

Shanghai Liangxin Electrical Co., Ltd.

NDM5EU-1600 Product Specification

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Approved by	_____	Date	_____

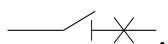
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1. Application Range

Refer to this Specification, NDM5EU-1600 molded case circuit breakers (referred to as circuit breakers) with rated insulation voltage of 1000V and rated working voltage (AC240V, AC480V, AC600V, AC690V (UL) & AC380/400/415V (IEC)), can be applied in circuits of current (800A~1200A) to distribute power and to protect wirings and power suppliers from overload long-delay inverse time lag. It has the functions of overload long time delay inverse time limit, short-circuit short time delay definite time limit, short-circuit short time delay inverse time limit, short-circuit instantaneous, grounding, which can protect the line and power equipment from damage.

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



Comply with standards: UL 489, IEC 60947-2, GB/T 14048.2 .

2. Picture of the Product



Product picture

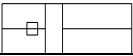
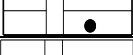
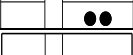
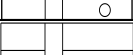
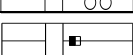
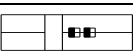
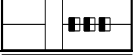
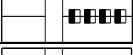
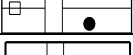
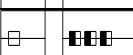
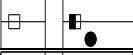
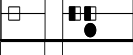
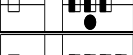
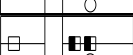
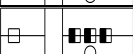
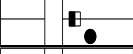
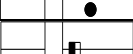
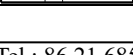
3. Specification and Model Description

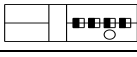
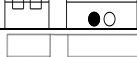
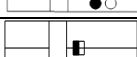
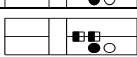
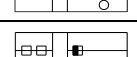
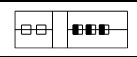
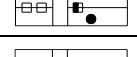
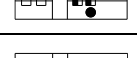
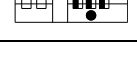
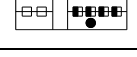
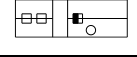
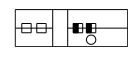
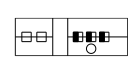
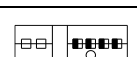
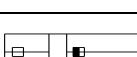
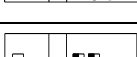
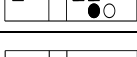
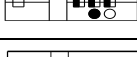
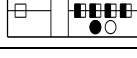
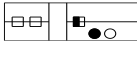
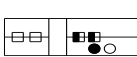
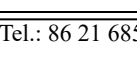
<u>ND</u> 1	<u>M</u> 2	<u>5</u> 3	<u>E</u> 4	<u>U</u> - <u>1600</u> 5 6	<u>□</u> 7	<u>□</u> / <u>□</u> / <u>□</u> / <u>□</u> 8 9 10	<u>□</u> 11	<u>□</u> 12	<u>□</u> 13	<u>□</u> 14	<u>□</u> 15	
S.N.		Name of S.N.				NDM5						
1		Enterprise characteristic code				ND: Nader low-voltage apparatus						
2		Product type code				M: MCCB						
3		Design SN				5						
4		Product type code				E: Electronic						
5		Standard code				U: UL489						
6		The frame grade				1600						
7		Interruption level code				L（Standard）						
						M（Mid-high）						
						H（Highest）						
8		Rated current In				see table 2						
9		Pole				3: 3Pole						
						4: 4Pole						
10		Release trip type				ETB: basic electronic controller						
						ETC-PT: communication energy efficiency intelligent release						
11		Installation method				Null: fixed						
12		Connection method				Null: front connection						
						ES: extended front connection						
						L: UL486E Lug Terminal						
13		operaiton method				null: Handle						
						Z2A150: rotary handle with round eccentric hole + length of shaft 150mm						
						Z2A200: rotary handle with round eccentric hole + length of shaft 200mm						
						Z2A300: rotary handle with round eccentric hole + length of shaft 300mm						
						Z2A350: rotary handle with round eccentric hole + length of shaft 350mm						
						Z2A650: rotary handle with round eccentric hole + length of shaft						

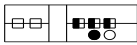
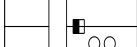
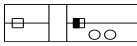
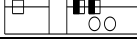
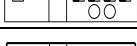
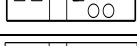
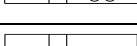
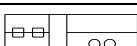
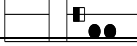
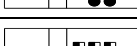
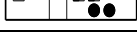
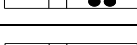
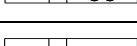
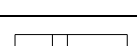
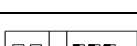
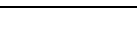
		650mm
		M02: motor operation DC24V
		M12: motor operation AC120V/DC120V
		M24: motor operation AC240V/DC240V
14	Accessories code	see table 1
15	Other code	FT02: Shunt release DC24V
		FT12: Shunt release operation voltage AC/DC120V
		FT24: Shunt release operation voltage AC/DC240V
		120V: Under-voltage release operation voltage AC/DC120V
		240V: Under-voltage release operation voltage AC/DC240V
		S: Extended handle
		MS2: MS2 lock

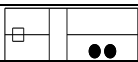
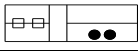
Note: LUG and terminal covers are not used for the product with rotary handle or motor operation. If necessary, please contact the manufacturer.

Table 1

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

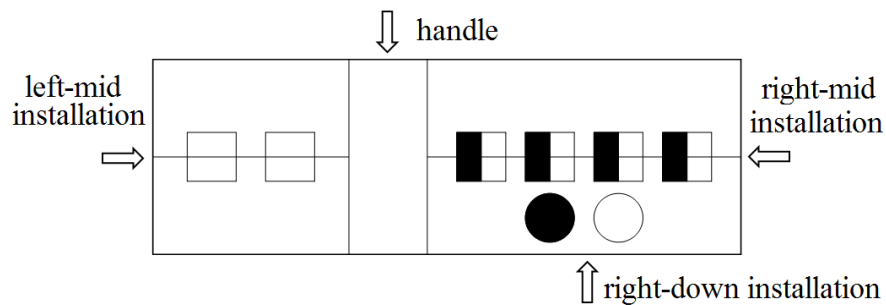
73	Under-voltage release, three sets of single auxiliary contacts	
74	Under-voltage release, four sets of single auxiliary contacts	
31	Under-voltage release, shunt release, alarm contact	
37	Under-voltage release, shunt release, two sets of single alarm contacts	
50	Under-voltage release, shunt release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

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

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

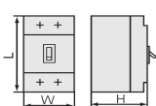
Note:  Single auxiliary contact;  Alarm contact;  Shunt release;  Under-voltage release

ETC-PT in NDM5EU-1600 has no four auxiliary codes.



4. Main Technical Parameters

Table 2

Model			NDM5EU-1600		
Frame size Current Inm(A)			1200		
Poles			3、4		
Rated working voltage Ue (V)	UL 489		AC240V、AC480V、AC600V、AC690V		
	IEC 60947-2、GB/T 14048.2		AC380/400/415V		
Rated current In (A)			800、1000、1200		
Rated insulation voltage Ui (V)			1000		
Power frequency withstand voltage (V)			3500		
Rated impulse withstand voltage Uimp (kV)			12		
Icw(kA/s)			20		
Interrupting ratings			L	M	H
Interrupting ratings (kA) UL489	AC240V		65	100	150
	AC480V		50	65	100
	AC600V		25	50	65
	AC690V		20	35	50
Interrupting ratings (kA) IEC 60947.2 GB/T 14048.2	AC380/400/415V	Icu	50	70	100
		Ics	50	70	100
Utilization category			B		
Endurance without current (cycles)			3P 10000/4P 6000		
Endurance with current (cycles)		UL 489	500		
		IEC 60947-2、 GB/T 14048.2	3000		
Boundary dimension		L (mm)	276		
		W (mm)	210(3P)/280(4P)		
		H (mm)	162		
Flashover distance(mm)			≤100		

Note1: The dimension of Terminal cover and LUG is not included in the boundary dimension.

Note2: when testing the inter-pole withstand voltage, the controller needs to be removed for ETC-PT type product.

Note3: Terminal cover and LUG are not suitable for 690V.

Note4: Suitable for continuous operation at 100-percent of rating up to 1200A.

4.1 Sectional Area Option for connection of Copper Cable and Busbar (see table 3)

Table3

Standard	Rated current (A)	Type of Copper Wire		Type of Copper Busbar	
		size	number	size	number
UL489	800	300kcmil	3	The size of the bus bar shall be 1.55 A/mm ² .	
	1000	400 kcmil	3		
	1200	350 kcmil	4		
		600 kcmil	3		

IEC 60947-2、 GB/T 14048.2	800	/	/	50×5	2
	1000	/	/	50×6	2
	1200	/	/	50×8	2

Note : 1.Copper Wires are used with LUG terminals. Copper Busbars are used with extended Busbars.

2.Suitable for continuous at 100-percent of rating up to 1200A with 90 °C wire.

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)
NDM5EU-1600	Wiring screw	M10	20
	Set screw	M5	4

4.3 Derating factor of temperature change for the circuit breaker

Table 5

Model	Temperature derated coefficient of productions							
NDM5EU-1600	Temperature (°C)	40	45	50	55	60	65	70
	derated Coefficient	1	0.98	0.95	0.92	0.88	0.84	0.80

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

2) Temperature derated Coefficient is tested with running rated current.

