NA8G Air Circuit Breaker

1. General

1.1 Application scope

With rated current from 200A to 6300A, and rated service voltage of AC 415V or 690V, NA8G series air circuit breaker is mainly used in the distribution network with the circuit of AC 50HZ/60HZ to distribute electric energy and protect circuits and electric equipment against over-load, under-voltage,short- circuit, single-phase earthing fault.

Having art-oriented appearance, high breaking capacity, zero arcover and varities of intellectualized protection functions, the breaker can be used for selective protection with accurate action, no unnecessary power cut, and better power supply reliability.

That breaker can be widely used for power stations, factories, mines and modern tall buildings, especially the distribution system in the intelligent building, and also widely used in green projects such as wind and solar power generation.

1.2 Standard : IEC/EN 60947-2

2. Operating conditions

2.1 Temperature condition:
-5℃~40℃; the average value within 24h shall not exceed +35℃ (special situation excluded);
2.2 Altitude:≤2000m;
2.3 Pollution grade: Grade 3;
2.4 Air conditions:
At mounting site, relative humidity not exceed 50% at the max temperature of +40℃, higher relative humidity is allowable under lower temperature, RH could be 90% at +20℃, special measures should be taken to occurrence of dews;
2.5 Note: Without the intelligent controller, the breaker functions as a switch-disconnector.

2.6 Type designation

NA8 G - □-□□ / □-□-□-□-□

Voltage of secondary circuit
AC220V, AC380V,
AC230V, AC400V
DC220V, DC110V

Wiring of main circuit:
H:Horizontal wiring of main circuit
V:Vertical wiring of main circuit

Mode of installation:
F:Fixed type
D:Draweout type

Mode of operation:
M:Manual
P: Power-driven

No. of poles:
3:3-pole
4:4-pole

Intelligent controller:
M: Standard type
H: Multifunctional type

Rated current:

Frame size rated current	Rated current
1600A	200A
	400A
	630A
	800A
	1000A
	1250A
	1600A
3200A	1600A
	2000A
	2500A
	2900A
	3200A
4000A	1000A
	1250A
	1600A
	2000A
	2500A
	2900A
	3200A
	3600A
	4000A
6300A	4000A
	5000A
	6300A

Frame size rated current:
1600A, 3200A, 6300A, 4000A

Improved product code

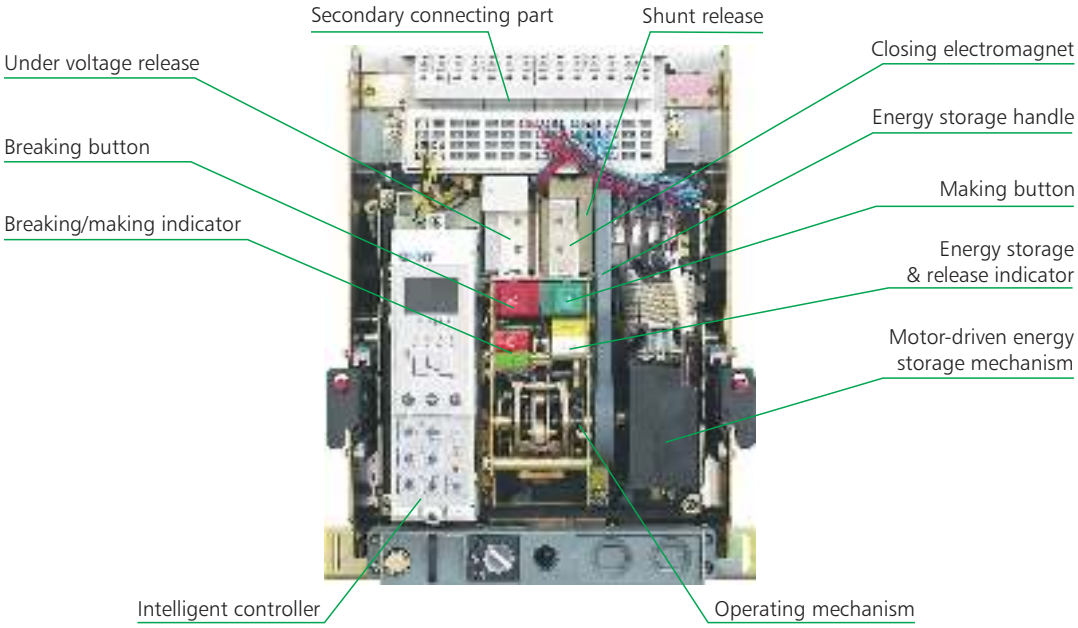
Design sequence number

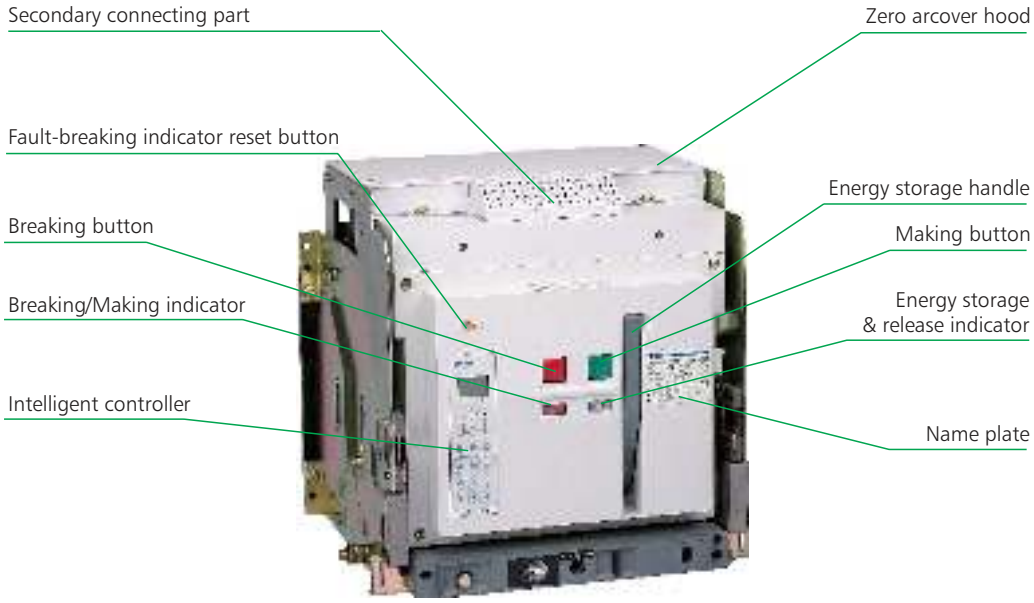
ACB

Company code

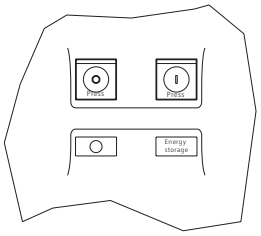
3. Product structure

Body structure

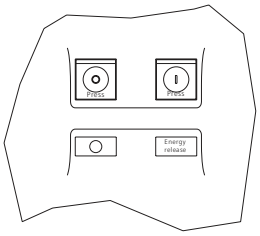




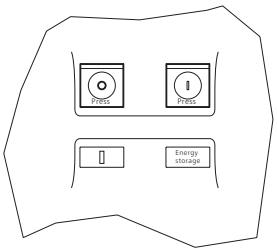
Breaker off and energy storage over



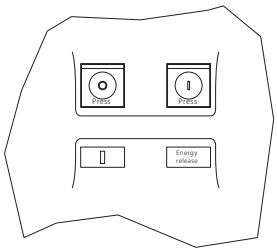
Breaker off and no energy storage



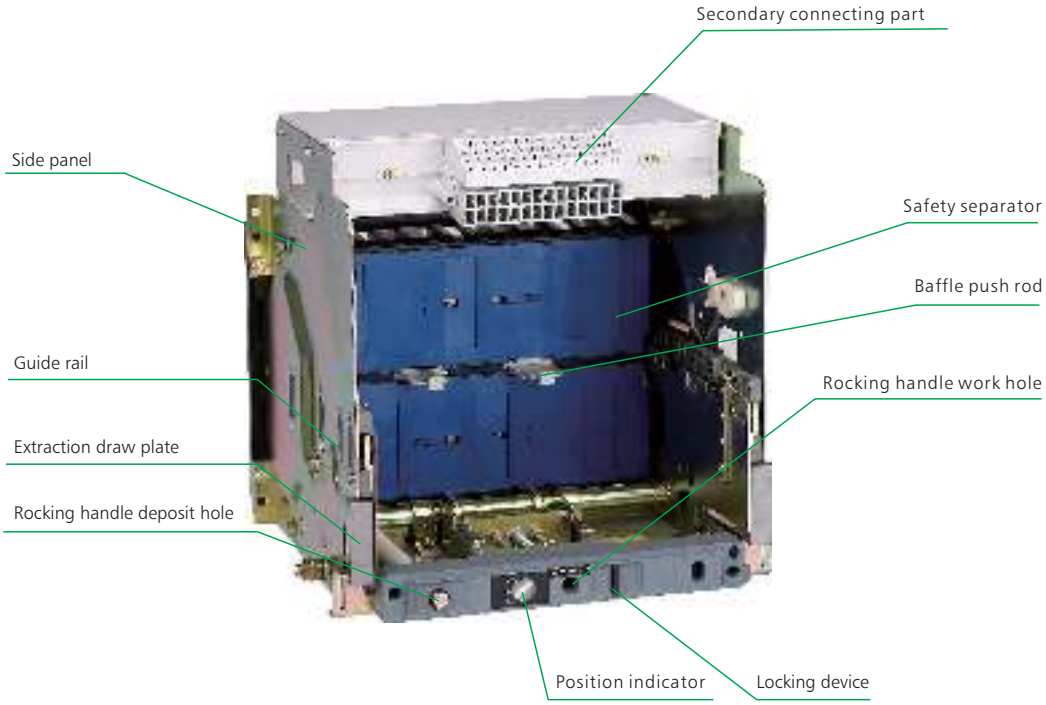
Breaker on and energy storage over

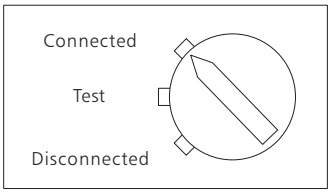


Breaker on and no energy storage

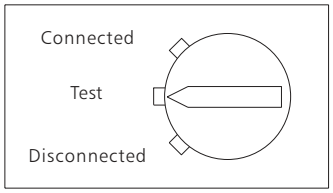


Drawout structure

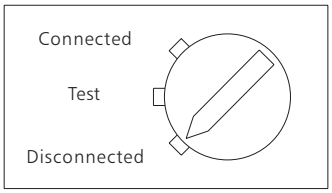




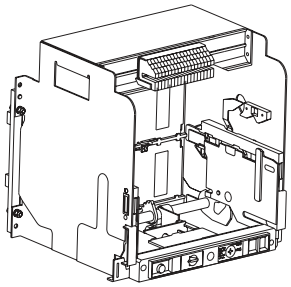
Connected: both main circuit and secondary circuit are connected



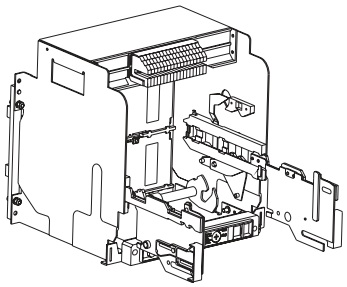
Test: the main circuit is disconnected,
the safety separator works well,
and the secondary circuit is connected.



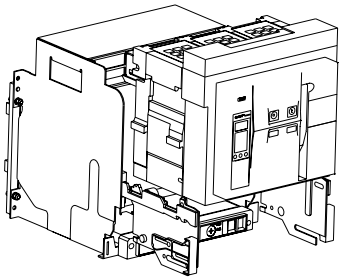
Disconnected: neither main circuit nor secondary circuit is connected



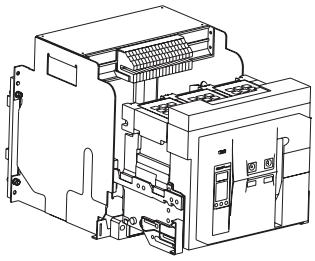
(1)Draw-out socket placed horizontally



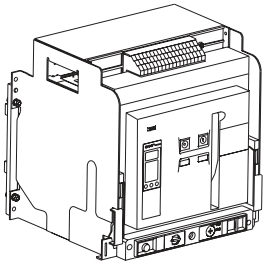
(2)Pull out the guide rail



(3)Place the breaker body on the guide rail



(4)Move the breaker body onto the guide rail with a snap



(5)Push the breaker body in, and turn the break body to the connected position

4. Main technical parameters

4.1 Main technical parameters

Shell grade rated current Inm (A)		1600	3200	4000	6300	
Rated current In (A)		200,400,630,800, 1000,1250,1600	1600,2000,2500, 2900,3200	1000,1250,1600,2000, 2500,2900,3200,3600,4000	4000,5000	6300
Nominal insulation voltage Ui (V)		690	1000	1000	1000	
Rated operational voltage Ue (V)		415 690	415 690	415 690	415	
Rated ultimate short circuit breaking capacity Icu (kA)		50 25	100 65	100 65	120	
Rated service short circuit breaking capacity Ics (kA)		40 20	80 65	100 65	100	
Rated short time withstand current Icw, 1s (kA)		40 20	80 65	85 65	100	
Number of poles		3P 4P	3P 4P	3P 4P	3P 4P	3P
Frequency of operation (number of times/hour)		20	10	10	10	
Number of operations	Mechanical life	3000	3000	3000	2000	
	Electrical Life	1000	1000	1000	500	
Flashover distance mm		0	0	0	0	
Wire incoming pattern		Wire to enter from the upper or lower port	Wire to enter from the upper or lower port	Wire to enter from the upper or lower port	Wire to enter from the upper or lower port	
Net weight (3 poles/4 poles)	fixed type (kg)	22/26.5	52.5/66.5	58/75	-	
	draw-out type (kg)	42.5/55	98/121	110/145	210/233	233
Size(3 poles/4 poles) Height × width × depth	fixed type	320×(254/324)×258	406×(422/537)×329	402×(432.5/547.5)×330	-	
	draw-out type	351×(282/352)×352	439.5×(435/550)×445	439.5×(435/550)×445	439×(813/928)×501	439×928×501

4.2 Capacity-reducing usage

4.2.1 Capacity-reducing at different temperatures

The following table shows the continual current-loading capacity of the circuit breakers and buses in each wiring mode at the corresponding ambient environment temperatures and under the conditions of the satisfaction of conventional heating with a similarity in capacity reducing between the breaker connected in a mixed way and the breaker connected horizontally.

