

Shanghai Liangxin Electrical Co., Ltd.

NDM3DE-400 Product Specification

(IPD-ENG-DEV-T20 A2 2023-03-14)

Prepared by		Date	
Reviewed by		Date	
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Approved by		Date	

Revision History					
Version	Revision Reason/Content	Implementation Date	Prepared by	Reviewed by	Approved by
0	Newly Added	20241008	Wang Zhongbin	Zhang Ying	Ao Zhining
1	1.Revise the characteristic curve graph 2. Add wiring requirements for terminal N-1	20241223	Wang Zhongbin	Zhang Ying	Ao Zhining

1 Application Scope and Purpose

NDM3DE-400 intelligent molded case circuit breaker is suitable for infrequent switching in circuits with AC 50Hz/60Hz, working voltage AC380V to AC415V, and rated working current 250A~400A. With the overload, short-circuit, short-circuit short time-delay, and undervoltage functions, the circuit breaker can protect the lines and power equipment from being damaged.

Circuit breakers can provide feedback to the terminal devices on current, voltage, power, energy, life and other information with meter-level accuracy, which is used to detect and monitor the load side, reduce the operation and maintenance costs of the power grid, and provide necessary data for future energy-efficiency systems.

2 Picture of the Product



Picture 1: 400-3P



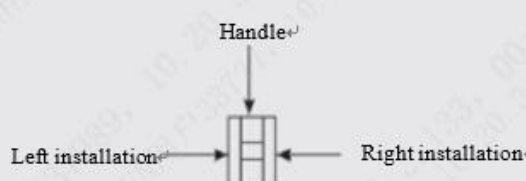
Picture 2: 400-4P

3 Specifications and Models Description

ND	M	3	DE	-	400	□	□	/	□	□	□	□	□	□	□
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
SN	SN name					NDM3DE									
1	Enterprise code					ND: "Nader" low-voltage apparatus									
2	Product code					M: Molded case circuit breaker (MCCB)									
3	Design SN					3									
4	Derived code of the series					DE: Intelligent type									
5	Shell frame level					400									

6	Breaking capacity level	S: S-type breaking M: M-type breaking H: H-type breaking U: U-type breaking
7	Operation mode	No code: Direct handle-operated mode
		Z: Rotation handle
8	Means of communication	No code: RS485; BT: Bluetooth
9	Number of poles	3: 3-pole 4: 4-pole
10	Accessory code	See Remarks
11	Application code	No code: Power distribution type
		2: Motor protection type
12	N-pole (neutral pole) type of the 4P product	A: The N-pole isn't installed with an overcurrent release, but always connected
		B: The N-pole isn't installed with an overcurrent release, but on-off with the other three poles
		C: The N-pole is installed with an overcurrent tripper, and on-off with the other three poles
		D: The N-pole is installed with an overcurrent tripper, but always connected
13	Contact/Busbar Temperature Measurement	No code: no temperature measurement; WB: with temperature measurement function
14	Rated current	250、400
15	Other code	CS1-A/150: Circular center hole rotary handle + shaft length 150mm
		CS1-A/200: Circular center hole rotary handle + shaft length 200mm
		CS1-A/300: Circular center hole rotary handle + shaft length 300mm
		CS1-A/350: Circular center hole rotary handle + shaft length 350mm
		CS1-A/650: Circular center hole rotary handle + shaft length 650mm
		CS1-F/150: Square center hole rotary handle + shaft length 150mm
		CS1-F/200: Square center hole rotary handle + shaft length 200mm
		CS1-F/300: Square center hole rotary handle + shaft length 300mm
		CS1-F/350: Square center hole rotary handle + shaft length 350mm
		CS1-F/650: Square center hole rotary handle + shaft length 650mm
		CS2-A/150: Circular eccentric hole rotary handle + shaft length 150mm
		CS2-A/200: Circular eccentric hole rotary handle + shaft length 200mm
		CS2-A/300: Circular eccentric hole rotary handle + shaft length 300mm
		CS2-A/350: Circular eccentric hole rotary handle + shaft length 350mm
		CS2-A/650: Circular eccentric hole rotary handle + shaft length 650mm
		CS2-F/150: Square eccentric hole rotary handle + shaft length 150mm
		CS2-F/200: Square eccentric hole rotary handle + shaft length 200mm
		CS2-F/300: Square eccentric hole rotary handle + shaft length 300mm
		CS2-F/350: Square eccentric hole rotary handle + shaft length 350mm
		CS2-F/650: Square eccentric hole rotary handle + shaft length 650mm
		AC230V: Shunt release operation voltage AC230V
		AC380V: Shunt release operation voltage AC380
		DC24V: Shunt release operation voltage DC24V
		DC220V: Shunt release operation voltage DC220V

Remarks:

			Legend:	
			- Single auxiliary contact - Dual-auxiliary contact - Alarm contact - Shunt release - Auxiliary alarm contact (a single accessory features the auxiliary and alarm functions)	
Accessory code	Installation Position	Model	NDM3DE-400	
			3/4A/4D	4B/4C
300	None		—	—
310	Shunt release			
320	Dual-auxiliary contact			
321	Single auxiliary contact			
340	Shunt release, dual-auxiliary contact		—	
341	Shunt release, single auxiliary contact			
360	Two sets of dual-auxiliary contacts		—	
361	Two sets of single auxiliary contacts			
362	Dual-auxiliary contact Single auxiliary contact			
308	Alarm contact			
318	Shunt release, alarm contact			
328	Dual-auxiliary contact, alarm contact			
348	Shunt release Auxiliary alarm contact			
358	Auxiliary alarm contact			
368	Dual-auxiliary contact Auxiliary alarm contact			
344	Shunt release, dual auxiliary contact, alarm contact		—	

4 Main Technical Parameters

4.1 Electrical parameters

Table 1 Main technical parameters

Model			NDM3DE-400			
Rated current of frame Inm (A)			400			
Rated current In (A)			250,400			
Number of poles			3, 4			
Rated operating voltage Ue (AC V)			380/400/415			
Rated insulation voltage Ui (AC V)			1000			
Rated impulse withstand voltage Uimp(V) ¹			8000			
Power frequency withstand voltage U (1 min) (V) ²			3500			
Flashover distance (mm)			≤100			
Utilization category			B			
Rated short-time withstand current Icw (kA/1s)			8			
Breaking capacity level			S	M	H	U
Rated ultimate short circuit Breaking capacity Icu		AC380 400/415V	50	70	85	100
Rated operating short circuit Breaking capacity Ics		AC380 400/415V	50	70	85	85
Operating performance (times)	Electrical life 415V		7500			
	Mechanical life	Maintenance-free life	10000			
		Maintainable life	20000			
External dimensions		L (mm)	257			
		W (mm)	3P:140 4P:184			
		H (mm)	121			

Notes 1 and 2: It is required to remove the voltage sampling line

4.2 Other parameters

4.2.1 Selection of the cross-section area for the circuit breaker connecting bus or cable

Table 2 Selection of the Cross-section Area for the Connecting Bus or Cable

Rated current (A)	250	400
Cross-section area	120	240

4.2.2 Tightening Torque of the Circuit Breaker Connection Terminal and Mounting Screw

Table 3 Tightening Torque of the Circuit Breaker Connection Terminal and Mounting Screw

Model	Thread Diameter (mm)	Torque (N·m)
NDM3DE-400	M10	20
	M5	4

4.2.3 Derating factor of temperature change for the circuit breaker

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

Model	Derating factor of product temperature change							
	Temperature (°C)	40	45	50	55	60	65	70
NDM3DE-400	Derating factor	1	1	1	0.978	0.957	0.934	0.911

4.2.4 High-altitude derating factor of the circuit breaker

Table 5 High-altitude Derating Factor Table of Circuit Breaker

Altitude (m)	Correction factor of the working current	Power Frequency withstand voltage (V)	Insulation voltage (V)
2000	1	3500	1000
2500	1	3500	1000
3000	0.98	3150	900
3500	0.97	3000	850
4000	0.95	2800	810
4500	0.94	2650	770
5000	0.93	2500	730

