CCC, CQC, CB, CE, TUV

Molded Case Circuit Breakers

NDM3-1600 series

QUISURE
Keep quick, Make sure
ISO9001:2015
QUALITY GUARANTEED

1 Applicable scope and purpose

The NDM3-1600 series of molded case circuit breakers (referred to as circuit breakers) have a rated insulation voltage of 1000V and apply to circuits with the AC 50Hz/60Hz, the rated working voltage (AC400V/415V, AC500V, AC690V) and rated working current (800A~1250A). The circuit breakers are used for distributing power while protect the overload, short circuit and under-voltage (with an under-voltage release) of lines and power units.

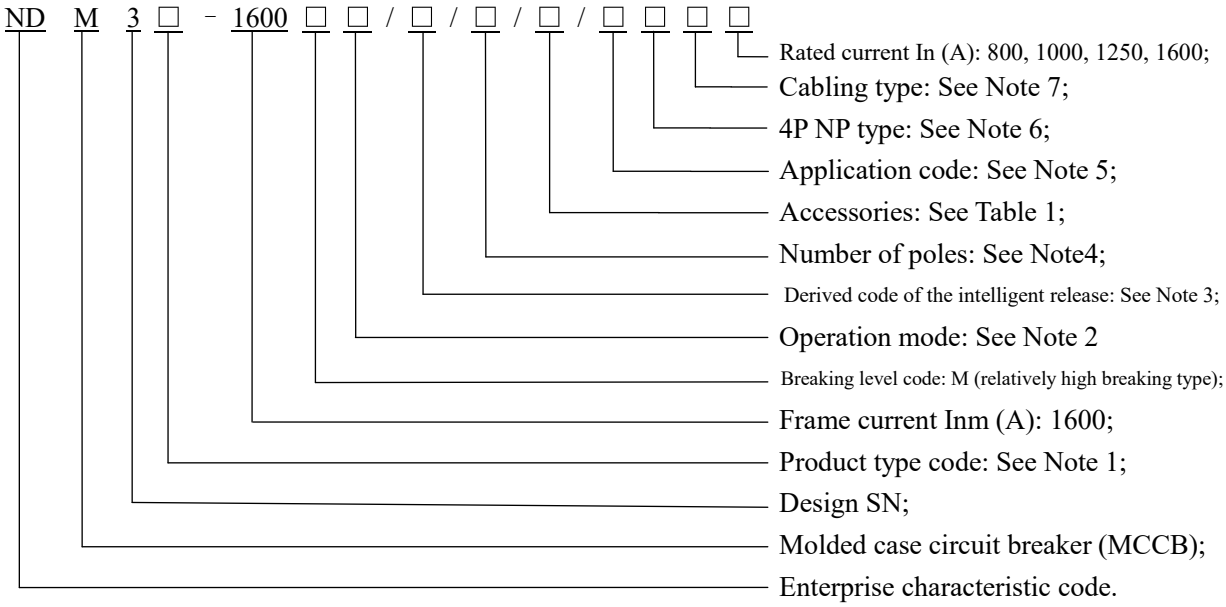
The NDM3EX-1600 series of molded case circuit breakers (referred to as circuit breakers) have a rated insulation voltage of 1000V and apply to circuits with the AC 50Hz/60Hz, the rated working voltage (AC400V/415V, AC500V, AC690V) and rated working current (800A~1600A). The circuit breakers are used for distributing power while protect the overload, short circuit and under-voltage (with an under-voltage release) of lines and power units. They have the overload long time-delay inverse time-limit, short-circuit short time-delay inverse time-limit, short-circuit short time-delay fixed time-limit, short-circuit instantaneous protection, ground protection and alarm functions.

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

Comply with standards: IEC 60947-2, GB 14048.2.

2 Picture of the Product

3. Specification and Model Description



Note: 1) Product type code: no code: AC thermo-magnetic; EX: electronic miniaturization.

2) Operation mode: no code: direct handle-operated; "P" rotation handle operated; "Z": motor-operated;

3) Derived code of the intelligent release: no code: basic type; G: grounding protection type;

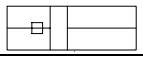
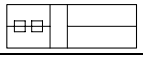
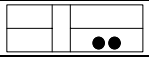
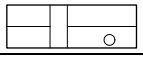
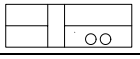
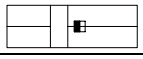
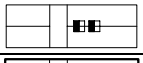
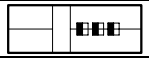
4) Number of poles: 3: 3P

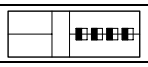
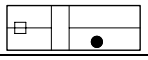
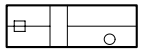
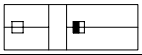
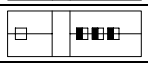
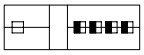
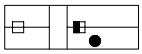
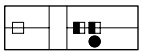
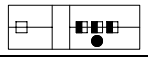
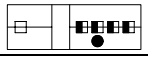
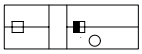
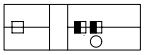
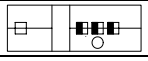
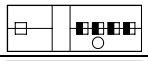
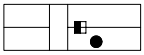
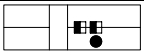
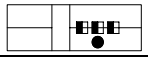
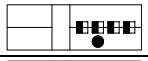
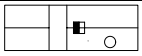
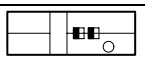
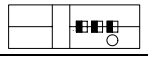
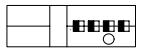
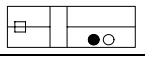
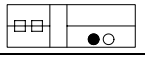
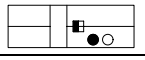
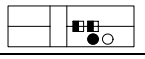
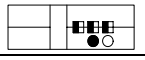
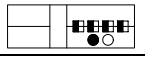
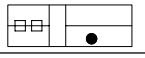
5) Application code: no code: power distribution type;

