Shanghai Liangxin Electrical Co., Ltd.

NDM2E-250 Product Specification

(IPD-ENG-DEV-T20 A1 2016-09-23)

Prepared by	孙兰萍	Date	2021-09-28
Reviewed by	徐富平	Date	2021-09-28
Countersigned by	黄金华	Date	2021-09-28
Approved by	丁飞	Date	2021-09-28

Revision History					
Version	Revision Reason/Content	Implementation Date	Prepared by	Reviewed by	Approved by
0	Newly added	5/8/2020	Wang Hu	Peng Haorang	Hu Qi
1	Update the product appearance picture and product dimension outline drawing	30/9/2021	Sun Lanping	Xu Fuping	Ding Fei

1. Applicable Scope and Purpose of Circuit Breaker

The NDM2E-250 series of electronic molded case circuit breakers (hereinafter referred to as circuit breakers) apply to infrequent switching of circuits with the AC 50Hz, the working voltage of AC400V and working current of 250A as well as infrequent motor starting. With the overload, short circuit and undervoltage protection functions, the circuit breaker can protect lines and power equipment from damage. The NDM2E circuit breaker can provide modules with the communication function, which can make the original circuit breaker upgrade to the communication circuit breaker conveniently, thus realizing "Four remotes" functions, namely, remote control, remote adjustment, remote measuring and remote measurement.

2. Product Picture of Circuit Breaker (The picture is for reference only; the specific kind prevail)

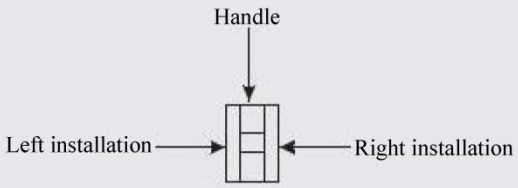
Picture of the Product

3. Specification and Model Description of Circuit Breaker

ND	M	2	E - 250	□	□ / □ / □	□	□	□	□	□
1	2	3	4	5	6	7	8	9	10	11	12	13	14

SN	SN name	NDM2E
1	Enterprise code	ND: “Nader” low-voltage apparatus
2	Product code	M: Molded case circuit breaker (MCCB)
3	Design SN	2
4	Derived code of the series	E: Electronic
5	Shell frame level	250
6	Breaking capacity level	M: Relatively high breaking type
		H: High breaking type
7	Operation mode	No code: Direct handle-operated mode
		P: Motor-operated
		Z: Rotary operation
8	Derived code of the function	No code: Basic type intelligent release
		G: Ground protection type intelligent release
		T: Communication type intelligent release
		GT: Ground protection communication type intelligent release
9	Number of poles	3
10	Accessory code	See Table 1
11	Application code	No code: Power distribution type
		2: Motor protection type
12	Setting current	See Table 2
13	Cabling type	No code: Normal product
		P: Connection busbar
		Z1: Rear-plate connection
		Z2H: Plug-in rear-plate connection
		Z2Q: Plug-in front-plate connection
14	Other codes	DT: Dedicated for power grid
		Codes of internal and external accessories: Such as manual operation: CS1-A, electric operation: DC1 220V, shunt: AC230V, undervoltage: DC220V

Table 1: Comparison Table of Accessory Code:



Legend

- Single auxiliary contact
- Dual-auxiliary contact
- Alarm contact
- Shunt release
- Under-voltage release
- Auxiliary alarm contact (a single accessory features the auxiliary and alarm functions)

Accessory code	Accessory name	NDM2E-250 (Non-communication type) 3
300	N/A	—
310	Shunt release	
320	Dual-auxiliary contact	
321	Single auxiliary contact	
330	Under-voltage release	
340	Shunt release, dual-auxiliary contact	
341	Shunt release, single auxiliary contact	
350	Shunt release, under-voltage release	—
360	Two sets of dual-auxiliary contacts	
361	Two sets of single auxiliary contacts	
362	Under-voltage release, dual-auxiliary contact	
370	Under-voltage release, single auxiliary contact	
371	Under-voltage release, dual-auxiliary contact	
308	Alarm contact	
318	Shunt release, alarm contact	
328	Dual-auxiliary contact, alarm contact	
338	Under-voltage release, alarm contact	
348	Shunt release, auxiliary alarm contact	
358	Auxiliary alarm contact	
368	Dual-auxiliary contact, auxiliary alarm contact	
378	Under-voltage release, auxiliary alarm contact	

Accessory code	Accessory name	NDM2E-250 (Communication type) 3
300	None/communication type	—
310	Shunt release/communication type	
320	Dual-auxiliary contact/communication type	
321	Single auxiliary contact/communication type	
330	Undervoltage release/communication type	
341	Shunt release single auxiliary/ communication type	
308	Alarm contact/communication type	
318	Shunt release, alarm contact/ communication type	
328	Dual-auxiliary contact, alarm contact/ communication type	
338	Under-voltage release, alarm contact/ communication type	
358	Auxiliary alarm contact/communication type	
361	Single auxiliary contact, single auxiliary contact/communication type	
362	Dual-auxiliary contact, single auxiliary contact/communication type	
371	Under-voltage release, single auxiliary contact/communication type	

Note :

1) The first number "3" of the release accessory code represents the intelligent controller with the three-section protection while the last two numbers represent the inner accessory code;

2) Since the communication type requires to use a set of right-side auxiliary contacts, the single auxiliary or alarm contact output is only located on the right side of the above accessory mode.

