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Technological improvements will be edited into new
version of user manual without further notice.





NA8 Series Air Circuit Breaker

User Manual

Thanks for purchasing this product, please read these instructions carefully before installing, operating or maintaining this product.

Safety Warnings

- ① This product should not be installed in inflammable, explosive, humid and condensing environment, do not operate the product with wet hand.
- ② No touching of conductive parts during operation.
- ③ Make sure to disconnect the power before installation, maintenance and service.
- ④ Do not let children play with the product or its packaging.
- ⑤ Leave sufficient space and safe distance around the product
- ⑥ Do not install the product at places where gas medium can cause metal corrosion and insulation damage.
- ⑦ During installation, the product must be connected to proper power and load through standard wires.
- ⑧ To avoid dangerous accidents, the product must be installed according to instructions strictly.
- ⑨ After unpacking the product, check for any damage and integrity of items.

Environmental Protection

In order to protect the environment, when the product or its components are scrapped, please dispose of it as industrial waste; or hand it over to the recycling station for disaggregation, recycling and reuse according to relevant national regulations.

Content

1	Main use and scope of applications	001
2	Type specification and definitions	001
3	Normal use, installation, transportation and storage conditions	001
4	Main technical parameters and performance	003
5	Structural features and operating principles	005
6	Installation technical requirements	007
7	Overall and installation dimensions	012
8	Control circuit electrical wiring diagram	041
9	Intelligent controller usage	045
10	Circuit breaker accessories instruction	057
11	Circuit breaker maintenance and repair	062
12	Fault diagnosis and troubleshooting	068
13	Warranty	071
14	Model selection and ordering information	071

1 Main use and scope of applications

The NA8 series air circuit breaker ("circuit breaker" in short), with rated current from 200A to 7500A and rated operating voltage of 380V-415V, 690V AC, is suitable for operation under 50Hz/60Hz AC and is mainly used in distribution network for power distribution, and to protect power line and power equipment from various faults such as overload, short circuit, undervoltage and single-phase ground. The circuit breaker is a combination of aesthetic appearance, high breaking capacity, zero flashover and multiple intelligent protection features. It can provide selective protection with accurate operations, to avoid unnecessary black out and guarantee reliable power supply.

The circuit breaker is widely applied in power plants, factories, mines and modern high rises, especially in power distribution system of intelligent buildings. It is also widely used in green projects such as wind power generation or solar power generation.

The product is available for top or bottom cable entries; bus can be rotated horizontally or vertically; withdrawable type is equipped with isolation function.

2 Type specification and definitions

NA8	-	1600	N	-	1600	-	M	/	3	MO	D	230VAC
Product code		Frame size current	Breaking capacity code		Rated current		Intelligent controller code		Pole number code	Operation method code	Installation method code	Control circuit voltage code
		1600	N: standard		200 400 630 800 1000 1250 1600 2000 2500 3200 4000 5000 6300 7500		M: basic type (digital display) H: communication type (LCD display)		3: three poles 4: four poles	MO: motor operation MN: manual operation	D: withdrawable F: fixed	230VAC: AC 230V 400VAC: AC 400V 110VDC: DC 110V 220VDC: DC 220V

Notes: 1. There is no need to mark "N" for the breaking capacity of NA8-7500 N type; if H type is chosen, it should be marked with "H".

2. Manual operation: not containing any motor operation mechanism, closing electromagnet and shunt release. Motor operation: including all standard accessories for remote operation.

3. Code example: NA8-2500H-2000M/3 MO D 230VAC: frame size 2500 with H type breaking capacity, rated current 2000A, M type intelligent controller, 3 poles, motor operation, withdrawable type, control voltage AC230V.

3 Normal use, installation, transportation and storage conditions

3.1 Ambient air temperature from -5°C~+40°C, with average temperature within 24h not exceeding +35°C.

Note: user shall consult with manufacturer for applications under temperature over +40°C or below -5°C.

3.2 The product shall not be installed at an altitude higher than 2000m.

3.3 Relative humidity shall not exceed 50% when ambient air temperature is at +40°C; higher relative humidity is allowed under lower temperature; if the average minimum relative humidity is 90% in wettest month, and the average minimum temperature in that month is +25°C, condensation due to temperature changes shall be taken into consideration.

3.4 The pollution grade is 3.

3.5 Circuit breakers with rated operating voltage of AC1140V belongs to installation type III; circuit breakers with undervoltage trip coil in auxiliary circuit, primary coil of power transformer and rated operating voltage not higher than AC380V belong to installation type IV, others are type III.

3.6 Circuit breaker should be installed in set or separately indoor according to this instruction, with vertical inclination not bigger than 5°.

4 Main technical parameters and performance

Table 1 Main technical parameters (1)

Number of poles	3/4
Rated operational voltage U_e (V)	380/400/415, 690
Rated insulation voltage U_i (V)	1000
Rated impulse withstand voltage U_{imp} (kV)	12
Rated frequency (Hz)	50/60
Flashover distance (mm)	0
Applicable to isolation	IEC/EN 60947-2 Applicable
Pollution grade	IEC 60664-1 N:3

Table 2 Main technical parameters (2)

Frame size			NA8-1600							
Rated current (A)			200	400	630	800	1000	1250	1600	
Rated current of N pole (A)			200	400	630	800	1000	1250	1600	
Type of the circuit breaker			N(400V)			N(690V)				
Rated ultimate short-circuit breaking capacity (kA rms) VAC 50/60Hz	Icu	380/400/415V、690V	55			30				
Rated service short-circuit breaking capacity (kA rms) VAC 50/60Hz	Ics	380/400/415V、690V	42			25				
Application type			B							
Rated short-time withstand current (kA rms) VAC 50/60Hz	Icw 1s	380/400/415V、690V	42			25				
	Icw 3s	380/400/415V、690V								
Rated short-circuit making capacity (kA peak) VAC 50/60Hz	Icm	380/400/415V、690V	121			63				
Making current tripping protection (MCR kA rms)			10							
Breaking time (ms)			20~30							
Making time (ms)			30~40							
Installation, connection and lifetime										
Life C/O cycle	Mechanical	Maintenance-free	20000							
	Electrical	Maintenance-free	8000			3000				
Connection		Horizontal, vertical, mixed		■						
Dimension (H×W×D)	Fixed	3P	320×254×250							
		4P	320×324×250							
	Withdrawable	3P	351×282×350							
		4P	351×352×350							

	NA8-2500							NA8-4000					NA8-7500						
	630	800	1000	1250	1600	2000	2500	1600	2000	2500	3200	4000	4000	5000	6300	7500			
	630	800	1000	1250	1600	2000	2500	1600	2000	2500	3200	4000	4000	5000	6300	3750			
	H(415V)		H(690V)		H(415V)		H(690V)		N(440V)	N(690V)	H(440V)	H(690V)	N(440V)	N(690V)	H(440V)	H(690V)			
	85		65		100		85		135	100	150	100	135	100	150	100			
	85		65		100		85		135	100	135	100	135	100	150	100			
	B				B				B										
	85		65		100		85		135	100	135	100	135	100	135	100	135	100	
	50		50		75		75		100	100	100	100	100	100	100	100	100	100	
	176		121		220		187		297	220	330	220	297	220	330	220			
	16				26				26										
	20~30				20~30				20~30										
	30~40				30~40				30~45										
	20000				10000				10000										
	8000		4000		6000		3000		1500(440V)		1000(690V)								
	■				■				■										
	367×370×357				402×422×341														
	367×461×357				402×537×341														
	431×375×478				431.5×455×456				472×786×464										
	431×470×478				431.5×550×456				472×1016×464										

5 Structural features and operating principles

5.1 NA8-1600 withdrawable circuit breaker structure

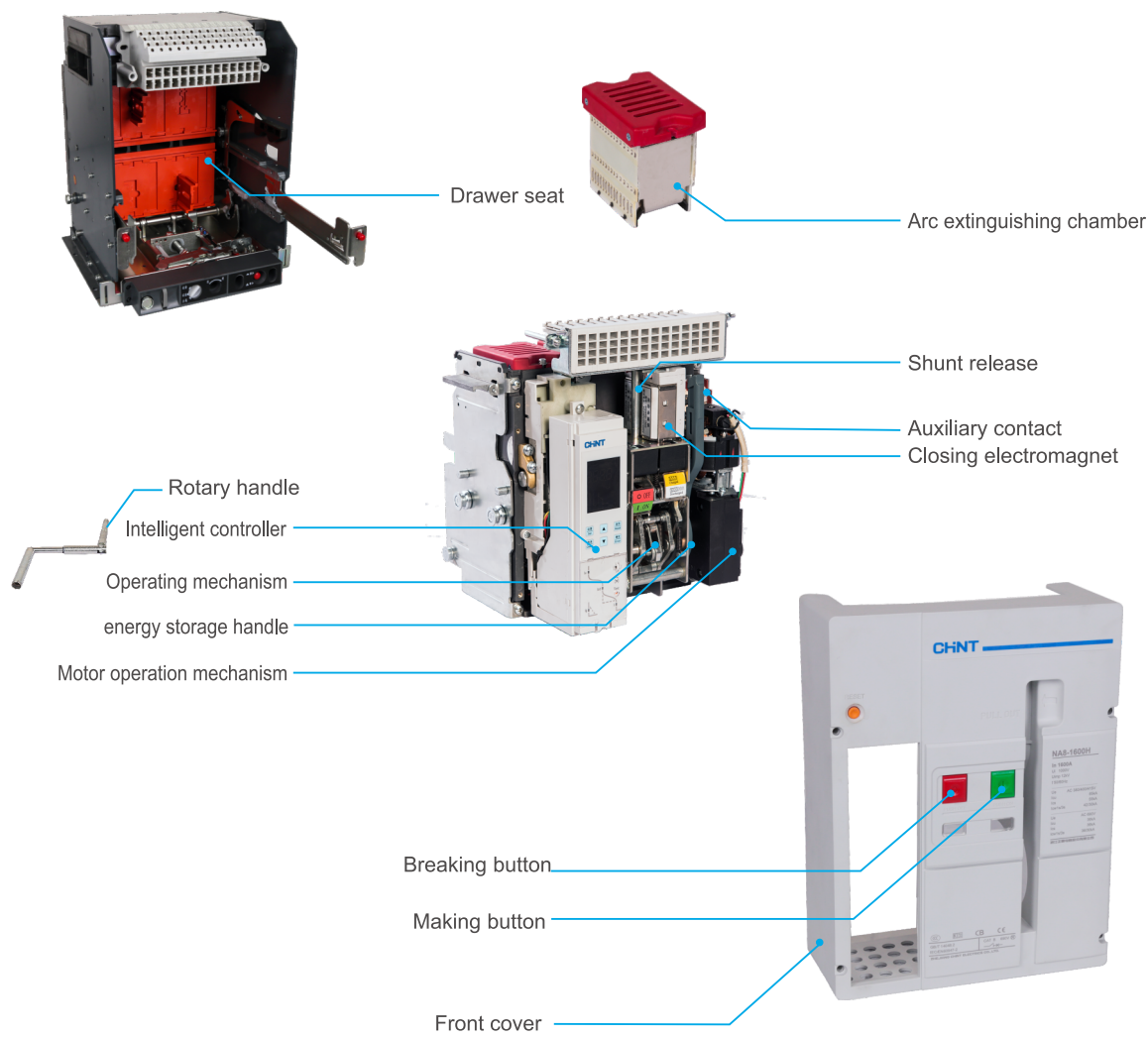


Figure 5.1 NA8-1600 withdrawable circuit breaker structure

5.2 NA8-2500 withdrawable circuit breaker structure



Figure 5.2 NA8-2500 withdrawable circuit breaker structure

- | | |
|------------------------------------|--|
| 1 Trademark | 9 Draw out plate |
| 2 Secondary terminal | 10 Three position locking device |
| 3 Breaking button | 11 Drawer padlock |
| 4 Energy storage handle | 12 Racking-handle entry |
| 5 Making button | 13 Position indicator |
| 6 Name plate | 14 Rotate handle storage hole |
| 7 Energy storage/release indicator | 15 Intelligent controller |
| 8 Opening/closing indication | 16 Fault-breaking indicator reset button |

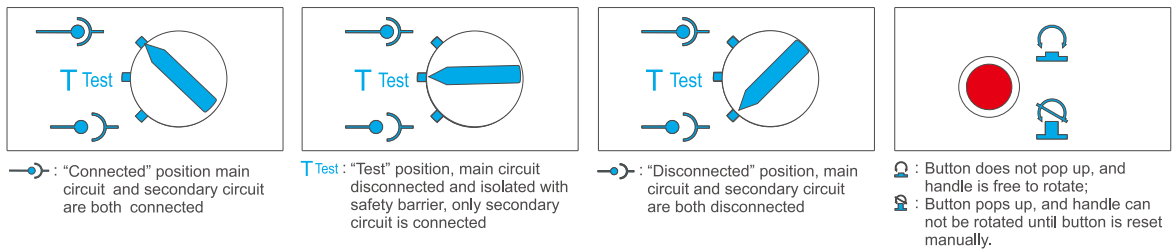


Figure 5.3 NA8 withdrawable circuit breaker positions

6 Installation technical requirements

6.1 Pre-installation check

6.1.1 Check with your order to see whether it is consistent with the parameters on the nameplate of the circuit breaker, check for the following items:

- Circuit breaker type, rated current, rated operating voltage;
- Installation method, operating method;
- Intelligent controller voltage, shunt release voltage, closing electromagnet voltage, energy storage motor voltage, undervoltage release voltage and delay time;
- Other special ordering requirements;

6.1.2 Check the packing contents according to the configuration described in this manual;

6.1.3 Before installing, operating, maintaining and repairing the product, read this manual carefully to avoid artificial damage to the circuit breaker and cause unnecessary problems.

6.2 Preparation before installation

6.2.1 Unpack according to the order described on the bottom of the package, do not use brutal force;

6.2.2 Remove the circuit breaker from the base plate of the package. If the circuit breaker is of withdrawable type, you can find fixing bolts inside the drawer seat, rotate the body out and clean up the drawer seat;

6.2.3 Use 500V megameter to test the insulation resistance of the circuit breaker. It shall not be lower than 20 megohm under ambient temperature of $25^{\circ}\text{C}\pm 5^{\circ}\text{C}$ and relative humidity of 50-70%. Position for testing insulation resistance: between phases and between phase and frame when the circuit breaker is closed; between inlet and outlet cable of each phase when the circuit breaker is open.

6.3 Recommended busbar, power consumption and derated application of circuit breaker

6.3.1 Recommendation busbar

Maximum allowable temperature of busbar: 100°C

Busbar is made of bare copper, with width and thickness in mm.

Table 3 Recommended busbar for circuit breaker

Frame size current	Rated current (A)	Ambient temperature (-5 ~40) °C				Ambient temperature 50°C				Ambient temperature 60 °C			
		Recommended busbar specifications				Recommended busbar specifications				Recommended busbar specifications			
		Width	Thickness	Pieces	Specification	Width	Thickness	Pieces	Specification	Width	Thickness	Pieces	Specification
1600A	200	30	5	1	30*5*1	30	5	1	30*5*1	40	5	1	40*5*1
	400	30	5	2	30*5*2	30	5	2	30*5*2	30	10	1	30*10*1
	630	40	5	2	40*5*2	40	5	2	40*5*2	50	5	2	50*5*2
	800	50	5	2	50*5*2	50	5	2	50*5*2	50	6	2	50*6*2
	1000	50	5	3	50*5*3	50	5	3	50*5*3	50	6	3	50*6*3
	1250	60	8	2	60*8*2	60	8	2	60*8*2	60	10	2	60*10*2
2500A	1600	60	10	2	60*10*2	60	10	2	60*10*2	60	10	3	60*10*3
	630	40	5	2	40*5*2	50	5	2	50*5*2	50	5	2	50*5*2
	800	50	5	2	50*5*2	50	5	2	50*5*2	60	5	2	60*5*2
	1000	50	5	3	50*5*3	50	5	3	50*5*3	60	5	3	60*5*3
	1250	60	8	2	60*8*2	60	8	2	60*8*2	60	8	3	60*8*3
	1600	60	10	2	60*10*2	60	10	2	60*10*2	60	10	3	60*10*3
4000A	2000	100	5	3	100*5*3	100	5	3	100*5*3	100	5	4	100*5*4
	2500	100	10	2	100*10*2	100	10	2	100*10*2	80	10	3	80*10*3
	2000	80	8	3	80*8*3	80	8	3	80*8*3	80	10	3	80*10*3
	2500	80	6	4	80*6*4	80	6	4	80*6*4	80	8	4	80*8*4
	3200	100	10	4	100*10*4	100	10	4	100*10*4	100	10	4	100*10*4
	4000	100	10	5	100*10*5	100	10	5	100*10*5	120	10	5	120*10*5

Table 3 (continue)

Frame size current	Rated current (A)	Ambient temperature (-5 ~40) °C				Ambient temperature 50°C				Ambient temperature 60 °C			
		Recommended busbar specifications				Recommended busbar specifications				Recommended busbar specifications			
		Width	Thickness	Pieces	Specification	Width	Thickness	Pieces	Specification	Width	Thickness	Pieces	Specification
7500A	4000	100	10	5	100*10*5	100	10	5	100*10*5	100	10	6	100*10*5
	5000	100	10	7	100*10*7	100	10	7	100*10*7	120	10	7	120*10*7
	6300	120	10	7	120*10*7	120	10	7	120*10*7	120	10	8	120*10*8
	7500	120	10	9	120*10*9	120	10	9	120*10*9	120	10	10	120*10*10

- Notes:
- If the busbar selected by user does not match with the terminals of circuit breaker, an extended busbar is needed for adaption. The extended busbar should be provided by user itself, with cross section area not smaller than the requirement in the table above. The clearance of extended busbar should not be smaller than that of circuit breaker terminals.
 - After installing the busbar according to the table above, make sure the electric clearance between each phase is not less than 18mm.
 - If silicon controlled electrical elements (such as high frequency induction heating furnace (medium frequency furnace for steelmaking), solid state high frequency welder (such as submerged arc welder), vacuum heating melting equipment (such as single crystal silicon growth furnace)) are used for three-phase rectification and high-frequency inversion in loading equipment, impact from ambient temperature and altitude as well as higher harmonic generated by silicon controlled electrical elements should all be considered when selecting circuit breaker. In such cases, the circuit breaker must be derated, the recommend derating factor is 0.5-0.8.
 - After the busbar is installed, the electrical clearance between the upper and lower fixing bolts of the busbar should not be smaller than 20mm.
 - After the circuit breaker is installed, the safety clearance between live parts of different electrical potentials and the safety clearance between live parts and earth should not be smaller than 18mm.

6.3.2 Power consumption and input/output resistance

Power consumption is measured under I_n , 50/60Hz for each pole.

Table 4 Power consumption of circuit breaker

Frame size	Rated current (A)	Power consumption of withdrawable type (W)	Power consumption of fixed type (W)
1600A	200	115	45
	400	140	80
	630	161	100
	800	215	110
	1000	230	120
	1250	250	130
	1600	460	220
2500A	630	58.6	26.4
	800	73.7	36.6
	1000	172	78
	1250	268	122
	1600	440	200
	2000	530	262
	2500	600	312
4000A	2000	470	250
	2500	550	280
	3200	670	420
	4000	1047	656
7500A	4000	550	-
	5000	590	-
	6300	950	-
	7500	1500	-

6.3.3 Circuit breaker derating

a) Circuit breaker derating under different temperature

Table 5 Temperature derating table for NA8-1600

Ambient temperature	200A		400A		630A		800A		1000A		1250A		1600A	
Connection method	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical
40°	-	-	-	-	-	-	-	-	-	-	-	-	-	-
45°	-	-	-	-	-	-	-	-	-	-	-	-	1550	-
50°	-	-	-	-	-	-	-	-	-	-	-	-	1500	1550
55°	-	-	-	-	-	-	-	-	950	950	1150	1200	1450	1500
60°	-	-	-	-	550	580	700	700	900	900	1050	1100	1350	1450

Table 6 Temperature derating table for NA8-2500

Ambient temperature	630A		800A		1000A		1250A		1600A		2000A		2500A	
Connection method	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical
40°	-	-	-	-	-	-	-	-	-	-	-	-	-	-
45°	-	-	-	-	-	-	-	-	-	-	1900	-	2400	2400
50°	-	-	-	-	-	-	-	-	1500	1550	1850	1900	2300	2300
55°	-	-	-	-	-	-	-	-	1400	1450	1800	1800	2200	2200
60°	-	-	-	-	-	-	-	-	1300	1350	1700	1700	2100	2100

Table 7 Temperature derating table for NA8-4000

Ambient temperature	1600A		2000A		2500A		3200A		4000A	
Connection method	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical
40°	-	-	-	-	-	-	-	-	-	-
45°	-	-	-	-	-	-	-	-	3800	3850
50°	-	-	-	-	-	-	3100	-	3600	3650
55°	-	-	-	-	2450	-	3000	3050	3400	3450
60°	-	-	1900	1950	2350	2400	2900	2950	3200	3250

Table 8 Temperature derating table for NA8-7500

Ambient temperature	4000A		5000A		6300A		7500A	
Connection method	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical
40°	-	-	4600	-	/	-	/	-
45°	-	-	-	-	/	6100	/	7000
50°	-	-	-	4800	/	6000	/	6550
55°	3900	3900	4700	4650	/	5500	/	6050
60°	3800	3800	4400	4500	/	5200	/	5650

Note: "-" means no derating; "/" means no horizontal connection.

b) Circuit breaker derating under different altitudes

Table 9 Voltage correction table under different altitudes

Altitude (m)		2000	3000	4000	5000
Rate impulse withstand voltage (kV)	U _{imp}	12	10	8.5	7.5
Insulation class (V)	U _i	1000	800	700	600
Power frequency withstand voltage (V)		2200	1955	1760	1600
Maximum operating voltage (V)	U _e	690	580	500	400

Table 10 Current correction table under different altitudes

Altitude (m)	Rated operating current (I _e)
2000	1.0I _e
2500	0.93I _e
3000	0.88I _e
3500	0.83I _e
4000	0.78I _e
4500	0.73I _e
5000	Must confirm with manufacturer

Note: If ambient temperature is lower than 40 °C, I_e=I_n; if ambient temperature is higher than 40 °C, I_e≠I_n, I_e and I_n should be referred to according to temperature derating table.

6.4 Circuit breaker installation**a. Fixed type circuit breaker installation**

Place the circuit breaker in the cabinet, use 4 M6 (I_{nm}=1600A) or M10 (I_{nm}=2500A and above) bolts and washers to fix the circuit breaker.

The circuit breaker should be secured properly, without additional mechanical force, to avoid damage of circuit breaker or poor contact of main bus.

b. Withdrawable type circuit breaker installation

Draw the circuit breaker body out of the drawer seat, install the drawer seat in the cabinet, use 4 M6 (I_{nm}=1600A) or M10 (I_{nm}=2500A and above) bolts and washers to fix the circuit breaker.

The circuit breaker should be secured properly, without additional mechanical force, to avoid damage of circuit breaker or poor contact of main bus and secondary circuit. Then, install the body back into the drawer seat.

6.5 Interval

Leave sufficient space for ventilation in the cabinet, the spacer for upper and lower connectors of circuit breaker must be made of non-magnetic material.

6.6 Busbar fixation

The busbar must be fixed with proper torque by using bolts and nuts, too big or too small torque is not allowed. Too big torque may cause bolts to slip which makes it difficult to tighten the bolts; too small torque may cause misalignment of bolts and nuts which leads to poor fastening and may cause excessive temperature rise. For circuit breaker connections, the data of torque tightening is applicable to copper busbar and steel bolts and nuts, with grade≥8.8, it is also applicable aluminum busbar.

