current gear. For example, for In = 250A product, the knob setting value is 200A, the key can realize the fine-tuning of the range of 180-200A; when the knob is set to the minimum gear or OFF gear, no adjustment is available.

Table 20

Step	Operation	Usage	Display
1	Turn the Ir knob to 250		Protect->Long Time Ir = 250A
2	If the set value of the current is inappropriate, set the exact value of Ir on the key: press the OK key, and then press the Down key.	OK ▼	Protect->Long Time Ir = 245 A
3	Confirm the setting.	OK	Protect->Long Time Ir = 245A

10.1 Example of Setting Protection Function Via Key

Table 21

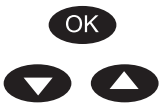
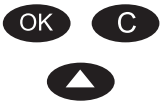
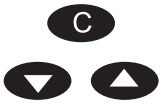
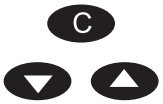
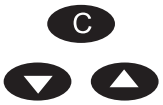
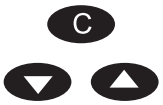
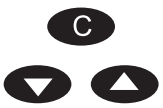
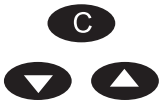
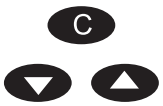
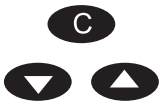
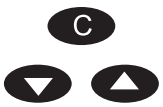
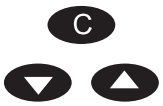
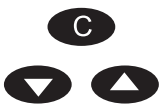
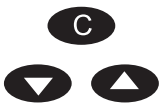
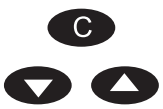
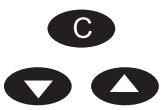
Step	Operation	Usage	Display
1	Boost screen		TENGEN
2	Enter the default interface after a delay, and press the "Up" or "Down" key to switch to the measurement information		Ia:0A Ib:0A Ic:0A
3	Press the “OK” key on the default menu to enter main menu, and press the "Up" or "Down" key to switch the contents		Menu ►Protect Trip Info.
4	Press the “OK” key on main menu to enter the overload long delay setting, press the “UP” key to return to the previous menu, and press the “C” key to return to main menu		Protect->Long Time Ir = 245A
5	Press the “DOWN” key to enter the overload long delay setting, press the “UP” key to return to the previous menu, and press the “C” key to return to main menu		Protect->long Time tr = OFF
6	Press the “DOWN” key to enter the overload long delay thermal memory setting, press the “UP” key to return to the previous menu, and press the “C” key to return to main menu		Protect->long Time Thermal OFF
7	Press the “DOWN” key to enter the short circuit short delay setting, press the “UP” key to return to the previous menu, and press the “C” key to return to main menu		Protect->Short Time Isd = 6.0Ir
8	Press the “DOWN” key to enter the short circuit short delay time setting, press the “UP” key to return to the previous menu, and press the “C” key to return to main menu		Protect->Short Time tsd = 0.30s Fixed
9	Press the “DOWN” key to enter the short circuit short delay thermal memory setting, press the “UP” key to return to the previous menu, and press the “C” key to return to main menu		Protect->Short Time Thermal OFF

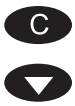
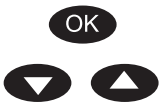
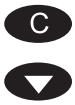
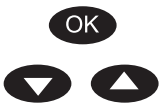
Table 21, continued

Step	Operation	Usage	Display
10	Press the “DOWN” key to enter the short circuit instantaneous setting, press the “UP” key to return to the previous menu, and press the “C” key to return to main menu		Protect->Instantaneo Ii = 10Ir
11	Press the “DOWN” key to enter the earthing protection setting, press the “UP” key to return to the previous menu, and press the “C” key to return to main menu		Protect->Ground Ig = 0.2In
12	Press the “DOWN” key to enter the earthing protection time setting, press the “UP” key to return to the previous menu, and press the “C” key to return to main menu		Protect->Ground tg = 0.4s@6Ig
13	Press the “DOWN” key to enter the pre-warning setting, press the “UP” key to return to the previous menu, and press the “C” key to return to main menu		Protect->Pre-alarm Ip = 0.90Ir
14	Press the “DOWN” key to enter the neutral line protection setting, press the “UP” key to return to the previous menu, and press the “C” key to return to main menu		Protect->Neutral Netral = 100%
15	Press the “DOWN” key to enter the current unbalance protection setting, press the “UP” key to return to the previous menu, and press the “C” key to return to main menu		Protect->Imbalance Iunbal = 30%
16	Press the “DOWN” key to enter the current unbalance time setting, press the “UP” key to return to the previous menu, and press the “C” key to return to main menu		Protect->Imbalance tunbal = 4s
17	Press the “DOWN” key to enter the overvoltage protection setting, press the “UP” key to return to the previous menu, and press the “C” key to return to main menu		Protect->0verVoltage Uover = 480V
18	Press the “DOWN” key to enter the overvoltage time setting, press the “UP” key to return to the previous menu, and press the “C” key to return to main menu		Protect->0verVoltage tover = 1.0s