4. Main Technical Parameters of Circuit Breaker

Table 2 Main Technical Parameters of Circuit Breaker

Model			NDM2E-250	
Rated current of frame Inm (A)			250	
Setting current Ir(A)			100, 125, 160, 180, 200, 225, 250	
Rated insulation voltage Ui (AC V)			800	
Rated impulse withstand voltage Uimp (V)			8000	
Rated working voltage Ue (AC V)			400	
Power frequency withstand voltage U (1min) (V)			3500	
Utilization category			A	
Rated short-time withstand current Icw (kA/1s)			2.5	
Number of poles			3	
Breaking capacity level			M	H
Rated limit short-circuit breaking capacity Icu (kA)	AC400V		50	85
Rated operating short-circuit breaking capacity Ics (kA)	AC400V		50	50
Operating performance (times)	Electrical life		8000	
	Mechanical life	Maintainable free life	20000	
		Maintainable life	40000	

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

Table 3 Selection of the NDM2E-250 Connecting Bus or Cable Cross-section Area

Rated current (A)	100	125	160	180, 200, 225	250
Wire cross-section area (mm^2)	35	50	70	95	120

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	Thread diameter (mm)	Torque (N·m)
NDM2E-250	M8	12
	M4	2.4

4.3 Derating factor of temperature change for the circuit breaker

Table 5 Derating Factor Table of Temperature Change for the Circuit Breaker

Model	Derating factor of product temperature change							
NDM2E-250	Temperature (℃)	40	45	50	55	60	65	70
	Derating factor	1	1	1	0.976	0.952	0.927	0.902

Note: 1) When the operating ambient temperature is below + 50℃, the product can be used normally without derating capacity.

2) The above derating factors are measured at the frame current.

4.4 High-altitude derating factor of the circuit breaker

Table 6 High-altitude Derating Factor Table of Circuit Breaker

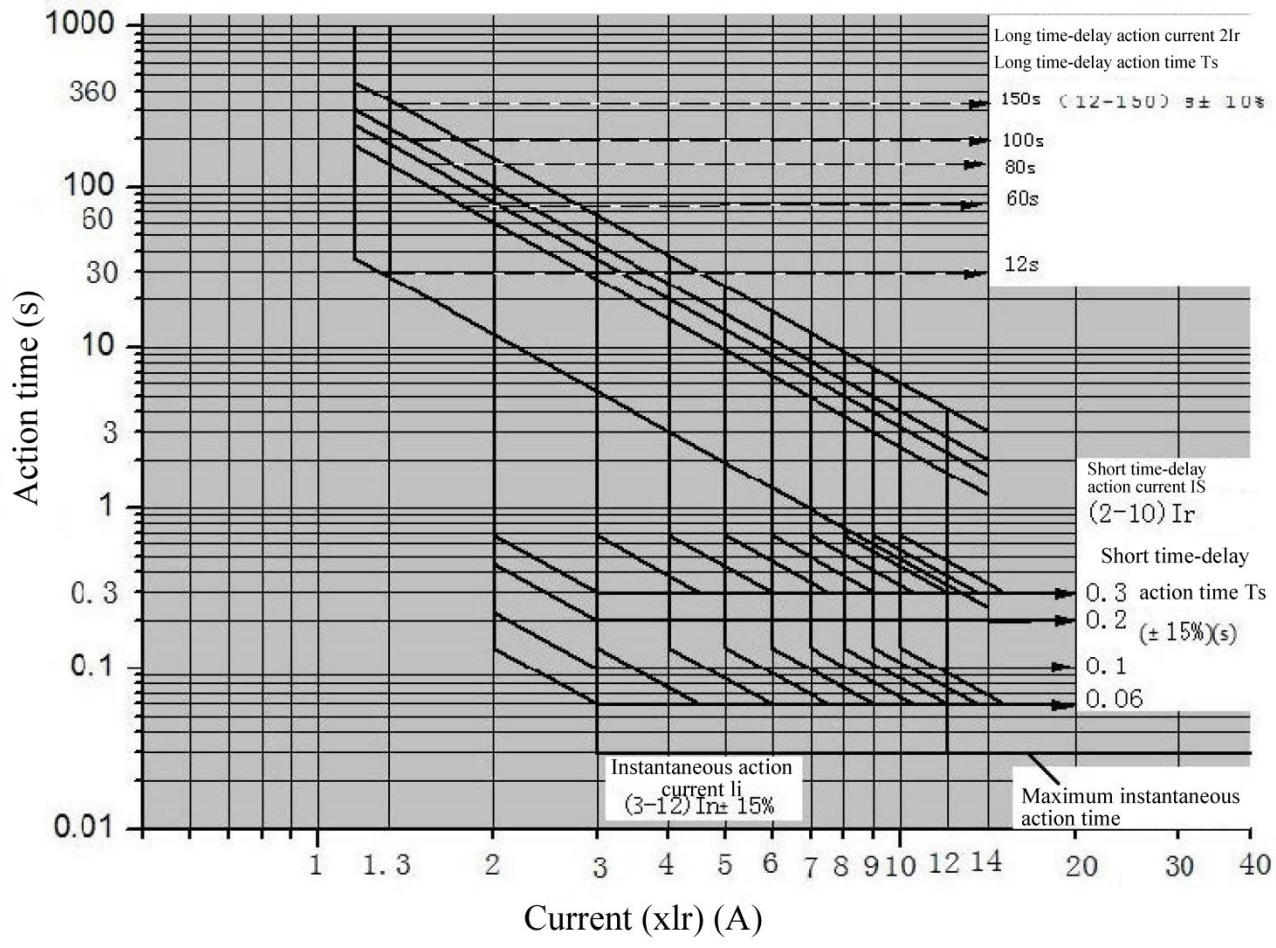
Elevation (m)	Working current correction coefficient	Power frequency withstand voltage correction coefficient	Isolation voltage correction coefficient
2000	1	3500	800
2500	1	3500	800
3000	0.98	3150	720
3500	0.97	3000	680
4000	0.95	2800	630
4500	0.94	2650	600
5000	0.93	2500	560

