

Shanghai Liangxin Electrical Co., Ltd.

NDM5-1600

Product Specification

(IPD-ENG-DEV-T22 A1 2016-09-23)

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[illegible]

1、Applicable scope and purpose

The NDM5-1600 series of moulded case circuit breakers (referred to as circuit breakers) have a rated insulation voltage of 1000V and apply to circuits with the AC 50Hz/60Hz, the rated working voltage AC380/400/415V、AC500V、AC660/690V、AC800V, V and rated working current (800A to 1250A). The circuit breakers are used for distributing power while protect the overload, short circuit and under-voltage (with a under-voltage release) of lines and power units as well as the infrequent starting, braking, overload and short circuit of motors.

The circuit breaker has an isolating function with the corresponding symbol of $\text{---}\diagup\diagdown\text{---}$;

Comply with standards: IEC60947-2, GB/T 14048.2.

Each voltage level and short-circuit section capacity of the circuit breaker can be connected with the lower incoming line.(Except AC800V)

2、Picture of the product

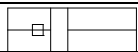
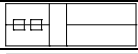
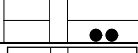
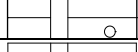
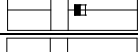
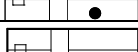
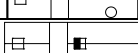
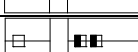
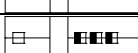
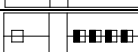
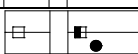
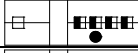
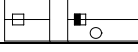
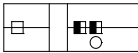
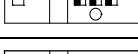
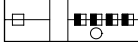
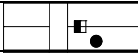
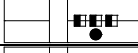
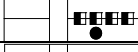
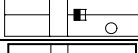


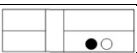
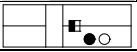
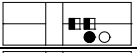
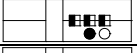
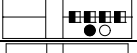
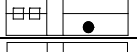
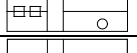
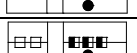
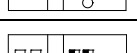
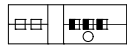
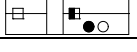
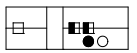
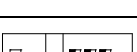
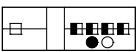
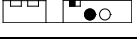
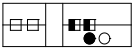
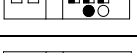
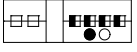
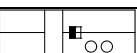
Fig.1 Product picture

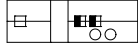
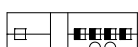
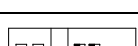
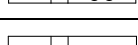
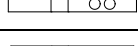
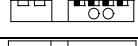
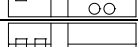
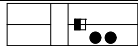
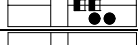
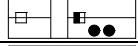
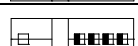
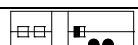
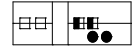
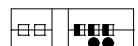
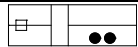
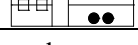
		M40: motor operation AC400V
11	Accessory code	See table 1
12	Other codes	MS2: MS2 lock
13	Special code	Pin 35: default 800A/1000A
		Pin 40: default 1250A/1600A

Note: Default length of wiring screw: 800A/1000A: nail 35; 1250A/1600A: Pin 40. If you need other wiring screw lengths, please refer to Table 9.

Table 1 Accessory code

Accessory code	Accessory name	Installation
		3P、4P
00	None	—
08	Alarm contact	
98	Two sets of alarm contact	
10	Shunt release	
K01	Two sets of shunt release	
30	Under-voltage release	
A01	Two sets of under-voltage release	
21	Single auxiliary contact	
61	Two sets of single auxiliary contact	
23	Three sets of single auxiliary contact	
24	Four sets of single auxiliary contact	
18	Shunt release、alarm contact	
38	Under-voltage release、alarm contact	
22	Alarm contact、alarm contact	
88	Two sets of alarm contact、alarm contact	
26	Three sets of alarm contact、alarm contact	
25	four sets of alarm contact、alarm contact	
42	Shunt release、alarm contact、alarm contact	
44	Shunt release、two sets of single auxiliary contact、alarm contact	
46	Shunt release、three sets of single auxiliary contact、alarm contact	
14	Shunt release、four sets of single auxiliary contact、alarm contact	
75	Under-voltage release、alarm contact、alarm contact	
77	Under-voltage release、Two sets of single auxiliary contact、alarm contact	
81	Under-voltage release、three sets of single auxiliary contact、alarm contact	
82	Under-voltage release、four sets of single auxiliary contact、alarm contact	
41	Shunt release、alarm contact	
11	Shunt release、Two sets of single auxiliary contact	
12	Shunt release、three sets of single auxiliary contact	
13	Shunt release、four sets of single auxiliary contact	
71	Under-voltage release、alarm contact	
72	Under-voltage release、two sets of single auxiliary contact	
73	Under-voltage release、three sets of single auxiliary contact	
74	Under-voltage release、four sets of single auxiliary contact	
31	Under-voltage release、shunt release、alarm contact	
37	Under-voltage release、shunt release、Two sets of alarm contact	

50	Under-voltage release、shunt release	
51	Under-voltage release、shunt release、alarm contact	
52	Under-voltage release、shunt release、Two sets of single auxiliary	
53	Under-voltage release、shunt release、there sets of single auxiliary	
54	Under-voltage release、shunt release、four sets of single auxiliary	
19	Shunt release、two sets of alarm contact	
79	Shunt release、two sets of alarm contact	
63	Single auxiliary contact、two sets of alarm contact	
64	Two sets of single auxiliary contact、two sets of alarm contact	
65	There sets of single auxiliary contact、two sets of alarm contact	
66	Four sets of single auxiliary contact、two sets of alarm contact	
43	Shunt release、alarm contact、two sets of alarm contact	
45	Shunt release、two sets of alarm contact、two sets of alarm contact	
47	Shunt release、there sets of alarm contact、two sets of alarm contact	
15	Shunt release、four sets of alarm contact、two sets of alarm contact	
76	Under-voltage release、alarm contact、two sets of alarm contact	
80	Under-voltage release、two sets of alarm contact、two sets of alarm contact	
83	Under-voltage release、there sets of alarm contact、two sets of alarm contact	
84	Under-voltage release、four sets of single alarm contact、two sets of alarm contact	
32	Under-voltage release、shunt release、alarm contact、alarm contact	
33	Under-voltage release、shunt release、two sets of alarm contact、alarm contact	
34	Under-voltage release、shunt release、there sets of alarm contact、alarm contact	
35	Under-voltage release、shunt release、there sets of alarm contact、alarm contact	
39	Under-voltage release、shunt release、alarm contact、two sets of alarm contact	
55	Under-voltage release、shunt release、two sets of alarm contact、two sets of alarm contact	
56	Under-voltage release、shunt release、there sets of alarm contact、two sets of alarm contact	
36	Under-voltage release、shunt release、four sets of single alarm contact、two sets of alarm contact	
A02	Two sets of under-voltage release、alarm contact	
A07	Two sets of under-voltage release、two sets of alarm contact	
A08	Two sets of under-voltage release、there sets of alarm contact	
A09	Two sets of under-voltage release、four sets of single alarm contact	
A10	Two sets of under-voltage release、alarm contact、alarm contact	

A12	Two sets of under-voltage release、 two sets of alarm contact、 alarm contact	
A14	Two sets of under-voltage release、 there sets of alarm contact、 alarm contact	
A16	Two sets of under-voltage release、 four sets of single alarm contact、 alarm contact	
A11	Two sets of under-voltage release、 alarm contact、 two sets of alarm contact	
A13	Two sets of under-voltage release、 two sets of alarm contact、 Two sets of alarm contact	
A15	Two sets of under-voltage release、 there sets of alarm contact、 Two sets of alarm contact	
A17	Two sets of under-voltage release、 four sets of single alarm contact、 Two sets of alarm contact	
A05	Two sets of under-voltage release、 alarm contact	
A06	Two sets of under-voltage release、 two sets of alarm contact	
K04	Two sets of shunt release、 alarm contact	
K06	Two sets of shunt release、 two sets of alarm contact	
K07	Two sets of shunt release、 there sets of alarm contact	
K08	Two sets of shunt release、 four sets of single alarm contact	
K12	Two sets of shunt release、 alarm contact、 alarm contact	
K09	Two sets of shunt release、 two sets of alarm contact、 alarm contact	
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K16	Two sets of shunt release、 four sets of single alarm contact、 Two sets of alarm contact	
K02	Two sets of shunt release、 alarm contact	
K05	Two sets of shunt release、 two sets of alarm contact	