4.4 High altitude derating factor of circuit breaker

Table 6

Altitude (m)	2000	2500	3000	3500	4000	4500	5000
Working current correction coefficient	1	1	0.98	0.97	0.95	0.94	0.93
Maximum operating voltage (V)	690	690	690	690	690	690	690
Power frequency withstand voltage (V)	3500	3500	3150	3000	2800	2650	2500
Average insulation class (V)	1000	1000	900	850	810	770	730
Short-circuit breaking correction coefficient(Ue=690V)	1	1	1	0.9	0.9	0.8	0.8
Short-circuit breaking correction coefficient(Ue=240V/480V/600V)	1	1	0.95	0.85	0.85	0.75	0.75

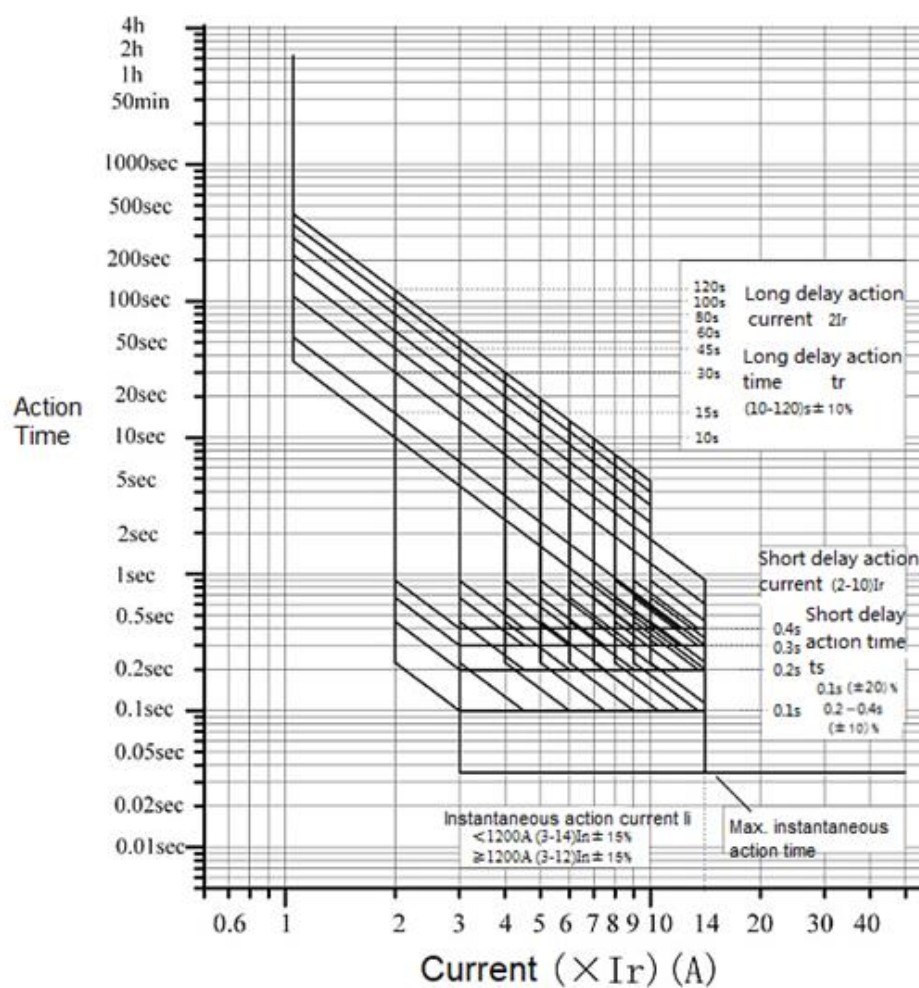
5. Normal Working Environment

- 1) Elevation should be no more than 2500m. for detail please see MCCB high elevation degrade coefficient table;
- 2) The applicable environment temperature range of the ETB product is from -35°C ~ +70°C. The applicable environment temperature range of the ETC-PT product is from -25°C ~ +45°C. The average

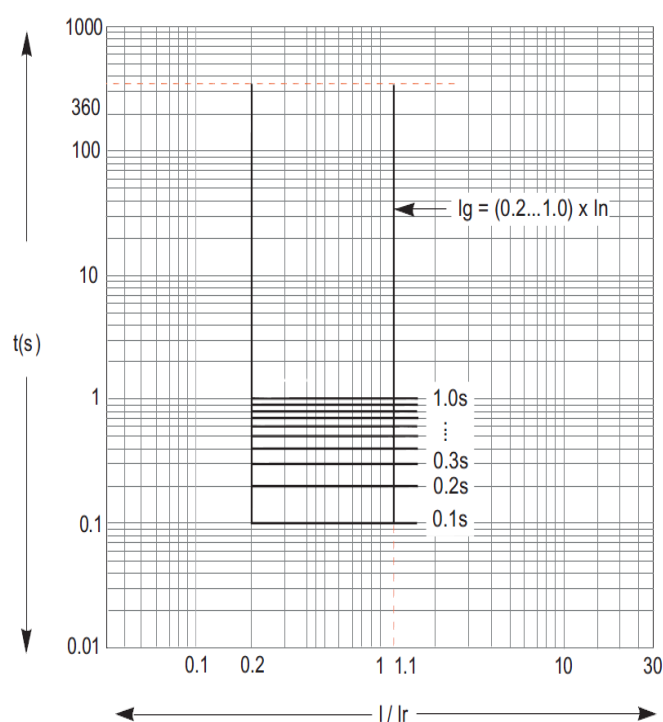
- temperature within continuous 24 hours should no more than $+35^{\circ}\text{C}$. If the environment temperature is higher than $+40^{\circ}\text{C}$. The MCCB should be used with degrade. For detail please see MCCB high temperature degrade coefficient table;
- 3) Its relative humidity at an ambient temperature of $+40^{\circ}\text{C}$ should not exceed 50%. A higher relative humidity is allowed at a lower temperature. For example, the relative humidity at 20°C can reach 90%; for frost due to temperature change, the corresponding measures should be taken;
 - 4) Products can resist from humid air, salty and oily fog and mould.
 - 5) Installation category for MCCB connecting to main circuit: type III(power distribution and control level), Installation category for MCCB disconnecting to main circuit: type II (load level)
 - 6) Class of pollution: 3;
 - 7) IP Code: IP20
 - 8) The product should be installed in places that are free from explosive media, media corrosive to metal, insulation damaging gas, and conductive dust.
 - 9) When products are intended to applied in harsher conditions than above ones, users should contact with manufacturer.

6. Tripping Characteristics

Tripping characteristic curve of NDM5EU-1600 under normal environment, see the picture below:



long-delay/ short-delay/ instant



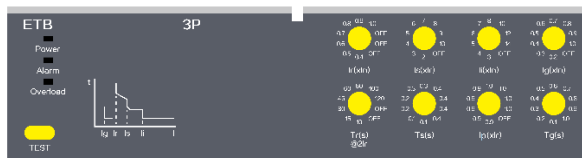
Ground fault

7. Electronic controller instruction

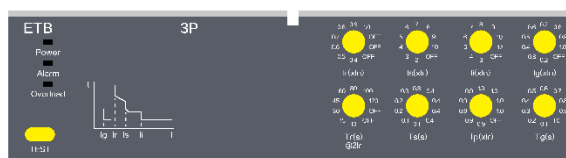
7.1 Controller manual

7.1.1 controller panel

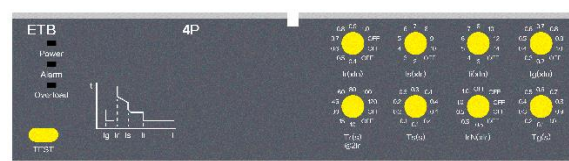
Nameplate of basic controller



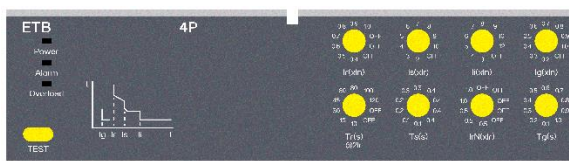
(3P 800A、1000A)



(3P 1200A)

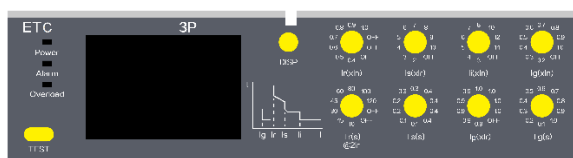


(4P 800A、1000A)

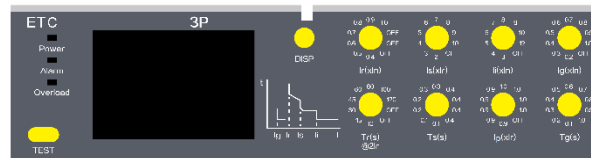


(4P 1200A)

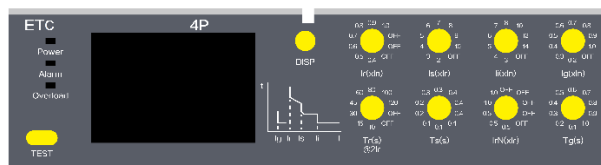
Nameplate of screen controller



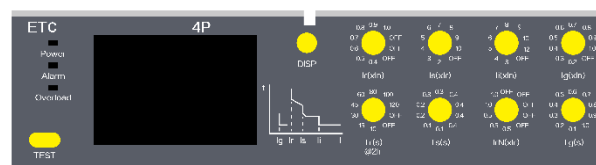
(3P 800A、1000A)



(3P 1200A)



(4P 800A、1000A)



(4P 1200A)

Component of circuit breaker controller panel

1. Ir Overload long delay current setting
2. Tr Overload long delay time setting
3. Is Short circuit short delay current setting
4. Ts Short circuit short delay time setting
5. Ii Short circuit instantaneous current setting
6. Ip Pre-alarm current setting
7. Ig GF current setting
8. Tg GF time setting
9. Irn N phase protection current setting
10. In Rated current
11. TEST test port

- 12. Power Power indicator
- 13. Alarm Pre-alarm indicator
- 14. Overload Overload indicator
- 15. DISP display in turns

Note: Settings must be operated by professionals

7.1.2 functions of controller panel components

(1) test port

NDM5EU-1600 dedicated device connect with controller through this port to test, adjust, etc. when the ETC-PT is required, the communication adaptor is also connected through this port.

