Shanghai Liangxin Electrical Co., Ltd.

NDM5E-1600 Product Specification

（IPD-ENG-DEV-T20 A0 2014-04-01）

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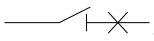
Reviewed by	张君	Date	2022-12-12
Countersigned by	杨文学	Date	2022-12-12
Approved by	丁飞	Date	2022-12-13

Revision Record					
Version	Revision Reason/Content	Date	Prepared by	Reviewed by	Approved by
0	New addition	2022.07.11	Yang rong rong	Yang wen xue	Ding fei
1	Add the terminal pin to the accessory package	2022.12.05	Yang rong rong	Yang wen xue	Ding fei

1. Application Range

NDM5E-1600 molded case circuit breakers (referred to as circuit breakers), with rated insulation voltage of 1000V and rated working voltage (AC380/400V/415V, AC500V, AC660/690V, AC800V), can be applied in circuits of current (800A~1600A) to distribute power and to protect wirings and power suppliers from overload long-delay inverse time lag. It has the functions of overload long time delay inverse time limit, short-circuit short time delay definite time limit, short-circuit short time delay inverse time limit, short-circuit instantaneous, grounding, overload alarm and non tripping, which can protect the line and power equipment from damage. In addition, it also has the function of feeding back the product's current, voltage, power, energy, frequency, service life, opening and closing status, operation times and other information to the upper computer or other energy efficiency management systems for the detection and monitoring of circuit breakers, Reduce the operation and maintenance cost of the power grid and provide necessary data for the future energy efficiency system.

The circuit breaker has an isolating function with the corresponding symbol of  .

Comply with standards: IEC 60947-2, GB/T 14048.2.

The circuit breakers can be connected to the circuit for all rated voltages and all short circuit interruption capacities with an exception of AC 800V.

2. Picture of the Product

Product picture

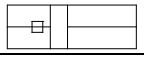
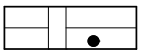
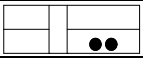
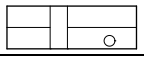
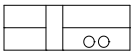
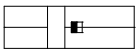
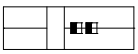
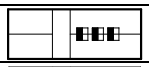
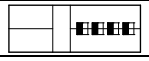
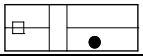
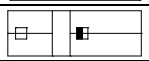
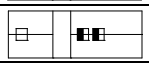
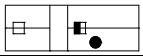
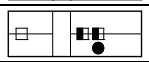
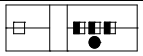
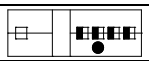
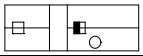
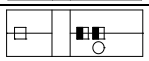
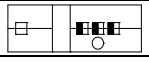
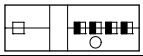
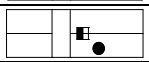
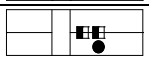
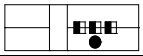
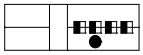
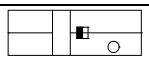
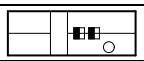
3. Specification and Model Description

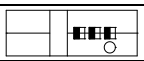
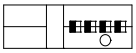
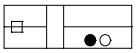
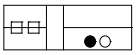
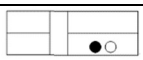
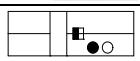
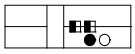
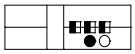
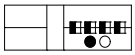
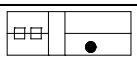
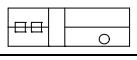
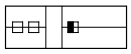
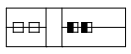
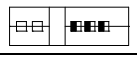
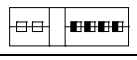
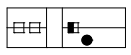
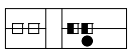
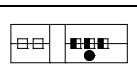
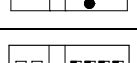
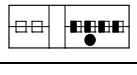
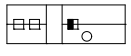
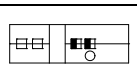
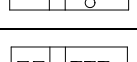
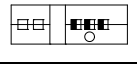
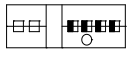
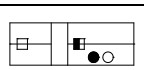
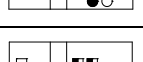
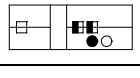
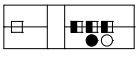
ND	M	5	E	-	1600	□	□	/	□	/	□	/	□	□	□	□
1	2	3	4		5	6	7		8		9		10	11	12	13

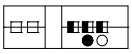
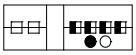
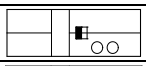
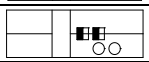
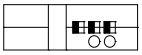
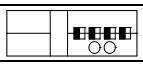
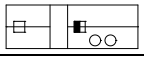
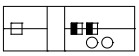
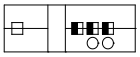
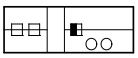
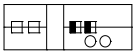
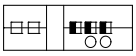
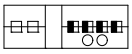
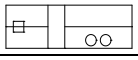
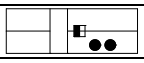
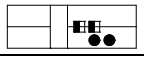
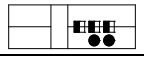
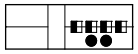
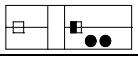
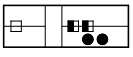
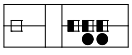
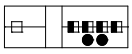
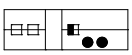
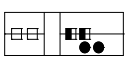
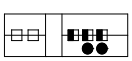
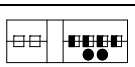
S.N.	Name of S.N.	NDM5E
1	Enterprise characteristic code	ND: Nader low-voltage apparatus
2	Product type code	M: MCCB
3	Design SN	5
4	Product type code	E：Electronic
5	Current of the frame size	1600
6	Interruption level code	L（Standard）

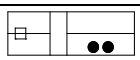
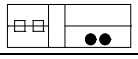
		M（Mid-high）
		H（Highest）
7	Rated current In	see table 2
8	Pole	3：3Pole
		4：4Pole
9	Release trip type	ETB：basic electronic controller
		ETB-T： communication electronic release
		ETB-PT：communication energy efficiency electronic release
		ETC：screen electronic controller
		ETC-P：energy efficiency intelligent release
		ETC-T：communication intelligent release
		ETC-PT：communication energy efficiency intelligent release
10	Installation method	Null：fixed
11	Connection method	Null：front connection
		ES：extended front connection
		R1：parallel rare connection
		R2：vertical rare connection
12	operaiton method	null: Handle
		Z2A150：otary handle with round eccentric hole + length of shaft 150mm
		Z2A200：otary handle with round eccentric hole + length of shaft 200mm
		Z2A300：otary handle with round eccentric hole + length of shaft 300mm
		Z2A350：otary handle with round eccentric hole + length of shaft 350mm
		Z2A650：otary handle with round eccentric hole + length of shaft 650mm
		M02：motor operation DC24V
		M11：motor operation AC110V/DC110V
		M22：motor operation AC230V/DC220V
		M40：motor operation AC400V
13	Accessories code	see table 1

Table 1

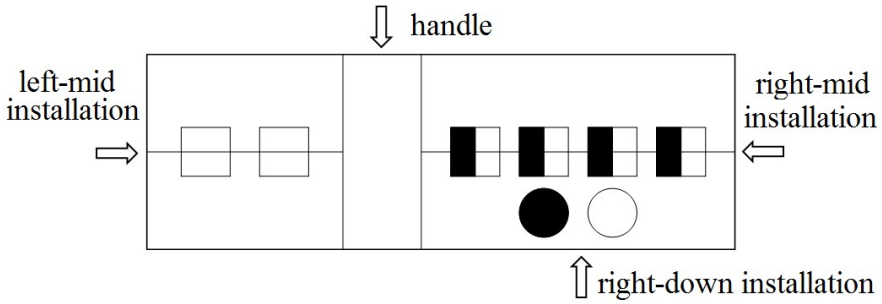
Code	Accessory	Installation Position
		3P、4P
00	None	—
08	One set of alarm contacts	
98	Two sets of alarm contacts	
10	Shunt release	
K01	Two sets of shunt releases	
30	Under-voltage release	
A01	Two sets of under-voltage releases	
21	Single auxiliary contact	
61	Two sets of single auxiliary contacts	
23	Three sets of single auxiliary contacts	
24	Four sets of single auxiliary contacts	
18	Shunt release, alarm contact	
38	Under-voltage release, alarm contact	
22	Single auxiliary contact, alarm contact	
88	Two sets of single auxiliary contacts, alarm contact	
26	Three sets of single auxiliary contacts, alarm contact	
25	Four sets of single auxiliary contacts, alarm contact	
42	Shunt release, single auxiliary contact, alarm contact	
44	Shunt release, two sets of single auxiliary contacts, alarm contact	
46	Shunt release, three sets of single auxiliary contacts, alarm contact	
14	Shunt release, four sets of single auxiliary contacts, alarm contact	
75	Under-voltage□Release, single auxiliary contact, alarm contact	
77	Under-voltage release, two sets of single auxiliary contacts, alarm contact	
81	Under-voltage release, three sets of single auxiliary contacts, alarm contact	
82	Under-voltage release, four sets of single auxiliary contacts, alarm contact	
41	Shunt release, single auxiliary contact	
11	Shunt release, two sets of single auxiliary contacts	
12	Shunt release, two sets of single auxiliary contacts	
13	Shunt release, four sets of single auxiliary contacts	
71	Under-voltage release, single auxiliary contact	
72	Under-voltage release, two sets of single auxiliary contacts	

73	Under-voltage release, three sets of single auxiliary contacts	
74	Under-voltage release, four sets of single auxiliary contacts	
31	Under-voltage release, shunt release, alarm contact	
37	Under-voltage release, shunt release, two sets of single alarm contacts	
50	Under-voltage release, shunt release	
51	Under-voltage release, shunt release, single auxiliary contact	
52	Under-voltage release, shunt release, two sets of single auxiliary	
53	Under-voltage release, shunt release, three sets of single auxiliary	
54	Under-voltage release, shunt release, four sets of single auxiliary	
19	Shunt release, two sets of single alarm contacts	
79	Under-voltage release, two sets of single alarm contacts	
63	Single auxiliary contact, two sets of single alarm contacts	
64	Two sets of single auxiliary contacts, two sets of single alarm contacts	
65	Three sets of single auxiliary contacts, two sets of single alarm contacts	
66	Four sets of single auxiliary contacts, two sets of single alarm contacts	
43	Shunt release, single auxiliary contact, two sets of single alarm contacts	
45	Shunt release, two sets of single auxiliary contacts, two sets of single alarm contacts	
47	Shunt release, three sets of single auxiliary contacts, two sets of single alarm contacts	
15	Shunt release, four sets of single auxiliary contacts, two sets of single alarm contacts	
76	Under-voltage release, single auxiliary contact, two sets of single alarm contacts	
80	Under-voltage release, two sets of single auxiliary contacts, two sets of single alarm contacts	
83	Under-voltage release, three sets of single auxiliary contacts, two sets of single alarm contacts	
84	Under-voltage release, four sets of single auxiliary contacts, two sets of single alarm contacts	
32	Under-voltage release, shunt release, single auxiliary contact, alarm contact	
33	Under-voltage release, shunt release, two sets of single auxiliary contacts, alarm contact	
34	Under-voltage release, shunt release, three sets of single auxiliary contacts, alarm contact	
35	Under-voltage release, shunt release, four sets of single auxiliary contacts, alarm contact	
39	Under-voltage release, shunt release, single auxiliary contact, two sets of single alarm contacts	
55	Under-voltage release, shunt release, two sets of single auxiliary contacts, two sets of single alarm contacts	

