

Shanghai Liangxin Electrical Co., Ltd.

NDM5Z-1600 Product Specification

(IPD-ENG-DEV-T20 0 2014-04-01)

Product name: Molded Case Circuit Breaker (MCCB)

Product model: NDM5Z-1600

Prepared by	_____	Date	_____
Reviewed by	_____	Date	_____
Approved by	_____	Date	_____

Revision Record					
Version	Revision Reason/Content	Date	Prepared by	Reviewed by	Approved by
0	New addition	05.09.2018	QIU Z.	YANG W.	WU C.
1	Updating major technical parameters	11.05.2018	QIU Z.	YANG W.	WU C.
2	Updating accessory parameters, adjusting parameters of motor operator in Table 12	08.29.2019	YANG W.	ZHANG Y.	WU C.
3	1、Adding Circuit mechanic life with under voltage and shunt trip 2、Adding Circuit Handle mechanic life	10.24.2019	YANG W.	ZHANG Y.	WU C.
4	Update as per new template content.	5.17.2021	SUN L.	WANG Z.	DING F.
5	New attachment information	8.26.2022	YANG R.	YANG W.	DING F.
6	Add DC1500V,1600A	9.28.2023	LIU X.	ZHANG Y.	SUN L.
7	Delete 1600A	12.12.2023	LIU X.	ZHANG Y.	SUN L.

1 Application range

NDM5Z-1600 molded case circuit breakers (referred to as circuit breakers), which suitable for direct current, with rated insulation voltage of 1200V and rated working voltage DC500V (2P in series), DC600V (2P connect in series), DC750V (2P in series), DC750V (3P in series), DC1000V (3P connect in series), DC1000V (4P connect in series), DC1200V (4P connect in series) and DC1500V (4P connect in series) can be applied in circuits of current up to 1500A to distribute power and to protect cables and power supply from overload, short circuit and under-voltage protection (with under-voltage release).

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

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

2 Picture of product



3 Specifications and Model Description

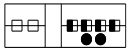
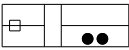
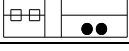
ND 1	M 2	5 3	Z - 1600 4 5	☐ 6	☐ / ☐ / ☐ 7 8 9	☐ 10	☐ 11	☐ 12	☐ 13
No	Item			NDM5Z					
1	Enterprise code			ND: "Nader" low-voltage apparatus					
2	Product code			M: Molded case circuit breaker (MCCB)					
3	Design SN			5					
4	Series derived code			Z:thermal-magnetic for DC					
5	Current of the frame size			1600					
6	Breaking capacity level			M:medium-high					
7	Rated current			See table 2					
8	Number of poles			2:2 poles					
				3:3 poles					
				4:4 poles					
9	Release code			TMDC : fixed thermal-magnet release (power distribution protection for DC)					
10	Installation + wiring method			null: fixed + front panel					
				ES: fixed + front panel extended					
				R1: fixed + rare terminal horizontal					
				R2: fixed + rare terminal vertical					
11	Operation method			Null: directly handle operation					
				Z2A200: rotary handle with round eccentric hole and square shaft length 200 mm					
				Z2A300: rotary handle with round eccentric hole and square shaft length 300mm					
				Z2A350: rotary handle with round eccentric hole and square shaft length 350 mm					
				Z2A650: rotary handle with round eccentric hole and square shaft length 650 mm					
				M02: motor operation DC24V					
				M11: motor operation AC110V/DC110V					
				M22: motor operation AC230V/DC220V					
12	Accessory code			See table 1					
13	Other code			MS2: MS2 lock					

Table 1 Accessory code

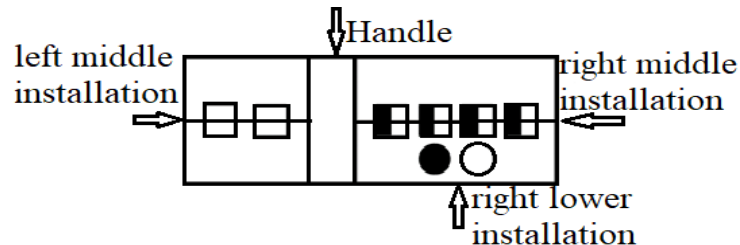
Code	Accessory	Installation
		2P、3P、4P
00	None	—
08	One set of alarm contacts	
98	Two sets of alarm contacts	
10	Shunt release	
K01	Two sets of shunt releases	
30	Under-voltage release	
A01	Two sets of under-voltage releases	
21	Single auxiliary contact	
61	Two sets of single auxiliary contacts	
23	Three 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 contacts	
53	Under-voltage release, shunt release, three sets of single auxiliary contacts	
54	Under-voltage release, shunt release, four sets of single auxiliary contacts	
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 contacts	
A09	Two sets of under-voltage releases, four sets of single auxiliary contacts	
A10	Two sets of under-voltage releases, single auxiliary contact, alarm contact	
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	

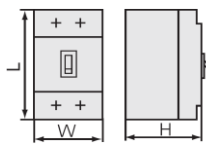
Note:  Single auxiliary contact;  Alarm contact;  Shunt release;  Under-voltage release



4. Main Technical Parameters (table 2)

Table 2 technical parameters

Model type		NDM5Z-1600		
Frame size Inm(A)		1600		
Rated working voltage Ue(DC V)		500、600、750、1000、1200、1500		
Rated current In(A)		800、1000、1250、1500*		
Rated insulation voltage Ui(V)		1500		
Power frequency withstand voltage U(V)		3500		
Rated impulse withstand voltage Uimp(kV)		12		
Number of poles		2	3	4
Breaking capacity level		M		
Rated ultimate breaking capacity Icu (kA)	DC500V	70	/	/
	DC600V	35	/	/
	DC750V	20	70/20 (2P+N)	/
	DC1000V	/	50	70/50 (3P+N)
	DC1200V	/	/	35
	DC1500V	/	/	20
Rated running breaking capacity Ics(kA)	DC500V	70	/	/
	DC600V	35	/	/
	DC750V	20	70/20 (2P+N)	/
	DC1000V	/	50	70/50 (3P+N)
	DC1200V	/	/	35
	DC1500V	/	/	20
Utilization category		A		
Operating performance (times)	Electrical life	DC500V	1000	/
		DC600V	1000	/
		DC750V	500	1000
		DC1000V	/	500

			DC1200V	/	/	500
			DC1500V	/	/	500
	Mechanical life	Without maintenance	10000			
		With maintenance	20000			
Outline dimensions			L(mm)	268		
			W(mm)	210 (2P、3P) /280 (4P)		
			H(mm)	152		
Flashover distance(mm)				≤100		

Note: 1500*: Maximum working current is 1440A for 3-pole and 4-pole products.

4.1 Recommendations of cross-section area of cables or bars for the circuit breakers

Table 3 Choice of cross-section area of the conductors

Rated current (A)	Copper bars	
	Sizes (mm ²)	Amount
800	50×5	2
1000	50×6	2
1250	50×8	2
1500	50×10	2

4.2 Tighten torques of connecting and installation screws for the circuit breakers

Table 4 tighten torques of connection and installation screws for the circuit breakers

Model type	Screw usage	Thread specification	Torque(N • m)
NDM5Z-1600	Wire connection	M10	20
	Installation	M5	4

4.3 Derating coefficient corresponding to ambient temperature for the circuit breakers

Table 5 Derating coefficient corresponding to ambient temperature for the circuit breakers

Model	Ambient temperature and corresponding derating coefficient							
NDM5Z-1600	Temperature(°C)	40	45	50	55	60	65	70
	Derating coefficient	1	0.97	0.94	0.85	0.83	0.81	0.75

Note 1. If the temperature is lower than 40°C, products can come into use normally without derating.

2. All the derating coefficients above are measured and derived under rated current.

4.4 Derating coefficient at high elevation for the circuit breakers

Table 6 Derating coefficient at high elevation for the circuit breakers

Elevation (m)	Working current correction coefficient	Maximum working current correction coefficient	Power frequency withstand voltage correction coefficient	Isolation voltage correction coefficient
2000	1	1	1	1
2500	1	1	1	1
3000	0.98	1	1	1
3500	0.95	1	1	1
4000	0.93	1	1	1
4500	0.91	1	1	1
5000	0.89	1	1	1

4.5 Power dissipation of circuit breakers

Table 7 Current specification power dissipation at single phase of NDM5Z-1600 products

Model type	Current specification(A)	Power dissipation at single phase(W)
		Front/rare panel connection
NDM5Z-1600	800A	28W
	1000A	40W
	1250A	47W
	1440A	56W
	1500A	58W
Note: the datum above is measured in 40℃ ambient temperature and in rated current for power dissipation at single phase.		

