Shanghai Liangxin Electrical Co., Ltd.

NDM5-160

Product Specification

（IPD-ENG-DEV-T22 A1 2016-09-23）

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Approved		Date	2022-12-30

Revision information					
Version	Revised contents and reasons	Date	Prepared	Reviewed	Approved
0	Newly added	9/16/2019	Jiang Guping	Ding Fei	Cao Jian
1	Modify the figure of chapter 11, modify the description of adjustable release.	12/18/2019	Jiang Guping	Ding Fei	Cao Jian
2	Modify accessory code	01/08/2020	Jiang Guping	Ding Fei	Cao Jian
3	Update product related information	08/09/2021	Sun Lanping	Wang Hu	Jiang Wushan
4	Newly added outline and installation dimension of terminal cover	2022/12/12	Yang rong rong	Xu jun cheng	Ding fei

1 、Applicable scope and purpose

The NDM5-160 series of moulded case circuit breakers (referred to as circuit breakers) have a rated insulation voltage of 800V and apply to circuits with the AC 50Hz/60Hz, the rated working voltage AC230/240V、AC380/400/415Vand 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 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  ;

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

3P Product 4P Product

Fig.1 Product picture

3、 Specification and model description

Table 1 Model Interpretation

ND	M	5	- 160	□	□	/ □ / □ / □	□	□	□
1	2	3	4	5	6	7	8	9	10	11	12

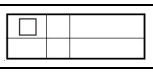
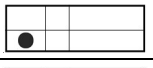
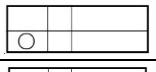
S.N.	Name of S.N.	Interpretation
1	Enterprise characteristic code	ND: Nader low-voltage apparatus
2	Product type code	M:Moulded case circuit breaker (MCCB)
3	Design S.N.	5
4	Current of the frame size	160
5	Interrupting level code	L:standard
		M:medium-high
		H:high
6	Rated current	16A, 20A, 25A, 32A, 40A, 50A, 63A,80A,100A,125A,160A
7	Pole	2:2 poles
		3:3 poles
		4A:N-pole is without the over-current protection and always connect
		4B:N-pole is without the over-current protection and acts together with other three poles(N-pole close first and open last)
		4C:N-pole is with the over-current protection and acts together with other three poles(N-pole close first and open last)
		4D:N-pole is without the over-current protection and always connect
8	Trip release code	TMD: AC protection-thermo-magnetic distribution release
		TMM: Thermo-magnetic motor release
9	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
10	Operation method	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
		M11:motor operation AC110V/DC110V
		M22:motor operation AC230V/DC220V
		M40:motor operation AC400V
11	Accessory code	See table 2
12	Other codes	J:Mechanical interlocking(2P except)
		MS2：MS2 lock(2P except)

Note: TMD (distribution protection): [thermo-adjustable (0.8-0.9-1.0) In, magnet-adjustable (5-6-7-8-9-10) In (magnet-fixed 10In in 16-80A), for the distribution];

TMM (motor protection): [thermo-adjustable (0.8-0.9-1.0) In, magnet-adjustable (9-10-11-12-13-14) In (magnet-fixed 14In in 16-80A), for the motor].

Table 2 Accessory code

Accessory code	Accessory name	Installation position	
		3P, 4P	
—	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.

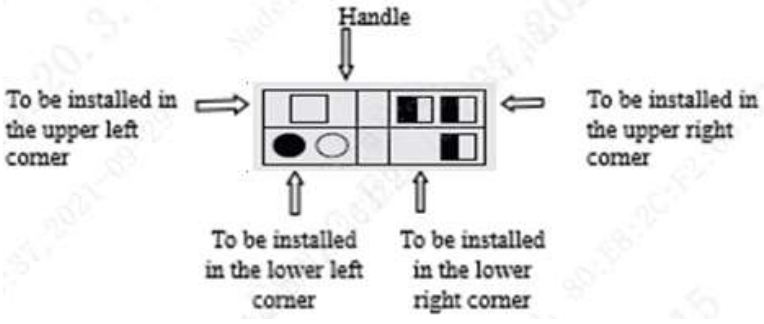
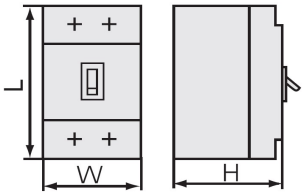


Fig.2 Attachment installation diagram

4 Main technical parameters

Table 3 Main technical parameters

Model			NDM5-160							
Frame current Inm			160A							
Rated current In			16A, 20A, 25A, 32A, 40A, 50A, 63A, 80A, 100A, 125A, 160A							
Rated voltage Ue (V)			AC230/AC240, AC400/AC415							
Usage category			A							
Rated impulse withstand voltage Uimp			8000V							
Rated insulation voltage Ui			800V							
Power frequency withstand voltage (1min)			3000V							
Number of poles			2			3			4	
Rated Ultimate/Service Short-circuit breaking Capacity Icu/Ics(kA)		Interrupting level code	L	M	H	L	M	H	L	M	H
		AC230/AC240V	100	120	150	100	120	150	100	120	150
		AC380/400/415V	/	/	/	70	100	150	70	100	150
		AC230/AC240V	100	120	150	100	120	150	100	120	150
		AC380/400/415V	/	/	/	70	100	150	70	100	150
Operational performance (times)	Mechanical life	Maintainable free life	20000							
		Maintainable life	40000							
	Electrical life	AC230/240V	10000							
		AC380/400/415V	10000							
Boundary dimension		L(mm)	135							
		W(mm)	61(2P)/90(3P)/120(4P)							
		H(mm)	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 4 Wire parameters

Rated current (A)	16, 20	25	32	40, 50	63	80	100	125	160
Conductor area（mm²）	2. 5	4	6	10	16	25	35	50	70

4.2 Tightening Torque of the Circuit Breaker Terminal and Mounting Screw

Table 5 Tightening Torque of the Circuit Breaker Terminal and Mounting Screw

Model	Screw application	Thread specification	Torsional moment (N • m)
NDM5-160	Wiring screw	M6	6
	Set screw	M4	1. 2

4.3 Derating factor of temperature change for the circuit breaker

Table 6 Derating Factor Table of Temperature Change for the Circuit Breaker

Model	Derating factor of product temperature change							
NDM5-160	Temperatu (℃)	40	45	50	55	60	65	70
	Derating factor	1	0. 97	0. 95	0. 92	0. 9	0. 87	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 7 Altitude drop correction factor

Altitude (m)	2000	2500	3000	3500	4000	4500	5000
Working current correction coefficient	1	1	0. 98	0. 97	0. 95	0. 94	0. 93
Power frequency withstand voltage (V)	3000	3000	2700	2550	2400	2300	2200
Average insulation class (V)	800	800	720	670	630	600	560

4.5 Power consumption of circuit breaker

Table 8 NDM5-160 Product current specification single phase power consumption able

Model	Current specification	Single phase power consumption (W)		
		Front and rear wiring	Plug in front of plate、rear board wiring	Extended row wiring
NDM5-160	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 ：IP20；

7）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;

8）In case of stricter user conditions than the above description, negotiate with the manufacturer.

6 Tripping characteristics

6.1Tripping characteristics curve

NDM5-160 Tripping characteristics curve under normal environment (ambient air temperature: +40℃)