5. Normal Working Environment of Circuit Breaker

1) The altitude of the installation site doesn't exceed 2,500m. See the "High-altitude Derating Factor Table of Circuit Breaker" for the derating factor at the altitude;
2) The ambient temperature is -35℃ ~ + 70℃; the average within 24 h shall not be more than +35℃. If the ambient temperature is higher than +50℃, the user needs to reduce the capacity. See the "Derating Factor Table of Temperature Change for the Circuit Breaker" for the derating factor;
3) Its relative humidity at an ambient temperature of +40℃ should not exceed 50%. A higher relative humidity is allowed at a lower temperature. For example, the relative humidity at 20℃ can reach 90%; for frost due to temperature change, the corresponding measures should be taken;
4) The product can withstand the effects of wet air, salt mist, oil mist and mould;
5) The installation category of the circuit breaker connected to the main loop is: Category Ⅲ (power distribution and control level), The installation category of the circuit breaker not connected to the main loop is: Category Ⅱ (load level);
6) The pollution level is Level 3;
7) The product should be installed in places that are free from explosive media, media corrosive to metal, insulation damaging gas, and conductive dust, which should be also avoided from snow and rain;
8) In case of stricter user conditions than the above description, negotiate with the manufacturer.

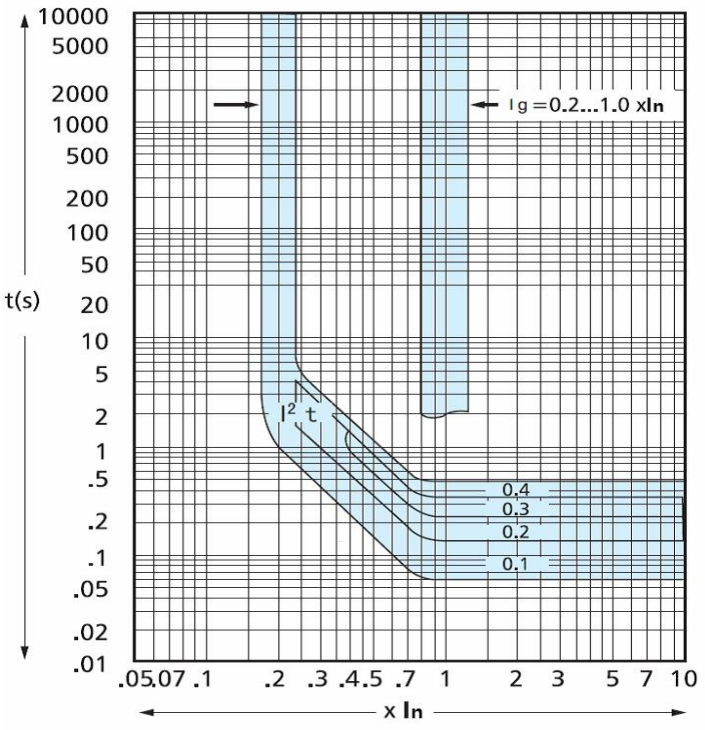
6. Short-circuit Overload Protection Characteristic Curve of Circuit Breaker