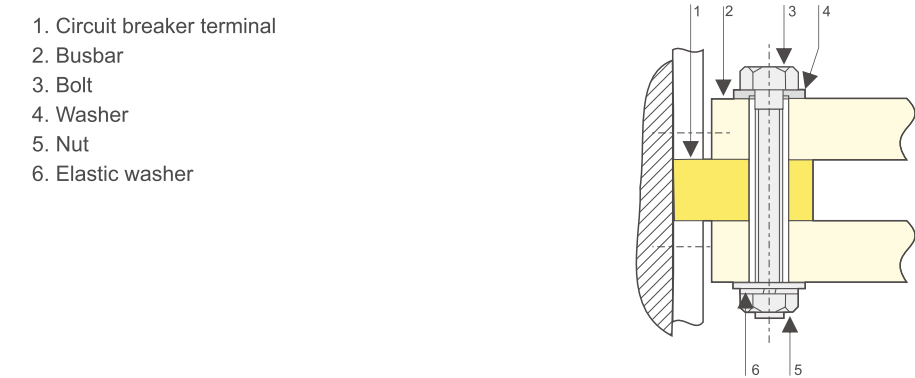


Figure 6.6-1 Diagram of busbar fixing

Recommended installation method

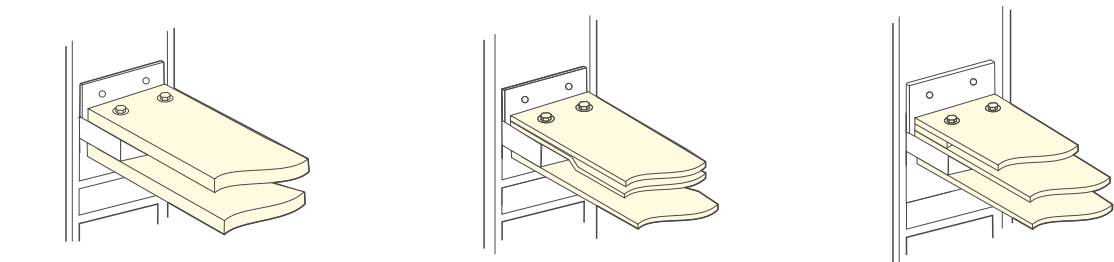


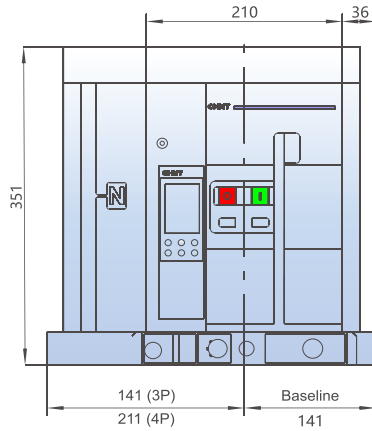
Figure 6.6-2 Recommended installation diagram of busbar

Table 11 Tightening torque for circuit breaker

Bolt type	Application	Preferred tightening torque
M3	Secure secondary connection cable	(0.5~0.7) N·m
M8 (only with flat washer)	Secure the product to cabinet (1600A frame size)	(18~25) N·m
M10 (only with flat washer)	Secure the product to cabinet (2500A frame size and above)	(25~40) N·m
M10	Secure busbar	(36~52) N·m

7 Overall and installation dimensions

Front view



Side view

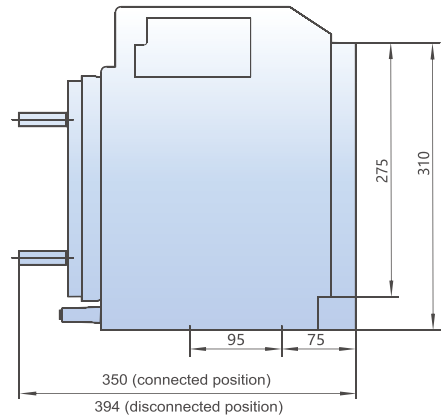
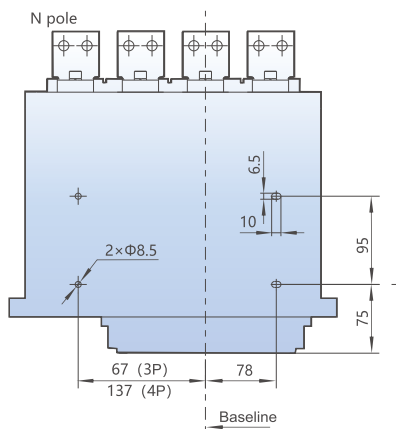


Figure 7.1 Overall dimension of NA8-1600 withdrawable type

Hole size of the base



Hole size of the panel

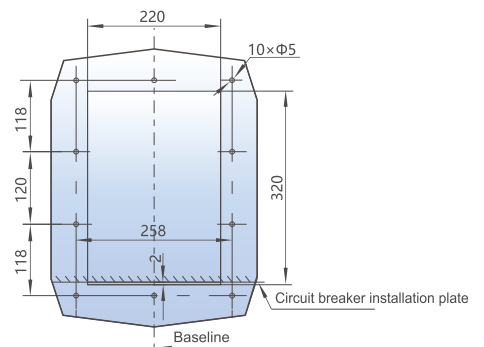
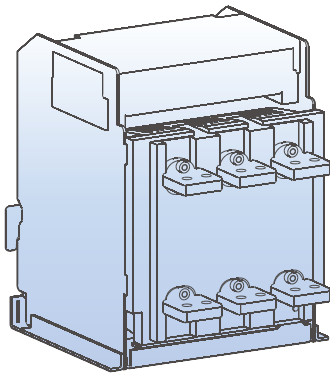


Figure 7.1-1 Perforating size of NA8-1600 withdrawable type

Side view



In(A)	D(mm)
200~800	10
1000~1600	16

Busbar installation dimensions

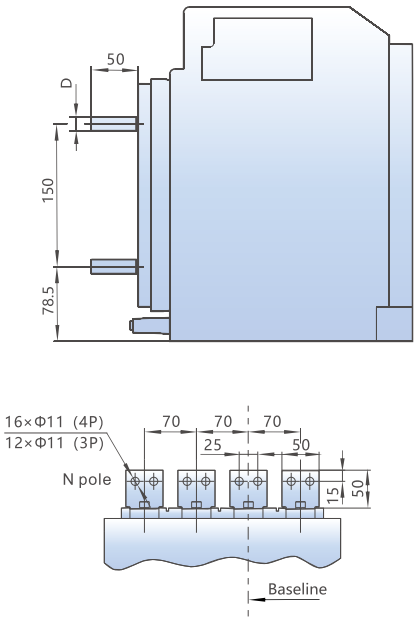
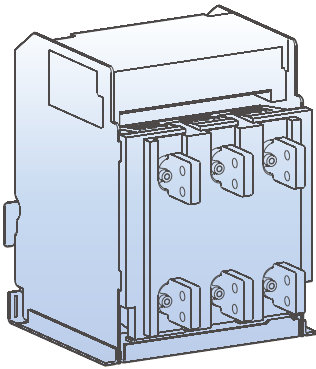


Figure 7.1-2 Horizontal busbar connection of NA8-1600 withdrawable type

Busbar installation dimensions



In(A)	D(mm)
200~800	10
1000~1600	16

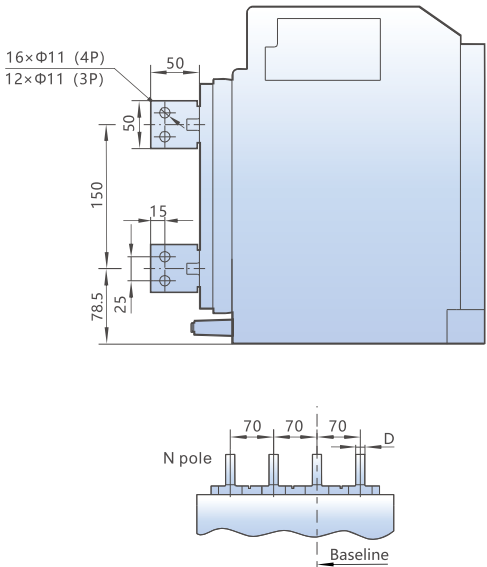
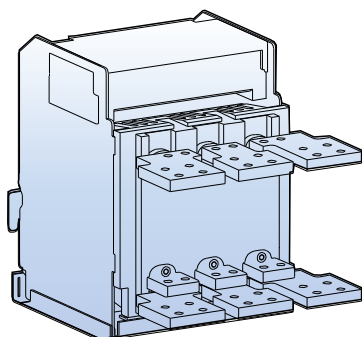


Figure 7.1-3 Vertical busbar connection of NA8-1600 withdrawable type

Side view



Unit: mm

In(A)	A	B	C	D
200~800	68.5	169	10	10
1000~1600	63	179	15	16

Note: The extended bus is an optional accessory, which will be charged separately.

Busbar installation dimensions

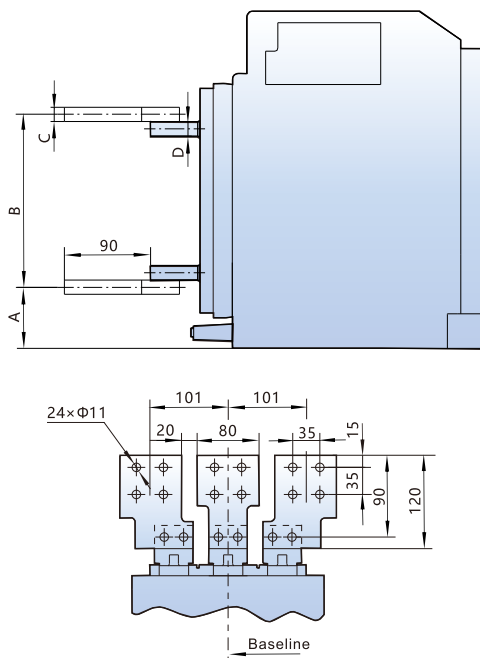
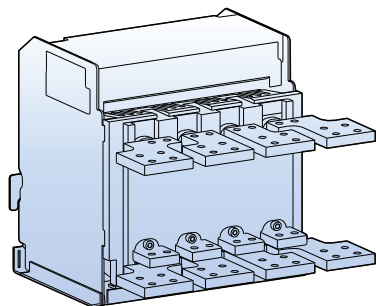


Figure 7.1-4 3 poles extended bus horizontal connection of NA8-1600 withdrawable type

Side view



Unit: mm

In(A)	A	B	C	D
200~800	68.5	169	10	10
1000~1600	63	179	15	16

Note: The extended bus is an optional accessory, which will be charged separately.

Busbar installation dimensions

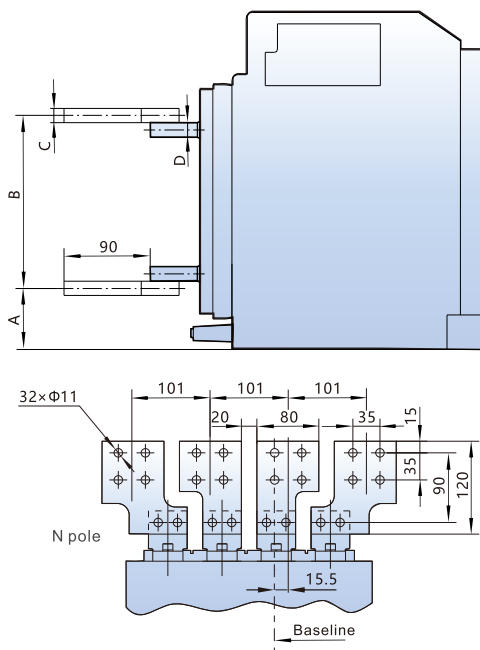
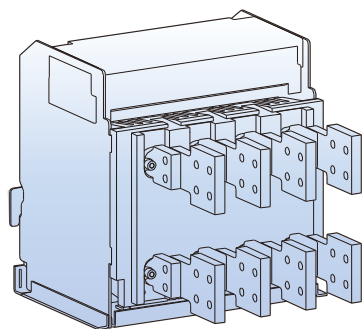


Figure 7.1-5 4 poles horizontal extended bus connection of NA8-1600 withdrawable type

Side view



Unit: mm

In(A)	A	B	D
200~800	10	10	10
1000~1600	15	15.5	16

Note: The extended bus is an optional accessory, which will be charged separately.

Busbar installation dimensions

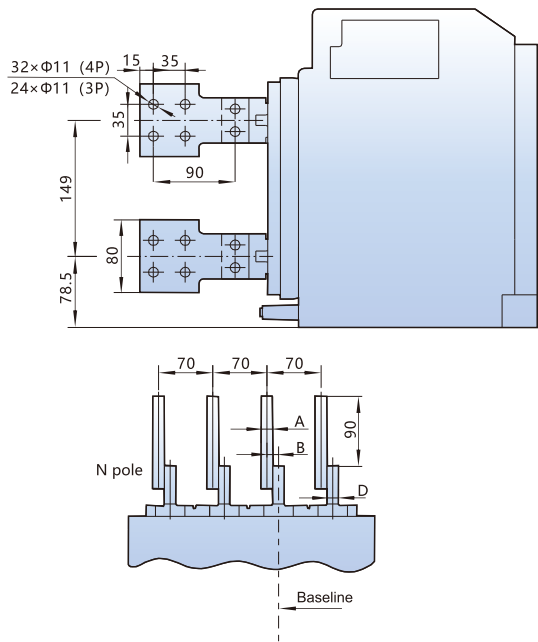
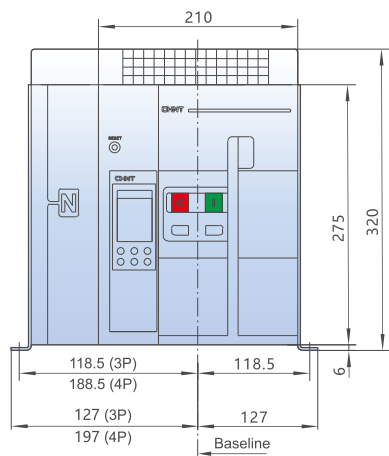
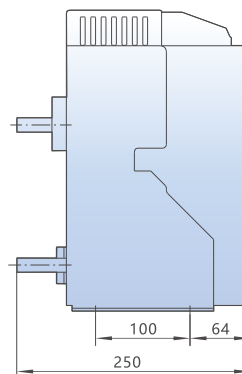


Figure 7.1-6 Extended bus vertical connection of NA8-1600 withdrawable type

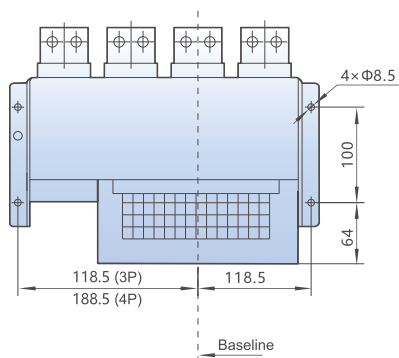
Front view



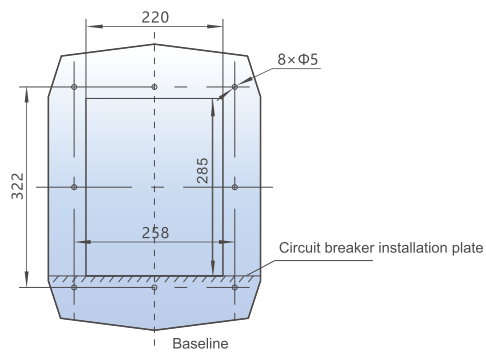
Side view


Figure 7.2 Overall dimensions of NA8-1600 fixed type

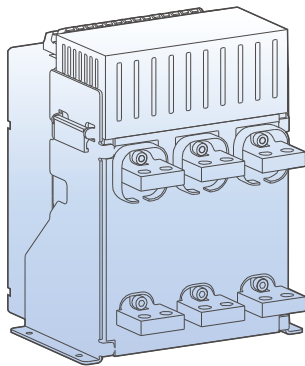
Hole size of the base



Hole size of the panel


Figure 7.2-1 Perforating size of NA8-1600 fixed type

Side view



In(A)	D(mm)
200~800	10
1000~1600	16

Note: User only needs to rotate the bus 90° to change vertical connection to horizontal connection.

Busbar installation dimensions

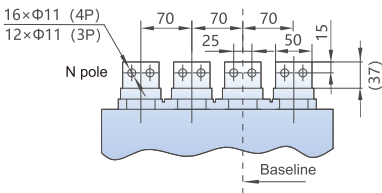
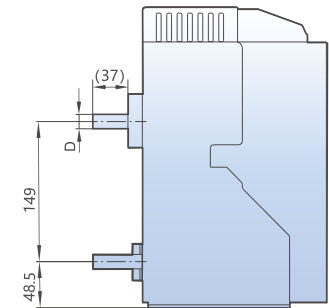
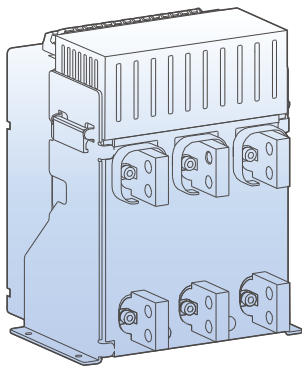


Figure 7.2-2 Busbar horizontal connection of NA8-1600 fixed type

Side view



In(A)	D(mm)
200~800	10
1000~1600	16

Note: User only needs to rotate the bus 90° to change vertical connection to horizontal connection.

Busbar installation dimensions

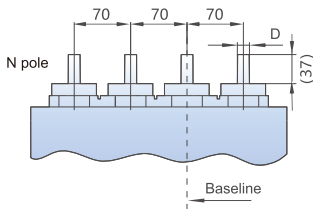
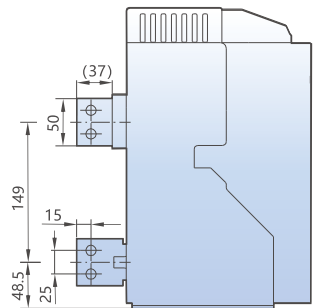
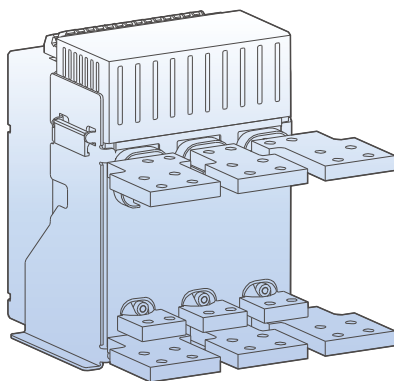


Figure 7.2-3 Vertical busbar connection of NA8-1600 fixed type

Side view



Unit: mm

In(A)	A	B	C	D
200~800	38.5	169	10	10
1000~1600	33	179	15	16

Note: The extended bus is an optional accessory, which will be charged separately.

Busbar installation dimensions

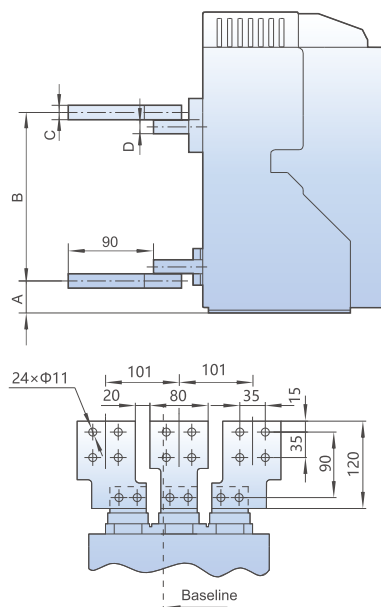
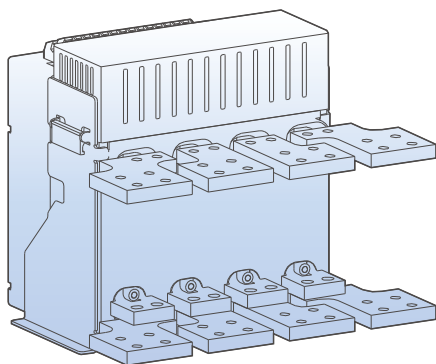


Figure 7.2-4 3 poles horizontal extended busbar connection of NA8-1600 fixed type

Side view



Unit: mm

In(A)	A	B	C	D
200~800	38.5	169	10	10
1000~1600	33	179	15	16

Note: The extended bus is an optional accessory, which will be charged separately.

Busbar installation dimensions

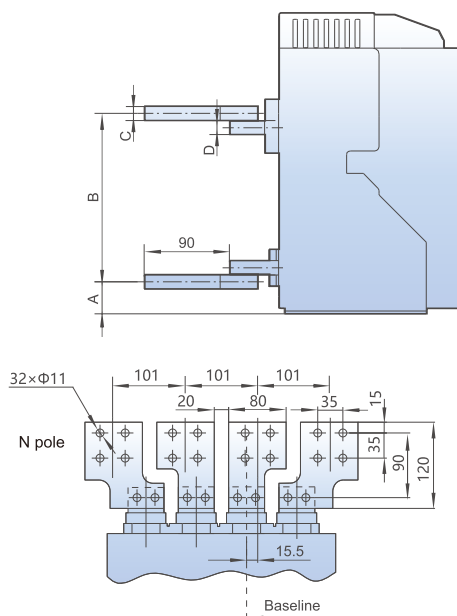
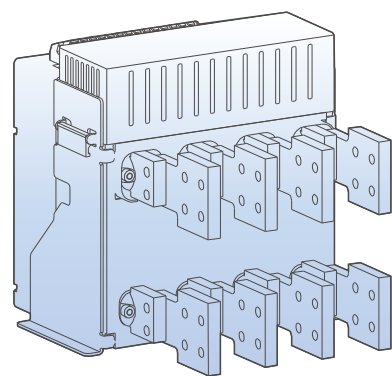


Figure 7.2-5 4poles horizontal extended busbar connection of NA8-1600 fixed type

Side view



Unit: mm

In(A)	A	B	D
200~800	10	10	10
1000~1600	15	15	16

Note: The extended bus is an optional accessory, which will be charged separately.