(2) current、time rotary button

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

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

For example: .When $I_n=1200A$, Ir is set to 1.0, Tr to 10s and the current through main circuit is $2 \times 1200A$, the circuit breaker will trip after lasting 10s. The accuracy of action time is $\pm 10\%$.

At the overload current, the tripping time of the main circuit followed by on the formula below: $t=(2 \cdot I_r/I)^2 \cdot T_r$

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

(3) DISP alternate display button

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

7.1.3 indicator light

(1) Power indicator light

Light is on when controller working

(2) Alarm indicator light

Light twinkles when actual current exceeds the pre-alarm current setting value I_p . After the time of $T=(2 \cdot I_r/I)^2 \cdot T_r / 2$, the yellow keeps on.

(3) Overload indicator light

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

7.2 Controller parameter setting

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

Table 7-1

Rated current In (A)	Poles	Current, time parameter							
		Ir($\times$ In)	Tr(s)	Is($\times$ Ir)	Ts(s)	Ig($\times$ In)	Tg(s)	Ii($\times$ In)	Ip($\times$ Ir)
800/1000	3	0.4,0.5,0.6,	10,15,30,45,	2,3,4,5,6,7,8	0.1,0.2,	0.2,0.3,0.4,0.5,	0.1,0.2,0.3,0.4,	3,4,5,6,7,8,	0.9,1.0,
		0.7,0.8,0.9, 1.0,OFF	60,80,100, 120,OFF	,9,10,OFF	0.3, 0.4	0.6,0.7,0.8,0.9, 1.0,OFF	0.5,0.6,0.7,0.8, 0.9,1.0	10,12,14, OFF	OFF
1200	3	0.4,0.5,0.6,	10,15,30,45,	2,3,4,5,6,7,8	0.1,0.2,	0.2,0.3,0.4,0.5,	0.1,0.2,0.3,0.4,	3,4,5,6,7,8,9,	0.9,1.0,
		0.7,0.8,0.9, 1.0,OFF	,60,80,100, 120, OFF	,9,10,OFF	0.3, 0.4	0.6,0.7,0.8,0.9, 1.0,OFF	0.5,0.6,0.7,0.8, 0.9,1.0	10,12,OFF	OFF

Table 7-2

Rated current In (A)	Poles	current time parameter							
		Ir($\times$ In)	Tr(s)	Is($\times$ Ir)	Ts(s)	Ig($\times$ In)	Tg(s)	Ii($\times$ In)	IrN($\times$ Ir)
800/1000	4	0.4,0.5,0.6,	10,15,30,45,	2,3,4,5,6,7,8	0.1,0.2,	0.2,0.3,0.4,0.5,	0.1,0.2,0.3,0.4,	3,4,5,6,7,8,1	0.5,1.0,
		0.7,0.8,0.9, 1.0,OFF	60,80,100, 120, OFF	,9,10,OFF	0.3, 0.4	0.6,0.7,0.8,0.9, 1.0,OFF	0.5,0.6,0.7,0.8, 0.9,1.0	0,12,14, OFF	OFF
1200	4	0.4,0.5,0.6,	10,15,30,45,	2,3,4,5,6,7,8	0.1,0.2,	0.2,0.3,0.4,0.5,	0.1,0.2,0.3,0.4,	3,4,5,6,7,8,9	0.5,1.0,
		0.7,0.8,0.9, 1.0,OFF	60,80,100, 120, OFF	,9,10,OFF	0.3, 0.4	0.6,0.7,0.8,0.9, 1.0,OFF	0.5,0.6,0.7,0.8, 0.9,1.0	,10,12, OFF	OFF

7.3 function introduction

7.3.1 table of basic function (see table 8)

Table 8

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

		action time, fault phase	—	
		Overvoltage protection ,under-voltage protection ,action time, fault phase		
		Operation time with electricity		
		Abrasion of contact		
		Alarm record		
screen		Open and Closing record	—	10
		real time current		
		real time volatge		
		power energy frequency		
		setting value display		
		Last time fault type fault current/ voltage	—	√
		action time happen time		

Note a: when choosing ETC-PT type product, Current protection parameters and the measurements can be read through the communication adapter.

Note b: when choosing ETC-PT type product, the overvoltage and under-voltage protection function is disabled by default. This function can be turned on through the communication adapter. For 3P product, the overvoltage protection value is 1.2Ue, the under-voltage protection value is 0.8Ue. For 4P product, the overvoltage protection value is 1.2Ue/1.732, the under-voltage protection value is 0.8Ue/1.732. Ue default value is 480V, it can be modified according to the customers' needs.

Note c: Frequency default setting: 60Hz

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

7.3.2 Setting value of the controller

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

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

Table 9 Overload Long-Delay Protection Parameter Setting

Setting current Ir		(0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, OFF) ×In tolerance±3%							
Action characteristics	Tr@2Ir setting gear (s)	In=800/1000/1200A							
		10	15	30	45	60	80	100	120
	≤1.05Ir	> 2h (no action)							
	> 1.30Ir	< 1h (action)							
	At1.5Ir tr (s)	17.77	26.67	53.33	79.99	106.67	142.22	177.77	213.33
	At 2.0Ir tr (s)	10	15	30	45	60	80	100	120
	Accuracy (%)	±10							

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

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

I: Actual working current

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

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

(2) The overload long delay has a thermal memory function, which can be activated 20 minutes after the tripping of the circuit breaker.

When the energy of the first trip is $QT = (2 * Ir)^2 * T$, T is the trip time. The energy lost at interval T1 is

$Q1 = QT \times T1 / T_{thm}$, the energy required for the second trip is $Q0 = QT - Q1$, that is, the second trip time is $t = (QT - Q1) / (2 \times Ir)^2$; For thermal memory function, please contact the manufacturer.

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

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

Table 10 Short Circuit Short Delay Protection Parameter Setting

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

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

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

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

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

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

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

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

Table 11 Short-Circuit Instant Protection Parameter Setting

Action characteristic	setting current gear $Ii (\times In)$	See Table 7-1,7-2
	current accuracy(%)	±15
	$I \geq 1.15Ii$ action time	<50ms
	$I \leq 0.85Ii$	no action

(5) Ground fault protection (see Table 12)

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

Table 12 Ground Fault Protection Parameter Setting

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

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

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

(6) N phase protection

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

Table 13 N-Phase Protection Setting Value

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

1.0Ir	when neutral phase has overload and short-delay fault, protection action time is setting value.
OFF	Instantaneous protection only

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

(7) overload pre-alarm (see table 14)

Table 14 Controller with Pre-Alarm Function

Setting current Ip		see table 7-1	Accuracy （%）	Note
Action characteristics	< 0.9 IP	pre-alarm indicator light change from twinkling to keeping on	±10	No gear setting for 4-pole controller. Fixed 0.9 Ir
	>1.1 IP	pre-alarm indicator light change from twinkling to keeping on		
	OFF	OFF	OFF	
Function Description		when $I \geq IP$, the warning indicator (yellow light) flashes. After $t = t / 2$, the indicator turns to be on continuously.		