6.1. Time/current characteristic curve of power distribution protection type



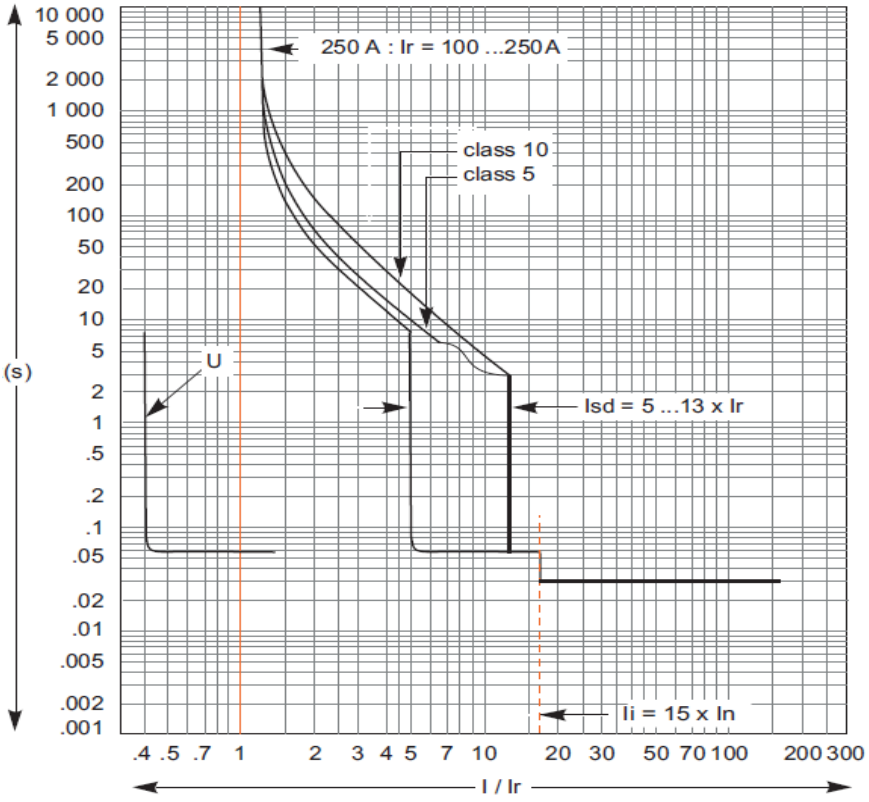
Time/Current Characteristic Curve

6.2. Time/current characteristic curve of ground protection type



Time/Current Characteristic Curve

6.3. Time/current characteristic curve of motor protection type



Time/Current Characteristic Curve

6.4. Setting value of the intelligent controller

6.4.1. Communication-type intelligent controller

Table 7 Communication-type Intelligent Controller

Model	Rated current of frame In(A)	Current and time parameters							
		Ir(A)	Tr(s)	Isd (*Ir)	Tsd(s)	Ii (*In)	Ip (*Ir)	Ig (*In)	Tg(s)
NDM2E-250	250	100, 125 160, 180 200, 225 250, OFF	12 60 80 100	2,3, 4 5, 6, 7 8, 10 OFF	0.06 0.1 0.2 0.3	3, 4, 5 6.4, 7.2 8, 9 10, 12	0.7 0.8 0.9 1.0	0.2, 0.3 0.4, 0.5 0.6, 0.8 1.0, OFF	0.1 0.2 0.3 0.4

Note: When Isd is in the OFF position, the short time-delay is closed.

6.4.2. Non-communication type intelligent controller

Table 8 Communication-type Intelligent Controller

Model	Rated current of frame In(A)	Current and time parameters							
		Ir(A)	Tr(s)	Isd (*Ir)	Tsd(s)	Ii (*In)	Ip (*Ir)	Ig (*In)	Tg(S)
NDM2E-250	250	100, 125 160, 180 200, 225 250, OFF	12 60 80 100	2,3, 4 5, 6, 7 8, 10 OFF	0.06 0.1 0.2 0.3	3, 4, 5 6.4, 7.2 8, 9 10, 12	0.7 0.8 0.9 1.0	0.2, 0.3 0.4, 0.5 0.6, 0.8 1.0, OFF	0.1 0.2 0.3 0.4

Note: When Ir is in the OFF position, the long and short time-delay is closed at the same time; when Isd is in the OFF position, the short time-delay is closed.

6.4.3. Motor protection-type intelligent controller

Table 9 Motor Protection-type Intelligent Controller

Model	Shell frame level Rated current In(A)	Current and time parameters			
		Ir(*In)	Class(s)	Isd(*Ir)	Iunbl (%)
NDM2E-250	250	0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0	4-10	5, 6, 7, 8, 9 10, 11, 12, 13 OFF	10, 20, 30 40, OFF

Note: 1) When Isd is in the OFF position, the short time-delay is closed;

2) When Iunbl is in the OFF position, the current imbalance protection is off;

3) The short circuit instantaneous Ii has built-in 15In.