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

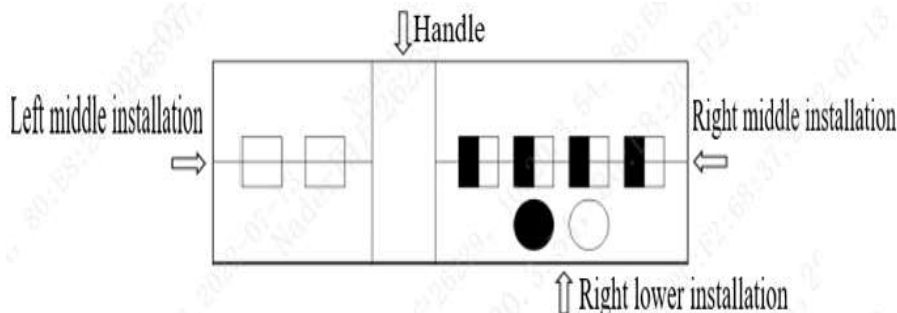
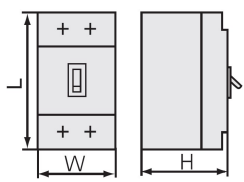


Fig.2 Attachment installation diagram

4、Main technical parameters

Table 2 Main technical parameters

Modle			NDM5-1600		
Frame current Inm （A）			1600		
Rated voltage Ue（V）			AC380/400/415、500、660/690、800		
Rated current In（A）			800、1000、1250		
Rated insulation voltage Ui（V）			1000		
Power frequency withstand voltage（V）			3500		
Rated impulse withstand voltage Uimp（kV）			12		
Number of poles			3	3、4	3
Interrupting level code			L	M	H
Rated limit short-circuit breaking capacity Icu（kA）	AC380/400/415V		70	100	100
	AC500V		50	70	85
	AC660/690V		20	35	50
	AC800V		/	/	30
Rated operating short-circuit breaking capacity Ics（kA）	AC380/400/415V		70	100	100
	AC500V		50	70	70
	AC660/690V		20	35	42
	AC800V		/	/	20
Usage category			A		
Operational performance（times）	Mechanical life	Maintainable free life	10000（3P）/6000（4P）		
		Maintainable life	20000（3P）/12000（4P）		
	Electrical life	AC415V	3000		
		AC500V	1500		
		AC690V	1000		
		AC800V	500		
Boundary dimension			L（mm）	268	
			W（mm）	210（3P）/280（4P）	
			H（mm）	152	
Flashover distance(mm)			≤100		

Note: The overall dimension does not include the dimension of terminal cover.

4.1 Sectional area and applicable rated current adopted in wiring

Table 3 Wire parameters

Rated current (A)	Copper bar	
	size (mm ²)	Quantity
800	50×5	2
1000	50×6	2
1250	50×8	2

4.2 Derating factor of temperature change for the circuit breaker

Table 4 Derating Factor Table of Temperature Change for the Circuit Breaker

Model	Screw application	Thread specification	Torsional moment (N·m)
NDM5-1600	Wiring screw	M10	20
	Set screw	M5	4

4.3 Derating factor of temperature change for the circuit breaker

Table 5 Derating Factor Table of Temperature Change for the Circuit Breaker

Model	Derating factor of product temperature change							
NDM5-1600	Temperatu (°C)	40	45	50	55	60	65	70
	Derating	1	0.96	0.92	0.87	0.82	0.76	0.70

Note: 1)When the operating ambient temperature is below + 40℃,the product can be used normally without derating capacity. and do not need to reduce capacity.

2)The above derating factors are measured under the rated current of the shell frame.

4.4 High altitude derating factor of circuit breaker

Table 6 Altitude drop correction factor

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

4.5 Power consumption of circuit breaker

Table 7 NDM5-1600 Product current specification single phase power consumption able

Model	Current specification	Single phase power consumption (W)	
		Front panel wiring	Extended row wiring
NDM5-1600	800A	28	31
	1000A	40	43
	1250A	47	52
Note: The above data are the single-phase loss measured under the rated current of the circuit breaker when the ring temperature is 40℃。			

5、Normal Working Environment of Circuit Breaker

- 1) The altitude of the installation site doesn't exceed 2,500m. See the "High-altitude Derating Factor Table of Circuit Breaker" for the derating factor at the altitude;
- 2) The ambient temperature is -35℃ ~ +70℃; the average within 24 h shall not be more than +35℃. If the ambient temperature is higher than +40℃, the user needs to reduce the capacity. See the "Derating Factor Table of Temperature Change for the Circuit Breaker" for the derating factor;
- 3) Its relative humidity at an ambient temperature of +40℃ should not exceed 50%. A higher relative humidity is allowed at a lower temperature. For example, the relative humidity at 20℃ can reach 90%; for frost due to temperature change, the corresponding measures should be taken;
- 4) The product can withstand the effects of wet air, salt mist, oil mist and mould;
- 5) The installation category of the circuit breaker connected to the main loop is: Category III (power distribution and control level), The installation category of the circuit breaker not connected to the main loop is: Category II (load level);
- 6) The pollution level is Level 3;
- 7) Degree of protection: IP 20;
- 8) The product should be installed in places that are free from explosive media, media corrosive to metal, insulation damaging gas, and conductive dust, which should be also avoided from snow and rain;
- 9) In case of stricter user conditions than the above description, negotiate with the manufacturer.

6、Tripping characteristics

6.1 Tripping characteristics curve

Tripping characteristics curve under normal environment (ambient air temperature: $+40^{\circ}\text{C}$), see the figure below:

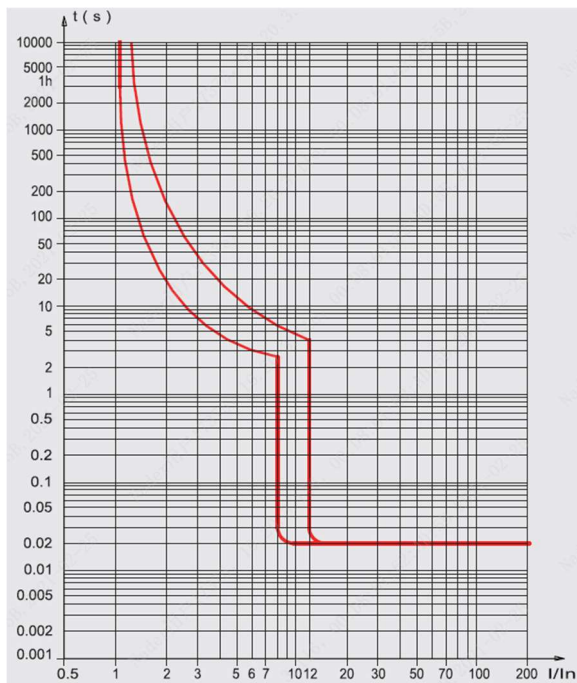


Fig.3 800A、1000A

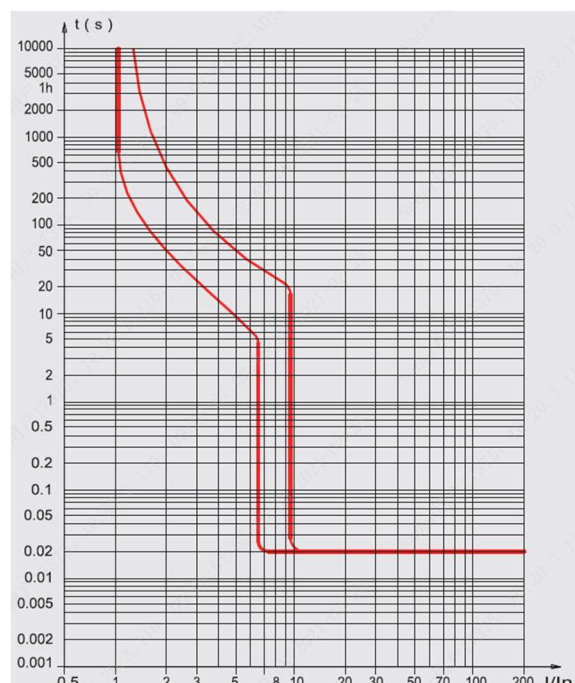


Fig.4 1250A

6.2 Current limiting and permissive characteristic curve

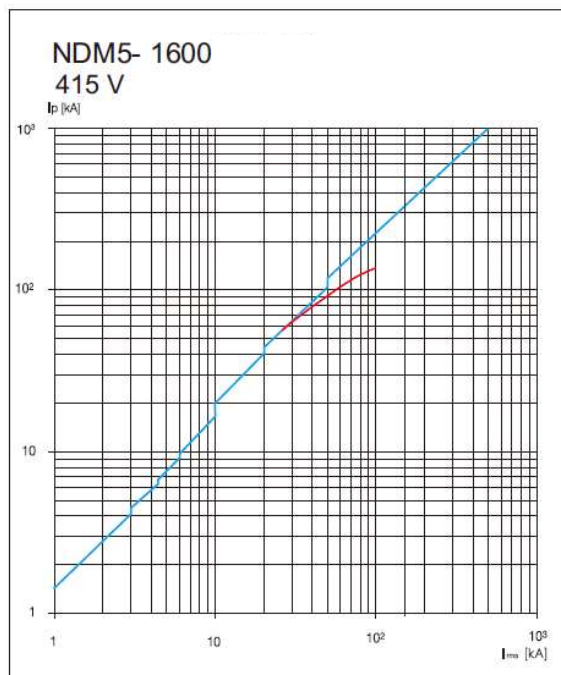


Fig.5 Current limiting characteristic curve chart

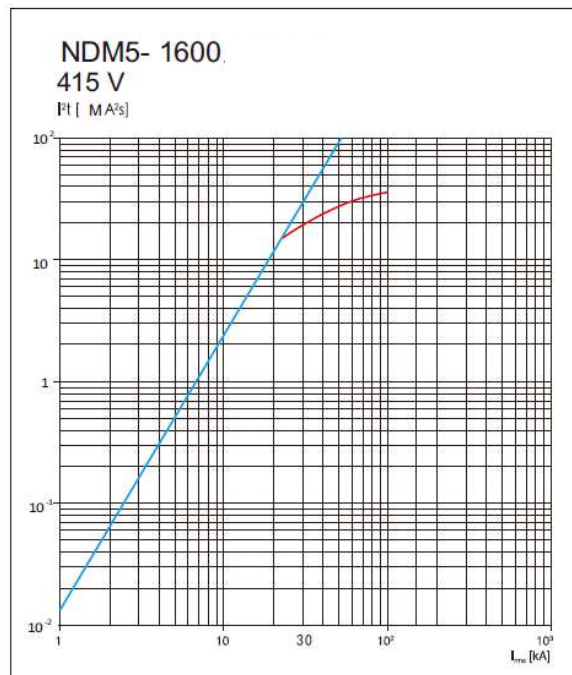


Fig.6 Permissive characteristic curve chart

7、Products Outline and Installation Dimensions

7.1 3P Outline and installation dimensions of front board wiring products

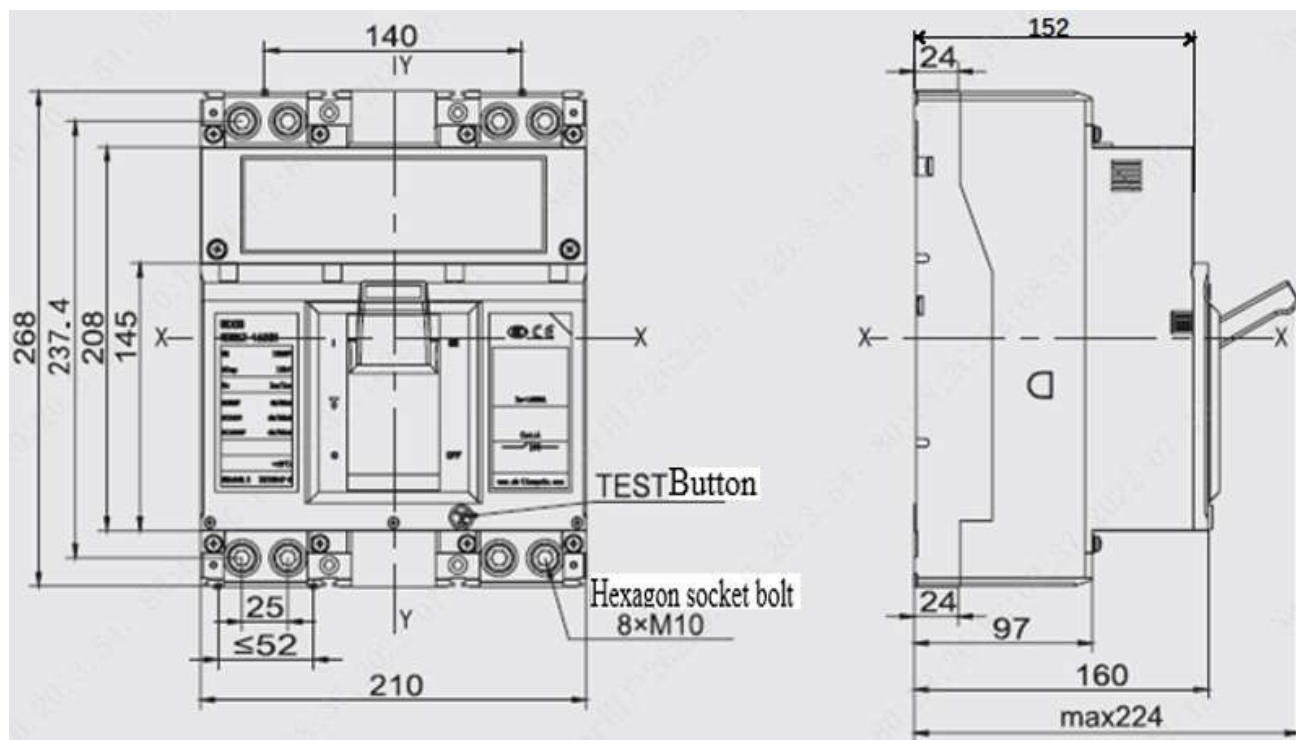


Fig.7 Overall dimensions of front board wiring products

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

7.2 3P Outline and installation dimensions of expansion wiring in front of the board

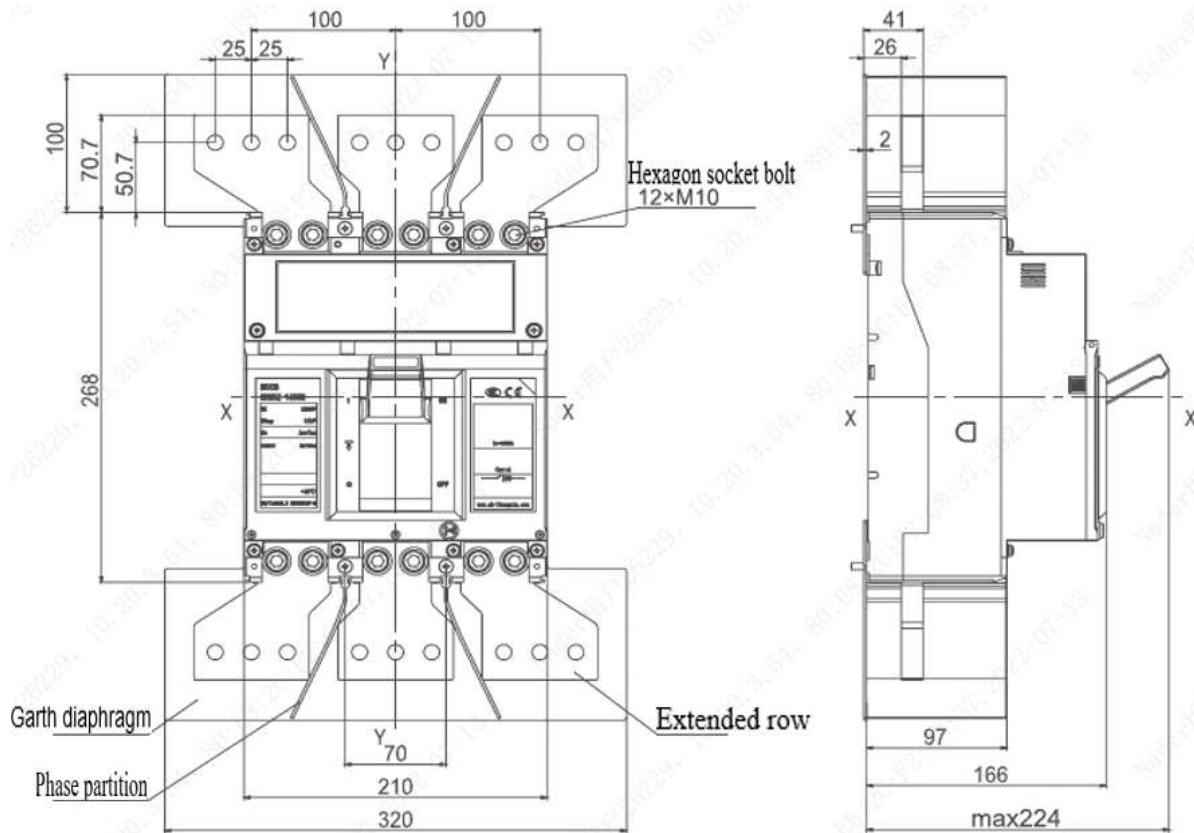


Fig.8 Outline and installation dimensions of expansion wiring in front of the board