TeM7E Series Moulded Case Circuit Breaker

10.2 Keys used to view/set history records, communication parameters, and clock settings

Table 22

Step	Operation	Usage	Display
1	Press the “DOWN” key on main menu to select the history records		Menu Protect ►TripInfo.
2	Press the “OK” key on main menu to enter the history records, and press the “DOWN” key to view the fault type and time		TripInfo.->Short 00 19-09-09 19:44:32
3	Press the “C” key to return to main menu, and press the “DOWN” key to select the communication parameters		Menu ►COMM. CLOCK
4	Press the “OK” key on main menu to enter the communication parameters option, and press the “UP” or “DOWN” key to view and modify the communication address and baud rate		COMM.->Address Address = 3
5	Press the “C” key to return to main menu, and press the “DOWN” key to select the clock setting		Menu COMM. ► CLOCK
6	Press the “OK” key on main menu to enter the clock setting option, and press the “UP” or “DOWN” key to set the clock		CLOCK->Year 24-07-03 14:27:46

10.3 Protection Functions of Circuit Breaker

E2

Overload long delay + Short circuit short delay + Short circuit instantaneous + Pre-warning/Neutral line protection/Earthing fault protection/Three-phase unbalance

EM2

Overload long delay + Jam + Short circuit instantaneous + Pre-warning/Neutral line protection/Earthing fault protection/Three-phase unbalance/Low load/Long start

E4

LCD display, multi-gear setting protection via knob, with all the functions of the E2 series and the voltage, current, power measurement functions, communicable

EM4

LCD display, multi-gear setting protection via knob, with all the functions of the EM2 series and the voltage, current, power measurement functions, communicable

11 Power Distribution System Protection

11.1 E type Trip Unit

The E type trip unit can be used in the 125~630A circuit breakers with breaking level L/M/H/S, and there are knob type and LCD type controllers. The basic LSI three-stage protection or LSI + earth fault protection G are provided. Measurement, alarm and communication functions are available.

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11.2 Protection Type

The protection value can be set in two ways – coarse tuning via knob and fine-turning via keys . Among them, keys are used for fine-tuning in steps of 0.05~1 from the maximum value defined by the knob setting.

Overload protection: Long delay protection (Ir)

The overload protection has the inverse time limit characteristics with a knob used to adjust the overload protection current Ir, and the keys are also used for fine-tuning. At the same time, keys are used to adjust the overload protection delay time tr.

Short circuit short delay protection: (Isd)

By adjusting the short circuit short delay protection current Isd and the delay time tsd, realize the short circuit short delay protection.

Short circuit instantaneous protection: (Ii)

The short circuit instantaneous protection current Ii can be adjustable.

Earth fault protection (Lg)

The earth fault protection current Lg is adjustable (and can be disable), and the delay time tg is also adjustable.

Neutral line protection (Irn)

- 4-pole circuit breaker, with keys used to set this protection:
  - Off: No protection for the neutral line.
  - 0.5: Neutral line semi-protection; the protection value is half of the protection current of each phase - 0.5xIr.
  - 1.0: Neutral line full-protection; the protection value is equal to the protection current of each phase - 1.0xIr.

Current unbalance protection (Iunbal)

The current unbalance protection Iunbal is adjustable (and can be disable) and the delay time tunbal is also adjustable.

Overvoltage protection (UOV)

The overvoltage protection Uov is adjustable (and can be disable), and the delay time tov is also adjustable.

MCR protection

MCR protection provides a high-speed instantaneous protection for the circuit breaker itself; when an out-of-limit fault current occurs, the controller will issue a trip command within a very short time.
The fixed value of the MCR protection current is 18In, and the maximum breaking time is ≤ 30ms.

Plug-in type electrical interlock protection

In plug-in type product installations, the insert in the mounting base is used to trigger this button for forced opening operation.
Note: The normal operation can be guaranteed when the single-phase power supply current is 0.4In and the three-phase power supply current is 0.2In or more.

11.3 Fault Type Display

After tripping due to fault, view the fault type and the relevant fault phase and corresponding fault information by querying the history records. The controller shall be powered by an external power supply.