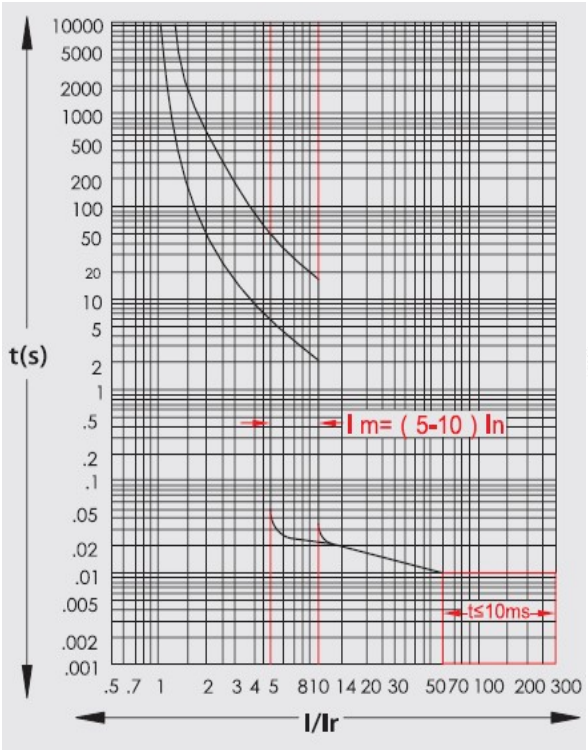


Fig.3 NDM5-160 Distribution Protection

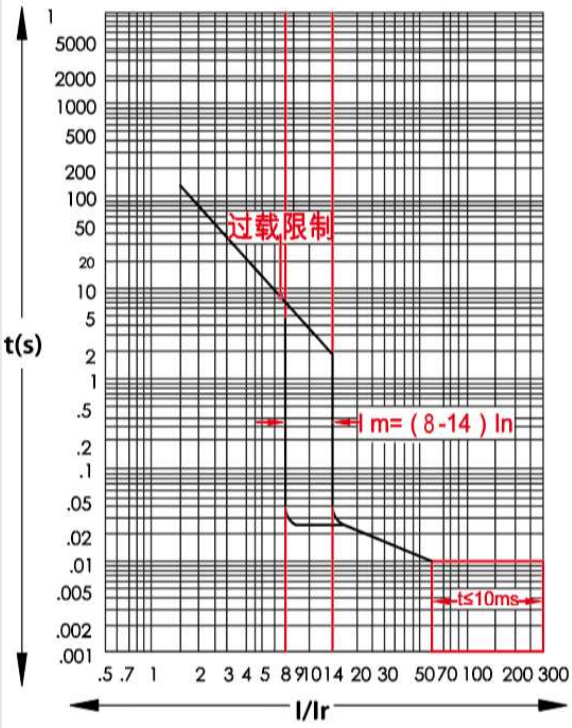


Fig.4 NDM5-160 Motor protection

6.2 Current limiting and permissive characteristic curve

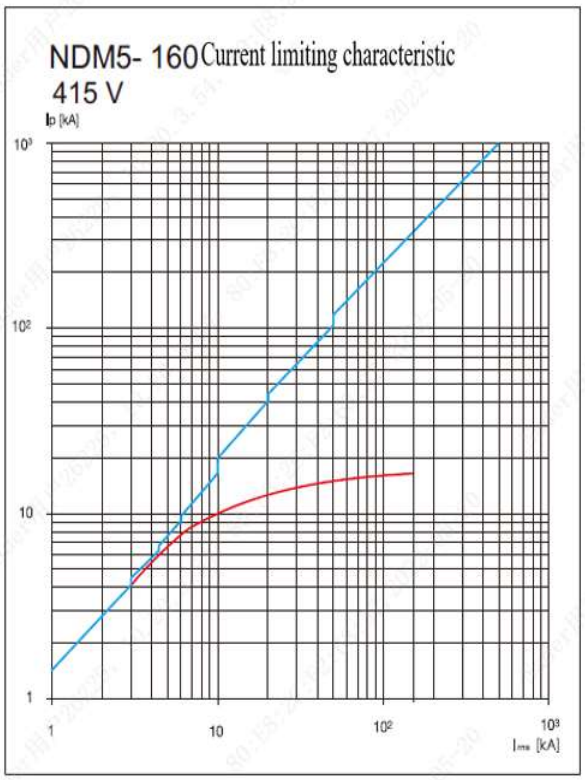


Fig.5 Current limiting characteristic curve chart

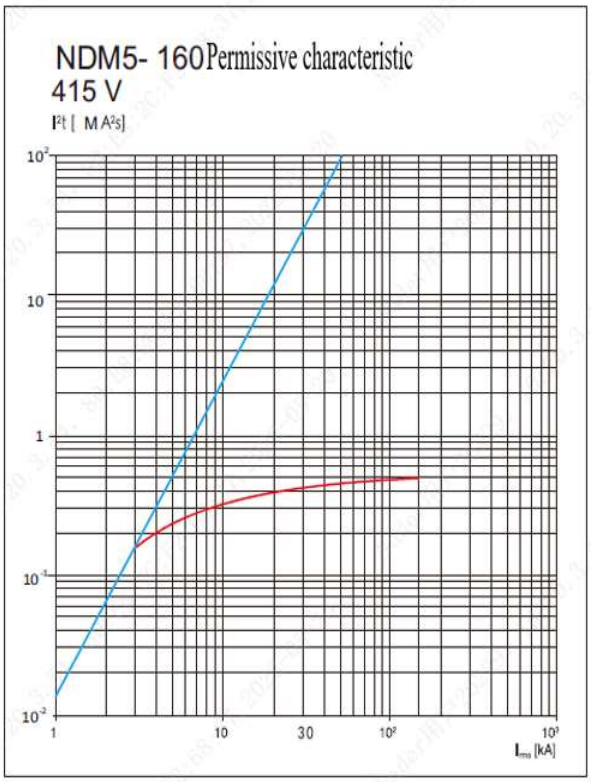
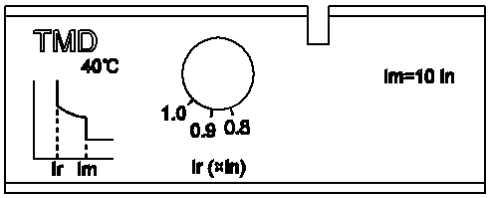
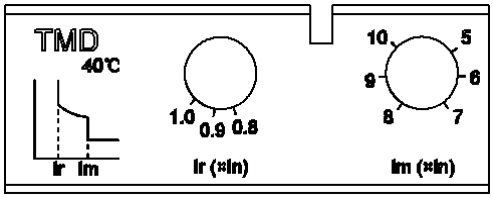


Fig.6 Permissive characteristic curve chart

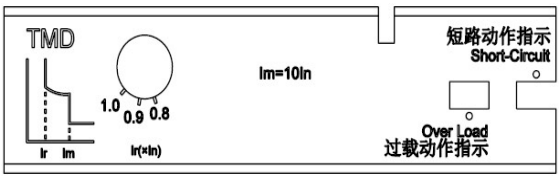
7 Controller operation description and function introduction



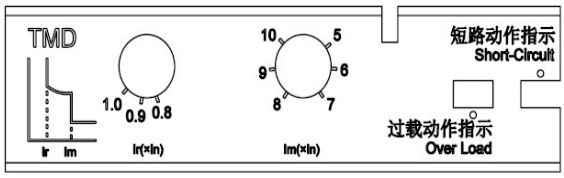
16A-80A TMD（2P）



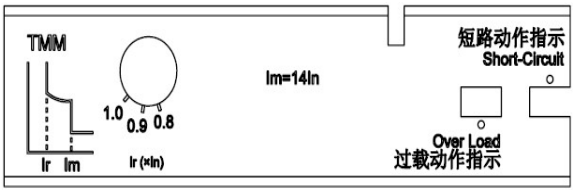
100A-160A TMD（2P）



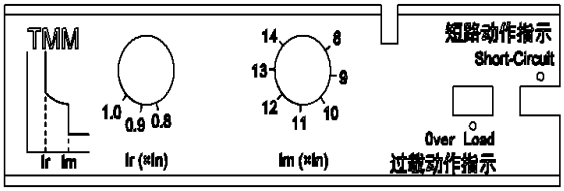
16A-80A TMD (3P/4P)



100A-160A TMD (3P/4P)



16A-80A TMM (3P/4P)



100A-160A TMM (3P/4P)