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

7.3 4P Outline and installation dimensions of front board wiring products

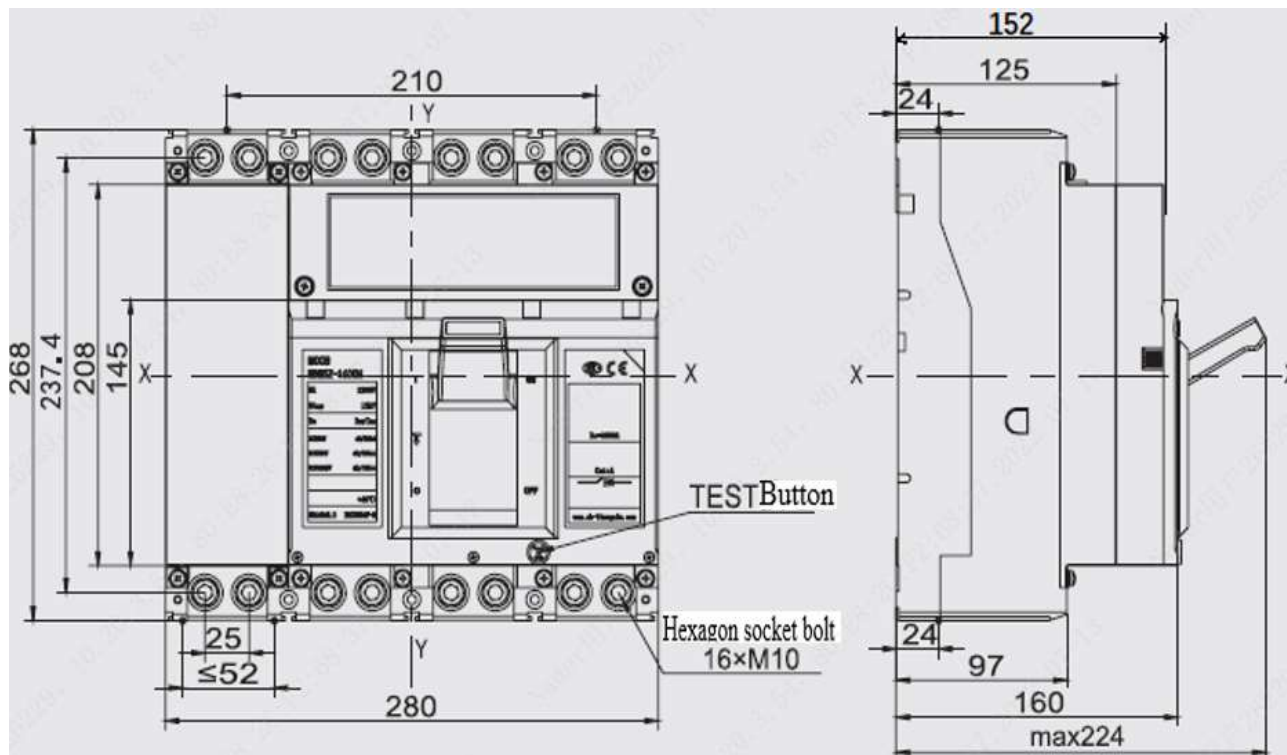


Fig.10 Overall dimensions of front board wiring products

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

7.4 4P Outline and installation dimensions of expansion wiring in front of the board

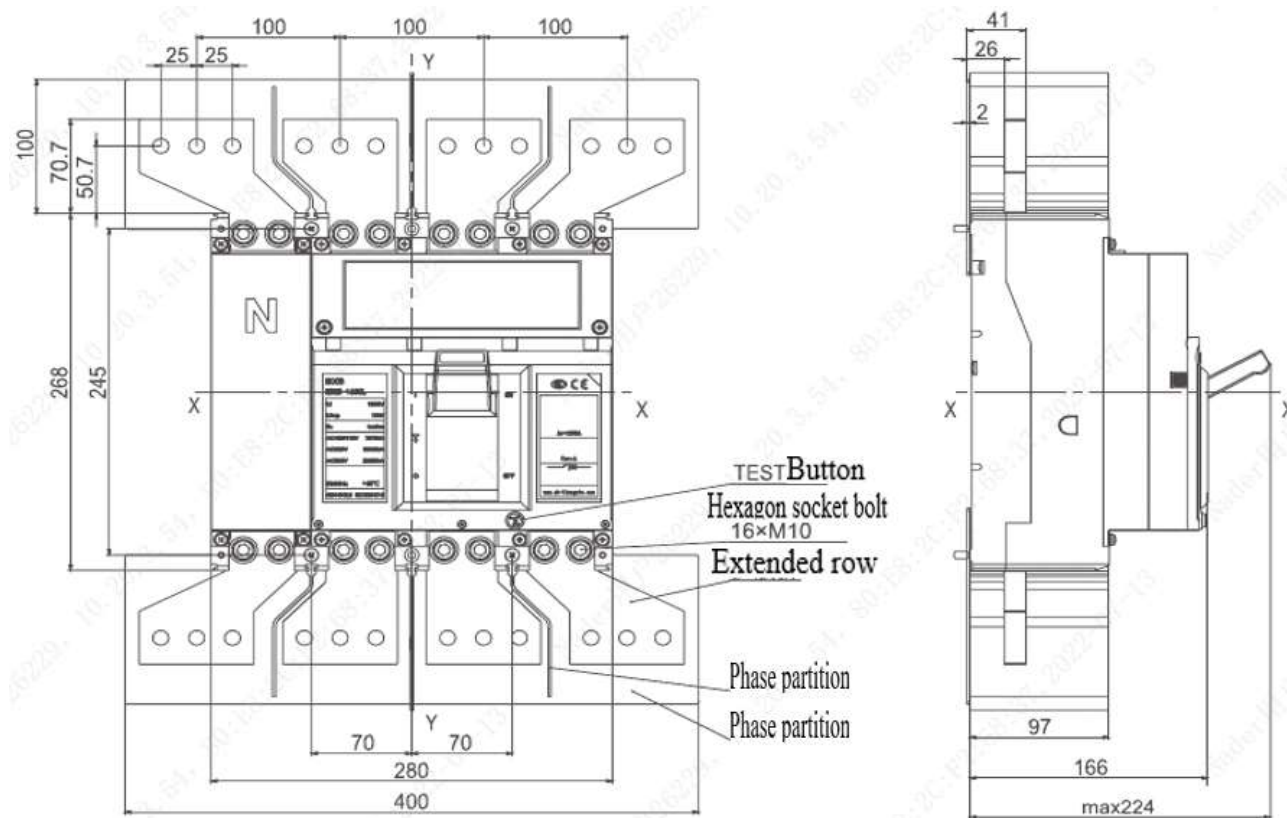


Fig.11 Outline and installation dimensions of expansion wiring in front of the board