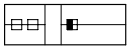
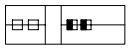
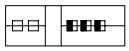
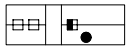
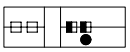
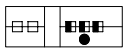
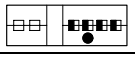
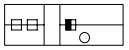
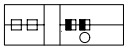
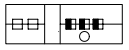
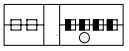
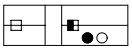
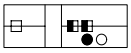
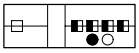
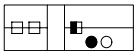
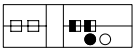
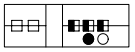
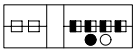
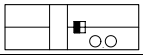
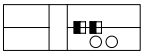
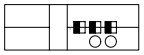
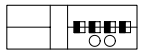
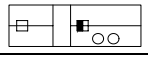
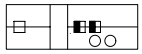
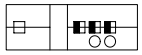
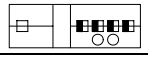
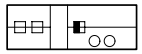
6) 4P NP type: this product is not involved;

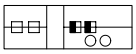
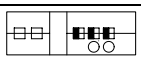
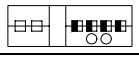
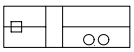
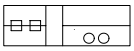
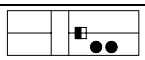
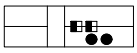
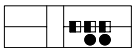
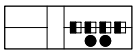
7) Cabling type: no code: front-plate cabling; "P": extended busbar.

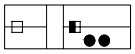
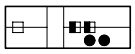
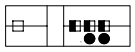
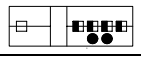
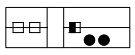
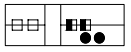
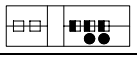
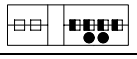
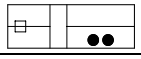
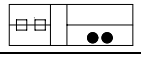
Table 1

Accessory code	Accessory name	Installation
		3P
300	None	—
308	One set of alarm contacts	
398	Two sets of alarm contacts	
310	Shunt release	
3K01	Two sets of shunt releases	
330	Under-voltage release	
3A01	Two sets of under-voltage releases	
321	Single auxiliary contact	
361	Two sets of single auxiliary contacts	
323	Three sets of single auxiliary contacts	

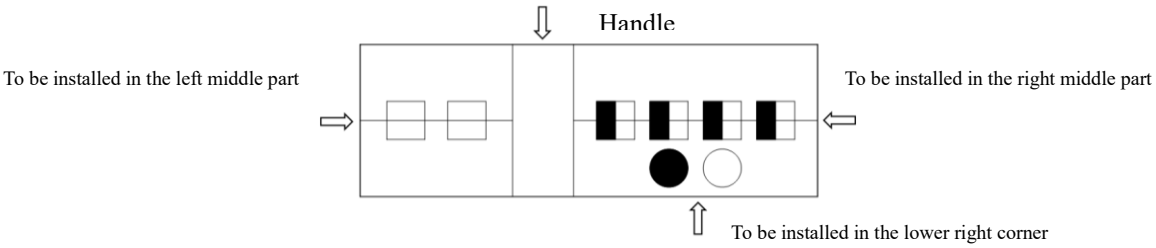
324	Four sets of single auxiliary contacts	
318	Shunt release, alarm contact	
338	Under-voltage release, alarm contact	
322	Single auxiliary contact, alarm contact	
388	Two sets of single auxiliary contacts, alarm contact	
326	Three sets of single auxiliary contacts, alarm contact	
325	Four sets of single auxiliary contacts, alarm contact	
342	Shunt release, single auxiliary contact, alarm contact	
344	Shunt release, two sets of single auxiliary contacts, alarm contact	
346	Shunt release, three sets of single auxiliary contacts, alarm contact	
314	Shunt release, four sets of single auxiliary contacts, alarm contact	
375	Under-voltage Release, single auxiliary contact, alarm contact	
377	Under-voltage release, two sets of single auxiliary contacts, alarm contact	
381	Under-voltage release, three sets of single auxiliary contacts, alarm contact	
382	Under-voltage release, four sets of single auxiliary contacts, alarm contact	
341	Shunt release, single auxiliary contact	
311	Shunt release, two sets of single auxiliary contacts	
312	Shunt release, three sets of single auxiliary contacts	
313	Shunt release, four sets of single auxiliary contacts	
371	Under-voltage release, single auxiliary contact	
372	Under-voltage release, two sets of single auxiliary contacts	
373	Under-voltage release, three sets of single auxiliary contacts	
374	Under-voltage release, four sets of single auxiliary contacts	
331	Under-voltage release, shunt release, alarm contact	
337	Under-voltage release, shunt release, two sets of single alarm contacts	
351	Under-voltage release, shunt release, single auxiliary contact	
352	Under-voltage release, shunt release, two sets of single auxiliary contacts	
353	Under-voltage release, shunt release, three sets of single auxiliary contacts	
354	Under-voltage release, shunt release, four sets of single auxiliary contacts	
319	Shunt release, two sets of single alarm contacts	

