Shanghai Liangxin Electrical Co., Ltd.

Product Specification

（IPD-ENG-DEV-T22 A1 2016-09-23）

Product Name: Moulded Case Circuit Breaker (MCCB)

Product type: NDM5Z-160

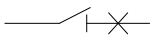
Date: 2022/12/15

Prepared		Date	
Reviewed		Date	
Approved		Date	

Revision information					
Version	Revised contents and reasons	Date	Prepared	Reviewed	Approved
0	Newly added	2022.12.12	Yang rongrong	Xu Juncheng	Jiang Wushan

1 Applicable scope and purpose

The NDM5Z-160 series of moulded case circuit breakers (referred to as circuit breakers) have a rated insulation voltage of 1200V and apply to circuits with the rated working voltage of DC500V (2P in series), DC750V (3P in series), DC1000V (4P in series) and DC1200V (4P in series) as well as the rated working current (16A to 160A). 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.

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

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.

2 Picture of the product (The pictures are for reference only, and the details shall be subject to the real object)

Fig 1：4P Product

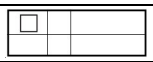
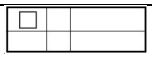
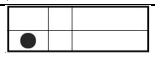
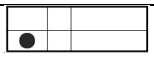
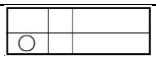
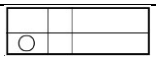
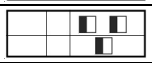
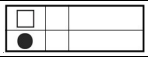
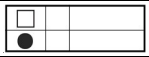
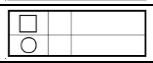
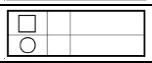
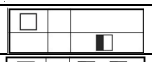
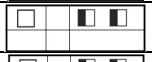
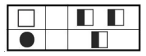
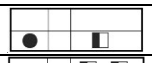
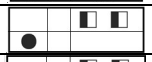
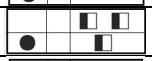
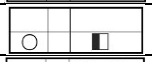
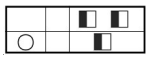
3 Specification and model description

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

S.N.	Serial number name	NDM5Z
1	Company code	ND：“Nader” low voltage electrical apparatus
2	Product code	M：Molded case circuit breaker (MCCB)
3	Design serial	5
4	Derived code of	Z：Special code for the DC circuit breaker
5	Shell frame grade Inm(A)	160
6	Breaking ability level	L：Standard
		M：Relatively high score broken type
		H：High score broken type
7	Rated current In(A)	See Table 2
8	Number of poles	2：2 poles；
		3：3 poles；
		4：4 poles；
9	Release code	TMDC：DC thermo-magnetic distribution release;
10	Installation code+ Wiring method	Null：Stationary connector + front panel wiring
		ES：Stationary connector+ front extension wiring board
		R0：Stationary connector + screw connector +on after terminal
		Fcu：Stationary connector +front bare copper cable wiring
		G：Guide rail type+ front panel wiring(2Pexcept)
		GES：Guide rail type+ front extension wiring board (2Pexcept)
		GFcu：Guide rail type+ front bare copper cable wiring (2Pexcept)
		P0FH：plug-in without secondary connector +horizontal wiring in front of board
		P0RH：plug-in without secondary connector + horizontal wiring behind the board
		P0RV：plug-in without secondary connector +rear vertical wiring
		P1FH：plug-in with secondary connector + horizontal wiring in front of board
		P1RH：plug-in with secondary connector + horizontal wiring behind the board
		P1RV：plug-in with secondary connector + rear vertical wiring
11	Operation mode	Null: directly handle operation
		Z1A150:rotary handle with round center hole and square axis

		length 150
		Z1A200:rotary handle with round center hole and square axis length 200
		Z1A300:rotary handle with round center hole and square axis length 300
		Z1A350:rotary handle with round center hole and square axis length 350
		Z1A650:rotary handle with round center hole and square axis length 650
		Z1F150:rotary handle with round square hole and square axis length 150
		Z1F200:rotary handle with round square hole and square axis length 200
		Z1F300:rotary handle with round square hole and square axis length 300
		Z1F350:rotary handle with round square hole and square axis length 350
		Z1F650:rotary handle with round square hole and square axis length 650
		M02:motor operation DC24V(2P except)
		M11:motor operation AC110V/DC110V(2P except)
		M22:motor operation AC230V/DC220V(2P except)
		M40:motor operation AC400V(2P except)
12	Accessory code	See Table 1
13	Other codes	J:Mechanical interlocking(2P except)
		MS2：MS2 lock(2P except)
		J0: No short connection bar
		J0DJ: With short connection bar

Table 1

Accessory code	Accessory name	Installation position	
		2P	3P, 4P
00	None	—	—
08	Alarm contact		
10	Shunt release		
30	Under-voltage release		
21	Single auxiliary contact	—	
61	Two sets of single auxiliary contacts	—	
23	Three 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	—	
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	—	
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	—	
41	Shunt release, single auxiliary contact	—	
11	Shunt release, two sets of single auxiliary contacts	—	
12	Shunt release, three 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	—	

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

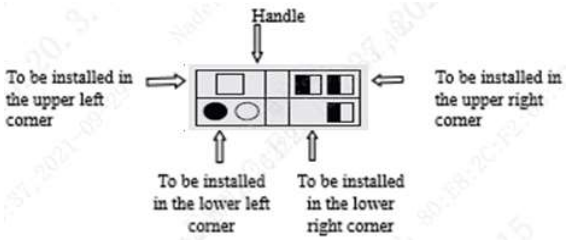
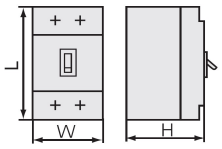


Fig 2：Attachment installation diagram

4、Main Technical Parameters of Circuit Breaker

Table 2 Main Technical Parameters of Circuit Breaker

Model			NDM5Z-160							
Rated current of frame Inm (A)			160							
Rated working voltage Ue (AC V)			500、750、1000、1200							
Rated current In (A)			16、20、25、32、40、50、63、80、100、125、160							
Rated insulation voltage Ui (AC V)			1200							
Power frequency withstand voltage U (1min) (V)			3500							
Rated impulse withstand voltage Uimp (V)			8							
Number of poles			2			3			4	
Breaking capacity level			L	M	H	L	M	H	L	M	H
Rated limit short-circuit breaking capacity Icu (kA)	DC500		50	85	100	/	/	/	/	/	/
	DC750		/	/	/	50	85	100	/	/	/
	DC1000		/	/	/	/	/	/	25	35	50
	DC1200		/	/	/	/	/	/	/	/	25
Rated limit short-circuit breaking capacity Icu (kA)	DC500		50	85	100	/	/	/	/	/	/
	DC750		/	/	/5	50	85	100	/	/	/
	DC1000		/	/	/	/	/	/	25	35	50
	DC1200		/	/	/	/	/	/	/	/	25
Usage category			A							
Operational performance (times)	Electrical life	DC500	5000			/			/		
		DC750	/			5000			/		
		DC1000	/			/			4000		
		DC1200	/			/			3000		
	Mechanical life	Maintenance free	20000			25000			25000		
		Maintenance	40000			50000			50000		

Boundary dimension		L(mm)	135	135	135
		W(mm)	61	90	120
		H(mm)	80	80	80
Flashover distance(mm)			≤50		

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)	16, 20	25	32	40, 50	63	80	100	125	160
Conductor area(mm^2)	2.5	4	6	10	16	25	35	50	70

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)
NDM5Z-160	Wiring screw	M6	12
	Set screw	M4	1.2

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							
NDM5Z-160	Temperature(℃)	40	45	50	55	60	65	70
	Derating factor	1	0.97	0.95	0.925	0.9	0.875	0.85

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)	2000	2500	3000	3500	4000	4500	5000
Working current correction coefficient	1	1	0.98	0.95	0.93	0.91	0.89
Maximum operating voltage（V）	1	1	1	1	1	1	1
Power frequency withstand voltage (V)	1	1	1	1	1	1	1
Average insulation class (V)	1	1	1	1	1	1	1

4.5 Power consumption of circuit breaker

Table 7 Product current specification single phase power consumption able

Model	Current specification	Single phase power consumption (W)		
		Front panel wiring rear panel wiring	Plug in front of plate、rear board wiring	Extended row wiring
NDM5Z-160	160A	10	15	11
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 under normal environment (ambient air temperature: +40℃)。See the figure below：