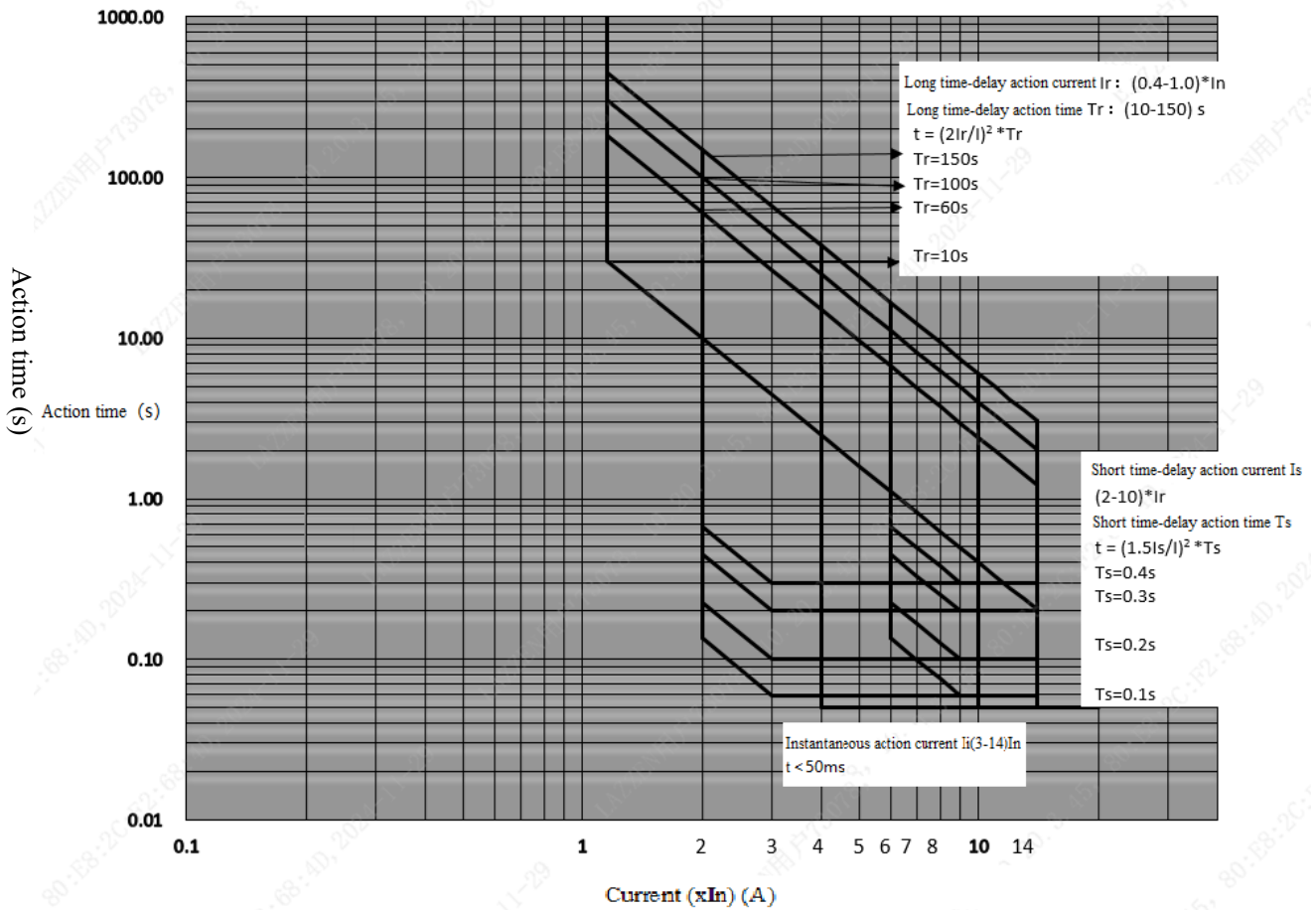
5 Normal Working Environment

- (1) The altitude of the installation site is ≤ 2500 m. See the "High-altitude Derating Factor Table of Circuit Breaker" for the derating factor at the altitude;
- (2) The operating ambient temperature is $-40^{\circ}\text{C} \sim +70^{\circ}\text{C}$; the average within 24h shall not be more than $+35^{\circ}\text{C}$. When the ambient temperature is higher than $+50^{\circ}\text{C}$, users need to reduce the capacity to use;
- (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) 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) Pollution level: 3;
- (7) Protection Class: IP20;
- (8) The product should be disposed in places that are free from explosive media, media corrosive to metal, insulation damaging gas, and conductive dust, and shall not be used in places with the intrusion of rain and snow;
- (9) In case of stricter user conditions than the above description, it is required to negotiate with the manufacturer;