56	Under-voltage release, shunt release, three sets of single auxiliary contacts, two sets of single alarm contacts	
36	Under-voltage release, shunt release, four sets of single auxiliary contacts, two sets of single alarm contacts	
A02	Two sets of under-voltage releases, single auxiliary contact	
A07	Two sets of under-voltage releases, two sets of single auxiliary contacts	
A08	Two sets of under-voltage releases, three sets of single auxiliary	
A09	Two sets of under-voltage releases, four sets of single auxiliary contacts	
A10	Two sets of under-voltage releases, single auxiliary contact, alarm	
A12	Two sets of under-voltage releases, two sets of single auxiliary contacts, alarm contact	
A14	Two sets of under-voltage releases, three sets of single auxiliary contacts, alarm contact	
A16	Two sets of under-voltage releases, four sets of single auxiliary contacts, alarm contact	
A11	Two sets of under-voltage releases, single auxiliary contact, two sets of single alarm contacts	
A13	Two sets of under-voltage releases, two sets of single auxiliary contacts, two sets of single alarm contacts	
A15	Two sets of under-voltage releases, three sets of single auxiliary contacts, two sets of single alarm contacts	
A17	Two sets of under-voltage releases, four sets of single auxiliary contacts, two sets of single alarm contacts	
A05	Two sets of under-voltage releases, alarm contact	
A06	Two sets of under-voltage releases, two sets of single alarm contacts	
K04	Two sets of shunt releases, single auxiliary contact	
K06	Two sets of shunt releases, two sets of single auxiliary contacts	
K07	Two sets of shunt releases, three sets of single auxiliary contacts	
K08	Two sets of shunt releases, four sets of single auxiliary contacts	
K12	Two sets of shunt releases, single auxiliary contact, alarm contact	
K09	Two sets of shunt releases, two sets of single auxiliary contacts, alarm contact	
K10	Two sets of shunt releases, three sets of single auxiliary contacts, alarm contact	
K11	Two sets of shunt releases, four sets of single auxiliary contacts, alarm contact	
K13	Two sets of shunt releases, single auxiliary contact, two sets of single alarm contacts	
K14	Two sets of shunt releases, two sets of single auxiliary contacts, two sets of single alarm contacts	
K15	Two sets of shunt releases, three sets of single auxiliary contacts, two sets of single alarm contacts	
K16	Two sets of shunt releases, four sets of single auxiliary contacts, two sets of single alarm contacts	

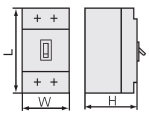
K02	Two sets of shunt releases, alarm contact	
K05	Two sets of shunt releases, two sets of single alarm contacts	

Note: ◧ Single auxiliary contact; □Alarm contact; ●Shunt release; ○Under-voltage release



4. Main Technical Parameters

Table 2

	NDM5E-1600L	NDM5E-1600M	NDM5E-1600H
Frame size Inm(A)	1600		
Poles	3	3、4	3
Rated working voltage Ue (V)	AC380/400/415V、AC500V、AC660/690V、AC800V		
Rated current In (A)	800、1000、1250、1600		
Rated insulation voltage Ui (V)	1000		
Power frequency withstand voltage (V)	3500		
Rated impulse withstand voltage Uimp (kV)	12		
Icu（kA） (AC400/415V)	70	100	100
Ics（kA） (AC400/415V)	70	100	100
Icu（kA） (AC500V)	50	70	85
Ics（kA） (AC500V)	50	70	70
Icu（kA） (AC690V)	20	35	50
Ics（kA） (AC690V)	20	35	42
Icu（kA） (AC800V)	/	/	30
Ics（kA） (AC800V)	/	/	20
Icw（kA）	20/1s		
Utilization category	B		
Endurance without current (cycles)	10000(3P)/6000(4P)		
AC415V Endurance with current (cycles)	2000(1600),3000(1250)		
AC500V Endurance with current (cycles)	1500		
AC690V Endurance with current (cycles)	1000		
AC800V Endurance with current (cycles)	500		
Boundary dimension 	L(mm)	268	
	W(mm)	210(3P)/280(4P)	
	H(mm)	154	
Flashover distance(mm)	≤100		

4.1 Boundary dimension front connection product (see table 3)

Table3

Rated current(A)	800	1000	1250	1600
Busbar dimension：width×thickness（mm）	50×5	50×6	50×8	50×10
Number of busbar	2	2	2	2

4.2 Tightening Torque of the Circuit Breaker Terminal and Mounting Screw

Table 4 Tightening Torque of the Circuit Breaker Terminal and Mounting Screw

Model	Screw application	Thread specification	Torsional moment (N·m)
NDM5-250	Wiring screw	M10	20
	Set screw	M5	4

4.3 Derating factor of temperature change for the circuit breaker

Table 5

Model	Temperature derated coefficient of productions							
NDM5E-1600	Temperature（℃）	40	45	50	55	60	65	70
	derated Coefficient	1	0.98	0.95	0.92	0.88	0.84	0.80

Note：1）While ambient temperature is below 40℃，productions can be normally operated，No derated

2）Temperature derated Coefficient is tested with running rated current

4.4 High altitude derating factor of circuit breaker

Table 6

Altitude (m)	2000	2500	3000	3500	4000	4500	5000
Working current correction coefficient	1	1	0.98	0.97	0.95	0.94	0.93
Maximum operating voltage（V）	800	800	720	670	630	600	560
	690	690	620	580	550	520	500
Power frequency withstand voltage (V)	3500	3500	3150	3000	2800	2650	2500
Average insulation class (V)	1000	1000	900	850	810	770	730

5. Normal Working Environment

1) Elevation should be no more than 2500m. for detail please see MCCB high elevation degrade coefficient table
2) The environment temperature is from -35℃～+70℃. The average temperature within continuous 24 hours should no more than +35℃. If the environmnent temperature is higher than +40℃. The MCCB should be used with degrade. For detail please see MCCB high temperature degrade coefficient table
3) Thermal and humidity resistance: accord with IEC60086-2-30(40℃ 95% relative humidity)

4) Products can resist from humid air, salty and oily fog and mould.

5) Installation category for MCCB connecting to main circuit: type III(power distribution and control level)

6) Installation category for MCCB connecting to main circuit: typeII (load level)

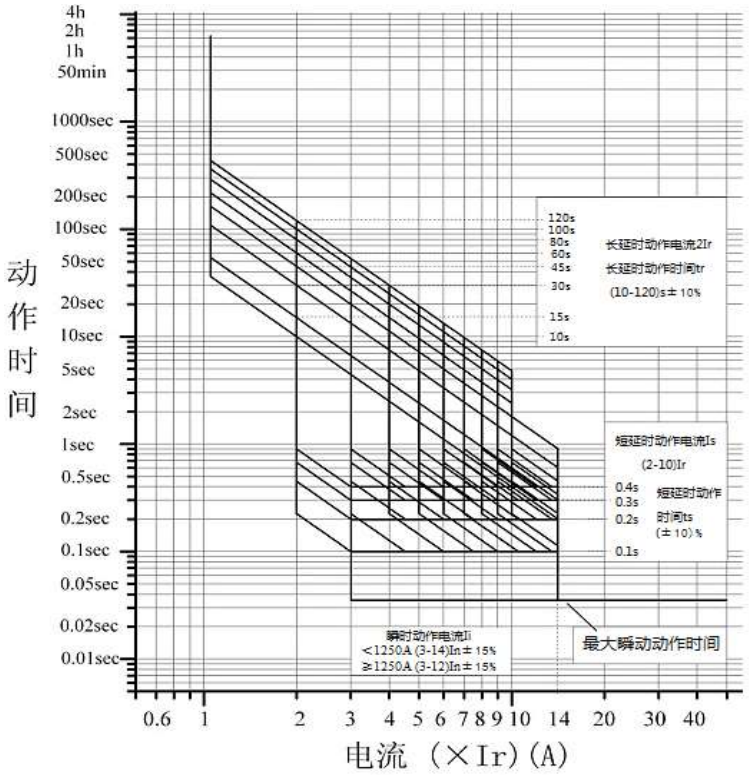
7) Class of pollution: 3;

8) The product should be installed in places that are free from explosive media, media corrosive to metal, insulation damaging gas, and conductive dust.

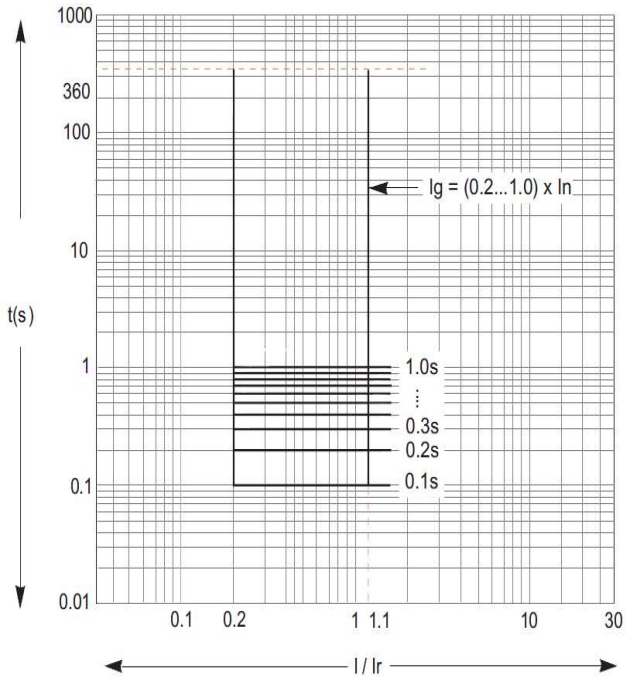
9) When products are intended to applied in harsher conditions than above ones, users should contact with manufacturer.

6. Tripping Characteristics

6.1 Tripping characteristic curve of NDM5E-1600 under normal environment (ambient air temperature: +40℃), see the picture below:



long-delay short-delay instant



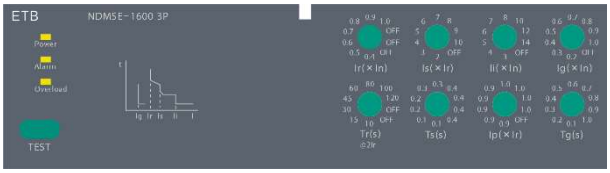
Ground fault

7 Electronic controller instruction

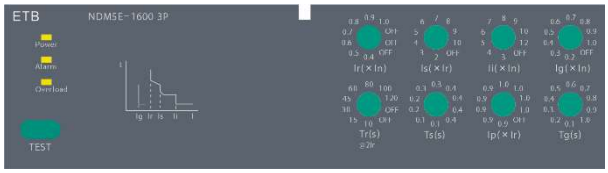
7.1 Controller manual

a) controller panel

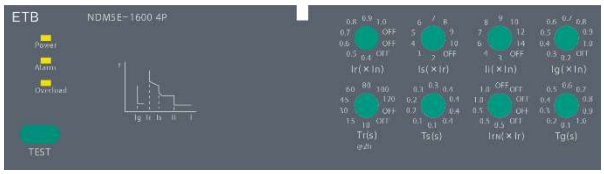
Nameplate of basic controller



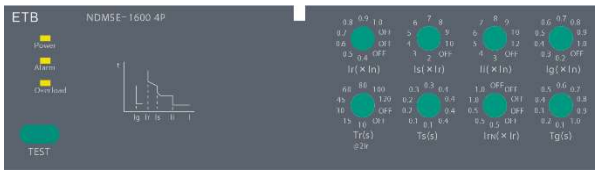
（3P 800A、1000A）



（3P 1250A、1600A）

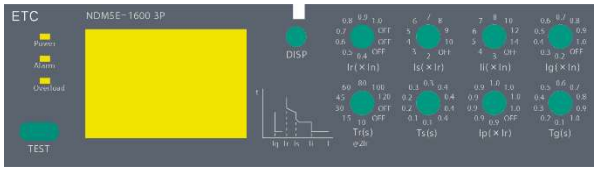


（4P 800A、1000A）

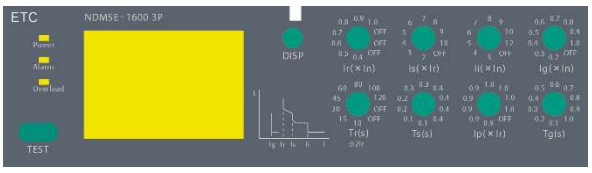


（4P 1250A、1600A）

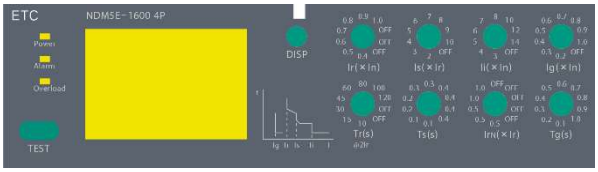
Nameplate of screen controller



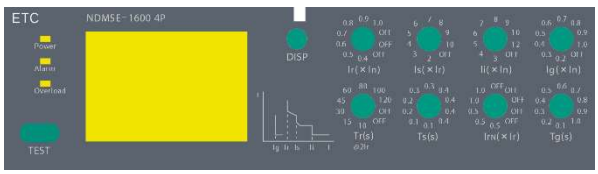
（3P 800A、1000A）



（3P 1250A、1600A）



（4P 800A、1000A）



（4P 1250A、1600A）

Component of circuit breaker controller panel

1. Ir Overload long delay current setting
2. Tr Overload long delay time setting
3. Is Short circuit short delay current setting
4. Ts Short circuit short delay time setting
5. Ii Short circuit instantaneous current setting
6. Ip Pre-alarm current setting
7. Ig GF current setting
8. Tg GF time setting
9. Irn N phase protection current setting
10. In rated current
11. DISP display in turns
12. TEST test port
13. Power power indicator
14. Alarm Pre-alarm indicator
15. Over Overload indicator
16. Comm Communication indicator

Note: Settings must be operated by professionals

b) functions of controller panel components

(1) test port

MDN5E dedicated device connect with controller through this port to test, adjust, etc.