6.5. Protection characteristics of power distribution-type circuit breaker

Table 10 Protection Characteristics of Intelligent Release

<table>
<tr><td colspan="7">Overload long time-delay protection Ir, Tr</td></tr>
<tr><td colspan="2">Setting current Ir</td><td colspan="5">See Table 7 or 8</td></tr>
<tr><td rowspan="7">Action features (reverse time limit)</td><td rowspan="2">Tr setting value (s)</td><td colspan="5">In = 250A</td></tr>
<tr><td>12</td><td>60</td><td>80</td><td>100</td></tr>
<tr><td>≤1.05Ir</td><td colspan="4">＞2h inaction</td></tr>
<tr><td>＞1.30Ir</td><td colspan="4">＜1h action</td></tr>
<tr><td>t(s) at 1.5Ir</td><td>21.3</td><td>106.7</td><td>142.2</td><td>177.8</td></tr>
<tr><td>t(s) at 2.0Ir</td><td>12</td><td>60</td><td>80</td><td>100</td></tr>
<tr><td>t(s) at 7.2Ir</td><td>0.93</td><td>4.63</td><td>6.17</td><td>7.72</td></tr>
<tr><td>Accuracy (%)</td><td colspan="4">±10</td></tr>
<tr><td colspan="7">Note: The action curve conforms to $t=(2Ir/I)^2 \times Tr$
t: overload long time-delay action time Tr: setting value of the overload long time-delay action
I: Actual running current Ir: setting value of the overload long time-delay action current</td></tr>
<tr><td colspan="7">Short circuit short-time delay protection Isd, Tsd</td></tr>
<tr><td colspan="3">Setting current Isd</td><td colspan="4">See Table 7 or 8</td></tr>
<tr><td rowspan="5">Action characteristics</td><td rowspan="2">Reverse time limit
Isd≤I＜1.5Isd</td><td>Tsd setting</td><td>0.06</td><td>0.1</td><td>0.2</td><td>0.3</td></tr>
<tr><td>t action time (s)</td><td colspan="4">$t=(1.5Isd/I)^2 \times Tsd$</td></tr>
<tr><td rowspan="3">Fixed time limit
1.5Isd≤I＜Ii</td><td>t action time (s)</td><td>0.06</td><td>0.1</td><td>0.2</td><td>0.3</td></tr>
<tr><td>Returnable</td><td>/</td><td>/</td><td>0.14</td><td>0.21</td></tr>
<tr><td>Accuracy (%)</td><td colspan="4">±10</td></tr>
<tr><td colspan="7">Note: The inverse time limit action curve conforms to $t=(1.5Isd/I)^2 \times Tsd$
The reverse time limit is ON while the fixed time limit is OFF
t: short-circuit short time-delay action time Tsd: setting value of the short-circuit short time-delay
I: Actual running current Isd: setting value of the short-circuit short time-delay action current</td></tr>
</table>

Table 10 (Continued) Protection Characteristics of Intelligent Release

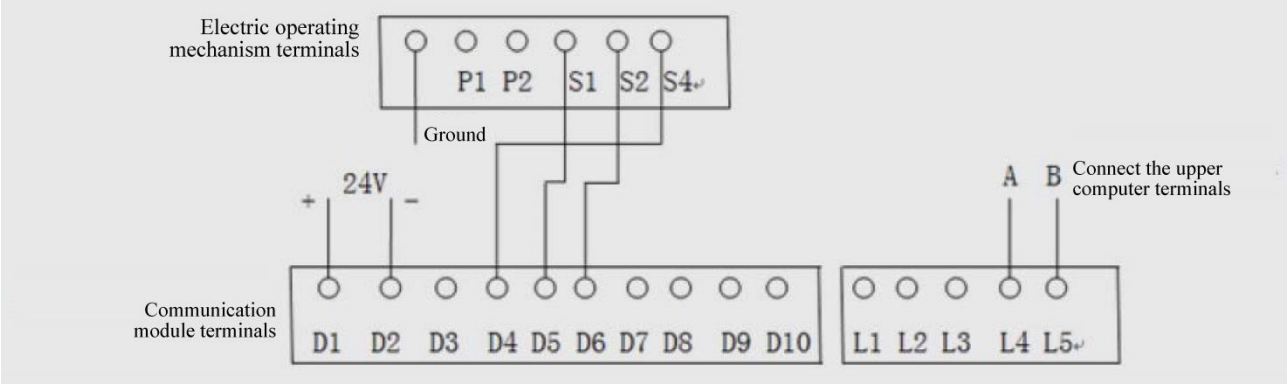
<table>
<tr><td colspan="7">Short circuit instantaneous protection Ii</td></tr>
<tr><td rowspan="2">Action characteristics</td><td colspan="3">Setting current Ii</td><td colspan="3">See Table 7 or 8</td></tr>
<tr><td colspan="3">Action time</td><td colspan="3">＜50ms</td></tr>
<tr><td colspan="7">Pre-alarm Ip</td></tr>
<tr><td colspan="4">Setting current Ip</td><td colspan="3">See Table 7 or 8</td></tr>
<tr><td rowspan="2">characteristics</td><td colspan="3">Alarm indicator</td><td colspan="3">The indicator changes to be constantly on from flashing</td></tr>
<tr><td colspan="3">Accuracy (%)</td><td colspan="3">±10</td></tr>
<tr><td colspan="7">Overload indicator (maximum load)</td></tr>
<tr><td rowspan="3">characteristics</td><td colspan="3">Current value range</td><td colspan="3">1.15×Ir</td></tr>
<tr><td colspan="3">Overload indicator</td><td colspan="3">Constantly on</td></tr>
<tr><td colspan="3">Accuracy (%)</td><td colspan="3">±10</td></tr>
<tr><td colspan="7">Ground fault protection Ig, Tg</td></tr>
<tr><td colspan="3">Setting current Ig</td><td colspan="4">(0.2, 0.3, 0.4, 0.5, 0.6, 0.8, 1.0)×I_n+OFF</td></tr>
<tr><td rowspan="4">Action characteristics</td><td rowspan="2">Reverse time limit Ig≤I_Δ＜2Ig</td><td>Tg setting value (s)</td><td>0.1</td><td>0.2</td><td>0.3</td><td>0.4</td></tr>
<tr><td>t action time (s)</td><td colspan="4">$t=(2I_g/I)^2\times T_g$</td></tr>
<tr><td rowspan="2">Fixed time limit I_Δ≥2Ig</td><td>t action time (s)</td><td>0.1</td><td>0.2</td><td>0.3</td><td>0.4</td></tr>
<tr><td>Accuracy (%)</td><td colspan="4">±10</td></tr>
<tr><td colspan="7">Note: I: 3P products are A/B/C three-phase current vector sum.</td></tr>
</table>