11.1.3 Indicators

TeM7E Series Moulded Case Circuit Breaker

- Green: LED indicator for normal operation; the circuit breaker is in protection-ready state; it is not lit when I<20%In; when I>20%In, the LED will flicker slowly (1s).
- Yellow: Pre-alarm LED indicator; when I>110%Ip, the indicator will always on; when I<90%Ip, the indicator does not light up.
- Red: Alarm LED indicator; when I>105%Ir, it will flicker for the first half of the specified trip time and will be always on for the second half of the time.

11.4 Protection Characteristic

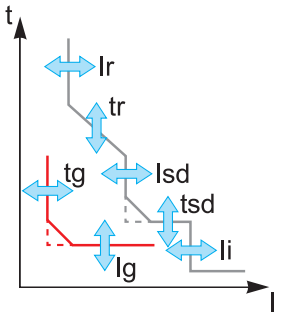

Table 23

Protection	E trip unit						
Rated current (A)	In 40°C (1)	125	250	400	630		
Circuit breaker	TeM7E-125	■	-	-	-		
	TeM7E-250	-	■	-	-		
	TeM7E-400	-	-	■	-		
	TeM7E-630	-	-	-	■		

Table 24

L	Long delay protection										
Trip current set value (A)	Rated current of trip unit (In) Set value on knob, Ir										
Ir = Knob set value											
	In=125A	50	56	63	70	75	80	90	100	112	125
	In=250A	100	112	125	140	150	160	180	200	225	250
	In=400A	160	180	200	225	250	280	315	350	375	400
	In=630A	250	280	315	350	375	400	450	500	560	630
	Key set value	With the knob set value as the maximum value, fine tune it in steps of 1A									
Delay time (s) tr=...	Key set value				1	2	4	8	16	OFF	
Accuracy ±10 %		1.5 x Ir			16	32	64	128	256		
		3 x Ir			4	8	16	32	64		
		6 x Ir			1	2	4	8	16		
Thermal memory		30 minutes before and after trip									

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Table 25

S	Short circuit short delay protection											
Trip current set value (A) Accuracy ±10 %	Isd = Ir x ...	Knob set value	1.5	2	3	4	5	6	7	8	9	10
		Key set value, with fine-tuning in steps of 0.5 x Ir										
Delay (s) Accuracy ±10 %	tsd = ...	Knob set value	Definite time limit		0.05		0.1	0.2	0.3	OFF		
			Inverse time limit		0.05		0.1	0.2	0.3	OFF		

Table 26

I	Instantaneous protection											
Trip current set value (A) Accuracy ±15 %	Ii = Ir x	Key set value	2	3	4	5	6	8	10	12	14	OFF
		Key set value, with fine-tuning in steps of 0.5 x Ir										
	Max. breaking time	50 ms										

Table 27

G	Earth fault protection											
Trip current set value (A) Accuracy ±10 %	Ig = In x	Knob set value	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	OFF
		Key set value, with fine-tuning in steps of 0.05In										
Delay (s)	tg = ...	Knob set value	Definite time limit				0.1	0.2	0.3	0.4		
			Inverse time limit				0.1	0.2	0.3	0.4		

Table 28

Irn	Neutral line protection		
Trip current set value (A)	Irn = Ir x ...	Knob set value	0.5 1 OFF
50% half-protection of neutral line	In the event of the overload fault of the neutral phase, the protection action point is equal to half of the set value. In the event of the short circuit short delay fault of the neutral phase, the protection action point is equal to half of the set value. In the event of the short circuit instantaneous fault of the neutral phase, the protection action point is equal to the set value.		
100% full-protection of neutral line	In the event of the overload fault of the neutral phase, the protection action point is equal to the set value. In the event of the short circuit short delay fault of the neutral phase, the protection action point is equal to the set value. In the event of the short circuit instantaneous fault of the neutral phase, the protection action point is equal to the set value.		

Table 29

Iunbal	Current unbalance protection		
Trip current set value (A) Accuracy ±10 %	Iunbal =	Knob set value	10% 15% 20% 25% 30% 35% 40% 50% 60% Off
		Key set value, with fine-tuning in steps of 1%	
Delay (s)	tunbal = ...	Knob set value	During normal operation: 1~40.0s During startup of product: 0.7s
Accuracy ±10 %		Key set value, with fine-tuning in steps of 1s	

Table 30

Uov	Overvoltage protection		
Trip voltage set value (A) Accuracy ±1 %	Uov=	Key set value	Four-pole: 240~480, OFF Three-pole: 420~800, OFF
		Key set value, with fine-tuning in steps of 1V	
Delay (s) Accuracy ±10 %	tov = ...	Key set value	0.2~60s
		Key set value, with fine-tuning in steps of 0.1s	

(1) If the product works in a high-temperature environment, to determine the set value, the temperature derating must be considered. For more information, please refer to the temperature derating table.