(2) current time rotary button

Suitable combination can be set by adjusting time and current rotary button to protect wiring and device. This have to be done by professional technicians.

Note: Tr represents the action time of the circuit breaker when the actual current is 2 times of the Ir setting value.

e.g. When Ir is set to 1.0, Tr to 10s and the current through main circuit is 2×1600A, the circuit breaker will trip after lasting 10s. The accuracy of action time is ± 10%.

At the overload current, the tripping time of the main circuit followed by on the formula below: $t=(2*Ir/I)^2*Tr$

I indicates the actual current value through the main circuit in overload conditions.

(3) DISP alternate display button

DISP button can update the data on the screen quickly, long pressing the button can enter the failure logging interface and will automatically quit after some certain time.

c) indicator light

(1) Power indicator light

Light is on when controller working

(2) Alarm indicator light

Light twinkles when actual current exceeds the pre-alarm current setting value Ip. After the time of $T=（2*Ir/I)^2*Tr/2$, the yellow keeps on.

(3) Overload indicator light

When overload indicator keeps on, the actual current exceeds 1.15 times of overload long-lag setting value Ir, namely, under overload condition, and the circuit will trip after some certain time.

(4) Commuication indicator（Comm）

When Commuication indicator is lightning，Controller is communicating with external devices

7.2 Controller parameter setting

7.2.1Controller parameter of distribution protection type (see table 7)

Table 7-1

Rated current In（A）	Poles	current time parameter							
		Ir(×In)	Tr(s)	Is(×Ir)	Ts(s)	Ig(×In)	Tg(s)	Ii(×In)	Ip(×Ir)
800/1000	3	0.4,0.5,0.6, 0.7,0.8,0.9, 1.0,OFF	10,15,30,45, 60,80,100, 120,OFF	2,3,4,5,6,7,8 ,9,10,OFF	0.1,0.2, 0.3, 0.4	0.2,0.3,0.4,0.5, 0.6,0.7,0.8,0.9, 1.0,OFF	0.1,0.2,0.3,0.4, 0.5,0.6,0.7,0.8, 0.9,1.0	3,4,5,6,7,8, 10,12,14, OFF	0.9,1.0, OFF
1250/1600	3	0.4,0.5,0.6, 0.7,0.8,0.9, 1.0,OFF	10,15,30,45 ,60,80,100, 120, OFF	2,3,4,5,6,7,8 ,9,10,OFF	0.1,0.2, 0.3, 0.4	0.2,0.3,0.4,0.5, 0.6,0.7,0.8,0.9, 1.0,OFF	0.1,0.2,0.3,0.4, 0.5,0.6,0.7,0.8, 0.9,1.0	3,4,5,6,7,8,9, 10,12,OFF	0.9,1.0, OFF

Table 7-2

Rated current In（A）	Poles	current time parameter							
		Ir(×In)	Tr(s)	Is(×Ir)	Ts(s)	Ig(×In)	Tg(s)	Ii(×In)	IrN(×Ir)
800/1000	4	0.4,0.5,0.6, 0.7,0.8,0.9, 1.0,OFF	10,15,30,45, 60,80,100, 120, OFF	2,3,4,5,6,7,8 ,9,10,OFF	0.1,0.2, 0.3, 0.4	0.2,0.3,0.4,0.5, 0.6,0.7,0.8,0.9, 1.0,OFF	0.1,0.2,0.3,0.4, 0.5,0.6,0.7,0.8, 0.9,1.0	3,4,5,6,7,8,1 0,12,14, OFF	0.5,1.0, OFF
1250/1600	4	0.4,0.5,0.6, 0.7,0.8,0.9, 1.0,OFF	10,15,30,45, 60,80,100, 120, OFF	2,3,4,5,6,7,8 ,9,10,OFF	0.1,0.2, 0.3, 0.4	0.2,0.3,0.4,0.5, 0.6,0.7,0.8,0.9, 1.0,OFF	0.1,0.2,0.3,0.4, 0.5,0.6,0.7,0.8, 0.9,1.0	3,4,5,6,7,8,9 ,10,12, OFF	0.5,1.0, OFF

7.3 function introduction

7.3.1 table of basic function (see table 8)

Table 8

release code			ETB	ETC	ETB-T	ETC-T	ETB-PT	ETC-P	ETC-PT
Protection alarm	long-delay protection		√	√	√	√	√	√	√
	short-delay protection		√	√	√	√	√	√	√
	short-circuit instant protection		√	√	√	√	√	√	√
	neutral protection		√	√	√	√	√	√	√
	ground protection		√	√	√	√	√	√	√
	over/under voltage protection		—	—	—	—	√	√*1	√
	prealarm for overload		√	√	√	√	√	√	√
	Heat simulation(heat memory)		√	√	√	√	√	√	√
measurement	current measurement		—	√	√	√	√	√	√
	Voltage measurement	Line/phase volatge	—	—	—	—	√	√	√
	power measurement	Active power reactive power apparent power power factor	—	—	—	—	√	√	√
	energy measurement	Active energy reactive energy apparent energy	—	—	—	—	√	√	√
	Frequency measurement		—	—	—	—	√	√	√
maintenance	setting	rotary button	√	√	√	√	√	√	√
		menu setting	—	—	—	—	—	—	—
	Fault log	Overload short circuit short delay short circuit instant action time fault phase	1*2	1	20	20	20	1	20
		Overvoltage protection under-voltage protection	—	—	—	—			

	action time fault phase							
	Operation time with electricity	—	—	—	√	√	√	—
	Abrasion of contact	—	—	—	√	√	√	—
	log	—	—	1	20	20	20	1
screen	real time current	—	—	√	√	√	√	√
	real time volatge	—	—	—	—	—	√	√
	power energy frequency	—	—	—	—	—	√	√
	setting value display	—	—	—	—	—	√	√
	Last time fault type fault current/ voltage action time happen time	—	—	√	√ *3	√	√ *3	√
Extended module	Display module *4	○	○	○	○	○	○	○
	Temperature monitoring module*4	○	○	○	○	○	○	○

Notice 1: etc-p overvoltage/undervoltage value cannot be modified, default parameter.

Notice 2: need to read with DF-MB/C3 communication adapter or DF-XS1 display unit

Notice 3: displayed by upper computer

Notice 4：“○” means optional functions

All the protections must meet the pre-requisites of power supply, namely, 0.2In though every phase or 0.4In though single phase.

7.3.2 Setting value of the controller

（1）Overload long-delay protection (See Table 9)

The overload long time-delay protection is based on the true RMS value for protecting the load.

Table 9 Overload Long-Delay Protection Parameter Setting

Setting current Ir		(0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0,OFF) ×In tolerence±3%							
Action characteristics	Tr@2Ir setting gear (s)	In=800/1000/1250/1600A							
		10	15	30	45	60	80	100	120
	≤1.05Ir	＞2h (no action)							
	＞1.30Ir	＜1h (action)							
	At1.5Ir tr（s）	17.77	26.67	53.33	79.99	106.67	142.22	177.77	213.33
	At 2.0Ir tr（s）	10	15	30	45	60	80	100	120
	At 7.2Ir tr（s）	0.77	1.16	2.31	3.47	4.63	6.17	7.72	9.26
	Accuracy（%）	±10							

Note: The action curve complies with $tr=（2Ir）^2×Tr/I^2$

tr: overload long-delay action time; Tr: setting value of the overload long -delay action time

I: Actual working current Ir: setting value of the overload long-delay action current

When Tr is off, MCCB will not trip if overload happen. Delay time is 50s。

（2）Short circuit short- delay protection (see Table 10)

The short time-delay protection prevents the impedance short-circuit of the distribution system. Divided into two intervals: reverse time limit and fixed time limit.

Table 10 Short Circuit Short Delay Protection Parameter Setting

Setting current Is		(2, 3, 4, 5, 6, 7, 8, 9, 10,OFF)×Ir				
Action characteristics	Reverse time limit Is≤I＜1.5Is	Ts setting value（s）	0.1	0.2	0.3	0.4
		ts action time（s）	$t_s=（1.5Is）^2×Ts/I^2$			
	Fixed time limit 1.5Is≤I＜Ii	ts action time（s）	0.1	0.2	0.3	0.4
		Accuracy（%）	±20	±10		

Note1: The action curve of the reverse time limit complies with $ts=(1.5Is/Is)^2\times Ts$, while the action time of the fixed time limit tracks the Ts setting value.

ts: short-circuit short time-delay action time Ts: setting value of the short-circuit short time-delay action time

I: Actual running current Is: setting value of the short-circuit short time-delay action current

Note2: There is an additional fixed error 20ms except from the time accuracy in table above

Note3: when Ir is ture off Is will turn off synchronously

（3）Short circuit instantaneous protection (see Table 11)

The instantaneous protection function can prevent short circuit from conductive solid of the distribution system. Due to larger short-circuit current of that fault, the system requires being disconnected rapidly.

Table 11 Short-Circuit Instant Protection Parameter Setting

Action characteristic	setting current gear Ii(×In)	3	4	5	6	7	8	10	12	14
	current accuracy(%)	±15								
	I≥1.15Ii action time	＜50ms								
	I≤0.85Ii	no action								

（4）Ground fault protection (see Table 12)

The ground protection function can prevent the grounded short circuit from conductive solid of the distribution system with the fixed time-limit protection.

Table 12 Ground Fault Protection Parameter Setting

Ig		(0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0,OFF) ×In tolerance ±10%									
Action characteristics	Fixed time limit	tg action time(s)	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
		Accuracy (%)	±20	±10								
	I△≤0.9Ig	no action										

Note1: In addition to the accuracy of action time allowed in the above table,the inherent error ±20ms shall also be considered.

Note2: I△ is the three-phase current vector sum of the circuit breaker or the vector sum of three phases plus N-phase current.

（6）N phase protection

Neutral phase overload long-delay and short-delay protection characteristic for 4-pole controller

Table 13 N-Phase Protection Setting Value

Current setting Ir N	Action characteristics
0.5Ir	when neutral phase has overload and short-delay fault, protection action time is half of setting value.
1.0Ir	when neutral phase has overload and short-delay fault, protection action time is setting value.
OFF	Instantaneous protection only

Note： N phase overload long-delay action time follows Tr setting. N phase overload long-delay action time follows Ts setting. 4-pole controller N phase short circuit instantaneous protection has the same action time with other three phases.