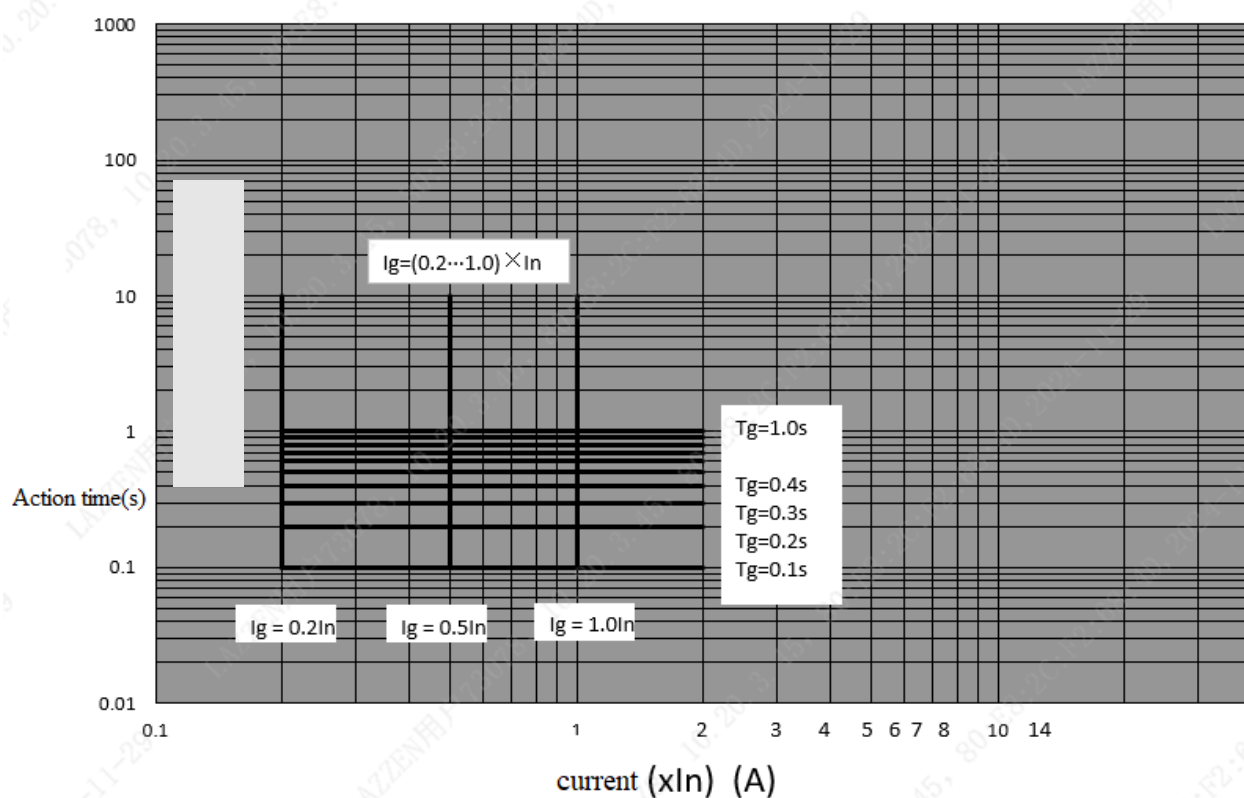
6 Tripping Characteristics

6.1 Long time-delay, short time-delay and instantaneous protection characteristic curve of power distribution type.



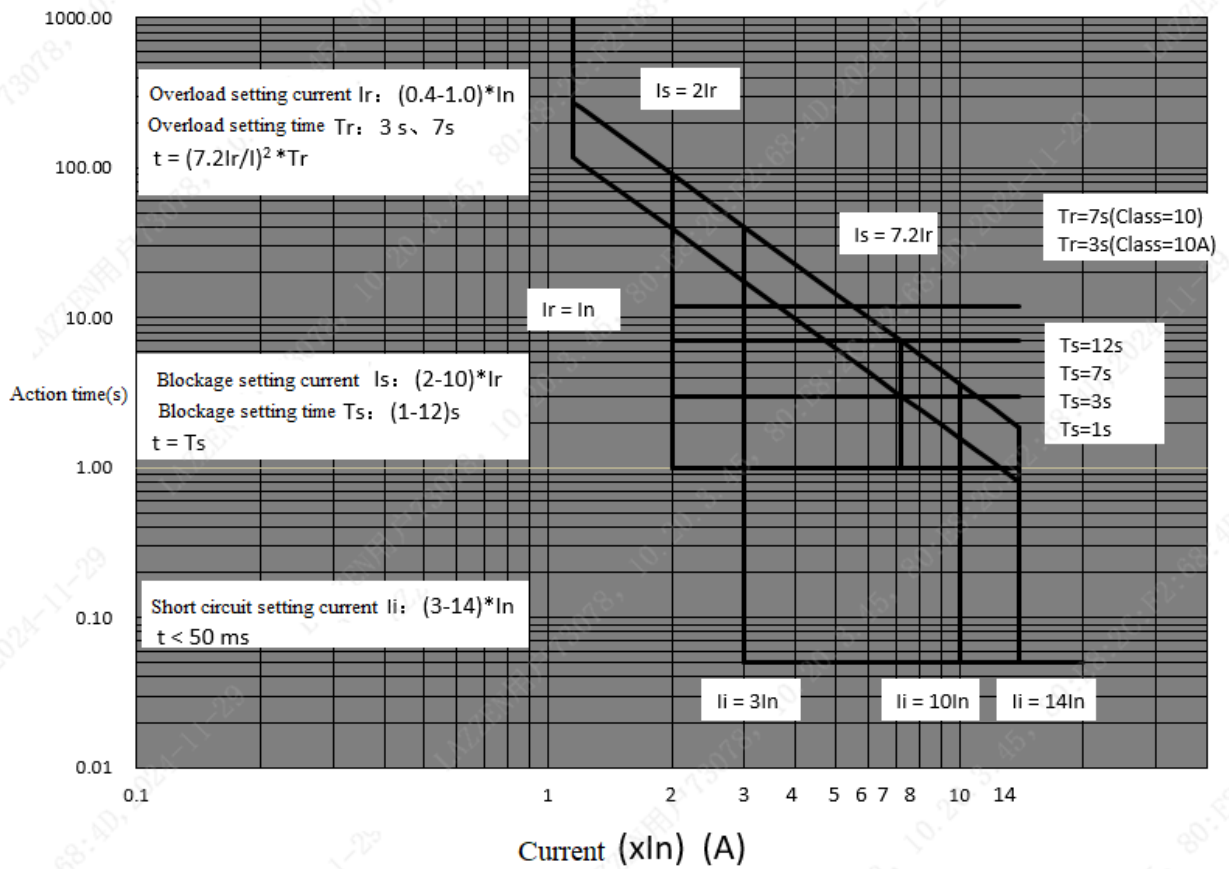
Time/Current Characteristic Curve

6.2 Ground protection characteristic curve of power distribution type



Ground-type protection curve

6.3 Motor-type protection characteristic curve

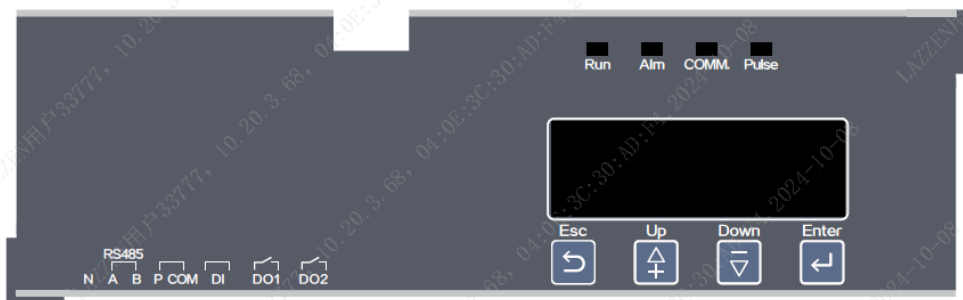


Time/Current Characteristic Curve

- 6.4 The tripping characteristics should be corrected due to changes when the ambient air temperature varies (see Table 4 for the correction factor)

7 Operation and Function Description of Intelligent Controller Module

7.1 7 Introduction of intelligent controller module panel



7.2 Introduction to Panel Indicators

(1) Run: Run light (green)

The indicator light flashes green to indicate when the controller is in the operating state.

(2) Alm: Alarm light (red)

When there is an alarm on the controller, the alarm indicator light is normally on.

(3) COMM.: RS485 communication light (yellow)

The RS485 communication indicator indicates the RS485 communication status, and the yellow light flashes during communication.

(4) Pulse: Active/reactive pulse light (red)

Active/reactive pulse output indicator, red indicator flashes when pulse is outputted.

7.3 Button introduction

(1) Esc: Return key

Press this button to return to the previous menu level.

(2) Up: Up key

Page up the interface or increase the value, keep pressing when increasing the value to increase it quickly.

(3) Down: Down key

Page down the interface or reduce the value, keep pressing when reducing the value to reduce it quickly.

(4) Enter: Confirmation key

Confirmation of parameters.

7.4 Definition of Panel External Interface

The product provides the following interfaces to the outside:

- N phase line inlet;
- 1 RS485 external communication interface with isolation and protection;
- 1 electrical energy active/reactive pulse output interface;
- 1 DI signal input;
- 2-way DO relay output.

According to the design requirements as well as the product experience of IoT molded case, the external terminal is used with one 11-pin terminal interface, and in accordance with the universal design requirements, the external interface is subject to the maximization design, and is defined as follows, respectively:

Table 6 N1 Terminal

Terminal	Definition	Definition	Remarks
N1-1	N	Phase N	3P products need to be

			connected to an N-phase line
N1-2	RS485A	Isolated 485 Signal A	
N1-3	RS485B	Isolated 485 Signal B	
N1-4	P	Active/reactive pulse output	
N1-5	COM	Pulse output common end	
N1-6	DI	DI signal input	
N1-7			
N1-8	DO1	Relay Output 1	
N1-9			
N1-10	DO2	Relay Output 2	
N1-11			

7.5 Introduction to function

For basic function table, see Table 7

"√" has this feature

"-" does not have this function

"Δ" means optional function

Table 7 Table of Basic Functions

Function description		Distribution type	Motor type
Protection function (distribution type)	Overload long-time delay protection	√	—
	Short circuit short-time delay protection	√	—
	Short circuit instantaneous protection	√	—
	Overload pre-alarm	√	—
	Neutral wire protection	√	—
	Ground fault protection	√	—
	Overvoltage protection	√	—
	Undervoltage protection	√	—
	Open-phase protection	√	—
	Neutral Loss Protection	√	—
	Three-phase voltage unbalance protection	√	—
	Three-phase current unbalance protection	√	—
	Frequency protection	√	—