5、 Normal working environments

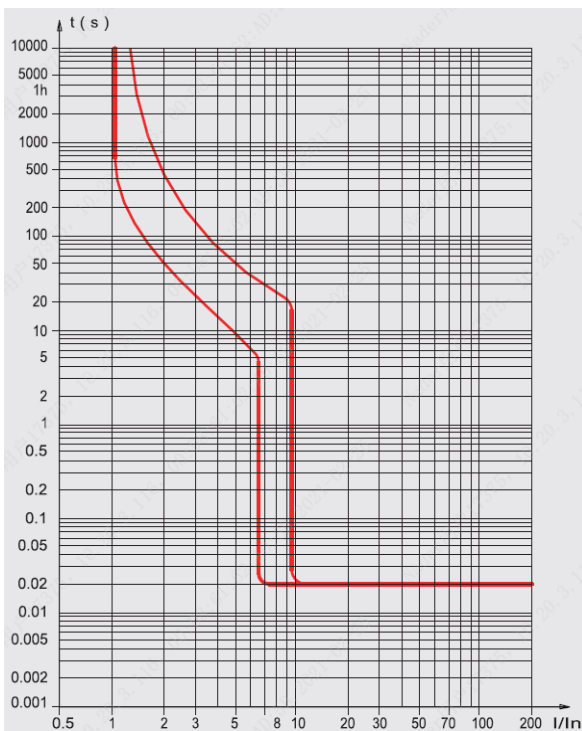
- 1) Elevation of installation site should be no more than 2500m, see Table 6 Derating coefficient at high elevation for the circuit breakers for derating coefficient at high elevation
- 2) Ambient temperature should be within the range of -35℃~+70℃, meanwhile the mean temperature over 24hours should no more than 35℃. If the ambient temperature is higher than 40℃, the products should put into use with deration. See Table 5 Derating coefficient according to ambient temperature for the circuit breakers for Derating coefficient according to ambient temperature.
- 3) The relative humidity should no more than 50%, when the ambient temperature is 40℃. Somehow relatively high humidity is acceptable if the temperature is relatively low. For instance, 90% humidity is acceptable when temperature is 20℃. Actions should be taken to deal with the condensation result from the temperature changes.
- 4) The product can withstand the effects of wet air, salt mist, oil mist and mould.

- 5) Installation category if switch disconnectors connecting to the main circuit: III (power distribution and control level.). Installation category if switch disconnectors not connecting to the main circuit: II (load level)
- 6) Pollution level: 3;
- 7) Protection class: IP20;
- 8) The product can be disposed in places that are free from explosive media, metal-corrosive or insulation-damaging gas, or conductive dust. And should avoid using in places invaded by rain or snow.
- 9) If customers are intending to deploy the products in the harsher condition than mentioned above, please talk to manufacturer first.

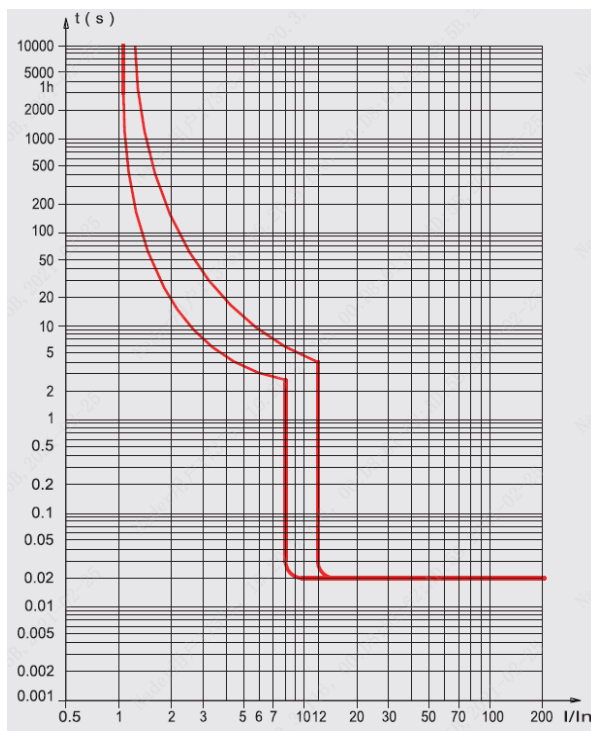
6、 Characteristics Curves

6.1 Tripping characteristic curve

Tripping characteristic curve under normal environment (ambient air temperature: 40°C), see the picture below:

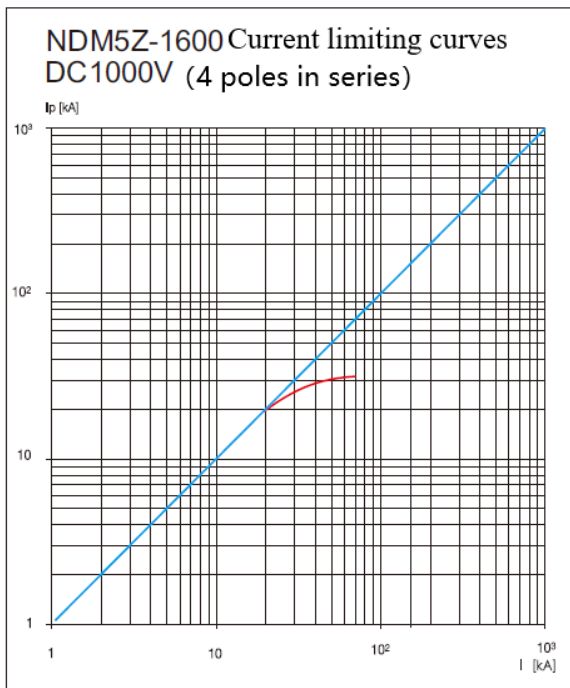


800A, 1000A

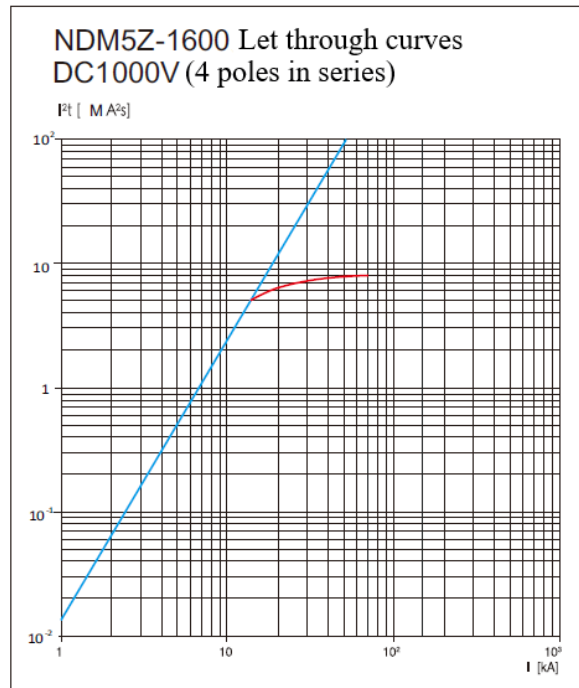


1250A, 1500A

6.2 current limiting characteristic curves



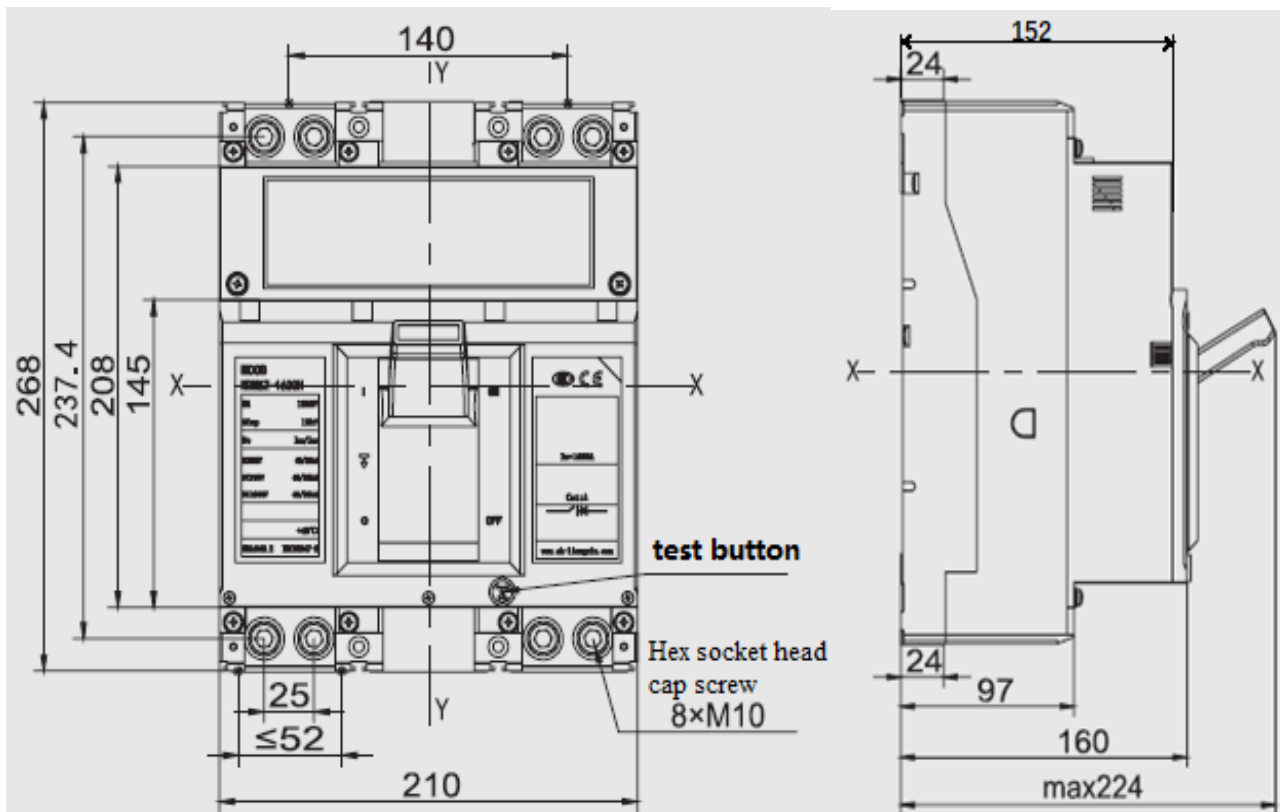
Current limiting curves



Let through curves

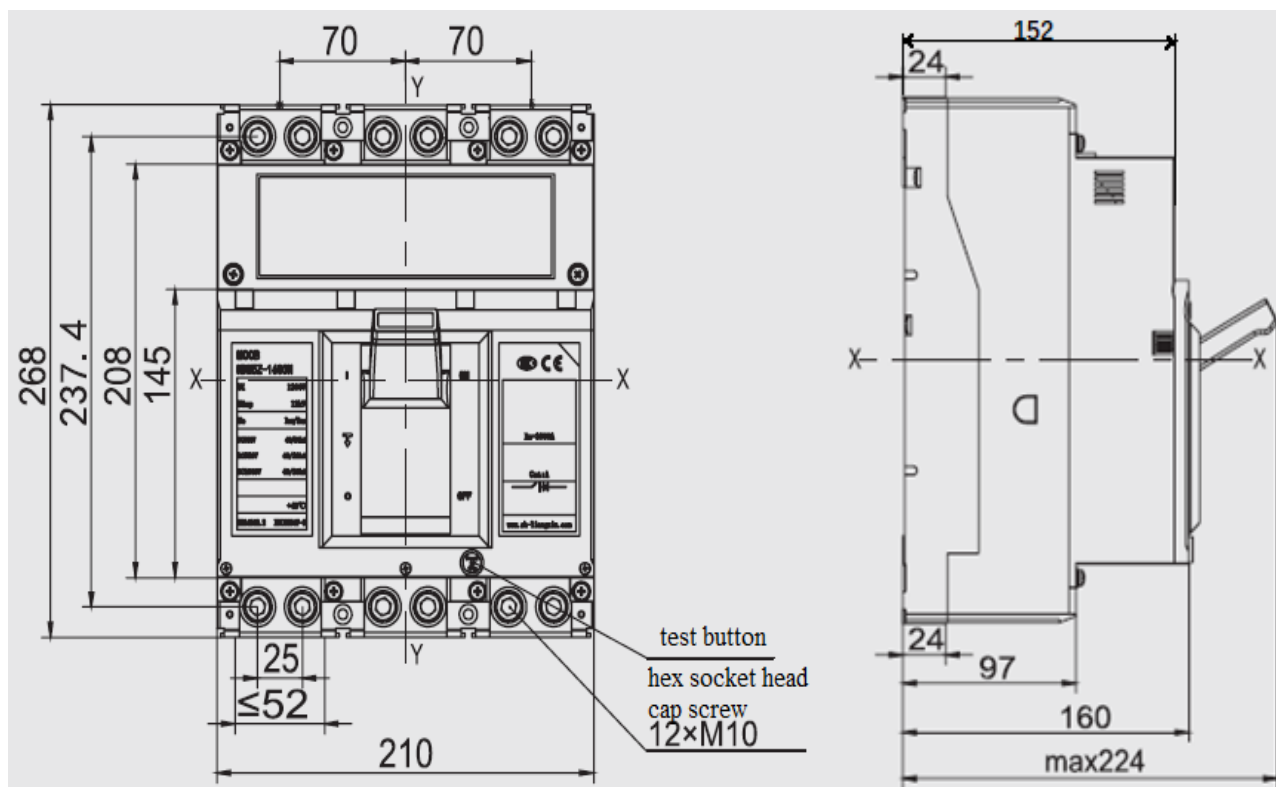
7、Outline and installation dimensions

7.1 Outline dimension of 2-pole front panel products (unit: mm)



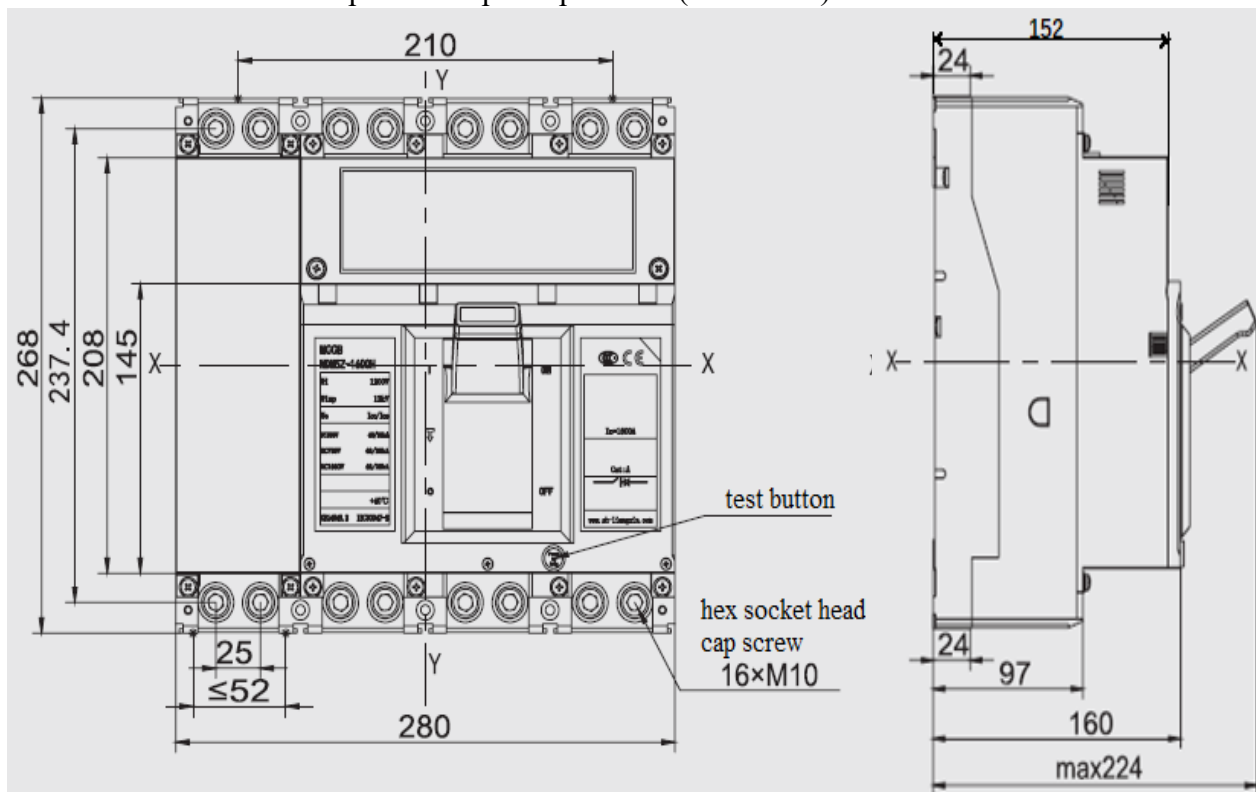
Note: unlabeled tolerance level should follow GB/T 1804-c.