Style wiring mode ambient temperature℃	Draw-out type									
	Front/rear horizontal wiring mode					Rear vertical wiring mode				
	-5~40	45	50	55	60	-5~40	45	50	55	60
1600	200	200	200	200	200	200	200	200	200	200
	400	400	400	400	400	400	400	400	400	400
	630	630	630	630	550	630	630	630	630	580
	800	800	800	800	700	800	800	800	800	700
	1000	1000	1000	950	900	1000	1000	1000	950	900
	1250	1250	1250	1150	1050	1250	1250	1250	1200	1100
	1600	1550	1500	1450	1350	1600	1600	1550	1500	1450
3200	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
	2000	2000	2000	2000	1900	2000	2000	2000	2000	1950
	2500	2500	2500	2450	2350	2500	2500	2500	2500	2400
	2900	2900	2900	2800	2700	2900	2900	2900	2900	2800
	3200	3200	3100	3000	2900	3200	3200	3200	3050	2900
4000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250
	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
	2000	2000	2000	2000	1900	2000	2000	2000	2000	1950
	2500	2500	2500	2450	2350	2500	2500	2500	2500	2400
	2900	2900	2900	2800	2700	2900	2900	2900	2900	2800
	3200	3200	3100	3000	2900	3200	3200	3200	3050	2900
	3600	3600	3400	3200	3000	3600	3600	3400	3200	3000
	4000	3800	3600	3400	3200	4000	3800	3600	3400	3200
6300	4000	4000	4000	3900	3800	4000	4000	4000	3900	3800
	5000	5000	4700	4600	4400	5000	5000	4800	4650	4500
	6300	6100	6000	5500	5200	6300	6100	6000	5500	5200

4.2.2 Capacity-reducing at different altitudes

When the altitude is higher than 2000m, there will appear changes in insulation property, cooling performance, pressure, and the performance can be modified in reference to the following table.

Altitude(m)	2000	3000	4000	5000
Insulation withstand voltage(V)	3500	3000	2500	2000
Insulation voltage(V)	1000	800	700	600
Rated operational voltage(V)	690	580	500	400
Rated operational current(A)	1×In	0.96×In	0.92×In-	0.87×In

4.3 Power loss

Power loss is the loss at each pole which is measured when the breaker is charged with the rated current.

Power loss			
Breaker type	**Rated current**	**Draw-out type**	**Fixed type**
NA8G-1600	200	115	45
	400	140	80
	630	161	100
	800	215	110
	1000	230	120
	1250	250	130
	1600	460	220
NA8G-3200	1600	390	170
	2000	470	250
	2500	600	260
	2900	600	260
	3200	670	420
NA8G-4000	1000	152	66
	1250	238	104
	1600	390	170
	2000	470	250
	2500	600	260
	2900	600	260
	3200	670	420
	3600	848	532
	4000	1047	656
NA8G-6300	4000	550	-
	5000	590	-
	6300	950	-

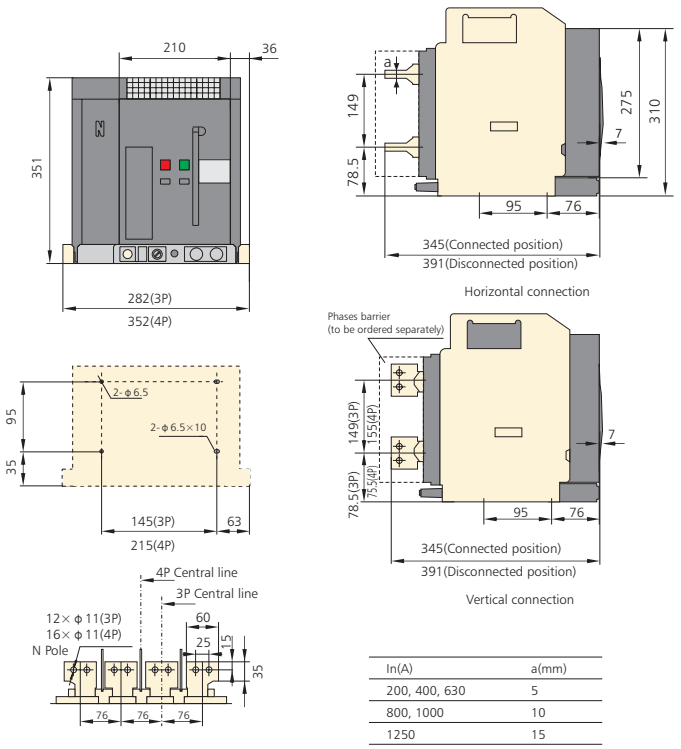
Note: The data and parameters in the above technical documentation results from tests and theoretical calculation, and can only be used as a general type selection guide.They cannot replace industrial practical experience or proof test.

5.4 Recommended bus for the breaker and recommendation for users to install the buses

Inm(A)	**NA8G-1600**								**NA8G-3200**					**NA8G-4000**									**NA8G-6300**		
In(A)		200	400	630	800	1000	1250	1600	1600	2000	2500	2900	3200	1000	1250	1600	2000	2500	2900	3200	3600	4000	4000	5000	6300
Busbar	Thickness(mm)	5	5	5	5	5	8	10	6	6	5	10	10	5	8	8	8	6	10	10	10	10	10	10	10
	Width(mm)	20	50	40	50	60	60	60	100	100	100	100	100	60	60	80	80	80	100	100	100	100	100	100	100
	Number of buses	1	1	2	2	2	2	2	2	3	4	3	4	2	2	2	3	4	3	4	5	5	5	7	8

5. Dimensions and connection

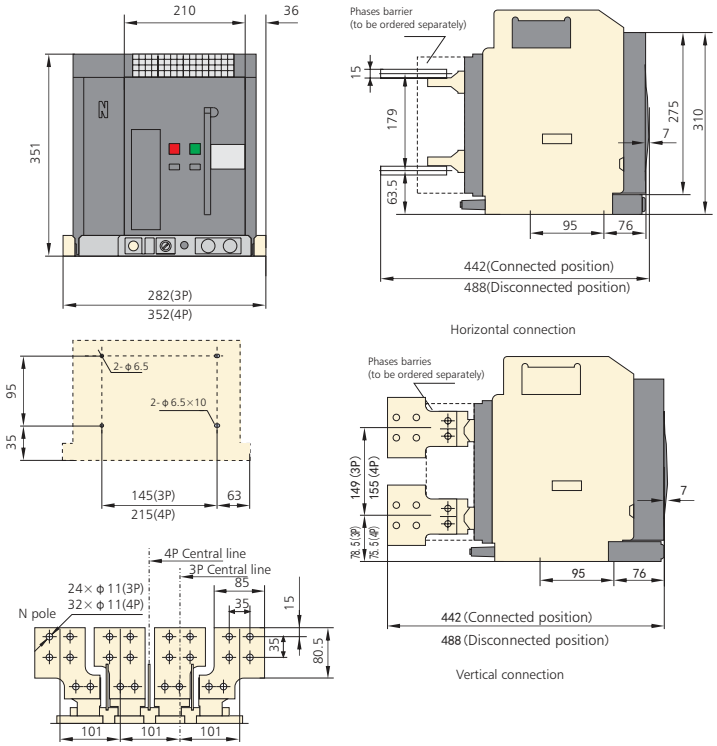
NA8G-1600 (In=200A ~1250A) Draw-out type
(Only horizontal connection is provided by the factory, vertical one has to be made by users themselves).



In(A)	a(mm)
200, 400, 630	5
800, 1000	10
1250	15

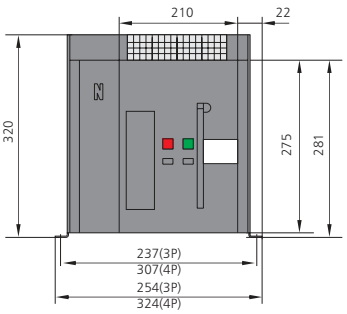
Note: If users intend to change the horizontal connection into vertical connection, they need to replace the upper and lower busbars on both sides with the same one as the central busbar.

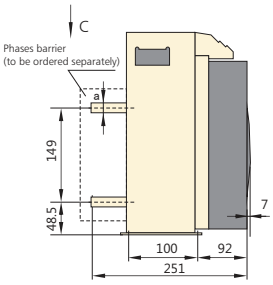
NA8G-1600 (In=1600A) Draw-out type
(Only horizontal connection is provided by the factory, vertical one has to be made by users themselves).



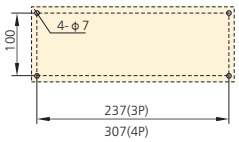
Note: If users intend to change the horizontal connection into vertical connection, they need to replace the upper and lower busbars on both sides with the same one as the central busbar.

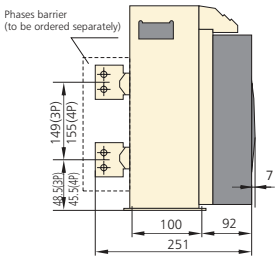
NA8G-1600 (200A~1250A) Fixed type
(Only horizontal connection is provided by the factory, vertical one to has be made by users themselves).



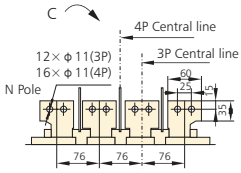


Horizontal connection





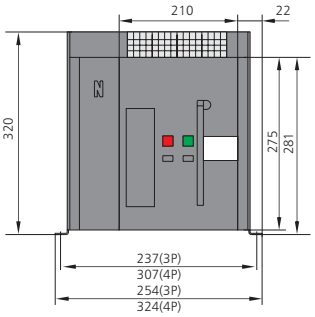
Vertical connection

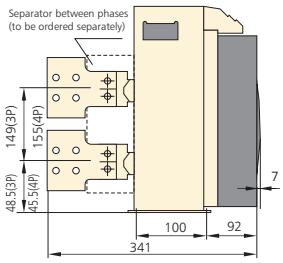


In(A)	a(mm)
200, 400, 630	5
800, 1000	10
1250	15

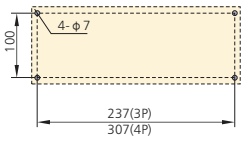
Note: If users intend to change the horizontal connection into vertical connection, they need to replace the upper and lower busbars on both sides with the same one as the central busbar.

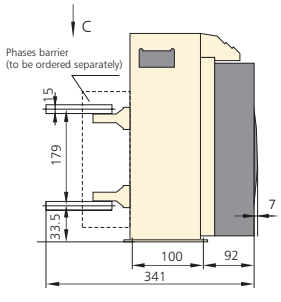
NA8G-1600 (In=1600A) Fixed type
(Only horizontal connection is provided by the factory, vertical one has to be made by users themselves).

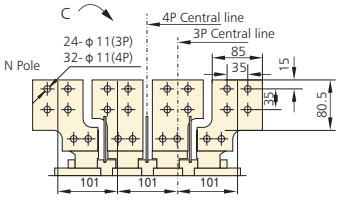




Vertical connection



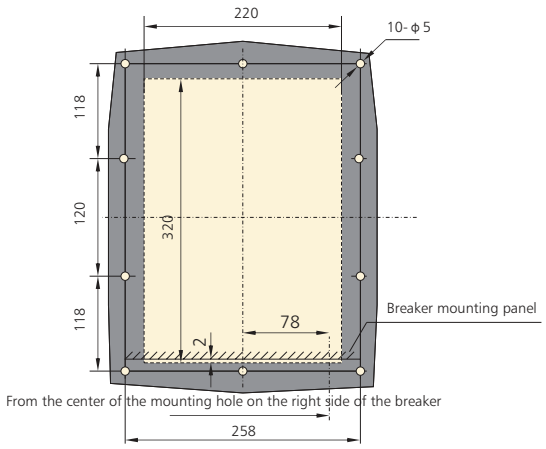




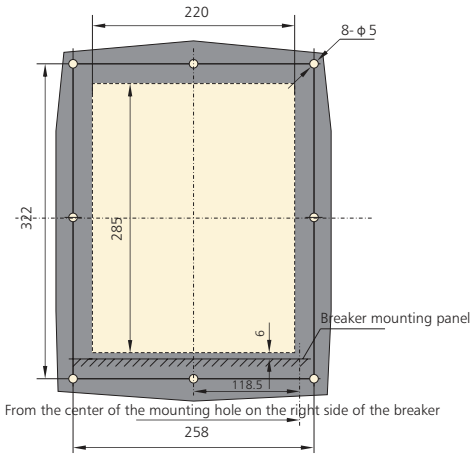
Horizontal connection

Note: If users intend to change the horizontal connection into vertical connection, they need to replace the upper and lower busbars on both sides with the same one as the central busbar.