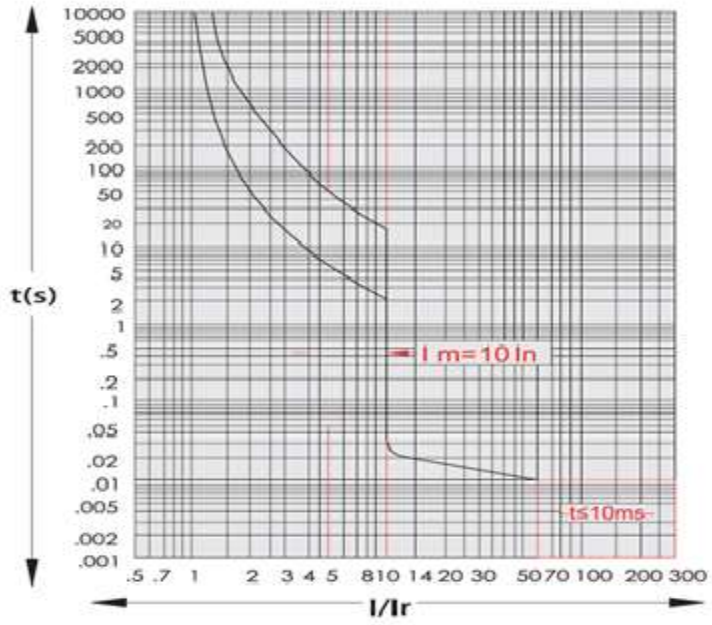


Fig.3 Trip curve

6.2 Current limiting and permissive characteristic curve chart

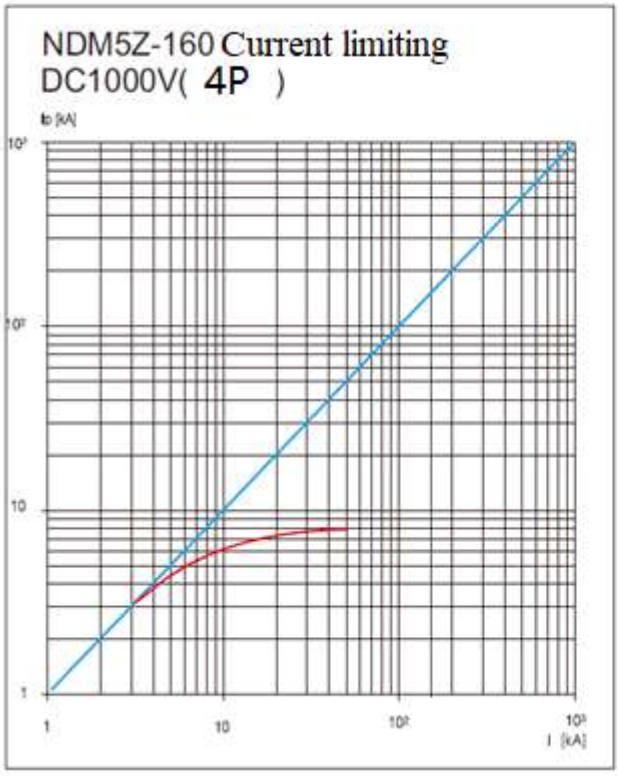


Fig.4 Current limiting characteristic curve chart

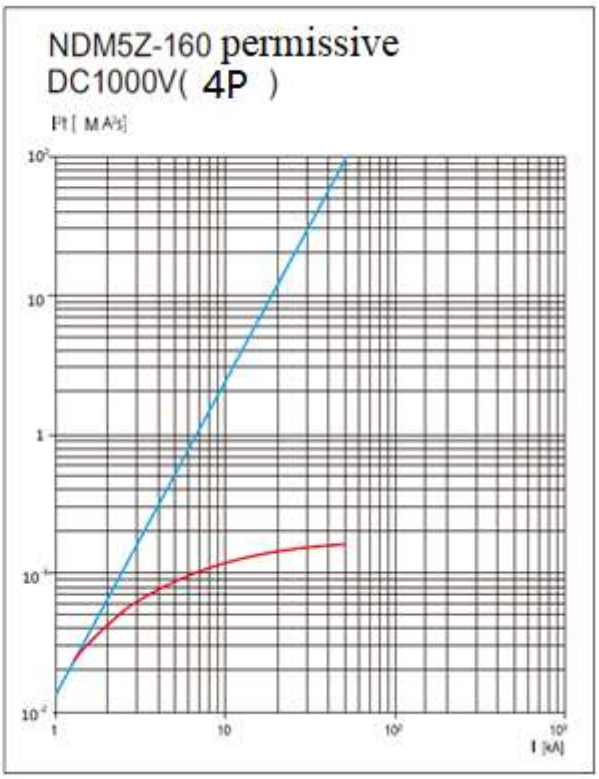


Fig.5 Permissive characteristic curve chart

7、Controller operation description and function introduction

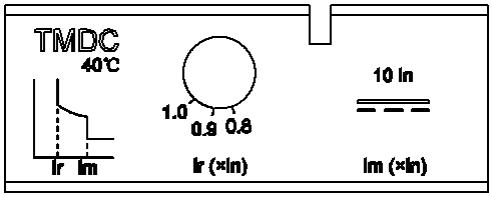


Fig. 6 2P TMDC

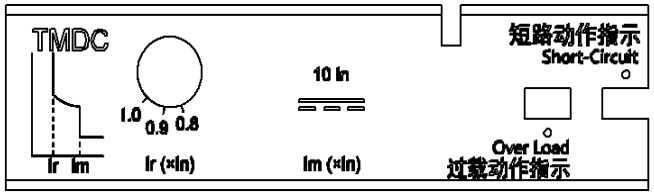


Fig.7 3P、4P TMDC

8、Outline and installation dimensions

8.1 2P、3P、4P Overall dimension and installation dimension of wiring products in front of the board (unit: mm)