379	Under-voltage release, two sets of single alarm contacts	
363	Single auxiliary contact, two sets of single alarm contacts	
364	Two sets of single auxiliary contacts, two sets of single alarm contacts	
365	Three sets of single auxiliary contacts, two sets of single alarm contacts	
366	Four sets of single auxiliary contacts, two sets of single alarm contacts	
343	Shunt release, single auxiliary contact, two sets of single alarm contacts	
345	Shunt release, two sets of single auxiliary contacts, two sets of single alarm contacts	
347	Shunt release, three sets of single auxiliary contacts, two sets of single alarm contacts	
315	Shunt release, four sets of single auxiliary contacts, two sets of single alarm contacts	
375	Under-voltage release, single auxiliary contact, two sets of single alarm contacts	
377	Under-voltage release, two sets of single auxiliary contacts, two sets of single alarm contacts	
381	Under-voltage release, three sets of single auxiliary contacts, two sets of single alarm contacts	
382	Under-voltage release, four sets of single auxiliary contacts, two sets of single alarm contacts	
332	Under-voltage release, shunt release, single auxiliary contact, alarm contact	
333	Under-voltage release, shunt release, two sets of single auxiliary contacts, alarm contact	
334	Under-voltage release, shunt release, three sets of single auxiliary contacts, alarm contact	
335	Under-voltage release, shunt release, four sets of single auxiliary contacts, alarm contact	
339	Under-voltage release, shunt release, single auxiliary contact, two sets of single alarm contacts	
355	Under-voltage release, shunt release, two sets of single auxiliary contacts, two sets of single alarm contacts	
356	Under-voltage release, shunt release, three sets of single auxiliary contacts, two sets of single alarm contacts	
336	Under-voltage release, shunt release, four sets of single auxiliary contacts, two sets of single alarm contacts	
3A02	Two sets of under-voltage releases, single auxiliary contact	
3A07	Two sets of under-voltage releases, two sets of single auxiliary contacts	
3A08	Two sets of under-voltage releases, three sets of single auxiliary contacts	
3A09	Two sets of under-voltage releases, four sets of single auxiliary contacts	
3A10	Two sets of under-voltage releases, single auxiliary contact, alarm contact	
3A12	Two sets of under-voltage releases, two sets of single auxiliary contacts, alarm contact	
3A14	Two sets of under-voltage releases, three sets of single auxiliary contacts, alarm contact	
3A16	Two sets of under-voltage releases, four sets of single auxiliary contacts, alarm contact	
3A11	Two sets of under-voltage releases, single auxiliary contact, two sets of single alarm contacts	

3A13	Two sets of under-voltage releases, two sets of single auxiliary contacts, two sets of single alarm contacts	
3A15	Two sets of under-voltage releases, three sets of single auxiliary contacts, two sets of single alarm contacts	
3A17	Two sets of under-voltage releases, four sets of single auxiliary contacts, two sets of single alarm contacts	
3A05	Two sets of under-voltage releases, alarm contact	
3A06	Two sets of under-voltage releases, two sets of single alarm contacts	
3K04	Two sets of shunt releases, single auxiliary contact	
3K06	Two sets of shunt releases, two sets of single auxiliary contacts	
3K07	Two sets of shunt releases, three sets of single auxiliary contacts	
3K08	Two sets of shunt releases, four sets of single auxiliary contacts	

3K12	Two sets of shunt releases, single auxiliary contact, alarm contact	
3K09	Two sets of shunt releases, two sets of single auxiliary contacts, alarm contact	
3K10	Two sets of shunt releases, three sets of single auxiliary contacts, alarm contact	
3K11	Two sets of shunt releases, four sets of single auxiliary contacts, alarm contact	
3K13	Two sets of shunt releases, single auxiliary contact, two sets of single alarm contacts	
3K14	Two sets of shunt releases, two sets of single auxiliary contacts, two sets of single alarm contacts	
3K15	Two sets of shunt releases, three sets of single auxiliary contacts, two sets of single alarm contacts	
3K16	Two sets of shunt releases, four sets of single auxiliary contacts, two sets of single alarm contacts	
3K02	Two sets of shunt releases, alarm contact	
3K05	Two sets of shunt releases, two sets of single alarm contacts	

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



4 Main Technical Parameters

Table 2

Model	NDM3-1600M	NDM3EX-1600M
Number of poles	3	
Rated working voltage Ue (V)	AC400V/415V、AC500V、AC690V	
Rated current In (A)	800、1000、1250、	800、1000、1250、1600
Rated insulation voltage Ui (V)	1000	
Power frequency withstand voltage (V)	3500	
Rated impulse withstand voltage Uimp (kV)	12	
Icu (kA) (AC400V/415V)	70	
Ics (kA) (AC400V/415V)	50	
Icu (kA) (AC500V)	50	
Ics (kA) (AC500V)	50	
Icu (kA) (AC690V)	20	
Ics (kA) (AC690V)	20	
Icw (kA)	/	20/1s
Utilization category	A	B
Mechanical life (times)	10000	
AC415V Electrical life (times)	3000	2000(1600)、3000(1250)
AC690V Electrical life (times)	2000	1000(1600)、2000(1250)
Release form	Thermo-magnetic	Electronic
External dimensions (length×width×height)	268×210×154	
Installation Dimension	245×70	