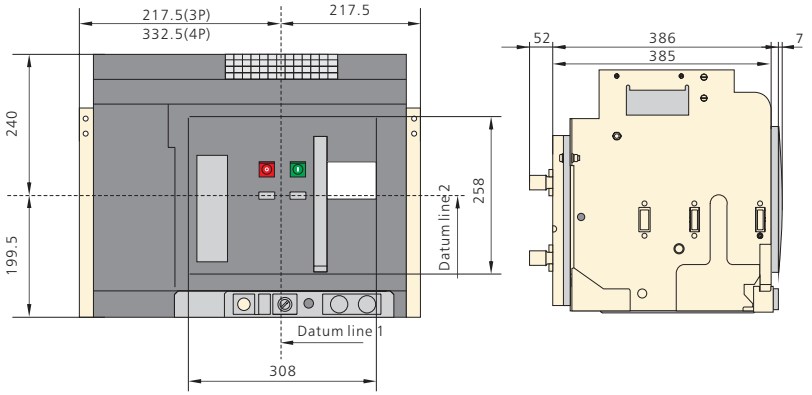
NA8G-1600 Draw-out type
Size of the hole to be drilled on the panel

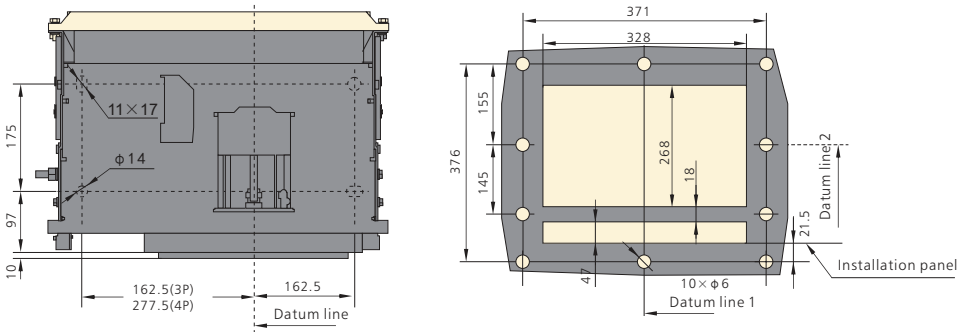


NA8G-1600 Fixed type
Size of the hole to be drilled on the panel



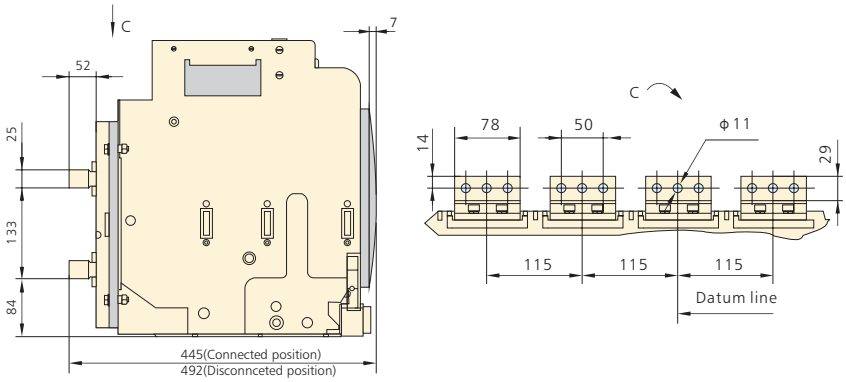
NA8G-3200 Draw-out type
Size of the hole to be drilled on the panel





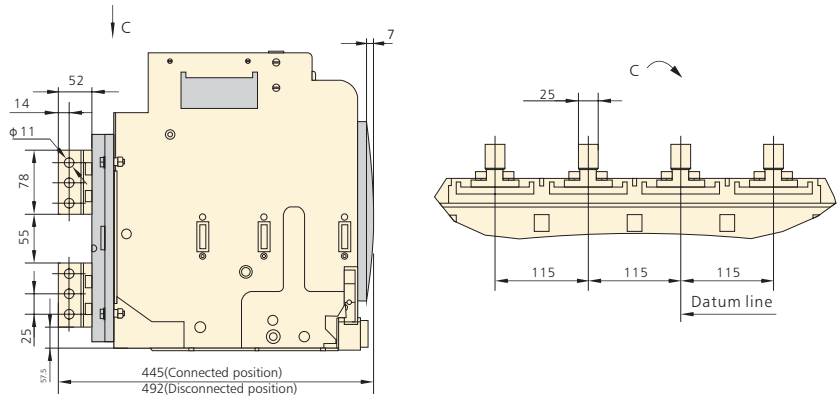
Size of the hole to be drilled on the panel

NA8G-3200(In=1600A~2500A) Draw-out type
(Only horizontal connection is provided by the factory).



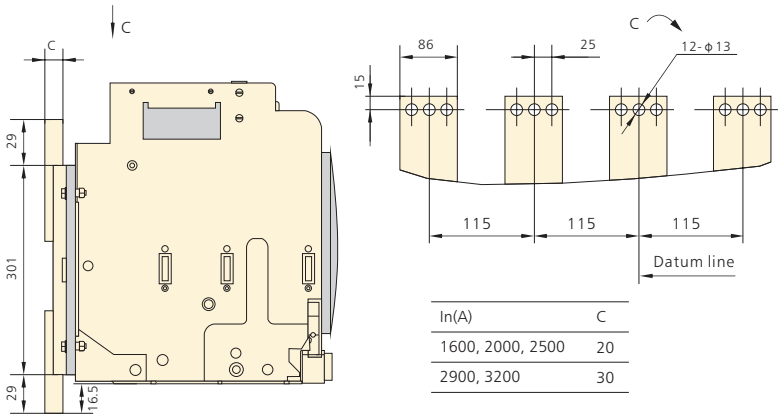
Note: If users want to change the horizontal connection into vertical connection, they only have to turn the busbar by 90°

NA8G-3200(In=1600A~2500A) Draw-out type
(Vertical connection has to be made by users themselves).



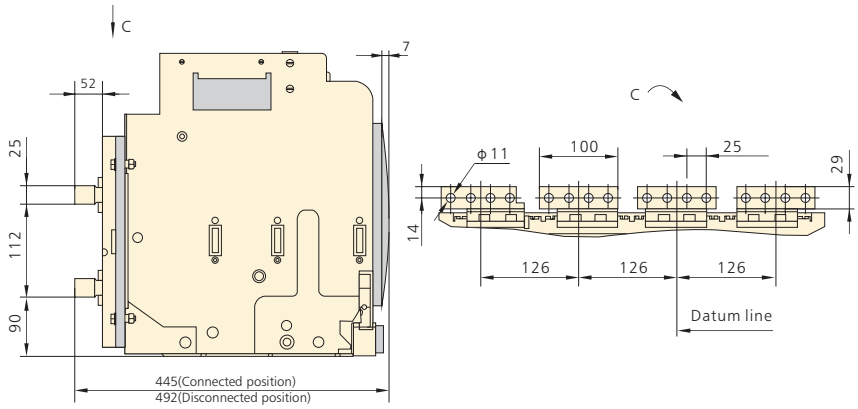
Note: If users want to change the vertical connection into horizontal connection, they only have to turn the busbar by 90°

NA8G-3200 Draw-out type; Front connection

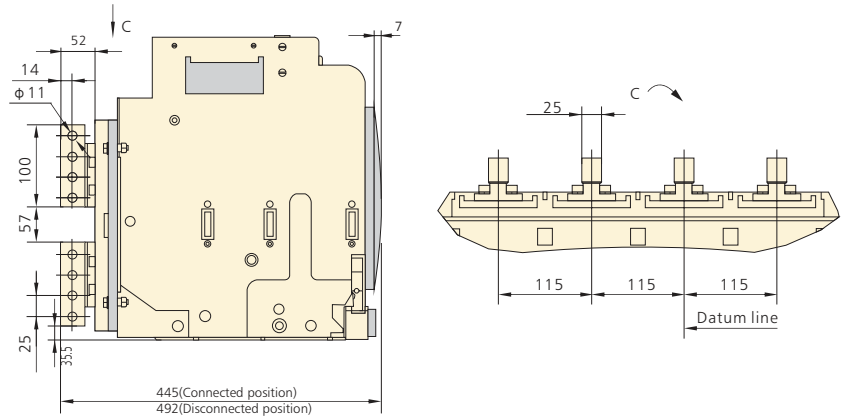


In(A)	C
1600, 2000, 2500	20
2900, 3200	30

NA8G-3200(In=2900, 3200A) Draw-out type (Only horizontal connection is provided by the factory)

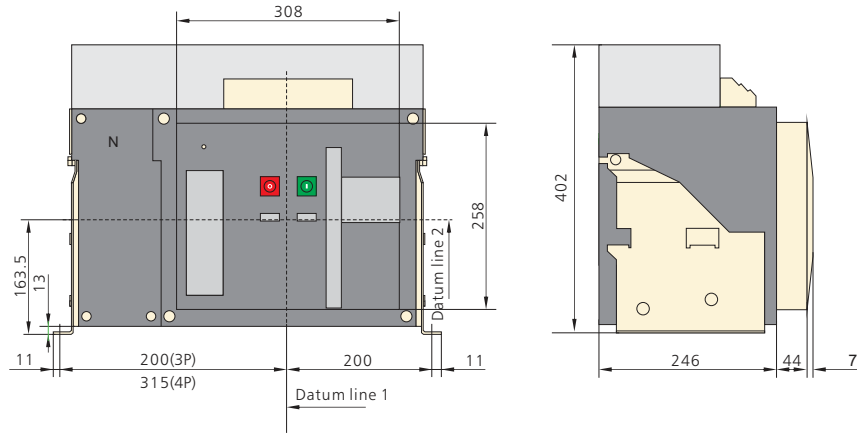


NA8G-3200(In=2900, 3200A) Draw-out type (Vertical connection has to be made by users themselves)

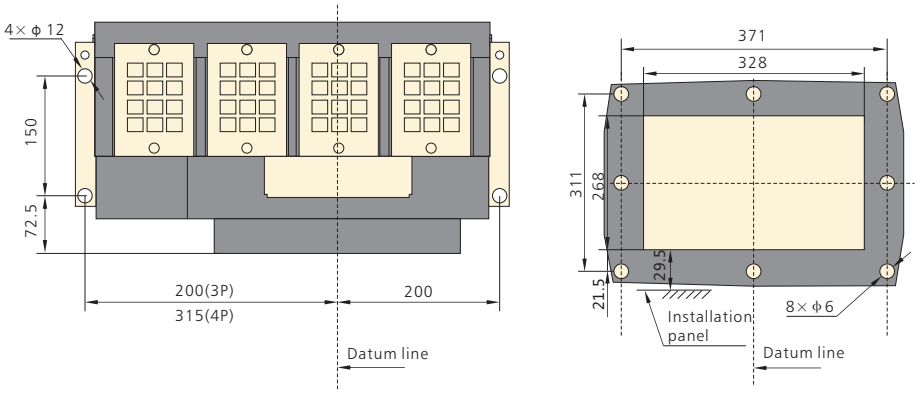


Note: If users want to change the horizontal connection into vertical connection,
it is necessary to replace the upper and lower busbars for the N and B phases with the same one as the A and C phases.

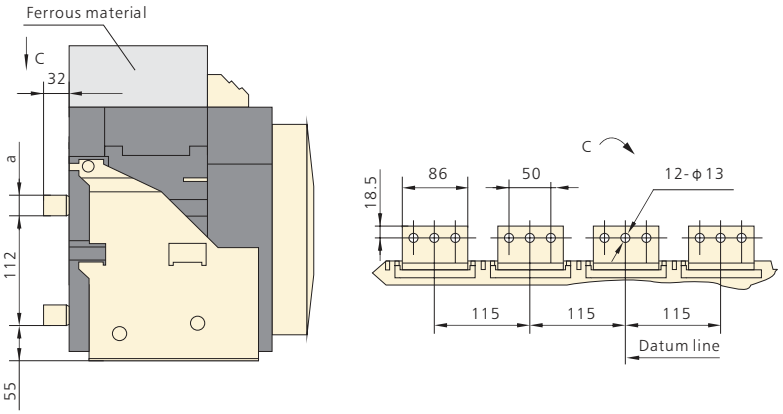
NA8G-3200 Fixed type



NA8G-3200 Fixed type, size of the hole to be drilled on the panel



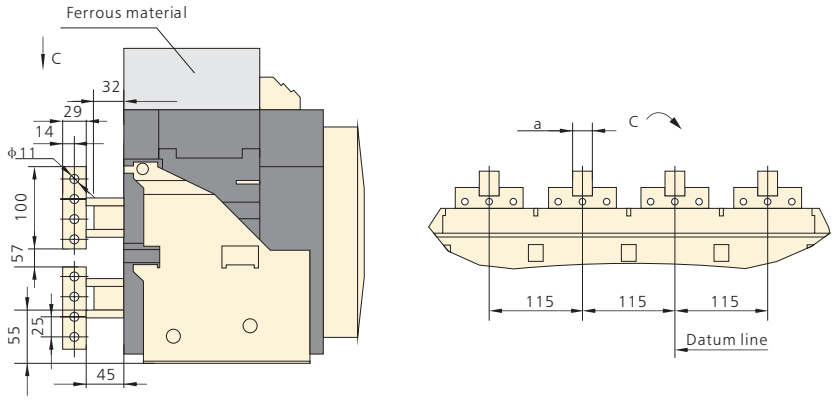
NA8G-3200 Fixed type (Only horizontal connection is provided by the factory)



In(A)	a(mm)
1600~2500	20
2900~3200	30

Note: If users want to change the horizontal connection into vertical connection, they only have to additionally install vertical busbars.