（6）overload pre-alarm (see table 14)

Table 14 Controller with Pre-Alarm Function

Setting current Ip		see table 7-1	Accuracy （%）	Note
Action characteristics	＜ 0.9 IP	pre-alarm indicator light change from twinkling to keeping on	±3	No gear setting for 4-pole controller. Fixed 0.9 Ir
	＞1.1 IP	pre-alarm indicator light change from twinkling to keeping on		
	OFF	OFF	OFF	
Function Description		when I ≥ IP, the warning indicator (yellow light) flashes. After t = t / 2, the indicator turns to be on continuously		

7.3.3 Measurement accuracy

Table 15 Measurement Accuracy Parameter

		Measurement range	Accuracy
Current	Ia, Ib, Ic, In	（0.2～2）In	±1%;
Voltage	Line voltage	（0.5～1.5）Ue	±0.5%
	Phase volatge	（0.5～1.5）Ue/1.732	±0.5%
Power	Active power	（0.2～2）In, （0.5～1.5）Ue	±1%
	Reactive power		
	Apparent power		
	Power function	-0.5～-1，0.5～1；	±1 %
Energy	Active energy	（0.2～2）In, （0.5～1.5）Ue	±1%
	Reactive energy		
	Apparent energy		
Frequency		/	±0.1Hz

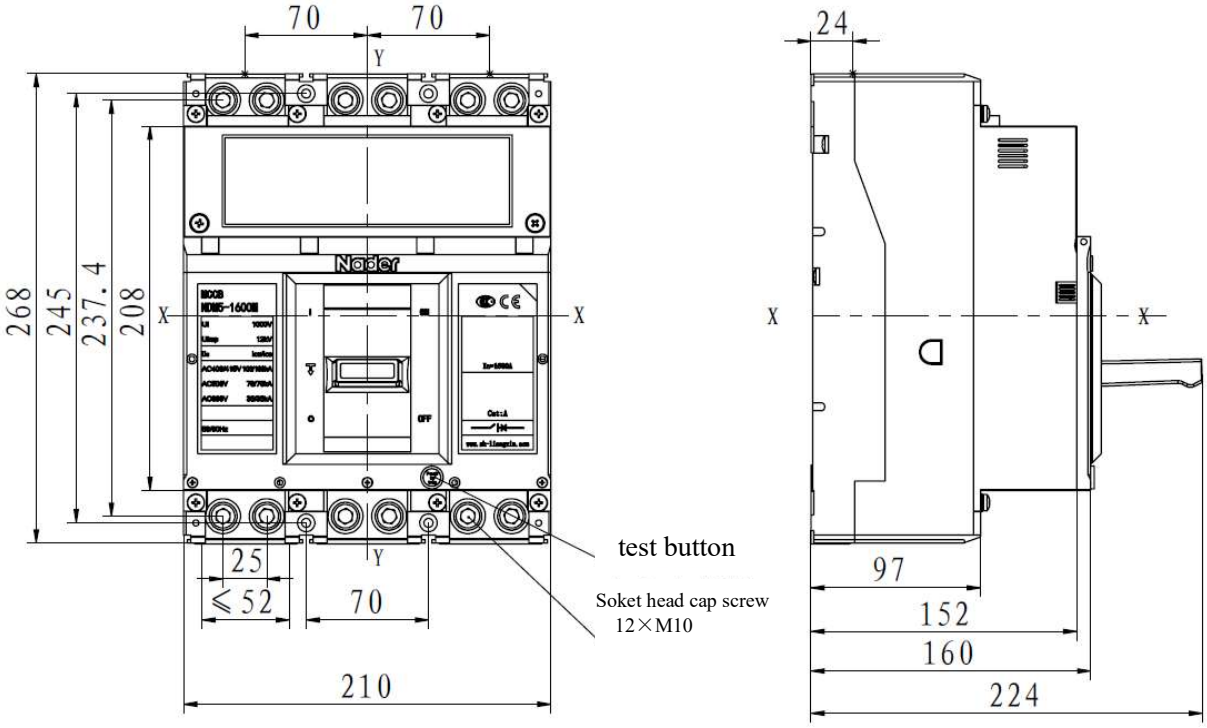
7.3.4 Health management

The indication of circuit breaker health is expressed by 0 to 100%，and the superposition management id carried out form the three dimensions of production date, operation tmes and contact wear。

Note: It can only be read through communication.

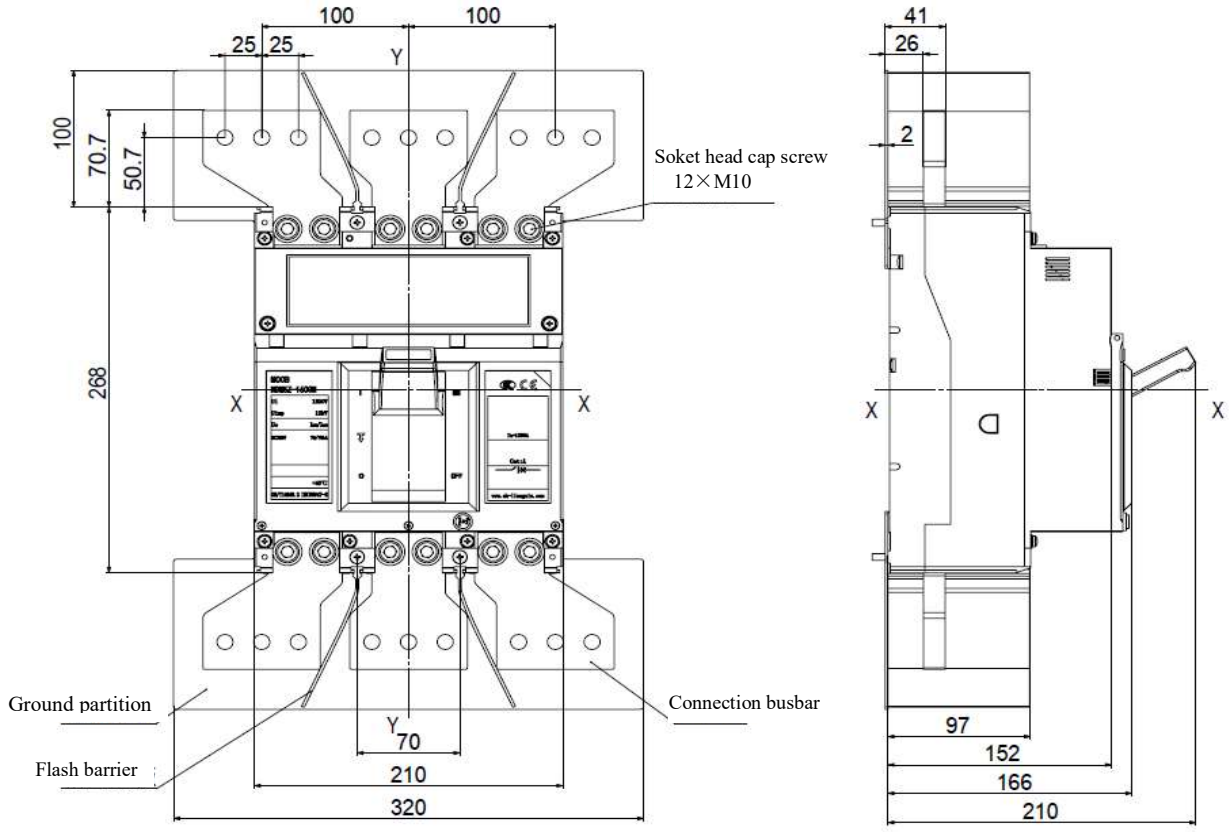
8 Products Configuration and Installation Dimension

8.1 Boundary dimension of 3 poles front connection product



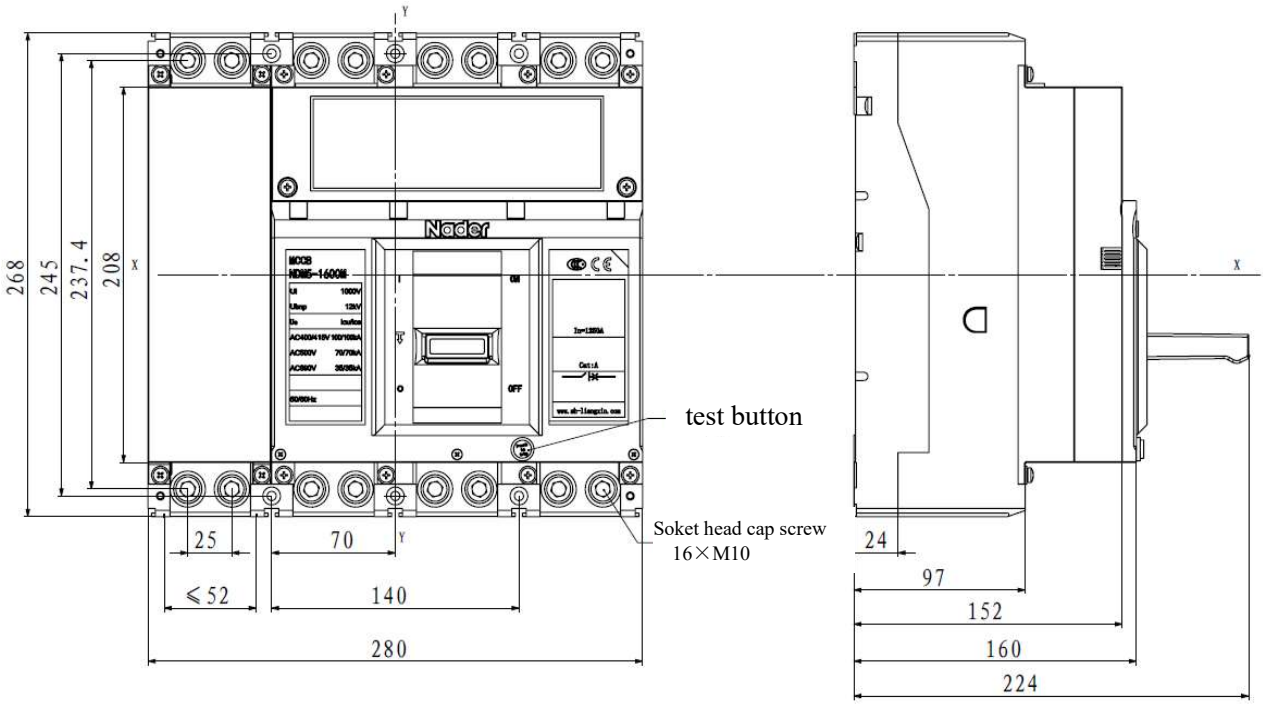
Note: the unmarked dimensional tolerance shall be in accordance with GB / T 1804-c.

8.2 Boundary dimension of 3 poles front connection product with extended busbars



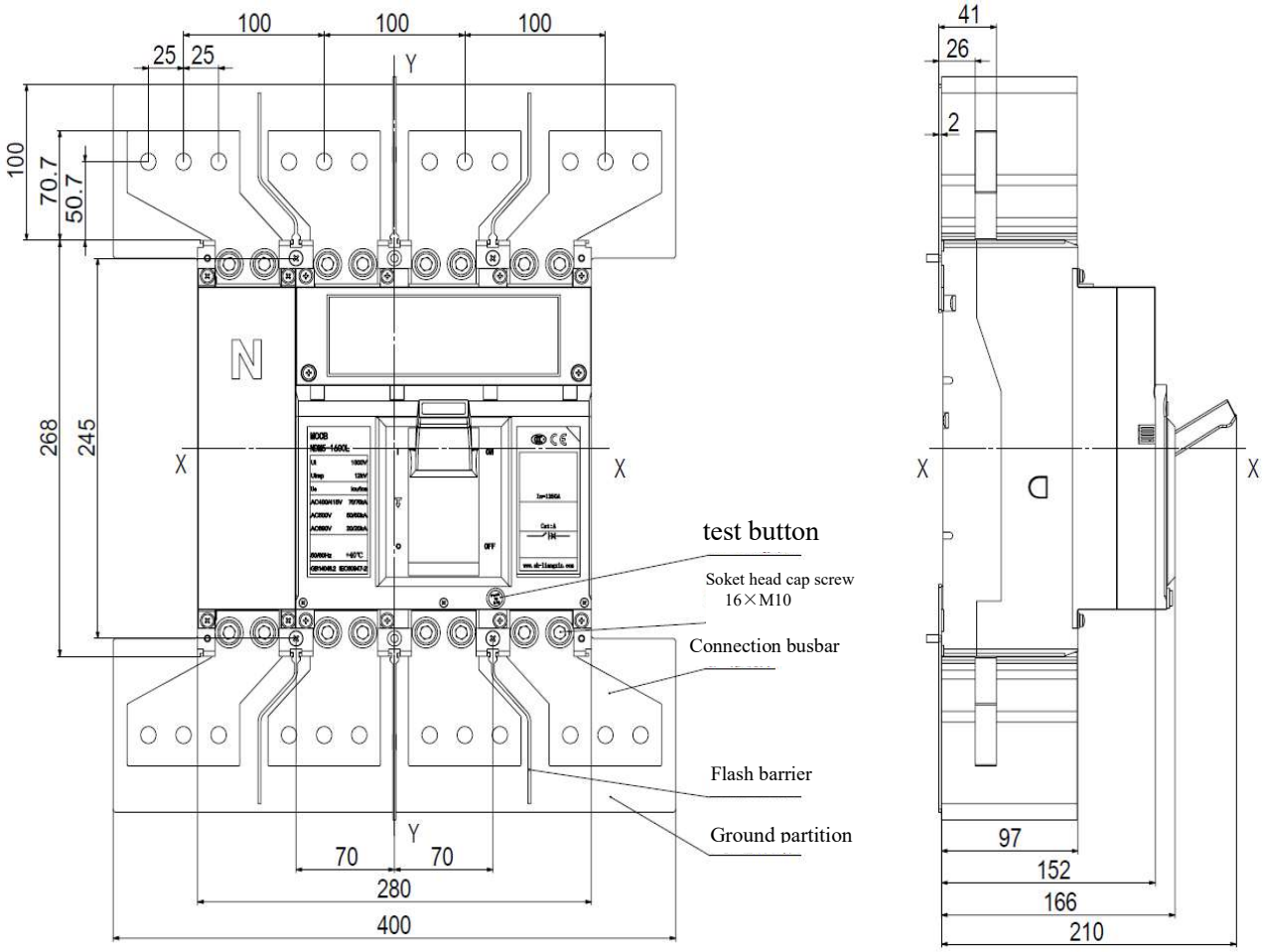
Note: the unmarked dimensional tolerance shall be in accordance with GB / T 1804-c.