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12 Multi-Parameter Electric Energy Measurement

12.1 E type Intelligent Trip Unit

In addition to protection functions, the E type trip unit provides powerful functions such as multi-functional power parameter measurement and operation management.

- Display settings
- Measurement function
- Alarm
- Historical data log with time display
- Communications

With the intelligent and precise instrument transformer of the E type intelligent trip unit, the E type trip unit can realize the measurement functions. They all processed by the built-in microprocessor.

12.2 LCD Display

The user can view all protection settings and the measurements of main power parameters on the LCD screen of the trip unit.

- The E type intelligent trip unit can measure the followings: instantaneous true current RMS value, voltage, and power.

In order to ensure that the LCD display can work under all operating conditions, it is recommended to provide an external power supply. The external power supply must be used in the following situations:

- Reliable display of fault and fault current values
- Use all the functions of all E type intelligent trip units (such as: measurement at low loads).
- Ensure the reliable operation of the communication system

12.3 Parameter Measurement

True RMS value measurements

- The E type intelligent trip unit can continuously display the true RMS current values for the three-phase and neutral lines. In the event of a fault trip, the fault current is stored.
- The E type intelligent trip unit can measure phase current, neutral line current, and earth fault current.
- The E type intelligent trip unit can also provide voltage and power measurement.

Max/Min value measurements

For E type intelligent trip unit, each instantaneous measured value can be cumulative for calculation of the maximum and minimum values. The maximum values of three-phase and neutral line current, demand current, and power can be reset by the communication system.

12.4 Power parameter measurement function of E type intelligent trip unit integration

Table 31

Measured value		
True RMS measured current (A)		
Current (A)	Phase current and neutral line current	Ia, Ib, Ic, In
	Earth current	Ig
	Interphase unbalance current	Ba, Bb, Bc
Voltage	Line voltage	U_{AB}, U_{BC}, U_{CA}
	Phase voltage	U_{an}, U_{bn}, U_{cn}
	Unbalanced line voltage, unbalanced phase voltage	BUab,BUac,BUbc BUan,BUbn,BUcn
Power	Active (kW)	Pt, three-phase / phase
	Reactive (kVAR)	Qt, three-phase / phase
	Apparent (kVA)	St, three-phase / phase
	Power factor	PF , three-phase and each phase

TeM7E Series Moulded Case Circuit Breaker

Other technical characteristics - measurement accuracy

These accessories are available for the entire system - including transformer.
- Current: ±1% (up to±0.5%)
- Voltage: ±0.5%
- Power: ±1.5% (up to ±1%)

13 Power Management for E type Intelligent Trip Unit

13.1 Personalized alarm with time display

Alarm type

- LCD window display
- Alarm current display
- Alarm time display

13.2 History Logs and Event Tables

The history logs and events tables are always in the recordable state

Three types of history logs with time display

- Trip caused by LR, LSD, LI, LG out of the threshold: the last 20 trips

Each history log is recorded

- Trip cause (including fault type, fault phase)
- Trip threshold
- Delay time

Current or voltage value (not available for some fault types, such as mcr trip)
Failure time (year, month, day, hour, minute, second)

Display a history logs and events table

Through the communication system, the time-based history log and event table can be displayed on a single PC.

Built-in memory

With a nonvolatile built-in memory, the setting data, fault records, and history logs can be saved, and all recorded data can also be saved in the event of a power failure.

Manage installed devices

Each circuit breaker equipping with an E type intelligent trip unit can be identified by a communication system.
- Serial number
- Firmware version
- Hardware version
- User-assigned device name

This information combining with the above-mentioned instructions clearly describes the status of the installed equipment.

14 Motor Protection

14.1 EM type electronic trip unit

The EM type trip unit provides the same protection functions as the E type trip unit:
- Short circuit
- Overload

In addition, it can provide motor-specific protection functions that can be set via keys.

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Protection

The protection value can be set in two ways – coarse tuning via knob and fine-turning via keys . Among them, keys are used for fine-tuning in steps of 1A from the maximum value defined by the knob setting.
The jam, low load, long-start protection and long delay trip class are added for motor protection, and other protections are the same as those of the power distribution controller.