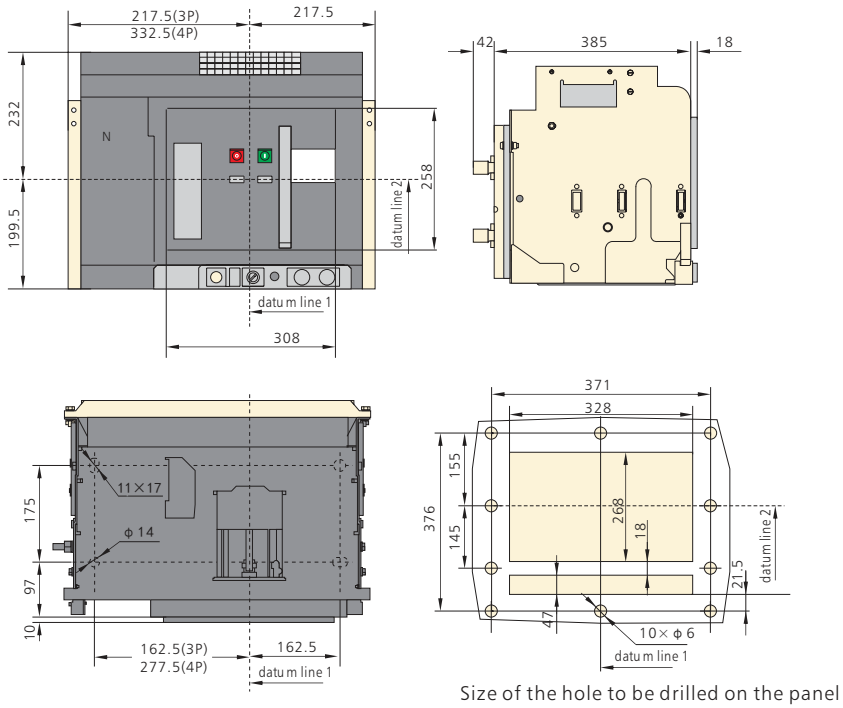
NA8G-3200 Fixed type (Vertical connection has to be made by users themselves)



In(A)	a(mm)
1600~2500	20
2900~3200	30

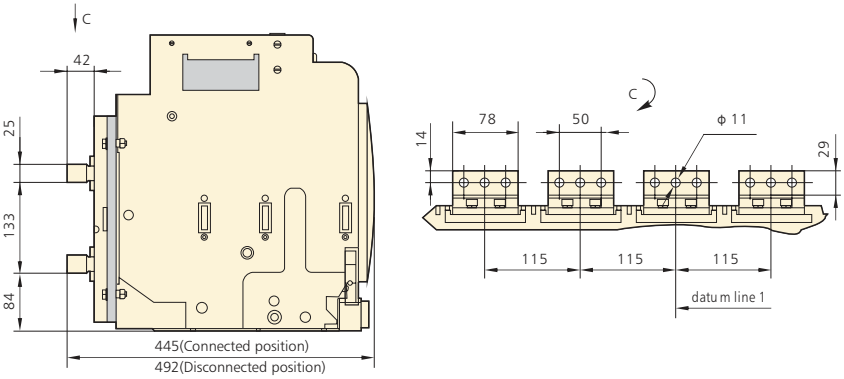
Note: If users want to change the horizontal connection into vertical connection, they only have to additionally install vertical busbars.

NA8G-4000 Draw-out type, size of the hole to be drilled on the panel



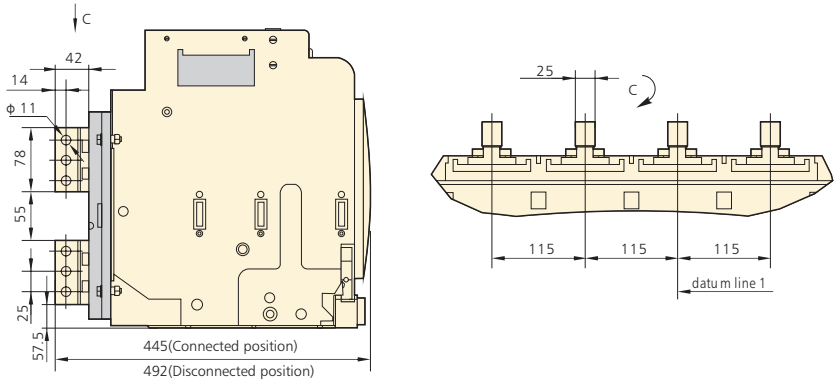
Size of the hole to be drilled on the panel

NA8G-4000(In=1000A~2500A) Draw-out type (only horizontal connection is provided by the factory)



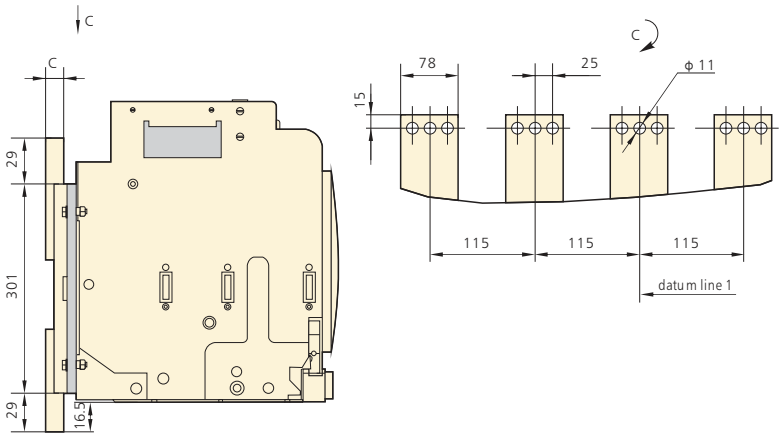
Note: If users want to change the horizontal connection into vertical connection,they only have to rotate the busbars by 90°

NA8G-4000(In=1000A~2500A) Draw-out type (vertical connection has to be made by users themselves)



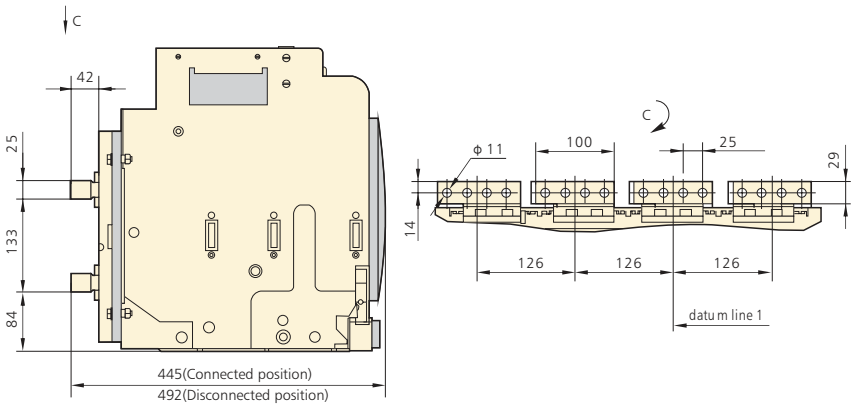
Note: If users want to change the horizontal connection into vertical connection,they only have to rotate the busbars by 90°

NA8G-4000 Draw-out type, size of the hole to be drilled on the panel



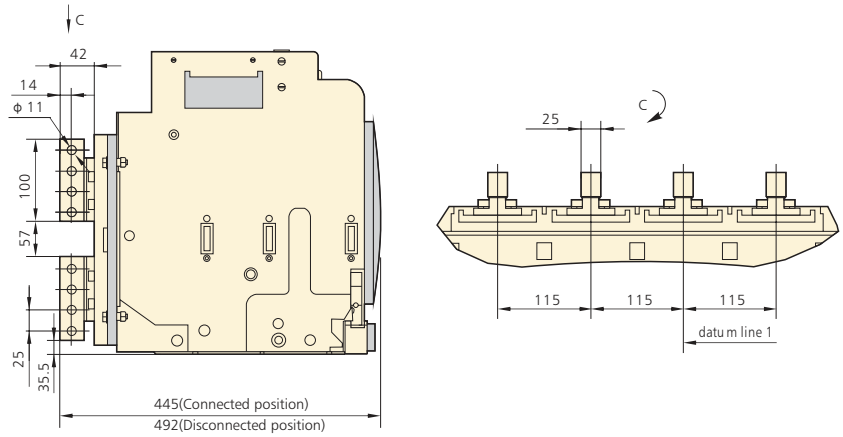
In(A)	C
1000～2000	20
2500	25
2900～4000	30

NA8G-4000(In=2900A～4000A) Draw-out type (only horizontal connection is provided by the factory)



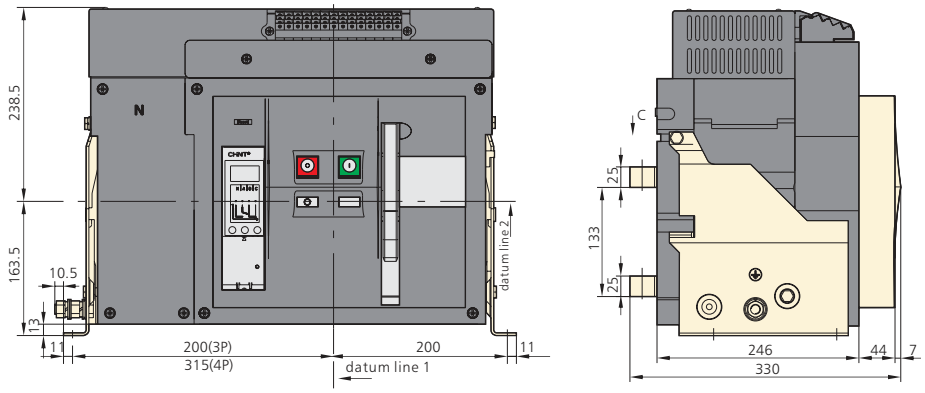
Note: If users want to change the horizontal connection into vertical connection,they only have to change the busbar of N、B phases to A、C phases

NA8G-4000(In=2900A～4000A) Draw-out type (vertical connection has to be made by users themselves)

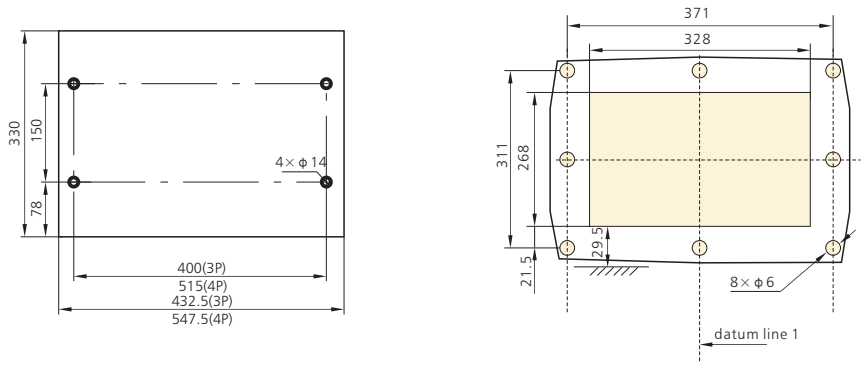


Note: If users want to change the horizontal connection into vertical connection,they only have to change the busbar of N、B phases to A、C phases

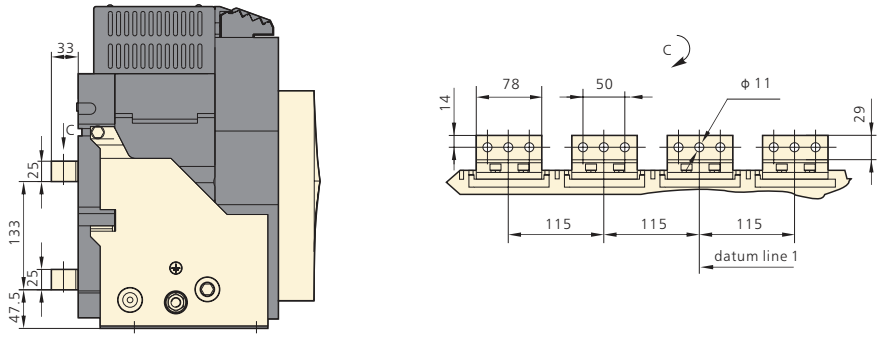
NA8G-4000 Fixed type , outline dimension



NA8G-4000 Fixed type ,size of the hole to be drilled on the panel

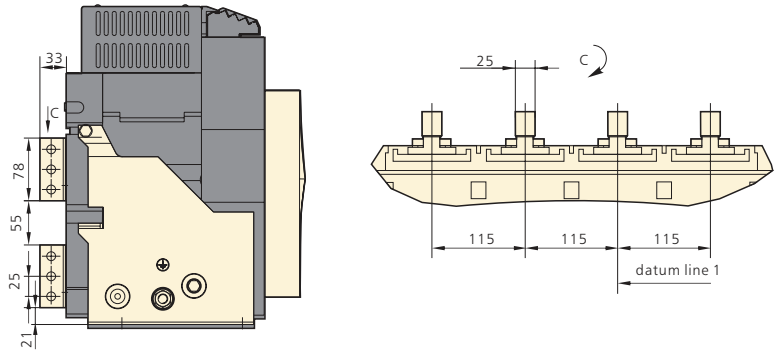


NA8G-4000(In=1000A~2500A) Fixed type (only horizontal connection is provided by the factory)