7.2 Outline dimension of 3-pole front panel products (unit: mm)



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

7.3 Outline dimension of 4-pole front panel products (unit: mm)



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

7.4 Outline dimensions of products with accessory radiators

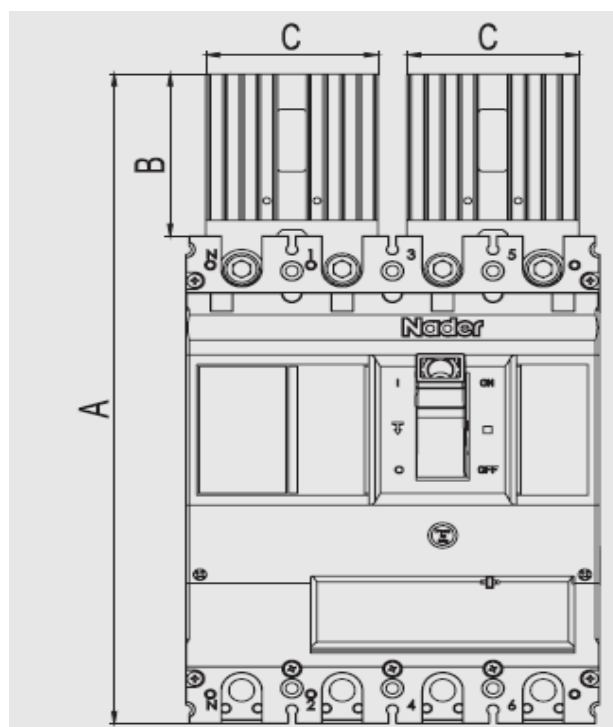
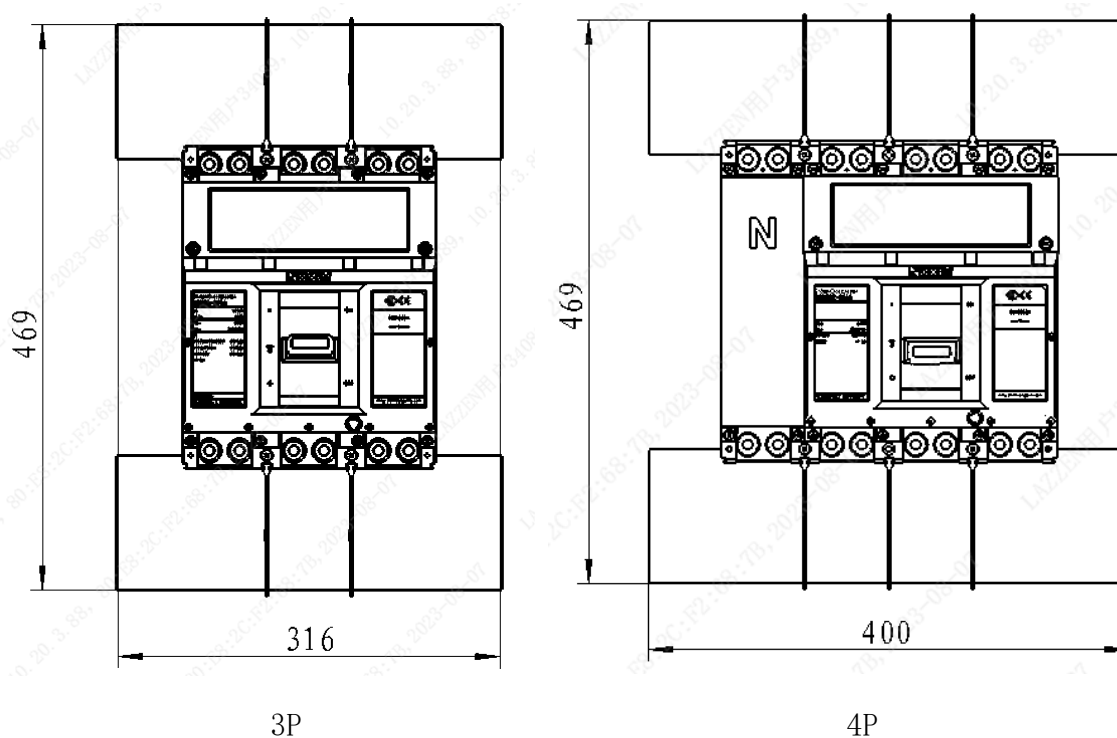


Table 8 outline dimension of products (unit: mm)

Model type	A	B	C
NDM5Z-1600	354	86	120

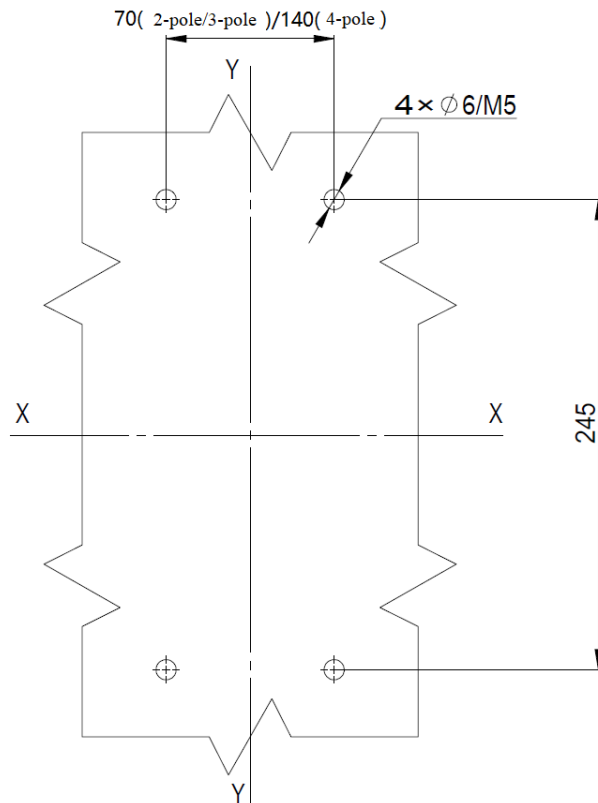
Note: unlabeled tolerance level should follow GB/T 1804-c.

7.5 Outline dimensions of products with accessory ground partition



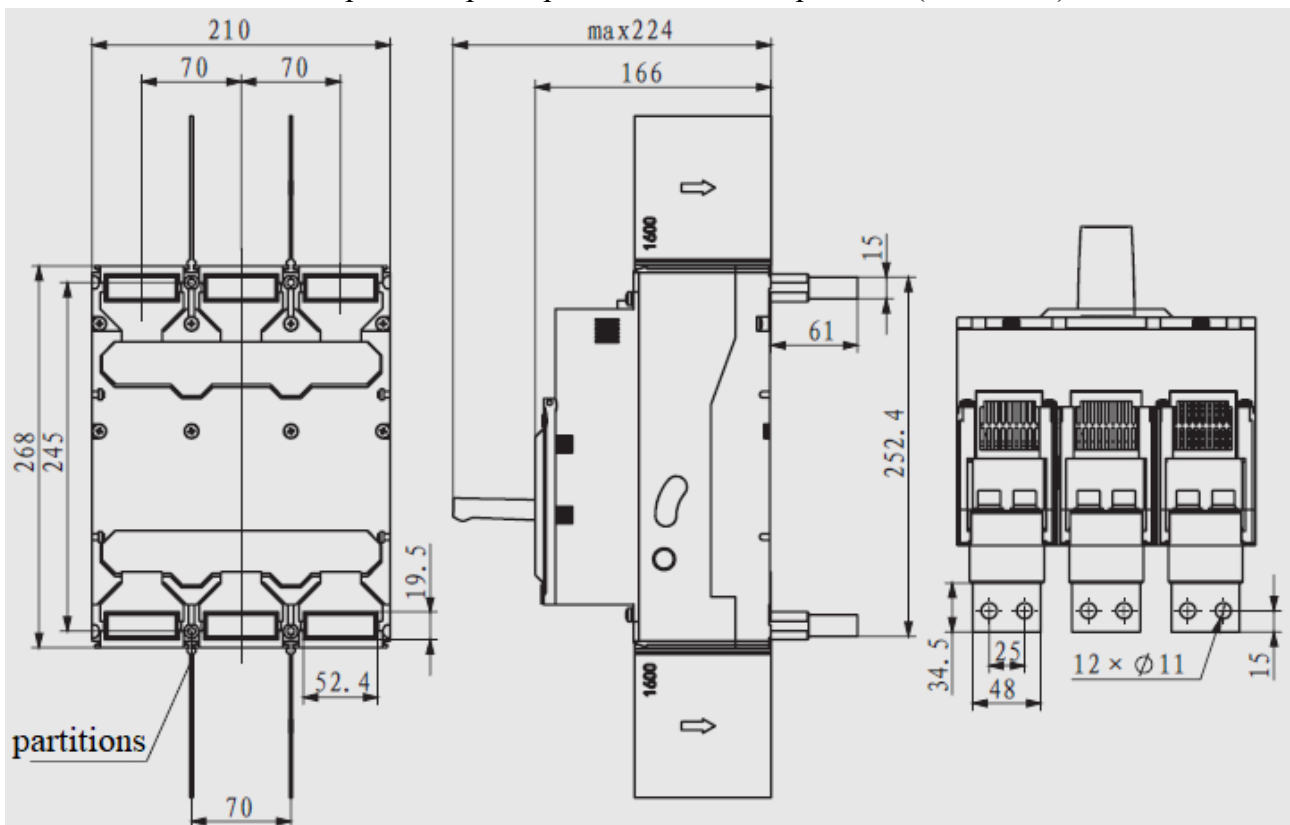
Note: unlabeled tolerance level should follow GB/T 1804-c.