Busbar installation dimensions

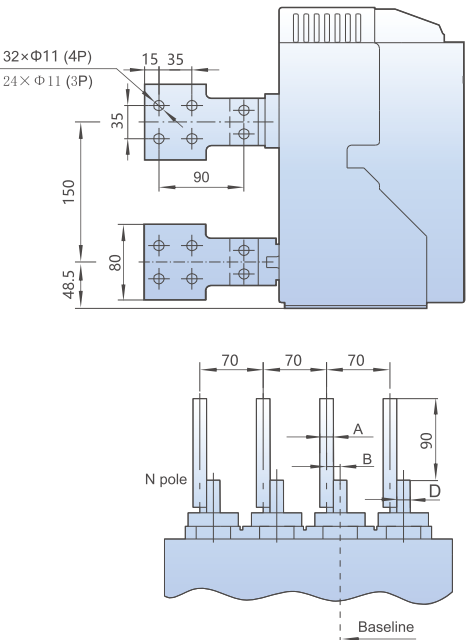
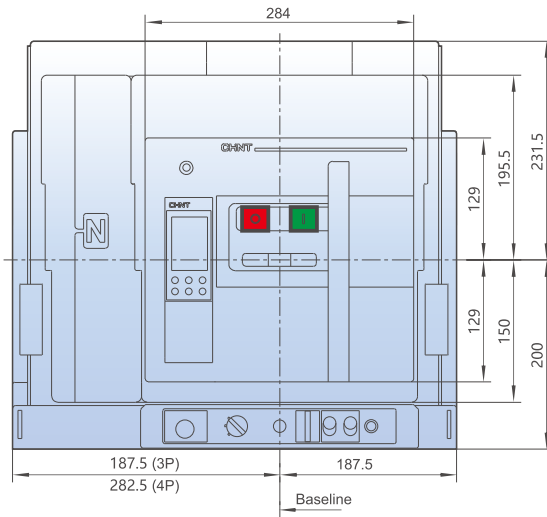
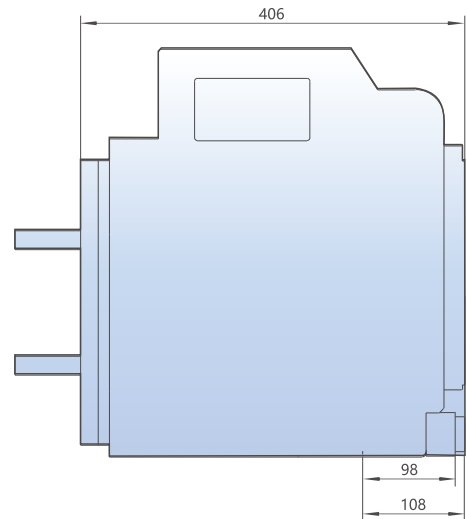


Figure 7.2-6 Vertical extended busbar connection of NA8-1600 fixed type

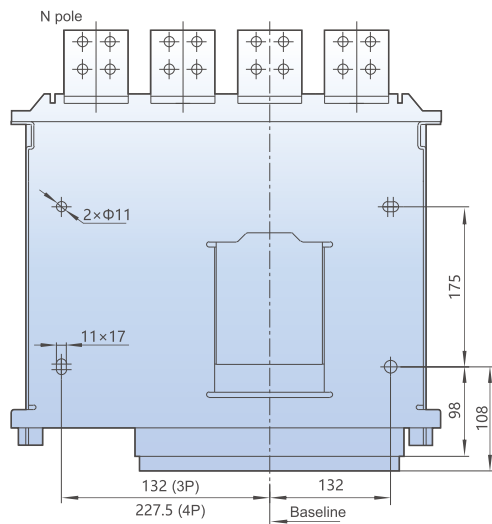
Front view



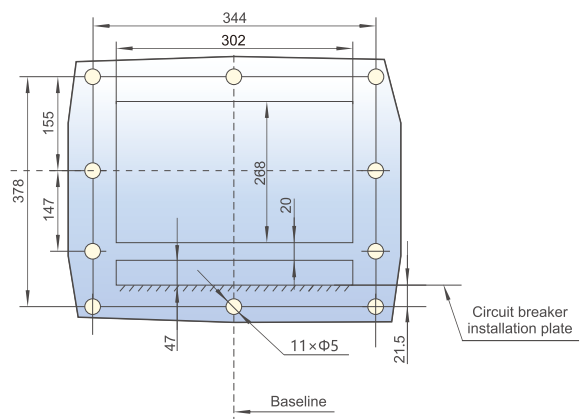
Side view


Figure 7.3 Overall dimensions of NA8-2500 withdrawable type

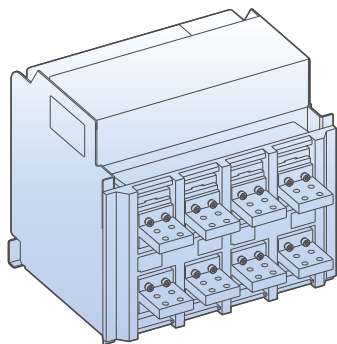
Hole size of the base



Hole size of the panel


Figure 7.3-1 Perforating size of NA8-2500 withdrawable type

Side view



Unit: mm

In(A)	D	L
630~1600	15	60
2000~2500	20	70

Note: User only needs to rotate the bus 90°to change horizontal connection to vertical connection.

Busbar installation dimensions

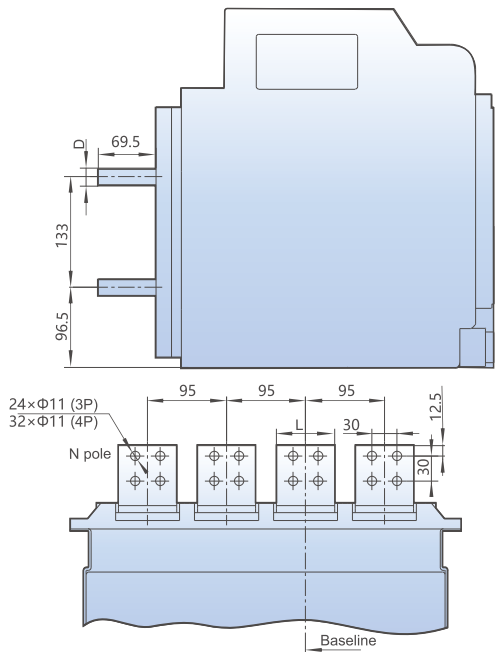
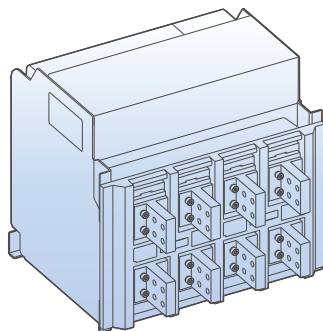


Figure 7.3-2 Horizontal busbar connection of NA8-2500 withdrawable type

Side view



Unit: mm

In(A)	D	L
630~1600	15	60
2000~2500	20	70

Note: User only needs to rotate the bus 90°to change horizontal connection to vertical connection.

Busbar installation dimensions

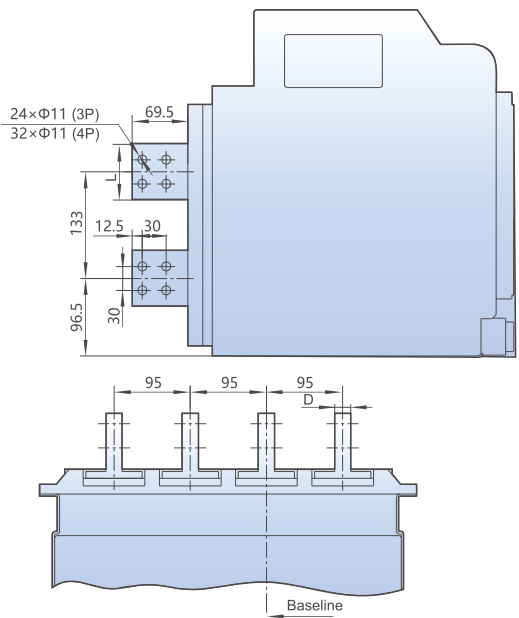
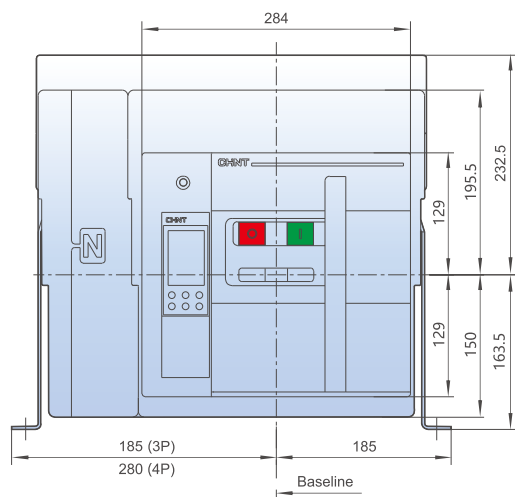
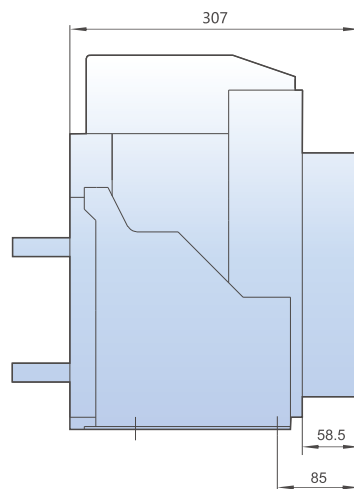


Figure 7.3-3 Vertical busbar connection of NA8-2500 withdrawable type

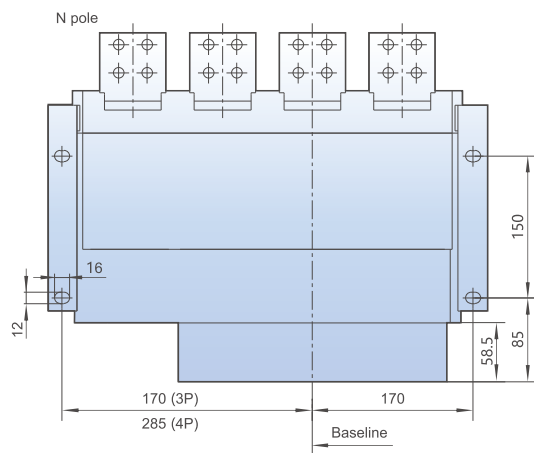
Front view



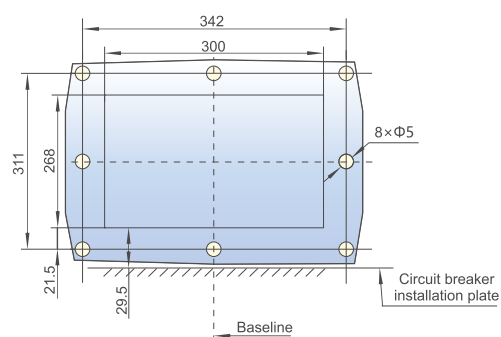
Side view


Figure 7.4 Overall dimensions of NA8-2500 fixed type

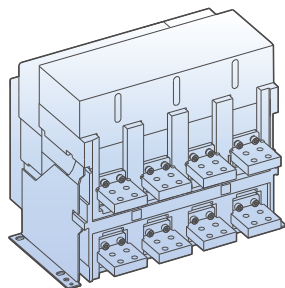
Hole size of the base



Hole size of the panel


Figure 7.4-1 Perforating size of NA8-2500 fixed type

Side view



Unit: mm

In(A)	D	L
630~1600	15	60
2000~2500	20	70

Note: User only needs to rotate the bus 90° to change horizontal connection to vertical connection.

Busbar installation dimensions

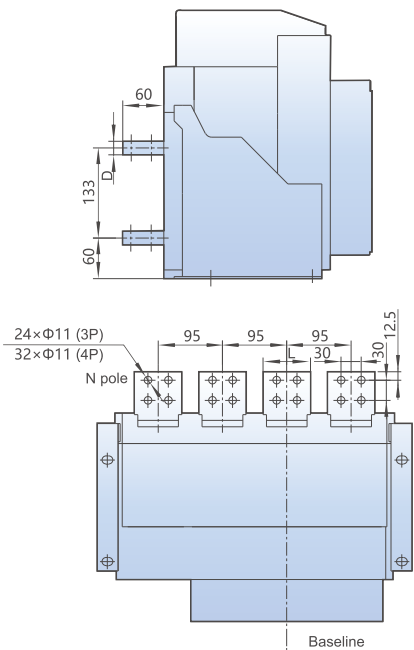
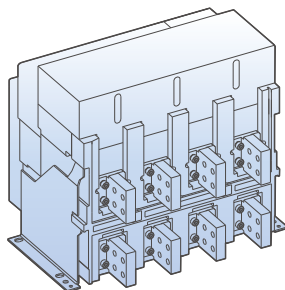


Figure 7.4-2 Horizontal busbar connection of NA8-2500 fixed type

Side view



Unit: mm

In(A)	D	L
630~1600	15	60
2000~2500	20	70

Note: User only needs to rotate the bus 90° to change vertical connection to horizontal connection.

Busbar installation dimensions

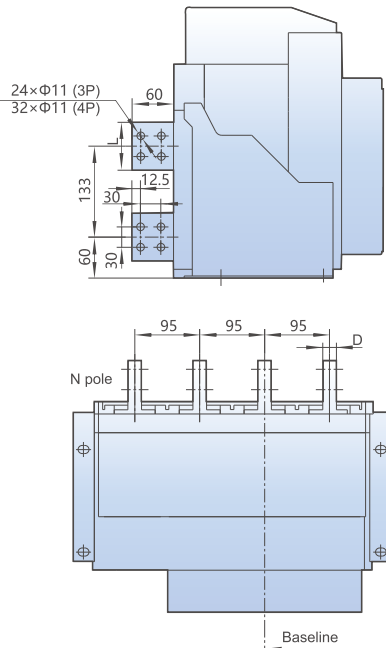
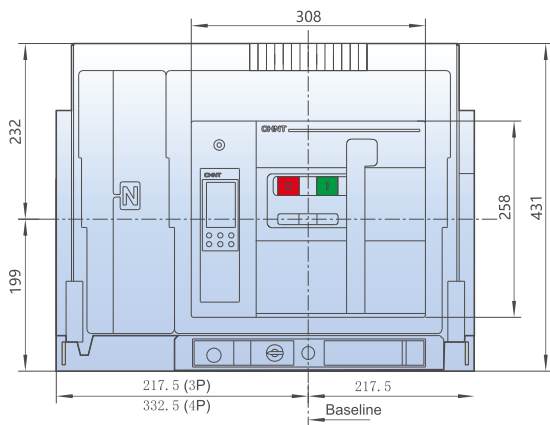
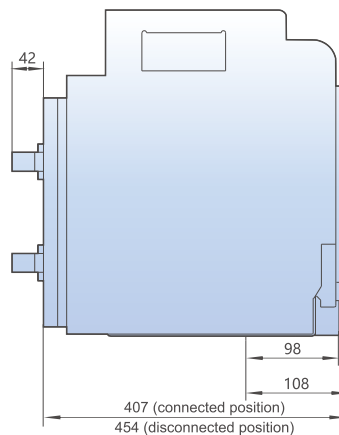


Figure 7.4-3 Vertical busbar connection of NA8-2500 fixed type

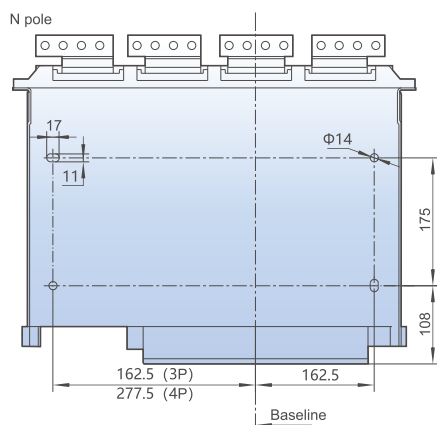
Front view



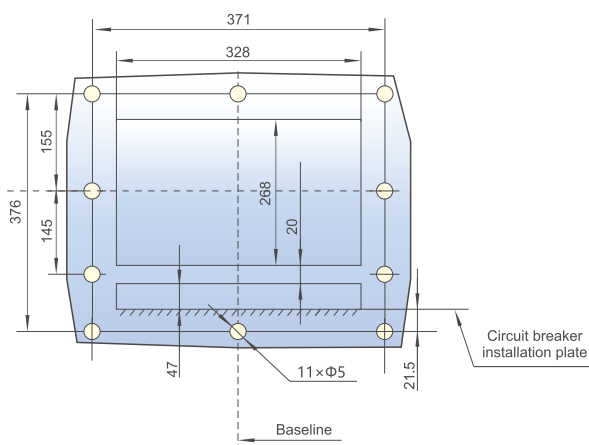
Side view


Figure 7.5 Overall dimensions of NA8-4000 withdrawable type

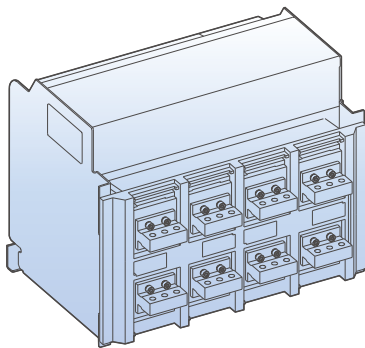
Hole size of the base



Hole size of the base


Figure 7.5-1 Perforating size of NA8-4000 withdrawable type

Side view



Note: User only needs to rotate the bus 90°to change horizontal connection to vertical connection.

Busbar installation dimensions

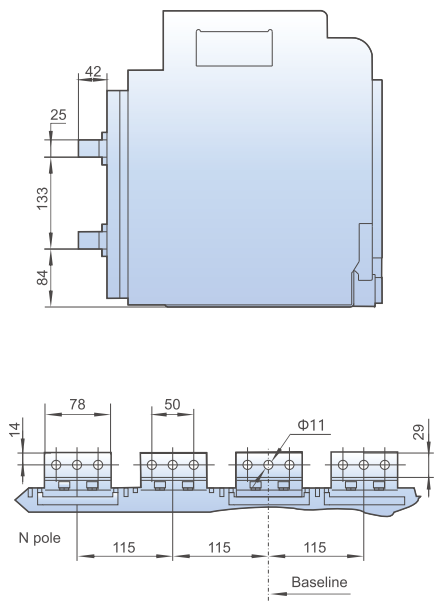
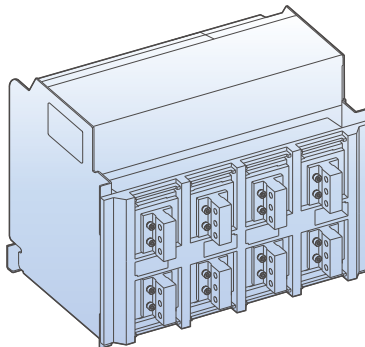


Figure 7.5-2 Horizontal busbar connection of NA8-4000 withdrawable type(In=1600A~2500A)

Side view



Note: User only needs to rotate the bus 90°to change vertical connection to horizontal connection.

Busbar installation dimensions

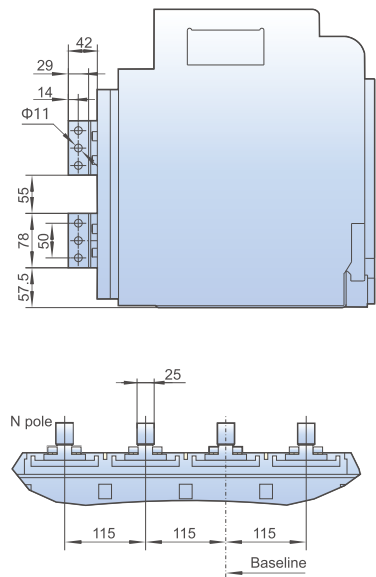
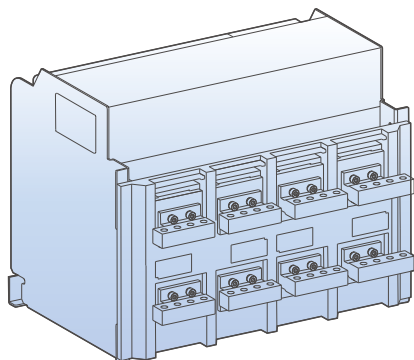
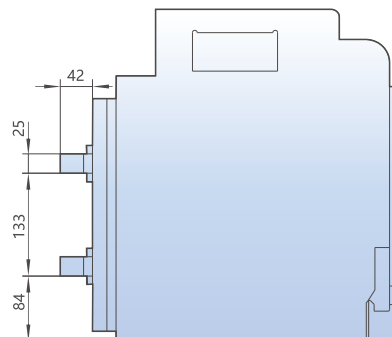


Figure 7.5-3 Vertical busbar connection of NA8-4000 withdrawable type(In=1600A~2500A)

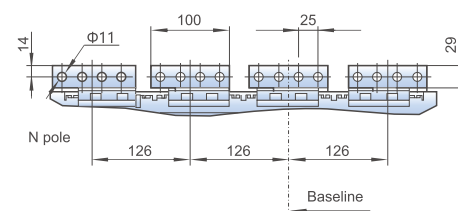
Side view



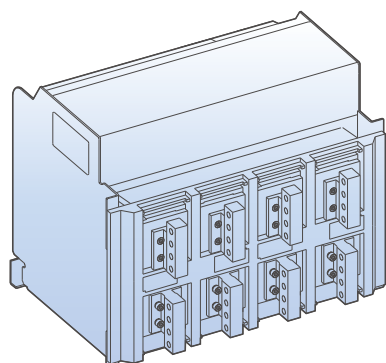
Busbar installation dimensions



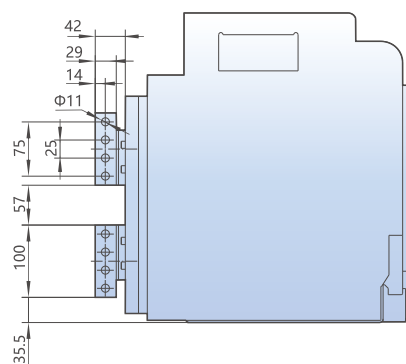
Note: To change horizontal connection to vertical connection, user needs to change the upper and lower buses of phase N and phase B to the same as those of phase A and phase C.


Figure 7.5-4 Horizontal busbar connection of NA8-4000 withdrawable type ($I_n=3200A\sim4000A$)

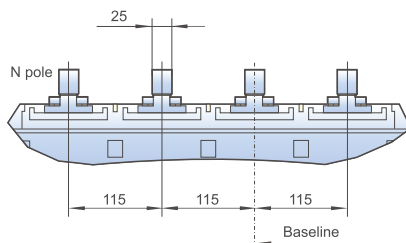
Side view



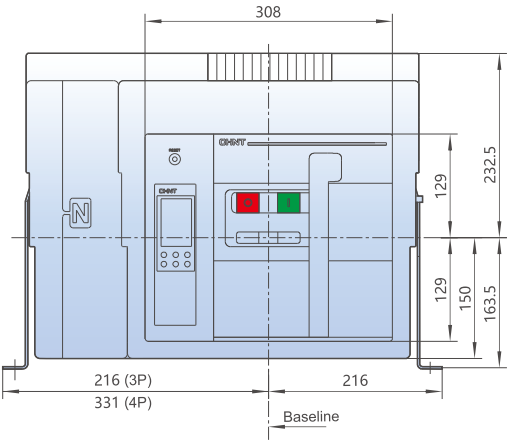
Busbar installation dimensions



Note: To change vertical connection to horizontal connection, user needs to change the upper and lower buses of phase N and phase B to the same as those of phase A and phase C.


Figure 7.5-5 Vertical busbar connection of NA8-4800 withdrawable type ($I_n=3200A\sim4000A$)

Front view



Side view

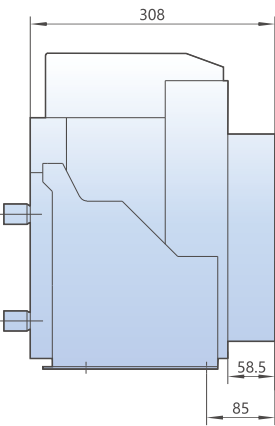
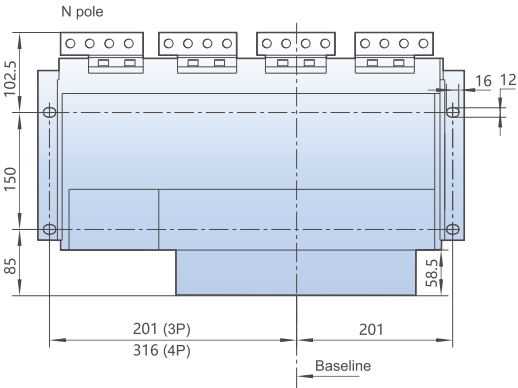


Figure 7.6 Overall dimensions of NA8-4000 fixed type

Hole size of the base



Hole size of the panel

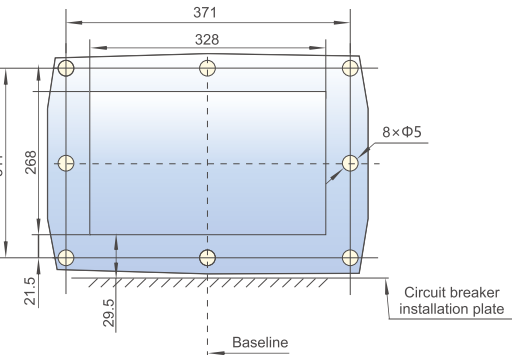
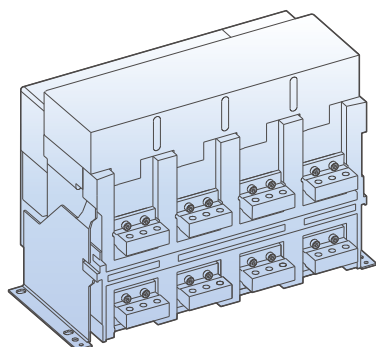


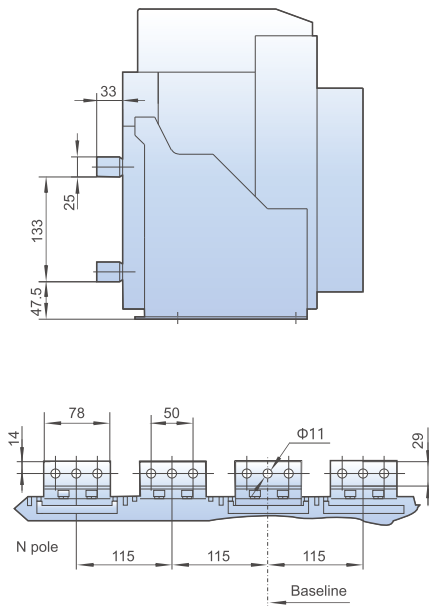
Figure 7.6-1 Perforating size of NA8-4000 fixed type

Side view

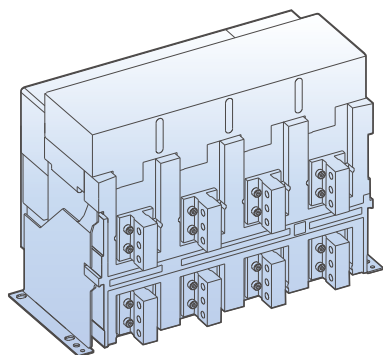


Note: User only needs to rotate the bus 90° to change horizontal connection to vertical connection.