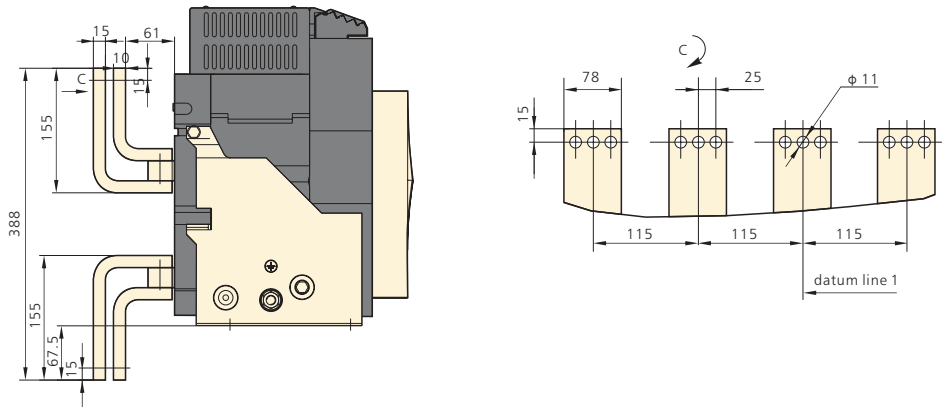
Note: If users want to change the horizontal connection into vertical connection,they only have to rotate the busbars by 90°

NA8G-4000(In=1000A~2500A) Fixed type (vertical connection has to be made by users themselves)

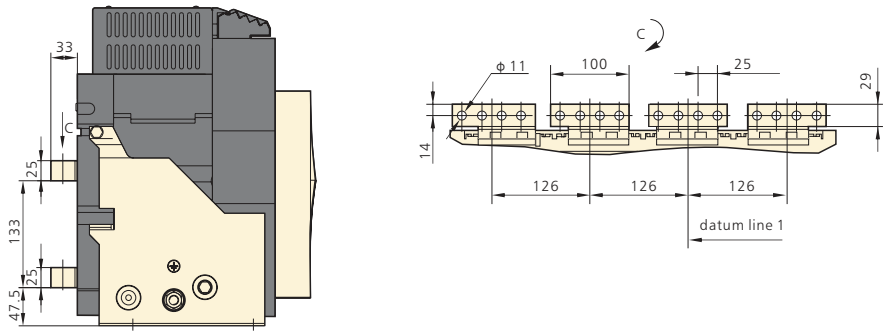


Note: If users want to change the horizontal connection into vertical connection,they only have to rotate the busbars by 90°

NA8G-4000 Fixed type , outline dimension(Front connection)

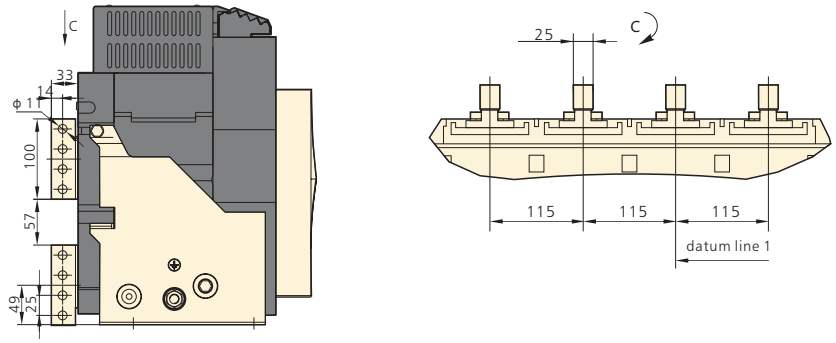


NA8G-4000(In=2900A~4000A) Fixed type (only horizontal connection is provided by the factory)



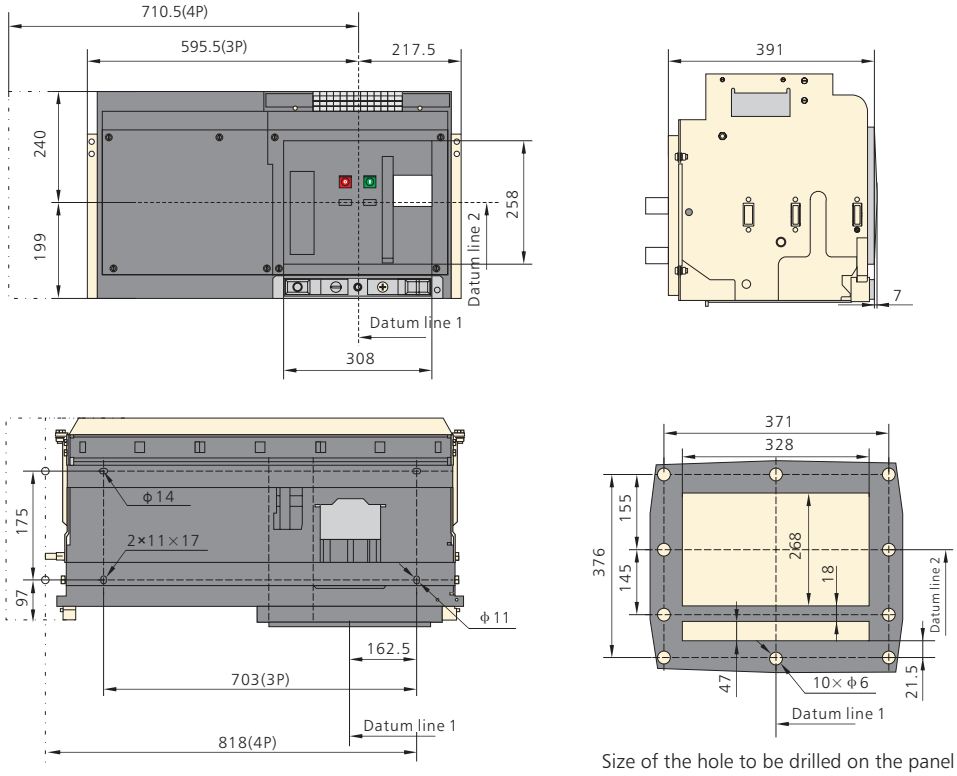
Note: If users want to change the horizontal connection into vertical connection,they only have to change the busbar of N、B phases to A、C phases

NA8G-4000(In=2900A~4000A) Fixed type (vertical connection has to be made by users themselves)



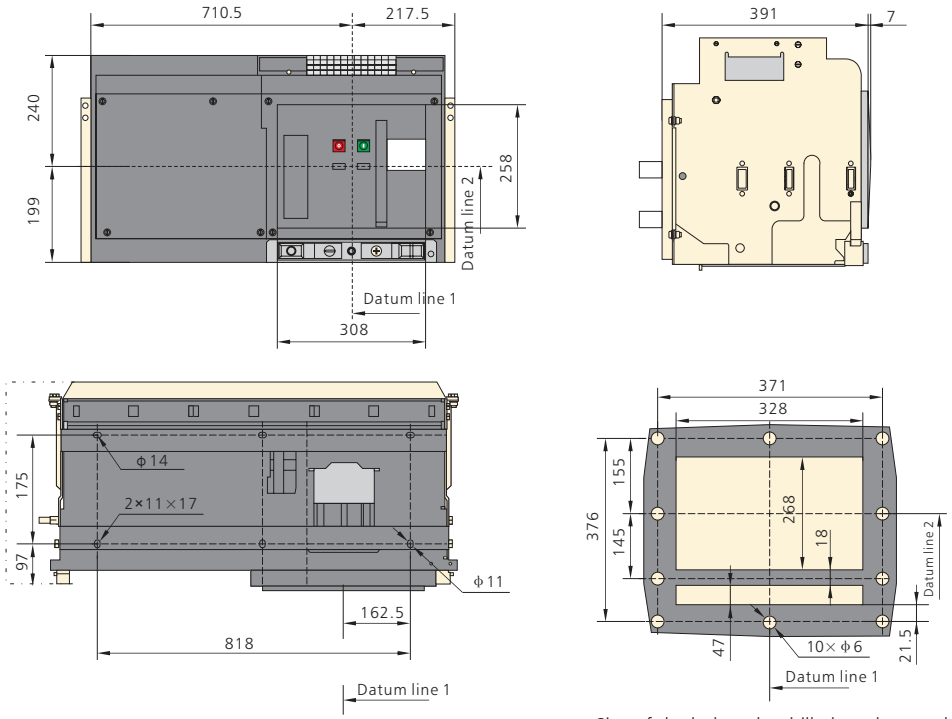
Note: If users want to change the horizontal connection into vertical connection,they only have to change the busbar of N、B phases to A、C phases

NA8G-6300 In=(4000A~5000A) Draw-out type
Size of the hole to be drilled on the panel



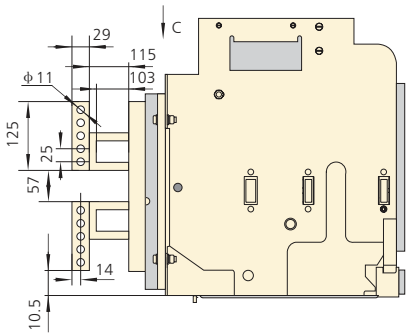
Size of the hole to be drilled on the panel

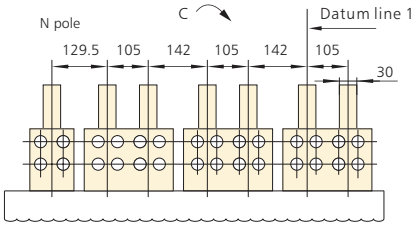
NA8G-6300 In=(6300A) Draw-out type
Size of the hole to be drilled on the panel



Size of the hole to be drilled on the panel

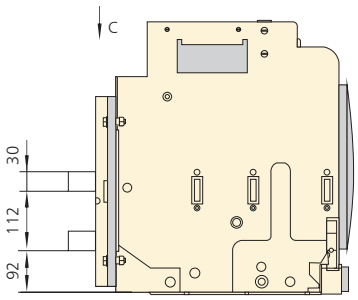
NA8G-6300(In=4000A~5000A) Draw-out type
(Vertical connection has to be made by users themselves)

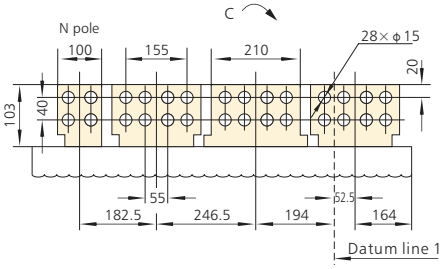




Note: If users want to change the horizontal connection into vertical connection,
they only have to additionally install vertical busbars.

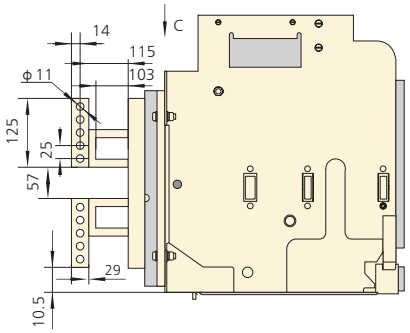
NA8G-6300(In=4000A~5000A) Draw-out type
(Only horizontal connection is provided by the factory)

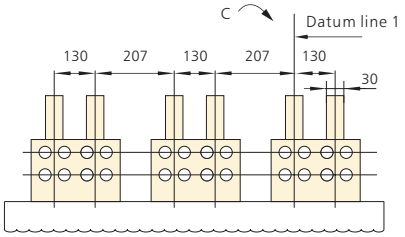




Note: If users want to change the horizontal connection into vertical connection,
they only have to additionally install vertical busbars.

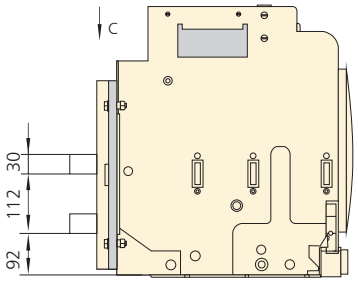
NA8G-6300(In=6300A) Draw-out type
(Vertical connection has to be made by users themselves)

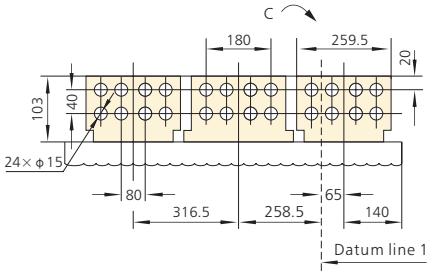




Note: If users want to change the horizontal connection into vertical connection,
they only have to additionally install vertical busbars.

NA8G-6300(In=6300A) Draw-out type
Only horizontal connection is provided by the factory

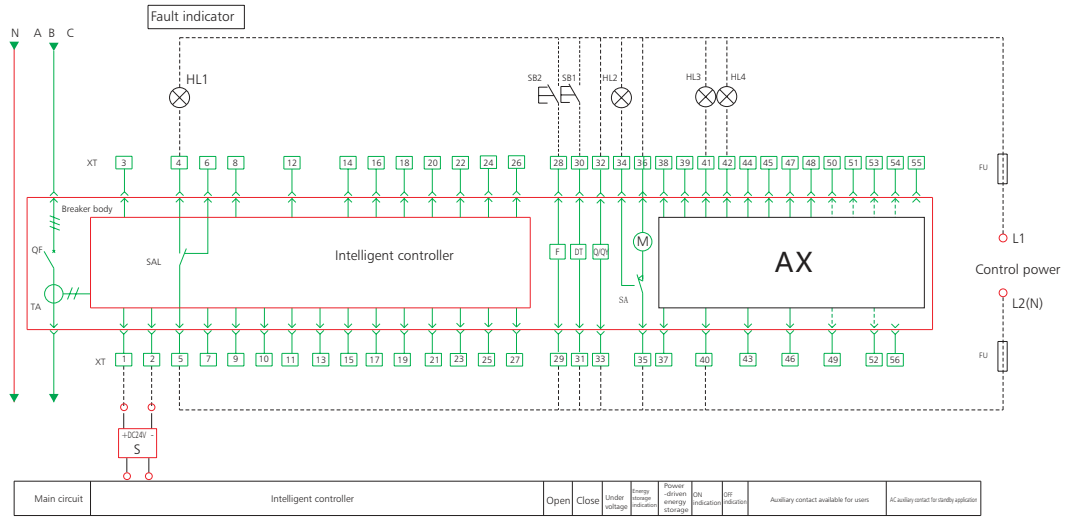




Note: If users want to change the horizontal connection into vertical connection,
they only have to additionally install vertical busbars.