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

7.5 3P、4P Overall dimensions of front board wiring product

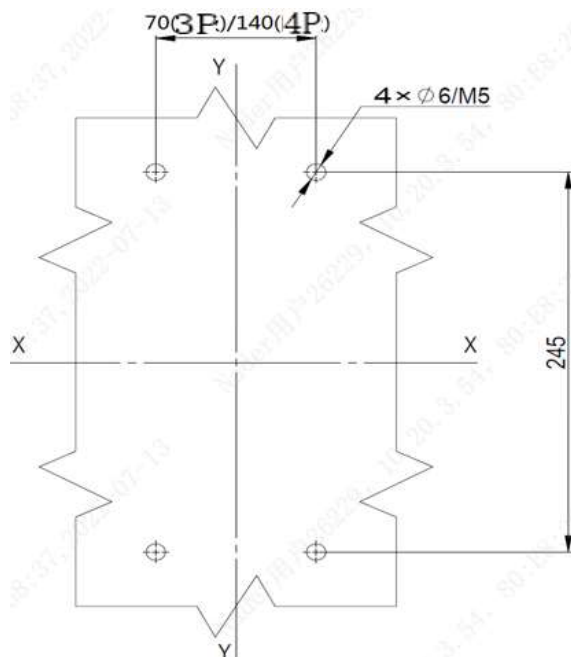


Fig.12 Mounting hole installed on the base plate

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

7.6 3P Overall dimensions of horizontal wiring products behind the board

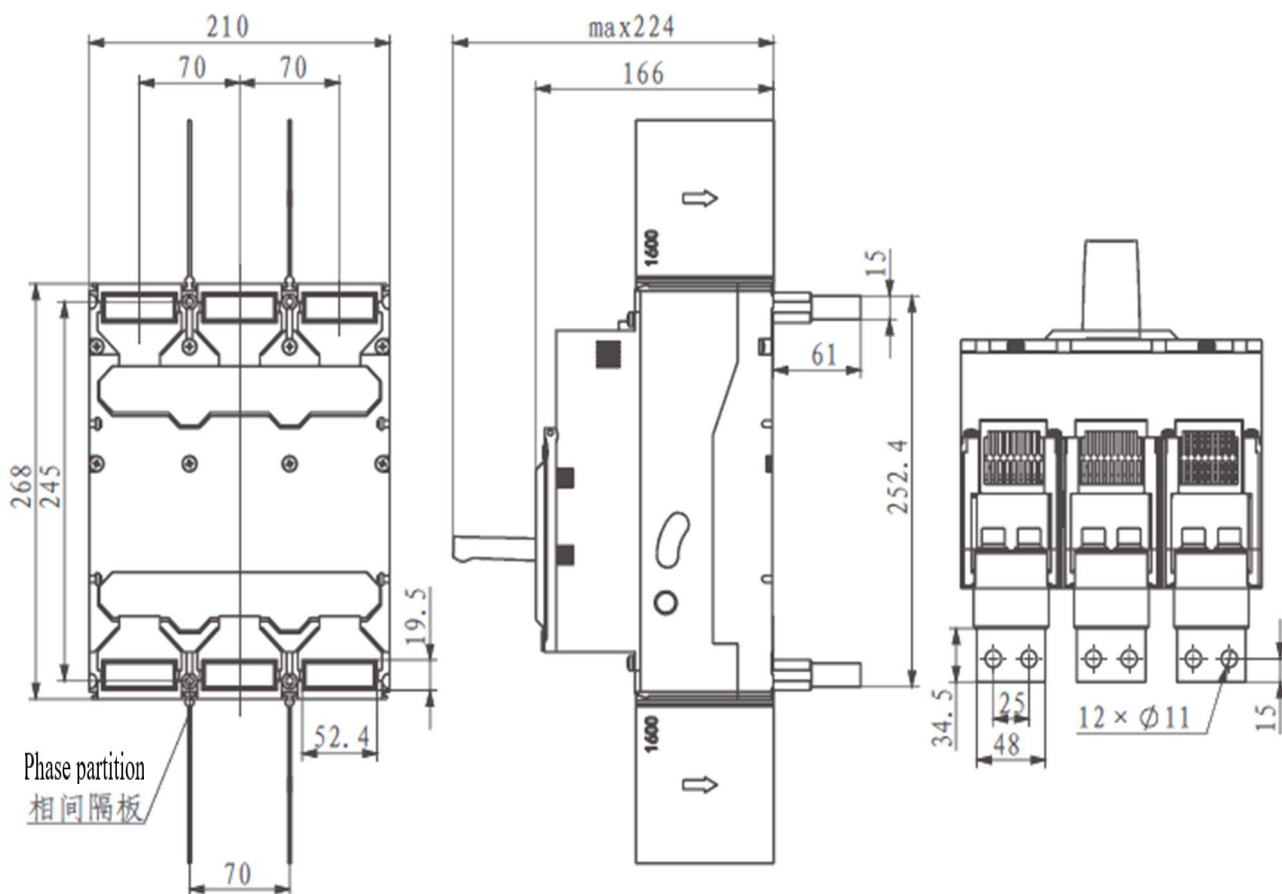


Fig.13 Overall dimensions of horizontal wiring products behind the board

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

7.7 4P Overall dimensions of horizontal wiring products behind the board

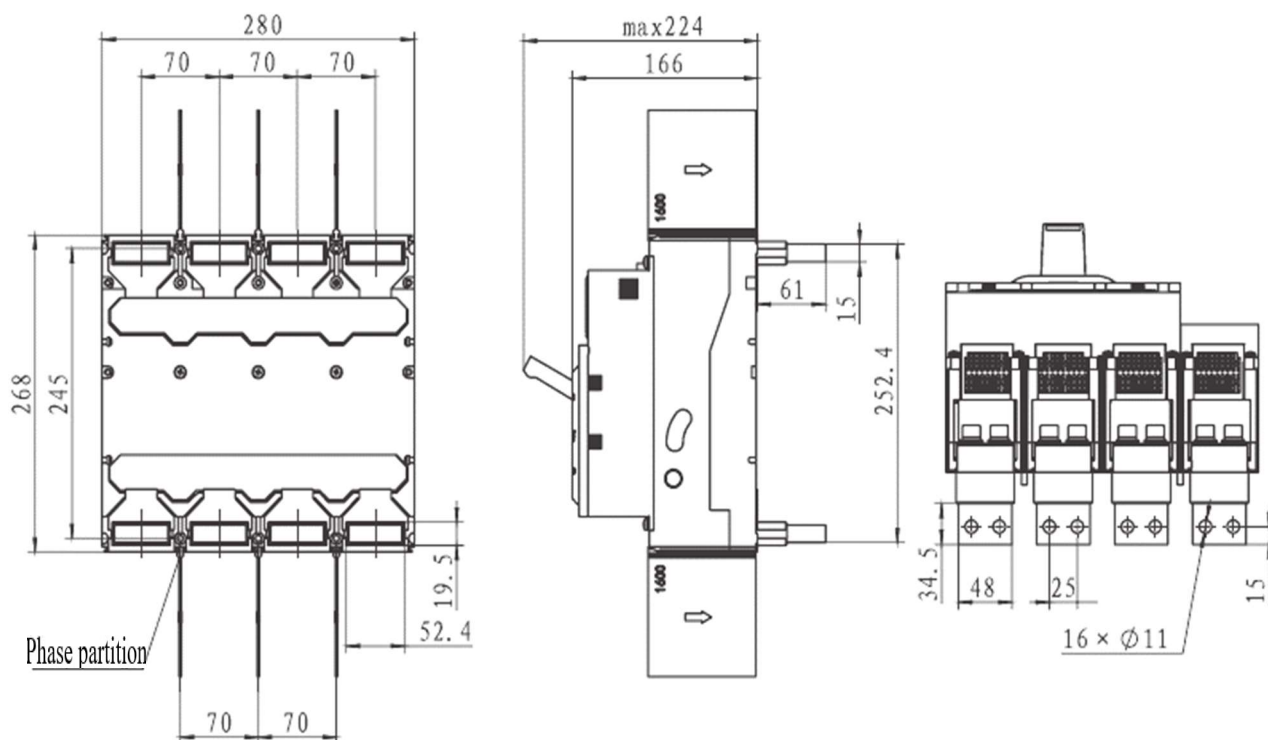


Fig.14 Overall dimensions of horizontal wiring products behind the board

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

7.8 3P Outline dimensions of vertical wiring products behind the board

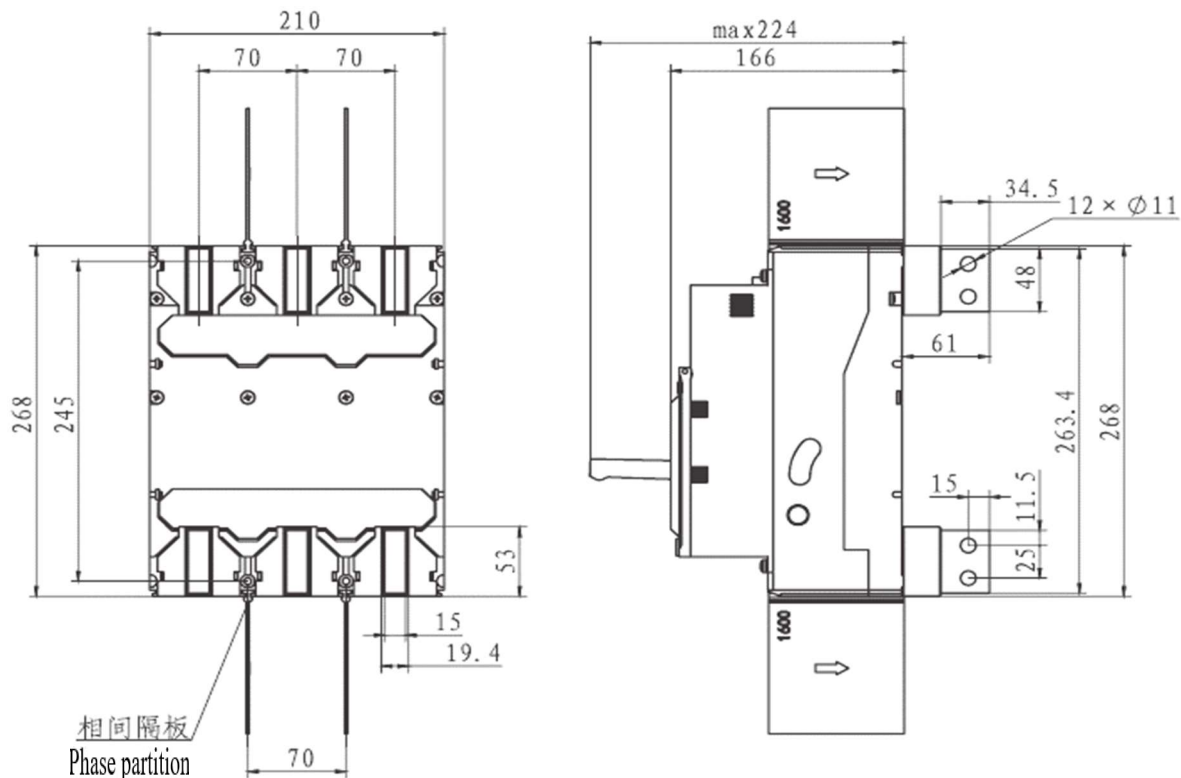


Fig.15 Outline dimensions of vertical wiring products behind the board