Jam (I_{jam})

This function detection is locked by the motor shaft due to load. This function is disabled during the startup of the motor. During normal operation, trip will occur in the following situations:
- Fine tune within the 1-8 x Ir if higher than the threshold I_{jam}
- Delay time T_{jam} is adjustable: 1-30 seconds

Low load (I_{und})

This function can be used to detect the no-load operation of the motor due to insufficient loads (such as drain pumps) and can also detect low phase currents. During the startup of the motor, this function is always available. During the normal operation, it will trip in the following situations:
- Fine turn within the range of 0.3-0.9 x Ir if below the threshold I_{undo}
- Delay time T_{und} is adjustable: 1-200 seconds

Long start (I_{long})

This protection function can perfect the thermal protection (rating). Provide a better protection during the startup of the motor.
Detect the abnormal startup of motor; that is, it will trip if the starting current is always too high or too low relative to the protection threshold and delay time in the following situations:
- For threshold I_{long} related, the fine-tuning range is 1-8 x Ir
- For delay time T_{long} related, the adjustment range is 1-200 seconds

Trip Class (Class)

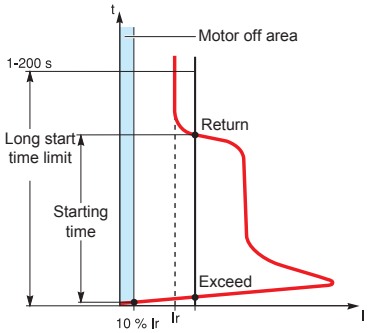
Five trip classes: 5, 10A, 10, 20, 30; they can be disabled

Other Technical Features

The start-up time depends on the trip class
In order to start the motor normally, the EM trip unit shall check the relevant conditions according to the thermal protection (long delay) trip current Ir.
- Current > 10% x Ir (motor cut-off limit)
- When exceeding 1.5 x Ir threshold, return to the value below this threshold before the end of the 10s delay.

If any of these conditions is not met, the thermal protection function will be enabled to trip the switch after a maximum time equal to the time corresponding to the selected trip class. The threshold Ir must be set to the current indicated on the nameplate of motor.

Long Startup



Motor start and long start

When this function is enabled, additional thermal protection (rating) is provided.
Trip will occur during long start-ups, which is characterized as follows:
- Current > 10% x Ir (motor cut-off limit), and:
- Failed to return to the value below this threshold before the end of the long delay (1-200s) when the current exceeds the long delay threshold (1-8 x Ir).
- Or, failed to exceed the long delay threshold (1-8 x Ir) before the end of the long delay (1-200s).

The threshold Ir must be set to the current indicated on the nameplate of motor, and this protection should be coordinated with the selected trip class.

TeM7E Series Moulded Case Circuit Breaker

14.2 EM Type Protection Characteristics

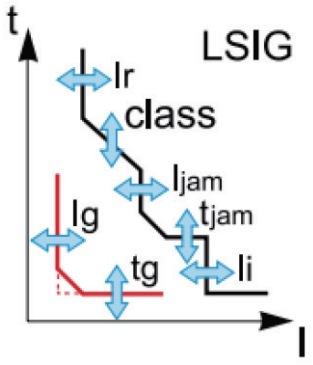


Table 32

L	Overload protection: Long delay protection										
Trip current set value (A)	Rated current of trip unit (In) Set value on knob, Ir										
Knob set value											
	In=125A	50	56	63	70	75	80	90	100	112	125
	In=250A	100	112	125	140	150	160	180	200	225	250
	In=400A	160	180	200	225	250	280	315	350	375	400
	In=630A	250	280	315	350	375	400	450	500	560	630
	Key setting	With the knob set value as the maximum value, fine turn in steps of 1A									
Trip class I				5	10A	10	20	30			
Delay time (s) Based on the selected trip class	tr	1.5 x Ir		64	96	160	320	480			
		2 x Ir		36	54	90	180	270			
		7.2x Ir		2.7	4.2	6.9	13.8	20.8			
Thermal memory	30 minutes before and after trip										

I_{jam}	Jam	
Set value (A) Accuracy ±10 %	I_{jam} = Ir x ...	1-8Ir, with OFF state, default setting = OFF, fine tune via key in steps 0.1 x Ir, which is disabled during the startup of the motor
Delay time (s)	T_{jam} =	1-30s Fine tune via key in steps 1s; default set value = 30s

I_{und}	Low load (low current)	
Set value (A) Accuracy ±10 %	I_{und} = Ir x ...	0.3-0.9Ir, with OFF state, default setting = OFF, fine tune the motor via key in steps Ir x 0.1, which is enabled during the startup
Delay time (s)	T_{und} =	1-200s Fine tune via key in steps 1s; default set value = 10s

I_{long}	Long start	
Set value (A) Accuracy ±10 %	I_{long} = Ir x ...	1-8Ir, with OFF state, default setting = OFF, fine tune the motor via key in steps Ir x 0.1, which is enabled during the startup of the motor
Delay time (s)	T_{long} =	1-200s Fine tune via key in steps 1s; default set value = 10s

15 Accessories

15.1 Internal Accessories

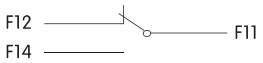
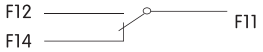
15.1.1 Aux. contact AX

[Function]

Accessories that remotely indicate the CLOSED (ON) or OPEN/FREE TRIP (OFF) state of the circuit breaker and are connected to the auxiliary circuit of the circuit breaker.