7.6 Installation dimension of 2-pole, 3-pole and 4-pole products (unit: mm)



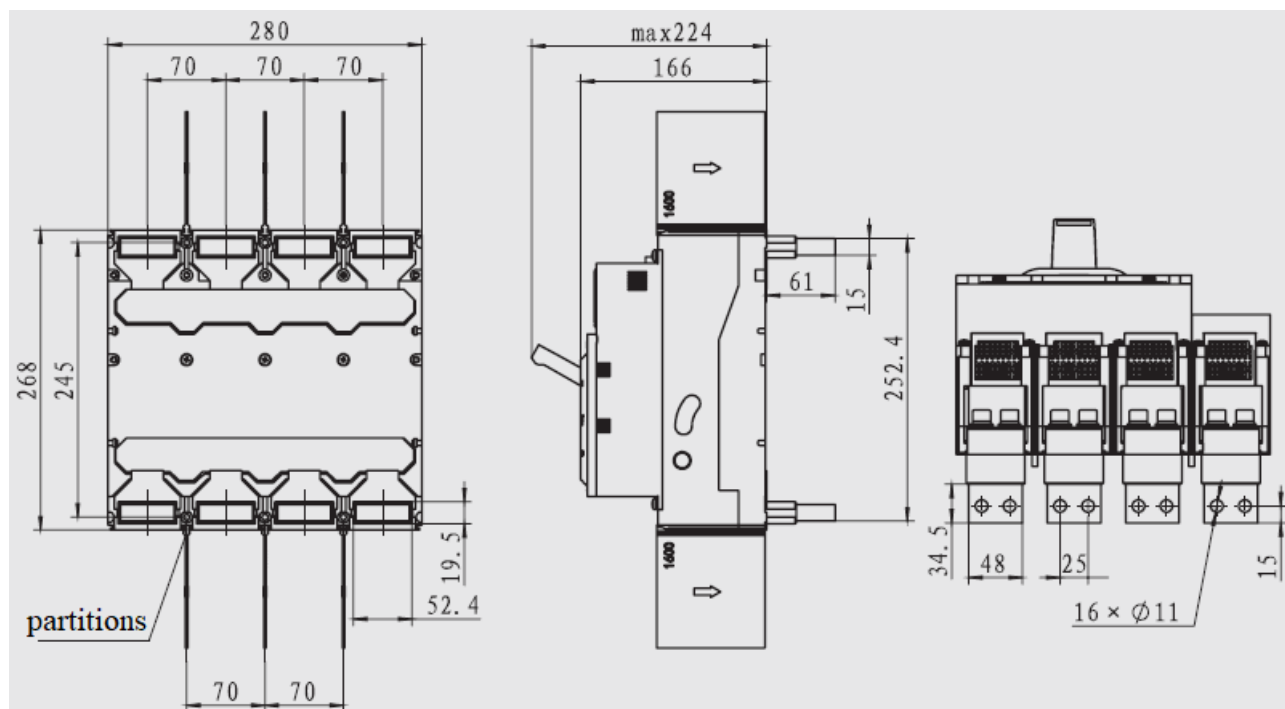
Note: unlabeled tolerance level should follow GB/T 1804-c.

7.7 Outline dimension of 3-pole rare panel parallel connection products (unit: mm)



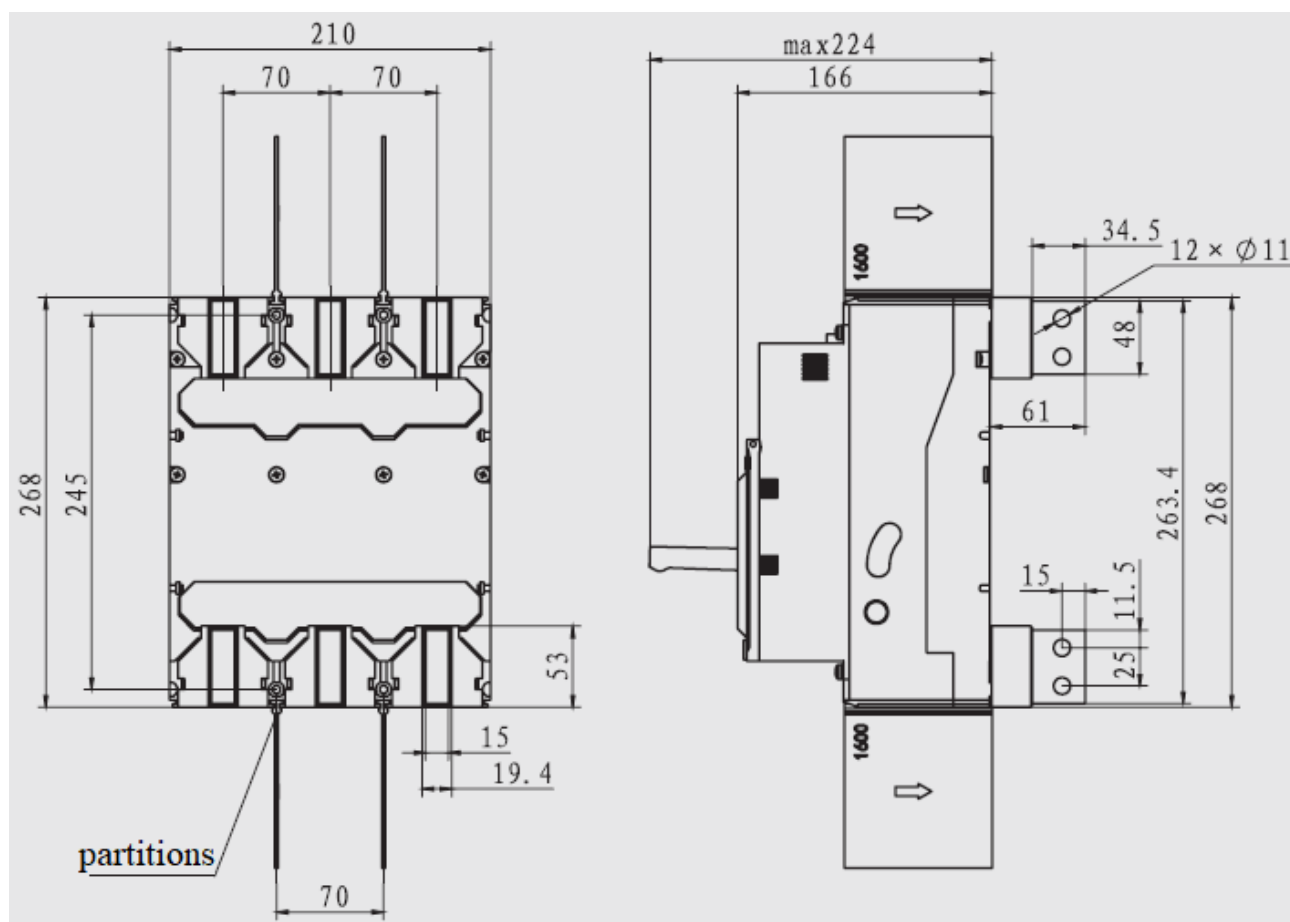
Note: unlabeled tolerance level should follow GB/T 1804-c.

7.8 Outline dimension of 4-pole rare panel parallel connection products (unit: mm)



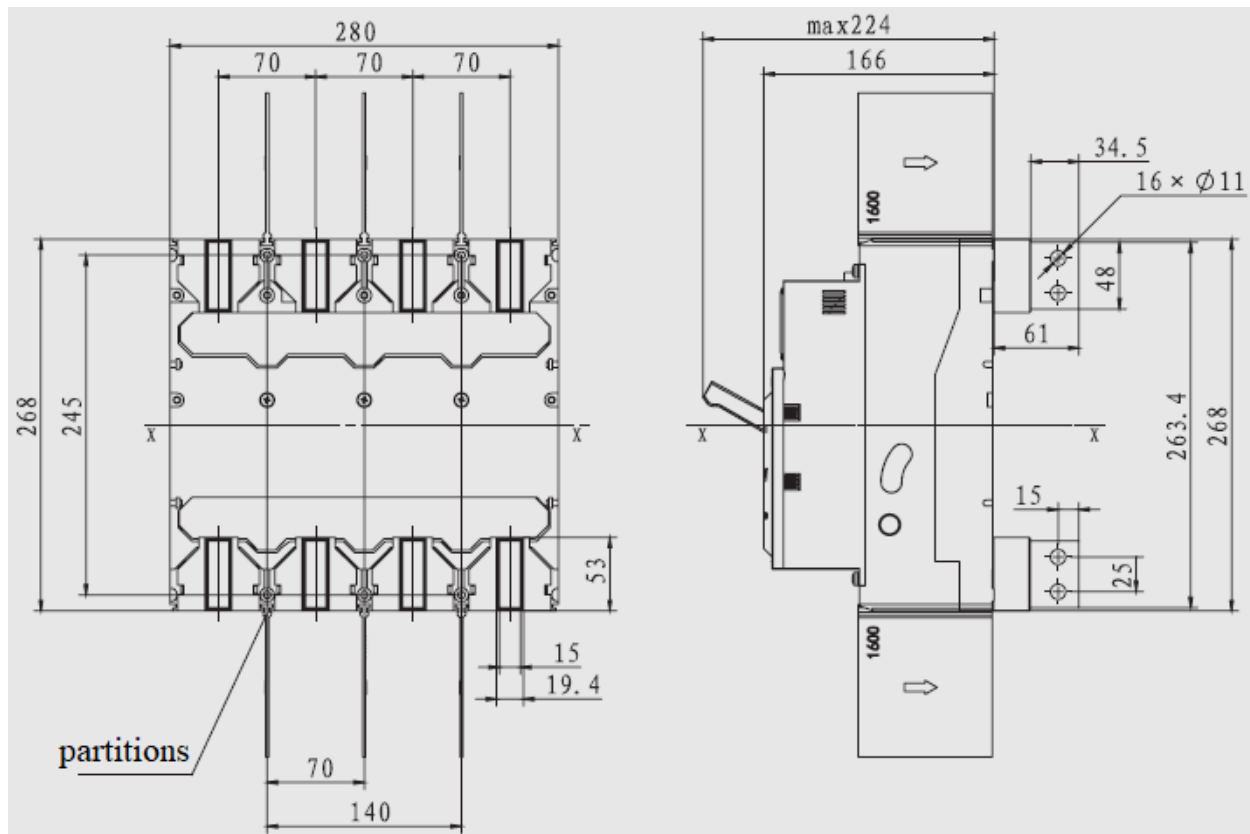
Note: unlabeled tolerance level should follow GB/T 1804-c.