Fig.7 Release adjustment gear chart

8、Products Outline and Installation Dimensions

8.1 2P、3P、4P Outline and installation dimensions of front board wiring products

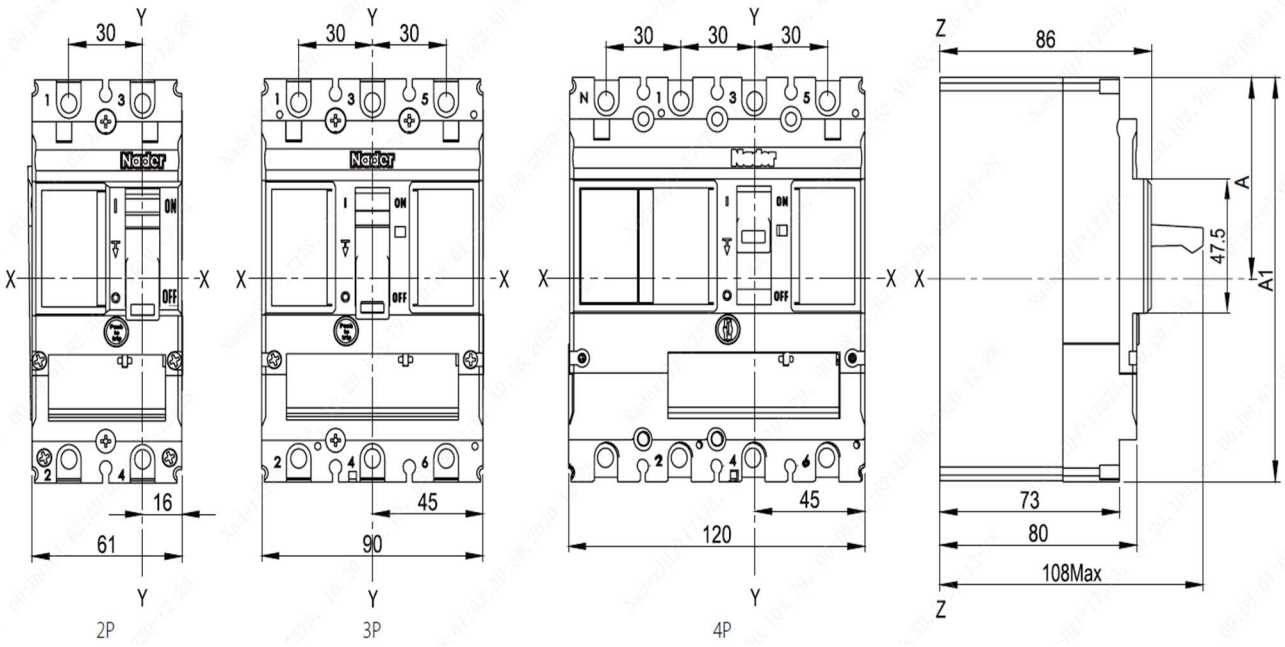


Fig.8 2P、3P、4P Overall dimensions of front board wiring products

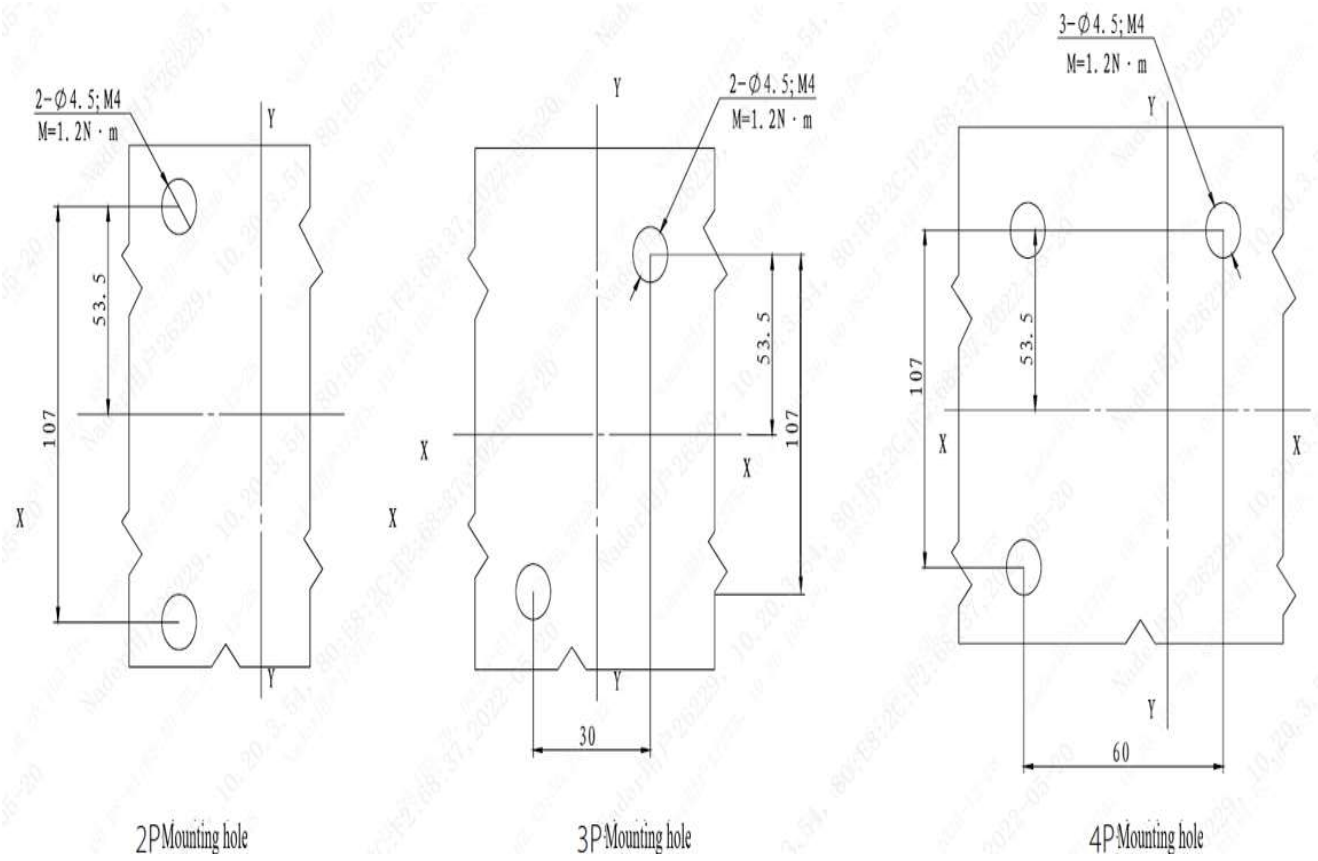


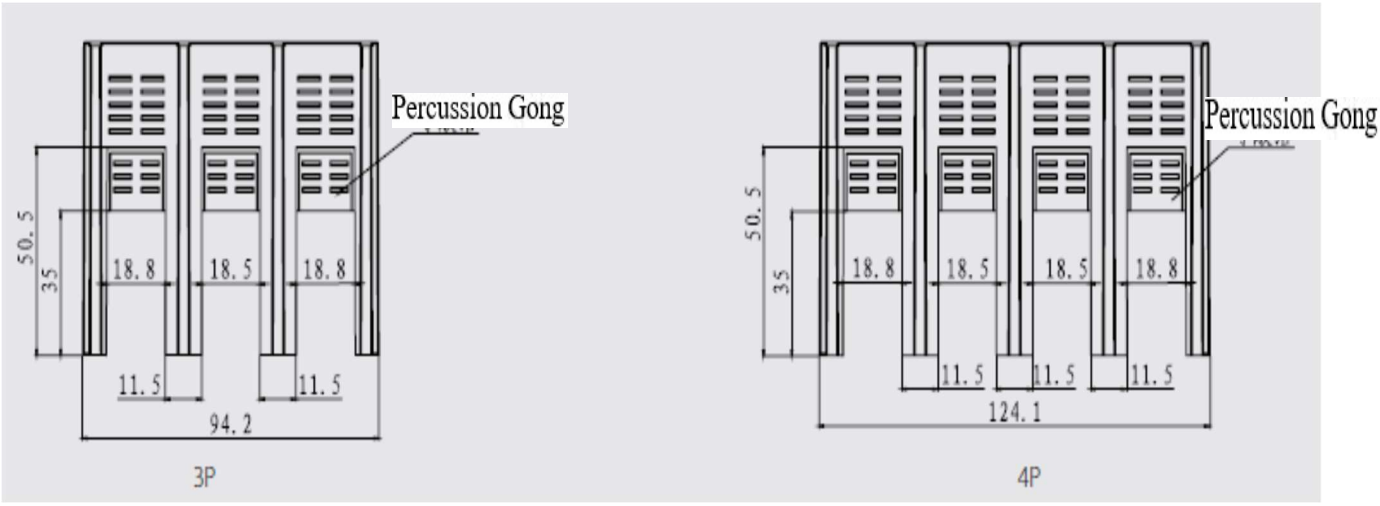
Fig.9 Mounting hole installed on the base plate