Busbar installation dimensions

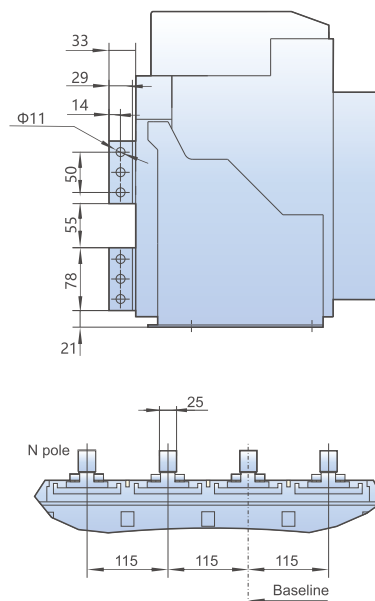

Figure 7.6-2 Horizontal busbar connection of NA8-4000 fixed type ($I_n=1600A\sim 2500A$)

Side view

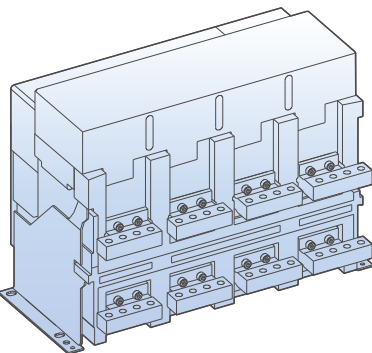


Note: User only needs to rotate the bus 90° to change vertical connection to horizontal connection.

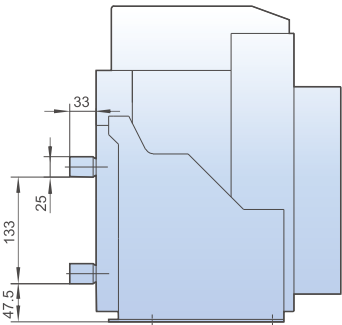
Busbar installation dimensions


Figure 7.6-3 Vertical busbar connection of NA8-4000 fixed type ($I_n=1600A\sim 2500A$)

Side view



Busbar installation dimensions



Note: To change horizontal connection to vertical connection, user needs to change the upper and lower buses of phase N and phase B to the same as those of phase A and phase C.

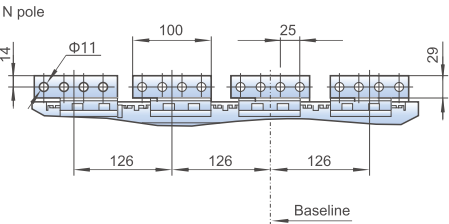
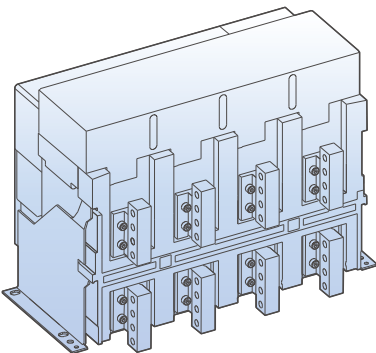
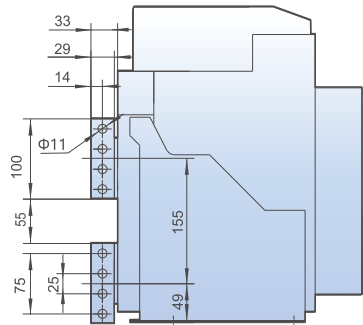


Figure 7.6-4 Horizontal busbar connection of NA8-4000 fixed type (In=3200A~4000A)

Side view



Busbar installation dimensions



Note: To change vertical connection to horizontal connection, user needs to change the upper and lower buses of phase N and phase B to the same as those of phase A and phase C.

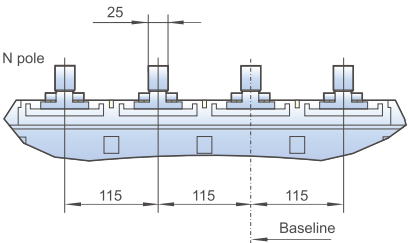


Figure 7.6-5 Vertical busbar connection of NA8-4000 fixed type (In=3200A~4000A)

Side view

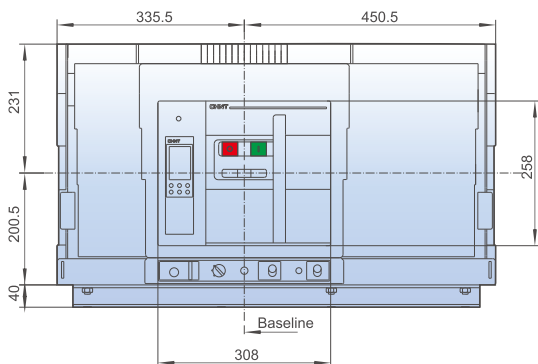


Figure 7.7 Overall dimensions of NA8-7500 3-pole withdrawable type (In=4000A~6300A)

Hole size of the panel

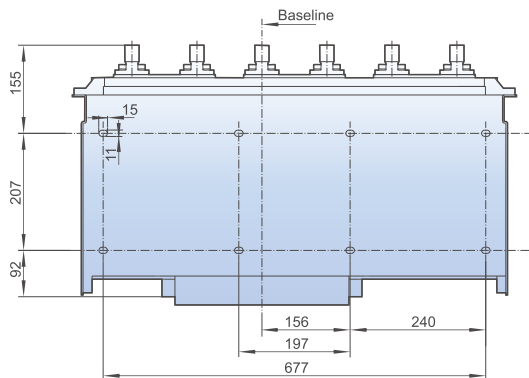
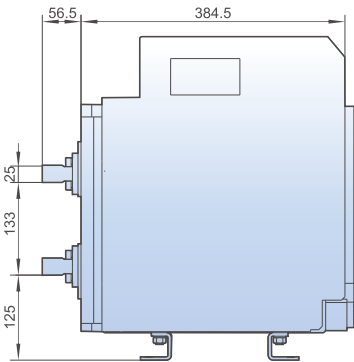
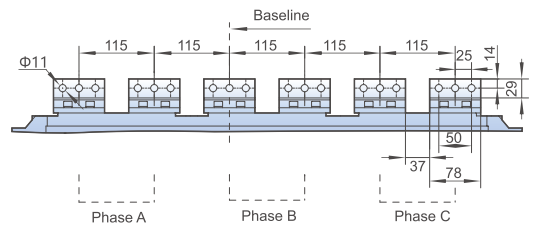


Figure 7.7-1 Perforating size of NA8-7500 3-pole withdrawable type (In=4000A~6300A)

Side view



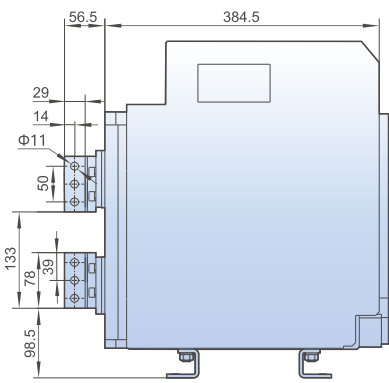
Busbar installation dimensions



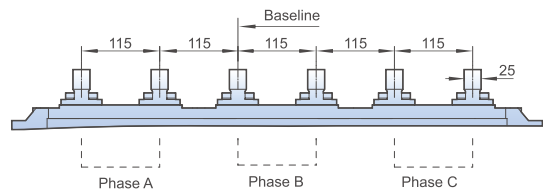
Note: User only needs to rotate the bus 90° to change horizontal connection to vertical connection.

Figure 7.7-2 Horizontal busbar connection of NA8-7500 3-pole withdrawable type (In=4000A~5000A)

Side view



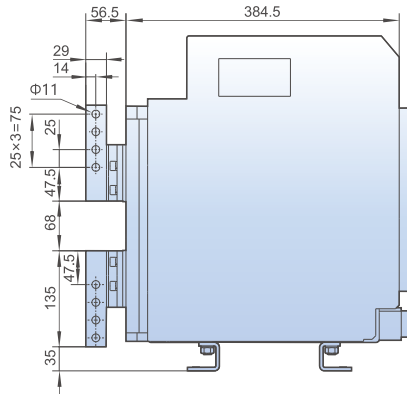
Busbar installation dimensions



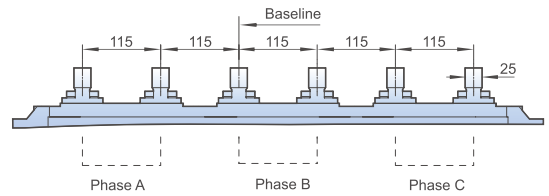
Note: User only needs to rotate the bus 90° to change vertical connection to horizontal connection.

Figure 7.7-3 Vertical busbar connection of NA8-7500 3-pole withdrawable type (In=4000A~5000A)

Side view



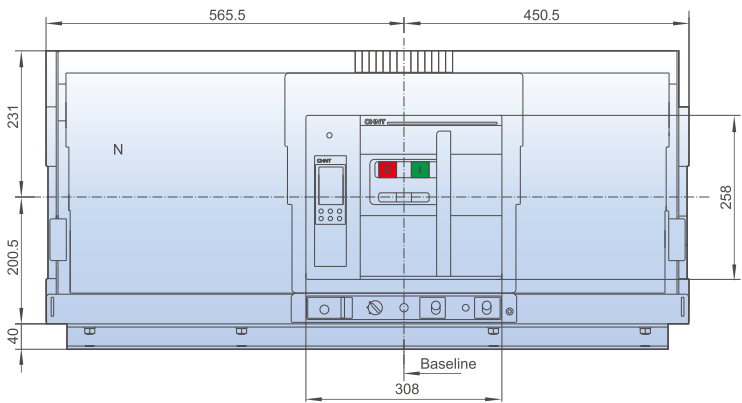
Busbar installation dimensions



Note: $I_n=6300A$ is only available with vertical connection, horizontal connection is not available.

Figure 7.7-4 Vertical busbar connection of NA8-7500 3-pole withdrawable type ($I_n=6300A$)

Front view



Side view

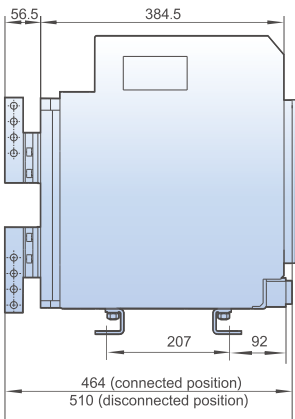
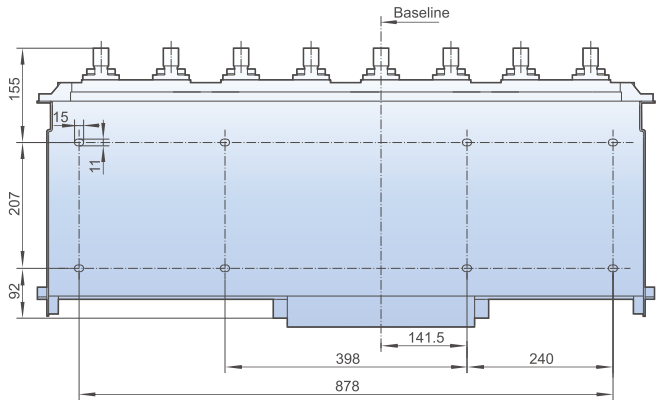


Figure 7.8 Overall dimensions of NA8-7500 withdrawable type 4 poles ($I_n=4000A\sim6300A$) /3&4 poles ($I_n=7500A$)

Hole size of the base



Panel perforating size

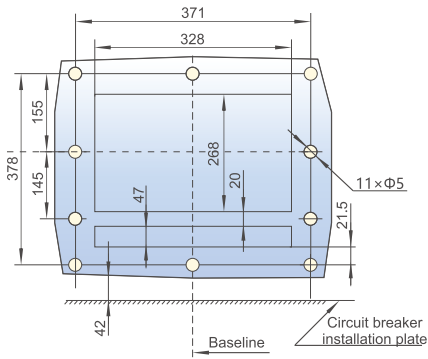
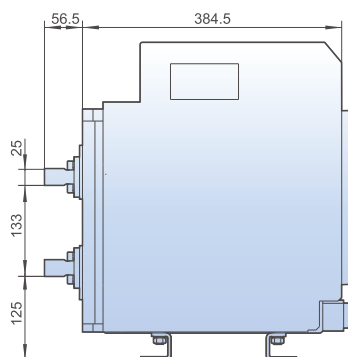
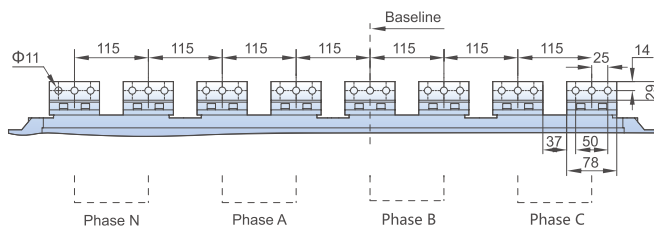


Figure 7.8-1 Perforating size of NA8-7500 withdrawable type 4 poles ($I_n=4000A\sim6300A$) /3&4 poles ($I_n=7500A$)

Side view



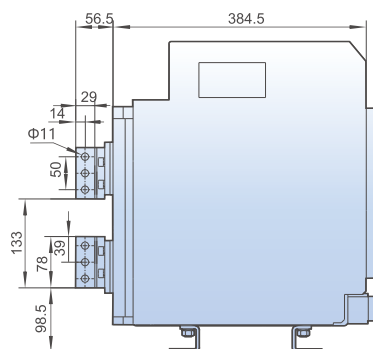
Busbar installation dimensions



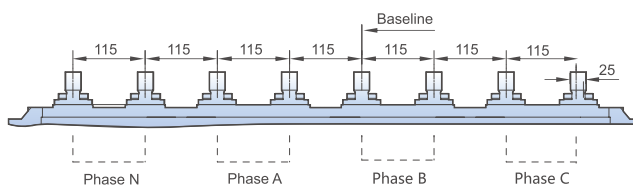
Note: User only needs to rotate the bus 90° to change horizontal connection to vertical connection.

Figure 7.8-2 Horizontal busbar connection of NA8-7500 4-pole withdrawable type ($I_n=4000A\sim 5000A$)

Side view



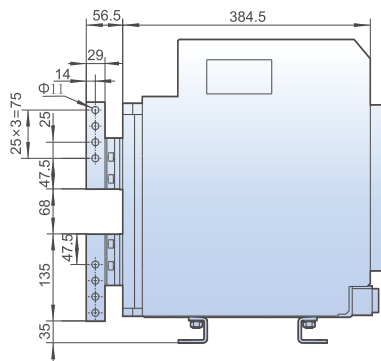
Hole size of the panel



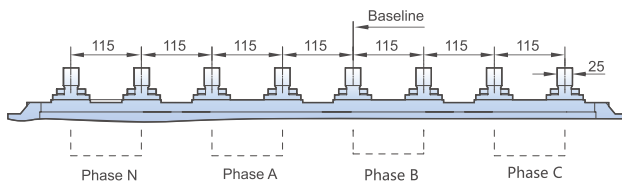
Note: User only needs to rotate the bus 90° to change vertical connection to horizontal connection.

Figure 7.8-3 Vertical busbar connection of NA8-7500 4-pole withdrawable type ($I_n=4000A\sim 5000A$)

Side view



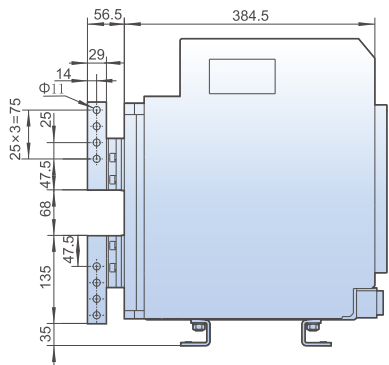
Busbar installation dimensions



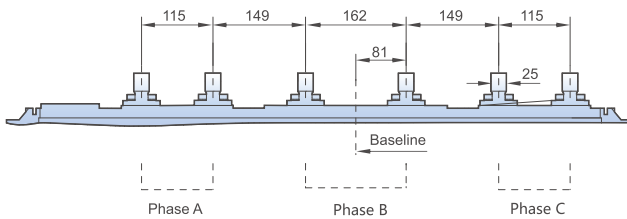
Note: In=6300A is only available with vertical connection, horizontal connection is not available.

Figure 7.8-4 Vertical busbar connection of NA8-7500 4-pole withdrawable type (In=6300A)

Side view



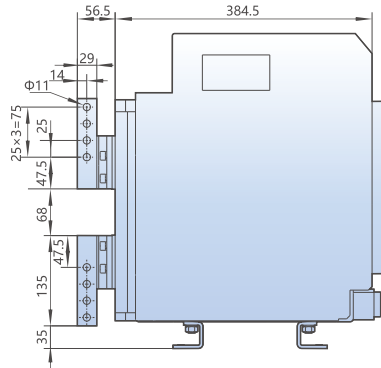
Busbar installation dimensions



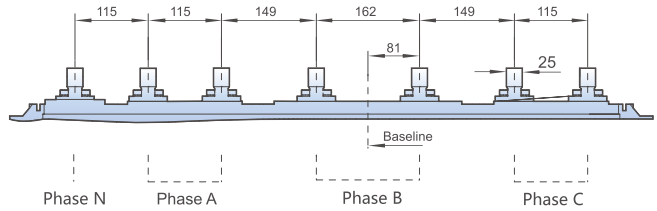
Note: In=7500A is only available with vertical connection, horizontal connection is not available.

Figure 7.8-5 Vertical busbar connection of NA8-7500 3-pole withdrawable type (In=7500A)

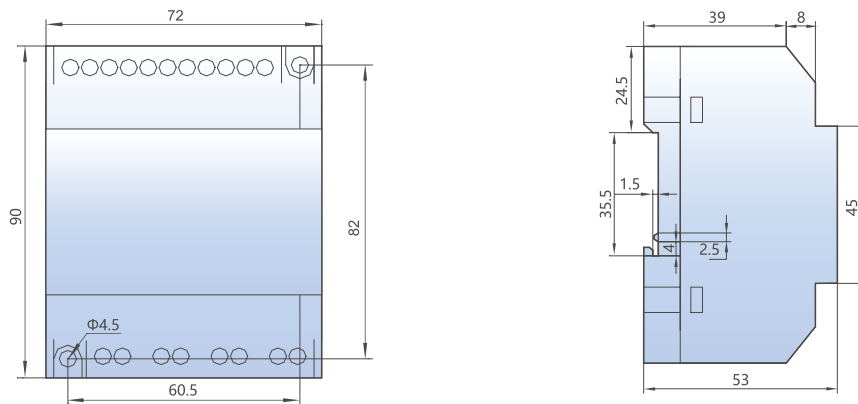
Side view



Busbar installation dimensions



Note: $I_n=7500A$ is only available with vertical connection, horizontal connection is not available.

Figure 7.8-6 Vertical busbar connection of NA8-7500 4-pole withdrawable type ($I_n=7500A$)


Note: Undervoltage delay control module, power module and RU-1 relay signal module are of same outline dimension, 35mm standard guide rail installation can also be used for installation.

Figure 7.9 Overall dimensions of undervoltage delay control module, power module, RU-1 relay signal module

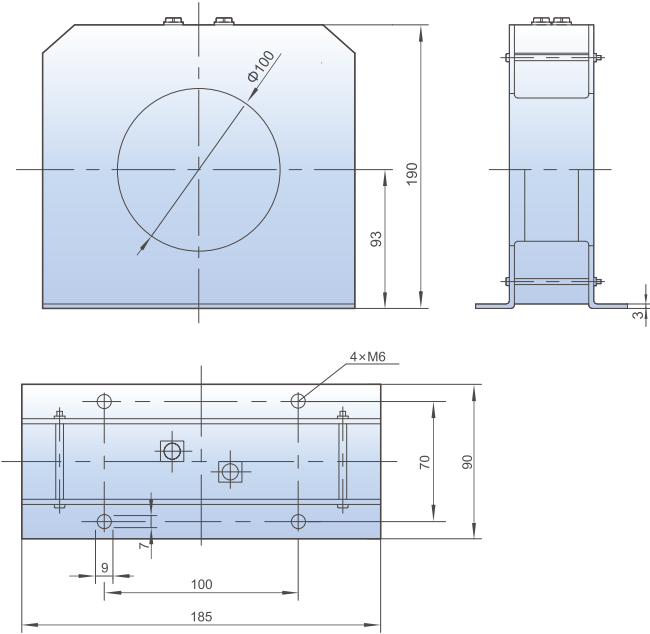
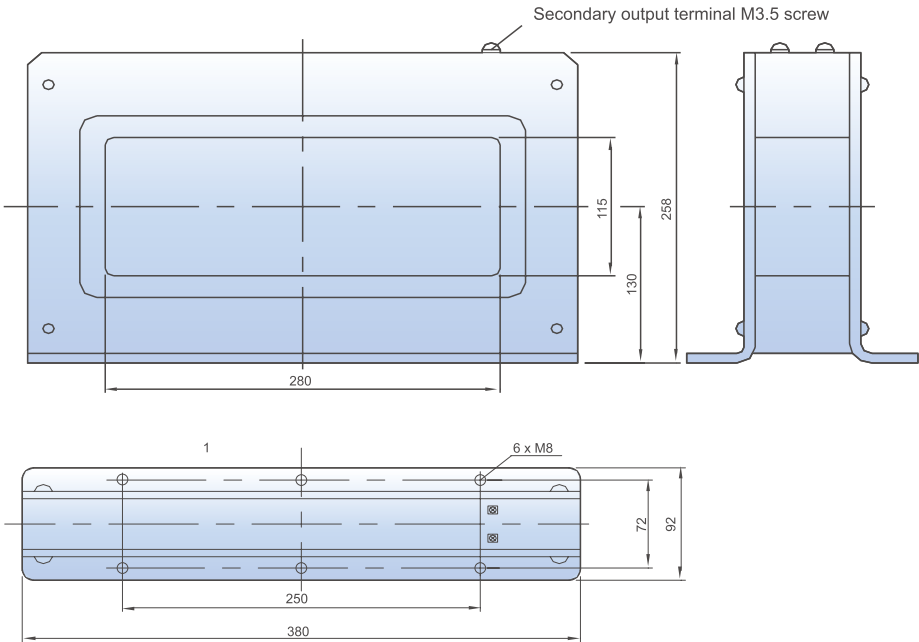


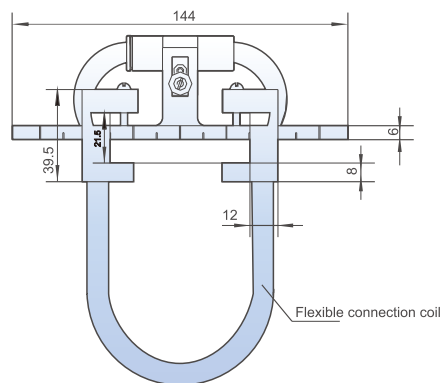
Figure 7.10 Overall dimensions of earth current transformer



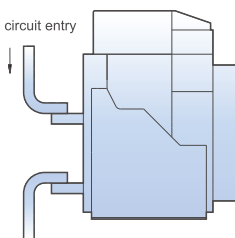
Note: Circuit breaker with leakage transformer must use vertical bus connection