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

7.9 4P Outline dimensions of vertical wiring products behind the board

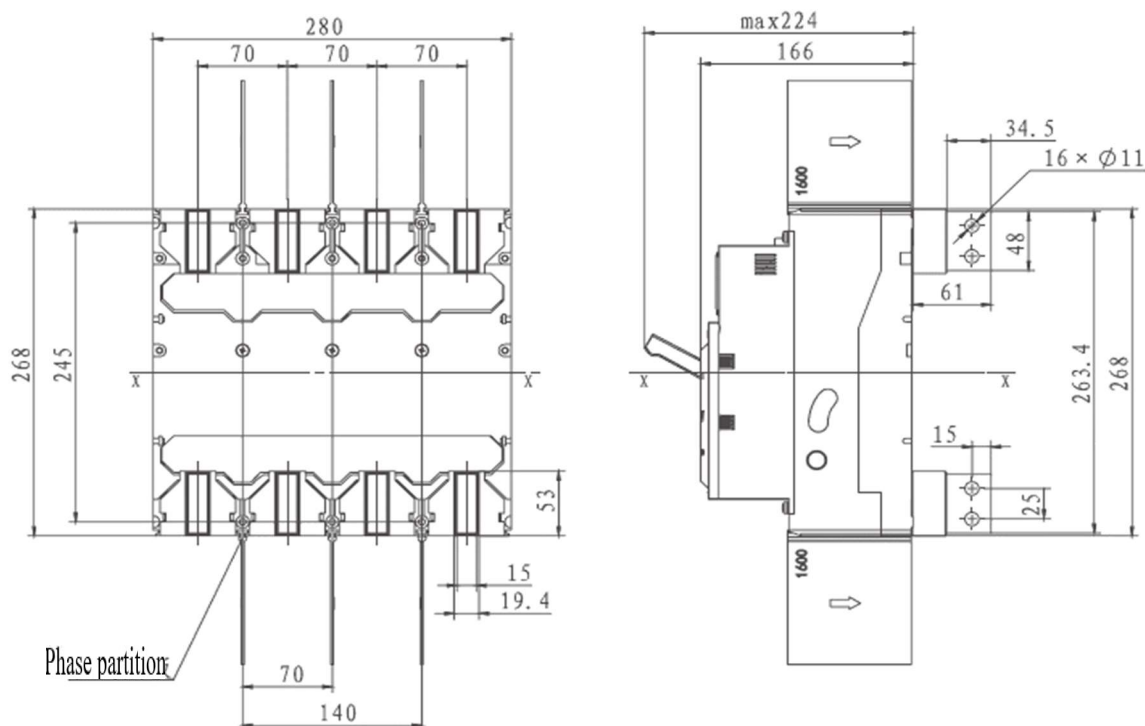


Fig.16 Outline dimensions of vertical wiring products behind the board

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

7.10 Rotary handle operating mechanism

Manual operation-the schematic diagram of handle installation and opening and the outline dimension diagram of manual operation are shown below respectively:

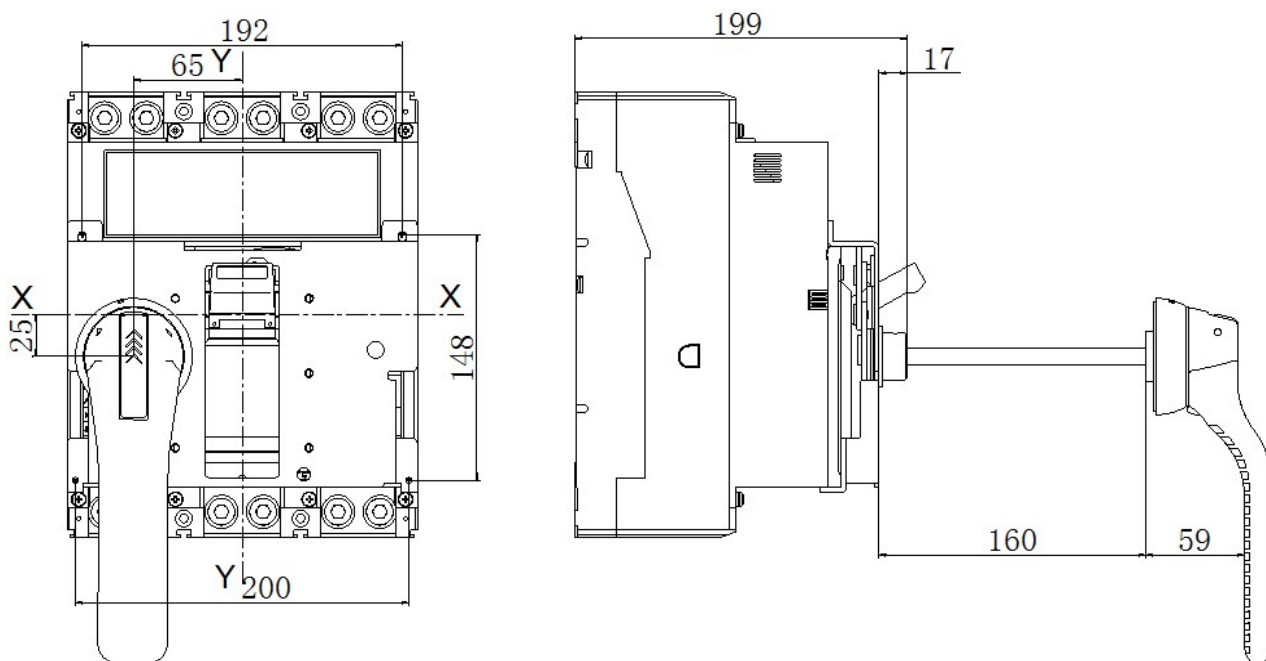


Fig.17 Installation drawing of rotary handle operating mechanism

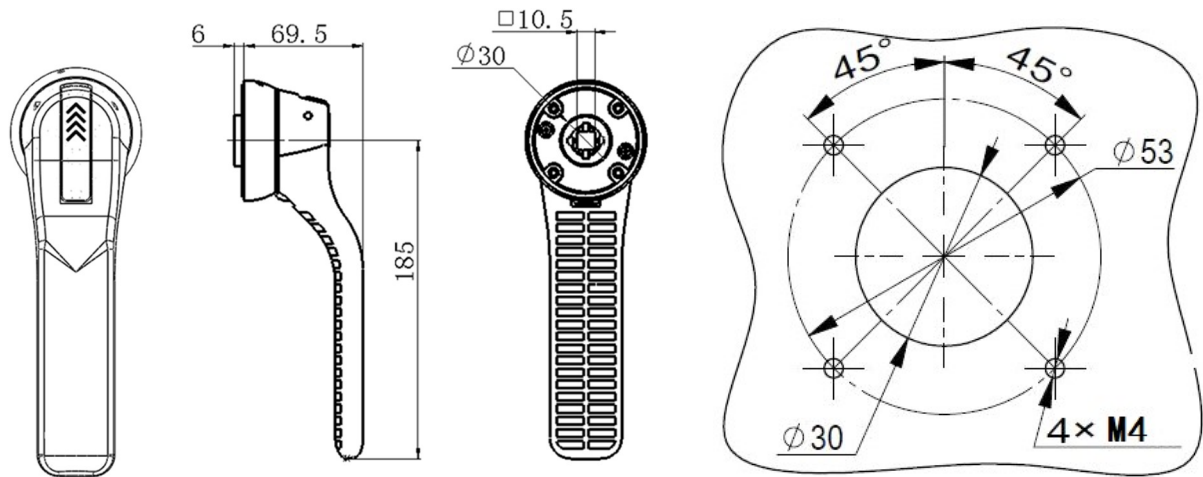


Fig.18 Installation opening diagram of rotary handle

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

7. 11 Electric operation

Electric operation-overall dimension of circuit breaker and its electric operating mechanism after installation:

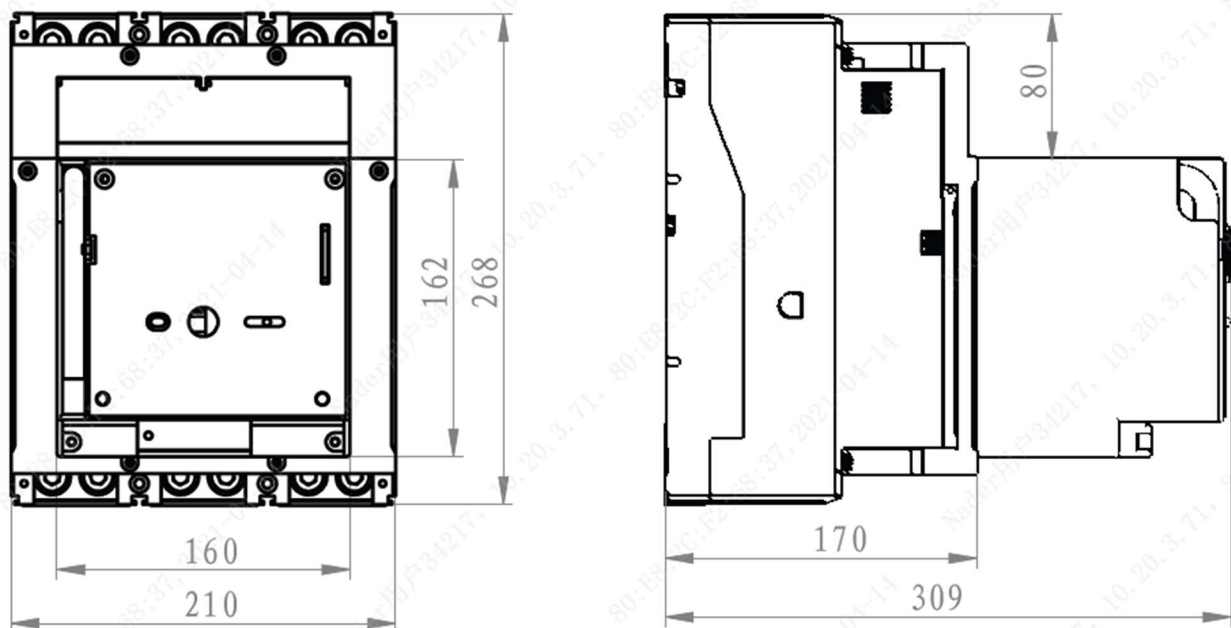


Fig.19 External dimension diagram of electric operation

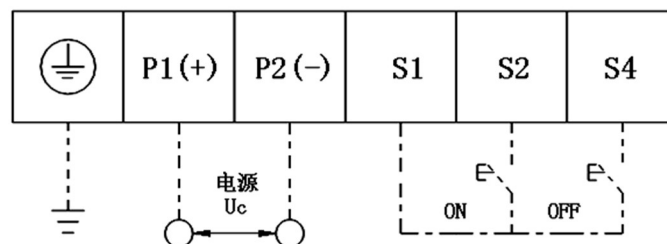


Fig.20 Electric operation wiring diagram

Note: 1) During manual operation, 180° shall be operated clockwise, and counterclockwise operation is prohibited

2) P1 and P2 shall not be connected with S1 and S2 and S4 during electric operation wiring

3) Unmarked tolerance level should follow GB/T 1804-c.

Table 8 Voltage specification and power of electric operation

Attachment Name	Electric operation			
Voltage specification	DC24V	AC110V/DC110V	AC230V/DC220V	AC400V
power (W)	240W	400W	400W	400W

7.12 Connction copper bar thickness and screw length

Table 9 Connction copper bar thickness and screw length

S.N.	thickness of wiring copper bar(mm)	Length of socket head cap screw(mm)
1	6、8	M10X30
2	10、12	M10X35
3	15	M10X40
4	20	M10X45

Note: The Length of socket head cap screw shall be indicated when ordering again.

7.13 Safety distance

The minimum safety distance between the top, bottom, side and front panel when installing the circuit breaker, see the figure below.

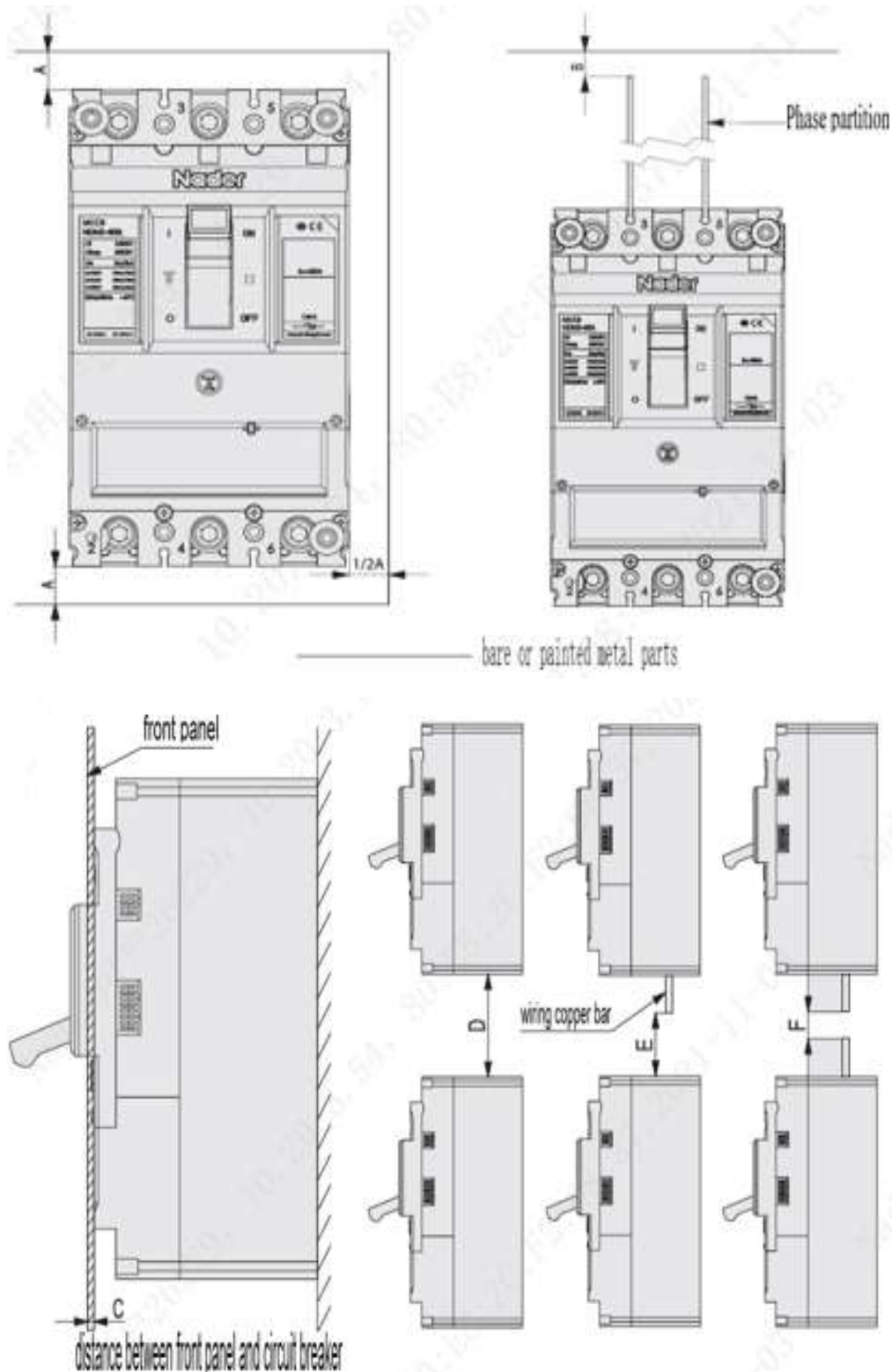


Fig.21 Insulation distance mounted in the metal cabinet

Table 10 Insulation distance mounted in the metal cabinet (unit: mm)