7.9 Outline dimension of 3-pole rare panel vertical connection products (unit: mm)



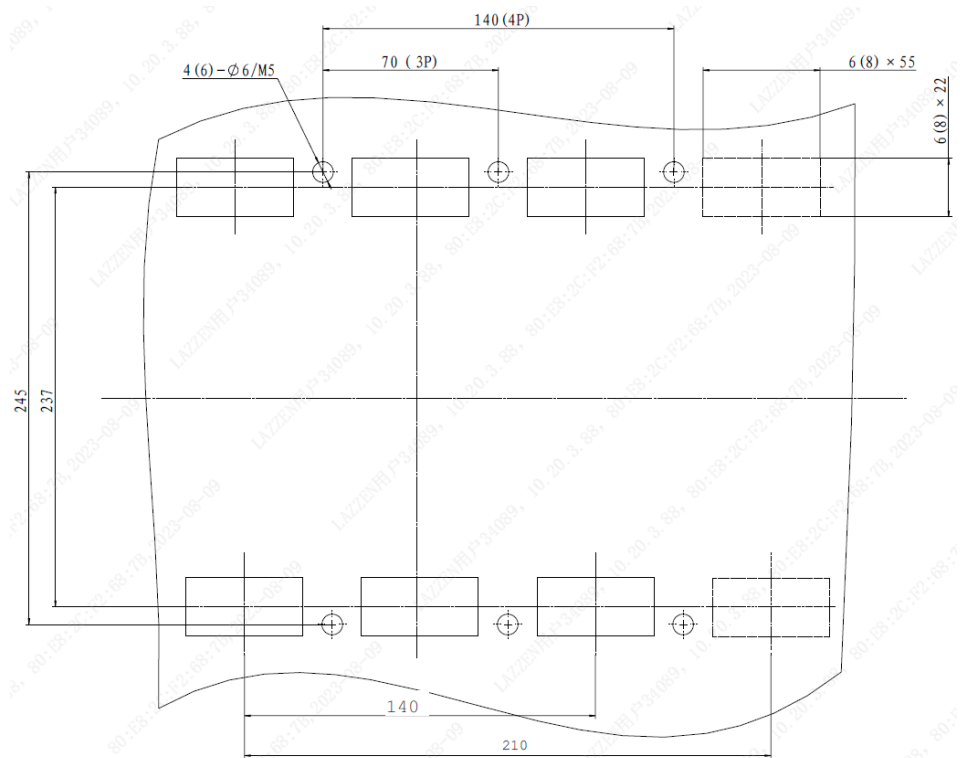
Note: unlabeled tolerance level should follow GB/T 1804-c.

7.10 Outline dimension of 4-pole rare panel vertical connection products (unit: mm)



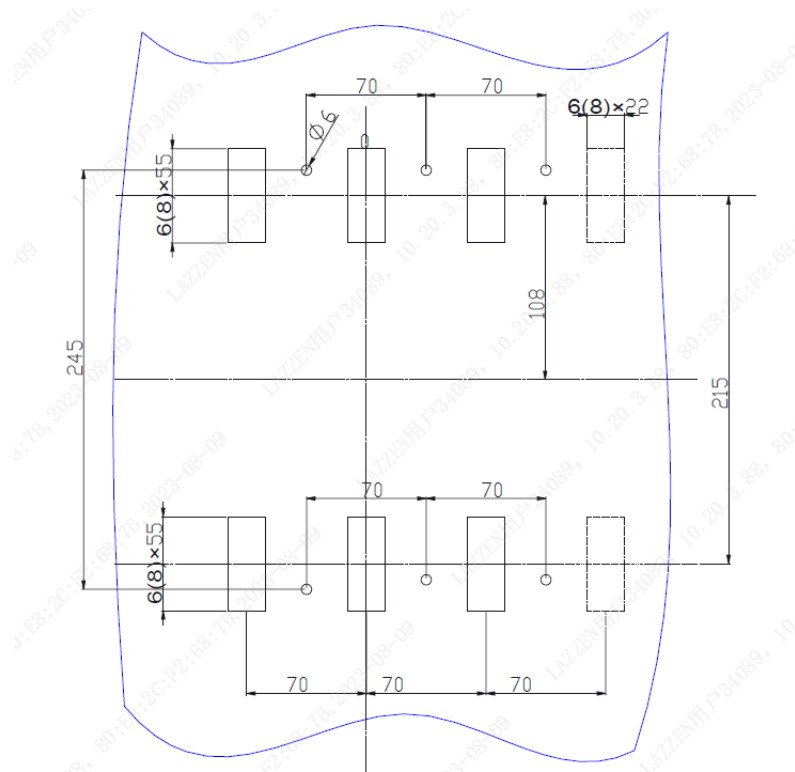
Note: unlabeled tolerance level should follow GB/T 1804-c.

7.11 Opening dimension of rare panel parallel connection products (unit: mm)



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

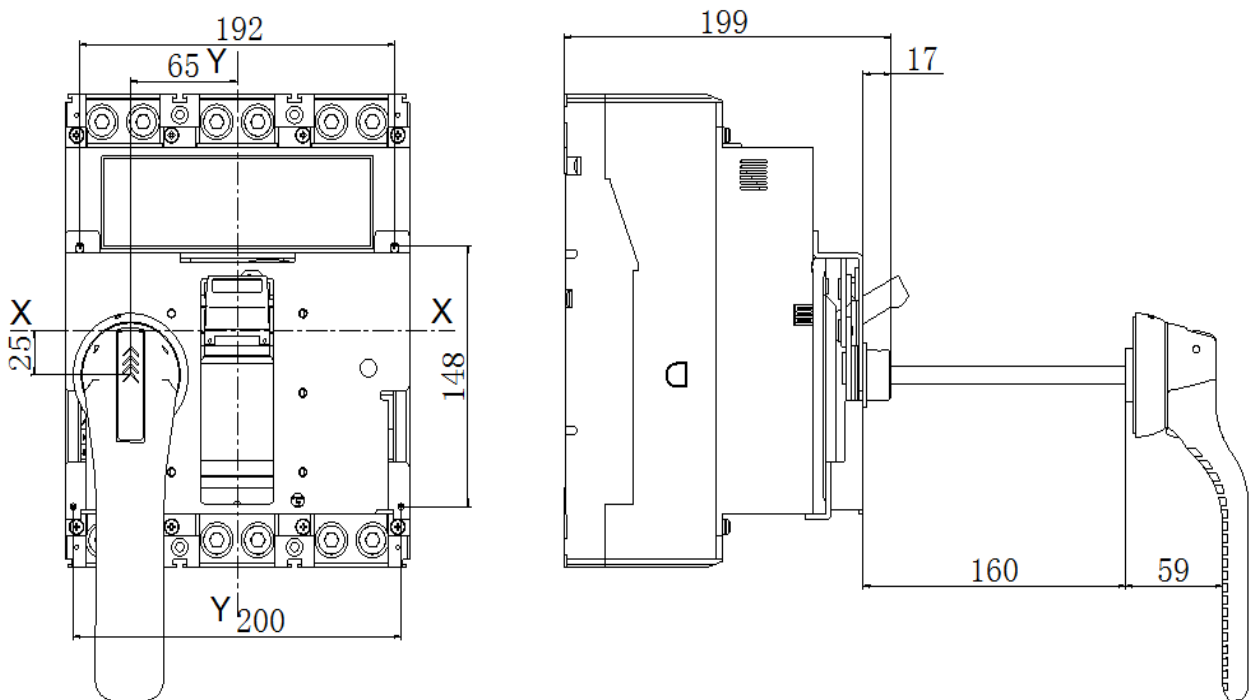
7.12 Opening dimension of rare panel vertical connection products (unit: mm)



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

7.13 Manual operation mechanism rotary handle

Installation holes of manual operation - rotary handle and outline dimensions of manual operation mechanism are shown as below. (unit: mm)