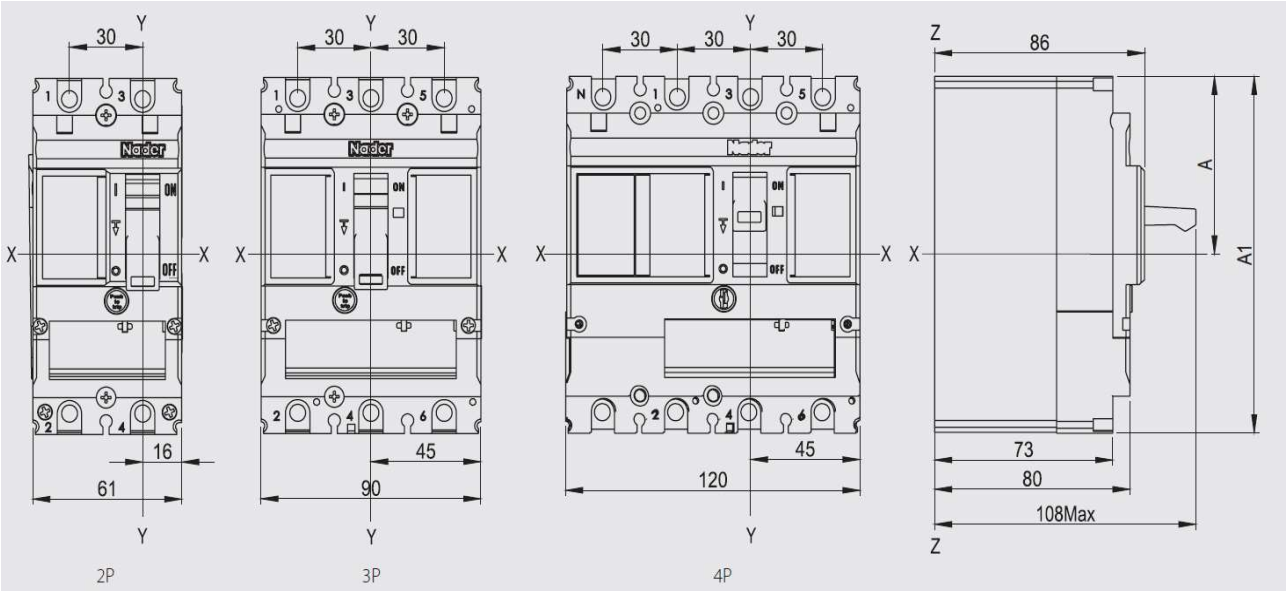


Fig. 8 2P 3P 4P Outline dimension drawing of front board wiring products

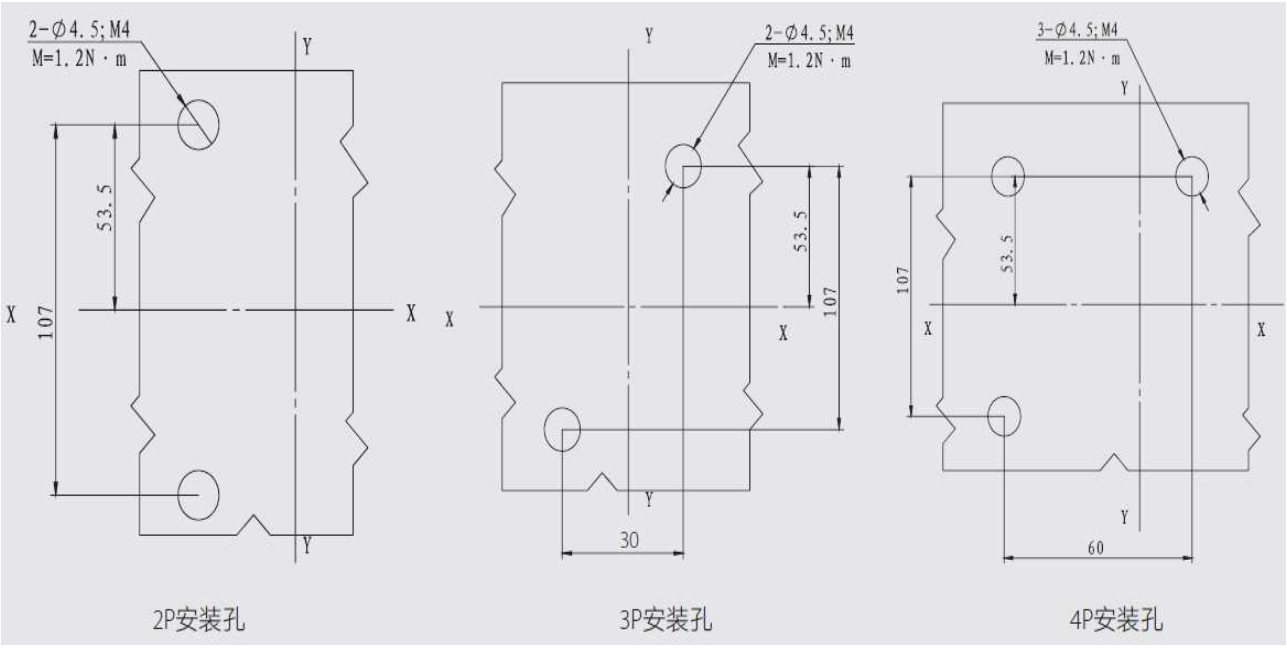


Fig. 9 2P 3P 4P Lnstallation dimension drawing of front board wiring products

Note:1)Dimensions of conducive bar or terminal front-plate connection products: A=67.5mm, A1=135mm;

Dimensions of bare cable front-plate connection products (FCu): A=77.5mm, A1=155mm;

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

8.2 External dimensions of extended front-plate connection products

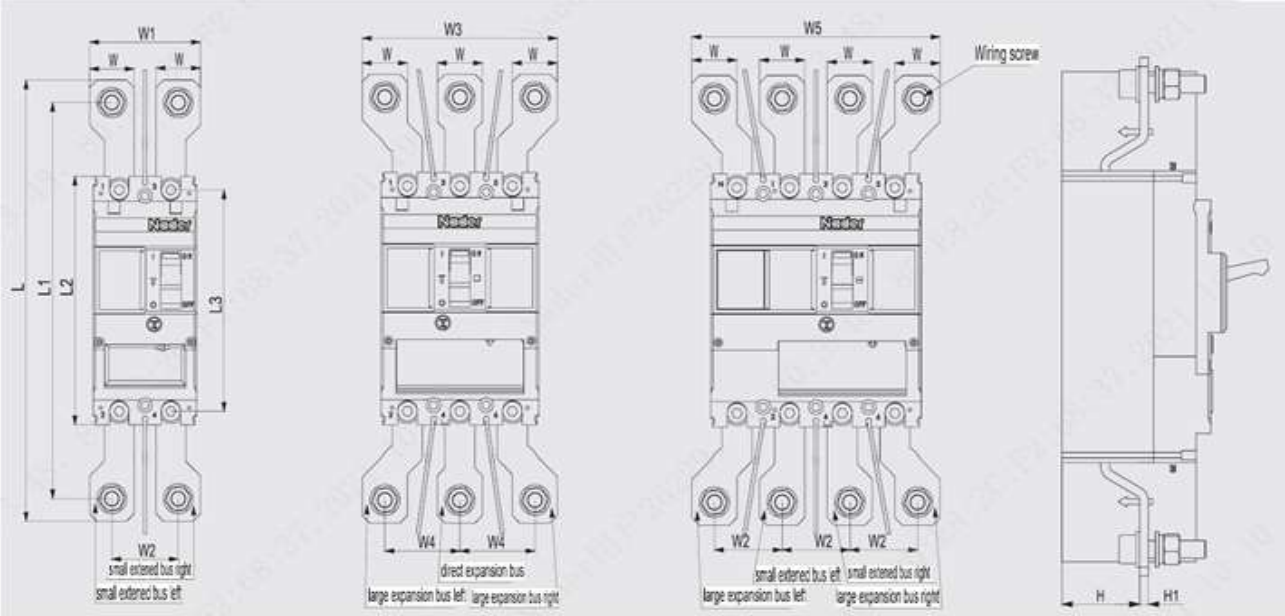


Fig. 10 2P、3P、4P Outline and installation dimensions of expansion wiring in front of the board

Table 8 2P、3P、4P The overall dimensions of the front wiring expansion bar and the circuit breaker after combined installation are shown in the figure below (unit: mm)

Extended bus	Applicable circuit breaker	L	L1	L2	L3	W	W1	Wiring screw(provided by the user)	Pole
KM1/M5-160	NDM5Z-160	244.5	214.5	135	119	30	76		
Extended bus	Applicable circuit breaker	W2	W3	W4	W5	H	H1	M10×40	2、3、4
KM1/M5-160	NDM5Z-160	45	130	52.5	160	25	5		

Note 1：The figure shows the wiring diagram of complete wiring busbar. Users can replace the expansion busbar with short-circuit busbar according to the actual wiring mode requirements.

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

Table 9 Expansion list

Model	Pole	Quantity/Set
NDM5Z-160	2	4
	3	4
	4	4

8.3 Increase the overall dimensions of heat dissipation accessories (optional)

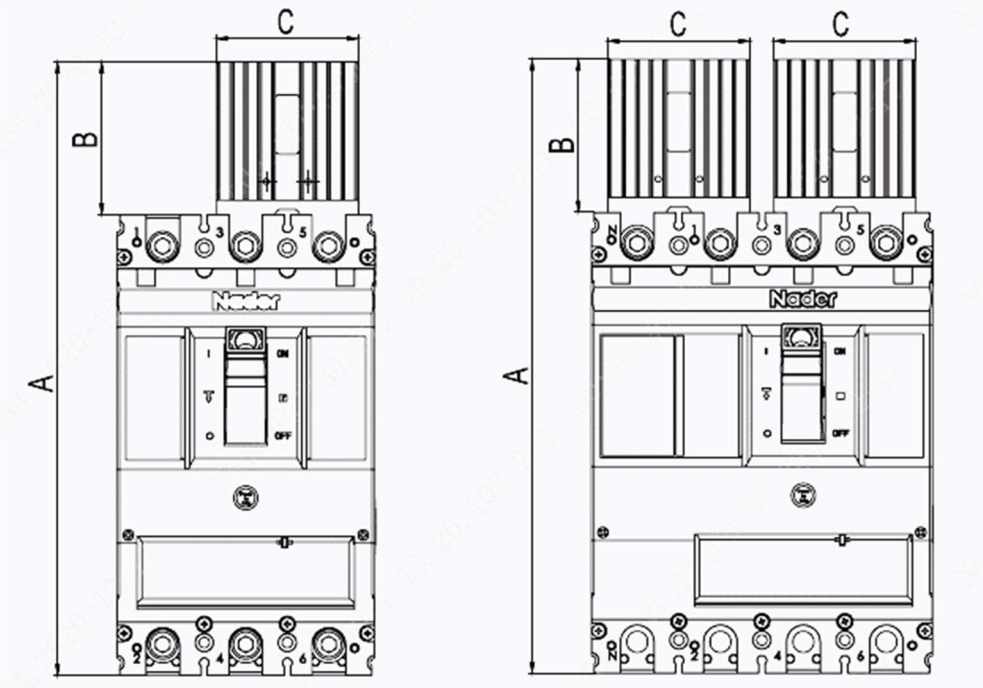


Fig.11 Increase the overall dimensions of heat dissipation accessories board

Table 10 Increase the overall dimensions of heat dissipation accessories (unit: mm)