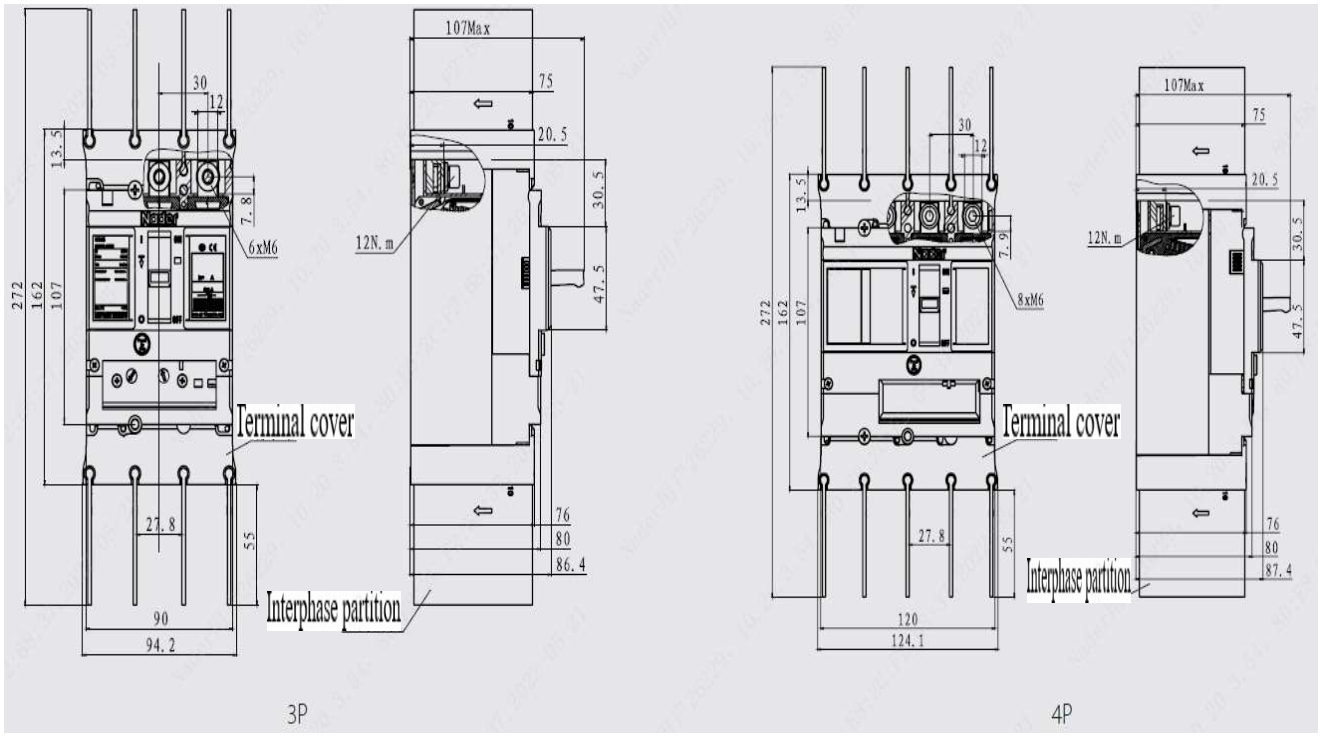
Note 1）:Dimensions of copper bar front-Panel connection products: A=67.5, A1=135.

Dimensions of cable front-Panel connection products (Fcu): A=77.5, A1=155.

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

8.2 Outline and installation dimension of terminal cover





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

8.3 2P、3P、4P Outline and installation dimensions of expansion wiring in front of the board

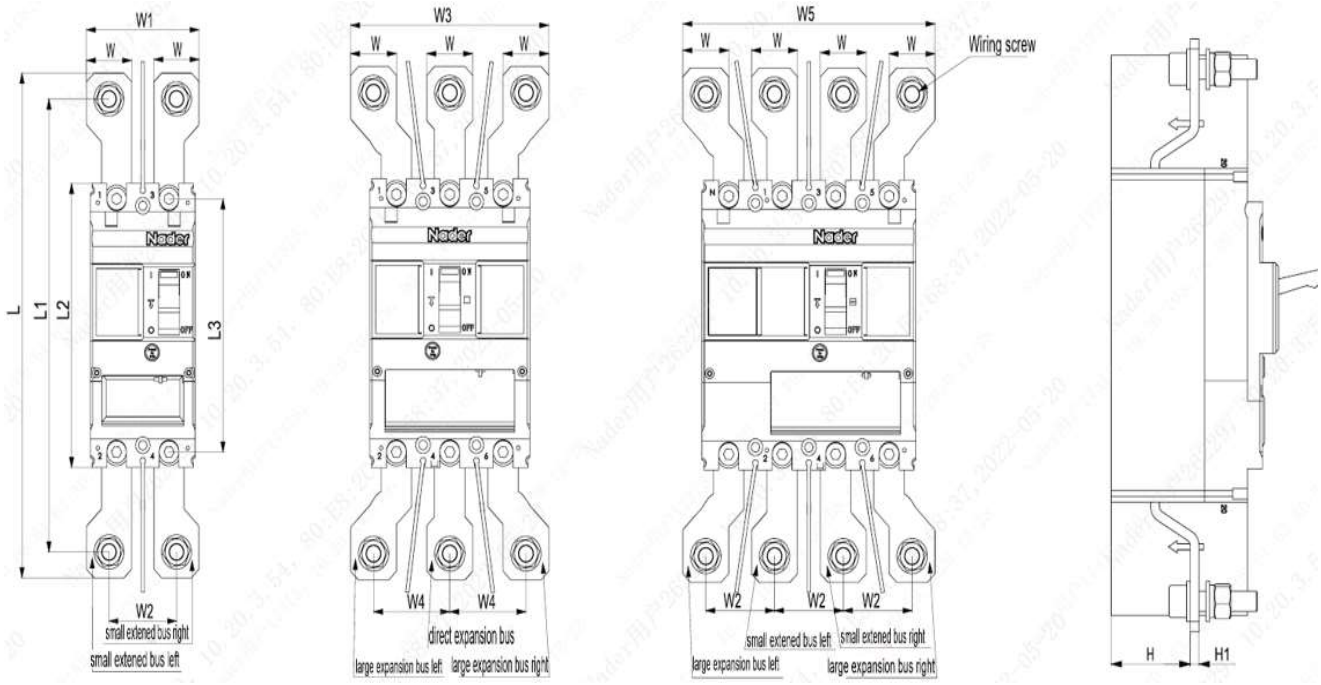


Fig.10 2P、3P、4P Outline and installation dimensions of expansion wiring in front of the board

Table 9 The overall dimensions of the front wiring expansion bar and the circuit breaker after combined installation are shown in the figure below：

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

Note 1：2p Extended bus combination mode：small expansion bus（2 pieces on the left、 right）;

2：3p Extended bus combination mode：large expansion bus（2 pieces on the left、 right）+2 –piece direct expansion busbar;

3：4p Extended bus combination mode：small expansion bus（2 pieces on the left、 right）large expansion bus（2 pieces on the left、 right）;

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

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

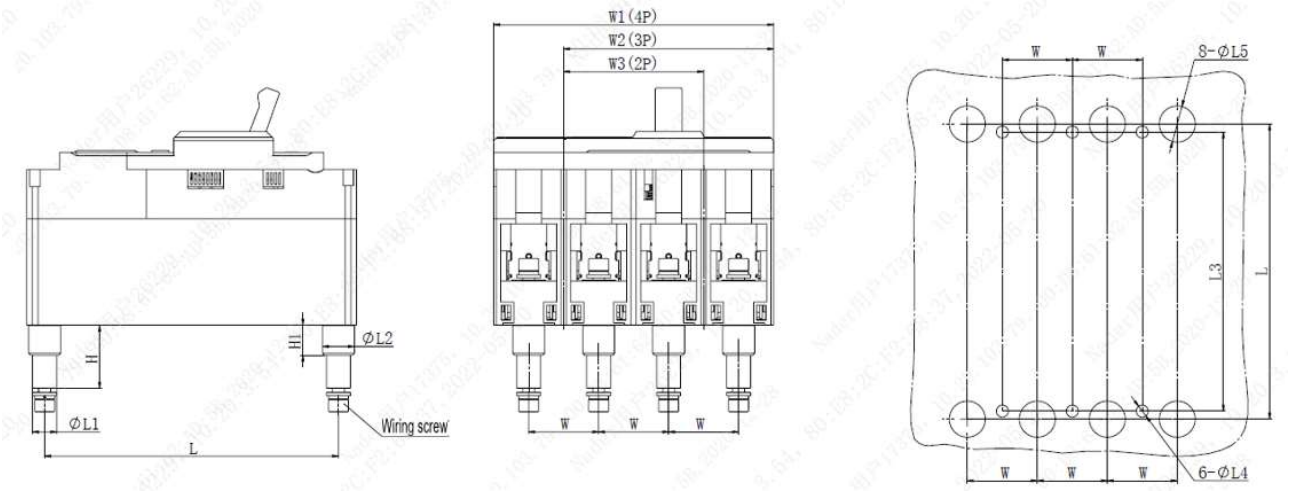


Fig.11 2P、3P、4P outline dimension drawing of rear wiring board

Table 10 2P、3P、4P the installation dimensions of wiring products behind the board are shown in the table below