Outline dimensions of manual operation mechanism

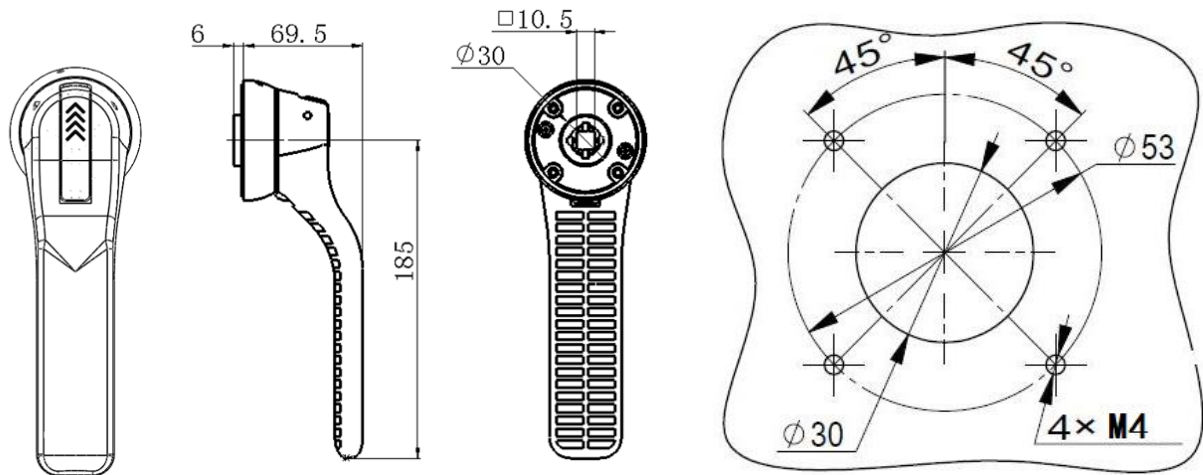
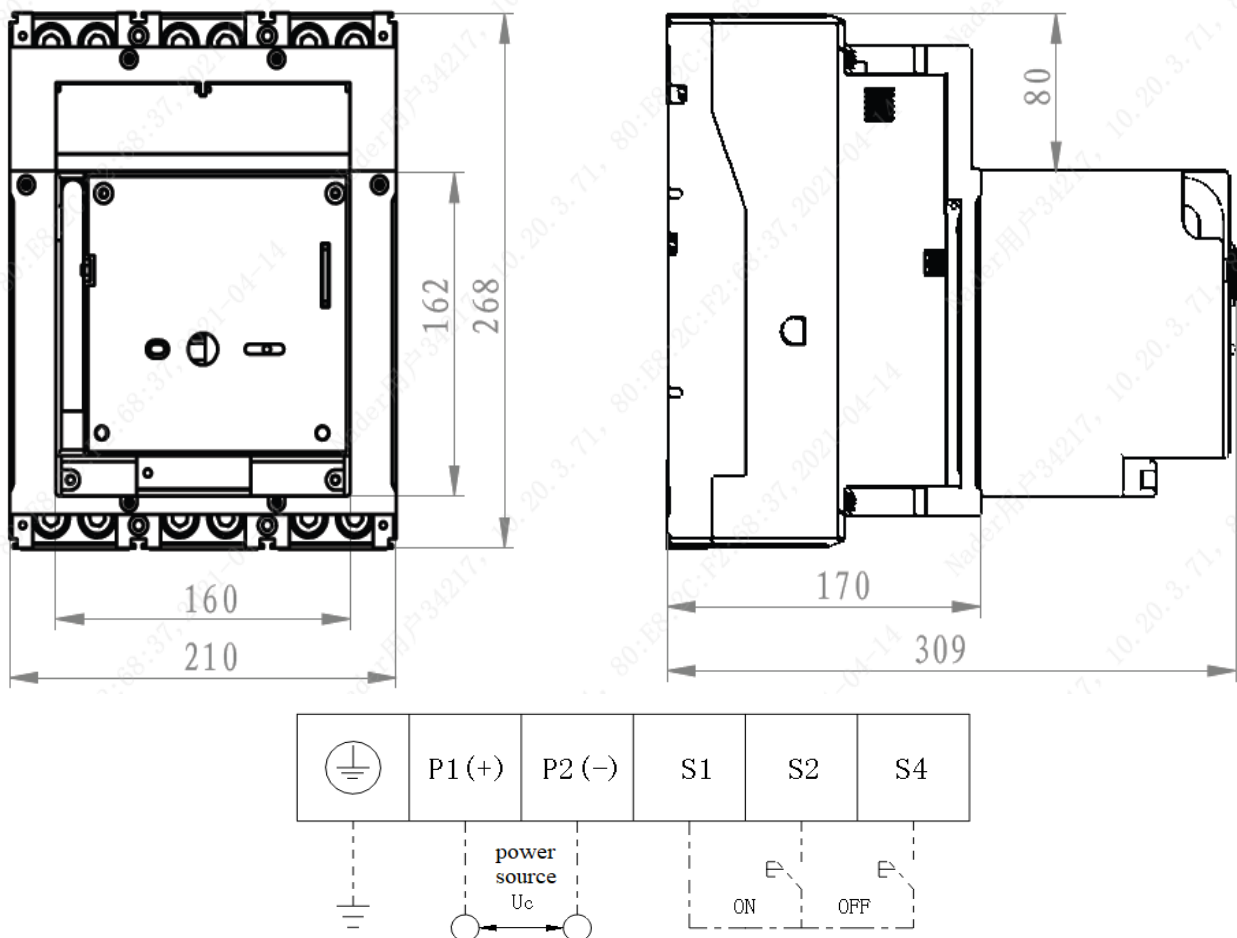


Illustration of installation holes dimensions

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

7.14 Motor operation mechanisms

Outline dimension of motor operation mechanisms-circuit breaker and its operation mechanism after installation (unit: mm)



motor operation wiring diagram

Note 1 when manual operating, the mechanism should go clockwise 180° . Must not do it counter clockwise.

2. When wiring P1 and P2 is PROHIBITED to connect with anyone among S1 S2 S4.

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

Table 9 voltage specification and power of motor operation

Accessory name	motor operation mechanism			
voltage specification	DC24V	AC110V/DC110V	AC230V/DC220V	AC400V
power (W)	240W	400W	400W	400W

7.15 Thickness of conenction bars and length of screw length

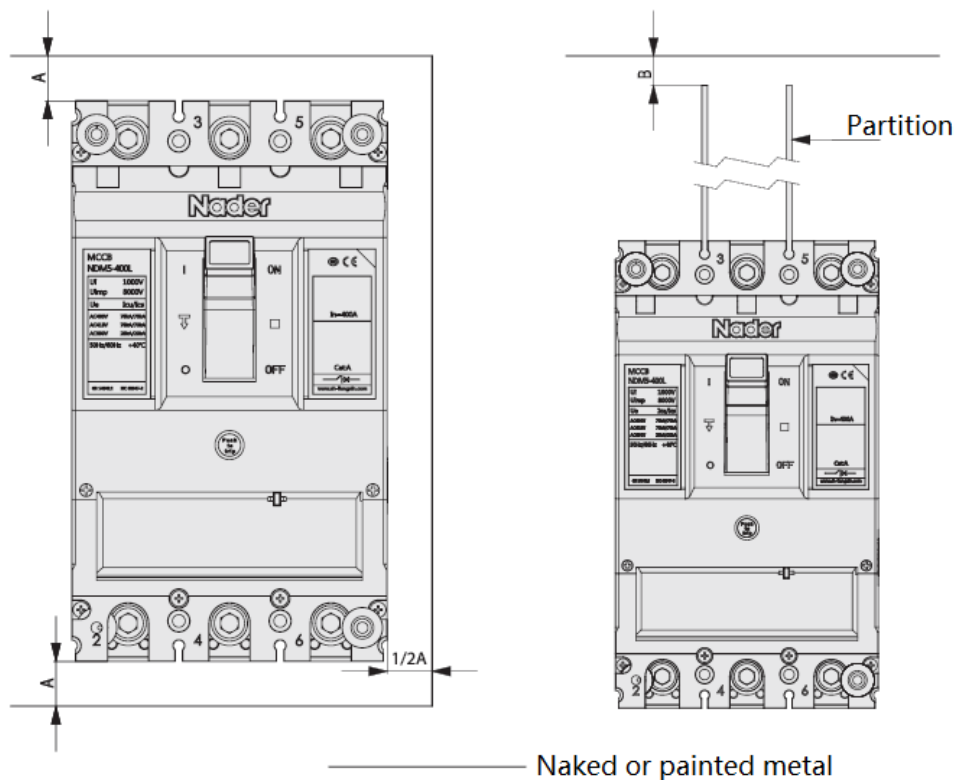
Table 10 thickness of conenction bars and length of screw length

SN	thickness of conenction bars (mm)	Length of hex socket head screws (mm)
1	6、8	M10X30
2	10、12	M10X35
3	15	M10X40
4	20	M10X45

Note: length of the hex socket head screws need to be demonstrated in order

7.16 Safety spacing

When circuit breaker installation, see table 11 for minimum spacing of upper, bottom flank and front plate.