5 Normal Working Environment

a) Altitude: ≤2000m;

b) Ambient temperature: -35℃~+70℃;

c) Pollution level: 3;

d) Storage environment: -40℃~+75℃;

e) Installation category: main circuit and under-voltage release: installation category Ⅲ; auxiliary circuit and control circuit: installation category Ⅱ;

f) The product can withstand the effects of wet air, salt mist and oil mist;

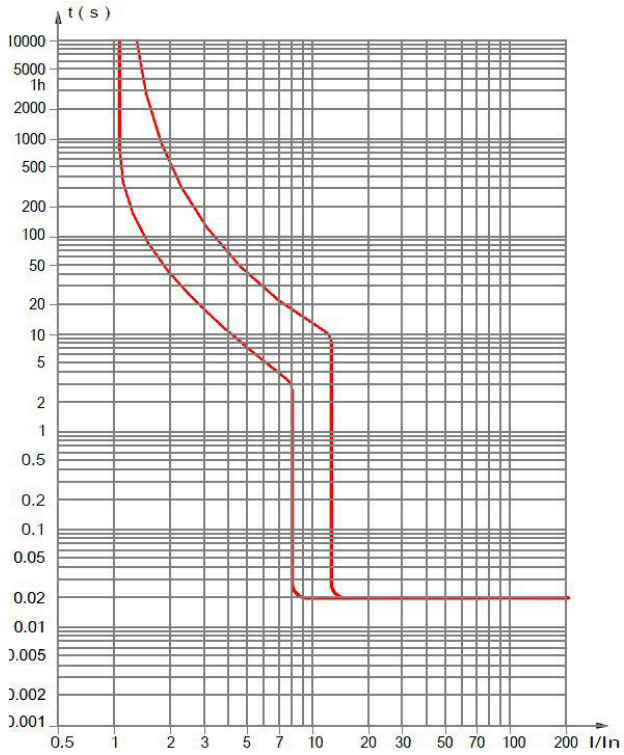
g) The vertical gradient is no more than 5°;

h) The product can be disposed in places that are free from explosive media, media corrosive to metal, insulation damaging gas, and conductive dust;

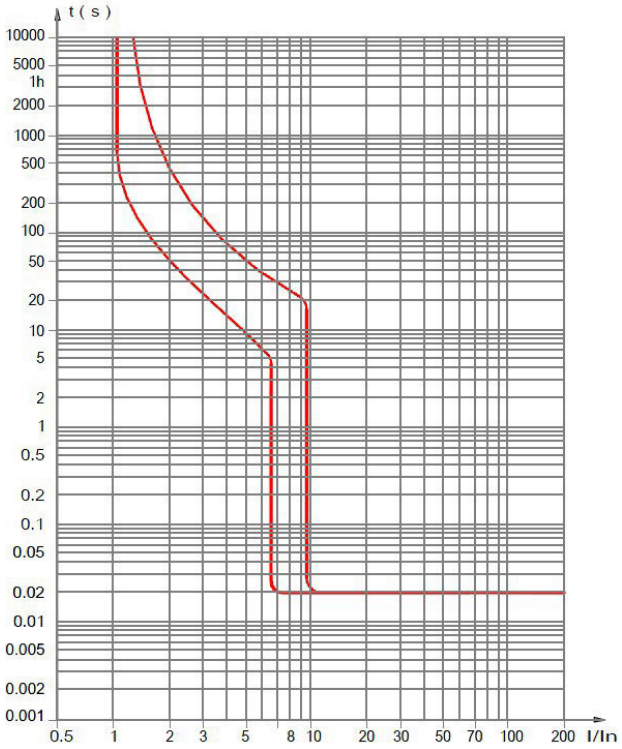
i) The product should be installed free from snow and rain.

6 Tripping Characteristics

6.1 Tripping characteristic curve of NDM3-1600 under normal environment (ambient air temperature: 40℃), see the picture below:

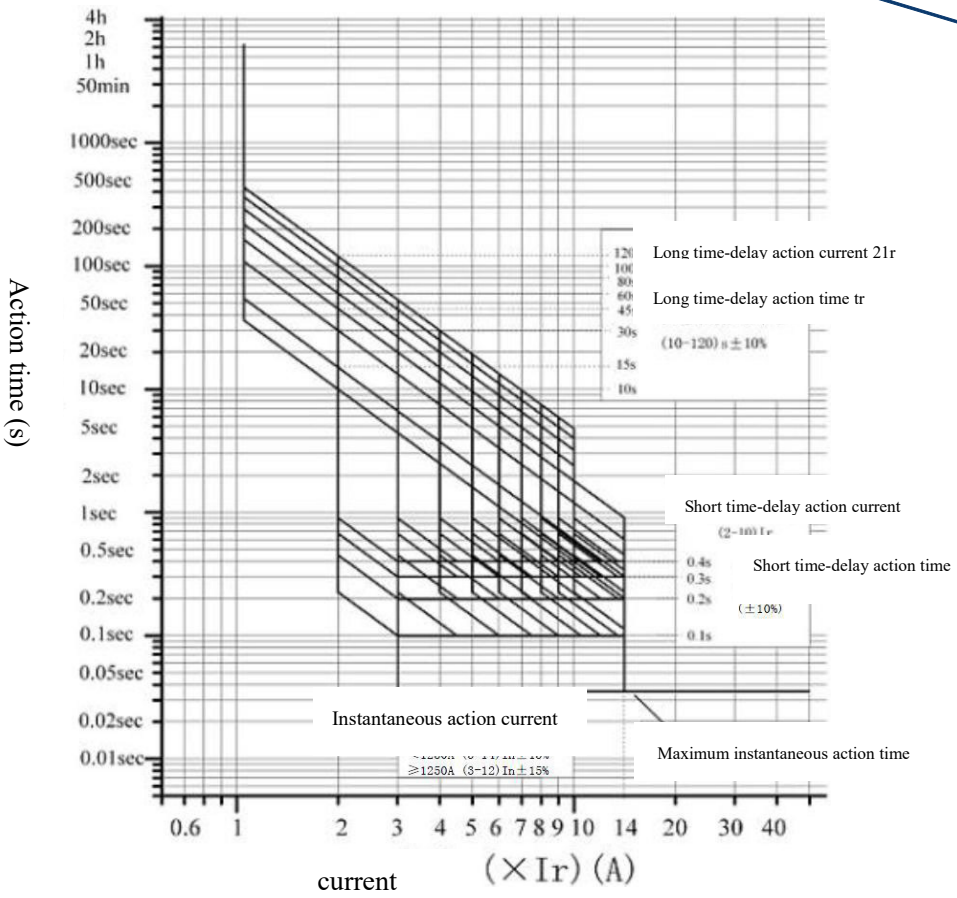


800A, 1000A

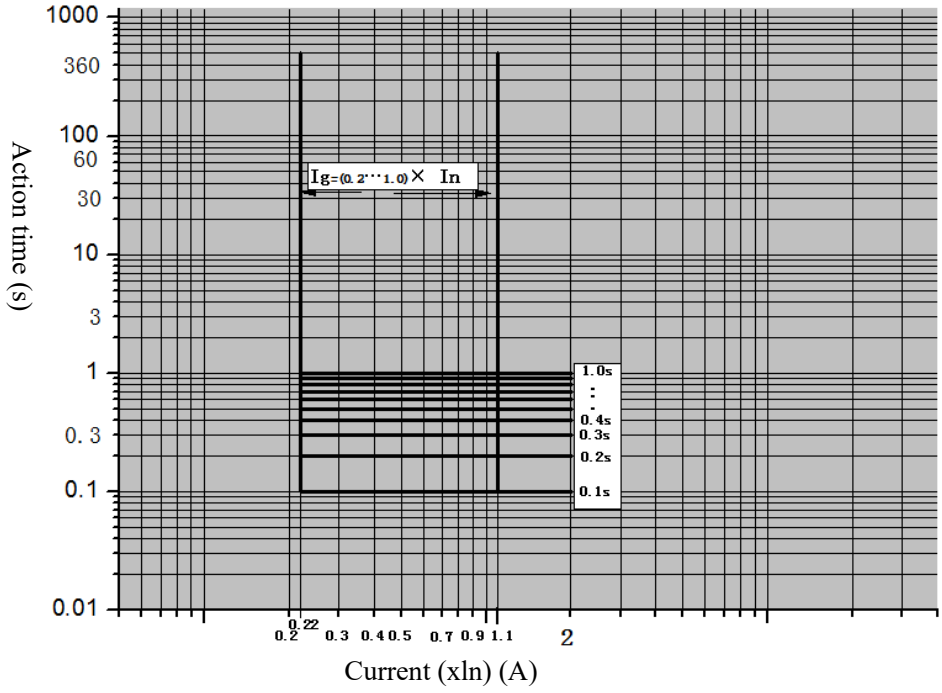


1250A

6.2 Tripping characteristic curve of NDM3EX-1600 under normal environment (ambient air temperature: -35℃~+40℃), see the picture below:



Long time-delay, short time-delay and instantaneous protection curve



Ground protection curve

6.3 The tripping characteristics should be corrected due to changes when the ambient air temperature varies (see Table 3 for the correction factor)

Table 3

Ambient air temperature	Correction factor	
	NDM3-1600	NDM3EX-1600
-35℃	1.42	1
-30℃	1.38	1
-25℃	1.34	1
-20℃	1.30	1
-15℃	1.27	1
-10℃	1.24	1
-5℃	1.21	1
0℃	1.18	1
5℃	1.15	1
10℃	1.12	1
15℃	1.10	1
20℃	1.08	1
25℃	1.06	1
30℃	1.04	1
35℃	1.02	1
40℃	1	1
45℃	0.96	0.98
50℃	0.92	0.95
55℃	0.87	0.92
60℃	0.82	0.88
65℃	0.76	0.84
70℃	0.7	0.8

Note: The above data is calculated according to the test and theory. The data represent only guidelines and recommendations.