Figure 7.11 Overall dimensions of leakage protection transformer

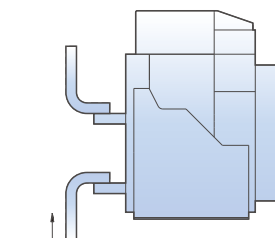
Front view



Main circuit entry



top entry



main circuit entry bottom entry

Note: 1. Neutral transformer should be installed at the entry end of circuit breaker, with its flexible cable side facing towards the entry direction of main circuit.
2. When the rated current is 200A-630A, the transformer needs to be wrapped around the busbar twice to be used normally

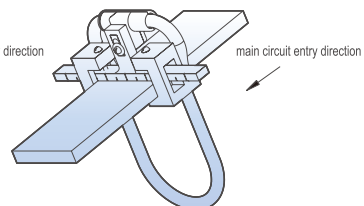
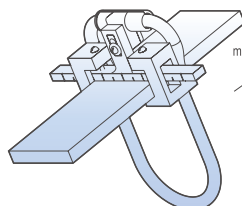


Figure 7.12 Overall dimensions of neutral pole current transformer

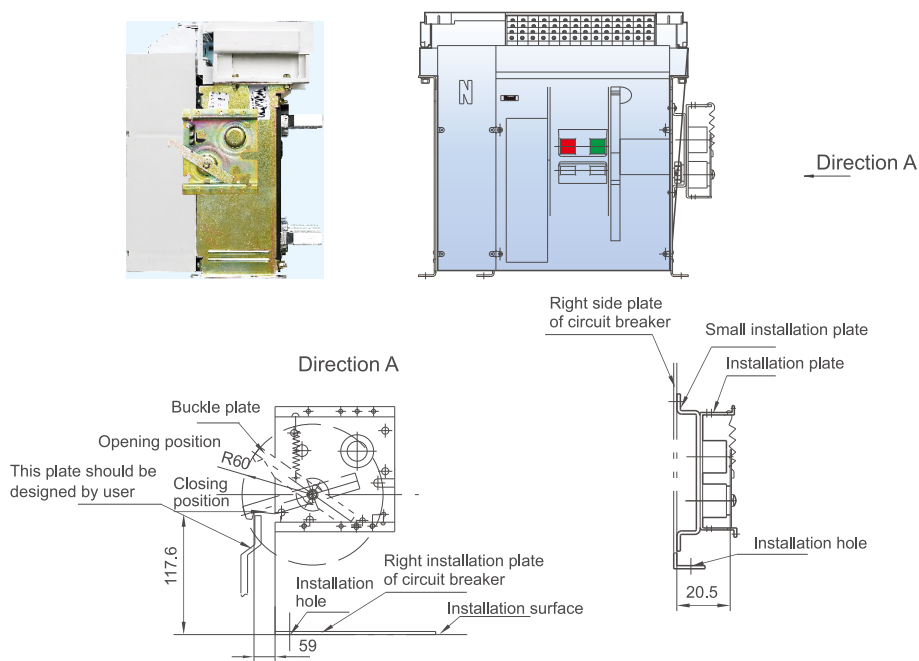


Figure 7.13 NA8-1600 fixed type circuit breaker status door interlock installation dimensions

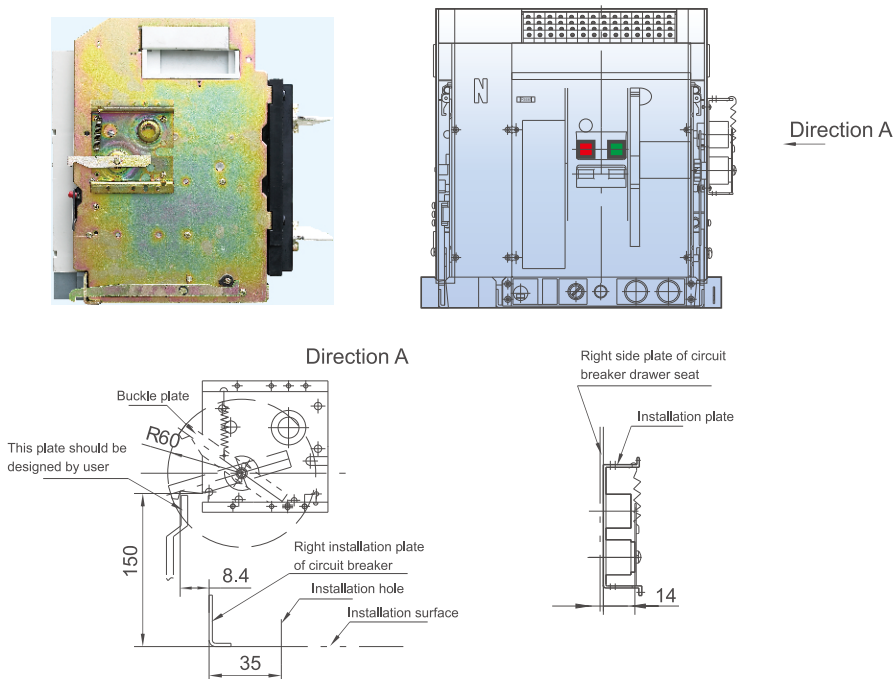


Figure 7.14 NA8-1600 withdrawable type circuit breaker status door interlock installation dimensions

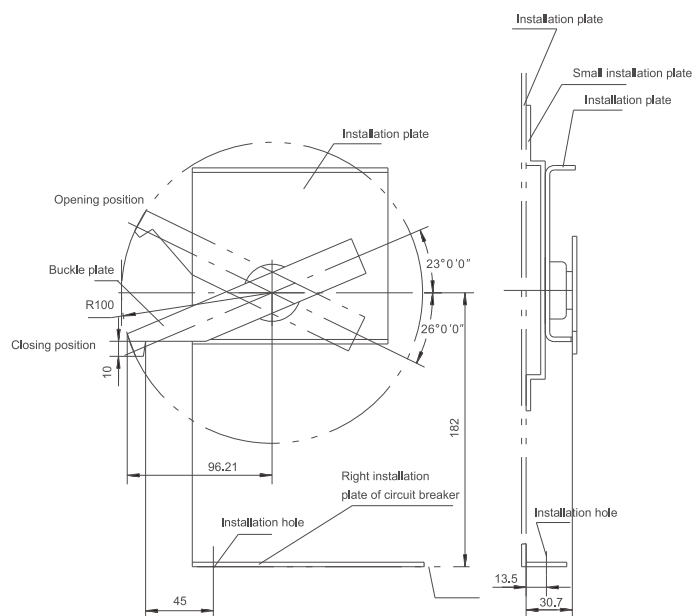


Figure 7.15 NA8-2500~4000 fixed type circuit breaker status door interlock installation dimensions

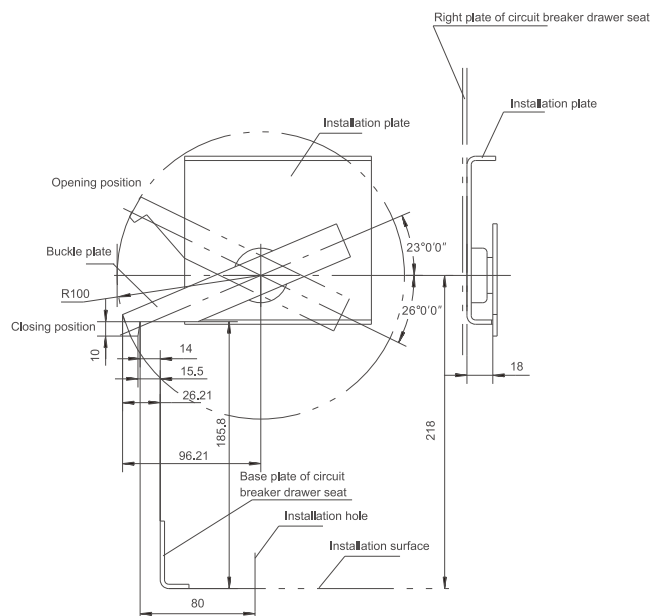


Figure 7.16 NA8-2500~7500 withdrawable type circuit breaker status door interlock installation dimensions

8 Control circuit electrical wiring diagram

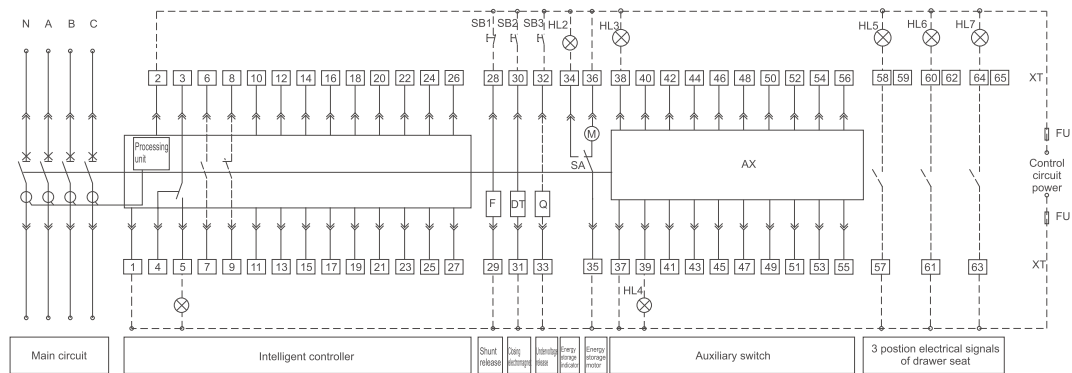
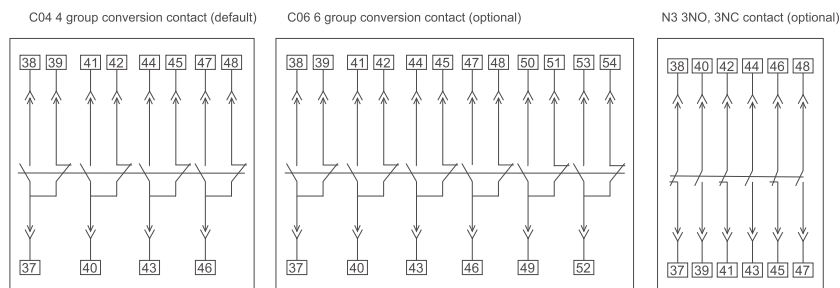


Figure 8.1 Control circuit wiring diagram of NA8-1600 M controller



F—shunt release DT—closing electromagnet Q—undervoltage release M—motor operating mechanism
SA—position switch XT—terminal AX—auxiliary terminal SB1—Breaking button
SB2—Making button SB3—emergency stop button HL1—fault indicator
HL2—energy storage indicator
HL3—Breaking indicator HL4—Making indicator HL5~7—position indicator
FU—fuse (6A)
1#, 2#: intelligent controller power: voltage AC220/380V, can be directly connected to 1#, 2#. If voltage is DC220/110V, a 24V output from power module is required before being connected to 1#, 2#
3#~ 5#: trip alarm contact (3 is the common contact)
6#~ 9#: auxiliary contact (1 NO and 1 NC contact), optional
10#, 11#: empty
12#~ 19#: empty

20#: empty
21#~ 24#: empty
24#, 25#: signal input contact for external N phase transformer, normally empty, used as signal input contact for external transformer if specially ordered by user.
27#: protectively earthed, connected to exterior panel of circuit breaker.
28#, 29#: shunt release; 30#, 31#: closing electromagnet; 32#, 33#: undervoltage release
34#~36#: motor operating mechanism
37#~ 56#: auxiliary contact. Normally 4 groups of changeover auxiliary contacts, 6 groups of changeover auxiliary contacts or 3NO/3NC contacts are available if specially ordered by user. 6-group conversion auxiliary contacts are only applicable to AC current.
57#~65#: 3 position signal indicator for withdrawable circuit breaker, no connection for regular delivery, only for withdrawable circuit breakers with the functions.
Note: Solid lines are factory connected, dotted lines need to be connected by user.

Figure 8.1-1 AX auxiliary contact wiring diagram of NA8-1600 M controller

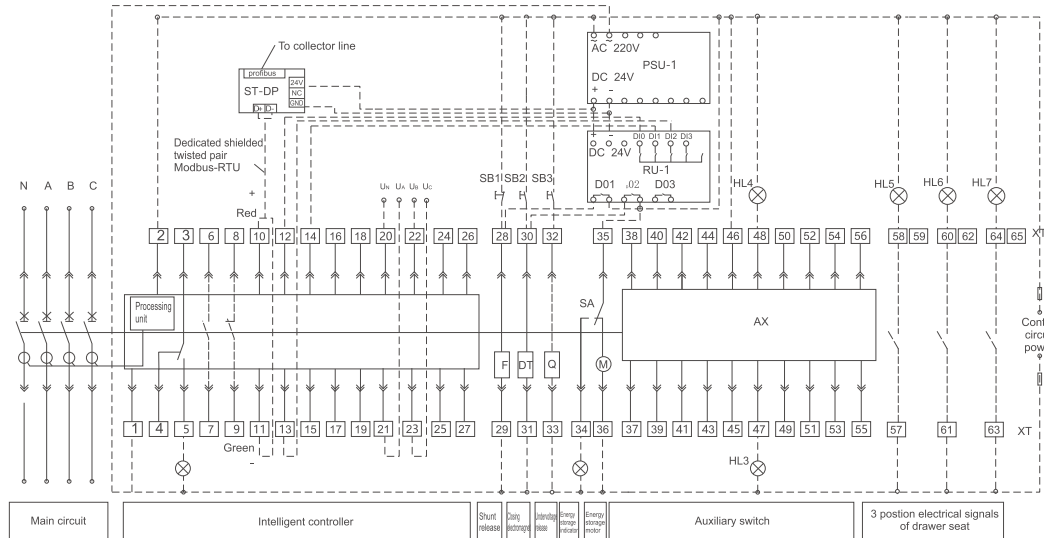
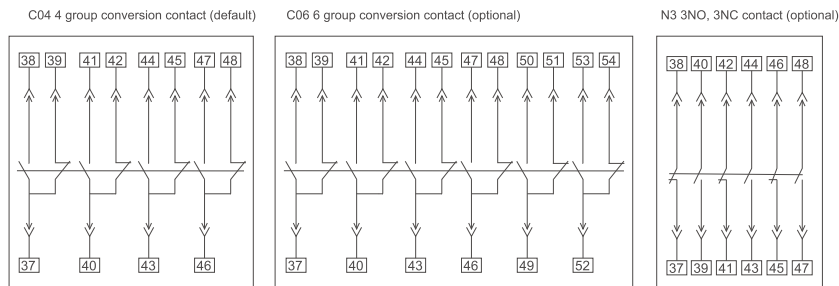


Figure 8.2 Control circuit wiring diagram of NA8-1600 H controller



F—shunt release DT—closing electromagnet Q—under voltage release M—motor operating mechanism SA—position switch XT—terminal AX—auxiliary terminal SB1—Breaking button SB2—Making button SB3—emergency stop button HL1—fault indicator HL2—energy storage indicator HL3—Breaking indicator HL4—Making indicator HL5~7—position indicator FU—fuse (6A)

1#, 2#: intelligent controller power: voltage AC220/380V, can be directly connected to 1#, 2#; If voltage is DC220/110V, a 24V output from power module is required before being connected to 1#, 2#

3#~ 5#: trip alarm contact (3 is the common contact)

6#~ 9#: auxiliary contact (1 NO and 1 NC contact), optional

10#, 11#: H type intelligent controller default communication output terminal

12#~ 15#: 3 groups of programmable output signals, must be connected with external RU-1 relay module. Default outputs of H type intelligent controller with programmable output signals: 12#, 13#: closing signal output, 12#, 14#: opening signal output, 12#, 15#: fault trip. No connection for normal product.

19#: H intelligent controller communication shield grounding.

20#~ 23#: voltage display input signal terminal, 20#: Phase N voltage signal, 21#: phase A voltage signal, 22#: phase B voltage signal, 23#: phase C voltage signal. No connection for normal product.

24#, 25#: signal input contact for external N phase transformer or external earth current transformer, normally empty, used as signal input contact for external transformer if specially ordered by user.

27#: protectively earthed, connected to exterior panel of circuit breaker.

28#, 29#: shunt release; 30#, 31#: closing electromagnet; 32#, 33#: undervoltage release 34#~36#: motor operating mechanism

37#~ 56#: auxiliary contact. 6-group conversion auxiliary contacts are only applicable to AC current.

Normally 4 groups of changeover auxiliary contacts, 6 groups of changeover auxiliary contacts or 3NO/3NC contacts are available if specially ordered by user.

57#~65#: 3 position signal indicator for withdrawable circuit breaker, no connection for regular delivery, only for withdrawable circuit breakers with the functions.

ST-DP: DP protocol module, no need for ST-DP protocol module if upstream communication protocol is Modbus-RTU; use ST-DP protocol module to transfer Modbus-RTU protocol into Profibus-DP protocol if upstream communication protocol is Profibus-DP, which will be charged separately.

RU-1: relay module. Upstream machine opens and closes circuit breaker through remote control, used for opening and closing signal energy amplification, which will be charged separately.

Note: Solid lines are factory connected, dotted lines need to be connected by user.

Figure 8.2-1 AX auxiliary contact wiring diagram of NA8-1600 H controller

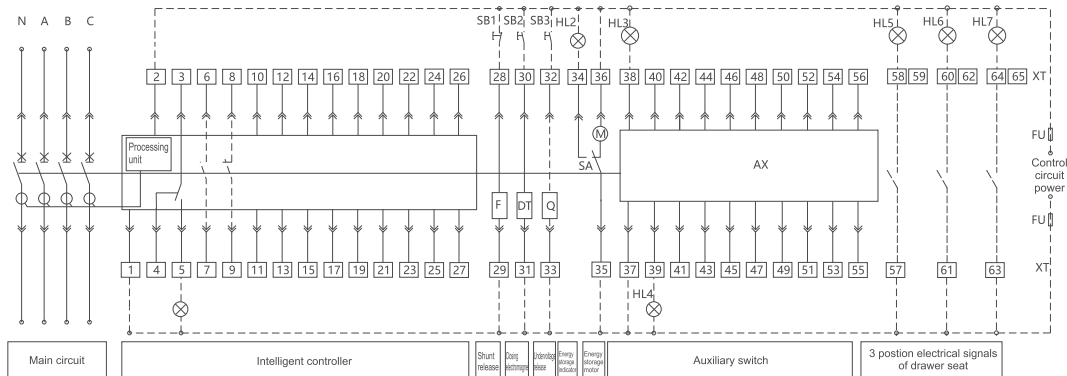
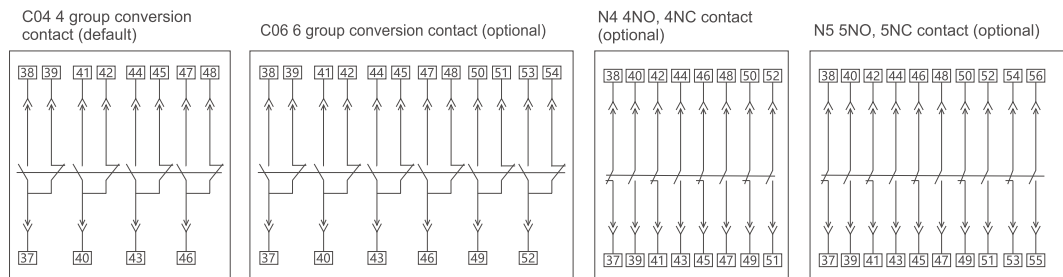


Figure 8.3 Control circuit wiring diagram of NA8-2500~7500 M controller



F—shunt release DT—closing electromagnet Q—under voltage release M—motor operating mechanism
SA—position switch XT—terminal AX—auxiliary terminal SB1—Breaking button SB2—Makeing button SB3—emergency stop button HL1—fault indicator HL2—energy storage indicator HL3—Breaking indicator HL4—Makeing indicator HL5~7—position indicator FU—fuse (6A)
1#, 2#: intelligent controller power: voltage AC220/380V, can be directly connected to 1#, 2#; If voltage is DC220/110V, a 24V output from power module will be required before being connected to 1#, 2#
3#~ 5#: trip alarm contact (3 is common contact)
6#~ 9#: auxiliary contact (1 NO and 1 NC contact), optional
10#, 11#: empty
12#~ 19#: empty
20#: empty
21#~ 24#: empty

24#, 25#: signal input contact for external N phase transformer, normally empty, used as signal input contact for external transformer if specially ordered by user.
27#: protectively earthed, connected to exterior panel of circuit breaker.
28#, 29#: shunt release; 30#, 31#: closing electromagnet; 32#, 33#: undervoltage release
34#~36#: motor operating mechanism
37#~ 56#: auxiliary contact. 6-group conversion auxiliary contacts are only applicable to AC current.
Normally 4 groups of changeover auxiliary contacts, 6 groups of changeover auxiliary contacts or 4NO/4NC contacts and 5NO/5NC contacts are available if specially ordered by user.
57#~65#: 3 position signal indicator for withdrawable circuit breaker, no connection for regular delivery, only for withdrawable circuit breakers with the functions.
Note: Solid lines are factory connected, dotted lines need to be connected by user.

Figure 8.3-1 AX auxiliary contact wiring diagram of NA8-2500~7500 M controller

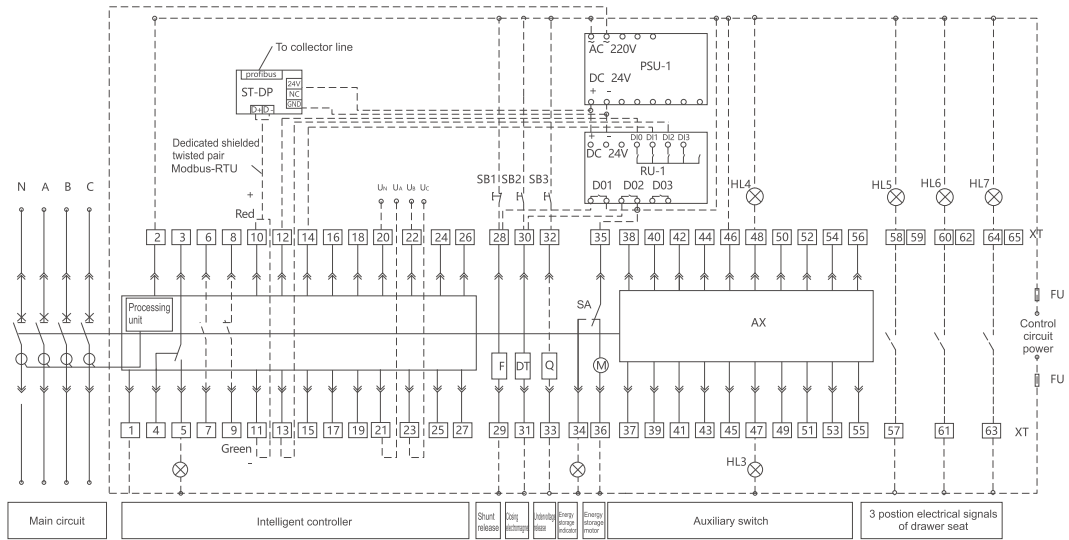
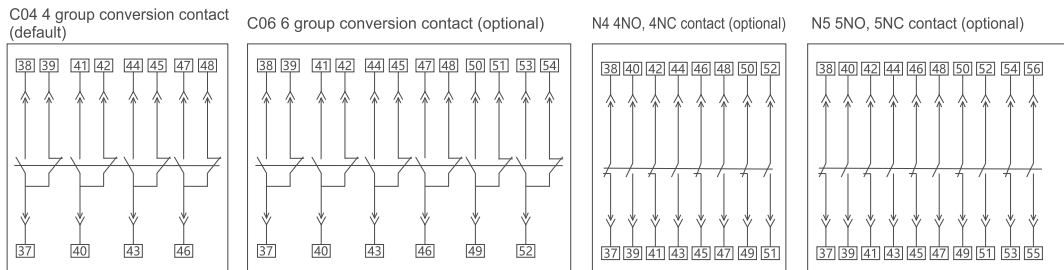


Figure 8.4 Control circuit wiring diagram of NA8-2500~7500 H controller



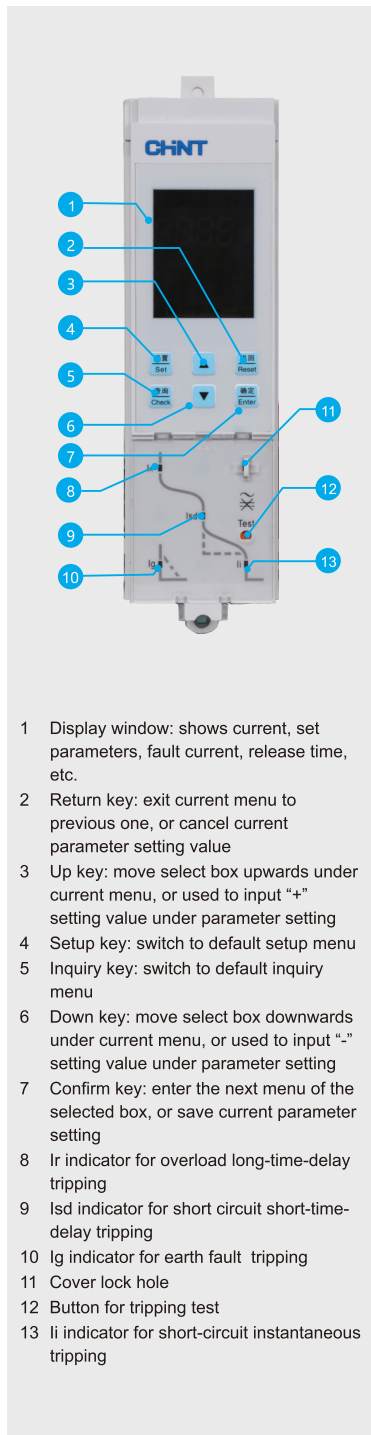
F—shunt release DT—closing electromagnet Q—undervoltage release M—motor operating mechanism SA—position switch XT—terminal AX—auxiliary terminal
SB1—Breaking button
SB2—Making button SB3—emergency stop button HL1—fault indicator
HL2—energy storage indicator HL3—Breaking indicator HL4—Making indicator
HL5~7—position indicator
FU—fuse (6A)
1#, 2#: intelligent controller power: voltage AC220/380V, can be directly connected to 1#, 2#: If voltage is DC220/110V, a 24V output from power module is required before being connected to 1#, 2#
3#~ 5#: trip alarm contact (3 is common contact)
6#~ 9#: auxiliary contact (1 NO and 1 NC contact), optional
10#, 11#: H type intelligent controller default communication output terminal
12#~ 15#: 3 groups of programmable output signals, must be connected with external RU-1 relay module. Default outputs of H type intelligent controller with programmable output signals: 12#, 13#: closing signal output, 12#, 14#: opening signal output, 12#, 15#: fault trip. No connection for normal product.
19#: H intelligent controller communication shield grounding.
20#~ 23#: voltage display input signal terminal, 20#: N phase voltage signal, 21#: phase A voltage signal, 22#: phase B voltage signal, 23#: phase C voltage signal. No connection for normal product.