Model	A	B	C
NDM5Z-160	171.5	36.5	51.2

Note 1：Radiator is optional。

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

8.4 2P、3P、4P、Outline and installation dimension of rear wiring board

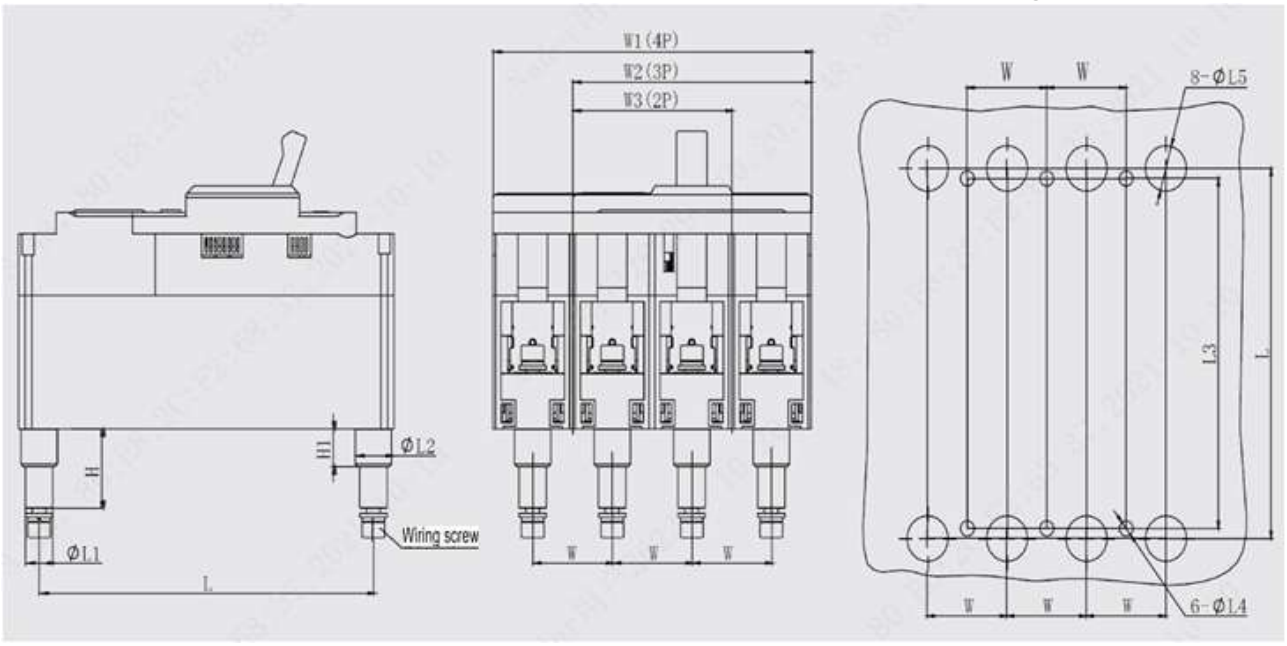


Fig.12 2P、3P、4P outline dimension drawing of rear wiring board

Table 11 2P、3P、4P the installation dimensions of wiring products behind the board are shown in the table below (unit: mm)

Model	L	L1	L2	L3	L4	L5	H	H1	H2	W	W1	W2	W3	Wiring screw
NDM5Z-160	119	10	13.5	107	5	15	33.5	10	25	30	120	90	61	M6×16

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

8.5 3P、4P Outline and installation dimensions of plug-in board front wiring

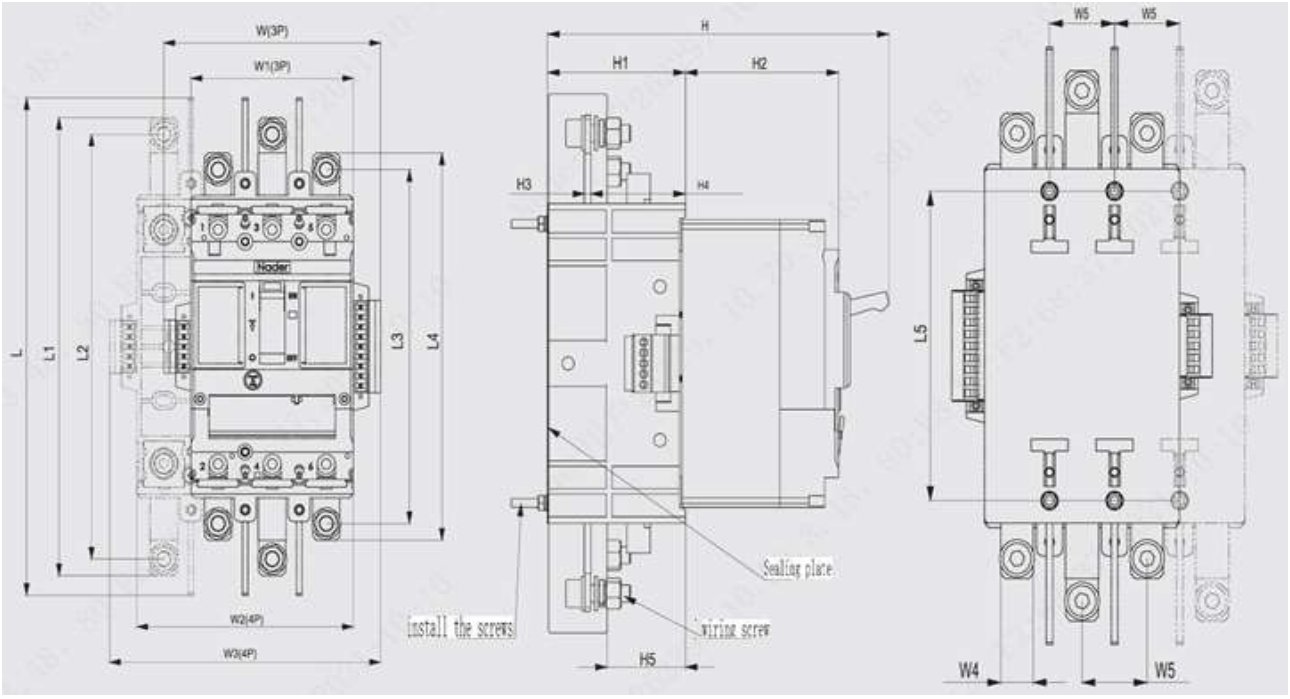


Fig.13 External dimensions of plug-in front-panel connection

Table 12 The overall dimensions of plug-in board front wiring (horizontal) and circuit breaker after installation are shown in the figure below (unit: mm)

Plug in specification	W	W1	W2	W3	W4	W5	L	L1	L2	Wiring screw	Pole
CR1-Q/M5-160	121	90	120	151	15	30	253	233	216	M8x25	3/4P
Plug in specification	L3	L4	L5	H	H1	H2	H3	H4	H5	Install the screws	
CR1-Q/M5-160	180	197	131	175	71	79	3	49	40	M4x75	