Model	Spacing A	Spacing B	Spacing C	Spacing D	Spacing E	Spacing F
NDM5-1600	≥ 100	≥ 0	≥ 0	≥ 180	≥ 100	≥ 40

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

7.15 Wiring diagram of circuit breaker

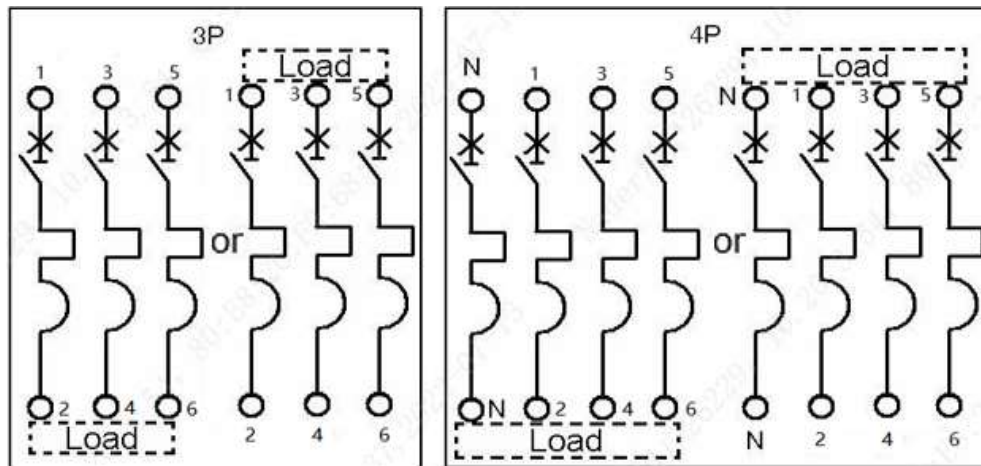


Fig.22 Main circuit wiring mode of AC products

8、 Attachment function description

8.1 Under-voltage release

When the power voltage drops to the range (35%~70%) of the under-voltage release, the release can break the circuit breaker reliably; when the power voltage is 35% lower than the rated working voltage of the under-voltage release, the release can prevent closing of the circuit breaker; when the power voltage is 85% higher than the rated working voltage of the under-voltage release, the release can guarantee reliable closing of the circuit breaker.

Table 11 Rated Parameters of the Under-voltage Release

Accessory name	voltage release		
Voltage specifications (V)	AC/DC110	AC/DC230	AC/DC400
Maintain power consumption (W)	7	8	10
Instantaneous power consumption(W)	230	500	270
Code name	Q11	Q22	Q40

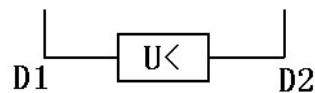


Fig. 23 Working diagram of under-voltage release

8.2 Shunt release

When the external voltage of the shunt release is between 70% and 110% of the rated control power voltage, the release can break the circuit breaker reliably.

Table 12 Rated Parameters of the Shunt Release

Accessory name	Shunt release		
Voltage specifications (V)	AC/DC24	AC/DC110	AC/DC230
Maintain power consumption (W)	3.5	3.5	3.5
Instantaneous power consumption(W)	240	230	300
Code name	FT02	FT11	FT22

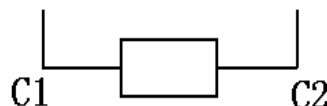


Fig.24 Working Diagram of Shunt Release

Note: shunt tripper is working principle: it is a single pulse action(power on time is recommended to be greater than 200ms)。 If it needs to act again, the shunt release must be power on before it can act again. (power on time is recommended to be greater than 200ms), The time from power on (receiving signal)of the shunt release to product tripping is 100ms。



Fig.25 Working principle diagram of shunt tripper

8.3 Rated parameters of the auxiliary contact

Table 13 Parameter of Auxiliary Contact

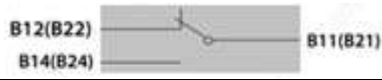
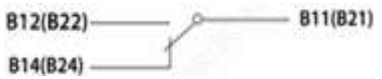
Accessory name		Auxiliary contact(conventional)	Auxiliary contact(Low power consumption)
Voltage specifications(V)/ conventional thermal current (Ith)		AC250V/10A、 AC400V/3A、 DC220V/0.2A	DC30V/0.1A
Wiring diagram	Off	The diagram shows a switch in the 'Off' position. It connects terminal F12(F22/F32/F42) to terminal F11(F21/F31/F41). Terminal F14(F24/F34/F44) is shown but not connected in this state.	
	On	The diagram shows a switch in the 'On' position. It connects terminal F12(F22/F32/F42) to terminal F14(F24/F34/F44). Terminal F11(F21/F31/F41) is shown but not connected in this state.	
Internal resistance		<30mΩ	<50mΩ

Note1: If need DC30V/0.1A auxiliary contact, please explain when ordering.

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 three groups of auxiliary harness are installed.

8. 4 Rated parameters of the alarm contact

Table 14 Rated parameters of the alarm contact

Accessory name		Alarm contact(conventional)	Alarm contact(Low power consumption)
Voltage specifications(V)/ conventional (Ith)		AC250V/10A、AC400V/3A、 DC220V/0.2A	DC30V/0.1A
Wiring diagram	On, off		
	Free tripping		
Internal resistance		<30mΩ	<50mΩ

Note1: If need DC30V/0.1A Alarm contact, please explain when ordering.

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 0.7mlong , 1m、2m、4m can be customized according to requirements.

9、 Installation direction of circuit breaker

For vertical installation of the product, the gradient between the installation surface and the vertical plane is no more than $\pm 5^\circ$

Horizontal installation of the product.

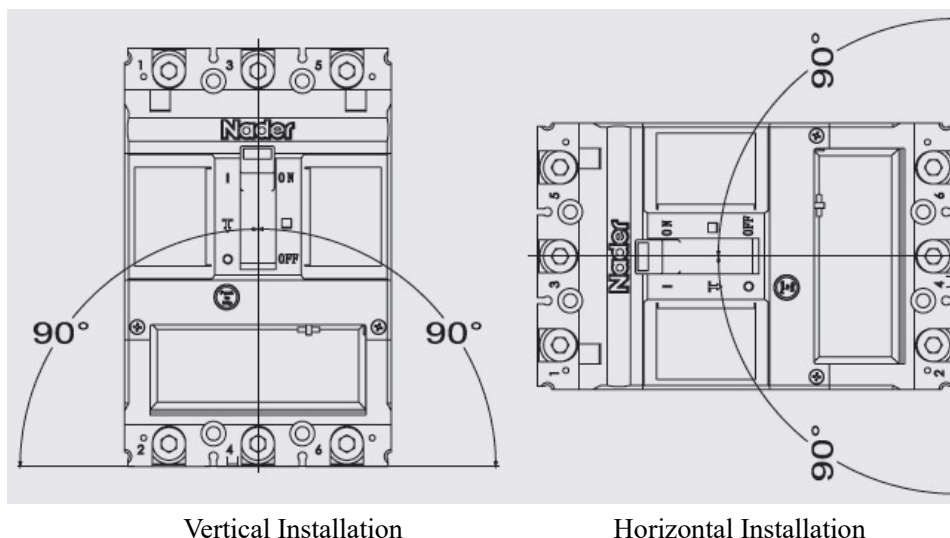


Fig.26 Mounting Method of Product

10、 Packaging and storage of circuit breaker

Minimum packaging quantity: 1 piece/box. The packaged products should be stored in a warehouse with the air ventilation and the relative humidity no more than 80% when the ambient temperature is $-40^{\circ}\text{C}\sim+75^{\circ}\text{C}$. No acidic alkaline or other corrosive gas exists in the ambient air in the warehouse. Under the conditions above, the storage period shall be no more than three years since the manufacturing date.

11、Environment

The environment that comply with RoHS instruction.

12、Installation direction of circuit breaker

Table 15 Accessories list form

S.N.	Name	Specification	3P Quantity/Set	4P Quantity/Set
1	Cross small pan-head screw	M5×100	4	4
2	Hexagon nut	M5	4	4
3	Spring washer	5	4	4
4	Plain washer	5	4	4
5	Phase partition	——	4	6
6	Garth diaphragm	——	2	2
7	Terminal screw*	see table 9*	12	16

Note : Terminal screw see table 9 connction copper bar thickness and screw length

13、Circuit breaker notes

- 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.