Pear panel wiring	L	L1	L2	L3	L4	L5	H	H1	H2	W	W1	W2	W3	Wiring screw(provided by the user)
BH1/M5-160	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

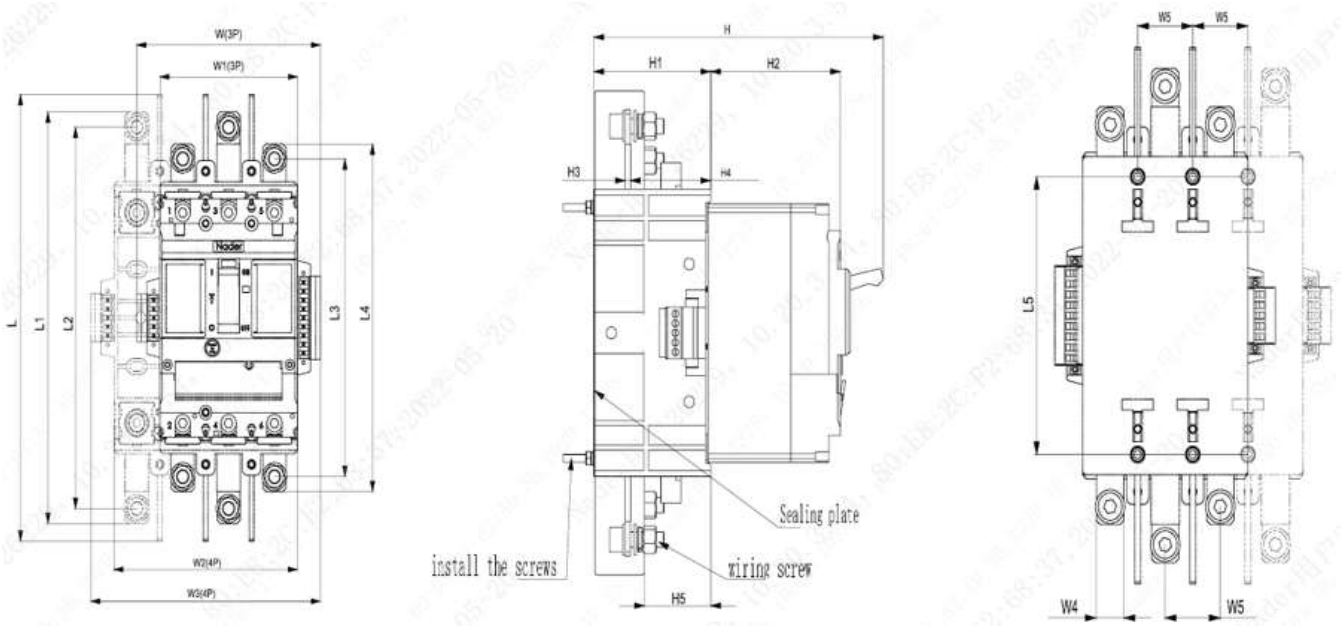


Fig.12 3P、4P Outline and installation dimensions of plug-in board front wiring

Table 11 The overall dimensions of plug-in board front wiring (horizontal) and circuit breaker after installation are shown in the figure below

Plug in specification	W	W1	W2	W3	W4	W5	L	L1	L2	Wiring screw
CR1-Q/M5-160	121	90	120	151	15	30	253	233	216	M8×25
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	M4×75

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

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

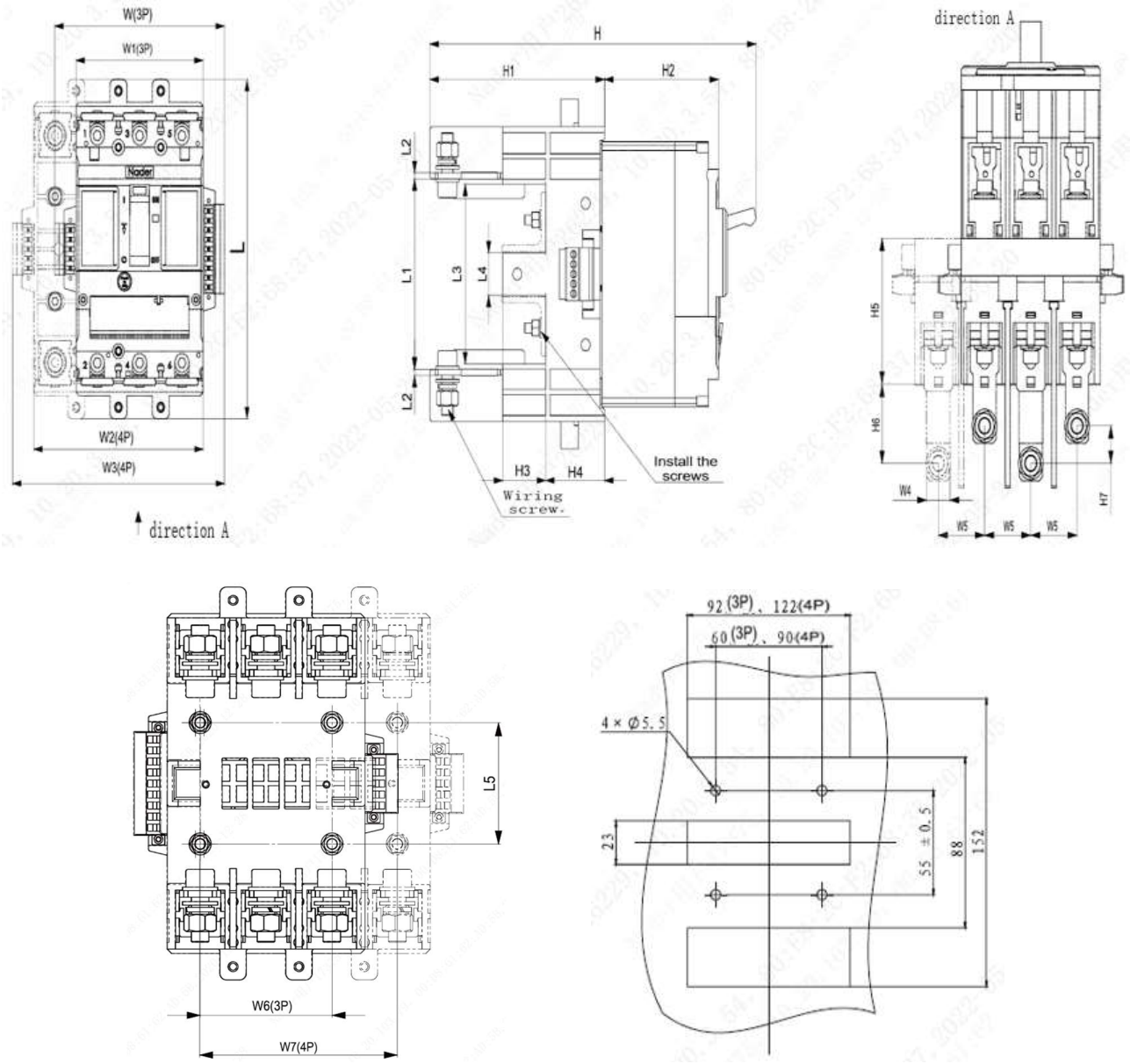


Fig.13 3P、4P Mounting hole dimensions of plug-in connections

Table 12 The overall dimensions of plug-in device (horizontal wiring behind the board)and circuit breaker after installation are shown in the table below

Plug in board rear wiring	W	W1	W2	W3	W4	W5	W6	W7	L	L1	L2	Wiring screw
CR1-H/M5-160	121	90	120	151	15	30	60	90	178	97	3	M8×25
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	M5×35

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

8.7 3P、4P Outline and installation dimensions of guide rail type safety rotation products