6.4 The tripping characteristics should be corrected due to small changes by considering the air insulation characteristics and cooling capacity with the ambient temperature of +40℃ and the altitude above 2,000m (See Table 4)

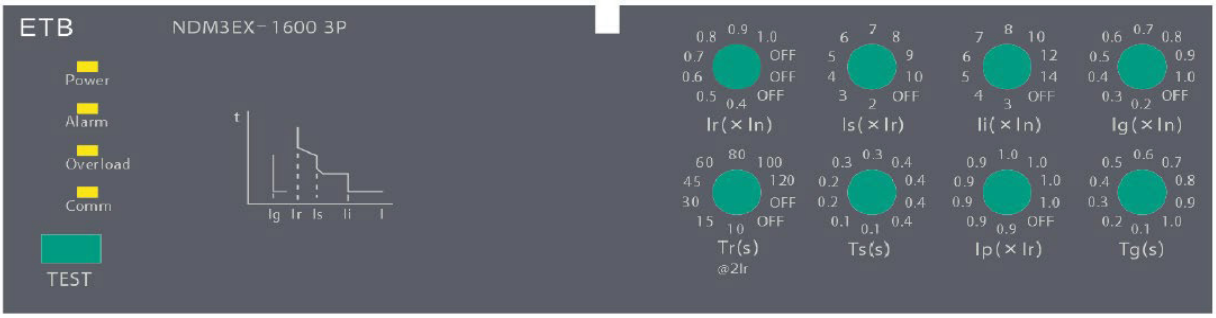
Table 4

Altitude (m)		2000	3000	4000	5000
Power frequency withstand voltage (v)		3500	3150	2700	2200
Average insulation class (v)		1000	900	780	670
Maximum working voltage (v)		690	600	500	440
Correction factor of the working current (+40℃)	NDM3-1600	1	0.94	0.88	0.81
	NDM3EX-1600	1	0.98	0.95	0.93

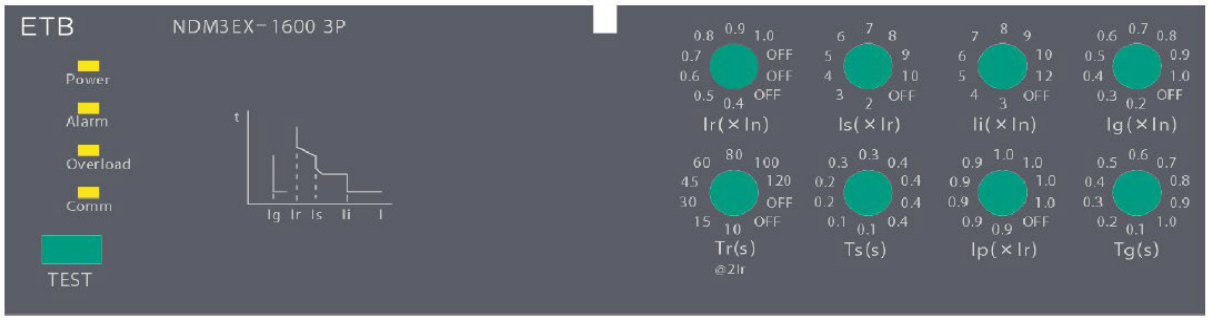
7 Operation and Function Description of Controller

7.1 Operation and use of the controller

a) Control panel of the controller



800A, 1000A



1250A, 1600A

Adjustment Gear Figure of Electronic Release

Components of the circuit breaker control panel:

(1) Ir rated current setting value (2) Tr long time-delay action time (3) Setting value of the Is short circuit short time-delay current (4) Ts short circuit short time-delay action time (5) Setting value of the short-circuit instantaneous current (6) Ip alarm current (7) Ig ground fault protection current (8) Tg ground fault protection time (9) TEST port(10) Power indicator (11) Alarm indicator (12) Overload indicator (13) Communication indicator

Note: Adjustment of the controller current and time must be exclusively performed by specialized technicians!

b) Each part function of the controller control panel

(1) Test port

Namely the "TEST" port: the NDM3EX special tester connects with the controller via this port for test, debugging and other operation.

(2) Current and time adjustment knobs

By adjusting the current and time knobs, select proper combinations to protect lines and devices. This operation must be exclusively performed by specialized technicians!

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

For example: When Ir is set to 1.0, Tr to 10s and the main loop current is 2×1600A, the circuit breaker will break the main loop after lasting 10s. The action time accuracy is about 10%.

At the overload current, the breaking time of the main loop performed by the circuit breaker depends on the formula below:

$t=(2*Ir/I)^2*Tr$

I-it indicates that the actual current value of the main loop under overload conditions.

c) Indicator lights

1. Power indicator

The indicator flashes when the controller is in the working state.

(2) Alarm indicator

When the alarm indicator flashes, it indicates that the actual current exceeds the setting value of the alarm current Ip, which will change to be constantly on from flashing (yellow) after a specified period of time.