8.3 Boundary dimension of 4 poles front connection product



Note: the unmarked dimensional tolerance shall be in accordance with GB / T 1804-c.

8.4 Boundary dimension of 4 poles front connection product with extended busbars



Note: the unmarked dimensional tolerance shall be in accordance with GB / T 1804-c.

8.5 installation dimension for 3 poles and 4 poles products

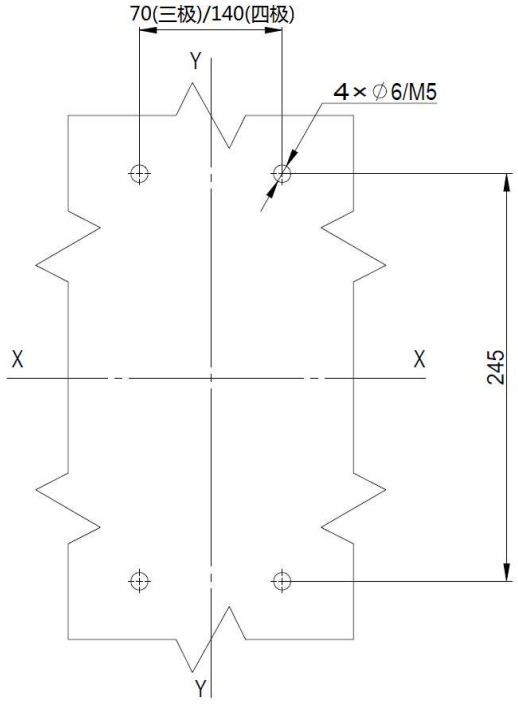
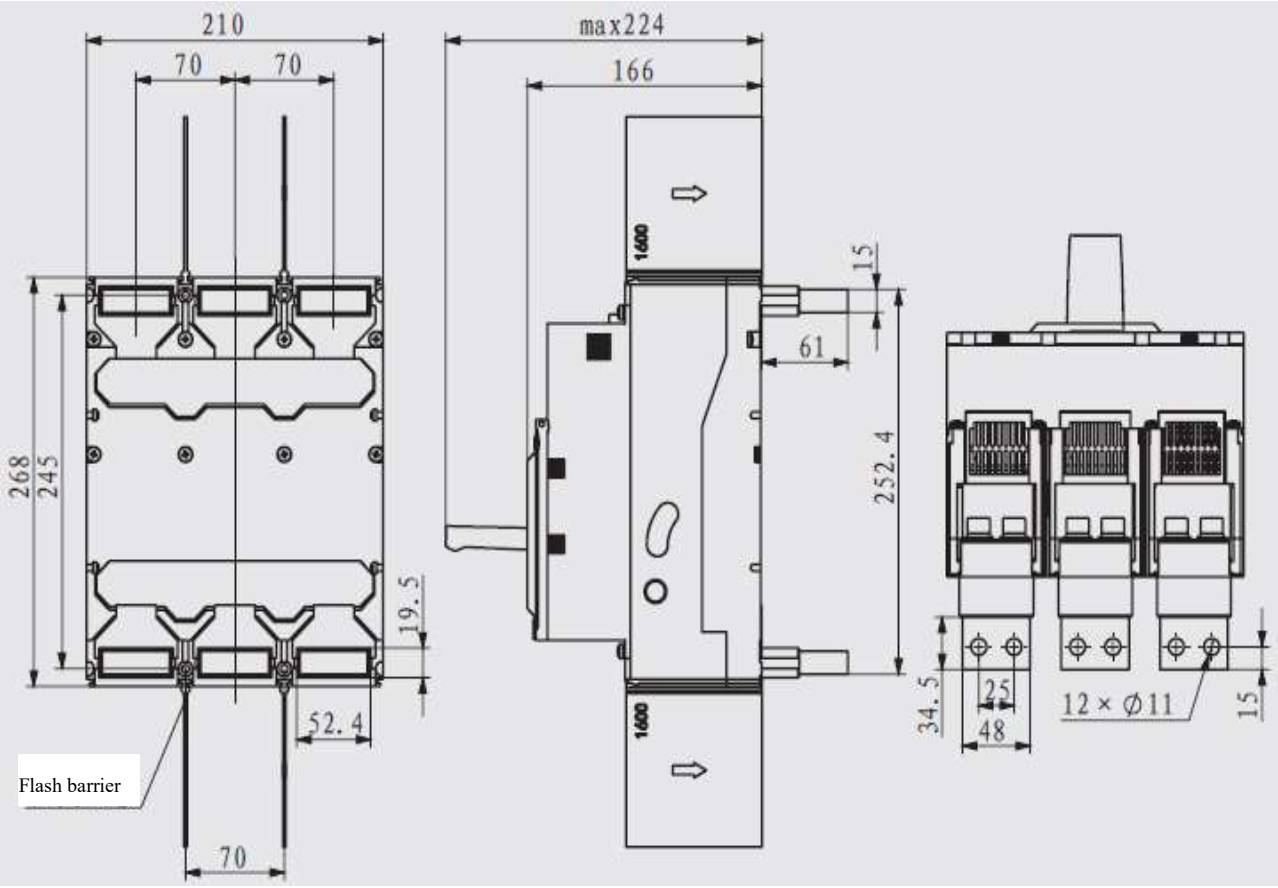


Table 16 connection screw size

Code	Busbar thickness (mm)	Hexagon socket screw length(mm)
1	6、8	M10X30
2	10、12	M10X35
3	15	M10X40
4	20	M10X45
Note: the length of hexagon socket screw need to be noticed when the orders are placed.		

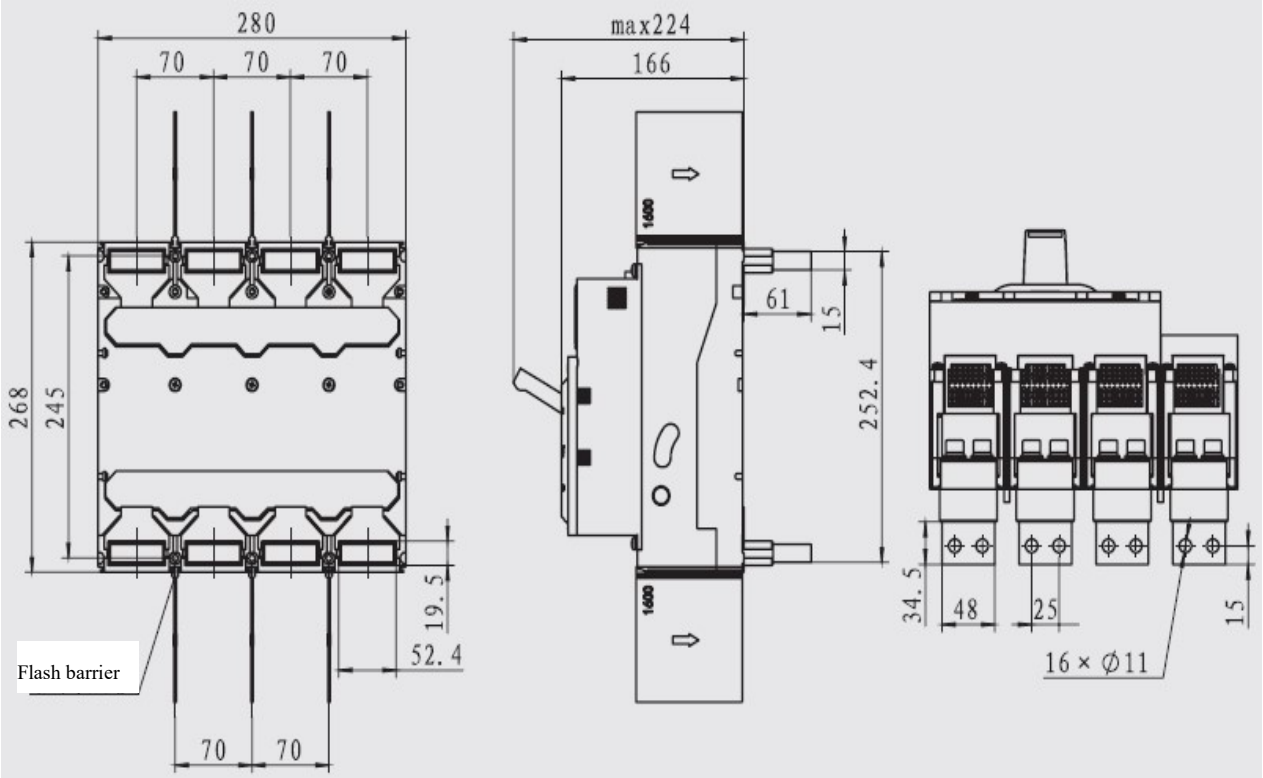
Note: 1) The crosspoint between X-X and Y-Y is the center of the 3-P and 4-P circuit breaker, as shown in the figure
2) Note: the unmarked dimensional tolerance shall be in accordance with GB / T 1804-c.

8.6 Outline dimension of 4P plate rear vertical horizontal line product



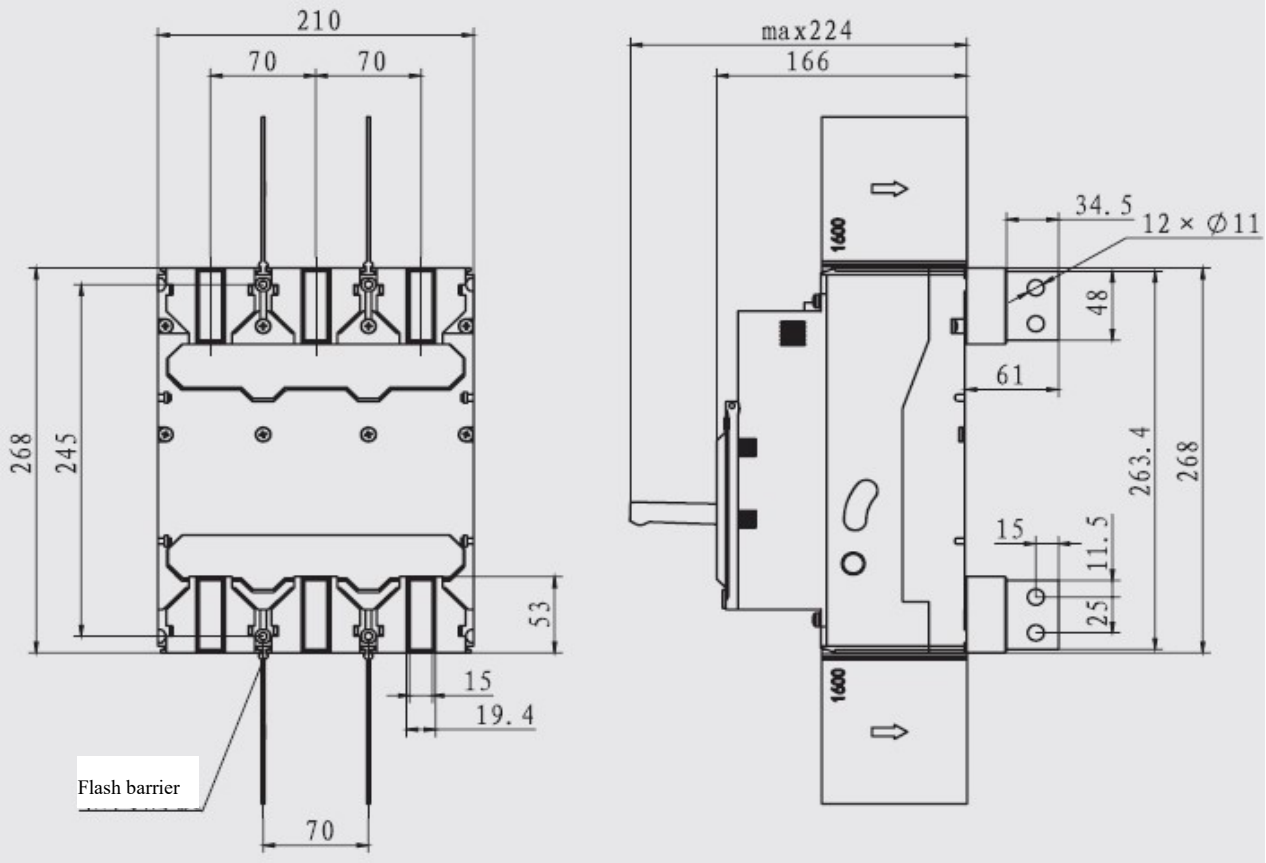
Note: the unmarked dimensional tolerance shall be in accordance with GB / T 1804-c.