	Temperature protection (NTC)	Δ	Δ
	Phase sequence	√	—
	Thermal memory	√	—
	On-board temperature and humidity alarm	√	—
	current unload	√	—
	Required current protection	√	—
	Total required power protection	√	—
Protection function (Electric motor type)	Overload long-time delay protection	—	√
	Blocking protection	—	√
	Short circuit instantaneous protection	—	√
	Current loss of phase	—	√
	Starting timeout protection	—	√
	Low load (undercurrent) protection	—	√
Measuring function	Current	√	√
	Voltage	√	√
	Frequency	√	√
	Electric energy	√	√
	Power	√	√
	Power factor	√	√
	Harmonic wave	√	√
	Required current amount	√	√
	Required amount of active power	√	√
	Voltage unbalance	√	√
	Current unbalance protection	√	√
	Onboard temperature	√	√
	On-board humidity	√	√
	Contact/Busbar Temperature	Δ	Δ
Communication function	RS485 method	√	√
	Bluetooth (5.0)	Δ	Δ
Communication protocol	Modbus-RTU	√	√
	DLT645	√	√
Maintenance function	Number of electrified operations	√	√
	Contact wear	√	√
	Lifespan and healthiness prediction	√	√
	Power Quality Monitoring	√	√
	Battery level monitoring	√	√
	Opening-Closing status monitoring	√	√

	Accumulated operating time of circuit breaker	√	√
	Online Upgrade	√	√
	Fault recording	√	√
	Local communication	√	√
	Multiple protection settings	√	√
	Setting of parameters	√	√
	Data zero	√	√
	Equipment Commissioning	√	√
	Clock function	√	√
	Communication Remote Trip	√	√
	Pulse tripping	√	√
	Clock battery alarm	√	√
	Self-diagnosis alarm	√	√
	Alarm record	√	√
	Self-inspection records	√	√
	Fault record	√	√
	Record of protective function commissioning and decommissioning	√	√
	Record of gate level changes	√	√
	High-voltage power loss/restoration records	√	√
	Controller pluggable*	√	√
Display function	LCD display: voltage, current, power, power factor, electrical energy, on-board temperature and humidity, etc.	√	√
	LCD display: protection parameters, communication parameters, fault records, date and time	√	√
	LCD display: temperature measurement and protection parameters	Δ	Δ
	Indicator display: operation status, communication status, alarm status, active pulse signal indication	√	√
External interface	N-phase line	√	√
	RS485	√	√
	Active/reactive pulse output	√	√
	1 DI input	√	√
	2-way DO	√	√

Note: Controller is pluggable* - it is required to disassemble the housing with 2 solid screws for pluggability

7.6 Introduction to measurement functions

Current	Minimum resolution: 0.001A Measuring range: $0.004I_n \leq I < 0.01I_n$, Error limit: $\pm 0.75\%$; $0.01I_n \leq I \leq 1.2I_n$, error limit: $\pm 0.5\%$;
Voltage	Minimum resolution: 0.1V Measuring range: $0.7U_e \sim 1.3U_e$, Error limit: $\pm 0.5\%$; $0.35U_e$ to $0.7U_e$, error limit: $\pm 1\%$;
Frequency	Minimum resolution: 0.01 Hz Measuring range: $45\text{Hz} \sim 65\text{Hz}$, error limit: $\pm 0.1\text{Hz}$
Electric energy	Level C (0.5s level)
Power	1.0: Current range: $0.004I_n$ to $0.05I_n$, error limit: $\pm 1\%$; $0.05I_n$ to $1.2I_n$, error limit: $\pm 0.5\%$; 0.5L/0.8C: Current range: $0.02I_n$ to $0.1I_n$, error limit: $\pm 1\%$; $0.1I_n$ to $1.2I_n(I_{\max})$, error limit: $\pm 0.6\%$. Reactive power: $\pm 1\%$, apparent power: $\pm 1\%$;
Power factor	Minimum resolution: 0.001 Measuring range: 0.5-1.00, error limit: ± 0.005
Harmonic wave	THD and thd of three-phase voltage, three-phase current, and 2nd to 31st harmonic content

7.7 Setting of controller parameters

Distribution-type controller parameter setting

Functional item	Function description
Overload long-time delay protection	$0.4 \sim 1.0I_n$ (0.1A step), $10 \sim 150\text{s}$ (1s step)
Short circuit short-time delay protection	$2 \sim 10I_r$ (0.1A step) $0.1 \sim 0.4\text{s}$ (0.1s step)
Short circuit instantaneous protection	$3 \sim 14I_n$ (0.1A step) $\leq 50\text{ms}$
Neutral line protection	Neutral line protection (overload protection only): 0.5Ir: The protective action point is half of the setting value in case of a N-phase overload; 1Ir: The protective action point is equal to the setting value in case of a N-phase overload; OFF: Overload shutdown;
Ground fault protection	0.2 to $1.0I_n$ (0.1A step) 0.1 to 1.0 (0.1s step)
Pre-alarm protection	$0.9I_r$, $1I_r$, OFF
Overvoltage protection	$253 \sim 299\text{V}$ (0.1V step) $0.5 \sim 60\text{s}$ (0.1s step)
Undervoltage protection	$161 \sim 207\text{V}$ (0.1V step) $0.5 \sim 60\text{s}$ (0.1s step)
Open-phase protection	$20 \sim 100\text{V}$ (0.1V step) $0.5 \sim 60\text{s}$ (0.1s step)
Neutral Loss Protection	Trip/Alarm/Off $0.5 \sim 60\text{s}$ (0.1s step)

Three-phase voltage unbalance protection	2%~30% (0.1% step) Setting time: 0.5~60s
Three-phase current unbalance protection	5%~80% (0.1% step) Setting time: 0.5~60s
Frequency protection	50Hz: 45-49Hz underfrequency (in steps of 0.1Hz); 51-55Hz overfrequency (in steps of 0.1Hz) 60Hz: 55-59Hz underfrequency (in steps of 0.1Hz); 61-65Hz overfrequency (in steps of 0.1Hz) Setting time: 1~60s
Phase order protection	ABC, ACB Setting time: 0.5~60s
current unload	Operating threshold: (0.2 to 1.0) In, 0.1A step change Operating delay: (20%-80%) Tr, 1s step change, tolerance $\pm 10\%$ Return Threshold: 0.1 In ~ Operating Threshold, step change 0.1A Return delay: 1s ~ 600s, 1s step change, tolerance $\pm 10\%$ 2-way DO, which can be set separately;
Temperature protection (NTC)	70~130°C (step 0.1°C), accuracy $\pm 3^\circ\text{C}$ Setting time: 1~60s
Thermal memory	Long delay/short delay (must be powered by voltage)
Temperature and humidity alarm	Temperature 60 to 85°C (step 0.1°C) Humidity 60 to 85% (step 0.1%) Setting time: 1~60s
Required current protection	0.4~1.0In Setting time: 1~60min
Total required power protection	(0.2In~1.0In) *220*3/1000 Setting time: 1~60min

(Note: protection switches are configured by the control word, trip/alarm/shutdown)

Motor-type controller parameter setting

Functional item	Function description
Overload long-time delay protection	0.4~1.0In (0.1A step), Class10A\10(3s\7s)
Blocking protection	3~8Ir 1~12s (0.1s step)
Short circuit instantaneous protection	4~14In (1A step) $\leq 50\text{ms}$
Current loss of phase	ON OFF 0.25s
Starting timeout protection	1~8In, which can be OFF (0.1A step), 1s~200s (1s step)
Low load (undercurrent) protection	0.3~0.9Ir 1~200s

(Note: protection switches are configured by the control word, trip/alarm/shutdown)

7.8 Controller protection characteristics

7.8.1 Setting value of distribution type controller

(1) Overload long-time delay protection

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

Table 8

Setting current IR		0.4~1.0In (0.1A step) In=250/400A							
Action features	Tr set value (s)	10~150s (1s step)							
		10	15	30	45	60	80	100	150
	≤1.05Ir	>2h inaction							
	>1.30IR	<1h (action)							
	t(s) at 1.5Ir	17.77	26.67	53.33	79.99	106.67	142.22	177.77	266.66
	t(s) at 2.0Ir	10	15	30	45	60	80	100	150
	Accuracy	±10% (inherent error ±20 ms)							

$$t_r = \left(\frac{2I_r}{I} \right)^2 \times T_r$$

Note: The action curve conforms to

tr: overload long time-delay action time; Tr@2Ir: setting value of the overload long time-delay action time

I: Actual running current IR: setting value of the overload long time-delay action current

(2) Short circuit short-time delay protection

The short time-delay protection prevents the impedance short-circuit of the distribution system

The short time-delay protection is divided into two segments: reverse time limit and fixed time limit.