(3) Overload indicator

When the overload indicator is constantly on, it indicates that the actual current exceeds 1.15 times of the overload long time-delay current setting value Ir; in the overload state, the circuit breaker will disconnect after a specified period of time.

(4) Communication indicator

When the indicator flashes, it indicates that the controller establishes the external communication.

7.2 Setting of controller parameters (See Table 5)

Table 5

Rated current In (A)	Number of poles	Current and time parameters							
		Ir (×In)	Tr (s)	Is (×In)	Ts (s)	Ig (×In)	Tg (s)	Ii (×In)	Ip (×Ir)
800/1000	3	0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, OFF	10, 15, 30, 45, 60, 80, 100, 120, OFF	2, 3, 4, 5, 6, 7, 8, 9, 10, OFF	0.1, 0.2, 0.3, 0.4	0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, OFF	0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0	3, 4, 5, 6, 7, 8, 10, 12, 14, OFF	0.9, 1.0, OFF
1250/1600	3	0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, OFF	10, 15, 30, 45, 60, 80, 100, 120, OFF	2, 3, 4, 5, 6, 7, 8, 9, 10, OFF	0.1, 0.2, 0.3, 0.4	0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, OFF	0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0	3, 4, 5, 6, 7, 8, 9, 10, 12, OFF	0.9, 1.0, OFF

7.3 Function description

7.3.1 Table of basic functions (see Table 6)

Table 6

	Protection functions	Other functions	Human Machine Interface
Type	Overload long-time delay protection	Alarm indication function	LED indicator light
	Short circuit short-time delay inverse time-limit protection		code switch operation
	Short circuit short-time delay fixed time-limit protection		
	Short circuit instantaneous protection		
	Ground protection		

7.3.2 Setting value of the controller

(1) Overload long time delay protection (See Table 7)

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

Table 7

Setting current Ir		See Table 5 and Table 6							
Action characteristics	Tr setting value (s)	In=800/1000/1250/1600A							
		10	15	30	45	60	80	100	120
	≤1.05Ir	>2h (no action)							
	>1.30Ir	<1h (action)							
	At 1.5Ir, 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
	At 7.2Ir, tr (s)	0.77	1.16	2.31	3.47	4.63	6.17	7.72	9.26
	Accuracy (%)	±10							

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

tr: overload long time-delay action time; Tr: 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 (see Table 8)

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

Table 8

Setting current Is		See Table 5 and Table 6				
Action characteristics	Reverse time limit Is≤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≤Ii	ts action time (s)	0.1	0.2	0.3	0.4
		Accuracy (%)	±20	±10		

Note: The action curve of the reverse time limit complies with $ts=(1.5Is)^2\times Ts/I^2$, 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

(3) Short circuit instantaneous protection (see Table 9)

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 9

Action characteristics	Setting current Ii (×In)	See Table 5
	Action time	<50ms

(4) Ground fault protection (see Table 10)

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

Table 10

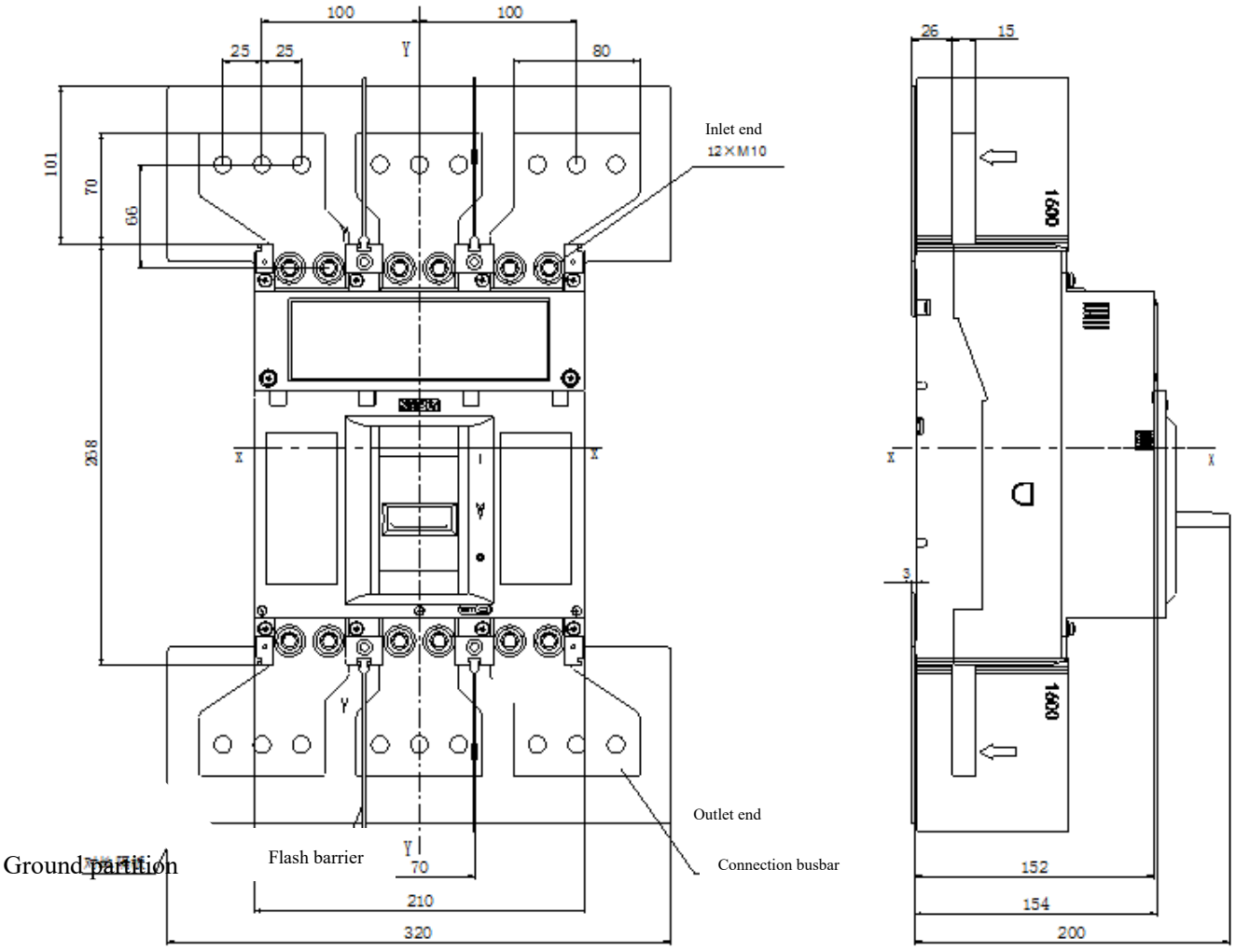
Setting current Ig		See Table 5									
Action characteristics	Fixed time limit	tg action time (s)	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
		Accuracy (%)	±20	±10								