6. Secondary circuit wiring

Connection diagram for the secondary circuit of NA8G-1600 with standard type intelligent controller

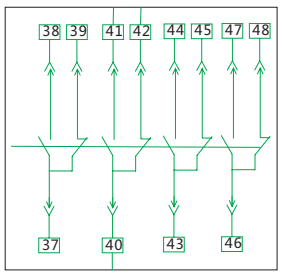


DT——closing electromagnet
F——shunt release
Q/QY—under voltage release
FU—fuse
SA——travel switch
M——energy storage motor
AX—auxiliary contact
TA—current transformer
SB1～SB2——pushbutton
HL1～HL4——indicator light
XT—connection terminal
QF——breaker
S——power module
SAL—sensitive switch

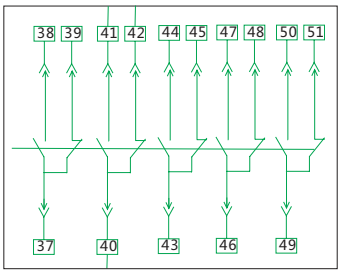
#1 and #2: input (terminals) for intellectual controller auxiliary power supply
#4, #5 and #6: faulty tripping contact output (#5 is the common terminal, AC250V 5A)

The auxiliary contact modes for customer use

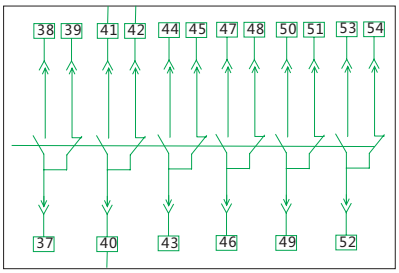
Ⅰ Four switch contact (acquiescence)



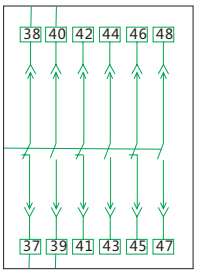
Ⅱ Five switch contact



Ⅲ Six switch contact

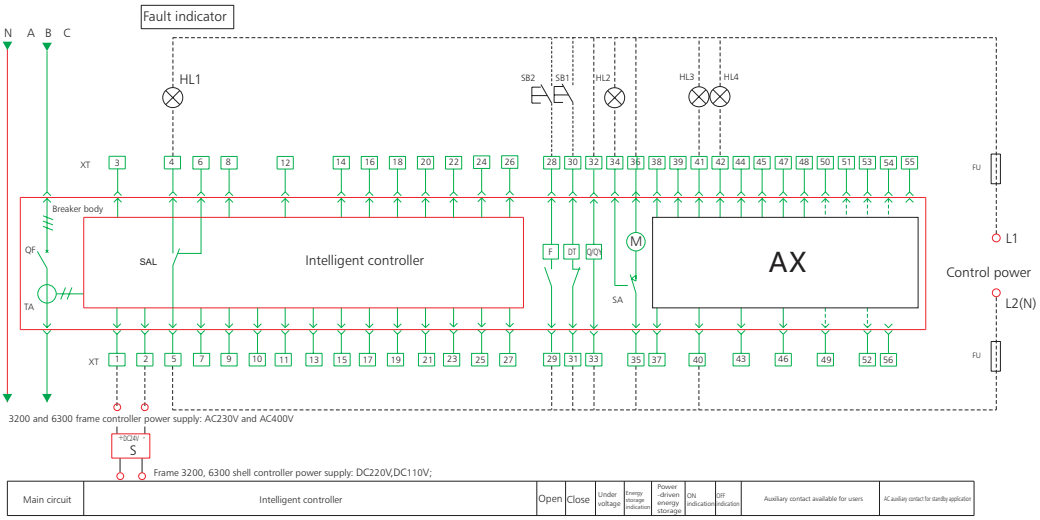


Ⅳ Three open and three close contact



Notes: 1. Four switch contact is the normal auxiliary contact mode.
When special order is made for alternating current, five switch contact, six switch contact, three open and three close contact can be selected additionally. Four switch contact is the only mode in case of direct current.
2. All control voltage of frame 1600 has to be put to #1 and #2 after the power module inputs DC24V.
3. The wiring for the part indicated by dashed lines shall be made by users.

Connection diagram for the secondary circuit of NA8G-3200 to 6300 with standard type intelligent controller

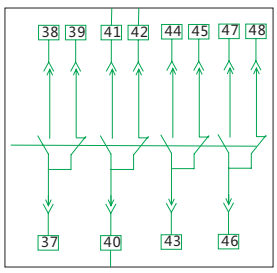


DT——closing electromagnet
F——shunt release
Q/QY—under voltage release
FU—fuse
SA——travel switch
M——energy storage motor
XT—connection terminal
TA—current transformer
SB1～SB2——pushbutton
HL1～HL4——indicator light
AX—Auxiliary contact
QF——breaker
S——power module
SAL—sensitive switch

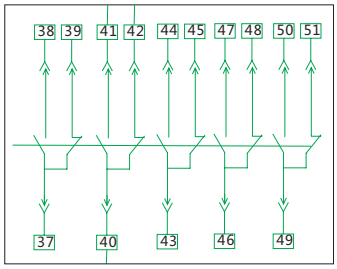
#1 and #2: input (terminals) for intelligent controller auxiliary power supply
#4, #5 and #6: faulty tripping contact output (#5 is the common terminal, AC250V 5A)

The auxiliary contact modes for customer use

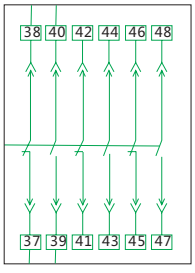
Ⅰ Four switch contact (acquiescence)



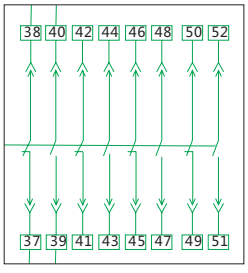
Ⅱ Five switch contact



Ⅲ Three open and three close contact

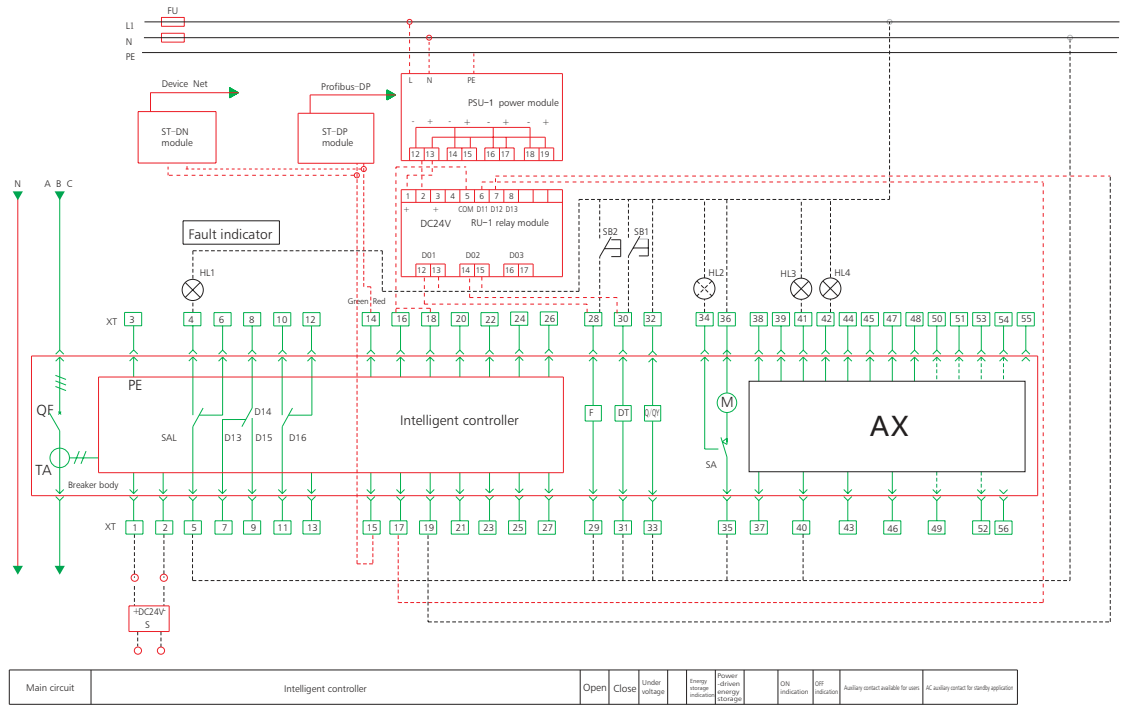


Ⅳ Four open and four close contact



Notes: 1. Four switch contact is the normal auxiliary contact mode. When special order, five switch contact, three open and three close contact, four open and four close contact can be selected additionally.
2. When the controller voltage of frame 3200 and 6300 is AC230V/400V, it can be directly put to #1 and #2; if the voltage is DC220V/110V, it has to be put to #1 and #2 after the power module outputs DC24V.
3. The wiring of the part indicated by dashed lines shall be made by users.

Connection diagram for the secondary circuit of NA8G-1600 with multifunctional type intelligent controller

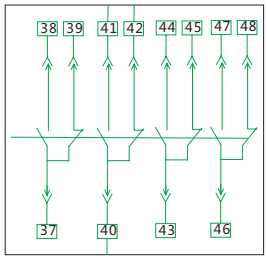


DT——closing electromagnet
F——shunt release
Q/QY—under voltage release
FU—fuse
SA——travel switch
M——energy storage motor
XT—connection terminal
TA—current transformer
SB1～SB2——pushbutton
HL1～HL4——indicator light
ST-DP —communication module
RU-1—relay module (optional)
QF——breaker
S——power module
ST-DN—communication module
PSU-1——power module (optional)
AX—Auxiliary contact
SAL—sensitive switch

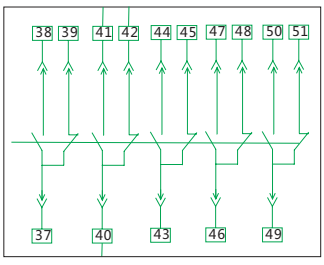
#1 and #2: input (terminals) for intelligent controller auxiliary power supply
#3：PE
#4, #5 and #6: faulty tripping contact output (#5 is the common terminal, AC250V 5A)
#7, #8 and #9: auxiliary contact output (#8 is the common terminal, AC250V 5A)
#10, #11 and #12: auxiliary contact output (#11 is the common terminal, AC250V 5A)
#14 and #15：RS485 communication interfaces (in case of communication type)
#16, #17, #18, #19, #26 and #27: programmable input/output points (DC110V 0.5A, AC250V, 5A)
#20, #21, #22, and #23: A, B, C, and N voltage signal output (in case of multifunction type) (maximum voltage AC400V)
#24 and #25: to be externally connected to the mutual inductor input

The auxiliary contact modes for customer use

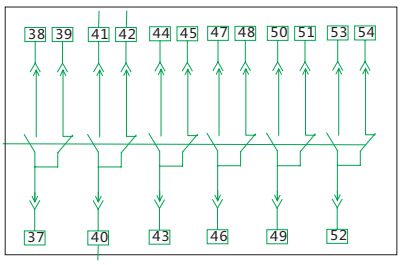
Ⅰ Four switch contact (acquiescence)



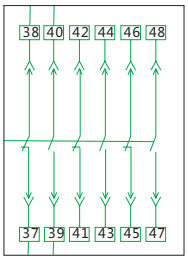
Ⅱ Five switch contact



Ⅲ Six switch contact

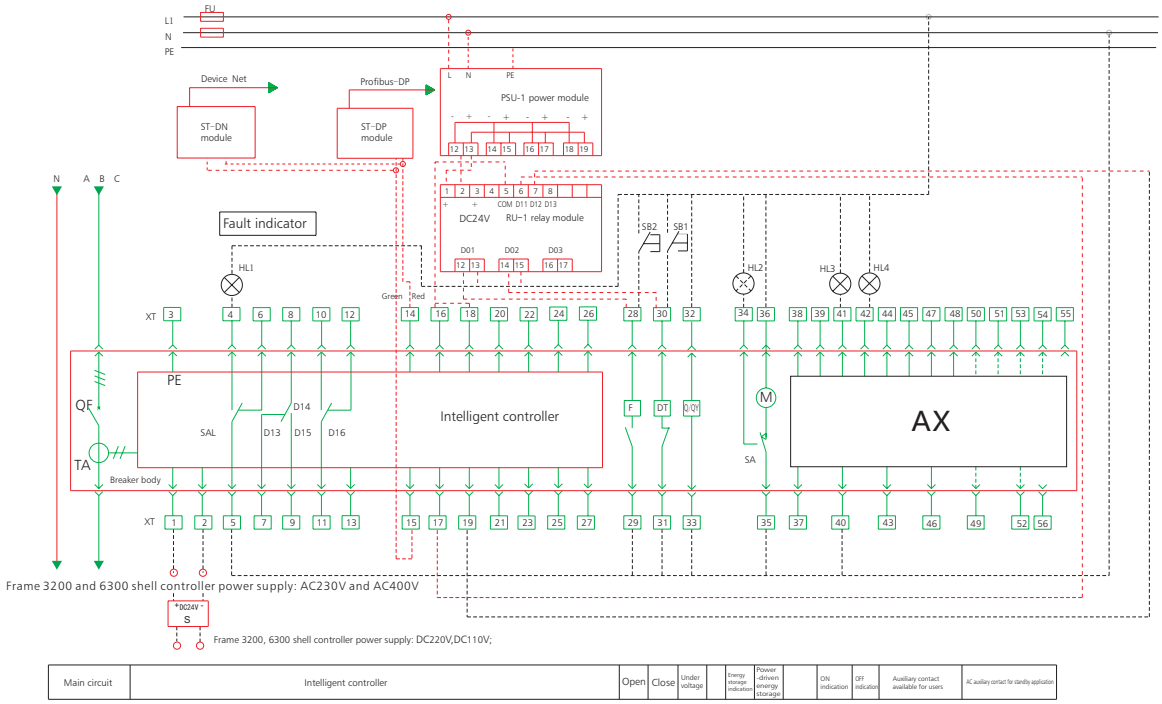


Ⅳ Three open and three close contact



Notes: 1. Notes: 1. Four switch contact is the normal auxiliary contact mode. When special order is made for alternating current, five switch contact, six switch contact, three open and three close contact can be selected additionally. Four switch contact is the only mode in case of direct current.
2. The wiring of the part indicated by dashed lines to be made by users.