7.3.3 Measurement accuracy

Table 15 Measurement Accuracy Parameter

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

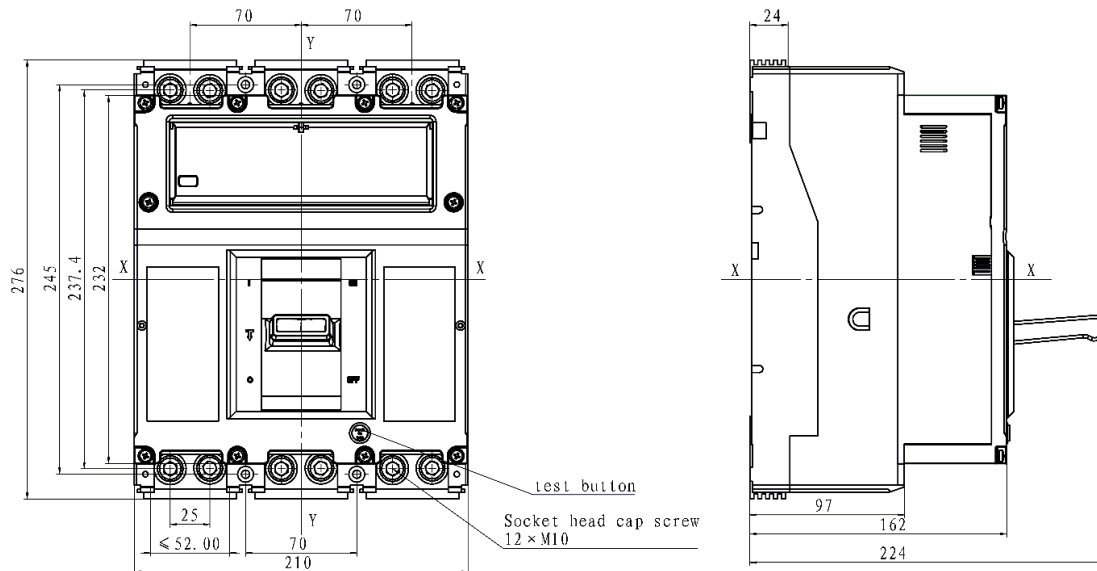
7.3.4 Health management

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

Note: It can only be read through communication.

8. Products Configuration and Installation Dimension

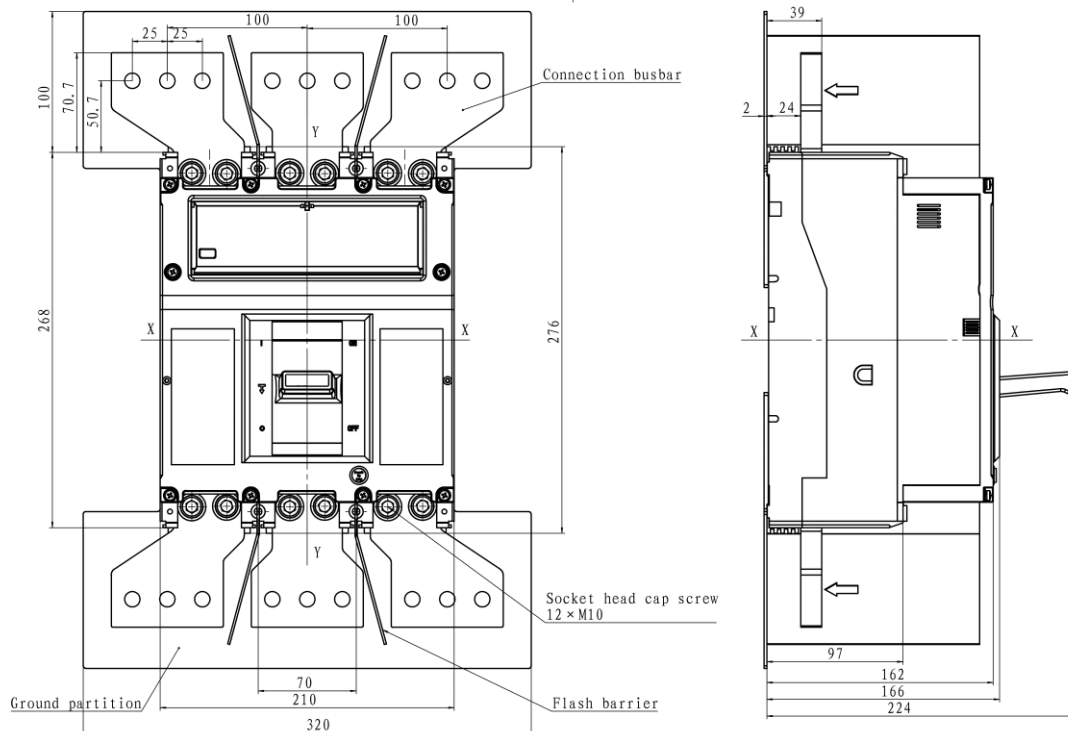
8.1 Boundary dimension of 3 poles front connection product



Note: 1. The unmarked dimensional tolerance shall be in accordance with GB / T 1804-c.

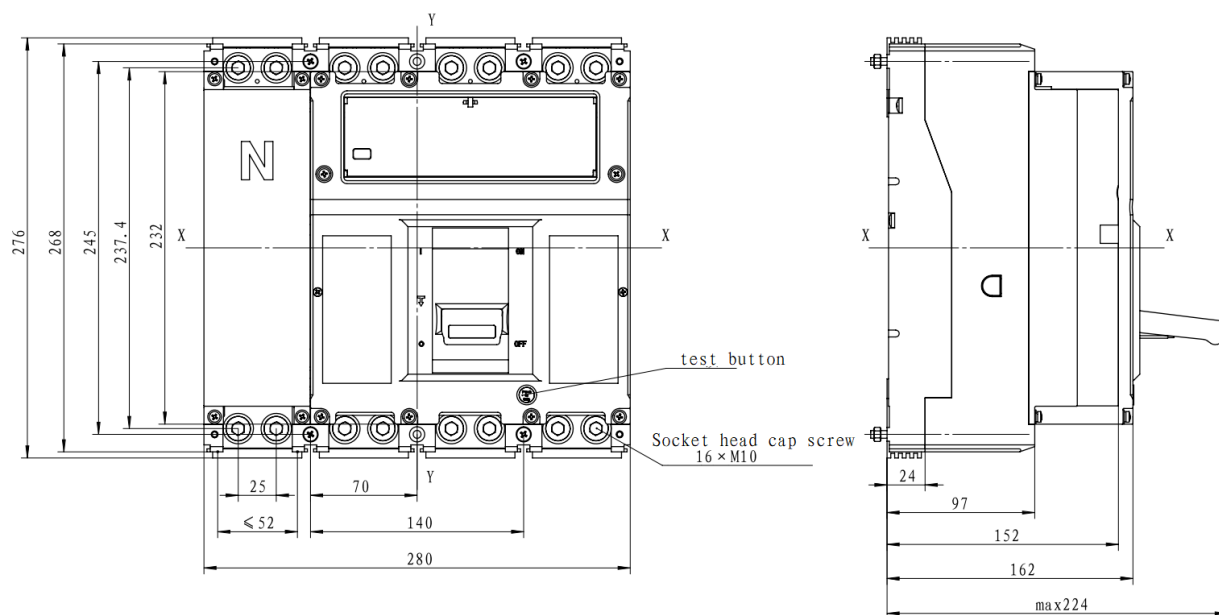
2. When the product is installed on a metal plate, the insulating base plate provided with the product (or provided by the customer) must be installed between the product and the metal plate.

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



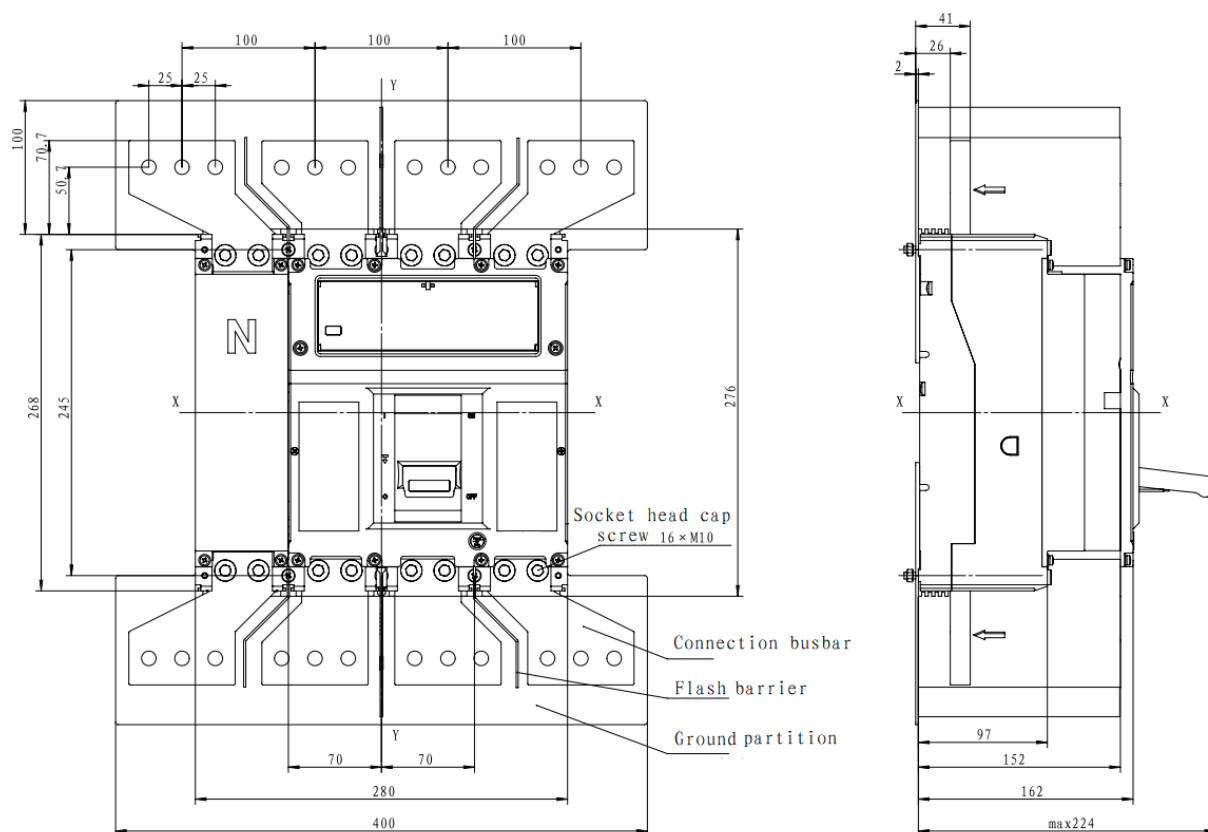
Note: the unmarked dimensional tolerance shall be in accordance with GB / T 1804-c.