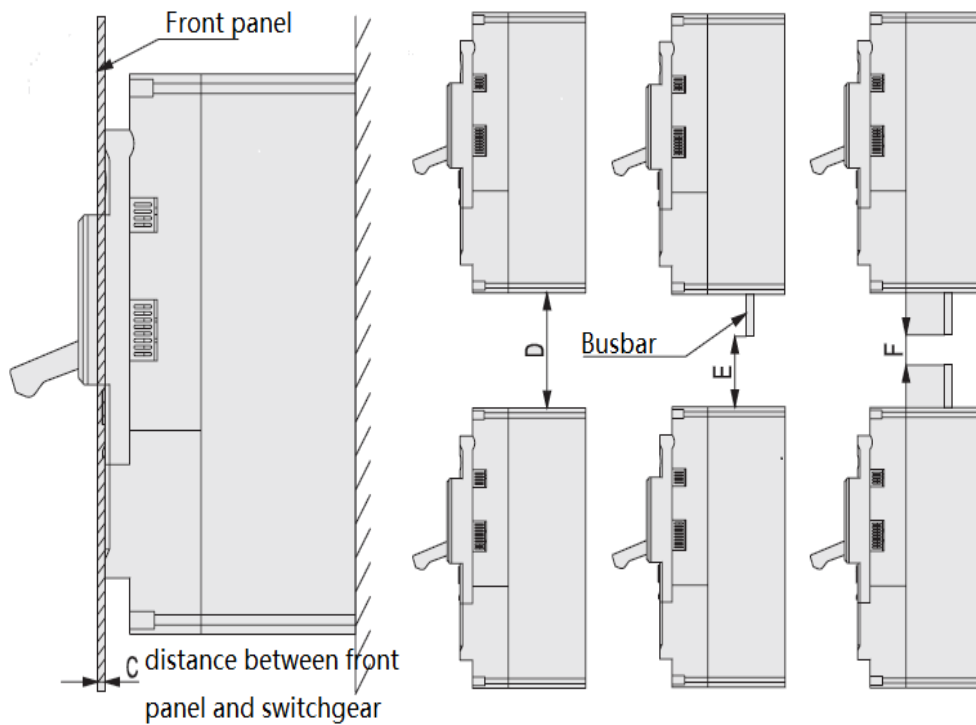
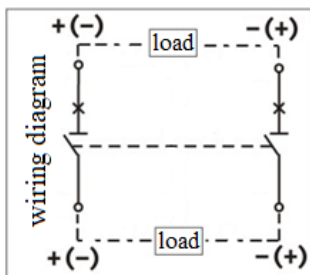


Table 11 minimum safety clearance at installation (unit: mm)

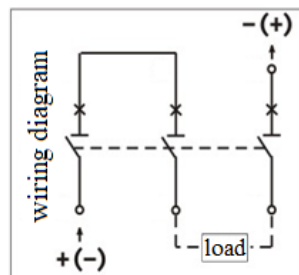
Model type	Distance A	Distance B	Distance C	Distance D	Distance E	Distance F
NDM5Z-1600	≥ 100	≥ 0	≥ 0	≥ 180	≥ 100	≥ 40

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

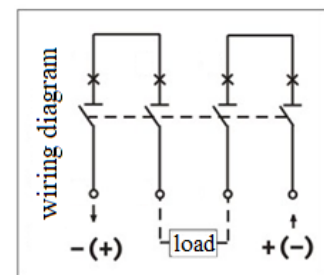
7.17 Main circuit wiring options for DC products



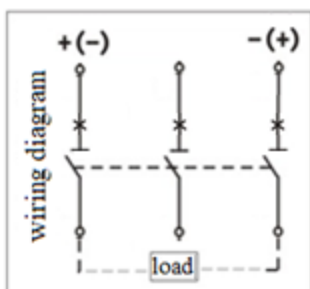
2P



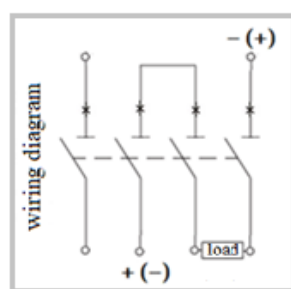
3P



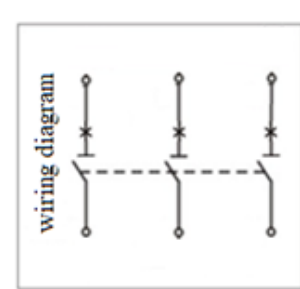
4P (J1)



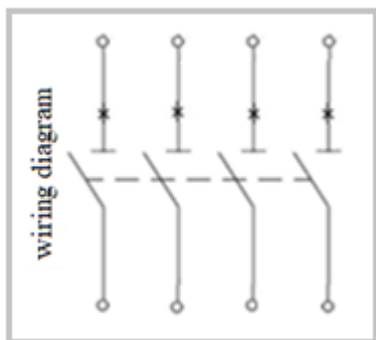
2P+N



3P+N



3P (J0)



4P (J0)

8、Illustration of accessory function

8.1 Under- voltage release

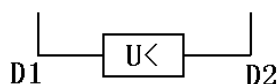
When the voltage is between the range of 35%~70% of the under-voltage release, it can trip the circuit breaker reliably.

When the voltage is lower than 35% of the under-voltage release, it can prevent the circuit breaker from being close.

When the voltage is higher than 85% of the under-voltage release, it can guarantee circuit breaker make or break reliably.

Table 12 voltage specification and power dissipations of under-voltage release

Accessory name	Under-voltage release		
voltage specification (V)	AC/DC110	AC/DC230	AC400
Holding dissipation (W)	7	8	10
Instant dissipation (W)	230	500	270
Code	Q11	Q22	Q40



Wiring diagram of undervoltage release

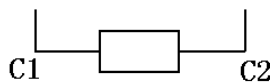
8. 2 Shunt release

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

Table 13 voltage specification and power dissipation of shunt release

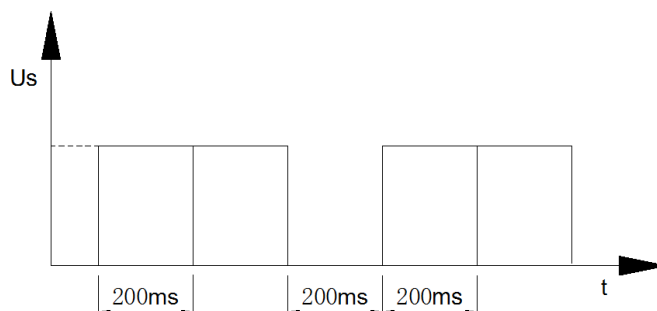
Accessory name	Shunt release		
voltage specification (V)	DC24	AC/DC110	AC/DC230
Holding dissipation (W)	3.5	3.5	3.5
Instant dissipation (W)	240	230	300

Code	FT02	FT11	FT22
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Wiring diagram of shunt release

Note: Working principle of the shunt releases: a single pulse action (energizing time is recommended no less than 200ms). If another action is needed, the shunt releases need to power off (interval time is recommended no less than 200ms), and then energized to act. There is a 100 ms delay between shunt releases energized (signal received) and products tripped.



Working principle diagram of shunt release

8.3 Rated parameters of the auxiliary contact

Table 14 Rated parameters of the auxiliary contacts

Accessory name		Auxiliary contact (conventional)	Auxiliary 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 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 four groups of auxiliary harness are installed.

8.4 Rated parameters of the alarm contact

Table 15 Rated parameters of the alarm contacts

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		$< 30\text{m}\Omega$	$< 50\text{m}\Omega$

Note 1): If need DC30V/0.1A Auxiliary contact, please explain when ordering.

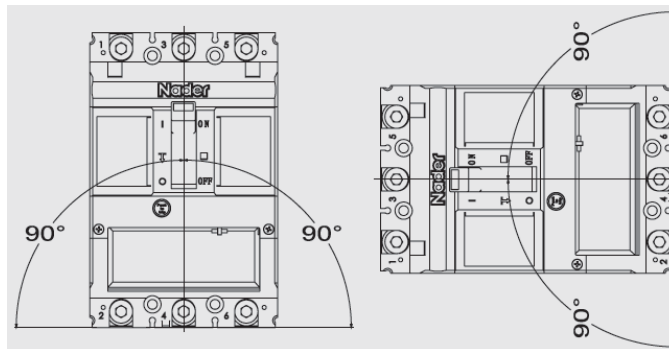
2) The first alarm harness is identified as B11 (red), B12 (white), B14 (yellow), and the second auxiliary harness is identified as B21 (red), B22 (white), B24 (yellow), and so on. At most two groups of alarms are installed.

Unless customized the default length of connection wires is 0.7 meters on under-voltage release, shunt release, auxiliary contact and alarm contact.

9、Installation direction

For vertically installed product (upright), inclination of installation plane and perpendicular plane should no more than $\leq \pm 5^\circ$.

Horizontally installed product (level)



Vertical installation (upright) Horizontal installation (level)

10、Packaging and Storage

Minimum packaging quantity: 1 piece/box. The packaged products should be stored in a warehouse with the ambient temperature of $-40^\circ\text{C}\sim 75^\circ\text{C}$ and 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 36 months since the manufacturing date.

11、Environment conformances

RoHS compliant

12、MCCB and accessory list

SN	Name	Specification	Quantity for 2P	Quantity for 3P	Quantity for 4P
1	Cross recessed small pan head screw	M5×100	4	4	4
2	Hexagon nut	M5	4	4	4
3	Spring washer	5	4	4	4
4	Plain washer	5	8	8	8
5	Phase partition	——	4	4	4
6	Ground partition	——	2	2	2
7	Connect bar	——	0	1	2
8	Hexagon socket cylindrical head combination	See table 10*	8	12	16
9	MCCB	NDM5Z-1600	1	1	1

Note: See table 10 thickness of connection bars and length of screw length

13、Precautions

- 1) The performance parameters of this specification are set by the manufacturer. Only trained or certified professional personnel can adjust, install or maintain the switch disconnectors, release units and other accessories according to the wiring design parameter.
- 2) Ensure that the power supply is off before installing or removing any device.
- 3) The handle of the switch disconnector can be at one of the three positions, which indicate the situation of ON OFF and TRIPPED respectively. When at the TRIPPED position, to close the switchgear, handle should be drawn toward OFF position to re-latch the switchgear and then close it.