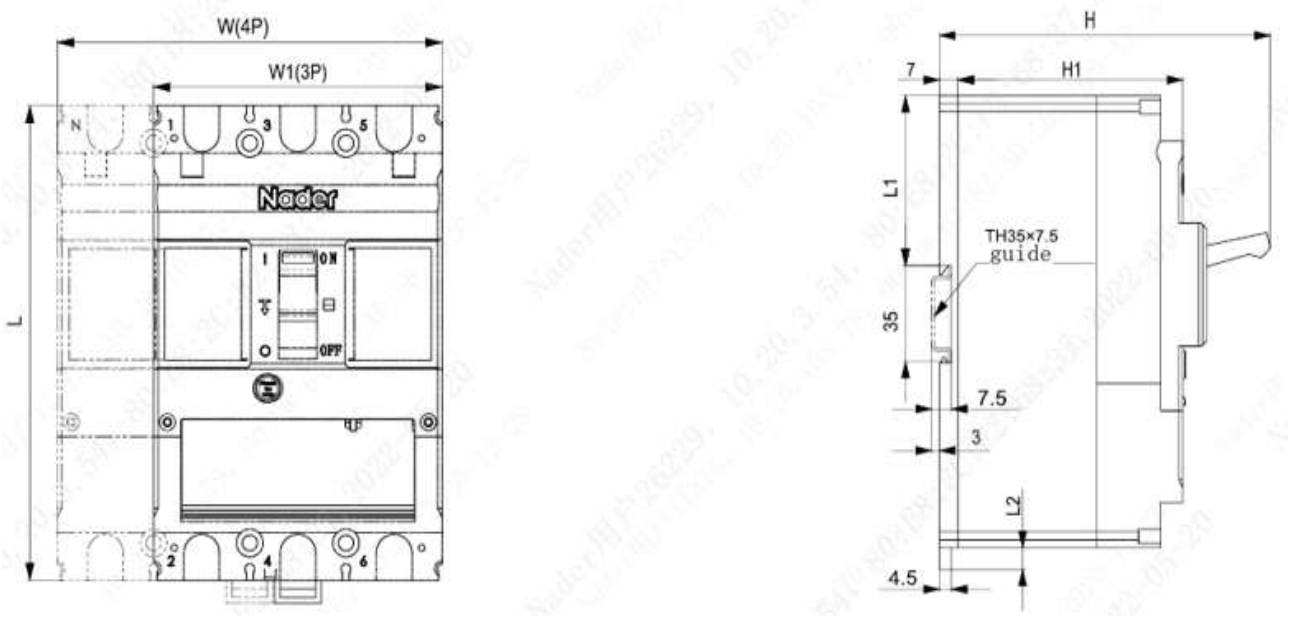


Fig.14 Outline and installation dimensions drawing of guide rail type safety rotation products

Table 13 The installation dimensions of guide rail type safety rotation products are shown in the figure