8.3 Boundary dimension of 4 poles front connection product



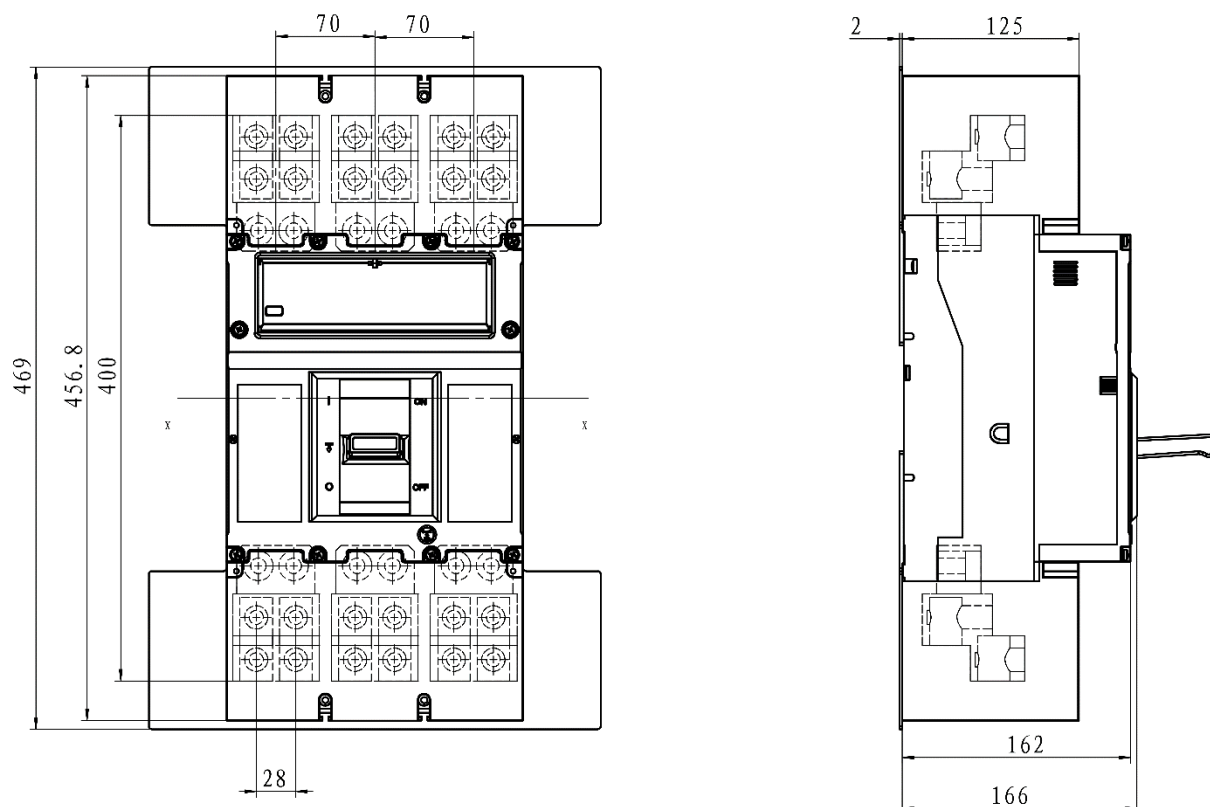
Note: the unmarked dimensional tolerance shall be in accordance with GB / T 1804-c.

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



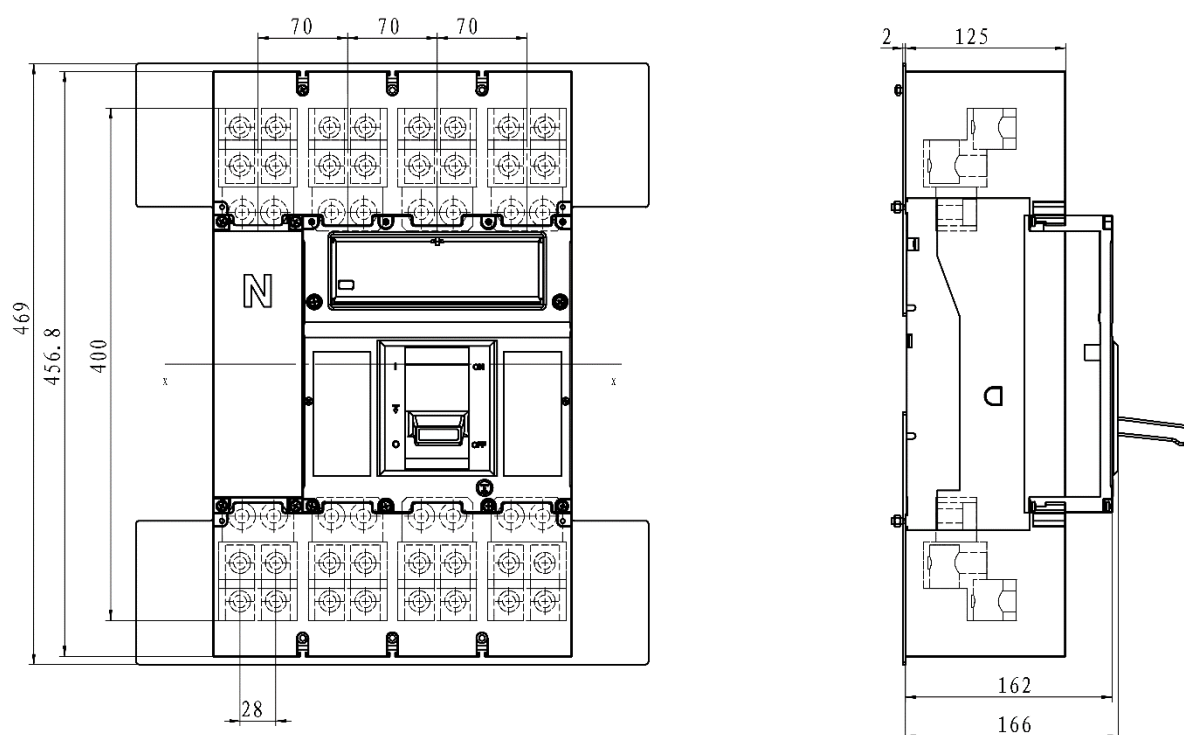
Note: the unmarked dimensional tolerance shall be in accordance with GB / T 1804-c.

8.5 Boundary dimension of 3 poles front connection product with LUG and terminal cover



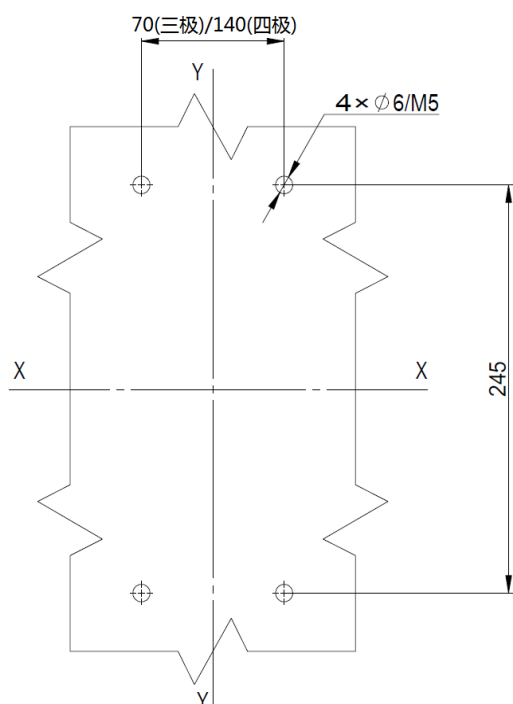
Note: the unmarked dimensional tolerance shall be in accordance with GB / T 1804-c.