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

8.6 3P、4P Mounting hole dimensions of plug-in connections

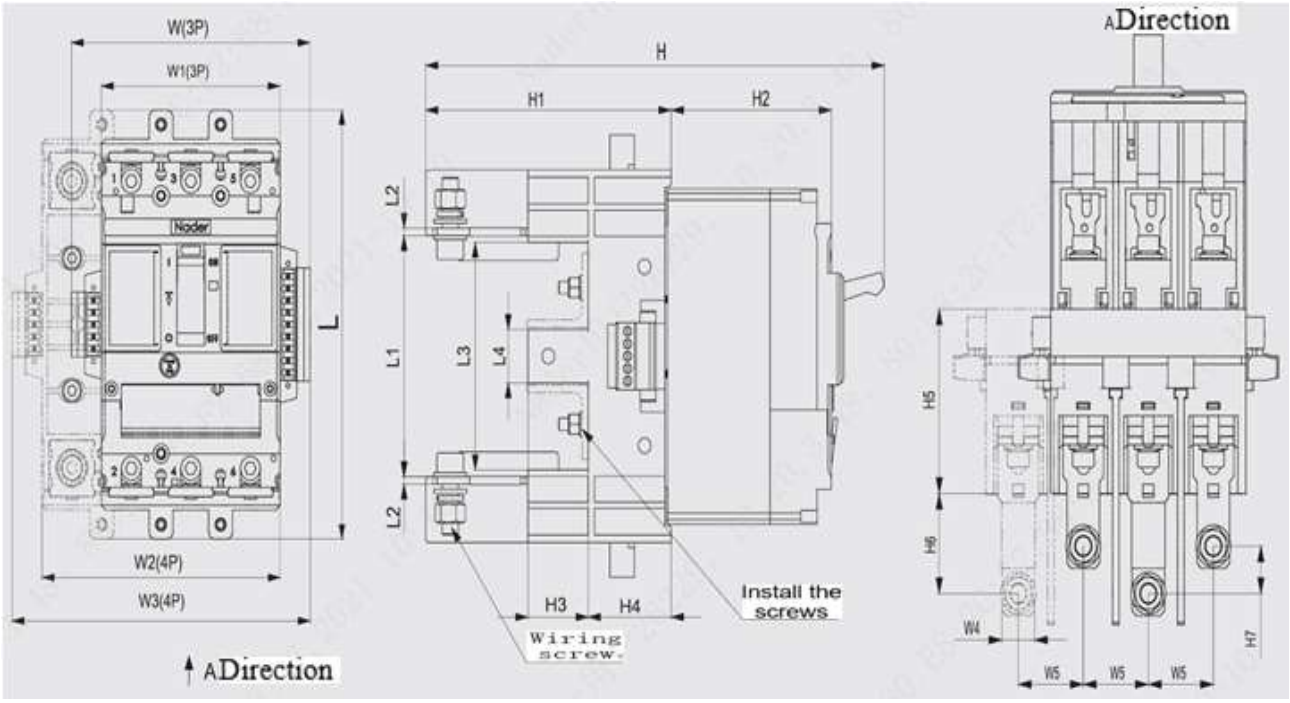


Fig.14 3P、4P Mounting hole dimensions of plug-in connections

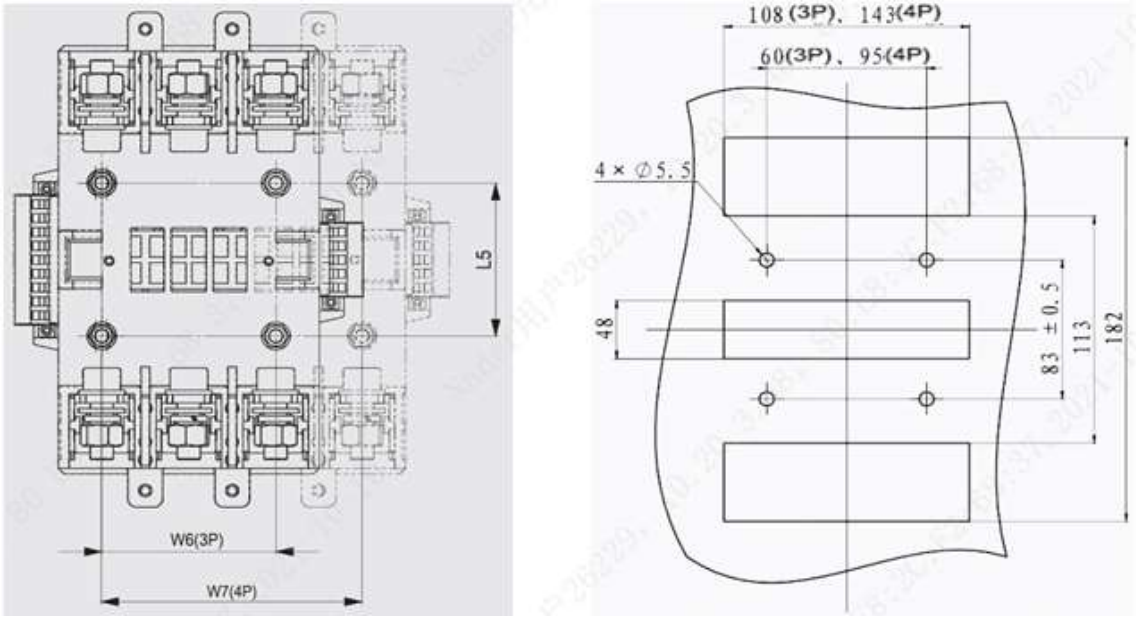


Fig.15 3P、4P Mounting hole dimensions of plug-in connections

Table 13 The overall dimensions of plug-in device (horizontal wiring behind the board)and circuit breaker after installation are shown in the table below (unit: mm)

Plug in board rear wiring	W	W1	W2	W3	W4	W5	W6	W7	L	L1	L2	Wiring screw	Pole
CR1-H/M5-160	121	90	120	151	15	30	60	90	178	97	3	M8x25	3/4P
Plug in board rear wiring	L3	L4	L5	H	H1	H2	H3	H4	H5	H6	H7	Install the screws	
CR1-H/M5-160	91	22	55	225	120	79	29	41	70	38	18	M5x35	

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

8.7 IN-Rail Mounting（TH35mm）

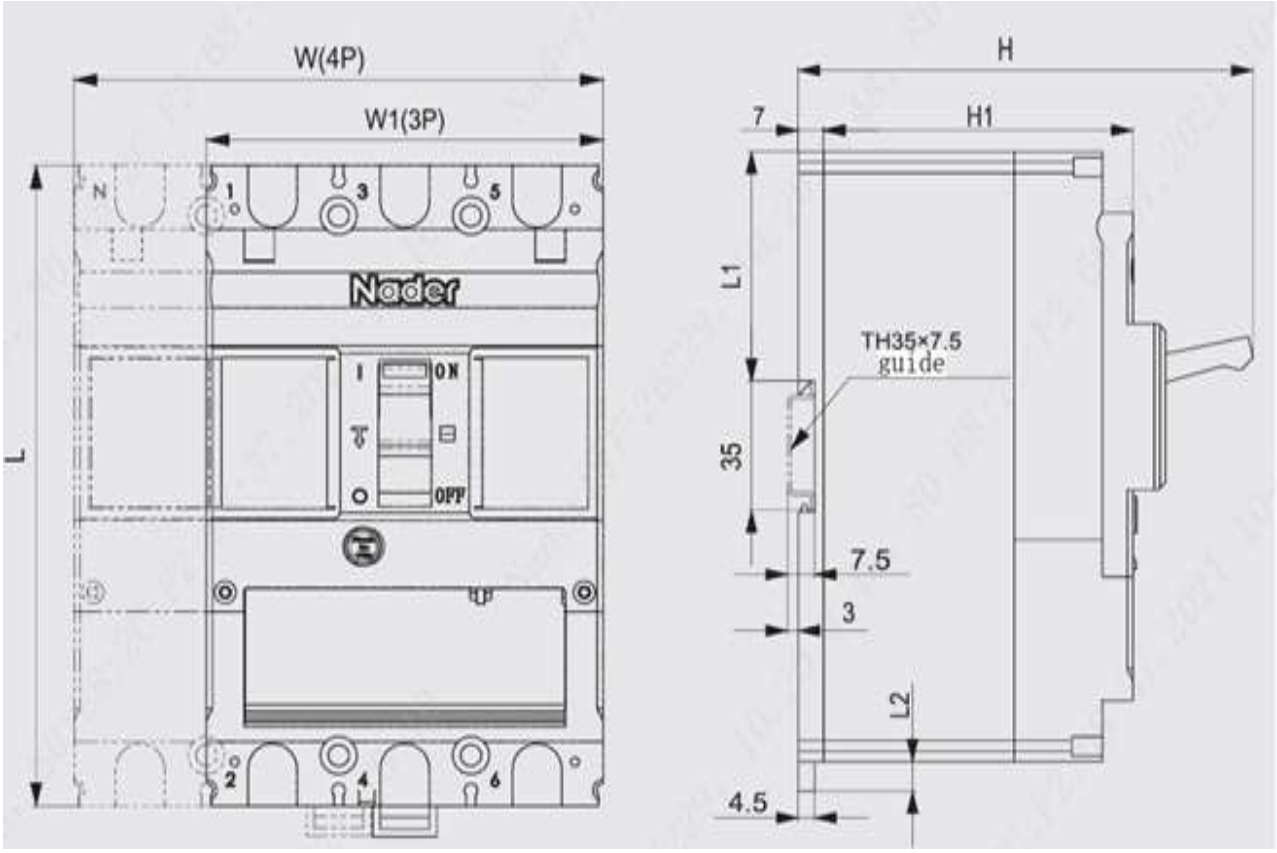


Fig.16 Outline and installation dimensions drawing of guide rail type safety rotation products

Table 14 The installation dimensions of guide rail type safety rotation products are shown in the figure (unit: mm)