Table 9

Setting current Is		2 to 10Ir (1A step)				
Action features	Reverse time limit $I_s \leq I < 1.5I_s$	Ts set value (s)	0.1	0.2	0.3	0.4
		ts action time (s)	$t_s = \left(\frac{1.5I_s}{I} \right)^2 \times T_s$			
	Definite time limit $1.5I_s \leq I < I_i$	ts action time (s)	0.1	0.2	0.3	0.4
		Accuracy	±20	±10% (inherent error ±20 ms)		

$$t_s = \left(\frac{1.5I_s}{I} \right)^2 \times T_s, \text{ fixed time limit action time}$$

Note: Inverse time limit action curve conforms to

tracking Ts set 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

(3) Short circuit instantaneous protection

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

Table 10

Action features	Setting current I_i ($\times I_n$)	3~14 I_n (1A step)	
	Action time	$\leq 0.85I_i$	$I_{naction}$
		$\geq 1.15I_i$	$< 50ms$

(4) Ground fault protection

The ground protection function can prevent the grounded short circuit of metal solids of the distribution system with the fixed time-limit protection.

Table 11

Setting current I _g		0.2 to 1.0I _n (0.1A step)											
Action features	Definite 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% (inherent error ±20 ms)										

(5) Overload pre-alarm

Table 12

Setting current I_p	0.9 I_r , 1 I_r , OFF		Accuracy
0.9 I_r	Alarm indicator	The indicator changes to be <u>constantly on from flashing</u>	$\pm 10\%$
1.0 I_r	Alarm indicator	The indicator changes to be <u>constantly on from flashing</u>	
OFF	OFF		/

(6) N-phase protection

The four-pole controller features the N-phase overload long time-delay protection features:

Table 13

N-phase protection type	Overload protection
0.5 I_r	The protective action point is half of the setting value in case of a N-phase overload fault
1.0 I_r	The protective action point equals to the setting value in case of a N-phase overload fault

OFF	N-phase protection off
-----	------------------------

Note: N-phase overload only

(7) Overvoltage protection

Table 14

Uov set voltage	253 to 299V (0.1V step)
Tov setting time (s)	0.5~60s (step 0.1s)
Accuracy (%)	±10%

(8) Undervoltage protection

Table 15

Uuv set voltage	161 to 207V (in 0.1V step)
Tuv setting time (s)	0.5~60s (0.1s step)
Accuracy (%)	±10%

(9) Open-phase protection

Table 16 Undervoltage alarm return features (when the execution mode is set as "alarm", this feature is available)

Ud set voltage	20 to 100V (step 0.1V), based on phase voltage (controller connected to N line)
Td setting time (s)	0.5~60s (0.1s step)
Accuracy (%)	±10%

(10) Neutral Loss Protection

Table 17

UN Set Voltage	Trip/Alarm/Off
Tn setting time (s)	0.5~60s (0.1s step)
Accuracy (%)	±10%

(11) Current unbalance protection Iunbl

Table 18

Setting value	5 to 80% (in 0.1% step)
Setting time	0.5 to 60.0s (in 0.1s step)
Accuracy (%)	±10%

Note: The actual current imbalance calculation is consistent with $\delta = (|E_{\max}|) \times 100\% / I_{\text{avg}}$ $I_{\text{avg}} = \frac{\sum_{k=1}^3 I_k}{3}$

δ : Percentage value of actual current imbalance of three-phase electricity, $E_{\max}$ is the maximum difference

between each phase current and I_{avg} , I : three-phase current, I_{avg} : three-phase average current value, k is the three-phase current serial number

(12) Voltage imbalance protection Vunbl

Table 19 Overvoltage alarm return features (when the execution mode is set as "alarm", this feature is available)

Setting value	2 to 30% (in 0.1% step)
Setting time	0.5 to 60.0s (in 0.1s step)

(13) Frequency protection

Table 20

Setting value	50Hz: 45-49Hz underfrequency (in steps of 0.1Hz); 51-55Hz overfrequency (in steps of 0.1Hz) 60Hz: 55-59Hz underfrequency (in steps of 0.1Hz); 61-65Hz overfrequency (in steps of 0.1Hz)
Setting time	1 to 60.0s (in 0.1s step)

(14) Temperature protection (NTC)

Table 21

Setting value	70~130°C (step 0.1°C), ±3°C
Setting time	1 to 60.0s (in 0.1s step)

(15) Phase order protection

Table 22

Setting value	ABC,ACB
Setting time	0.5 to 60.0s (in 0.1s step)

(16) Thermal memory

Table 23

Setting value	ON / OFF
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Note: Thermal memory, circuit breaker overcurrent (short delay, long delay).

(17) Current unload

Table 24

Setting value	Operating threshold: (0.2~1.0) In, step change 0.1A Operating delay: (20%~80%) Tr, 1s step change, tolerance ± 10% Return Threshold: 0.1 In~ Operating Threshold, 0.1A step change Return delay: 1s ~ 600s, 1s step change, tolerance ± 10%
---------------	--

Notes:

- 2 current unloading outputs (2 DO outputs) can be set.
- When the current flowing through the circuit breaker is greater than the operating threshold setting value and exceeds the operating delay time (inverse time limit operating), the circuit breaker sends a signal to disconnect the secondary load or alarm. When the current flowing through the circuit breaker is less than the return threshold setting value and exceeds the return delay time (fixed time limit action), the circuit breaker releases the alarm signal.
- The current unloading function can be set with on or off.

(18) Temperature alarm

Table 25

Setting value	Temperature 60 to 85°C (step 0.1°C)
Setting time	1 to 60.0s (in 0.1s step)

(19) Humidity Alarm

Table 26

Setting value	Humidity 60 to 85% (step 0.1%)
Setting time	1 to 60.0s (in 0.1s step)

(20) Current/power protection required

Table 27

Current Setting Value	0.4 to 1.0In (step 0.1A)
Setting value of total required power	$(0.2I_n \sim 1.0I_n) * 220 * 3 / 1000$ (step 0.1kW)
Setting time	1 ~ 60min (1min step)

7.8.2 Setting value of motor type controller

(1) Overload long-time delay protection

Table 28

Setting current IR		0.4 to 1.0In (0.1A step),	
Action characteristics (inverse time limit)	Class setting value (s)	10A	10
	Tr(s)	3	7
	≤1.0 5Ir	>2h inaction	
	>1.20 IR	<1h Action	
	tr(s) at 1.5 Ir	69.1	161.3
	tr(s) at 6.0 Ir	4.3	10.1
	tr(s) at 7.2 Ir	3	7
	Accuracy	±10% (inherent error ±20 ms)	

$$t_r = \left(\frac{7.2I_r}{I} \right)^2 \times T_r$$

Note: The action curve conforms to

tr: overload long time-delay action time; Tr@2Ir: setting value of the overload long time-delay action time

I: Actual running current IR: setting value of the overload long time-delay action current

(2) Blocking protection Isd

Table 29

Setting current Isd			3~8Ir
Action features	Fixed time limit I>Isd	t Action time (s)	1s~12s Step 0.1s
		Accuracy	±10% (inherent error ±20 ms)

(3) Short circuit instantaneous protection

Table 30

Action features	Setting current Ii (×In)	4~14 In (Step 1A) Tolerance: ±10%	
	Action time	≤0.85Ii	Inaction
		≥1.15Ii	<50ms

(4) Current loss of phase

Table 31

Setting value	0N/OFF
Setting time	0.2~1.0s
Accuracy (%)	±10%

(5) Starting timeout protection

Table 32

Set value Ilong	1~8I _r , which can be OFF, (step 1A)
Setting Time Tlong	1s~200s (1s step)
Accuracy (%)	±10%