Connection diagram for the secondary circuit of NA8G-3200 and 6300 with multifuctional type itelligent controller.

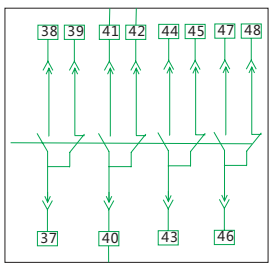


DT——closing electromagnet F——shunt release Q/QY—under voltage release FU—fuse
SA——travel switch M——energy storage motor XT—connection terminal TA—current transformer
SB1～SB2——pushbutton HL1～HL4——indicator light ST-DP —communication module RU-1—relay module (optional)
QF——breaker S——power module ST-DN—communication module
PSU-1——power module (optional) AX—Auxiliary contact SAL—sensitive switch

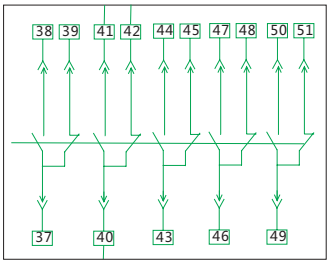
#1 and #2: input (terminals) for intelligent controller auxiliary power supply
#3：PE
#4, #5 and #6: faulty tripping contact output (#5 is the common terminal, AC250V 5A)
#7, #8 and #9: auxiliary contact output (#8 is the common terminal, AC250V 5A)
#10, #11 and #12: auxiliary contact output (#11 is the common terminal, AC250V 5A)
#14 and #15：RS485 communication interfaces (in case of communication type)
#16, #17, #18, #19, #26 and #27: programmable input/output points (DC110V 0.5A, AC250V, 5A)
#20, #21, #22, and #23: A, B, C, and N voltage signal output (in case of multifunction type) (maximum voltage AC400V)
#24 and #25: to be externally connected to the mutual inductor input

The auxiliary contact modes for customer use

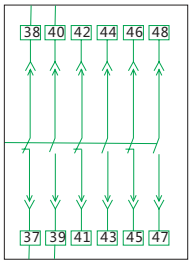
Ⅰ Four switch contact (acquiescence)



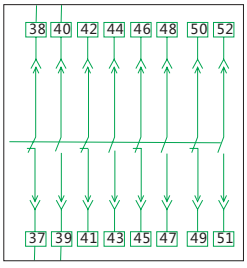
Ⅱ Five switch contact



Ⅲ Three open and three close contact



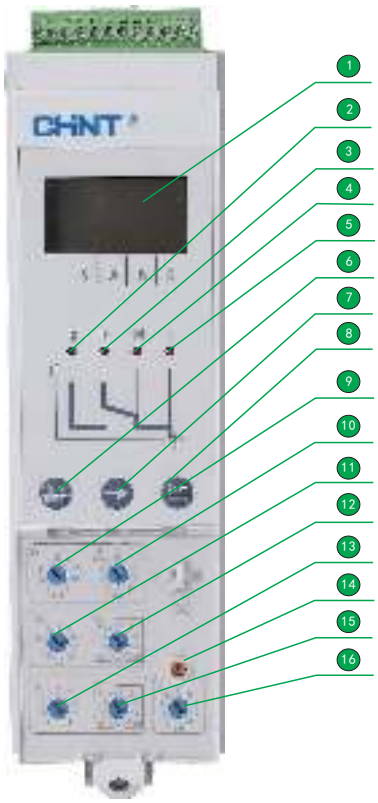
Ⅳ Four open and four close contact



Notes: 1 Four switch contact is the normal auxiliary contact mode. When special order, five switch contact, three open and three close contact, four open and four close contact can be selected additionally.
2. When the controller voltage of the 3200 and 6300 shells is AC230V/400V, it can be directly put to #1 and #2; if the voltage is DC220V/110V, it has to be put to #1 and #2 after the power module inputs DC24V.
3. The wiring of the part indicated by the dashed lines shall be made by users.

7. Intelligent controller and protective characteristics

7.1 User interface of the standard type controller



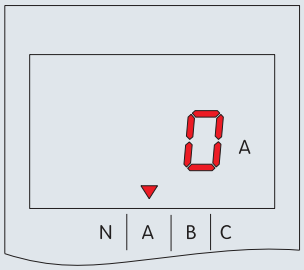
1 LED window	LED window capable of showing the current for each phase, various setting parameters, rated current, fault current, tripping time, and the like
2 " Ig " limp	Single-phase earthing fault indicator
3 " IR " limp	Long time-delay overcurrent fault indicator
4 " Isd " limp	Short-circuit short time-delay overcurrent
5 " Ii " limp	Short-circuit instantaneous overcurrent fault indication
6 " MENU " Pushbutton	Successively access to submenus at various levels by pressing the MENU key To inquire the current for each phase at present: recurrently select the contents in the menus at various levels
7 " → "Pushbutton	Return to previous menu; the intelligent controller software is reset;
8 " RESET " Pushbutton	RESET key must be pressed after the encoder switch position is adjusted; the intellectual controller faulty tripping results in fault memory which can be cleared only by pressing the RESET key;
9 " IR " Knob switch	There are (0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 0.95, 0.98, 1.0)In, nine settings altogether, for the current multiple setting of long time-delay overcurrent.
10 " tR " Knob switch	There are (1, 2, 4, 8, 12, 16, 20, 24, 30)s, nine settings altogether, for the time delay time setting of long time-delay overcurrent in case of 6IR.
11 " Isd " Knob switch	There are (1.5, 2, 2.5, 3, 4, 5, 6, 8, 10)Ir, nine settings altogether, for the current multiple setting of short-time short time-delay.
12 " tsd " Knob switch	For the short-circuit short time-delay time setting, there are nine settings: the inverse time limit, i.e., I2t on(0.1, 0.2, 0.3, 0.4)s, the definite-time limit, i.e., I2t OFF (0.1 0.2 0.3 0.4)s and X, i.e., closing the short time-delay
13 " Ig " Knob switch	There are (A, B, C, D, E, F G, H, J), nine settings altogether, for the current multiple setting of single-phase earthing.
14 " test " Pushbutton	Button for simulating instantaneous tripping test
15 " tg " Knob switch	For the time setting of single-phase earthing, there are nine settings: the inverse time limit, i.e., I2t on(0.1, 0.2, 0.3, 0.4)s, and the definite-time limit, i.e., I2t OFF(0.1 0.2 0.3 0.4)s, and X, i.e., closing the single-phase earthing.
16 " Ii " Knob switch	Short-circuit instantaneous current multiple setting.

7.2Default interface and operation method for the standard type controller

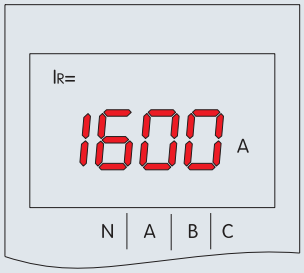
The default interface for the standard type controller is described as follows: (The current for each phase to be selected by pressing "→")

Press "MENU" key once to go to the status for parameter query as follows, and then press"→"to go to query the setting parameter of quadruple overcurrent protection.

Default interface of the standard type controller

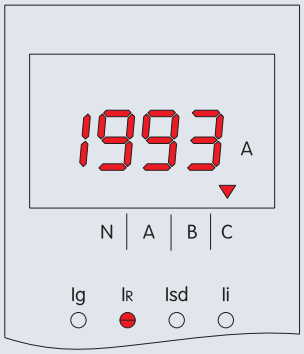


Status for parameter query—setting current of long time-delay

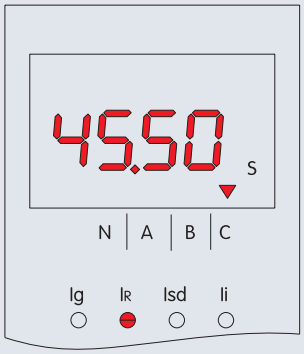


Press "MENU" key twice to go to the status for fault query as follows, show the latest fault information:

Status for fault query—tripping current

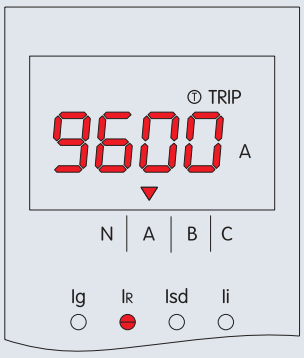


Status for fault query—tripping time

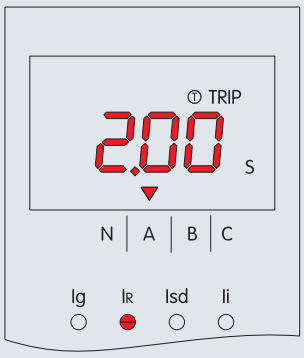


Press "TEST" key to go to the status for simulating tripping test in case of $6I_R$, and after tripping as follows:

Status of simulating tripping test—simulating current

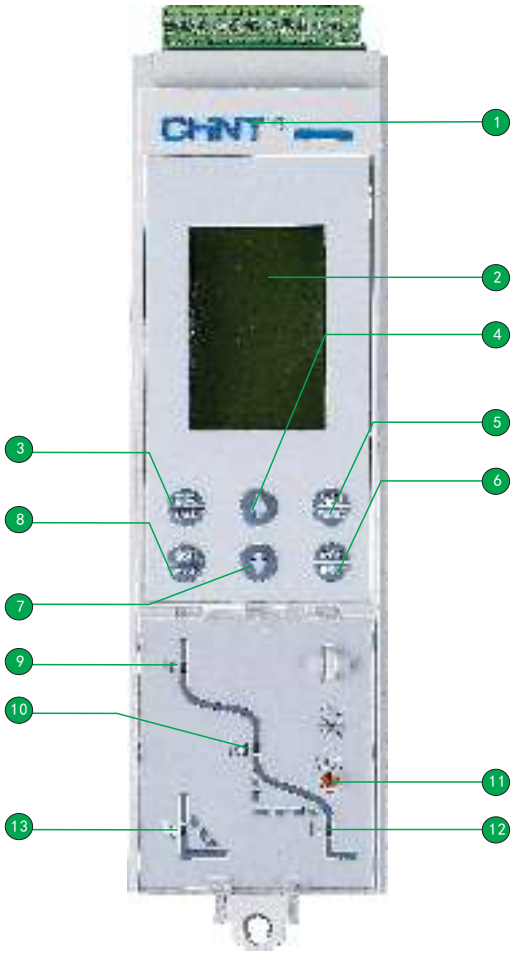


Status of simulating tripping test—simulating time



Press "RESET"key at any status to go back to default interface.

7.3 User interface of the multifunctional controller

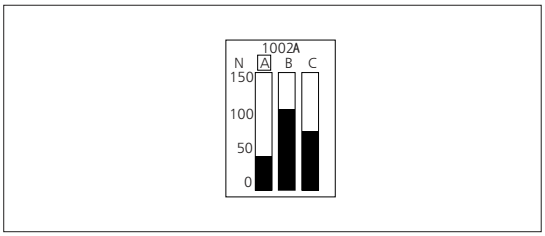


1	Brand	"CHINT" Brand
2	LED window	LCD window capable of showing the current for each phase, various setting parameters, rated current, fault current, tripping time and the like
3	SET key	Switch to the set default menu (left arrow key, when it is necessary to move leftwards or rightwards for the set interface).
4	UP key	Move the box select menu under the current menu to change the position of said box upwards, and perform the setting of the parameter ADD in the parameter setup menu.
5	RETURN key	Exit the current menu and go to the previous menu, or cancel the value of the current setup parameter.
6	ACK key	Go to the next menu of the currently selected select box (go to the set state under the set interface, a nd exit the set state by pressing the key again).
7	DOWN key	Move the box select menu under the current menu to change the position of said box downwards, and perform the setting of the parameter SUBTRACT in the parameter setup menu.
8	INQUIRY key	Switch to the inquiry default menu (right arrow key, when it is necessary to move leftwards or rightwards for the set interface).
9	" IR " limp	Long time-delay overcurrent fault indicator
10	" Isd " limp	Short-circuit short time-delay overcurrent fault indicator
11	" test "	Button for simulating instantaneous tripping test
12	" Ii " limp	Short-circuit instantaneous overcurrent fault indicator
13	" Ig " limp	Single-phase earthing fault indicator

7.4 Default interface and menu structure for the multifunctional controller

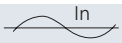
The multifunctional controller provides 4 title menus (measurement menu, parameter setup menu, protection parameter setup menu, and history record and maintenance menu) and 1 default menu.