IN-Rail Mounting	W	W1	L	L1	L2	H	H1	Pole
DK1/M5-160	120	90	135	50	5.3	106	80	3/4P

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

8.8 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：

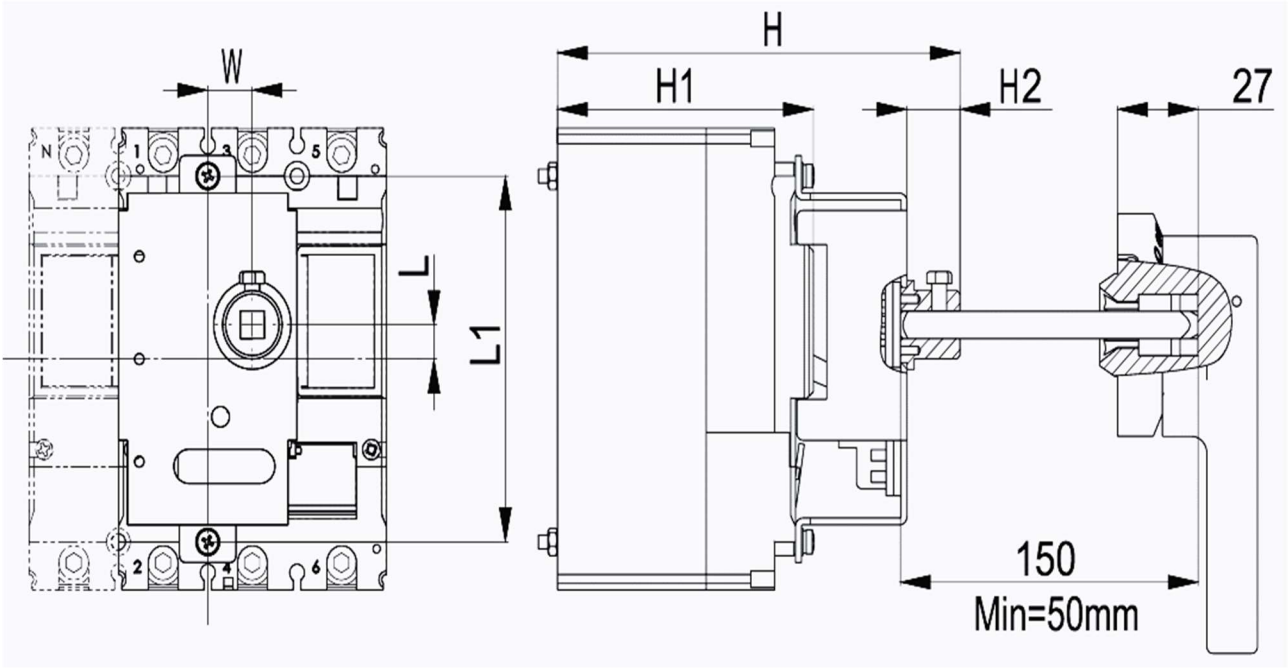


Fig.17 Installation drawing of rotary handle operating mechanism

Table 15 Installation drawing of rotary handle operating mechanism (unit: mm)

Manual operating mechanism	W	L	L1	H	H1	H2	Square shaft specification
SC1-Y/M5-160	15	10	107	136	86	18	8x8

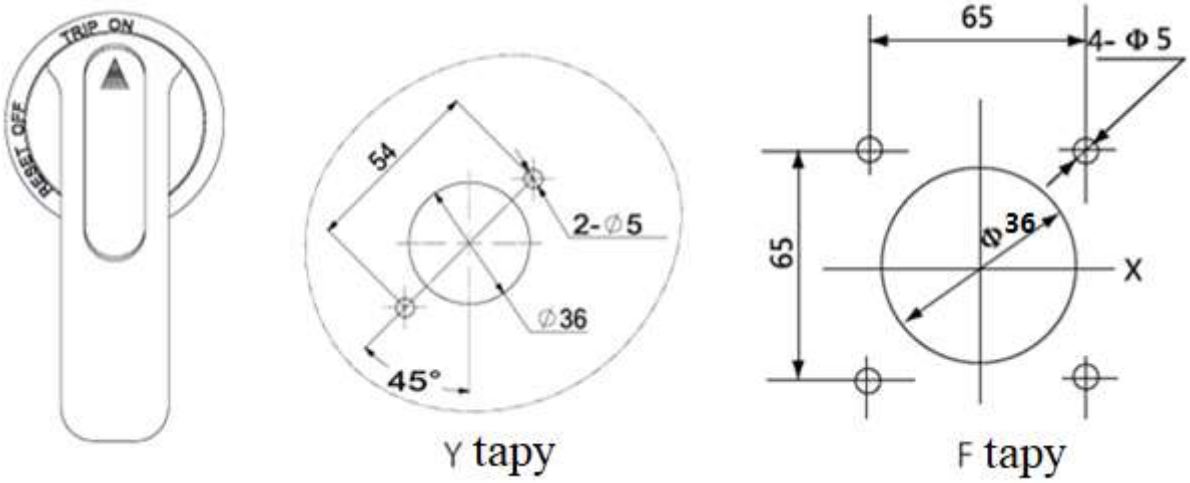


Fig.18 Installation opening diagram of rotary handle

Note:1）During manual operation, it shall rotate 180° clockwise，and counterclockwise operation is prohibited.

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

8.9 Electric operation

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

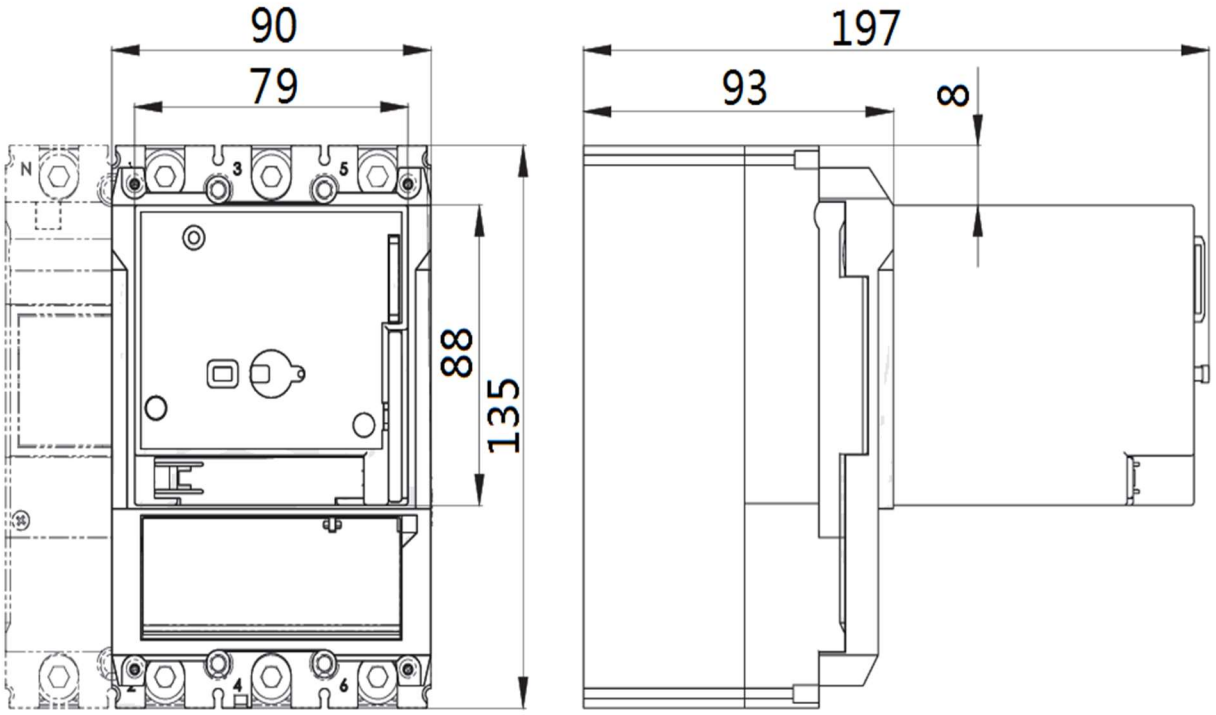


Fig.19 External dimension diagram of electric operation

Table 16 Voltage specification and power of electric operation

Attachment Name	Electric operation			
Voltage specification	DC24V	AC110V/DC110V	AC230V/DC220V	AC400V
power (W)	80	150	150	200

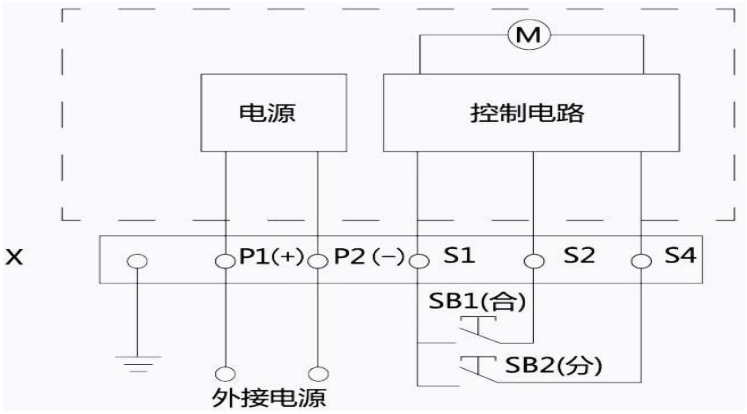


Fig.20 Electric operation wiring diagram

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.