Note: The starting timeout protection is only effective when the motor is starting, and the setting value should match the release level;

(6) Low load (undercurrent) protection

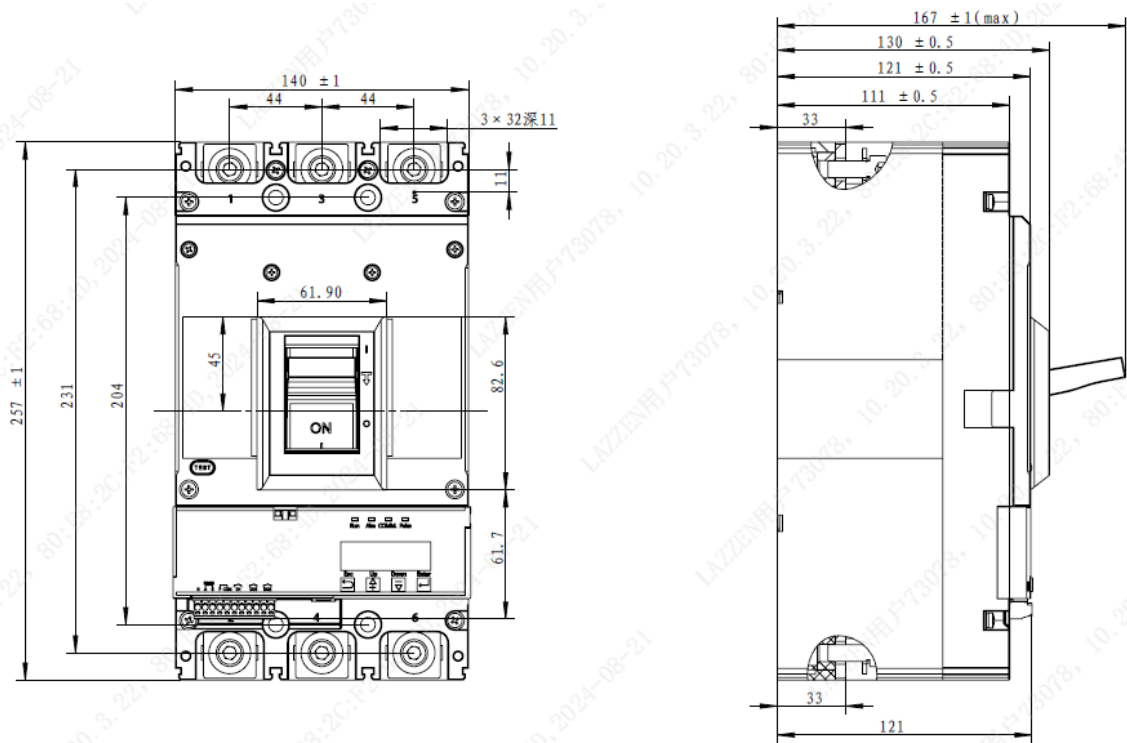
Table 33

Setting current Iuc	Setting current 0.3~0.9 I _r ; which can be OFF
Action time Tuc	Setting time: (1~200)s

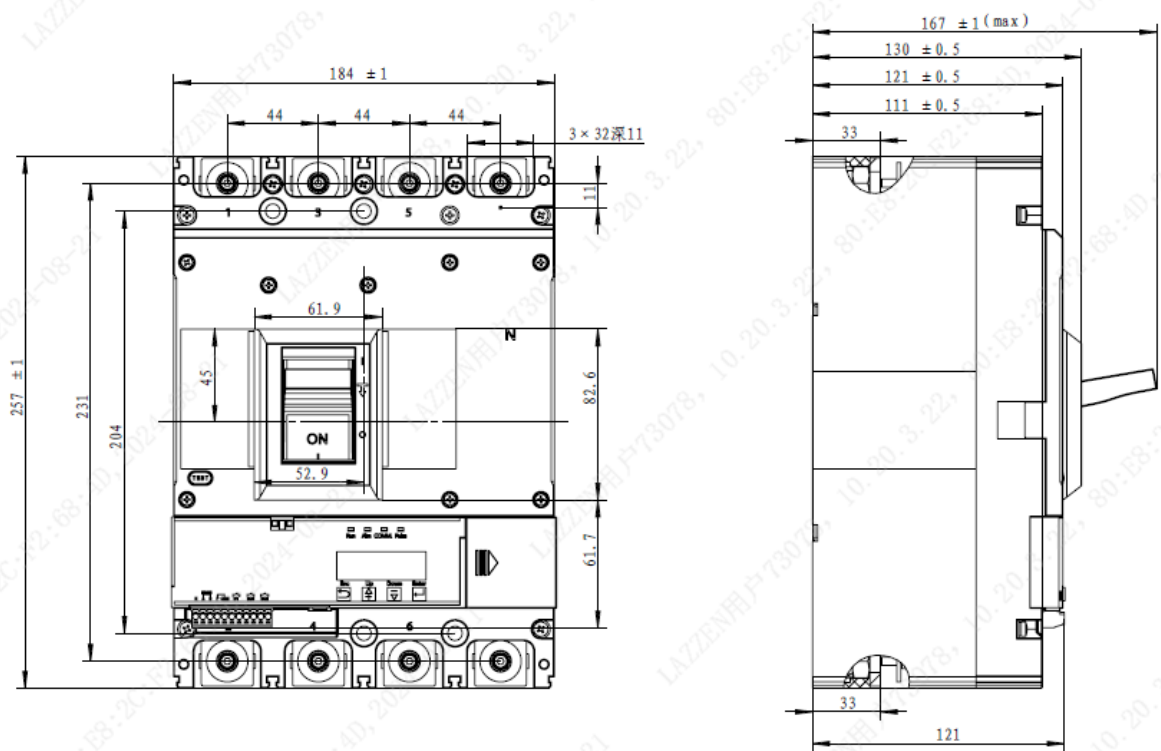
Note: Low load (undercurrent) protection takes effect after motor startup

8 Product outline, Installation Size and Safety Distance

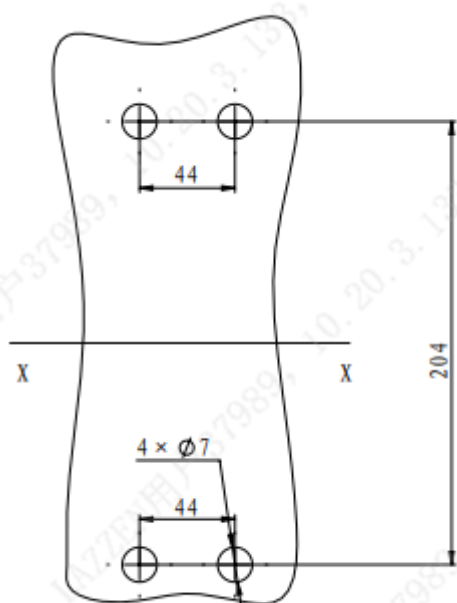
8.1 Circuit breaker outline and installation size