6.6. Protection characteristics of the motor protection-type intelligent release

Table 11 Protection characteristics of the motor protection-type intelligent release

<table>
<tr><td colspan="8">Overload protection Ir, Class</td></tr>
<tr><td colspan="2">Setting current Ir</td><td colspan="6">See Table 7 or 8</td></tr>
<tr><td rowspan="7">Action features (reverse time limit)</td><td>Class setting value (s)</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr>
<tr><td>≤1.05 Ir</td><td colspan="7">＞2h inaction</td></tr>
<tr><td>＞1.20 Ir</td><td colspan="7">＜1h action</td></tr>
<tr><td>tr(s) at 1.5 Ir</td><td>92.2</td><td>115.2</td><td>138.2</td><td>161.3</td><td>184.3</td><td>207.4</td><td>230.4</td></tr>
<tr><td>tr(s) at 6.0 Ir</td><td>5.8</td><td>7.2</td><td>8.6</td><td>10.1</td><td>11.5</td><td>12.9</td><td>14.4</td></tr>
<tr><td>tr(s) at 7.2 Ir</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr>
<tr><td>Accuracy (%)</td><td colspan="7">±10</td></tr>
<tr><td colspan="8">Note: The action curve conforms to t=(7.2) ²×(Ir) ²×Class/I ²
t: Overload protection action time Class: Setting value of the tripping level time
I: Actual running current Ir: Setting value of the overload protection action current</td></tr>
<tr><td colspan="8">Short circuit short-time delay protection Isd</td></tr>
<tr><td colspan="3">Setting current Isd</td><td colspan="5">See Table 7 or 8</td></tr>
<tr><td rowspan="2">Action characteristics</td><td rowspan="2">Fixed time limit Isd<I</td><td>t action time (s)</td><td colspan="5">0.06</td></tr>
<tr><td>Accuracy (%)</td><td colspan="5">±10</td></tr>
<tr><td colspan="8">Current unbalance protection Iunbl</td></tr>
<tr><td colspan="6">Setting value Iunbl(%)</td><td colspan="2">See Table 7 or 8</td></tr>
<tr><td rowspan="3">Action characteristics</td><td rowspan="2">δ≥Iunbl(%)</td><td>During startup (＜ Class)</td><td rowspan="2">t action time (s)</td><td colspan="2">0.7</td></tr>
<tr><td>During normal operation (≥Class)</td><td colspan="2">4</td></tr>
<tr><td>δ＜Iunbl(%)</td><td colspan="4">Inaction</td></tr>
<tr><td colspan="8">Note: The calculation of the actual current unbalance conforms to δ=(Imax-Imin)×3×100% ／ (Ia+Ib+Ic)
δ: Percentage value of the actual current unbalance of the three-phase electricity
Imax: Maximum current value Imin: Minimum current value
Ia: A-phase current value Ib: B-phase current value Ic: C-phase current value</td></tr>
<tr><td colspan="8">Open-phase protection</td></tr>
<tr><td rowspan="2">Action characteristics</td><td rowspan="2">I＜0.4Ir</td><td>During startup (＜ Class)</td><td rowspan="2">t action time (s)</td><td colspan="2">0.7</td></tr>
<tr><td>During normal operation (≥Class)</td><td colspan="2">4</td></tr>
<tr><td colspan="8">Short circuit instantaneous protection I i</td></tr>
<tr><td>Setting current Ii</td><td colspan="7">See Table 7 or 8</td></tr>
<tr><td>Action time</td><td colspan="7">＜ 50 ms</td></tr>
</table>

6.7. Communication module characteristics



Connection diagram of communication module and electric operating mechanism

Terminal code	Connection position	Input/output (IO)
D1	Power input DC24V(+)	Input
D2	Power input DC24V(-)	
D3	Empty	
D4	"OFF" control terminal of the electric operating mechanism	Output (DO)
D5	"COM" control terminal of the electric operating mechanism	
D6	"ON" control terminal of the electric operating mechanism	
D7	Empty	
D8, D9	Network control options	Input (DI)
D10	Empty	
L1	Power DC5V(+)	Output
L2	Power DC5V(-)	
L3	PE	
L4	Receive/send data (A)	Input/output
L5	Receive/send data (B)	