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

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：

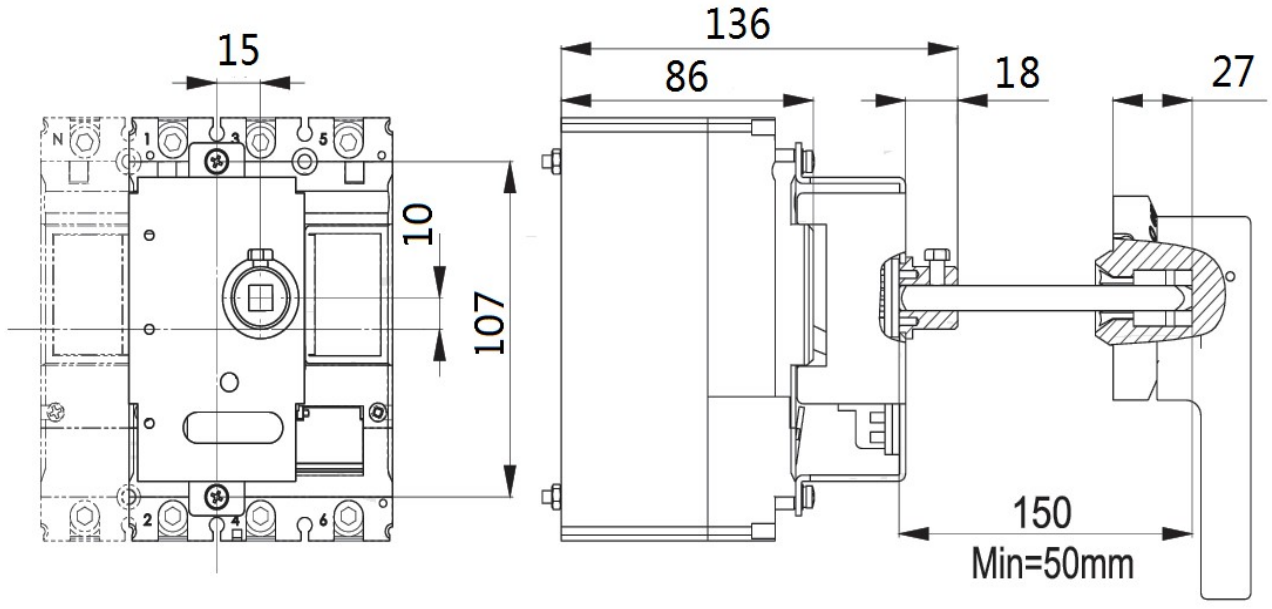


Fig. 15 Installation drawing of rotary handle operating mechanism

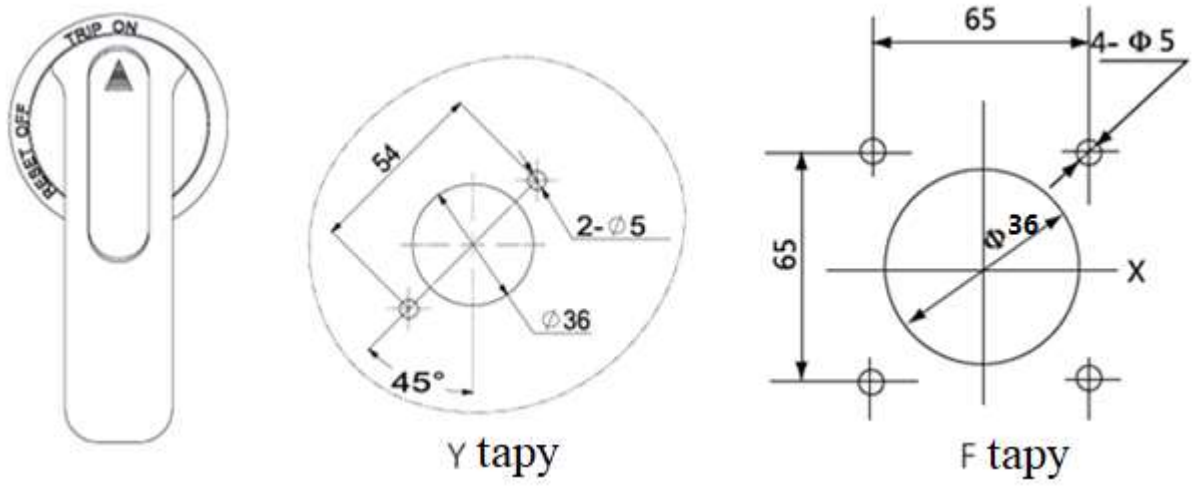


Fig. 16 Installation opening diagram of rotary handle

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：

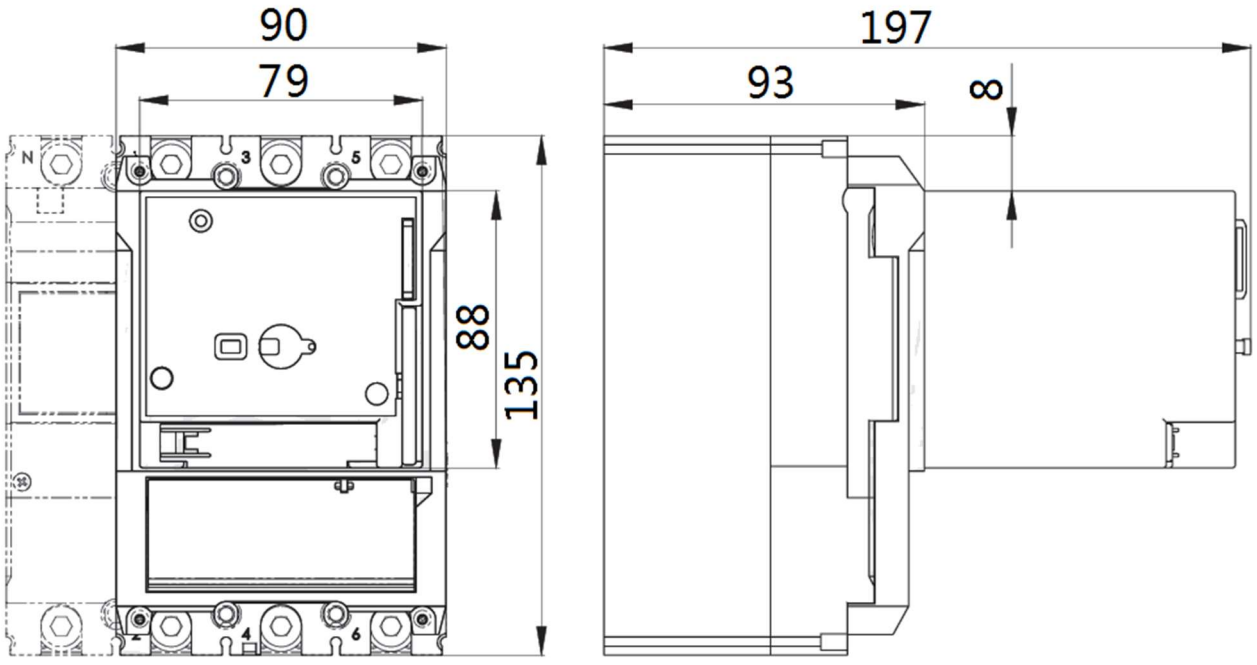


Fig.17 External dimension diagram of electric operation

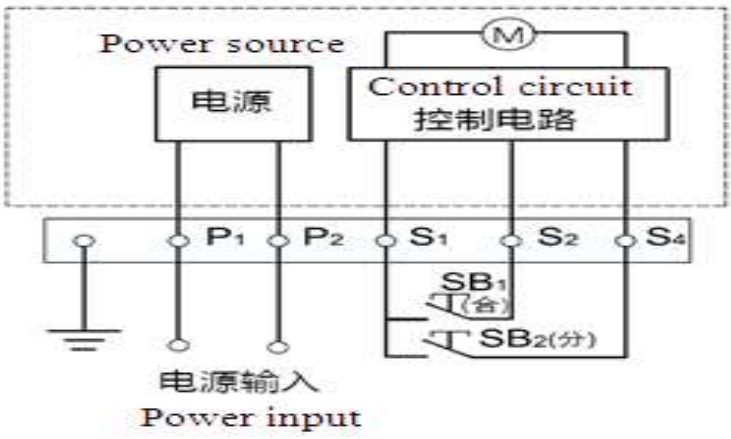


Fig.18 Electric operation wiring diagram

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 14 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

8.10 Mechanical interlock

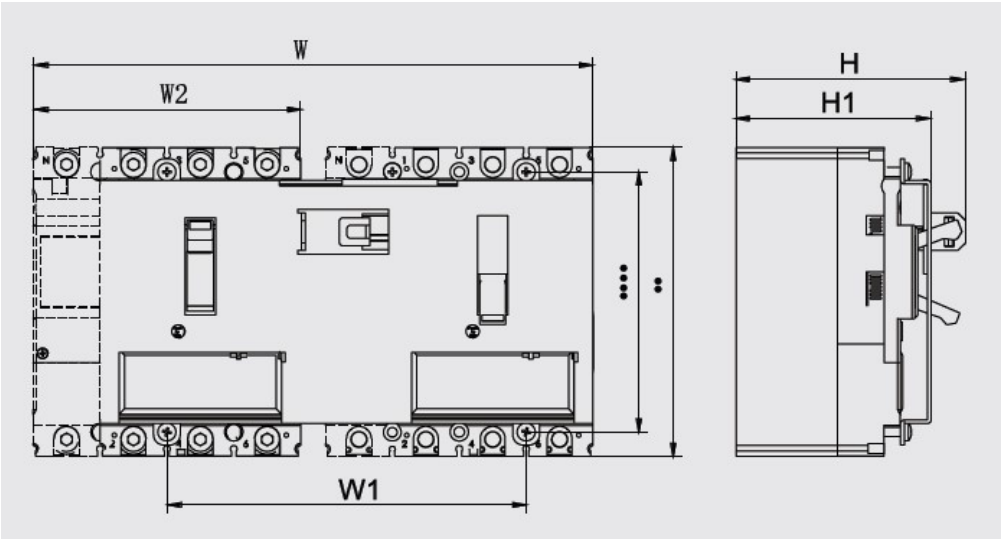


Fig.19 Outline dimension drawing of mechanical interlocking mechanism and circuit breaker after installation

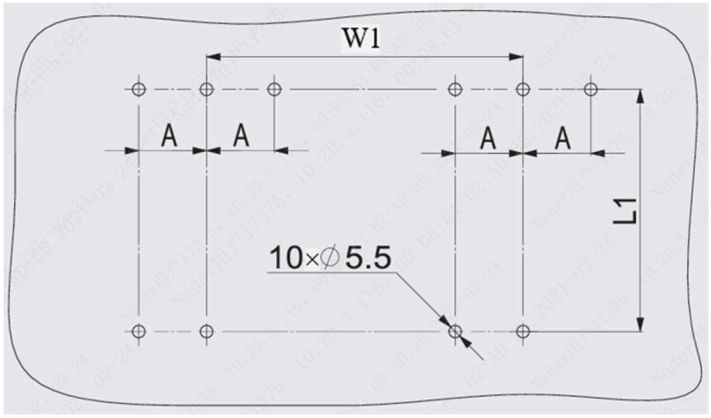


Fig.20 Installation opening dimension drawing

Table 15 Overall dimensions of mechanical interlocking mechanism and circuit breaker after installation

mechanical interlocking mechanism	Applicable circuit breaker	W	W1	W2	L	L1	H	H1	A
JS111Y/M5-160	NDM5-160/3P	230	140	90	135	107	114	96	30
	NDM5-160/4P	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

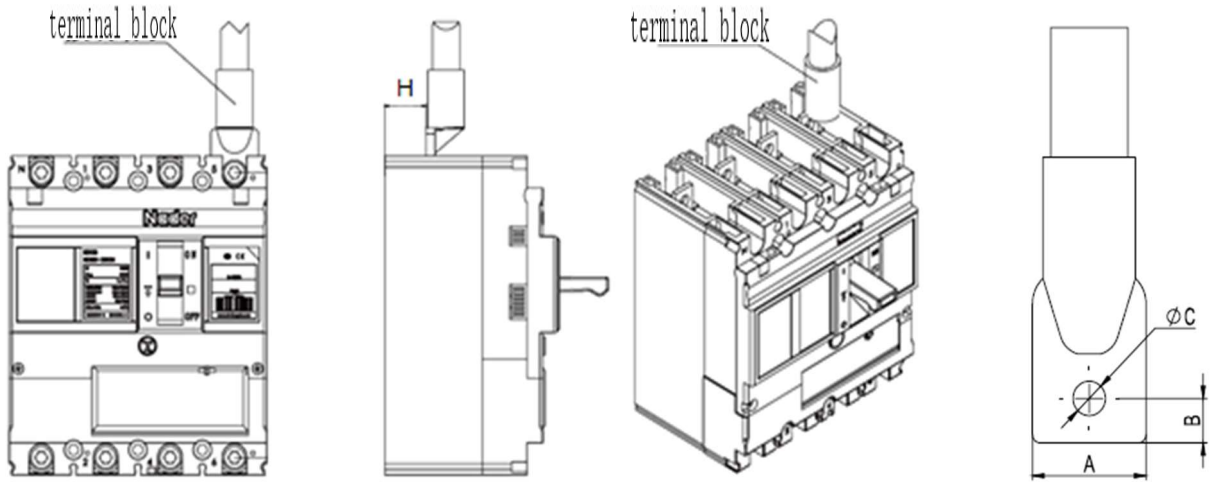


Fig.21 Connection diagram of copper bar in front of board or copper cable with wiring terminal

Table 16 Connection size of copper bar in front of board or copper cable with wiring terminal