8.10 Mechanical interlock

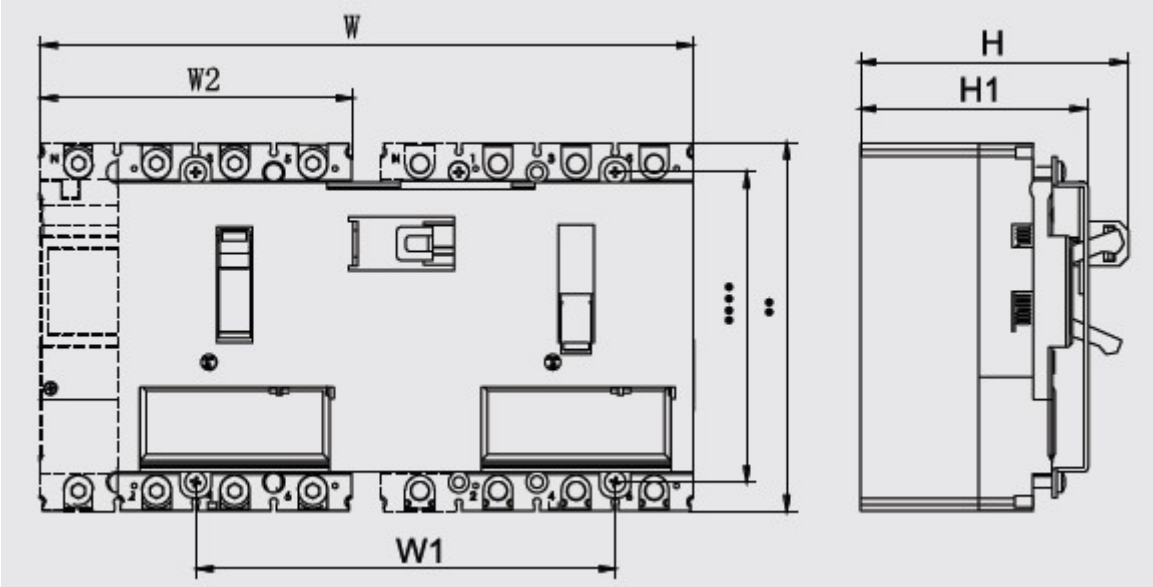


Fig.21 Outline dimension drawing of mechanical interlocking mechanism and circuit breaker after installation

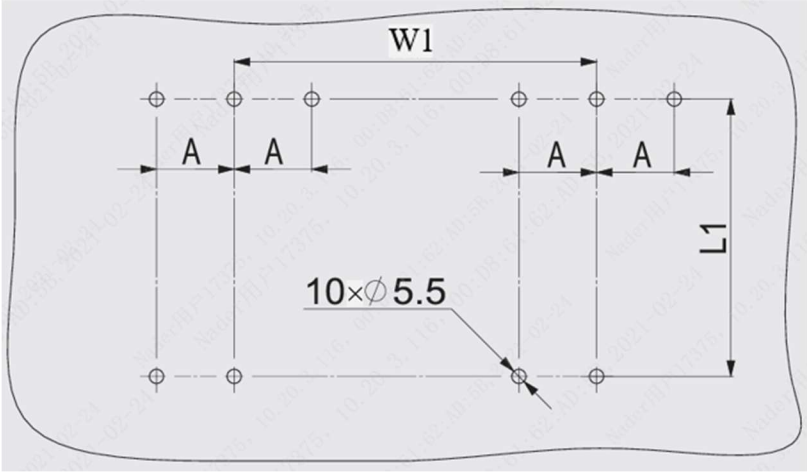


Fig.22 Installation opening dimension drawing

Table 17 Overall dimensions of mechanical interlocking mechanism and circuit breaker after installation (unit: mm)

mechanical interlocking mechanism	Applicable circuit breaker	W	W1	W2	L	L1	H	H1	A
JS111Y/M5-160	NDM5Z-160/3P	230	140	90	135	107	114	96	30
	NDM5Z-160/4P	260	140	120	135	107	114	96	30

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

8.11 Copper bar in front of board or copper cable with wiring terminal

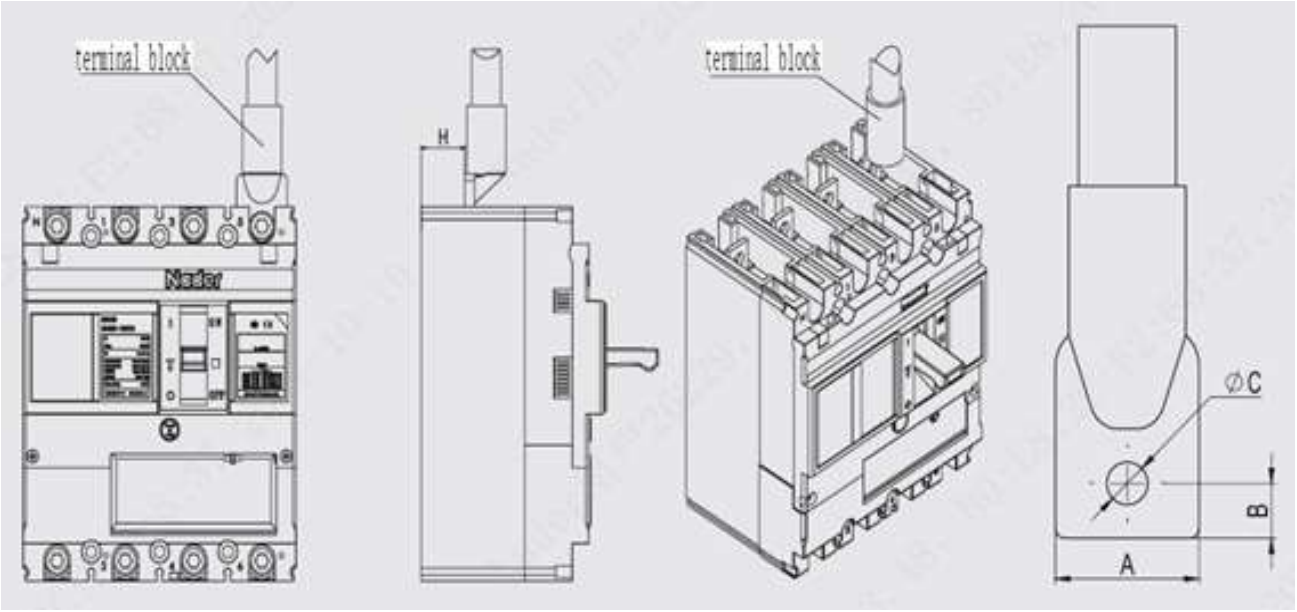


Fig.23 Connection diagram of copper bar in front of board or copper cable with wiring terminal

Table 18 Connection size of copper bar in front of board or copper cable with wiring terminal (unit: mm)

Model	A	B	ΦC	H
NDM5Z-160	≤12	≤8.5	6.5	21

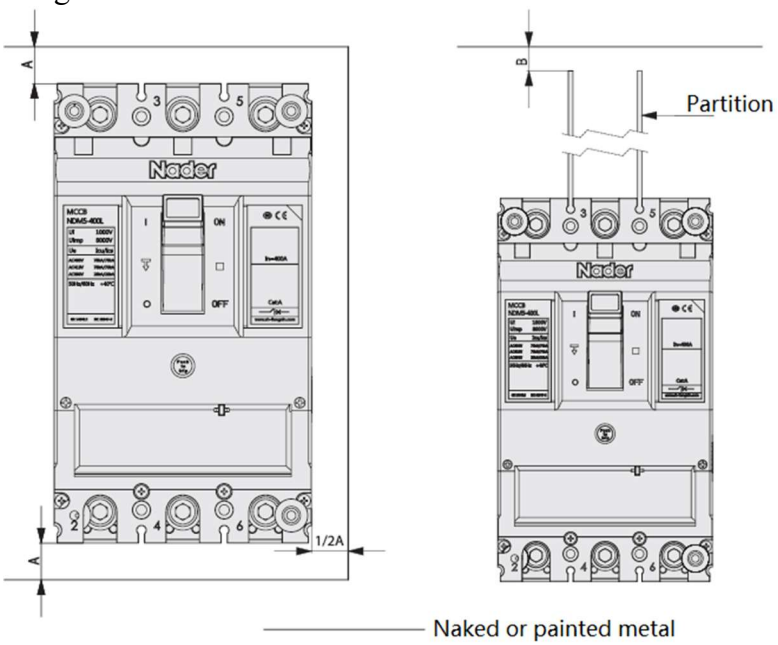
Note 1：Connect with the circuit breaker, and select the appropriate wiring mode according to the outline, installation dimension and wiring method；