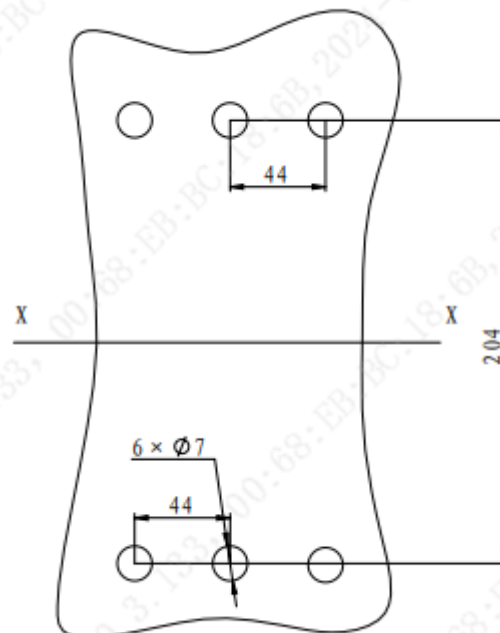
400-3P External Dimensions



400-4P External Dimensions



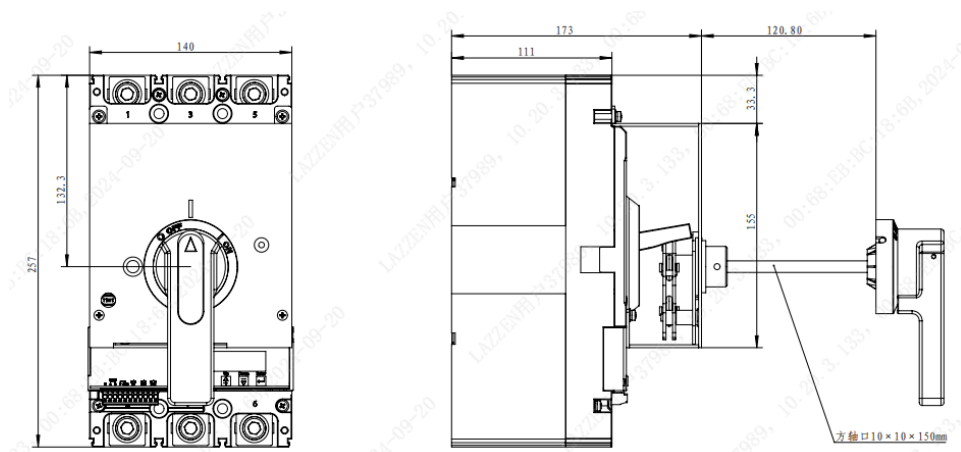
400-3P Mounting Dimensions



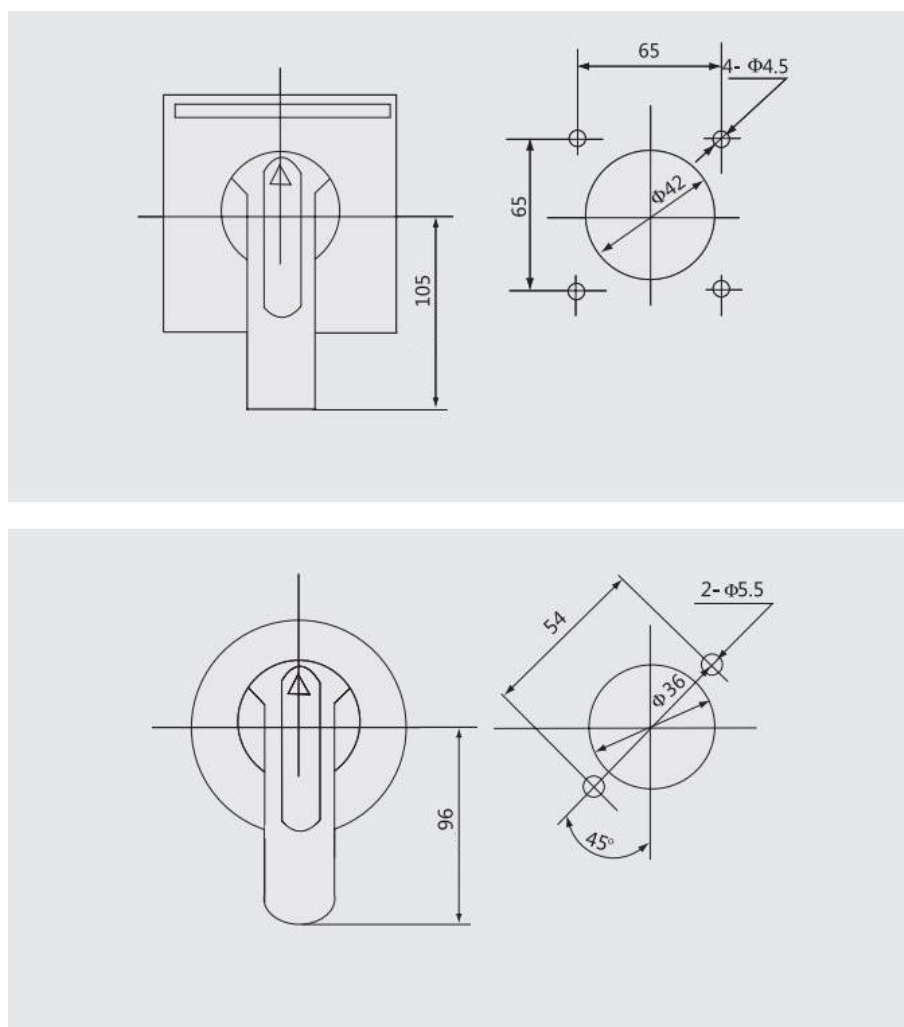
400-4P Mounting Dimensions

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

8.2 Main body + hand manipulation (CS1)



400 Handle External Dimensions



400 Handle Mounting Hole Diagram

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

8.3 Safe mounting distance of circuit breaker

Table 34 Insulation Distance Mounted in the Metal Cabinet (Unit: mm)

Mounting distance	A (inlet wire end to the cabinet face)	B (distance from the side to cabinet surface)	C (outlet wire end to the cabinet face)
Model			
NDM3DE-400	120	35	35

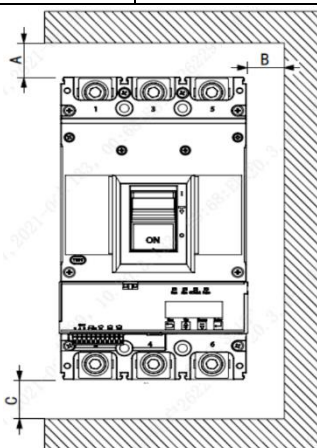


Table 35 Minimum Center Distance between Rowed Circuit Breakers (Unit: mm)

Model	Width of circuit breaker		Center distance	
	3 poles	4 poles	3 poles	4 poles
NDM3DE-400	140	184	180	224

Note: Check the connected busbar or cable during rowing or stacking of the circuit breaker to ensure that the air insulation distance won't be reduced.

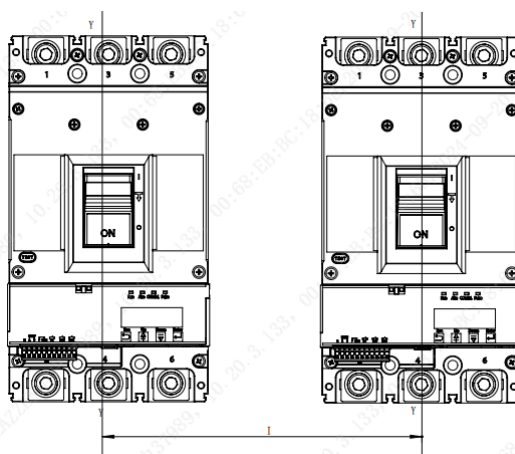


Table 36 Minimum Center Distance between Stacked Circuit Breakers (Unit: mm)

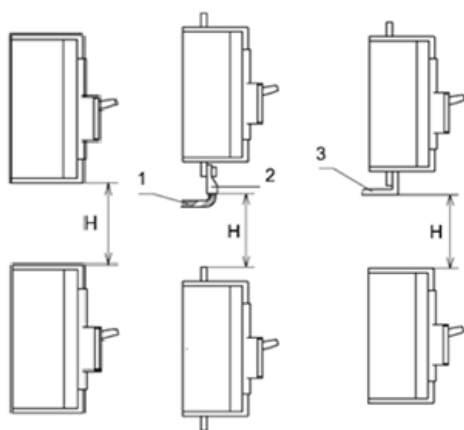
Model	H (distance of circuit breaker from bottom)
NDM3DE-400	155

Note: 1) Insulated cable

2) Cable terminals

3) Connection - no insulation

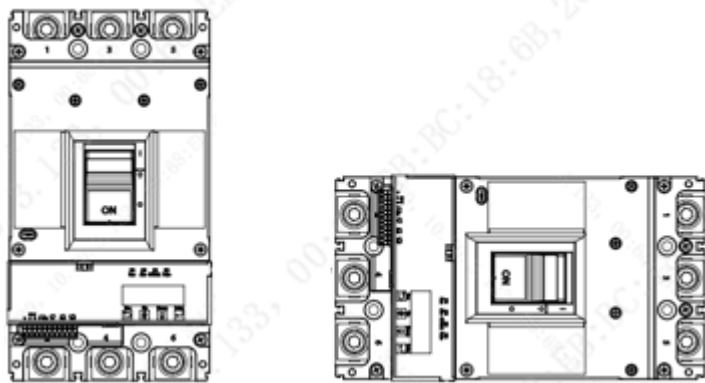
Requirements: Check whether the phase partition is assembled properly before products are energized.