8.7 Outline dimension of 4P plate rear vertical horizontal line product



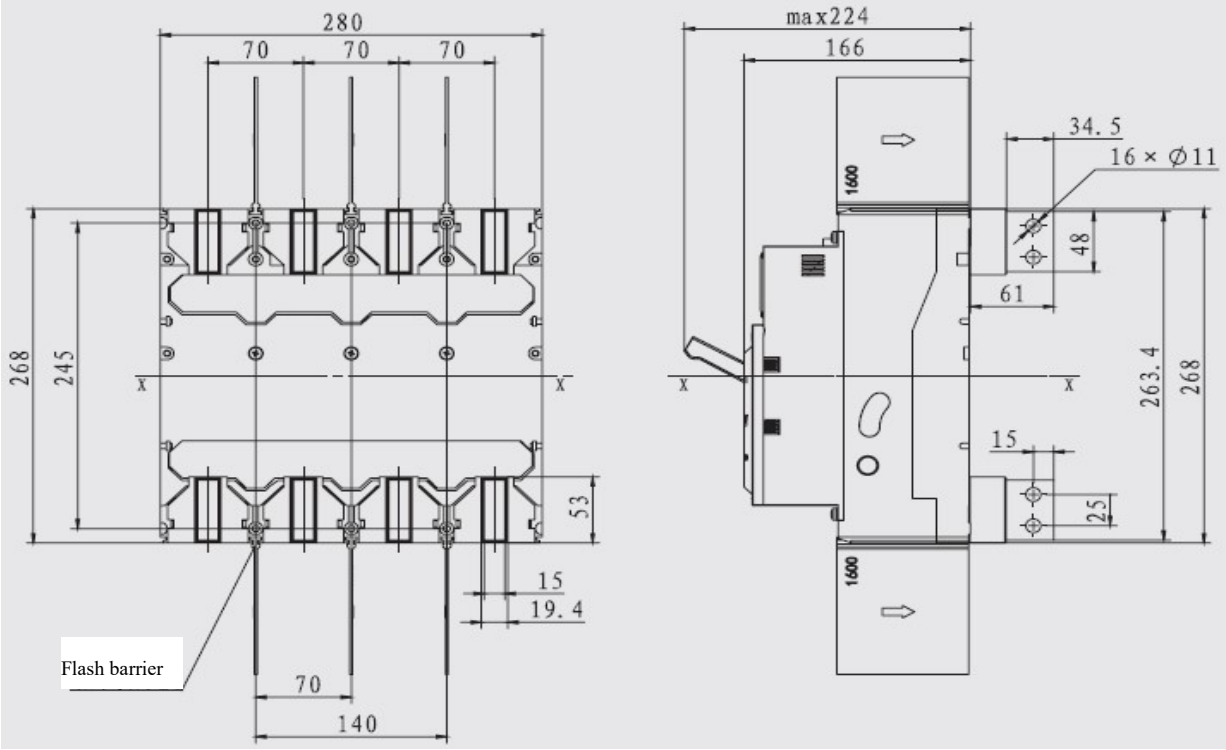
Note: the unmarked dimensional tolerance shall be in accordance with GB / T 1804-c.

8.8 Outline dimensions of vertical wiring products behind 3P board



Note: the unmarked dimensional tolerance shall be in accordance with GB / T 1804-c.

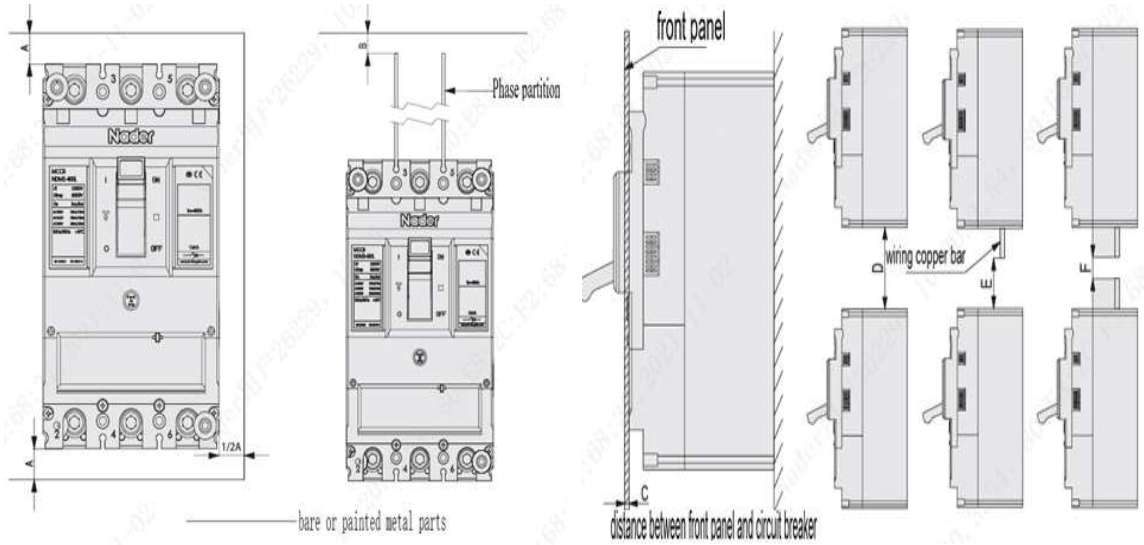
8.9 Outline dimensions of vertical wiring products behind 4P board



Note: the unmarked dimensional tolerance shall be in accordance with GB / T 1804-c.

8.10 Safety Clearance

When installed, the least safety clearance for top, bottom, flank side should accord to table 14 See picture below.



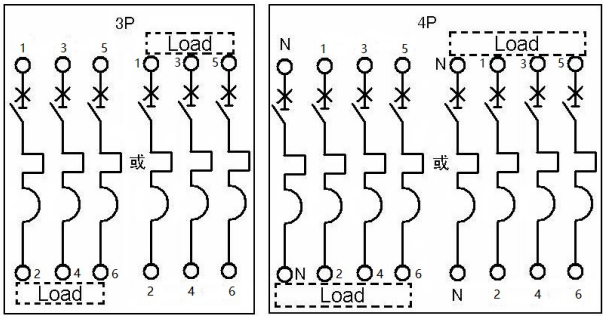
Insulation distance mounted in the metal cabinet

Table 27 Insulation distance mounted in the metal cabinet (unit: mm)

Model	Spacing A	Spacing B	Spacing C	Spacing D	Spacing E	Spacing F
NDM5E-1600	≥100	≥0	≥0	≥180	≥100	≥40

Note: Unmarked tolerance level should follow GB/T 1804-c.

8.11 Main circuit wiring mode of AC products



9、 Accessory

9.1 under-voltage release

When voltage of power supply decreases to 35% to 70% of the rated of working under-voltage release, the under-voltage release can trip the MCCB reliably. When voltage of power supply decreases below its 35%, the under-voltage release can prevent the MCCB from closing operation. When voltage of power supply keeps above its 85%, the under-voltage release can guarantee the MCCB close reliably.

Voltage specification and power dissipation of under-voltage release (see table 18)

Table 18 Rated Parameters of the Under-voltage Release

Accessory	under-voltage release		
Voltage specification（V）	AC/DC 110V	AC/DC 230V	AC/DC 400V
Maintaining dissipation (W)	7	8	10
Instantaneous dissipation (W)	230	500	270
Code	11	22	40

Note: The under-voltage release must be energized before the circuit breaker can be switched on and closed again, otherwise the circuit breaker will be damaged.

Working Diagram of Under-voltage Release

9.2 shunt trip release

When the voltage applied to the shunt trip release is between 70%~110% of the rated voltage, the circuit breaker can be tripped reliably.

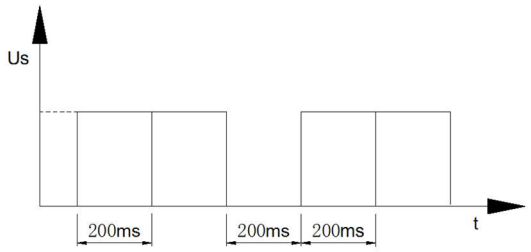
The specification and power dissipation see table 19

Table 19 Rated Parameters of the Shunt Release

Accessory	Shunt release		
Voltage specification（V）	AC/DC 24V	AC/DC 110V	AC/DC 230V
Maintaining dissipation (W)	3.5	3	3
Instantaneous dissipation (W)	170	230	280
Code	02	11	22

Principal of shunt release: single pulse reaction (energized time recommended to be longer than 200ms). If

a second action is needed, shunt release should energize after deenerging and re-latching (interval time recommended to be longer than 200ms). The time between shunt release energized (receiving signal) to product tripped is 100ms.



Working principle diagram of shunt tripper

9.3 The nominal parameter of auxiliary contact (see table 20)

Table 20 Rated parameters of the auxiliary contact

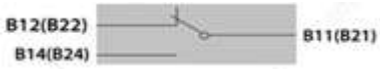
Accessory		Auxiliary contact(conventional)	Auxiliary contact(low power consumption)
Voltage specification (V)/conventional heating current (Ith)		AC250V/10A、AC400V/3A、DC220V/0.2A	DC30V/0.1A
Wiring diagram	Open		
	Close		
Internal resistance		＜30mΩ	＜50mΩ

Note1: If AC24V/10mA auxiliary contact is needed, it should be noticed in the order.

2: The first auxiliary harness is identified as F11 (red), F12 (white), F14(yellow), and the second auxiliary harness is identified as F21 (red), F22(white), F24 (yellow), and so on. At most four groups of auxiliary harness are installed.