2：If copper bar is selected for connection, the copper bar cannot be directly connected with the circuit breaker body, and it is necessary to purchase extended busbar accessories；

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

8.12 Safety distance

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



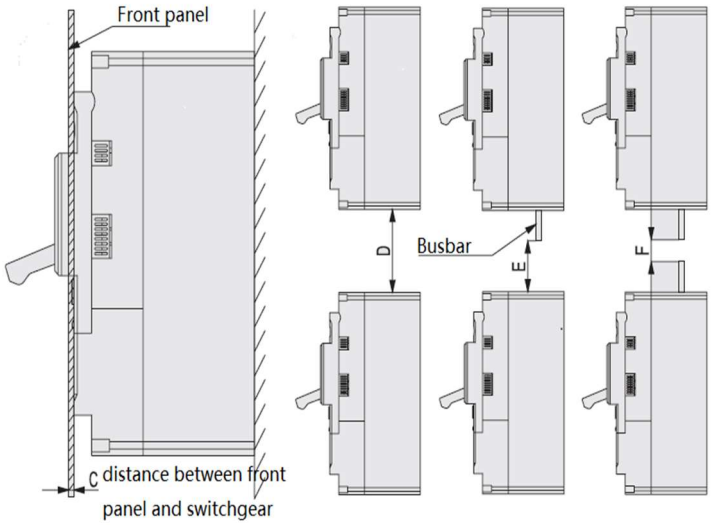


Fig.24 Insulation distance mounted in the metal cabinet

Table 19 Insulation distance mounted in the metal cabinet (unit: mm)

Model	Spacing A	Spacing B	Spacing C	Spacing D	Spacing E	Spacing F
NDM5Z-160	≥50	≥0	≥0	≥100	≥65	≥35

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

8.13 Main circuit wiring mode of DC products

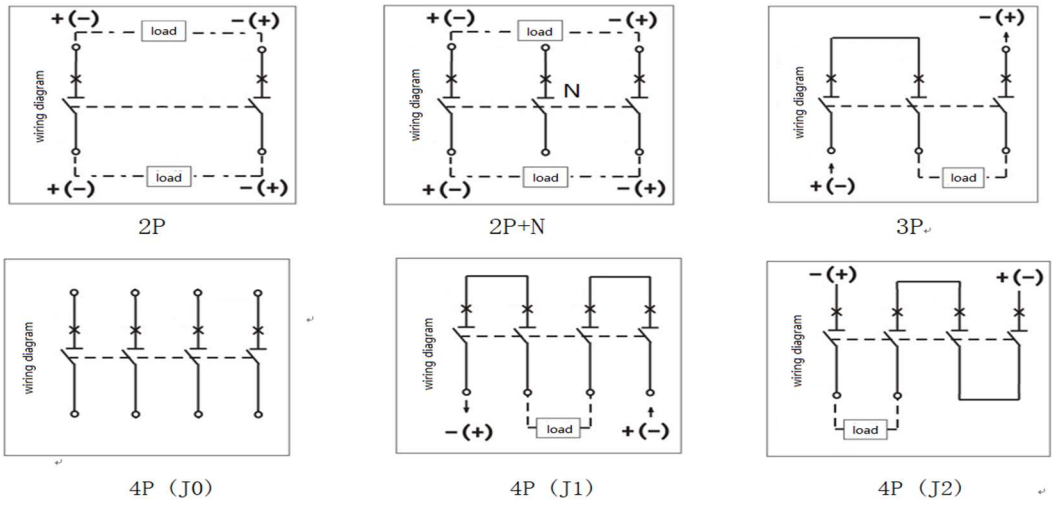


Fig.25 Main circuit wiring mode of DC products

9、Attachment function description

9.1 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 20 Rated Parameters of the Under-voltage Release

Accessory name	voltage release				Tightening torque value of wiring screw
Voltage specifications (V)	DC12V	AC/DC110	AC230/DC250	AC400	
Maintain power consumption (W)	0.5	1.0	1.5	0.5	1.2N.m
Code name	Q11	Q22	Q40	Q11	

Fig.26 Working diagram of under-voltage release

9.2 Under-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 21 Rated Parameters of the Shunt Release

Accessory name	Shunt release				Tightening torque value of wiring screw
Voltage specifications(V)	AC/DC24	AC/DC48	AC/DC110	AC230/DC250	
Power waste(W)	20	13	8	19	1.2N.m
Code name	FT02	FT04	FT11	FT22	

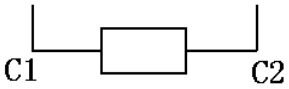


Fig.27 Working Diagram of Shunt Release

Note：shunt tripper is working principle：it is a single pulse action。If it needs to act again, the shunt release must be power on before it can act again.

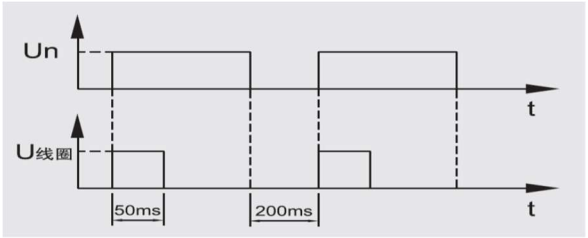
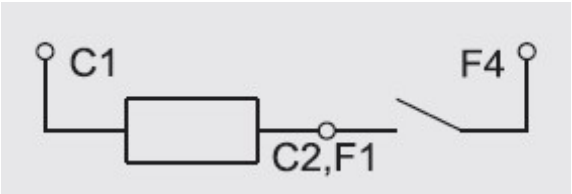


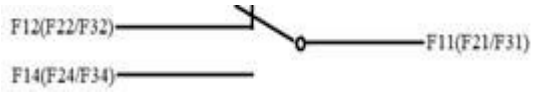
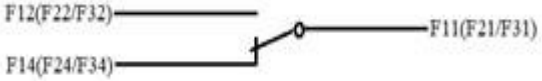
Fig.28 Working principle diagram of shunt tripper

If long-term power supply is required so that the circuit breaker cannot be closed normally, one auxiliary contact can be connected in series as shown in the figure below.



9.3 Rated parameters of the auxiliary contact

Table 22 Rated parameters of the auxiliary contact

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 three groups of auxiliary harness are installed.

9.4 Rated parameters of the alarm contact

Table 23 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

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

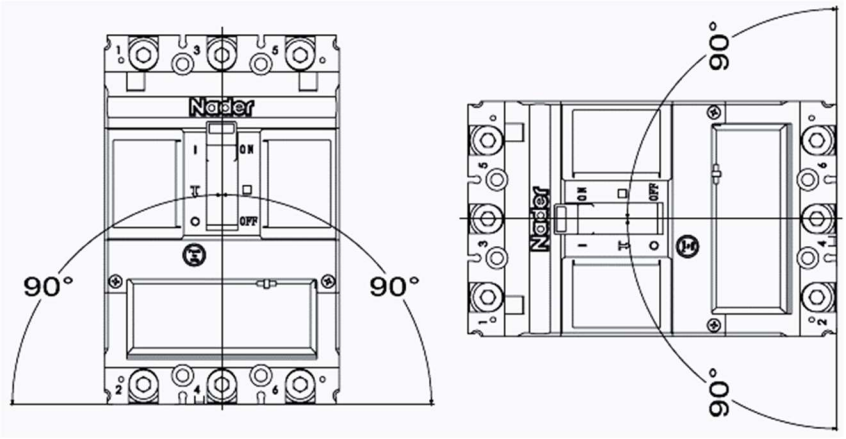
2) The first alarm harness is identified as B11 (red), B12 (white), B14 (yellow).

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.

10、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 ±22.5°.

Horizontal installation of the product.



Vertical installation Horizontal installation

Fig. 29 Installation direction diagram

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 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.

12、Environment

The environment that comply with RoHS instruction.

13、List of accessories and installation

Table 24 Accessories list form

SN	Name	Specification	2P Quantity/Set	3P Quantity/Set	4P Quantity/Set
1	Cross small pan-head screw	M5×85	2	4	4
2	Hexagon nut	M5	2	4	4
3	Spring washer	5	2	4	4
4	Plain washer	5	2	4	4
5	Partition	——	2	3	4
6	Short bus bar with a radiator (optional)	——	-	1	2
7	Hexagon socket head combination screw	M6×18	4	6	8

14、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.