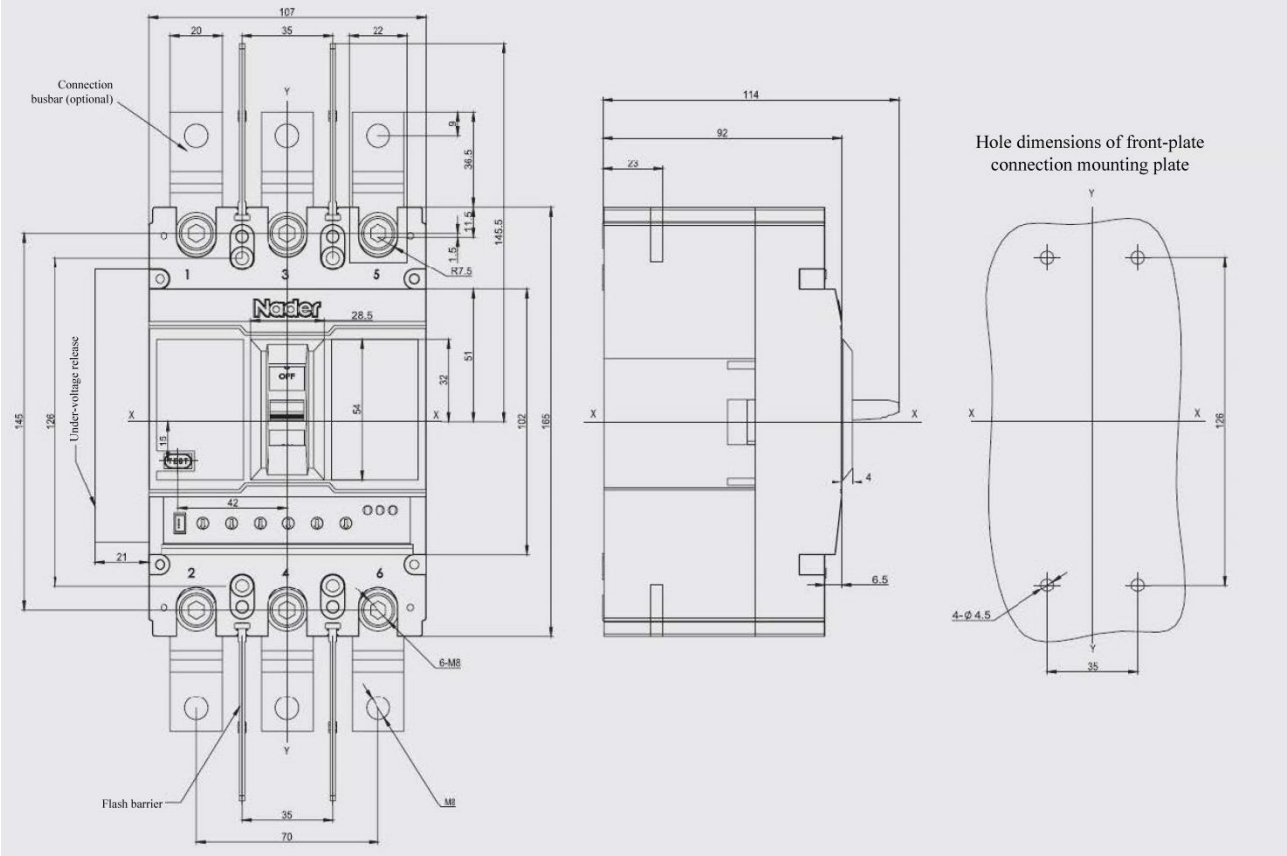
Note: 1) Specification of the rated working voltage: DC 24V, allowed range: ±15%, power ≤2W.

2) DI, switch input, input impedance: ≤100Ω

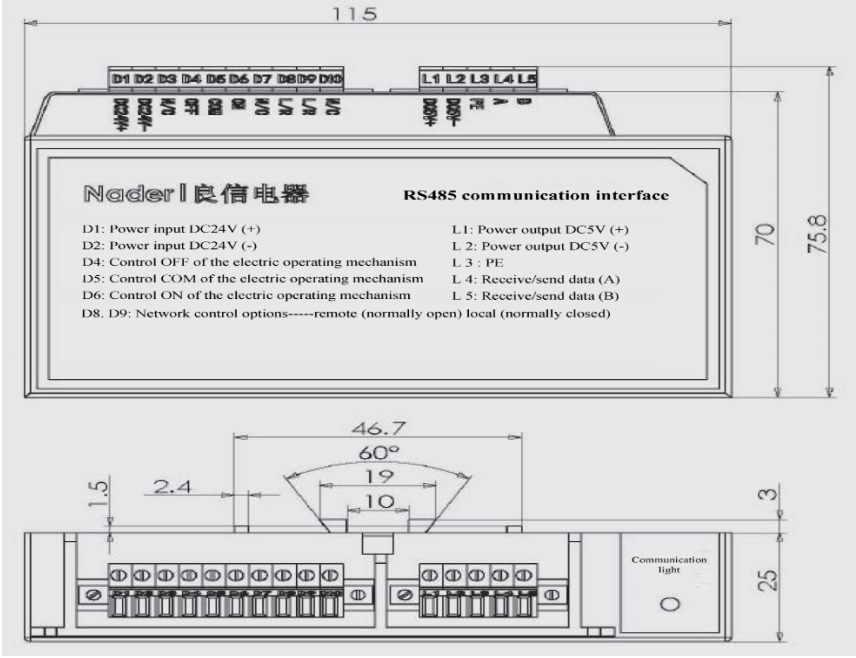
3) DO, switch output, contact capacity: Resistive load DC30V/5A, AC270V/3A.