8.6 Boundary dimension of 4 poles front connection product with LUG and terminal cover



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

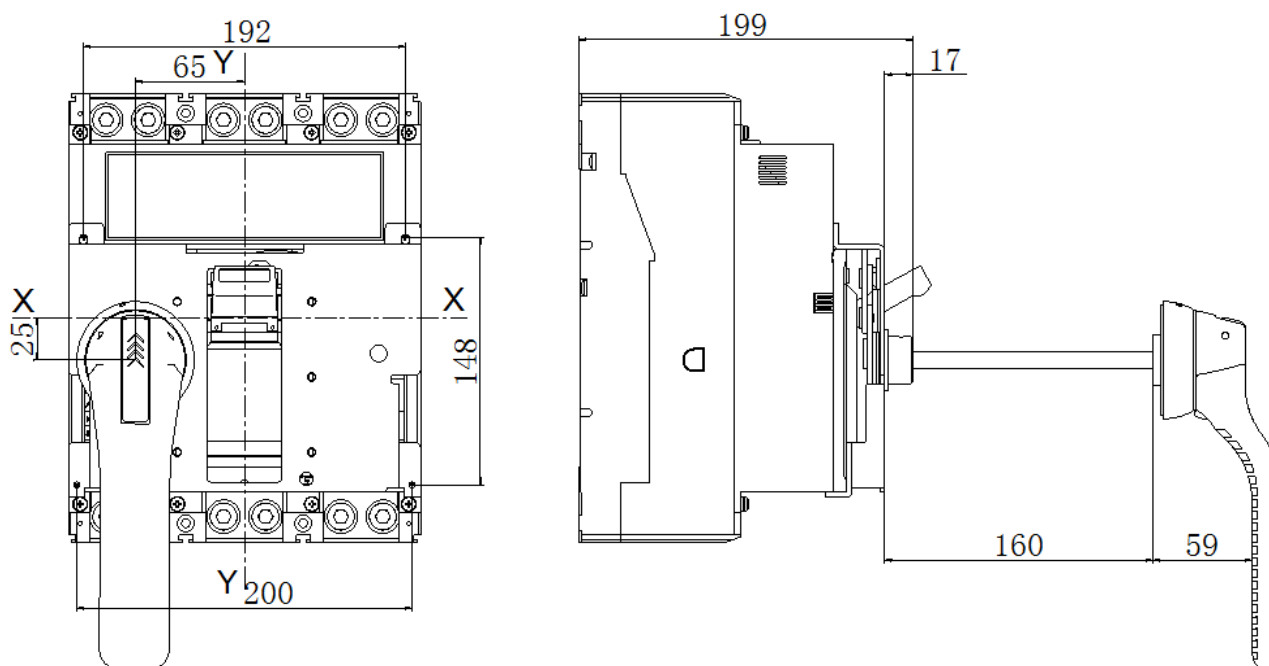
8.7 Installation dimension for 3 poles and 4 poles products



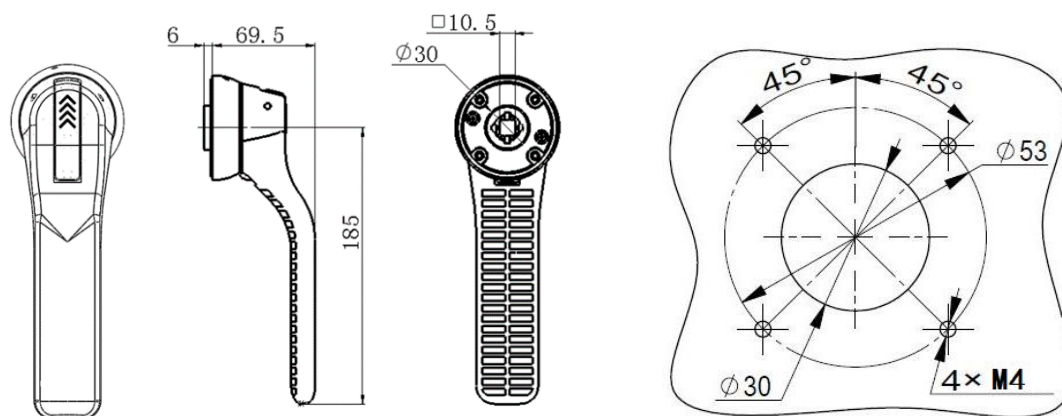
Note: 1) The crosspoint between X-X and Y-Y is the center of the 3-P and 4-P circuit breaker, as shown in the figure
2) Note: the unmarked dimensional tolerance shall be in accordance with GB / T 1804-c.

8.8 Rotary handle operation mechanism

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



External dimensions of manual operation mechanism

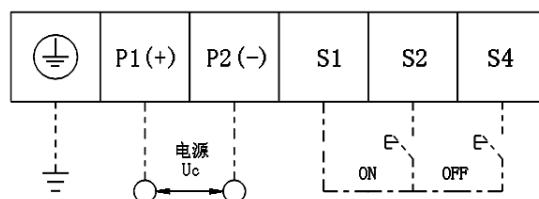
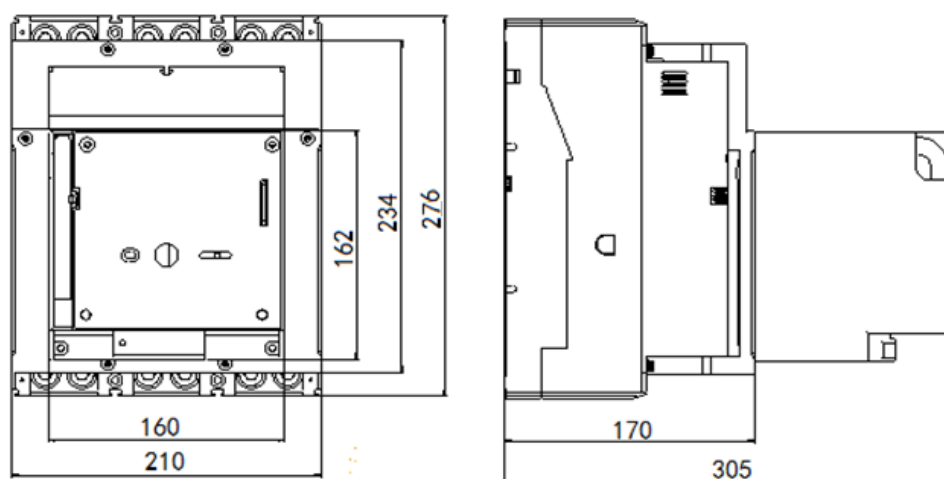


Trepanning schematics of manual operation-handle

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

8.9 Motor operation mechanism

The external dimensions of motor-circuit breaker and its motor operation mechanism after installation is shown as below, parameter see table 15.



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

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

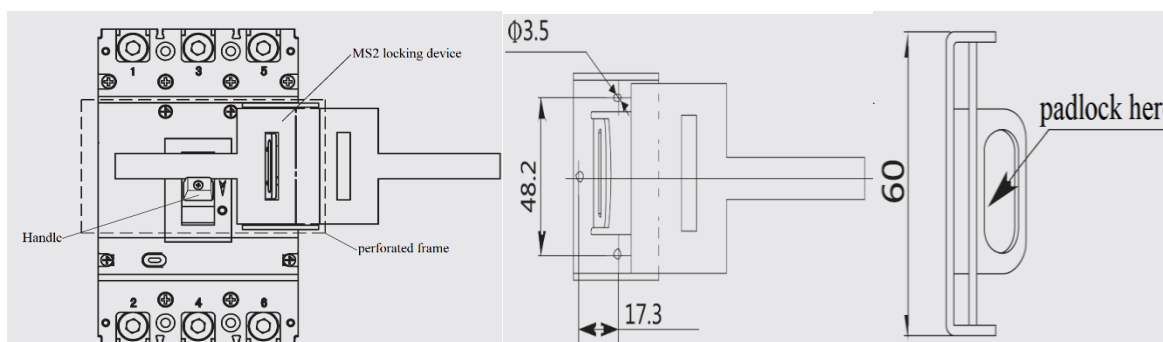
3) unlabeled tolerance of dimension follow GB/T1804-c.

Table 16 Voltage specification and power of electric operation

Accessory	Motor operation mechanism				
Power specification	UL489、 IEC 60947-2、 GB/T 14048.2	UL489	IEC 60947-2、 GB/T 14048.2	UL489	IEC 60947-2、 GB/T 14048.2
	DC24V	AC/DC120V	AC/DC110V	AC/DC240V	AC/DC230V
Power dissipation	240W	400W		400W	

8.10 MS2 locking device

MS2 is a split locking device (i.e. the device is installed on the left or right side of the Disconnecting Switch cover, and the default is installed on the right side if there are no special requirements). It is used for products to prevent manual closing and opening



Installation diagram of MS2 lock mechanism (Unit: mm)

Note 1: The limit deviation not indicated with the tolerance dimensions is as per GB/T 1804-c.

8.11 Busbar thickness and connection screw size

Table 17 connection screw size

Code	Busbar thickness (mm)	Hexagon socket screw length(mm)
1	6、 8	M10×30
2	10、 12	M10×35
3	15	M10×40
4	20	M10×45
5	LUG terminal	M10×45
Note: the length of hexagon socket screw need to be noticed when the orders are placed.		

8.12 Safety Clearance

When installed, the least safety clearance for top, bottom, flank side should accord to table 17 See picture below.