9.4 the nominal parameter of alarm contact (see table 21)

Table 21 Rated parameters of the alarm contact

Accessory		Alarm contact(conventional)	Alarm contact(low power consumption)
Voltage specification (V)/conventional heating current (Ith)		AC250V/10A、AC400V/3A、DC220V/0.2A	DC30V/0.1A
Wiring diagram	Open/ close		
	Free trip		
Internal resistance		＜30mΩ	＜50mΩ

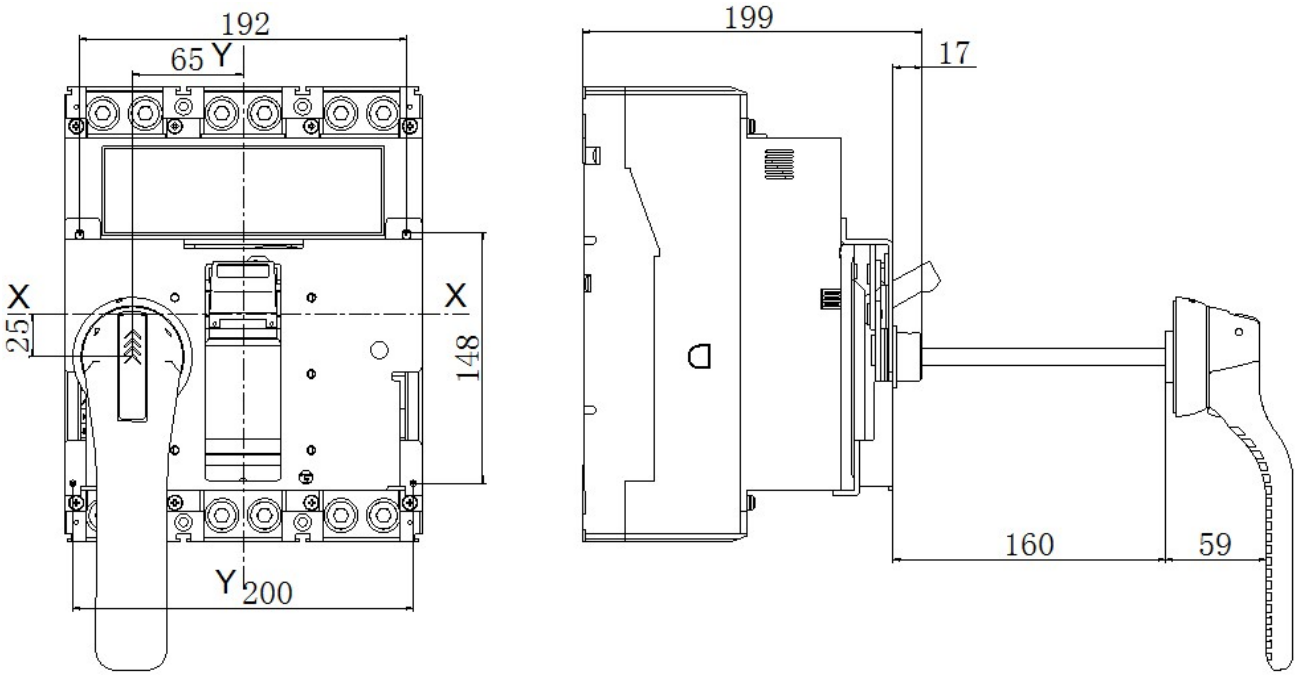
Note 1: If AC24V/10mA auxiliary contact is needed, it should be noticed in the order.

2: The first alarm harness is identified as B11 (red), B12 (white), B14 (yellow), and the second auxiliary harness is identified as B21 (red), B22 (white), B24(yellow), and so on. At most two groups of alarms are installed.

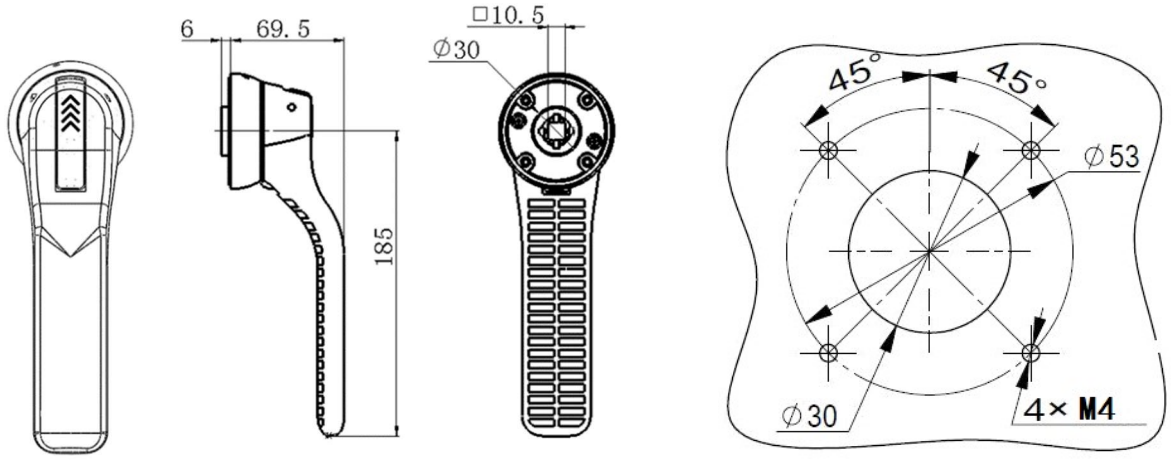
Under-voltage release、Shunt Release、Auxiliary contact、Alarm contact ， the standard wiring line is 0.7m long , 1m、2m、4m can be customized according to requirements。

9.5 Rotary handle operation mechanism：

Trepanning schematics of manual operation-handle installation and external dimensions of manual operation mechanism are shown as below.



External dimensions of manual operation mechanism

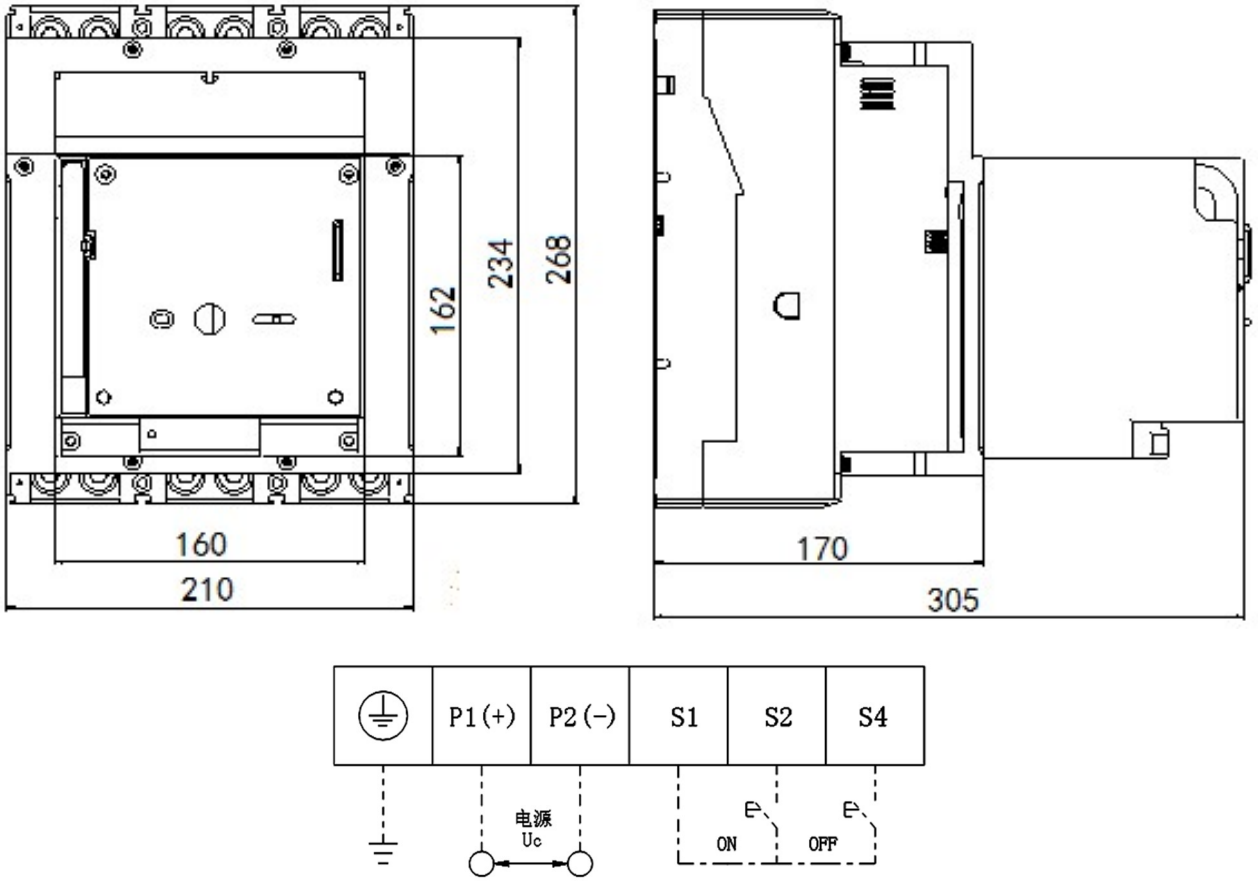


Trepanning schematics of manual operation-handle

Note: unlabeled tolerence of dimension follow GB/T1804-c.

9.6 motor operation mechanism

The external dimensions of motor-circuit breaker and its motor operation mechanism after installation is shown as below, parameter see table 21.



Note; 1) manual operation should turn 180°clockwise, MUST NOT OPERATE,

2) cunter clock wise. Must not connect P1, P2 with S2, S4.

3) unlabeled tolerence of dimension follow GB/T1804-c.

Table 22 Voltage specification and power of electric operation

Accessory	Motor operation mechanism			
Power specification	DC24V	AC110V/DC110V	AC230V/DC220V	AC400V
Power dissipation	240W	400W	400W	400W

9.7 Communication adaptor DF-MB/C3

Installing by DIN35 standard slide rail, the dimension of single product is shown as below. If there is a T in the MCCB release code, this unit is contained NDT2570020.

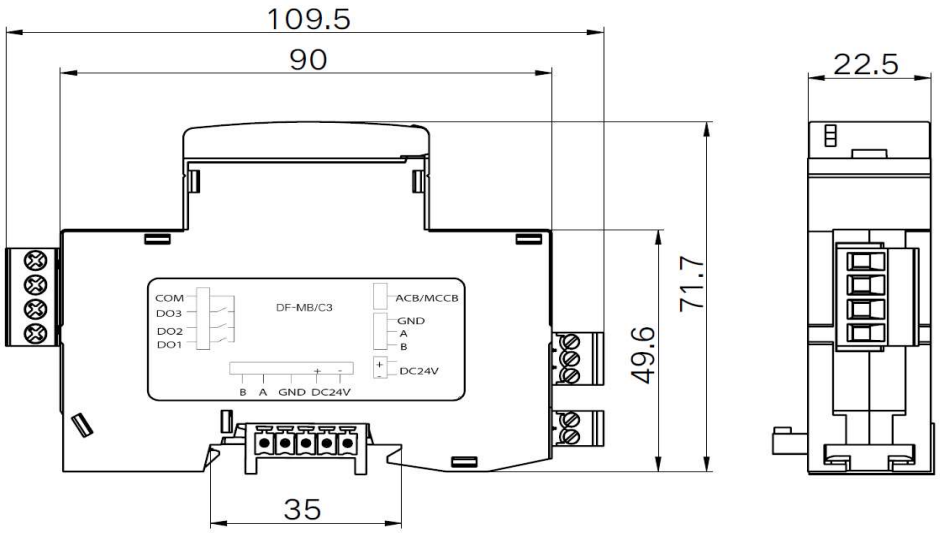
Main parameter is shown as below

Table 23 Main Parameter of Communication Adaptor

Communication adaptor common parameter		
Electrical characteristic	Power supply	24V DC（19.2～28.8VDC）
	Power dissipation	40mA
Communication	Port	RS485，2 Modbus RTU
	Optional address	1～99
	Baud rate	2400/4800/9600/19200bps

	Check bit	CRC check odd-even check not supported
	Maximum number of single unibus	32
Physical characteristic	Demension	90×71.7×22.5mm（terminal not included）
		109.5×71.7×22.5mm（terminal included）
	Weight	0.075kg
	Installation method	2*35mm standard DIN35 slide rail
Environment characteristic	Working temperature	-25℃～70℃
	Restoring temperature	-40℃～75℃
	Ambient condition	surrounding temperature 40℃， relative humidity 95%
	Pollution	3
	Fire resistance	UL94-V0
	Protection level	IP20

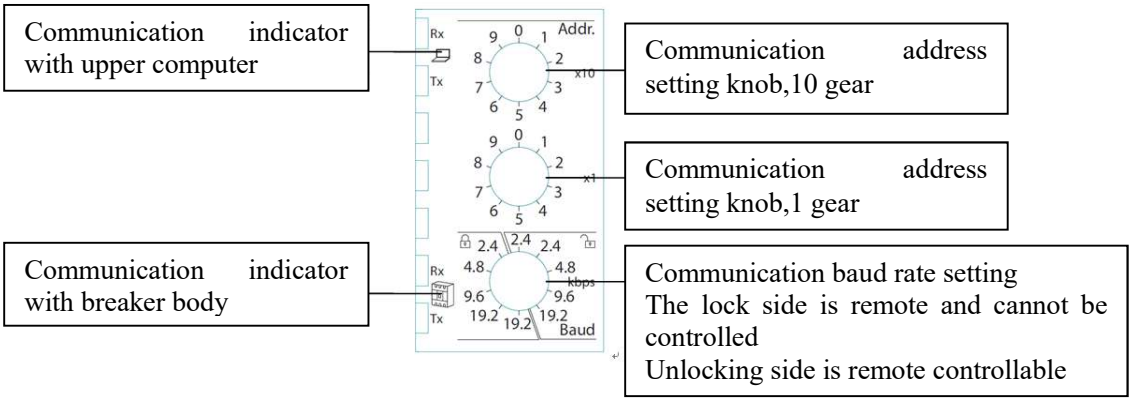
Definition of outside dimension, installation dimension and single terminal



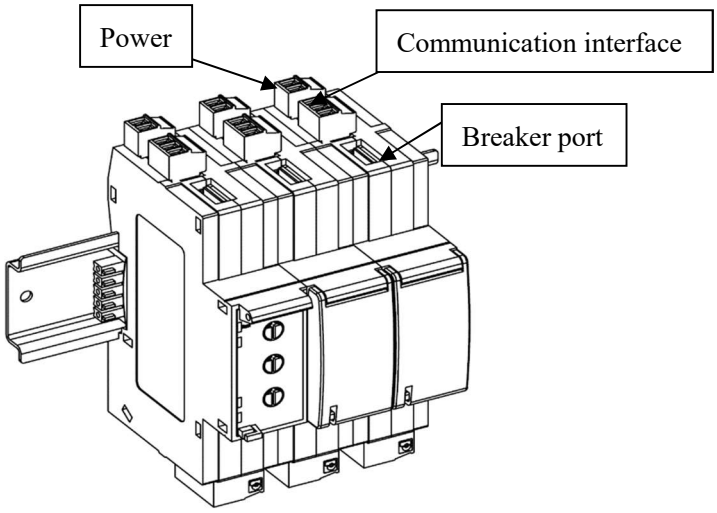
External Dimension of Communication Adaptor

Note: Unmarked tolerance level should follow GB/T 1804-c.