24#, 25#: signal input contact for external N phase transformer or external earth current transformer, normally empty, used as signal input contact for external transformer if specially ordered by user.
27#: protectively earthed, connected to exterior panel of circuit breaker.
28#, 29#: shunt release; 30#, 31#: closing electromagnet; 32#, 33#: undervoltage release
34#~36#: motor operating mechanism
37#~ 56#: auxiliary contact. 6-group conversion auxiliary contacts are only applicable to AC current.
Normally 4 groups of changeover auxiliary contacts, 6 groups of changeover auxiliary contacts or 4NO/4NC contacts and 5NO/5NC contacts are available if specially ordered by user.
57#~65#: 3 position signal indicator for withdrawable circuit breaker, no connection for regular delivery, only for withdrawable circuit breakers with the functions.
ST-DP: DP protocol module, no need for ST-DP protocol module if upstream communication protocol is Modbus-RTU; use ST-DP protocol module to transfer Modbus-RTU protocol into Profibus-DP protocol if upstream communication protocol is Profibus-DP, which will be charged separately.
RU-1: relay module. Upstream machine opens and closes circuit breaker through remote control, used for opening and closing signal energy amplification, which will be charged separately.
Note: Solid lines are factory connected, dotted lines need to be connected by user.

Figure 8.4-1 AX auxiliary contact wiring diagram of NA8-2500~7500 H controller

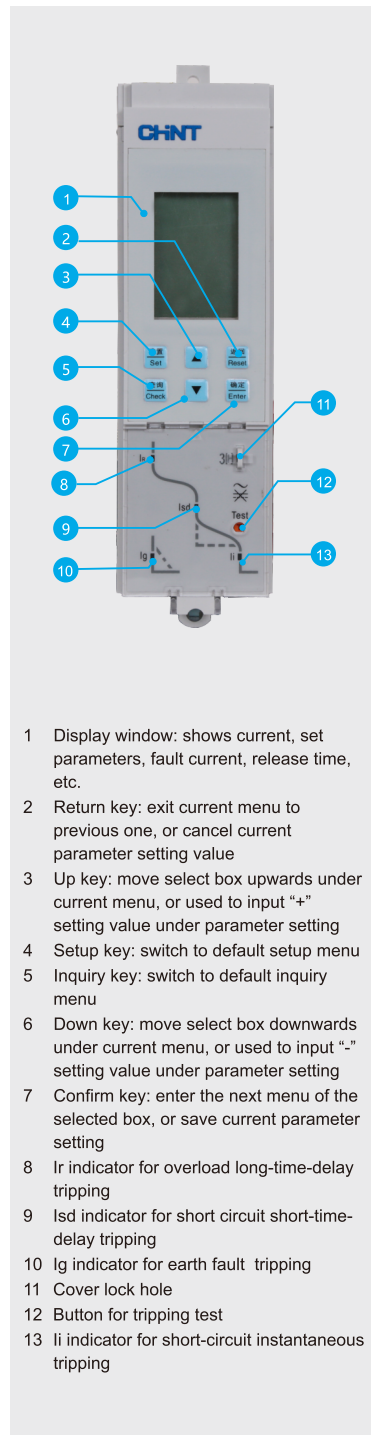
9 Intelligent controller usage

9.1 Operation interface of M/H type intelligent controller



- 1 Display window: shows current, set parameters, fault current, release time, etc.
- 2 Return key: exit current menu to previous one, or cancel current parameter setting value
- 3 Up key: move select box upwards under current menu, or used to input "+" setting value under parameter setting
- 4 Setup key: switch to default setup menu
- 5 Inquiry key: switch to default inquiry menu
- 6 Down key: move select box downwards under current menu, or used to input "-" setting value under parameter setting
- 7 Confirm key: enter the next menu of the selected box, or save current parameter setting
- 8 Ir indicator for overload long-time-delay tripping
- 9 Isd indicator for short circuit short-time-delay tripping
- 10 Ig indicator for earth fault tripping
- 11 Cover lock hole
- 12 Button for tripping test
- 13 Ii indicator for short-circuit instantaneous tripping

M type (basic type)



- 1 Display window: shows current, set parameters, fault current, release time, etc.
- 2 Return key: exit current menu to previous one, or cancel current parameter setting value
- 3 Up key: move select box upwards under current menu, or used to input "+" setting value under parameter setting
- 4 Setup key: switch to default setup menu
- 5 Inquiry key: switch to default inquiry menu
- 6 Down key: move select box downwards under current menu, or used to input "-" setting value under parameter setting
- 7 Confirm key: enter the next menu of the selected box, or save current parameter setting
- 8 Ir indicator for overload long-time-delay tripping
- 9 Isd indicator for short circuit short-time-delay tripping
- 10 Ig indicator for earth fault tripping
- 11 Cover lock hole
- 12 Button for tripping test
- 13 Ii indicator for short-circuit instantaneous tripping

H type (communication type)

9.2 Intelligent controller feature introduction

9.2.1 Overcurrent protection curve

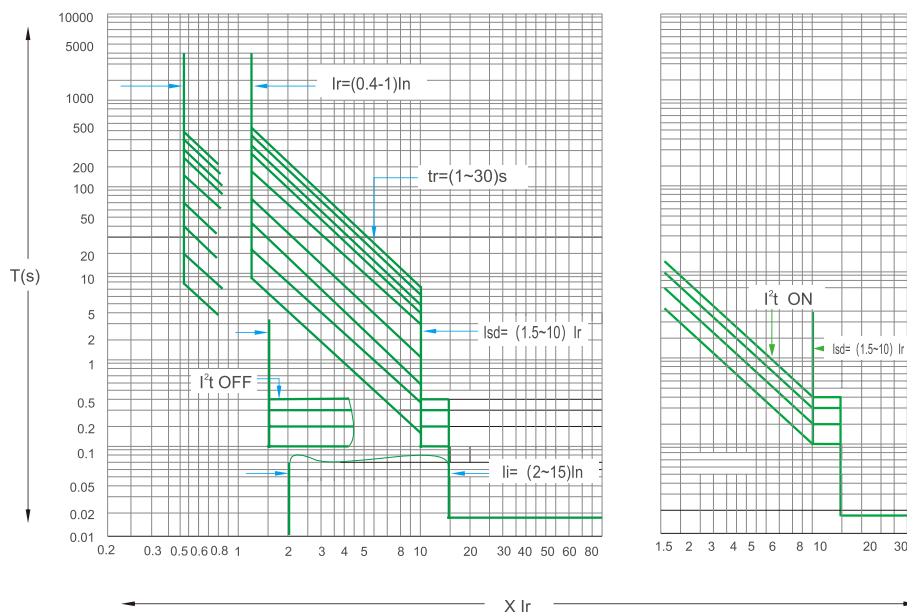


Figure 9.2-1 Overcurrent protection curve

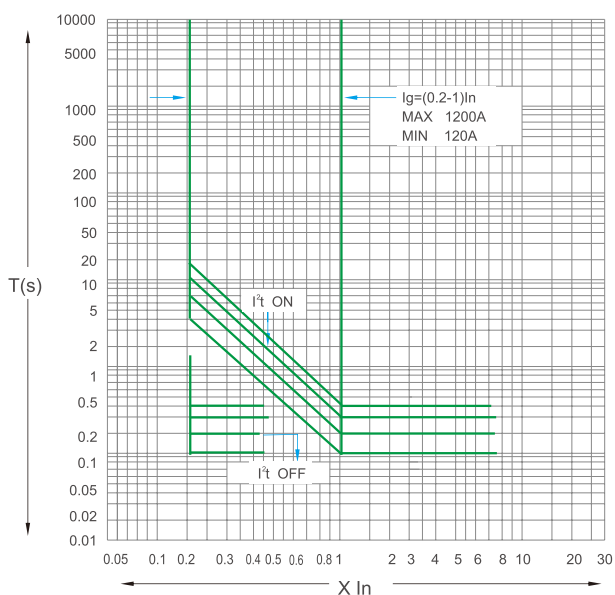


Figure 9.2-2 Neutral line (earthing) fault protection curve

9.2.2 Intelligent controller protection features

Overload long time delay protection

Long time delay protection I_r current setting range: $0.4I_n \sim 1.0I_n + \text{OFF}$, with error of $\pm 10\%$

Long time delay release is inverse time lag operation, there are 9 available release times ($t_r = (1-2-4-8-12-16-20-24-30)\text{s}$) under $6I_r$, with time error of $\pm 15\%$. Inverse time lag curve:

$$I^2 \times t = \left(\frac{6}{N}\right)^2 \times t_r$$

Overload long time delay protection threshold

$< 1.05I_r$: $> 2\text{h}$ do not operate

$\geq 1.3I_r$: $< 1\text{h}$ operate

Table 12 Operation feature of overload long time delay

Set current amplification factor	Operation time								
$1.5I_r$	16	32	64	128	192	256	320	384	480
$2.0I_r$	9	18	36	72	108	144	180	216	270
$6.0I_r$	1	2	4	8	12	16	20	24	30

Notes: N – fault current divided by set current amplification factor I/I_r

t – delay time for fault operation

t_r – set value of long time delay

Allowable error of operation time $\pm 15\%$

Normal factory setting: overload long time delay current $1.0I_n$;

Normal factory setting: overload $6I_r$; operation time 2s

Example: given overload long time delay current $1.0I_n$, delay time 2s (under $6I_r$), if line current $I = 1.8I_n$, the actual fault operation delay time

(t) can be calculated as:

$$N = 1.8I_n / 1.0I_n = 1.8$$

$$t = (6/1.8)^2 \times 2 = 22.2\text{s}$$

Short circuit short time delay protection feature

Operation threshold of short circuit short time delay protection

$< 0.85I_{sd}$ do not operate;

$> 1.15I_{sd}$: operate;

I_{sd} current setting range: $1.5I_r \sim 10I_r + \text{OFF}$, setting range of short time delay operation time (t_{sd}): $0.1 \sim 0.4\text{s}$.

Table 13 Short circuit short time delay operation feature

Current	Operation time	
$I_{sd} < 10I_r$	Anti-time limit	Operation feature $I^2t = (10I_r)^2 t_{sd}$
		Set time s: 0.1、0.2、0.3、0.4
$I_{sd} \geq 1.1I_{sd}$	Definite-time limit	Set time s: 0.11、0.21、0.31、0.41
		Minimum s: 0.06、0.16、0.255、0.34
		Maximum s: 0.14、0.24、0.345、0.46
	Return time	0.05、0.14、0.25、0.33

Notes: I_{sd} – set value of short time delay current

I – fault current value

I_r – set value of long time delay

t – delay time of fault action

t_{sd} – set value of short time delay inverse time lag

Allowable error of operation time $\pm 15\%$

Normal factory setting: short time delay current $8I_r$;

Normal factory setting: short time delay operation time 0.4s

Short circuit instantaneous protection feature

Short circuit instantaneous protection threshold

<0.85I_n: do not operate;

>1.15 I_n: operate

Current setting for instantaneous operation: 2I_n~15I_n+OFF

Note: operation times≤100ms

Normal factory setting: Short circuit instantaneous current 12I_n

Single phase Earthing fault protection feature

Earthing fault protection threshold

<0.9I_g: do not operate;

>1.1I_g: operate;

NA8-1600\2500: 0.2I_n~1.0I_n+OFF(MAX:1200A)

NA8-4000\7500: 500A~1200A+OFF

Table 14 Earthing fault protection feature

Definite-time limit	Set time (s)	0.11	0.21	0.31	0.41
	Minimum (s)	0.06	0.16	0.255	0.34
	Maximum (s)	0.14	0.24	0.345	0.46
	Return time	0.05	0.14	0.25	0.33
Anti-time limit	$t = \frac{(I_g)^2}{I^2} \times t_g$				

Notes: I_g – set value for Earthing protection, NA8-1600/2500 default factory setting I_g=0.5I_n, NA8-4000/7500 default factory setting I_g=800A.

I – fault current value

T – fault operation delay time

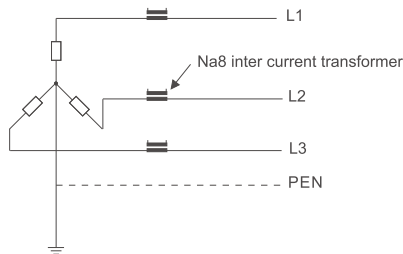
t_g –set value for earthing inverse time lag

Allowable error of inverse time lag operation time ±15%

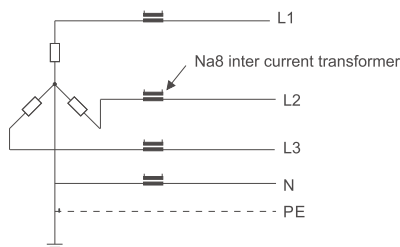
Normal factory setting: OFF

Metallic earthing protection with single phase earthing protection fault current over hundreds of amperes is usually used for neutral solidly grounded system. There are two types of protection: vector sum and external transformer. Please refer to the figure below for the connection of these two methods.

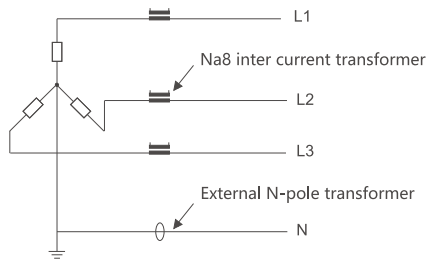
3-pole circuit breaker detects whether the vector sum of three phase current is zero by using three internal current transformers, so as to provide earthing protection



4-pole circuit breaker detects whether the vector sum of three phase current and N phase current is zero by using four internal current transformers, so as to provide earthing protection



3P+N system uses 3-pole circuit breaker and external N-pole transformer to calculate vector sum and provide earthing protection



- Notes: 1 The external N-pole transformer is a transformer that is specially configured by our company, with default cable length of 2 meters.
2 If 3PT method is used, earthing protection can only be used for balanced load, if used for unbalanced load, the function should be deactivated or set the set value above the allowable unbalanced current, otherwise it may cause the intelligent controller to operate.
3 If (3P+N) T method is used, the maximum distance between transformer and circuit breaker shall not be bigger than 5 meters, if the cable length of transformer is bigger than 2 meters, please specify in order.

Residual leakage protection

Residual leakage protection is ideal for applications with high sensitivity for residual leakage protection. It is applicable to leakage fault due to equipment insulation damage or leakage fault caused by human exposure to the live part. The set value of leakage current is presented in Ampere, which should not be bigger than 30A and irrelevant to the rated current of circuit breaker. It uses zero sequence sampling method to collect signal which requires a rectangular transformer, therefore this function is also called zero sequence current protection.

Setting range of residual leakage protection current $I_{\Delta n}$: 0.5A~30A+OFF, with error of $\pm 10\%$.

Residual leakage release is an inverse time lag operation, with release time $\Delta t =$ (instantaneous -0.06~0.83) s, there are multiple stages available, with time error of $\pm 15\%$.

Residual current protection threshold

$< 0.8I_{\Delta n}$: do not operate

$\geq 1.0I_{\Delta n}$: operate

Table 15 Residual leakage protection feature

Set current amplification factor/set time (s)	0.06	0.08	0.17	0.25	0.33	0.42
$1.0I_{\Delta n}$	0.36	0.5	1.0	1.5	2.0	2.5
$2.0I_{\Delta n}$	0.18	0.25	0.5	0.75	1.0	1.25
$5.0I_{\Delta n}$	0.072	0.1	0.2	0.3	0.4	0.5
$10I_{\Delta n}$	0.072	0.1	0.2	0.3	0.4	0.5

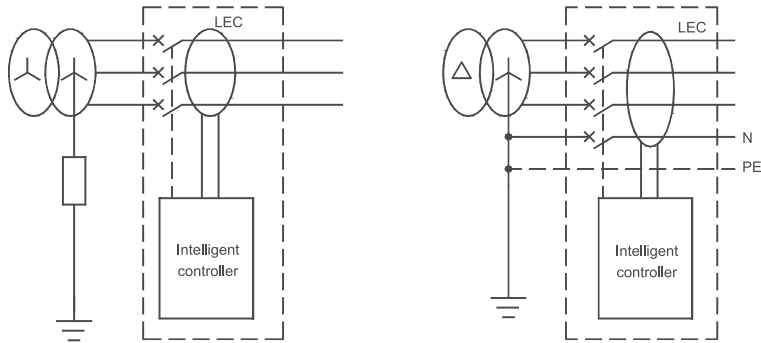
Table 15 (continue)

Set current amplification factor/set time (s)	0.50	0.58	0.67	0.75	0.83	Instantaneous
$1.0I_{\Delta n}$	3.0	3.5	4.0	4.5	5.0	0.04
$2.0I_{\Delta n}$	1.5	1.75	2.0	2.25	2.5	0.04
$5.0I_{\Delta n}$	0.6	0.7	0.8	0.9	1.0	0.04
$10I_{\Delta n}$	0.6	0.7	0.8	0.9	1.0	0.04

Notes: to provide residual current protection, NA8 circuit breakers must comply with the following requirements

1. Select H type controller;
2. Add leakage protection function for the controller;
3. Add leakage transformer (LEC) accessories;
4. Use vertical connection for the cable outlet of circuit breaker
5. The rated current of circuit breaker must be $\leq 3200A$.

Wiring schematic diagram for residual current protection.



9.3 Measurement accuracy of intelligent controller

Table 16 Measurement range of intelligent controller

Current measurement	
Measurement range	Ia, Ib, Ic and In is not smaller than 15In (rated current of circuit breaker)
Measurement accuracy	The measurement is inaccurate when the current is below 0.1In
	The accuracy will change linearly from 5% to 2% when the current is between 0.1In to 0.4In
	The accuracy will be 2% when the current is between 0.4In to 1.5In
	The accuracy will change linearly from 2% to 15% when the current is larger than 1.5In
Voltage measurement	
Measurement range	Line voltage: 0-600V
	Phase voltage: 0-300V
Measurement accuracy	Error: $\pm 1\%$
Frequency	
Measurement range	40Hz~70Hz
Measurement accuracy	Error: ± 0.1 Hz
Power	
Measuring method	rms
Measuring content	3P type: total active power, total passive power, total apparent power
	4P type: split phase active power, split phase passive power, split phase apparent power, total active power, total passive power, total apparent power
Measurement range	Active power: -32768KW~+32767KW
	Passive power: -32768Kvar~+32767Kvar
	Apparent power: 0KVA~65535KVA
	Error: $\pm 2.5\%$
Power factor	
Measuring content	3P type: total power factor
	4P type: split phase power factor
Measurement range	-1.00~+1.00

Table 16 (continue)

Electric energy	
Measuring content	Input reactive energy (EQin), output reactive energy (EQout)
	Input active energy (EPin), output active energy (EPout)
	Total active energy (Eptotal), total reactive energy (EQtotal), total apparent energy (ESTotal)
Measurement range	Active energy: -32768KWh~+32767KWh
	Reactive energy: -32768Kvarh~+32767Kvarh
	Apparent energy: 0~65535KVAh
Measurement accuracy	±2.5%
Harmonic measurement	
First harmonic measurement	Current: Ia, Ib, Ic
	Voltage: Uab, Ubc, Uca
Total harmonic distortion THD and thd	THD: total harmonic distortion rate corresponding to first harmonic
	thd: total harmonic distortion rate corresponding to rms
Harmonic amplitude spectrum	The controller can display the FFT amplitude of 3-31 odd harmonics in %
Control unit measurement accuracy	±2%

9.4 Factory minimum display current of controller

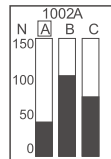
Table 17 Minimum display current of controller

Frame size	Rated current	Minimum display current
1600	400~1600	80
2500	630 ~ 2500	80
≥4000	≥1600	160

9.5 Default interface and menu structure of H type (communication type) controller

H type controller has 4 main menus and 1 default interface:

Main menus include measurement menu, parameter setting menu, protection parameter setting menu, and history record and maintenance menu.