[Indicate the ON/OFF state of circuit breaker]

Table 33

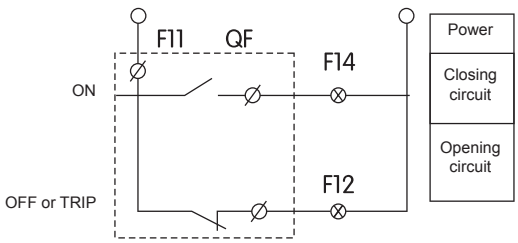
When the circuit breaker is in the "OFF" and "FREE TRIP" position	
When the circuit breaker is in the "ON" position	

[Electrical Characteristics]

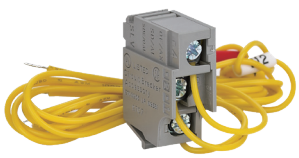
Table 34

Rated operating voltage (V)	Rated operating current (A)	
	AC-15	DC-13
AC 110	4	-
AC 220/240	3	-
AC 415	2.5	-
DC 110	-	0.3
DC 220	-	0.25

[Wiring diagram]



15.1.2 Alarm contact AL



[Function]

It is mainly used to provide signals in the event of the overload, short circuit or undervoltage fault or free trip of the circuit breaker.

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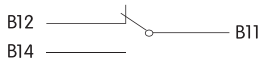
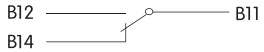
[Indicate the ON/OFF state of circuit breaker]

Table 35

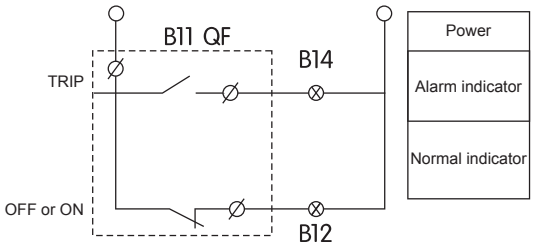
When the circuit breaker is in the "OFF" and "ON" position	
When the circuit breaker is in the "FREE TRIP (ALARM)" position	

[Electrical Characteristics]

Table 36

Rated operating voltage (V)	Rated operating current (A)	
	AC-15	DC-13
AC 110	4	-
AC 220/240	3	-
AC 415	2.5	-
DC 110	-	0.3
DC 220	-	0.25

[Wiring diagram]



15.1.3 Shunt release SHT

[Function]

The shunt release works according to the electrical signal to realize the remote control and automatic control of the circuit breaker. When the power voltage is equal to any voltage between 70%~110% of the rated control power voltage, the shunt release can make the circuit breaker works reliably.

[Electrical Characteristics]

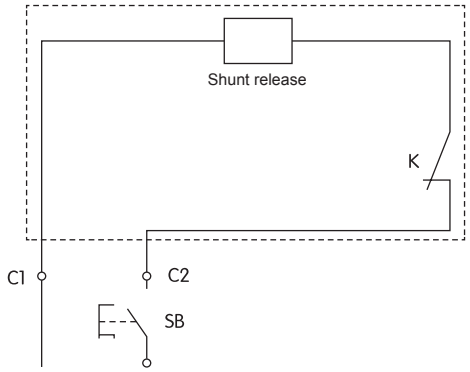
Table 37

Frame	Power Consumption (W)				
	AC220-240V	AC380-415V	DC24V	DC110V	DC220V
125/250/400/630A	2.2	2.5	2.2	2.5	2.5

[Operating Characteristics]

It is prohibited to energize the product for long time (≤ 5s); response time: pulse type ≥ 20ms, ≤ 60ms.

[Wiring diagram]



Note: When the shunt release with a rated control power voltage of DC24V is used, the maximum length of copper wire (the length of each of two wires) must comply with the table below:

Table 38

Sectional area of wire / Rated control power voltage U_s(DC24V)	1.5mm^2	2.5mm^2
100%U_s	150m	250m
85%U_s	100m	160m

15.1.4 Undervoltage release UVT

[Function]

Realize the undervoltage protection function of circuit breaker to disconnect the circuit breaker when the power supply voltage is too low for the protection of the electrical equipment.