Definition of Communication adopter rotary button and indication light on the front side.



Gear Adjustment of Communication Adaptor

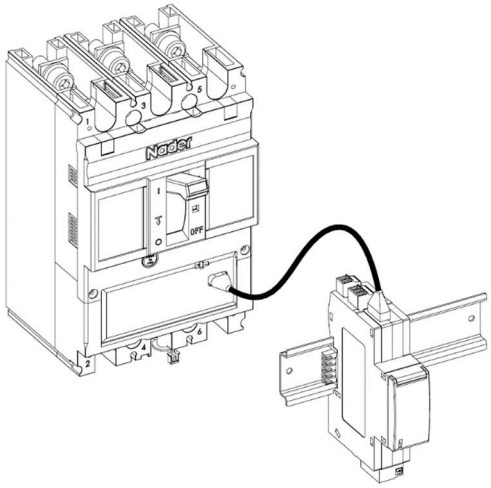


Terminal Ports of Communication Adaptor

Notice1: DO1~DO3 are three ways outpur control and can be customized the output functions. For example, the on/off control singal for motor operator.

Notice2 :multiple numbers of adapters can be cascade installed (maximum 32). Each MCCB can set address(1~99), there are 2400、4800、9600、19200bps, four option for baud rate set.

Notice3: when communication adaptor in temperature -35℃~-25℃, we suggest to declinebaud rate to increase communication reliability.



Terminal Ports of Communication Adaptor

9.8 DF-XS1 display module

This module installs in the cabinet door. The opening of cabinet should be $91.6_{0}^{+0.5} \times 91.6_{0}^{+0.5}$.

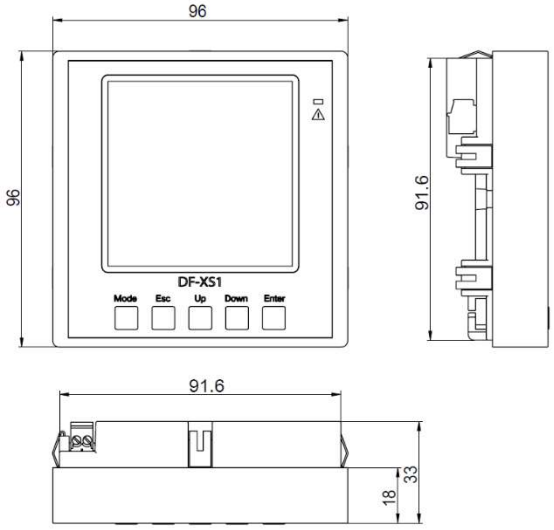
Detailed operation should follow the instruction book if DF-XS1 display module

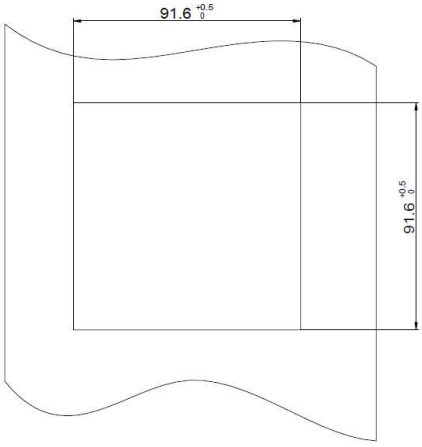
Main parameters are shown as below

Table 24 Main parameters of Display Module

Common parameters for display module DF-XS1		
Electrical characteristic	Power supply	24VDC（19.2～28.8VDC）
	Power dissipation	40mA
Physical	Dimension	96×96×33mm

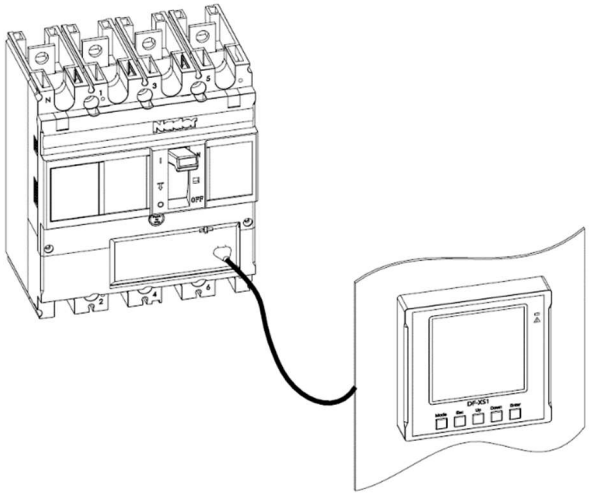
characteristic	Weight	0.22kg
	Display	160*160 pixel 、white back light
	Installation method	Horizontal installation (surface installation)
Environment characteristic	Working temperature	-25℃～70℃
	Restoring temperature	-40℃～75℃
	Ambient condition	Surrounding temperature40℃， relative humidity 95%
	Pollution	3
	Fire resistance	UL94-V0
	Protection level	IP20





Outline dimension drawing Schematic diagram of opening size

External Dimension for Display Module



Display Module Connected to Product

Notice this module has four ports, can connect to four MCCB in the same time in order to set and display MCCB parameter.

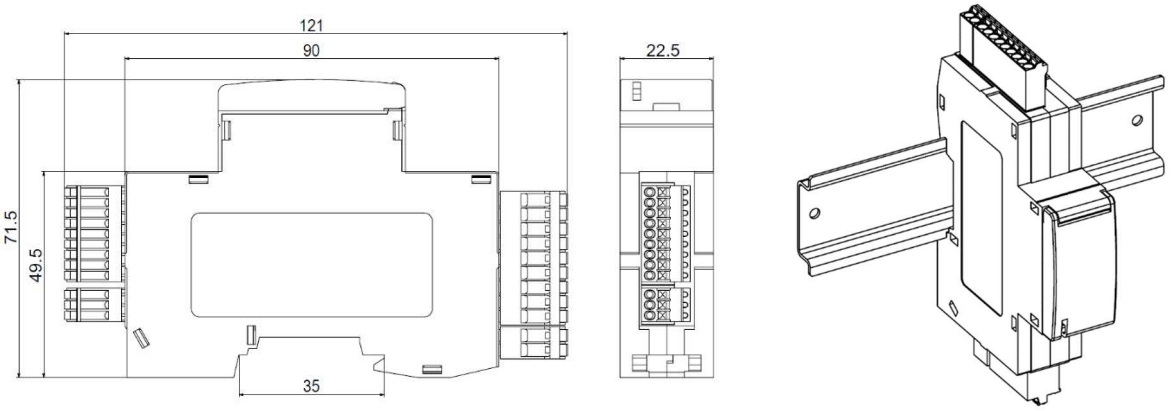
9.9 DF-WK6 Temperature module

Table 34 Parameter of Temperature Module

Temperature alarm module common parameter		
Electrical characteristic	Power supply	20～55V(Wide voltage)
	Static power consumption	2.4W
	DO static power dissipation	250VAC/30VDC 2.5A Resistive load
	Measurable temperature range	0℃-150℃
	Temperature resolution	1℃
	Temperature accuracy	±3℃
Communication	Port	RS485，2 Modbus RTU
	Optional address	1~9
	Baud rate	2400/4800/9600/19200bps
	Check bit	CRC check odd-even check not supported
Physical characteristic	Dimension	90×71.5×22.5mm(without extended terminal)
		121×71.5×22.5mm(with extended terminal)
	Weight	0.25kg
	Installation method	35mm standard DIN slide rail
Environment characteristic	Working temperature	-35℃～70℃
	Restoring temperature	-40℃～75℃
	Ambient temperature	Surrounding temperature 40 relative hunmiduty 95%
	Pollution	3
	Fire resistance	UL94-V0
	Protection level	IP20

Intalling with standard DIN35 slide rail, outside dimension and intallation dimension of single product shows as below. can be cascade installed. Temperature sampling points can be optional from 1 to 6 according to need. Each piont can be monitored and have alarm output.

when communication adaptor in temperature -35℃~-25℃, we suggest to declinebaud rate to increase communication reliability.



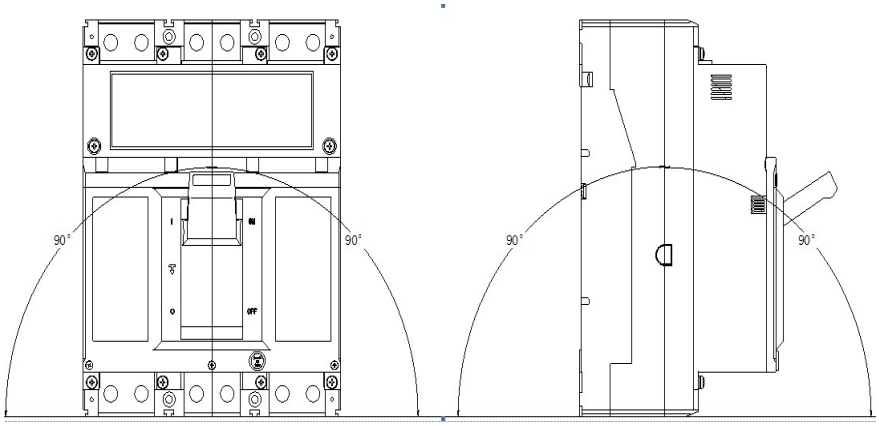
Outline dimension drawing Installation diagram

Fig.35 External Dimension of Temperature Module

Note: Unmarked tolerance level should follow GB/T 1804-c.

10、installation direction

Product can vertically. If being installed vertically,angles between installation plane and vertical direction should be no more than 5°.



Vertical Installation Horizontal Installation

11 Packaging and Storage

Minimum packaging quantity: 1 piece/box. The packaged products should be stored in a warehouse with the ambient temperature of -40℃~+75℃ and the corresponding relative humidity below 80% without acidic, alkali or other corrosive gas in the surrounding air. Under the conditions above, the storage period shall be no more than 18 months since the manufacturing date.

12 List of Accessories and Installation

SN	Name	Specification	3P Quantity/Set	4P Quantity/Set
1	Cross small pan-head screw	M5×110	4	4
2	Hexagon nut	5	4	4
3	Spring washer	5	4	4
4	Plain washer	M5	4	4
5	Phase partition	——	4	6
6	Ground partition	——	2	2
6	Terminal screw*	See Table 16	12	16

Note: Terminal screw See Table 16 connection screw size。

13 Precautions

1) Various characteristics and accessories of the circuit breaker are set in the factory. The circuit breaker, tripping unit or other accessories can only be adjusted, installed and maintained by the trained or qualified professionals according to the parameter requirements of the line design;

2) Ensure that the power supply is off before installing or removing any device;

3) The circuit breaker handle can be located in three positions, indicating three states: on, off and free tripping. When the handle is in the free tripping position, pull the handle in the off direction when the circuit breaker is connected and on.