9 Installation Mode

For vertical installation of the product, the gradient between the installation surface and the vertical plane is $\leq \pm 22.5^\circ$.

Horizontal installation of the product.



Vertical Installation Horizontal Installation

10 Packaging and Storage

Minimum packaging quantity: 1 set/box. The packaged products should be stored in a warehouse with the

ambient temperature of -40°C~+75°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.

11 Environmental compliance

Products comply with RoHs2.0.

[Note: Complies with EU Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment and its amending Directive (EU) 2015/863]

12 Accessories

12.1 List of Accessories

This product is packaged in cartons with a single unit per carton and covered with pearl wool for protection, which contains a circuit breaker, accessories, phase partition, product manual, warranty card, etc (see Table 31).

Table 37

Model	SN	Name	Model	Quantity 3P/4P
NDM3DE-400	1	Cross small pan-head screw	GB/T818 M6×70	4
	2	Hexagon nut	GB/T 6170 M5	4
	3	Spring washer	GB/T 93 5	4
	4	Plain washer	GB/T 848 5	4
	5	Phase partition	——	4/6
	6	Wiring screw	M10×30	6/8

12.2 Optional accessories

Internal accessories: shunt voltage specifications: DC24V, AC230V, DC220V, AC380V

Manual operation

12.3 Accessory parameters

12.3.1 Shunt release

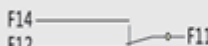
When the external voltage of the shunt release is between 70% and 110% of the rated control power voltage, the release can break the circuit breaker reliably.

Table 38 Voltage Specifications and Power Consumption of Shunt Release

Model	Shunt release	DC24V	AC230V	DC220V	AC380V
NDM3DE-400	Transient current value (A)	6.8	0.76	0.48	0.28
	Power consumption (W)	164.5	176.3	105	112

12.3.2 Auxiliary contact

(1) Auxiliary contact wiring diagram

The circuit breaker is in the "Off" or "Free tripping" position	Dual-auxiliary contact	
	Single auxiliary	
The circuit breaker is in the "On" position		
Closed" to "Disconnected ", "Disconnected" to "Closed"		

(2) Current parameters of auxiliary contacts

Table 39 Rated Parameters of the Auxiliary Contact

Classification	Shell frame current (A)	Agreed heating current Ith (A)	Rated operating current (A)	
			AC400V(AC-15)	DC220V(DC-13)
Auxiliary contact	400	3	0.4	0.15

(3) Electrical life of auxiliary contacts

Table 40 Electrical life of the auxiliary contact

Utilization category	Making			breaking			Number	Frequency	Power-on time
	I/Ie	U/Ue	cosφ	I/Ie	U/Ue	cosφ			
AC-15	10	1	0.3	1	1	0.3	6050	360	≥0.05s
DC-13	1	1	6Pe	1	1	6Pe			≥T0.95ms

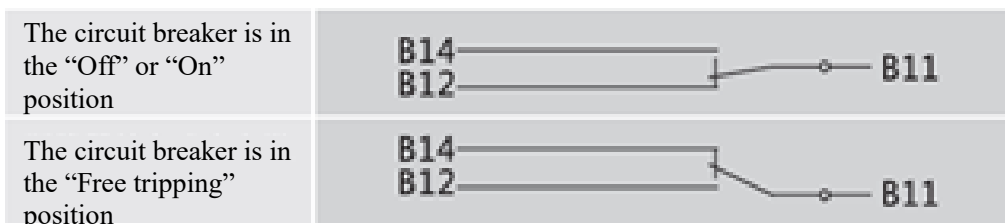
(4) Making and breaking capacity of the auxiliary contact

Table 41 Making and breaking capacity of the auxiliary contact

Utilization category	Making			breaking			Number	Frequency	Power-on time
	I/Ie	U/Ue	cosφ	I/Ie	U/Ue	cosφ			
AC-15	10	1.1	0.3	10	1.1	0.3	10	360	≥0.05s
DC-13	1.1	1.1	6Pe	1.1	1.1	6Pe			≥T0.95ms

12.3.3 Alarm contact

(1) Auxiliary Contact Wiring Diagram



(2) Alarm contact current parameters

Table 42 Alarm contact current parameters

Classification	Shell frame current (A)	Agreed heating current I _{th} (A)	Rated operating current (A)	
			AC400V	DC220V
Alarm contact	400	3	0.3	0.15

Note: The standard wire length of the shunt release, auxiliary contact and alarm contact wiring is 0.7m, which can be customized according to the requirements.

13 Use and Maintenance

13.1 Checks and preparations before operation

(1) Verify that the wiring is correct.

In particular, check that the input terminals (1, 3, 5) of the circuit breaker should be connected to the power line and the output terminals (2, 4, 6) should be connected to the load line.

(2) Verify that there are no short circuits or short circuits to the ground between the terminals or exposed live parts.

(3) Confirm that terminal connections and fastening screws are tightened without being loosened.

(4) 3P products must confirm that terminal N-1 is connected to the N-phase line.

13.2 Test run

After checking that there is no abnormality in all of the items in clause 13.1, the test run can be conducted.

(1) Pull the operating handle and turn on the power supply.

(2) After the main circuit of the circuit breaker is energized, press the emergency tripping button so that the circuit breaker shall be disconnected with the operating handle in the disconnected position.

(3) If all the test runs are satisfied, it can be put into operation.

13.3 Maintenance

◆ Maintenance checks must be carried out by specialized technicians.

If users will choose the internal and external accessories, they shall be provided by the company according to the ordered model, to ensure the quality. We will not be responsible for any purchase or modification made by the user.

The following operations must be completed before performing maintenance operations:

(1) Trip the circuit breaker;

(2) Disconnect the power supply from the circuit breaker (including main and auxiliary circuits);

(3) Remove the circuit breaker from its mounting position (generally for plug-in type, preferably also for fixed type)

◆ Circuit breaker maintenance is performed annually under normal operating conditions and semiannually under abnormal conditions, as described below:

- (1) Re-trigger the circuit breaker, close and open the circuit breaker, use the release button to de-trigger the circuit breaker when the circuit breaker is closed, and reciprocate the operation for 5 times, so that the circuit breaker should be able to reliably carry out the re-triggering, closing, opening and de-triggering action;
- (2) Remove dust from circuit breaker surfaces and connections (wipe with a clean and dry rag);
- (3) Clean the flash barrier and replace it if necessary;
- (4) Insulation test;
- (5) Check all connections, wipe off oxides with an emery cloth, clean with a soluble agent, and tighten bolts and nuts;
- (6) If the circuit breaker is equipped with other internal or external accessories, each accessory should be checked one by one to ensure that it is in normal working condition.

14 Precautions

- a) The performance parameters of this specification are suitable for normal conditions. For special requirements, put the equipment into use after consulting us with formal confirmation and re-adjusting parameters;
- b) The circuit breaker, tripping unit or other accessories can only be installed and maintained by the trained or qualified professionals;
- c) Ensure that the power supply is off before installing or removing any device.

15 Ordering Specifications

1. The user must confirm that they have a detailed understanding of the technical information for the product, and should order the products according to the "order specification" table based on the future use occasions of the circuit breaker.
2. If the user does not require protection parameters when ordering, the company will follow the configuration by default according to the models and specifications.