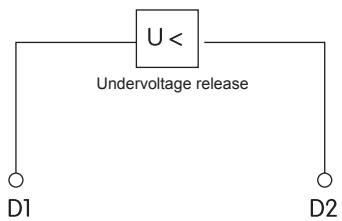
- When the supply voltage drops (or even slowly decreases) to the range of 70% to 35% of the rated control power voltage, the undervoltage release shall work to disconnect the circuit breaker reliably.
- When the power supply voltage is equal to or greater than 85% of the rated control power supply voltage of the undervoltage release, it is guaranteed that the circuit breaker is closed.
- When the supply voltage is less than 35% of the rated control power supply voltage of the undervoltage release, the undervoltage release shall work to prevent the circuit breaker from closing.

[Electrical Characteristics]

Table 39

Frame	Power Consumption (W)	
	AC220-240V	AC380-415V
125/250/400/630A	2.2	3

[Wiring diagram]



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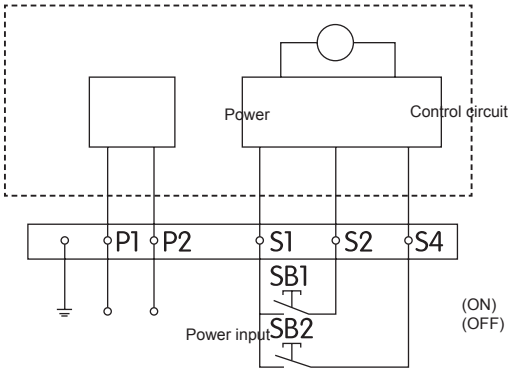
15.2 External Accessories

15.2.1 Motor mechanism CD2

[Function]

It is suitable for remote closing, opening and re-trip operations of the circuit breakers, as well as for automation applications.

[Electrical Characteristics & Wiring Diagram]



P1 and P2 are external power inputs
SB1 and SB2 are operating buttons (provided by the user)

15.2.2 Direct rotary handle (AH)

Protection grade: IP40

[Function]

With reliable insulation
Suitable for isolation functions
Realize the free trip of the circuit breaker
Three position indicators: ON/OFF/TRIP
Not affect the operation of the release and "Trip" test button by the user

[Lock]

Users can choose to hang padlock in the ON or OFF position (self-provided, diameter 5~8mm)
1~3 padlocks are allowed in each position
Or the handle lock accessory is used to lock it in the ON or OFF position

15.2.3 Extended rotary handle (RH)

Protection grade: IP56

With extended rotary handle provided, the circuit breaker installed in the switch cabinet can be operated from the door of the switch cabinet, and the following functions can still be guaranteed:

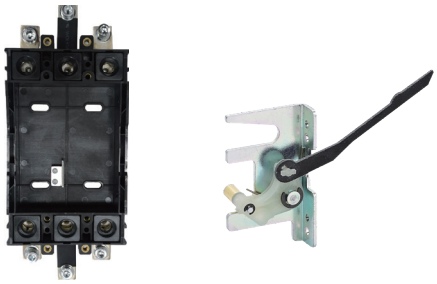
[Function]

- With reliable insulation
- Suitable for isolation function
- Realize the free trip of the circuit breaker
- Three position indicators: ON/OFF/TRIP
- When the cabinet door opens, it does not affect the operation of the release and "Trip" test button by the user and it can ensure that the circuit breaker will not be closed.

[Lock]

- Users can choose to hang padlock in ON or OFF positions (self-provided, diameter 5~8mm)
- 1~3 padlocks can be provided in each position
- After hanging a padlock, it can prevent the cabinet door from opening
- Or the handle lock accessory is used to lock it in the ON or OFF position

15.2.4 Plug-in type base (PIA)



[Function]]

- Realize the quick replacement of the circuit breaker without changing the inlet and outlet lines and mounting base
- The plug-in type base can be pre-installed to ensure convenient installation of the circuit breaker by the customer in the future
- It can be used to isolate the power supply circuit during the installation of the circuit breaker through-plate or base
- With a plug-in type safety device, it can ensure that the circuit breaker can trip automatically when the circuit breaker is pulled out in the ON state

15.2.5 Drawer type base (DOB)

[Function]

- Realize the quick replacement of the circuit breaker without changing the inlet and outlet lines and mounting base
- The drawer type base can be pre-installed to ensure convenient installation of the circuit breaker by the customer in the future
- With a safety device provided, it can ensure that the circuit breaker can trip automatically when the circuit breaker is pulled out in the ON state

Circuit breaker with a combined drawer type base has the two following states:

- Connection state: The power circuit is turned on
- Removable state: The circuit breaker can be taken out from the base

15.2.6 Phase partition

[Function]

It is used to ensure the safety of interphase insulation and prevent interphase short circuit.