Model	A(mm)	B(mm)	ΦC(mm)	H(mm)
NDM5-160	≤21	≤8.5	6.5	21

Note: 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。

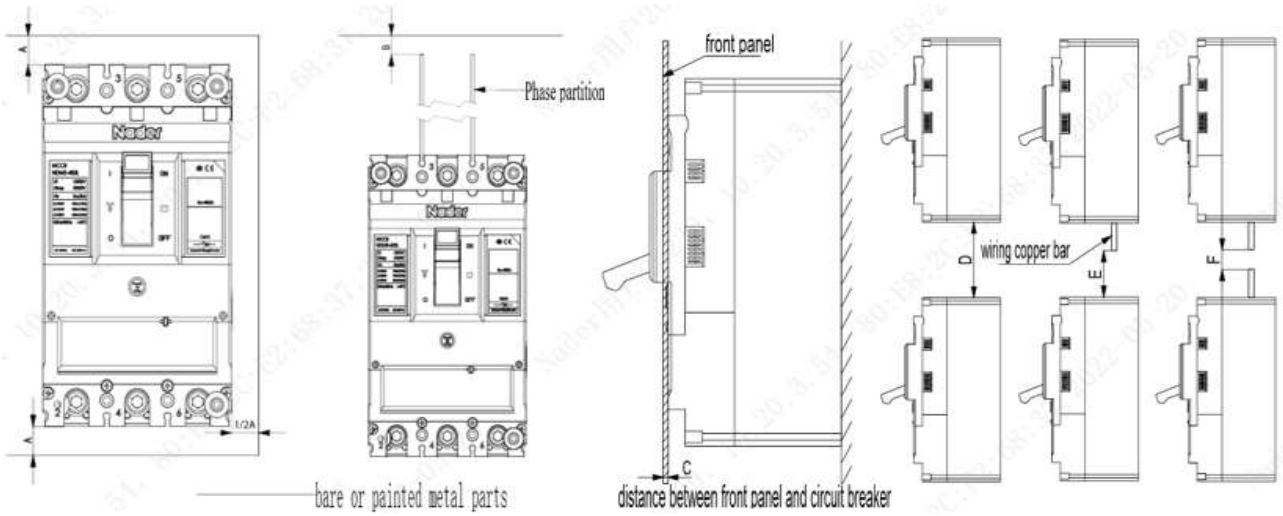


Fig.22 Insulation distance mounted in the metal cabinet

Table 17 Insulation distance mounted in the metal cabinet (unit: mm)

Model	Spacing A	Spacing B	Spacing C	Spacing D	Spacing E	Spacing F
NDM5-160	≥50	≥0	≥0	≥100	≥65	≥35

Note: 1）Front panel wiring（Standard Phase partition）unit: mm

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

8.13 Wiring diagram of circuit breaker

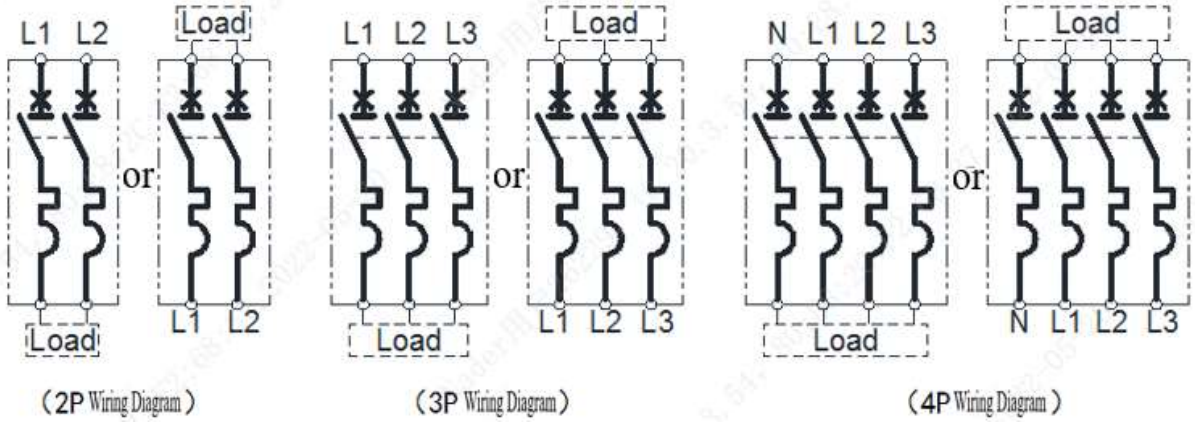


Fig.23 Main circuit wiring mode of AC products

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 18 Rated Parameters of the Under-voltage Release

Accessory name	voltage release			Tightening torque value of wiring screw
Voltage specifications (V)	AC110/DC110	AC230/DC250	AC400	
Maintain power consumption (W)	0.5	1.0	1.5	
Code name	Q11	Q22	Q40	1.2N.m

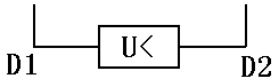


Fig. 24Working diagram of under-voltage release

9.2 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 19 Rated parameters of the shunt release

Accessory name	Shunt release				Tightening torque value of wiring screw
Voltage specifications (V)	AC24/DC24	AC48/DC48	AC110/DC110	AC230/DC250	
Power waste(W)	20	13	8	19	
Code name	FT02	FT04	FT11	FT22	1.2N.m

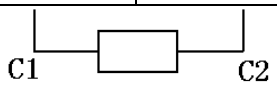


Fig.25 Working Diagram of Shunt Release

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.

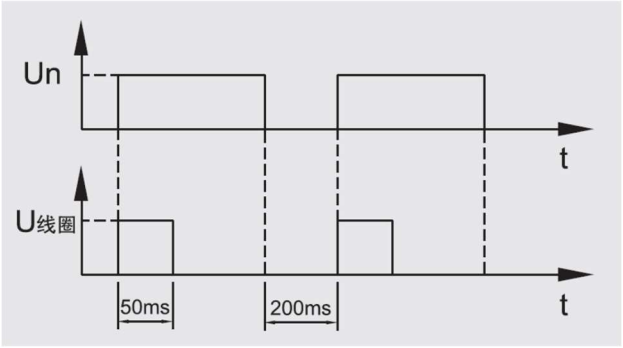
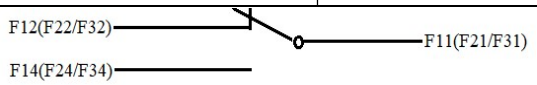
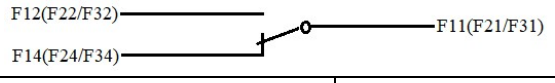


Fig.26 Working principle diagram of shunt tripper

9.3 Rated parameters of the auxiliary contact

Table 20 Parameter of Auxiliary Contact

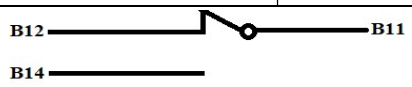
Accessory name		Auxiliary contact(conventional)	Auxiliary contact(Low power consumption)
Voltage specifications (V)/conventional thermal current (Ith)		AC250V/10A、AC400V/3A 、DC220V/0.2A	DC30V/0.1A
Wiring diagram	Off		
	On		
Internal resistance		＜30mΩ	＜50mΩ

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 21 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 Alarm contact，please explain when ordering。

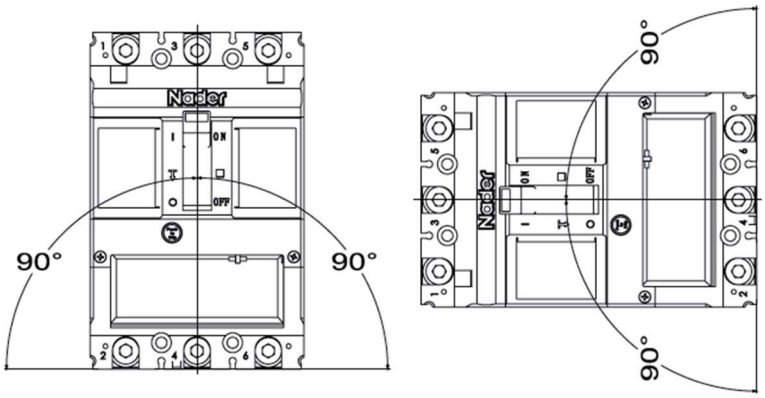
2)The first alarm harness is identified as B11 (red), B12 (white), B14 (yellow)。

Under-voltage release、Shunt Release、Auxiliary contact、Alarm contact ，the standard wiring line is 0.7m long ， 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.27 Mounting Method of Product

11、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℃~+75℃. 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.

12、Environment

The environment that comply with RoHS instruction.

13、Installation direction of circuit breaker

Table 22 Accessories list form

SN	Name	Specification	2P Quantity/Set	3P Quantity/Set	4P Quantity/Set
1	Cross small pan-head screw	M4×75	2	2	3
2	Hexagon nut	M4	2	2	3
3	Spring washer	4	2	2	3
4	Plain washer	4	2	2	3
5	Phase partition	——	2	4	6
6	Terminal 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.