Default interface of multifunction controller

9.5.1 Measurement menu structure

Table 18 Measurement menu of intelligent controller

Level 1 menu	Level 2 menu	Level 3 menu	Level 4 menu	Level 5 menu
Current I	Instantaneous value	Ia Ib Ic In	Ia= 1000A	
			Ib= 1001A	
			Ic= 998A	
			In= 0A	
			Ig= 0A or I△n=0.00A	
		Maximum value	Ia= 1300A	
			Ib= 1400A	
			Ic= 1380A	
			In= 200A	
			Ig= 0A or I△n=0.00A	
		Unbalance rate	Ia= 3%	
			Ib= 5%	
			Ic= 1%	
	Current heat capacity	100%		

Table 18 (continue)

Level 1 menu	Level 2 menu	Level 3 menu	Level 4 menu	Level 5 menu
Current I	Demand value	Real time value $\bar{I}_a, \bar{I}_b,$ \bar{I}_c, \bar{I}_n	15min	
			$\bar{I}_a = 1000A$	
			$\bar{I}_b = 1000A$	
			$\bar{I}_c = 998A$	
			$\bar{I}_n = 0A$	
		Maximum value	$\bar{I}_a = 1050A$	
			$\bar{I}_b = 1040A$	
			$\bar{I}_c = 1010A$	
			$\bar{I}_n = 0A$	
Voltage U	Instantaneous value	Uab= 380V		
		Ubc= 380V		
		Uca= 380V		
		Uan= 220V		
		Ubn= 220V		
		Ucn= 220V		
	Average value	Uav= 380V		
	Unbalance rate	0%		
	Phase sequence	A,B,C		
Frequency F	50Hz			
Electric energy E	Total electric energy	EP= 200kWh		
		EQ= 10kvarh		
		ES= 200kVAh		
	Input electric energy	EP= 200kWh		
		EQ= 200kvarh		
	Output electric energy	EP= 0kWh		
		EQ= 0kvarh		
	Electric energy reset	Reset		
Power P	Instantaneous value	P, Q, S	P= 660kW	
			Q= 0kvar	
			S= 660kVA	
		Power factor	-1.00	
			Inductive	
			PFa= 1.00	
			PFb= 1.00	
			PFc= 1.00	
		Pa, Qa, Sa	Pa= 220kW	
			Qa= 0kvar	
			Sa= 220kVA	
		Pb, Qb, Sb	Pb= 220kW	
			Qb= 0kvar	
			Sb= 220kVA	
		Pc, Qc, Sc	Pc= 220kW	
			Qc= 0kvar	
			Sc= 220kVA	
	Demand value	$\bar{P}, \bar{Q}, \bar{S}$	$\bar{P} = 660kW$	
			$\bar{Q} = 0kvar$	
			$\bar{S} = 660kVA$	
		Maximum value	$\bar{P} = 661kW$	
			$\bar{Q} = 2kvar$	
			$\bar{S} = 662kVA$	
			Reset (+/-)	

Table 18 (continue)


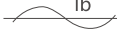


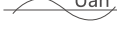
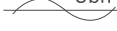

Level 1 menu	Level 2 menu	Level 3 menu	Level 4 menu	Level 5 menu
Harmonic H	Wave form	Ia , Ib Ic , In	 Ia	
			 Ib	
			 Ic	
			 In	
		Uan , Ubn Ucn	 Uan	
			 Ubn	
			 Ucn	
	Basic form	I(A)	Ia= 1000A	
			Ib= 1000A	
			Ic= 1000A	
			In= 1000A	
		U(V)	Uab= 380V	
			Ubc= 380V	
			Uca= 380V	
			Uan= 220V	
	THD	I(%)	Ubn= 220V	
			Ucn= 220V	
			Ia= 0.0%	
			Ib= 0.0%	
		U(%)	Ic= 0.0%	
			In= 0.0%	
			Uab= 0.0%	
			Ubc= 0.0%	
	thd	I(%)	Uca= 0.0%	
			Uan= 0.0%	
			Ubn= 0.0%	
			Ucn= 0.0%	
		U(%)	Ia= 0.0%	
			Ib= 0.0%	
			Ic= 0.0%	
			In= 0.0%	

Table 18 (continue)

Level 1 menu	Level 2 menu	Level 3 menu	Level 4 menu	Level 5 menu
Harmonic H	FFT	I(3, 5, 7...31)	Ia(3, 5, 7...31)	Ia FFT THD=0.0% 0.0% 3 5 7 9 11...31)
			Ib(3, 5, 7...31)	Ib FFT THD=0.0% 0.0% 3 5 7 9 11...31)
			Ic(3, 5, 7...31)	Ic FFT THD=0.0% 0.0% 3 5 7 9 11...31)
			In(3, 5, 7...31)	In FFT THD=0.0% 0.0% 3 5 7 9 11...31)
		U(3, 5, 7...31)	Uab(3, 5, 7...31)	Uab FFT THD=0.0% 0.0% 3 5 7 9 11...31)
			Ubc(3, 5, 7...31)	Ubc FFT THD=0.0% 0.0% 3 5 7 9 11...31)
			Ucb(3, 5, 7...31)	Ucb FFT THD=0.0% 0.0% 3 5 7 9 11...31)
			Uca(3, 5, 7...31)	Uca FFT THD=0.0% 0.0% 3 5 7 9 11...31)

9.5.2 Parameter setting menu structure

Table 19 intelligent controller parameter setting menu

Level 1 menu	Level 2 menu	Level 3 menu	Level 4 menu	Level 5 menu
Measurement table setup	System type	=3Φ4W 4CT		
	Cable entry method	= top entry		
Test & lock	Test release	Test type	= 3 step protections	
		Test parameters	=I : 9999A	
		Test start	= start	
	Remote lockout	Remote lockout	= unlock	
	Parameter lockout	Parameter lockout	Parameter lockout =lockout	
		(Input) user code =0000	user code (alter) =0000	
Communication setup	Address	=3		
	Baud rate	=9.6K		
I/O setup	Function setup	=DO1 =Zone interlock		
	Operation method	=DO1 =NO impulse =360s		
	I/O status	I/O status DO1 DO2 DO3 DI1 1 1 1 1		

9.5.3 Protection parameter setup menu structure

Table 20 Intelligent controller protection parameter menu

Level 1 menu	Level 2 menu	Level 3 menu	Level 4 menu	Level 5 menu
Current protection	Long time delay	IR	E.g.: =1000A=100%I _n	
		Current protection	E.g.: =ON	
		Delay time	E.g.: =C1, 1s@6I _R	
		Cooling time	E.g.: =3h	
	Short time delay	Definite time lag	Operation current	E.g.: =5000A=5.0IR
				E.g.: =0.1s
	Inverse time lag		Delay time	E.g.: =2000A=2.0IR
				E.g.: =C1, 0.1s@6IR
	Instantaneous	Operation current	E.g.: =10000A=10.0I _n	
	Middle phase protection	Middle phase protection	E.g.: =200%	
	Earthing protection	Operation current	E.g.: =800A	
		Delay time	E.g.: =0.4s	
		Earthing coefficient	E.g.: =6.0	
	Earthing alarm	Start current	E.g.: =600A	
		Start time	E.g.: =0.1s	
		Return current	E.g.: =100A	
		Return time	E.g.: =0.1s	
	Leakage protection	Operation current	E.g.: =8.0A	
		Set delay time	E.g.: =0.75s	
	Leakage alarm	Start current	E.g.: =5.0A	
		Start time	E.g.: =0.1s	
		Return current	E.g.: =4.0A	
		Return time	E.g.: =0.1s	
Load monitoring	Operation method	E.g.: =I method 1		
	Unload value 1	E.g.: =800A		
	Unload time 1	E.g.: =50%t _R		
	Unload value2	E.g.: =700A		
	Unload time 2	E.g.: =25%t _R		
Voltage protection	Undervoltage	Operation method	E.g.: =alarm	
		Start value	E.g.: =200V	
		Start time	E.g.: =0.2s	
		Return value	E.g.: =320V	
		Return time	E.g.: =60.0s	
	Overvoltage	Operation method	E.g.: =alarm	
		Start value	E.g.: =480V	
		Start time	E.g.: =1s	
		Return value	E.g.: =400V	
		Return time	E.g.: =60.0s	
	U unbalance	Operation method	E.g.: =alarm	
		Start value	E.g.: =10%	
		Start time	E.g.: =1s	
		Return value	E.g.: =5%	
		Return time	E.g.: =60.0s	

9.5.4 History records and maintenance menu structure

Table 21 Intelligent controller history records and maintenance menu

Level 1 menu	Level 2 menu	Level 3 menu	Level 4 menu	Level 5 menu
Current alarm	E.g.: phase sequence alarm, reverse power alarm, overfrequency alarm.....			
Operation times	Total times Operation times	E.g.:300 219 (confirm key reset)		
Contact wear	Total wear Contact wear	E.g.:120 E.g.: 20 (confirm key reset)		
Product information	Zhejiang CHINT Electrics Co. Ltd.			
Release records	E.g.: 1 Undervoltage trip	Undervoltage trip T=0.20s Umax=0V 0:16 a.m., Day 0		
		F=0.00Hz Uab= 0V Ubc= 0V Uca= 0V		
		
	E.g.: 8 Short circuit definite time lag	Phase A short circuit definite time lag T= 0.4s I= 4300A 0:16 a.m., Day 0		
		Ia= 4300A Ib= 4200A Ic= 4000A In= 150A		
Alarm records	E.g.: 1 DI input alarm	Di input alarm Di1 0:16 a.m., Day 0		
		
	E.g.: 8 Undervoltage alarm Note: maximum 8 records	Undervoltage alarm Umax= 0V 0:16 a.m., Day 0		
Position change records	E.g.: 1 Local closing	Local closing 0:16 a.m., Day 0		
		
	E.g.: 8 Test trip Note: maximum 8 records	Test trip 0:16 a.m., Day 0		

Notes: a. Actual menu may vary according to the functions selected by user.

b. Controller will enter screensaver status after 10min automatically.

9.6 Symbols and explanations of M type controller

Controller display uses customized module, the table below provides explanations of symbols for user's easy understanding.

Table 22 M type controller symbol explanation

No.	Symbol	Explanation
1	Ir= tr=	Indicates long time delay current set value and long time delay time set value respectively
2	Isd= tsd=	Indicates short time delay current set value and short time delay time set value respectively
3	Ig= tg=	Indicates ground current set value and ground time set value respectively
4	Ii=	Indicates instantaneous current set value
5	N=	Indicates neutral pole protection parameter set value
6	TM	Indicates software analog release status
7	TRIP	Indicates release status
8	RUN	Indicates normal operation status
9	SET	Solid indicates setup is allowed, flash indicates data alteration is allowed
10	LIN	Indicates data storage status
11	PI-O	Indicates four step current protection setup interface
12	FES	Indicates software analog test release setup interface
13	ALA	Indicates alarm setup and inquiry interface
14	SYS	Indicates system setup interface (for current calibration, system frequency setup)
15	DBS	Indicates communication setup interface (H type)
16	DOS	Indicates DO output setup interface (H type + DO type)
17	FAU	Indicates fault record inquiry interface
18	COU	Indicates operation times and lifetime inquiry interface
19	HOF	Indicates heat capacity inquiry interface
20	DOC	Indicates DO status inquiry interface
21	H.	Indicates heat capacity data
22	F--	Indicates fault record number
23	A--	Indicates alarm record number
24	Lg L1 L2 L3 LN	Indicates ground, A, B, C, N phases respectively
25	L L	Four section current curve, display all four means normal, the corresponding section flashes after fault release, the corresponding section also flashes during fault recording.

10 Circuit breaker accessories

10.1 Closing electromagnet (CC)

After the operation mechanism finishes energy storage, CC is energized and ready for remote closing.



1600 frame size CC



2500-7500 frame size CC

Table 23 Operation feature of Closing electromagnet

Feature		CC
Power Supply	VAC 50/60Hz	220/230/240
		380/400/415
	VDC	220,110
Operation voltage		0.85-1.1Us
Frame size: power consumption (VA or W)	AC	400VA
	DC	1600A: 380W; 2500A~7500A: 130W
Circuit breaker response time		30ms-45ms

10.2 Shunt release (ST)

After being energized, ST will instantaneously disconnect the circuit breaker, to realize remote opening.



Table 24 Operation feature of Shunt release

Feature		ST
Power Supply	VAC 50/60Hz	220/230/240
		380/400/415
	VDC	220,110
Operation voltage		0.85-1.1Us
Frame size: power consumption (VA or W)	AC	400VA
	DC	1600A: 380W; 2500A~7500A: 130W
Circuit breaker response time		25ms-35ms



10.3 Undervoltage release (UVT)

If the supply voltage drops to any point between 35%-70% of rated voltage, the release coil will disconnect the circuit breaker instantaneously. If the UVT release coil is not energized, the circuit breaker cannot be closed manually (closing button) or electrically (closing electromagnet). The circuit breaker can only be closed when the supply voltage of UVT release coil reaches 85% of rated voltage.

Table 25 Operation feature of undervoltage release

Feature			
Power Supply	VAC 50/60Hz		220/230/240
			380/400/415
	VDC		-
Operation threshold	Open	0.35-0.7Ue	0.35-0.7Ue
	Close	0.85Ue	0.85-1.1Ue
Frame size: power consumption (W)		1600A: 220W/15W; 2500A~7500A: 220W/13W	

Note: closing/maintain.

Delayed undervoltage release (UVTD)

To prevent unintended release due to voltage drop in short time, we add an operation delay to UVT by adding a delay unit.

Table 26 Operation feature of delayed undervoltage release

Power Supply		
Operation threshold	VAC 50/60Hz	
Operation threshold	Open	0.35-0.7Ue
	Close	0.85Ue
Frame size: power consumption (VA)	1600A: 20VA; 2500A~7500A: 48VA	
Adjustable time	1s-5s, delay time adjustable	

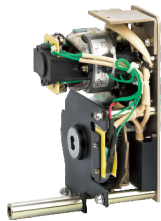
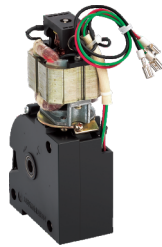
Note: only NA8-1600 uses external undervoltage delay module, delay unit is integrated into the undervoltage delay release for 2500-7500 products.

10.4 Motor operation mechanism (MO)

Storage energy by motor and automatically after circuit breaker closing, to ensure the circuit breaker can close immediately after opening. Energy storage handle used as standby measure if there is no auxiliary power supply.

Table 27 Feature of motor operation mechanism

Feature		
Power Supply	VAC 50/60Hz	220/230/240, 380/400/415
	VDC	110, 220
Operation threshold		0.85-1.1Us
Frame size: power consumption (VA or W)		1600A:75W; 2500A:85W 4000A:150W; 7500A:150W
Motor overcurrent time		≤1min
Energy storage time		≤7s
Operation frequency		≤2 times/min

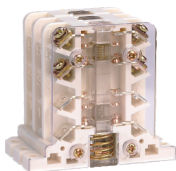
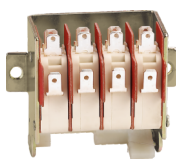


1600 frame size MO 2500-7500 frame size MO

After the motor operation mechanism (MO) finishes energy storing, the internal indication contact will switch to output, user may connect the energy storage indicator, see the table below for feature of indication contact.

Table 28 Indication contact technical parameters

Spring energy storage indication contact		
Standard supply		1NO
Breaking capacity		Current (A)/Voltage (V)
Application type	VAC (AC-15)	1.3/240, 0.75/415
	VDC (DC-13)	0.55/220, 0.27/110



1600 frame size OF 2500-7500 frame size OF

10.5 Auxiliary contacts (OF)

Standard configuration: 4 groups of changeover contacts (4CO)

Optional configuration: 6 groups of changeover contacts (6CO)

Optional for NA8 full series

3NO, 3NC (N3) Optional for NA8-1600

4NO, 4NC (N4) Optional for NA8-2500-7500

5NO, 5NC (N5) Optional for NA8-2500-7500

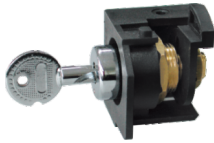
Table 29 Auxiliary contact technical parameters (1)

Features			
Auxiliary model		4CO/N4/N5	6CO(1600)
Breaking capacity		Current (A)	Current (A)
Application type	230/240VAC (AC-15)	1.3	1.3
	400/415VAC (AC-15)	0.75	0.75
	110VDC (DC-13)	0.55	-
	220VDC (DC-13)	0.27	-

Table 30 Auxiliary contact technical parameters (2)

Features		
Auxiliary model		6CO (2500 and above)
Breaking capacity		Current (A)
Application type	230/240VAC (AC-15)	1.3
	400/415VAC (AC-15)	0.75
	110VDC (DC-13)	0.55
	220VDC (DC-13)	0.27

Note: 6 groups of changeover contacts of NA8-1600 is not applicable to DC operation voltage.



10.6 Key lock (KL)

Key lock is used to lockout the opening button of circuit breaker. After pulling out the key, you will not be able to close the circuit breaker manually or electrically, and the circuit breaker will maintain opening status; user may choose this option, and we will provide lock and key; there are 3 types of key locks:

- 1 lock and 1 key (1S1S): 1 circuit breaker with an independent lock and a key
- 2 locks and 1 key (2S1S): 2 circuit breakers with two identical locks and a key
- 3 locks and 2 keys (3S2S): 3 circuit breaker with 3 identical locks and 2 keys

Notes: 1. Before you pull out the key, you must press the opening button first, then rotate the key counterclockwise
 2. If user purchase key lock separately, then you must use hole opener to open a hole on the panel before installation, there are two diameters available: $\Phi 21\text{mm}$ (NA8-1600) and $\Phi 24\text{mm}$ (NA8-2500~7500), hole opener should be provided by user itself.



10.7 Button lock (PL)

A padlock is used to lock the mechanical breaking and closing buttons on the panel. After lockout, user will not be able to open or close the circuit breaker manually (padlock should be provided by user itself).



10.8 Padlock for drawer seat disconnect position

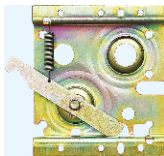
Use the padlock to lock the drawer seat and body at disconnect position, at this position, user cannot insert the drawer seat rotation handle into the hole to rotate and change the position of withdrawable circuit breaker body.

Padlock should be provided by user itself.

10.9 Padlock for drawer seat baffle

If a padlock is used, user ensure the body contact will not be connected with external live circuit when the circuit breaker body is at disconnect or test position.

Padlock should be provided by user itself.



10.10 Circuit breaker status door interlock

This interlock can prevent the cabinet from being opened when the circuit breaker is under closing status; the cabinet can only be opened when the circuit breaker is under opening status.



10.11 Circuit breaker position door interlock

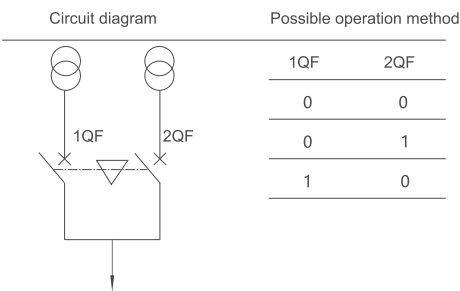
This interlock can prevent the cabinet from being opened when the circuit breaker is at connect or test position; the cabinet can only be opened when the circuit breaker is at disconnect position. This device is only applicable to withdrawable products.

10.12 Drawer seat position locking device

After using the rotate handle to rotate the circuit breaker body to disconnect, test or connect position, the device will automatically lockout the rotation mechanism of the drawer seat. User need to press the unlock button before rotating the circuit breaker body to next position.

10.13 Mechanical interlock ILK2 (steel cable double interlock)

For interlock of two horizontally or vertically installed 3 pole or 4 pole circuit breakers.

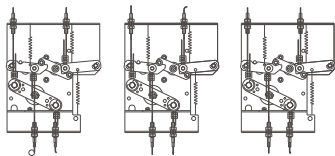


- Notes: a. If user needs to bend the steel cable, the transition arc at the bend must be larger than R120mm, to ensure the flexible movement of the cable.
b. Check the cable and make sure there is sufficient lubricant to guarantee the flexible movement of the cable.

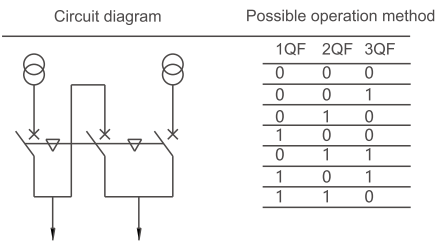
10.14 Mechanical interlock ILK3/4

For interlock of three horizontally or vertically installed 3 pole or 4 pole circuit breakers.

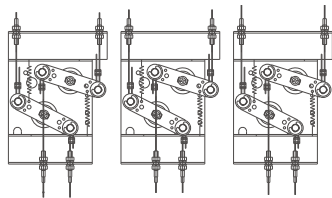
ILK-3 triple interlock diagram



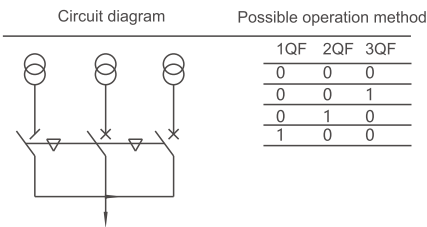
ILK-3 triple interlock circuit diagram



ILK-4 interlock diagram



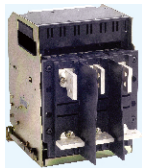
ILK-4 triple interlock circuit diagram



- Notes: a. If user needs to bend the steel cable, the transition arc at the bend must be larger than R120mm, to ensure the flexible movement of the cable.
b. Check the cable and make sure there is sufficient lubricant to guarantee the flexible movement of the cable.

10.15 Barrier

Installed between the phases of connector bar, to enhance the phase to phase insulation of circuit breaker.



10.16 Door frame and gasket

Installed on the cabinet door for sealing, with protection class of IP40.

11 Circuit breaker maintenance and repair

11.1 Notes for circuit breaker maintenance and repair

Complete the following procedures before maintaining and repairing circuit breaker:

- open the circuit breaker, make sure the circuit breaker is under opening status;
- disconnect the upstream disconnecter (if any), make sure the main circuit and secondary circuit are de-energized.
- release energy and opening circuit breaker, make sure the circuit breaker is free of energy and under opening status;
- all components and parts that may be touched by operator must be de-energized.



Caution

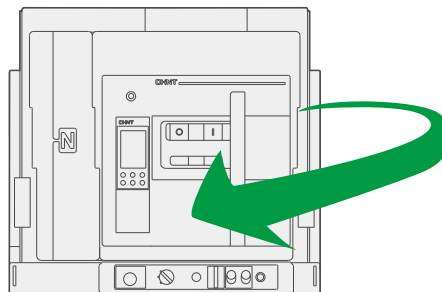
11.2 Maintenance and repair interval

Table 31 Circuit breaker maintenance and repair interval

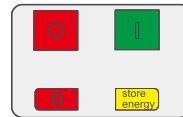
Conditions	Environment	Maintenance interval	Repair interval	Remarks
Normal conditions	Clean and dry air, no corrosive gas, with temperature between -5°C~+40°C, humidity comply with the requirements in 1.3 Operation condition c. extreme atmospheric conditions	Once half a year	Once a year (Once half a year after 3 years of installation)	Comply with IEC/EN 60947-2 General environmental condition requirements
Harsh conditions	Low temperature (-5°C~-40°C) or high temperature (40°C~65°C) or humidity≥90%	Once every 3 months	Once half a year (Once every 3 months after 3 years of installation)	
	With high content of dust and corrosive gas	Once a month	Once every 3 months	

11.3 Circuit breaker maintenance

- Clean the foreign matters (such as tools, wire head or debris, metal objects etc.) in the cabinet regularly
- Remove the dust on the circuit breaker regularly, ensure good insulation
- Check whether the connecting bolts, grounding bolts and washers of main circuit flat and secure
- Check if the opening and closing indicator is correct and reliable



Open and release energy



Open and store energy



Close and release energy



Close and store energy

11.4 Circuit breaker repair

Circuit breaker repair contents (note: take NA8-4000 as example)

1. Connection check

The recommended torques for main circuit and secondary circuit are listed as follows:

Table 32 Circuit breaker tightening torque

Fastener specification	Torque requirement N•m
M3	1.5 ~ 2.5
M4	2.5 ~ 3.6
M8	20 ~ 33
M10	38 ~ 55
M12	61 ~ 94

2. Insulation test

The insulation resistance between phases and between phase and earth should be $\geq 20\text{M}\Omega$;
An insulation resistance test must be conducted before repairing and recovering power after long period (≥ 7 days) of power-off.

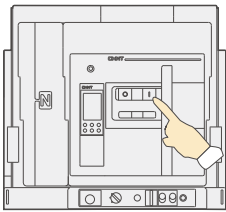
3. Operation check

Supply all the accessories with corresponding rated voltage according the nameplate and conduct the following operations:

Motor energy storage, opening and closing operations, conduct 5 cycles;

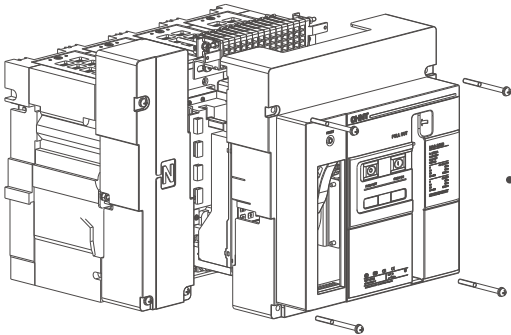
Manual energy storage, opening and closing operations, conduct 3 cycles;

The energy storage as well as opening and closing operations of circuit breaker should be normal. Note: main circuit must be de-energized, if an undervoltage release is used, you must supply with rated voltage first.