7. Outline and Mounting Hole Dimensions of Circuit Breaker

7.1 Outline and mounting hole dimensions of circuit breaker



7.2 Installation dimensions of communication module



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

7.3 Safe mounting distance of circuit breaker

Table 7 Insulation Distance Mounted in the Metal Cabinet (Unit: mm)

Mounting distance	A (inlet wire end to the cabinet face)		B (distance from side to the cabinet face)	C (outlet wire end to the cabinet face)
Model	With a terminal cover	Without a terminal cover		
NDM2E-250	25	65	30	30

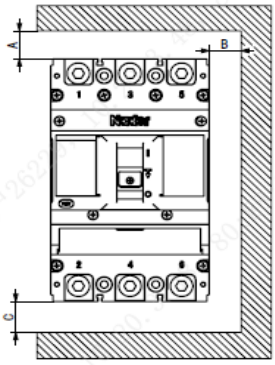


Table 8 Minimum Center Distance between Rowed Circuit Breakers (Unit: mm)

Model	Width of circuit breaker	I Center distance
	3 poles	3 poles
NDM2E-250	107	137

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.

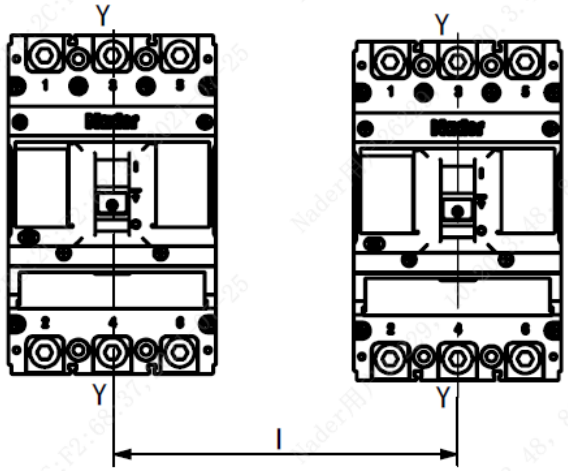


Table 9 Minimum Distance between Stacked Circuit Breakers (Unit: mm)

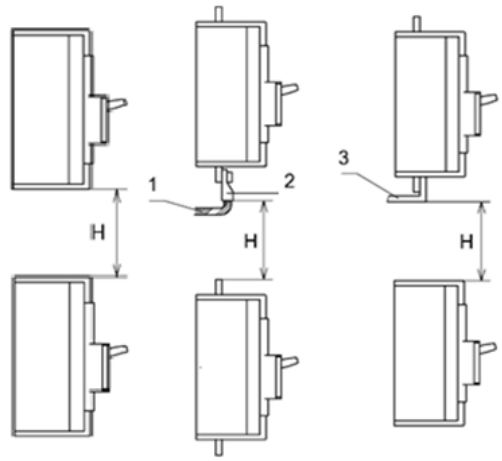
Model	H (distance of circuit breaker from bottom)	
	With a terminal cover	Without a terminal cover
NDM2E-250	90	93

Note: 1) Bare cable connection

2) Cable insulating connection

3) Connection without insulation

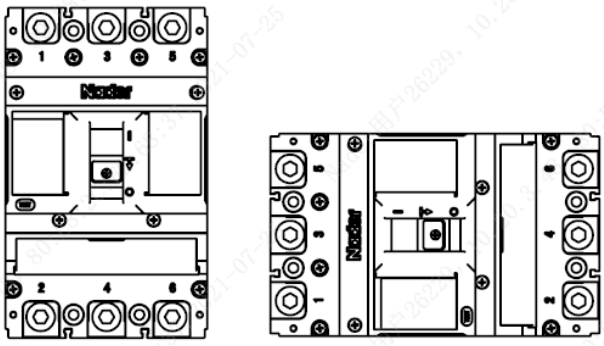
Requirements: Check whether the terminal cover or phase partition is assembled properly before products are energized.



8. Installation Direction of Circuit Breaker

For vertical installation of the product, the gradient between the installation surface and the vertical plane is no more than ±22.5°.

Horizontal installation of the product.



Vertical Installation Horizontal Installation

9. Packaging and Storage of Circuit Breaker

Minimum packaging quantity: 1 piece/box. The packaged products should be stored in a warehouse with the air ventilation and the relative humidity no more than 80% when the ambient temperature is -40℃~+75 ℃. No acidic alkaline or other corrosive gas exists in the ambient air in the warehouse. Under the conditions above, the storage period shall be no more than three years since the manufacturing date.

10. Installation Direction of Circuit Breaker

SN	Name	Specification	3P Quantity/Set
1	Cross small pan-head screw	M4×45	4
2	Hexagon nut	M4	4
3	Spring washer	4	4
4	Plain washer	4	4
5	Phase partition	——	4

11. Circuit Breaker Notes

1) Various characteristics and accessories of the circuit breaker are set in the factory. The circuit breaker, tripping unit or other accessories can only be adjusted, installed and maintained by the trained or qualified professionals according to the parameter requirements of the line design;

2) Ensure that the power supply is off before installing or removing any device;

3) The circuit breaker handle can be located in three positions, indicating three states: on, off and free tripping. When the handle is in the free tripping position, pull the handle in the off direction when the circuit breaker is connected and on.