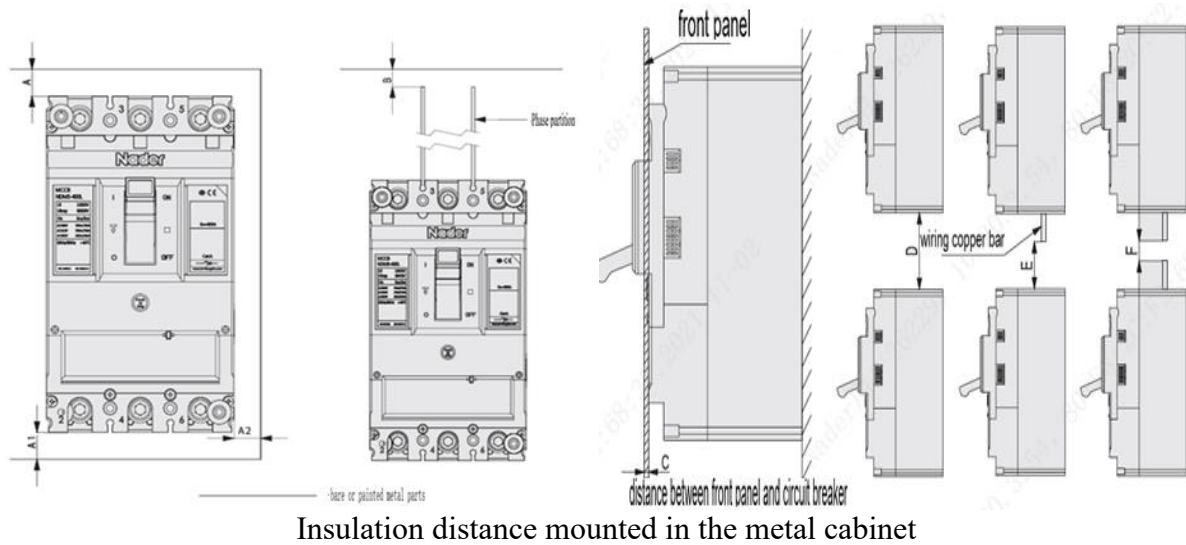
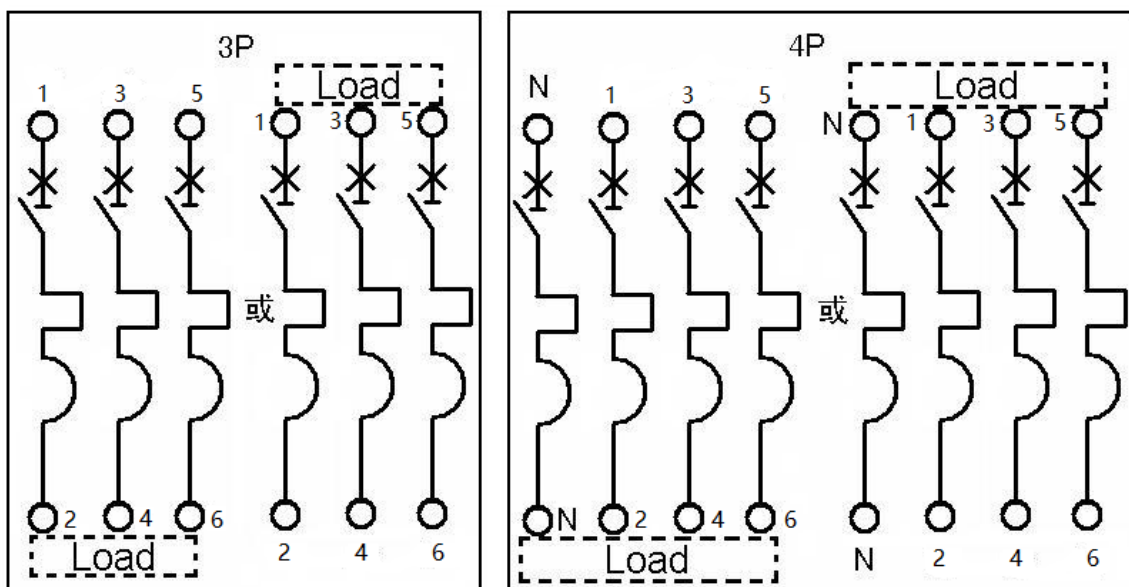


Table 18 Insulation distance mounted in the metal cabinet (unit: mm)

Model	Spacing A	Spacing A1	Spacing A2	Spacing B	Spacing C	Spacing D	Spacing E	Spacing F
NDM5EU-1600	≥ 150	≥ 30	≥ 85	≥ 50	≥ 60	≥ 180	≥ 150	≥ 40

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

8.13 Main circuit wiring mode of AC products



9. Accessory

9.1 under-voltage release

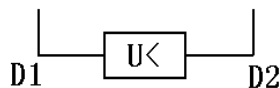
When voltage of power supply decreases to 35% to 70% of the rated of working under-voltage release, the under-voltage release can trip the MCCB reliably. When voltage of power supply decreases below its 35%, the under-voltage release can prevent the MCCB from closing operation. When voltage of power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

Voltage specification and power dissipation of under-voltage release (see table 19)

Table 19 Rated Parameters of the Under-voltage Release

Accessory	under-voltage release			
Voltage specification (V)	UL489	IEC 60947-2、 GB/T 14048.2	UL489	IEC 60947-2、 GB/T 14048.2
	AC/DC120	AC/DC110V	AC/DC240	AC/DC230V
Maintaining dissipation (W)	8		9	
Instantaneous dissipation (W)	250		530	
Code	Q1-12T		Q1-24T	

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



Working Diagram of Under-voltage Release

9.2 shunt trip release

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

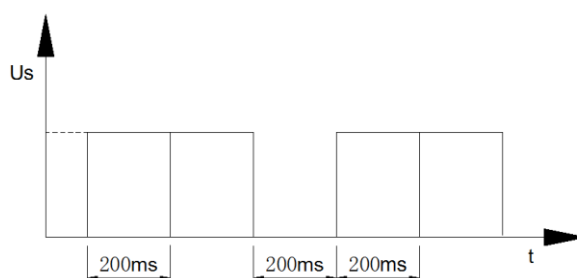
The specification and power dissipation see table 20

Table 20 Rated Parameters of the Shunt Release

Accessory	Shunt release				
Voltage specification (V)	UL489、IEC 60947-2、GB/T 14048.2	UL489	IEC 60947-2、GB/T 14048.2	UL489	IEC 60947-2、GB/T 14048.2
	DC 24V	AC/DC 120V	AC/DC110V	AC/DC 240V	AC/DC230 V
Maintaining dissipation (W)	5	5		5	
Instantaneous dissipation (W)	250	250		340	
Code	FT1-02T	FT1-12T		FT1-24T	

Principal of shunt release: single pulse reaction (energized time recommended to be longer than 200ms). If a second action is needed, shunt release should energize after deenergizing and re-latching (interval time

recommended to be longer than 200ms). The time between shunt release energized (receiving signal) to product tripped is 100ms.



Working principle diagram of shunt tripper

9.3 The nominal parameter of auxiliary contact (see table 21)

Table 21 Rated parameters of the auxiliary contact

Accessory		Auxiliary contact (Conventional)		Auxiliary contact (Low power consumption)
Voltage specification (V)/conventional heating current (I _{th})		UL489	IEC 60947-2、GB/T 14048.2	UL489、IEC 60947-2、GB/T 14048.2
		AC250V/5A、DC220V/0.2A	AC250V/10A、AC400V/3A、DC220V/0.2A	DC30V/10mA
Wiring diagram	Open			
	Close			
Internal resistance		<30m Ω		<50m Ω
Code		F1-11		F2-11

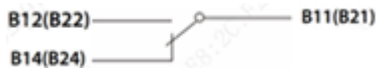
Note1: If DC30V/10mA auxiliary contact is needed, it should be noticed in the order.

Note2: The first auxiliary harness is identified as F11 (red), F12 (white), F14(yellow), and the second auxiliary harness is identified as F21 (red), F22(white), F24 (yellow), and so on. At most four groups of auxiliary harness are installed.

9.4 The nominal parameter of alarm contact (see table 22)

Table 22 Rated parameters of the alarm contact

Accessory		Alarm contact (Conventional)		Alarm contact (Low power consumption)
Voltage specification (V)/conventional heating current (I _{th})		UL489	IEC 60947-2、GB/T 14048.2	UL489、IEC 60947-2、GB/T 14048.2
		AC250V/5A、DC220V/0.2A	AC250V/10A、AC400V/3A、DC220V/0.2A	DC30V/10mA
Wiring diagram	Open/ close			

	Free trip		
Internal resistance		<30mΩ	<50mΩ

Note 1: If DC30V/10mA auxiliary contact is needed, it should be noticed in the order.

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

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

9.5 Communication adaptor DF-MB/C3

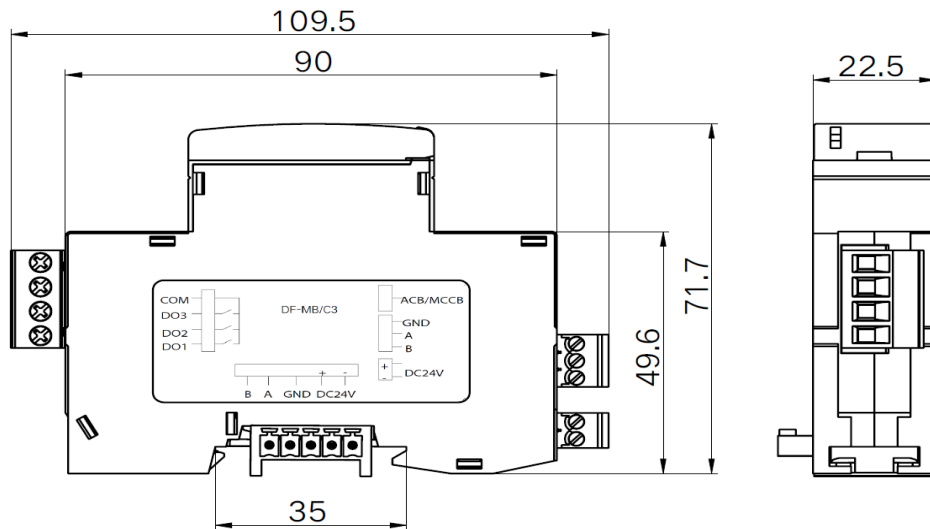
Installing by DIN35 standard slide rail, the dimension of single product is shown as below. If there is a T in the MCCB release code, this unit is contained NDT2570020.