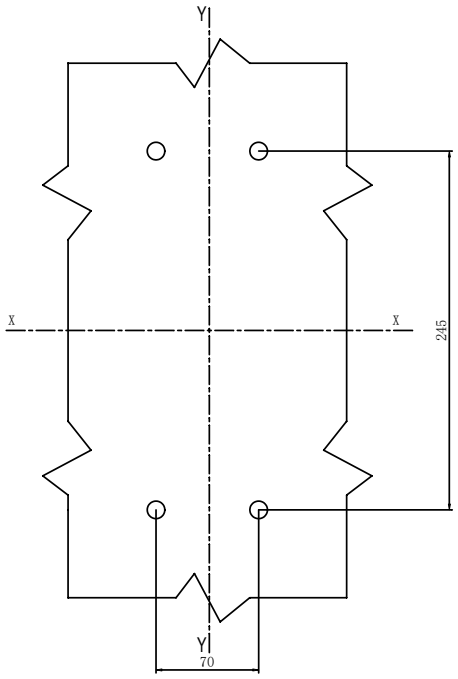
(5) Overload alarm (see Table 11)

Table 11

Setting current Ip	See Table 5	
0.9Ir	Alarm indicator	The indicator changes to be constantly on from flashing
1.0Ir	Alarm indicator	The indicator changes to be constantly on from flashing
OFF	Off	Off

8 Outline and Installation Dimensions





9 Installation Mode

Fixed type.

10 Packaging and Storage

Minimum packaging quantity: 1 piece/box. The packaged products should be stored in a warehouse with the ambient temperature of -40℃~+75℃ and 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 18 months since the manufacturing date.

11 Environmental Compliance

Comply with the requirements of RoHs directives.

12 List of Accessories and Installation

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.

Series Number	Name	Specification	Quantity
1	Cross small pan-head screw	M5×110	4
2	Plain washer	5	4
3	Spring washer	5	4
4	Hexagon nut	M5	4
5	Phase partition	——	4
6	Ground partition	——	2
7	Extended handle	——	1

13 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.

Table 3

Ambient air temperature	Correction factor	
	NDM3-1600	NDM3EX-1600
-35℃	1.42	1
-30℃	1.38	1
-25℃	1.34	1
-20℃	1.30	1
-15℃	1.27	1
-10℃	1.24	1
-5℃	1.21	1
0℃	1.18	1
5℃	1.15	1
10℃	1.12	1
15℃	1.10	1
20℃	1.08	1
25℃	1.06	1
30℃	1.04	1
35℃	1.02	1
40℃	1	1
45℃	0.96	0.98
50℃	0.92	0.95
55℃	0.87	0.92
60℃	0.82	0.88
65℃	0.76	0.84
70℃	0.7	0.8

Note: The above data is calculated according to the test and theory. The data represent only guidelines and recommendations.

6.4 The tripping characteristics should be corrected due to small changes by considering the air insulation characteristics and cooling capacity with the ambient temperature of +40℃ and the altitude above 2,000m (See Table 4)

Table 4

Altitude (m)		2000	3000	4000	5000
Power frequency withstand voltage (v)		3500	3150	2700	2200
Average insulation class (v)		1000	900	780	670
Maximum working voltage (v)		690	600	500	440
Correction factor of the working current (+40℃)	NDM3-1600	1	0.94	0.88	0.81
	NDM3EX-1600	1	0.98	0.95	0.93

7 Operation and Function Description of Controller

7.1 Operation and use of the controller

a) Control panel of the controller