4. Circuit breaker component check

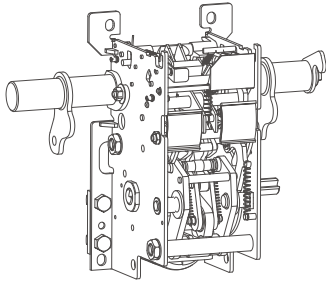
4.1 Remove Front cover



- Remove the four fixing bolts on circuit breaker panel, and take off the Front cover

4.2 Operation mechanism check

All the parts should be free of fracture or damage, secure and clean all the fasteners, evenly grease all the rotating parts





- Evenly apply 7012 low temperature grease or similar solid grease to lubricate all the rotating parts

4.3 Intelligent controller



Check display function



- Press "  /  " key, check whether the display and indicators can function normally

Parameter setup complies with on-site requirements



- Press "Setup" key, then press "  /  " key to select the parameter needs to be checked, check whether the parameter meets on-site test requirement
Requirement: the displayed parameter should comply with on-site requirements

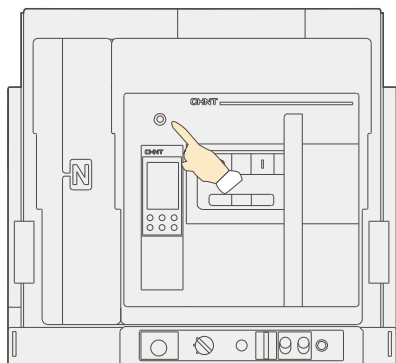
Analog test release function



- Use a small slot type screwdriver or other tools to poke the position given in the figure, the circuit breaker will release



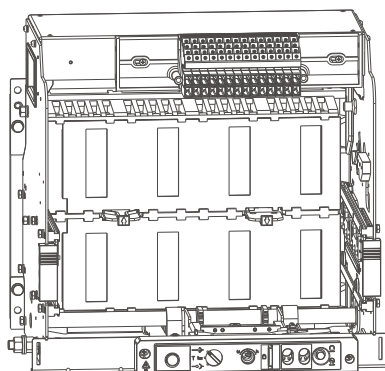
- Press "Return" key to exit the test



- Press the "Reset" key on the face shield to recover normal status

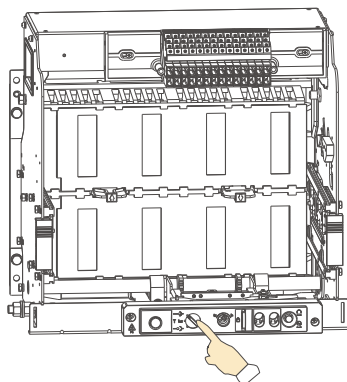
4.4 Drawer seat check (test after pulling out the body)

No foreign objects inside

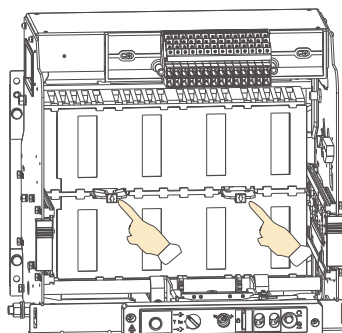


- Check whether there are foreign objects inside the drawer seat, such as screws, wire heads, iron scraps, etc. Remove any foreign objects found.

Flash barrier can open and close normally, isolation contacts are free of deformation and oxidation

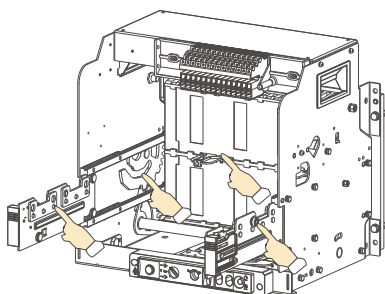


- Rotate to Disconnected position, the flash barrier should be able to open and close freely, as shown in figure on the left

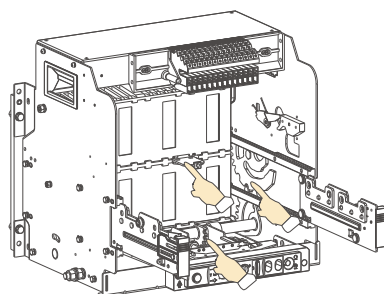


- Manually push the ejector rod in, the barrier should be able to open freely, as shown in figure on the left. After you release the ejector rod, the barrier should be able to close freely, check the bridge contacts of each phase are free of deformation, misalignment and oxidation. Replace the contact if any of these status is found.

Rotate the friction parts and apply grease evenly



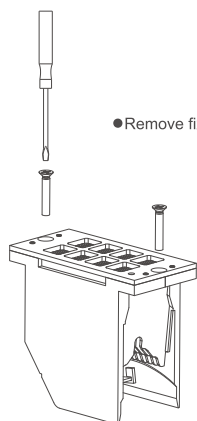
- Evenly apply 7012 low temperature grease or similar solid grease to lubricate the positions pointed out in the figure



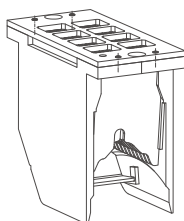
4.5 Arc extinguishing cover

All the grids and arc initiating pieces should be intact, the arc extinguishing cover should be free of damage, if there is any damage found, please replace the arc extinguishing cover and clean the dust, corrosion layer and arc discharge point timely, if there is serious corrosion, please replace in time.

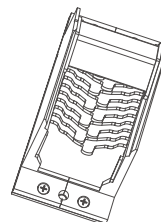
Note: must check after short circuit breaking



- Remove fixing bolts



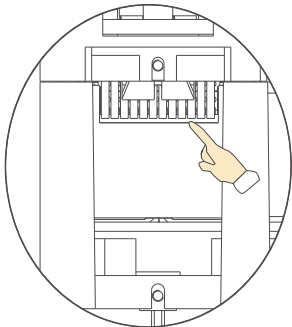
- Take out arc extinguishing cover



- Check the status inside

4.6 Main contact check

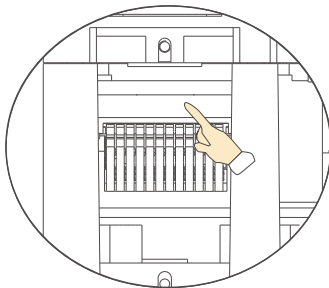
Over travel should be $\geq 2\text{mm}$



- Close the circuit breaker manually, observe the over travel of main contact

Note: replace the contact if it reaches the position pointed out in the figure

Clean dust, corrosion layer and burnt particles



- Open the circuit breaker, the main contact should be at the position point out in the figure, check if there is dust, burnt particles and oxidation layer on static and dynamic contacts. If any, please clean up in time.

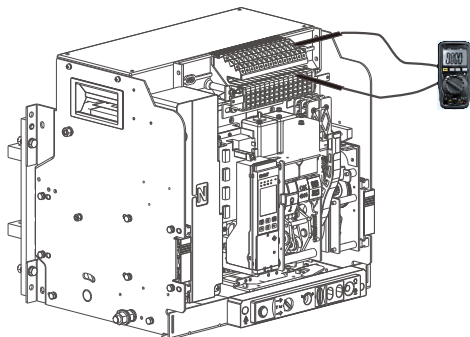
Note: must check after short circuit breaking

4.7 Second circuit check

Enclosure is free of damage

Use multimeter to check whether the contacts of secondary circuits of withdrawable body and drawer seat can function normally at "test" position and "connect" position.

Check whether the connection screws are secured and the conductor insulation is intact.

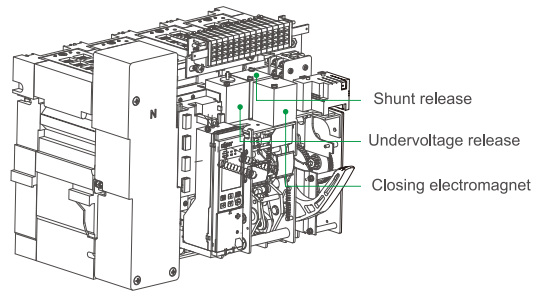


11.5 Circuit breaker accessory replacement

11.5.1 Replace undervoltage release, shunt release and closing electromagnet.

Conduct the following operations before replacing the any accessory.

Disconnect all power supplies, make sure none of the circuit breakers in main circuit and secondary circuit is under energy release and opening status.



11.5.2 Accessory replacement of fixed type circuit breaker

Remove the fixing bolts on the panel, take off the panel

Loosen the ties, remove the connection conductor

Remove the installation screws used to secure the accessories

Remove the accessories and replace them

11.5.3 Accessory replacement for withdrawable type circuit breaker

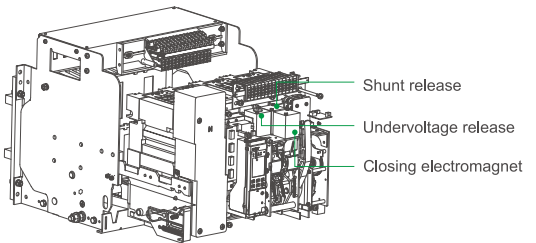
Rotate the body to disconnect position, take out the body

Remove the fixing bolts on the panel, take off the panel

Loosen the ties, remove the connection conductor

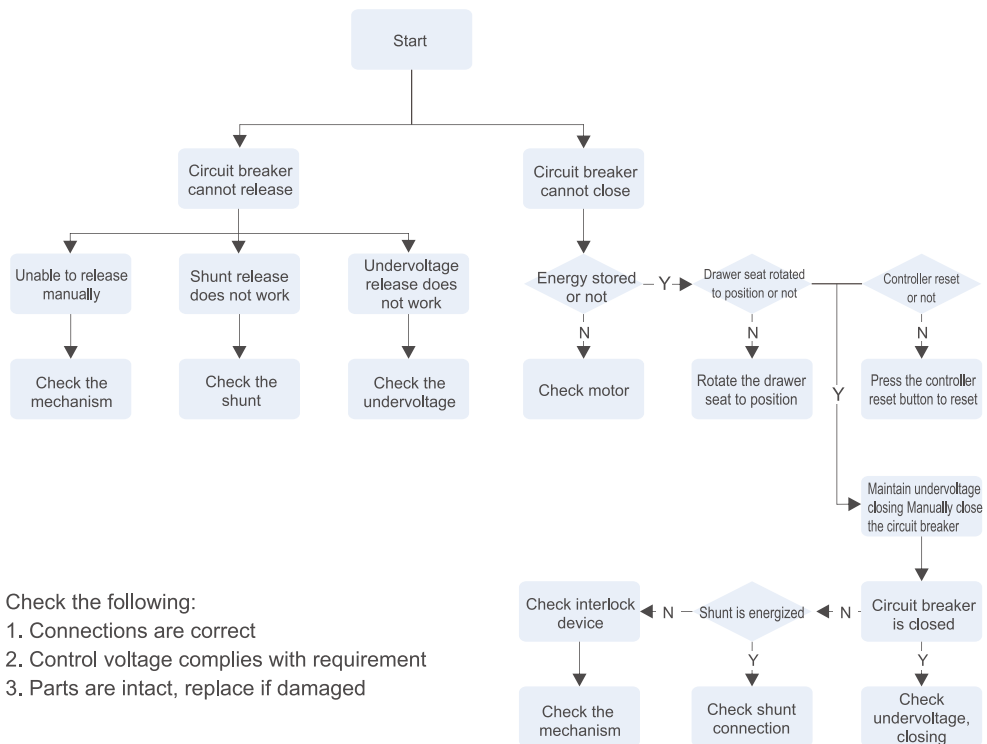
Remove the installation screws used to secure the accessories

Remove the accessories and replace them



12 Fault diagnosis and troubleshooting

12.1 Troubleshooting logic



12.2 Identify fault cause

Identify faults by intelligent controller instructions



●Press "Inquiry" key to enter main menu



●Press " ⚡ " key to identify fault



●Press "Return" key to exit

Note: do not close circuit breaker with power on before trouble shooting

12.3 Common fault causes and solutions

The table below provides the possible problems that may occur during circuit breaker installation, commissioning and operation, as well as the causes and solutions to these problems.

Table 33 Common fault causes and solutions

No.	Technical problem	Possible cause	
1	Circuit breaker tripping (fault indicator on)	Overload fault release (long time delay indicator on)	Inspection and troubleshooting 1 Check breaking current value and operation time of intelligent controller 2 Analyze load and grid operation 3 If overload is confirmed, conduct inspection and troubleshooting immediately 4 If the actual operation current does not match with long time delay operation current, please alter the set value of long time delay operation current based on the actual operation current to provide proper protection; 5 Press reset button to reclose the circuit breaker
		Short circuit fault release (short time delay or instantaneous indicator on)	1 Check breaking current value and operation time of intelligent controller 2 If short circuit is confirmed, conduct inspection and troubleshooting immediately 3 Check the set value of intelligent controller 4 Check whether the circuit breaker is intact, and confirm whether it can be closed; 5 Press reset button to reclose the circuit breaker

Table 33 (continue)

No.	Technical problem	Possible cause	
1	Circuit breaker tripping (fault indicator on)	Ground fault release (ground fault indicator on)	1 Check breaking current value and operation time of intelligent controller 2 If ground fault is confirmed, conduct inspection and troubleshooting immediately 3 If ground fault does not exist, check if the set value of ground fault current is correct and matches with actual phase to be protected; if the set value is incorrect, change it; 4 Press reset button to reclose the circuit breaker
2	Circuit breaker does not close	Undervoltage release tripping	1 Check if the supply voltage is under 70%U _e ; 2 Check if there is fault on undervoltage release and control unit
		Mechanical interlock operation	Check the status of the two circuit breakers installed with mechanical interlock
		Undervoltage release does not close	1 Check if the undervoltage release is energized; 2 Check if the supply voltage is under 85%U _e ; 3 Check if there is fault on undervoltage release and control unit Replace the undervoltage release if fault is identified.
		Reset button did not reset	Press the reset button to reclose the circuit breaker
		Withdrawable circuit breaker was not rotated to position	Rotate the withdrawable circuit breaker to position (lockout at connect position)
		Bad contact of circuit breaker secondary circuit	Check the contact of secondary circuit and solve the problem
		Circuit breaker does not store energy	1 Check if the motor control power is connected and $\geq 85\%U_s$; 2 Check if there is fault on the energy storage mechanism
3	Circuit breaker trips after closing	Immediate tripping	1 A short circuit current may exist during closing, check and solve the problem; 2 Check whether there is overload current and solve the problem; 3 Check whether the circuit breaker mechanism is intact; 4 Check whether the set value of intelligent controller is correct, reset the value if necessary; 5 Press the reset button to reclose the circuit breaker
		Delayed tripping	
4	Circuit breaker does not open	Does not open electrically Does not open manually	1 Check the connection of shunt release and whether there is a fault on shunt release, if a fault is identified, replace the shunt release; 2 Check the operation mechanism for any mechanical fault
5	Circuit breaker does not store energy	Does not store energy electrically	1 Check whether the supply voltage of the control power of motor energy storage device is $\geq 85\%U_s$, check the circuit; 2 Check the motor;
		Does not store energy manually	Energy storage mechanism fault.
6	Withdrawable circuit breaker can not pulled out at "Disconnected" position	The rotation handle is not pulled out; Circuit breaker did not fully reach "disconnect" position	Pull out the rotation handle Fully rotate the circuit breaker to "disconnect" position
7	Withdrawable circuit breaker cannot be rotated to "connected" position	The drawer is jammed by foreign object; the rotation mechanism or the gear of rotation mechanism is damaged; the position locking device is not unlocked	Check for foreign object and the status of gear. Turn the key on the drawer and unlock the device.
8	No display on intelligent controller	Intelligent controller is not energized; Incorrect voltage at input end of auxiliary power; Incorrect secondary output voltage of transformer; Poor connection between secondary output end of transformer and the controller;	1 Check the power connection of intelligent controller; 2 Disconnect the control power of intelligent controller, reconnect the power, if the fault still exists, it may be necessary to replace the intelligent controller.

13 Warranty

The warranty for this product is 12 months from the date of production if the normal storage and transportation conditions are observed and the package or the product itself is in good condition. The following circumstances are not covered by the warranty:

1. Damage due to user's improper use, storage and maintenance of the product.
2. Damage due to unauthorized disassembly, assembly and maintenance.
3. Warranty expires.
4. Damage due to force majeure

14 Model selection and ordering information

14.1 Circuit breaker configuration

Table 34 Circuit breaker standard configuration

Standard accessories	NA8-1600		NA8-2500		NA8-4000		NA8-7500
	Fixed	Withdrawable	Fixed	Withdrawable	Fixed	Withdrawable	Withdrawable
Circuit breaker body	■	■	■	■	■	■	■
Drawer seat		■		■		■	■
Intelligent controller	■	■	■	■	■	■	■
Top and bottom horizontal connection	■	■	■	■	■	■	■
Auxiliary contacts 4CO	■	■	■	■	■	■	■
Fault release indication contact	■	■	■	■	■	■	■
Motor operation mechanism	■	■	■	■	■	■	■
Closing electromagnet	■	■	■	■	■	■	■
Shunt release	■	■	■	■	■	■	■
Door frame	■	■	■	■	■	■	■

Table 35 Circuit breaker optional accessories

Standard accessories	NA8-1600		NA8-2500		NA8-4000		NA8-7500
	Fixed	Withdrawable	Fixed	Withdrawable	Fixed	Withdrawable	Withdrawable
Undervoltage instantaneous release	■	■	■	■	■	■	■
Relayed undervoltage release	■	■	■	■	■	■	■
Opening and closing button	■	■	■	■	■	■	■
Drawer position padlock		■		■		■	■
Drawer safety baffle padlock		■		■		■	■
Body key lock	■	■	■	■	■	■	■
Position door interlock		■		■		■	■
Status door interlock		■		■		■	■
Auxiliary contacts 6CO	■	■	■	■	■	■	■
Auxiliary contacts 3NO+3NC	■	■					
Auxiliary contacts 4NO+4NC			■	■	■	■	■
Auxiliary contacts 5NO+5NC			■	■	■	■	■
Drawer position indication contact		■		■		■	■
Mechanical interlock (2 sets)	■	■	■	■	■	■	■
External neutral line transformer	■	■	■	■	■	■	■
Earth current transformer and accessories	■	■	■	■	■	■	■
Interphase barrier	■	■	■	■	■	■	■
Mechanical interlock (3 sets)			■	■	■	■	■

14.2 Circuit breaker selection table

Table 36 Circuit breaker selection table

Frame size current	NA8-1600	NA8-2500	NA8-4000	NA8-7500	
Circuit breaker	N <input type="checkbox"/>	H <input type="checkbox"/>	H <input type="checkbox"/>	N <input type="checkbox"/>	H <input type="checkbox"/>
Rate current	200A <input type="checkbox"/>	630A <input type="checkbox"/>	1600A <input type="checkbox"/>	4000A <input type="checkbox"/>	4000A <input type="checkbox"/>
	400A <input type="checkbox"/>	800A <input type="checkbox"/>	2000A <input type="checkbox"/>	5000A <input type="checkbox"/>	5000A <input type="checkbox"/>
	630A <input type="checkbox"/>	1000A <input type="checkbox"/>	2500A <input type="checkbox"/>	6300A <input type="checkbox"/>	6300A <input type="checkbox"/>
	800A <input type="checkbox"/>	1250A <input type="checkbox"/>	3200 A <input type="checkbox"/>	7500A <input type="checkbox"/>	7500A <input type="checkbox"/>
	1000A <input type="checkbox"/>	1600A <input type="checkbox"/>	4000 A <input type="checkbox"/>		
	1250A <input type="checkbox"/>	2000A <input type="checkbox"/>			
	1600A <input type="checkbox"/>	2500A <input type="checkbox"/>			
Number of poles	3p <input type="checkbox"/>	4p <input type="checkbox"/>			
Installation method	Withdrawable <input type="checkbox"/>	Fixed <input type="checkbox"/> (not available for NA8-7500)			
Bus connection	Horizontal <input type="checkbox"/>	Vertical <input type="checkbox"/>	Mixed <input type="checkbox"/> (specify)		
Intelligent controller	M type <input type="checkbox"/> (basic) H type <input type="checkbox"/> (communication)				
Shunt, close, motor	Closing electromagnet <input type="checkbox"/>		Shunt release <input type="checkbox"/>	Energy storage motor <input type="checkbox"/>	
	AC220/230V <input type="checkbox"/>	AC380/400 V <input type="checkbox"/>	DC220V <input type="checkbox"/>	DC110V <input type="checkbox"/>	
Undervoltage release	UVT <input type="checkbox"/>		UVTD <input type="checkbox"/>		
	AC220/230V <input type="checkbox"/>		AC380/400V <input type="checkbox"/>		
Auxiliary contact	NA8-1600 C04 (standard) C 06 <input type="checkbox"/> (only for AC) N3 <input type="checkbox"/> (only for AC)				
	NA8-2500~7500 C04 (standard) C 06 <input type="checkbox"/> N4 <input type="checkbox"/> N5 <input type="checkbox"/>				
Auxiliary contact indicator(optional)	3 position signal device for drawer seat <input type="checkbox"/>				
Connection accessories (optional)	Interphase barrier <input type="checkbox"/>		NA8-1600 extended bus <input type="checkbox"/>		
Controller functions and accessories (optional)	External transformer: N phase external transformer <input type="checkbox"/> External LEC leakage transformer <input type="checkbox"/> Earth current protection transformer <input type="checkbox"/>				
	Controller function: 3P+N protection <input type="checkbox"/> Leakage protection <input type="checkbox"/> Earth current protection <input type="checkbox"/>				
	Voltage measurement and protection <input type="checkbox"/> Energy measurement and protection <input type="checkbox"/> Signal contact output <input type="checkbox"/>				
	ZSI zone selective interlock protection <input type="checkbox"/> Load monitoring <input type="checkbox"/>				
	Notes: 1) 3P+N protection requires N phase external transformer; 2) Leakage protection requires external LEC leakage transformer; 3) Earth current protection requires earth current protection transformer				
Locking mechanism (Optional)	Breaking and making button lock <input type="checkbox"/> 1 lock 1 key <input type="checkbox"/> 2 locks 1 key <input type="checkbox"/> 3 locks 2 keys <input type="checkbox"/>				
Mechanical interlock (Optional)	Steel cable interlock (dual interlock) <input type="checkbox"/> Steel cable interlock (MIT-3) <input type="checkbox"/> Steel cable interlock (MIT-4) <input type="checkbox"/>				
Module (Optional)	PSU-1 <input type="checkbox"/>	RU-1 <input type="checkbox"/>	ST-DP protocol conversion module <input type="checkbox"/>		

Notes: 1) specify frame size current, rated current and auxiliary control voltage when ordering

2) Please mark "☐" or "☒" in the "-" to select the option you need; if not marked, we will delivery with factory settings.

3) Extra charges are required for additional functions and special requirements. Telephone:

Fax: 0577-6287777-706288

Configuration

1. NA8-1600-7500 regular configuration

Shunt release, closing electromagnet, 4 groups of auxiliary changeover contacts, motor, M type intelligent controller, main circuit horizontal connection, door frame, main circuit installation bolts, circuit breaker manual, package box, drawer seat (withdrawable circuit breaker)

2. Optional configuration (extra charges)

NA8-1600 optional configuration: undervoltage instantaneous release, undervoltage delayed release, steel cable interlock, keylock, external transformer ground protection, 6 groups of auxiliary changeover contacts, 3 NO 3 NC contacts, H type intelligent controller, optional H type functions, interphase barrier, position signal.
NA8-2500-7500 optional configuration: undervoltage delayed release (1s-5s adjustable), steel cable interlock, button lock, keylock, door interlock, external transformer ground protection, vertical connection, 6 groups of auxiliary changeover contacts, 4 NO 4 NC contacts, 5 NO 5 NC contacts, H type intelligent controller, optional H type functions, position signal.