Main parameter is shown as below

Table 23 Main Parameter of Communication Adaptor

Communication adaptor common parameter		
Electrical characteristic	Power supply	24V DC (19.2~28.8VDC)
	Power dissipation	40mA
Communication	Port	RS485, 2 Modbus RTU
	Optional address	1~99
	Baud rate	2400/4800/9600/19200bps
	Check bit	CRC check odd-even check not supported
	Maximum number of single unibus	32
Physical characteristic	Demension	90×71.7×22.5mm (terminal not included)
		109.5×71.7×22.5mm (terminal included)
	Weight	0.075kg
	Installation method	2*35mm standard DIN35 slide rail
Environment characteristic	Working temperature	-25℃~45℃
	Restoring temperature	-40℃~75℃
	Ambient condition	surrounding temperature 40℃, relative humidity 95%
	Pollution	3
	Fire resistance	UL94-V0
	Protection level	IP20

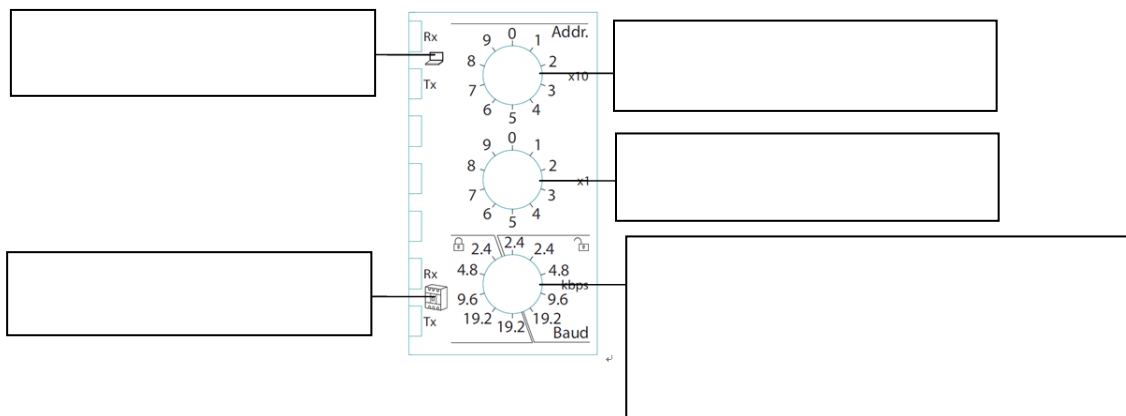
Definition of outside dimension, installation dimension and single terminal



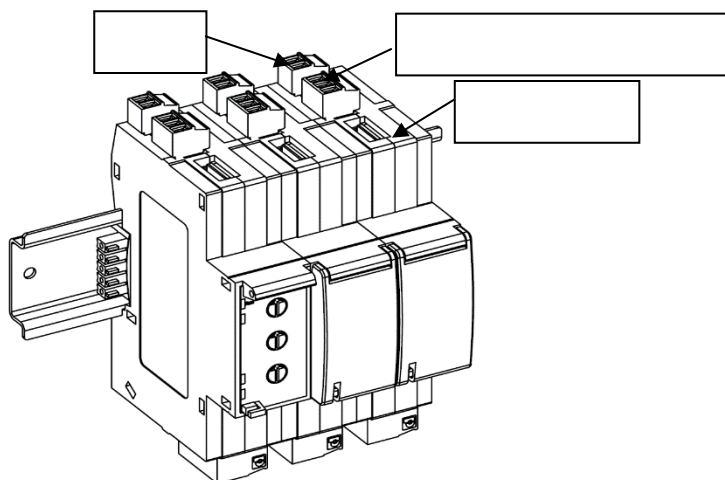
External Dimension of Communication Adaptor

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

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



Gear Adjustment of Communication Adaptor

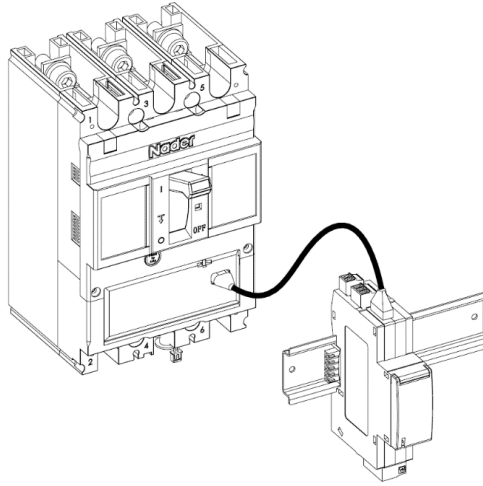


Terminal Ports of Communication Adaptor

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

For specific features and parameters, please refer to NDT-29252-DF-MB/C3 Communication Adaptor manual.
Notice2 :multiple numbers of adapters can be cascade installed (maximum 32). Each MCCB can set address(1~99), there are 2400、4800、9600、19200bps, four option for baud rate set.

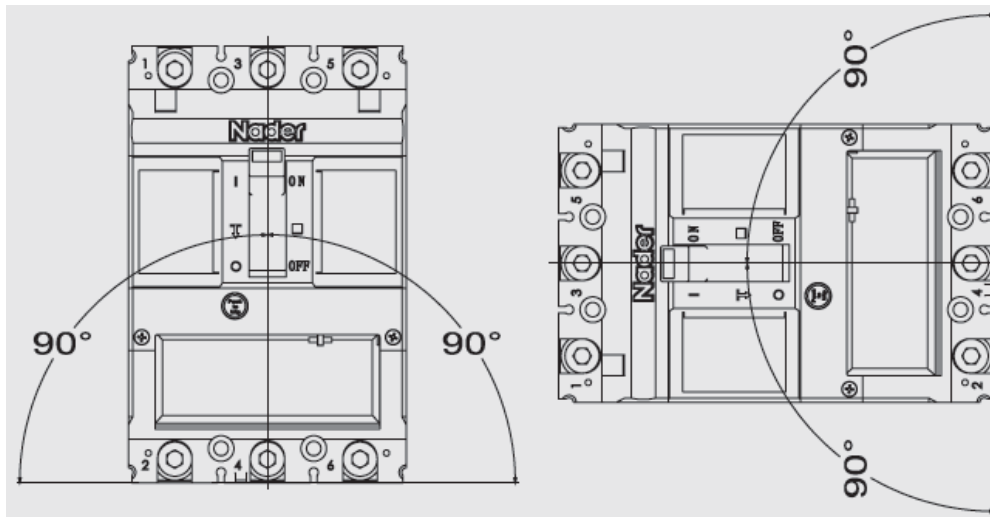
Notice3: when communication adaptor in temperature $-35^{\circ}\text{C}\sim 25^{\circ}\text{C}$, we suggest to decline baud rate to increase communication reliability.



Terminal Ports of Communication Adaptor

10.installation direction

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



Vertical Installation

Horizontal Installation

11. Packaging and Storage

Minimum packaging quantity: 1 piece/box. The packaged products should be stored in a warehouse with the ambient temperature of $-40^{\circ}\text{C}\sim +75^{\circ}\text{C}$ and the corresponding relative humidity below 80% without acidic, alkali or other corrosive gas in the surrounding air. Under the conditions above, the storage period shall be no more than 36 months since the manufacturing date.

12. Environmental Protection

Conform to the RoHs directive

13. List of Accessories and Installation

SN	Name	Specification	3P Quantity/Set 3P	4P Quantity/Set 4P
1	Cross small pan-head screw	M5×110	4	4
2	Hexagon nut	5	4	4
3	Spring washer	5	4	4
4	Plain washer	M5	4	4
5	Phase partition	——	4	6
6	Terminal screw*	M10×30	12	16
		M10×35	12	16
		M10×40	12	16
		M10×45	12	16

Note :1. See Table 16 for Terminal screw, M10×35 by default.

2.The default length for phase partition is 110mm , if need 35mm, please contact the manufacturer.

14. Precautions

- 1) Various characteristics and accessories of the circuit breaker are set in the factory. The circuit breaker, tripping unit or other accessories can only be adjusted, installed and maintained by the trained or qualified professionals according to the parameter requirements of the line design;
- 2) Ensure that the power supply is off before installing or removing any device;
- 3) The circuit breaker handle can be located in three positions, indicating three states: on, off and free tripping. When the handle is in the free tripping position, pull the handle in the off direction when the circuit breaker is connected and on.