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16 Appendix

16.1 Circuit Breaker Inverse Time Limit Characteristic Table

Table 40

Name of test current	Setting current multiple	Appointed time		Start state	Usage category	Electromagnetic release operating current (A)
		In≤63A	In>63A			
Conventional no-trip current	1.05In	≥1h	≥2h	Cold state	For power distribution protection	10In±20%
Conventional trip current	1.30In	≥1h	<2h	Hot state		
Conventional no-trip current	1.0In	≥2h		Cold state	For motor protection	12In±20%
Conventional trip current	1.2In	<2h		Hot state		

16.2 Circuit Breaker Trip Characteristic Curve

When the ambient air temperature changes, the trip characteristic has a little change and shall be corrected.
The correction coefficient of the thermal magnetic release is as follows:

Table 41

Ambient air temp.	-40°C	-35°C	-30°C	-25°C	-20°C	-15°C	-10°C	-5°C	0°C	5°C	10°C	15°C
Temp. correction factor	1.4	1.375	1.35	1.325	1.3	1.275	1.25	1.225	1.2	1.175	1.15	1.125
Ambient air temp.	20°C	25°C	30°C	35°C	40°C	45°C	50°	55°C	60°C	65°C	70°C	
Temp. correction factor	1.1	1.075	1.05	1.025	1.0	0.925	0.85	0.775	0.7	0.625	0.55	

16.3 Circuit Breaker Derating

High altitude derating

If the altitude exceeds 2000m in the applicable working environment, the electrical performance of the circuit breaker can be corrected according to the table below

Table 42

Altitude (m)	2000	3000	4000	5000
Power frequency withstand voltage (V)	3000	2500	2000	1800
Operating current correction factor	1	0.94	0.88	0.83
Short circuit breaking capacity correction factor	1	0.83	0.71	0.63

16.4 Install circuit breaker

◆ Connection with main circuit
Wiring connection must be carried out by professionally and technically qualified personnel.
The wiring connection can be performed only after confirming that the input power supply is completely disconnected

◆ Select the connecting wire.
The cross-sectional area of the connecting wire and the corresponding rated current are listed in the table below:

Table 43

Rated current (A)	16 20	25	32	40 50	63	80	100	125 140	160	180 200 225	250	315 350	400
Sectional area of wire (mm^2)	2.5	4	6	10	16	25	35	50	70	95	120	185	240

Table 44

Rated current (A)	Cable		Copper busbar	
	Qty.	Sectional area (mm^2)	Qty.	Size mm x mm
500	2	150	2	30×5
630	2	185	2	40×5

◆ For back-panel wiring connection, the insulating sleeve must be assembled onto the terminal block.
◆ Connect the crimped wire with the conductive electrode of the circuit breaker with bolt and tighten it.
◆ Install arc isolating sheet between the phases of the circuit breaker.
◆ Check

Check the circuit breaker according to the installation requirements before use, and ensure that its fixed connection part shall be connected reliably; operate the circuit breaker repeatedly several times and check whether the operating mechanism works flexibly and reliably.

16.5 Use and Maintenance of Circuit Breaker

◆ When selecting the circuit breaker, ensure that the technical parameters indicated on the circuit breaker should be consistent with the actual requirements.
◆ The various characteristics and accessories of the circuit breaker are set by the manufacturer, and they cannot be adjusted at will during operation.
◆ With periodic inspection, remove dust on the surface of the shell, and keep the circuit breaker clean and good insulation.
◆ Select the different rated currents according to the requirements of the protected object, otherwise the correct protection effect cannot be achieved.
◆ Maintenance and inspection must be carried out by professional and technical personnel.
◆ When the user chooses the internal and external accessories, their models provided by the company must be available to ensure the quality, and the company will not bear any consequences caused by purchase or modification without permission.
◆ Before performing maintenance operations, please make the circuit breaker open.
◆ Protect the circuit breaker to prevent rain attacks or drops during the operation, storage and transportation.

16.6 Application and Ordering Specifications

◆ The model and specification of the circuit breaker should be indicated. To order a 250 frame 3-pole product, current specification 250A, power distribution, breaking capacity of 50kA/AC415V, with shunt, circuit breaker product with a shunt voltage AC230V, the model is described as TeM7E-250L/3310 250A 230V;
◆ The rated voltage should be indicated for shunt and undervoltage accessories, such as AC230V;
◆ The rated operating voltage of the motor mechanism should be indicated, such as AC230V.