Default interface for the multifunctional controller



7.4.1 Structure of the measurement menu

Primary menu	Secondary menu	Third menu	Fourth menu	Fifth menu
Magnitude of current I	Instantaneous value	Ia	Ia= 1000A	
		Ib	Ib= 1001A	
		Ic	Ic= 998A	
		In	In= 0A	
			Ig= 0A or I△n=0.00A	
		Maximum	Ia= 1300A	
			Ib= 1400A	
			Ic= 1380A	
			In= 200A	
			Ig= 0A or I△n=0.00A	
		Unbalance rate	Ia= 3%	
			Ib= 5%	
			Ic= 1%	
	Current thermal capacitance	100%		
	Required 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	$\bar{I}a$= 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		
	Mean value	Uav= 380V		
	Unbalance rate	0%		
	Phase sequence	A,B,C		
FrequencyF	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		

Primary menu	Secondary menu	Third menu	Fourth menu	Fifth menu
Power P	Instantaneous value	P, Q, S	P= 660kW	
			Q= 0kvar	
			S= 660kVA	
		Power factor	-1.00	
			Perceptual	
			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	
	Required value	$\overline{P}$, $\overline{Q}$, $\overline{S}$	$\overline{P}$= 660kW	
			$\overline{Q}$= 0kvar	
			$\overline{S}$= 660kVA	
		Maximum	$\overline{P}$= 661kW	
			$\overline{Q}$= 2kvar	
			$\overline{S}$= 662kVA	
			Reset(+/-)	
Harmonic H	Waveform	Ia, Ib Ic, In	 Ia	
			 Ib	
			 Ic	
			 In	
		Uan, Ubn Ucn	 Uan	
			 Ubn	
			 Ucn	
	Base form	I(A)	Ia= 1000A	
			Ib= 1000A	
			Ic= 1000A	
			In= 1000A	
		U(V)	Uab= 380V	
			Ubc= 380V	
			Uca= 380V	
			Uan= 220V	
			Ubn= 220V	
			Ucn= 220V	
	THD	I(%)	Ia= 0.0%	
			Ib= 0.0%	
			Ic= 0.0%	
			In= 0.0%	
		U(%)	Uab= 0.0%	
			Ubc= 0.0%	
			Uca= 0.0%	
			Uan= 0.0%	
			Ubn= 0.0%	
			Ucn= 0.0%	
	thd	I(%)	Ia= 0.0%	
			Ib= 0.0%	
			Ic= 0.0%	
			In= 0.0%	

Primary menu	Secondary menu	Third menu	Fourth menu	Fifth menu
	thd	U(%)	Uab= 0.0%	
			Ubc= 0.0%	
			Uca= 0.0%	
			Uan= 0.0%	
			Ubn= 0.0%	
			Ucn= 0.0%	
	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)
			Ubc(3, 5. 7...31)	Ubc 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)

7.4.2 Structure of the parameter setup menu

Primary menu	Secondary menu	Third menu	Fourth menu	Fifth menu
Setting of the measurement meter	System type	=3Φ4W 4CT		
	Line incoming pattern	=Wire to enter from the upper port		
Test & lock	Test tripping	Test type	=three section protection	
		Test parameter	=I:9999A	
		Test initiation	=start	
	Remote locking	Remote locking	=unlock	
	Parameter locking	Parameter locking	Parameter locking =locking	
		(input) user password =0000	User password (change) =0000	
Communication setting	Address	=3		
	Baud rate	=9.6K		
I/O setting	Function setting	=DO1 =regional interlocking		
	Executive mode	=DO1 =N.O. pulse =360s		
	I/O state	I/O state DO1 DO2 DO3 DI1 1 1 1 1		

7.4.3 Structure of the protection parameter setup menu

Primary menu	Secondary menu	Third menu	Fourth menu	Fifth menu
Current protection	Long time delay	Ir	e.g.: =1000A=100%In	
		Current protection	e.g.: =ON	
		Delay time	e.g.: =C1, Is@6Ir	
		Cooling time	e.g.: =3h	

Primary menu	Secondary menu	Third menu	Fourth menu	Fifth menu
Current protection	Short-time delay	Definite-time limit	Operating current	e.g. =5000A=5.0Ir
				e.g. =0.1s
		Inverse-time limit	Delay time	e.g. =2000A=2.0Ir
				e.g. =C1, 0.Is@6Ir
	Instantaneous	Operating current	e.g. =10000A=10.0In	
	Neutral phase protection	Neutral phase protection	e.g. =200%	
	Ground protection	Operating current	e.g. =800A	
		Delay time	e.g. =0.4s	
		Coefficient of earthing	e.g. =6.0	
	Grounding alarm	Starting current	e.g. =600A	
		Starting time	e.g. =0.1s	
		Return current	e.g. =100A	
		Return time	e.g. =0.1s	
	Leakage protection	Operating current	e.g. =8.0A	
		Setup delay time	e.g. =0.75s	
	Electric leakage alarm	Starting current	e.g. =5.0A	
		Starting time	e.g. =0.1s	
		Return current	e.g. =4.0A	
		Return time	e.g. =0.1s	
Load Monitoring	Executive mode	e.g. =I the first method		
	Unloading value 1	e.g. =800A		
	Unloading time 1	e.g. =50%tr		
	Unloading value 2	e.g. =700A		
	Unloading time 2	e.g. =25%tr		
Voltage protection	Under voltage	Executive mode	e.g. =Alarm	
		Startup value	e.g. =200V	
		Starting time	e.g. =0.2s	
		Return value	e.g. =320V	
		Return time	e.g. =60.0s	
	Over voltage	Executive mode	e.g. =Alarm	
		Startup value	e.g. =480V	
		Starting time	e.g. =1s	
		Return value	e.g. =400V	
		Return time	e.g. =60.0s	
	U unbalanced	Executive mode	e.g. =Alarm	
		Startup value	e.g. =10%	
		Starting time	e.g. =1s	
		Return value	e.g. =5%	
		Return time	e.g. =60.0s	

7.4.4 Structure of the history record and maintenance menu

Primary menu	Secondary menu	Third menu	Fourth menu	Fifth menu
Current alarm	e.g. phase sequence alarm, Inverse power alarm, over frequency alarm...			
Number of operations	Total number of times	e.g.: 300		
	Number of operations	e.g.: 219(ACK key, reset)		
Contact wear	Total wear	e.g.: 120		
	lContact wear	e.g.: 20(ACK key, reset)		
Product information	Zhejiang CHINT electrics co., LTD			
Tripping record	e.g.: 1 Under voltage tripping 2004/06/17	Under voltage tripping T=0.20s Umax=0V 11:24:59 6/17		
		F=0.00Hz Uab= 0V Ubc= 0V Uca= 0V		
	.....	.....		

Primary menu	Secondary menu	Third menu	Fourth menu	Fifth menu
Tripping record	e.g. 8 (for) short-circuit definite-time limit 2004/05/30	A phase short-circuit definite-time limit T= 0.4s I= 4300A 15:28:25 5/30		
		Ia= 4300A Ib= 4200A Ic= 4000A In= 150A		
Alarm logging	e.g. 1 DI (for) DI input alarm 2004/07/16	Di input alarm Di1 2004/07/16 20:38:45		
	.....	.....		
	e.ge 8 Under voltage alarm 2004/06/20 Note: Up to 8 times of alarms can be recorded	Under voltage alarm Umax= 0V 2004/06/20 22:29:40		
Position changing record	e.g. 1 (for) local switch on 2002/06/18	local switch on 2002/06/18 9:30:56		
	.....	.....		
	e.g. 8 (for) testing tripping 2002/06/15 Note: Up to 8 times can be recorded	Test tripping 2002/06/15 10:30:20		

Notes: a. The actual menu will very depend on the function selected by the user.
b. The controller starts screensaver automatically 10min later.

7.5 List of the controller functions
Standard configuration

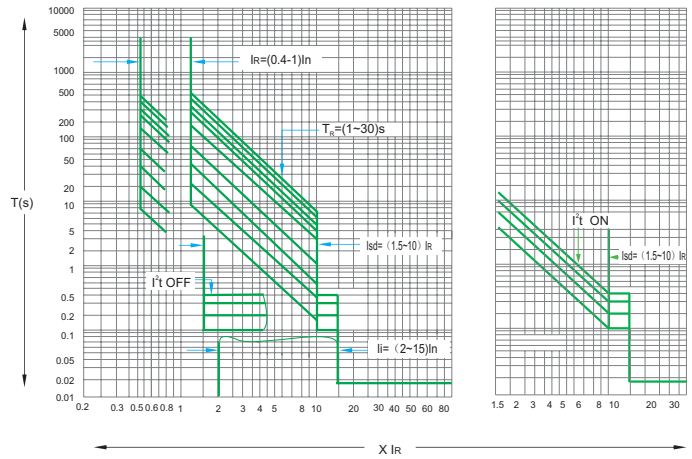
Standard type (M type)	Multifunction type (H type)
1.Quadruple overcurrent protection (for long time-delay, short-circuit short time-delay,instantaneous,earthing); earthing corresponds to vector sum (T type); 2.Parameter setup: fixed value setting position setting function 3.Current measurement 4.Test function; 5.Fault recording function; 6.Self-diagnostic function; 7.MCR make/break function; 8.Human-machine interface: 33×22 LED;	1.Quadruple over current protection (for long time-delay,short-circuit short time-delay,instantaneous,earthing); earthing corresponds to vector sum (T type); 2.Parameter setup: fixed value keyboard setting function; 3.Current measurement function; 4.Current unbalance rate measurement function; 5.Two test functions: (1)Instantaneous tripping test simulated on the panel; (2)Triple over current, grounding/leakage and operating time tests simulated by software; 6.Fault recording function: 8 times of failures can be recorded; 7.Self-diagnostic function 8.MCR make/break function 9.Communication function: MODBUS protocol; 10.Alarm logging function; 11.Recording number of operations; 12.Contact wear 13.Position changing record 14.Human-machine interface: 28×43 LCD; 15.Heat capacity measurement

Heat capacity measurement

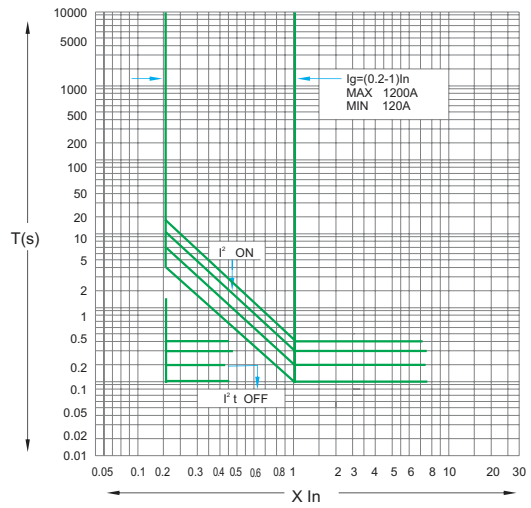
Standard type (M type)	Multifunction type (H type)	
	P Function	H Function
None	1.Voltage measurement; 2.Voltage unbalance measurement; 3.Frequency measurement; 4.Phase sequence measurement; 5.Electric energy measurement; 6.Power measurement; 7.Power factor measurement; 8.Earth-current grounding protection; 9.Leakage protection; 10.Load monitoring function; 11.Quadruple D0 output function; 12.DI input function; 13.Regional interlocking function; 14.Under and over voltage protection;	1.Voltage measurement; 2.Voltage unbalance measurement; 3.Frequency measurement; 4.Phase sequence measurement; 5.Electric energy measurement; 6.Power measurement; 7.Power factor measurement; 8.Earth-current grounding protection; 9.Leakage protection; 10.Load monitoring function; 11.Quadruple DO output function; 12.DI input function; 13.Regional interlocking function; 14.Under and over voltage protection; 15.Measurement of harmonic current; 16.Neutral phase protection

7.6 Characteristic parameters of the standard type intelligent controller

Overcurrent protection characteristics



Neutral line (earthing) fault protection characteristic



7.6.1 Long time-delay overcurrent protection characteristic

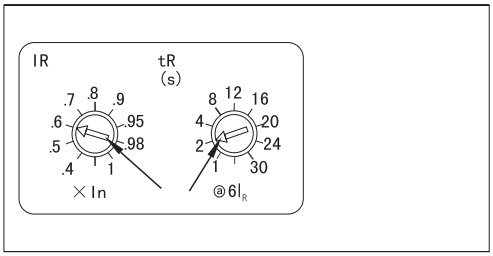
Rated current range [IR]	Error	Current [I]	Operating time [tR(s)]									Time error
(0.4～1)In	±10%	≤1.05I_R	No actuation within 2h									
		>1.30I_R	<1h and then actuate									
		1.5IR	16	32	64	128	192	256	320	384	480	±15%
		2.0 IR	9	18	36	72	108	144	180	216	270	
		6.0 IR	1	2	4	8	12	16	20	24	30	

Explanation for parameter setting

Current of long time-delay overcurrent protection:
I_R=(0.4-0.5-0.6-0.7-0.8-0.9-0.95-0.98-1)×In, optional

The long-time delay tripping time represents the inverse-time limit characteristic, and nine optional settings are readily available for tripping time in case of $6I_R$:T_R=(1-2-4-8-12-16-20-24-30)s.

For setting, insert a small slotted screwdriver to the knob groove as shown in the right drawing, gently turn it to make the arrow of the knob point at the current and time set as required.
As shown in the figure, the over current long time delay protection current setting value I_R=0.6In, and the delay tripping time is 2s (in the condition of $6I_R$).



Example 1: If it is known that in condition of $I=6I_R$,
The tripping time setting value is 2s,
and now the circuit current $I=1.5I_R$,
then the actual tripping time T_R can be worked out by:
$(1.5I_R)2\times T_R=(6I_R)2\times 2$. The answer is obtained as T_R=32s

7.6.2 Short-circuit short time-delay overcurrent protection characteristic.

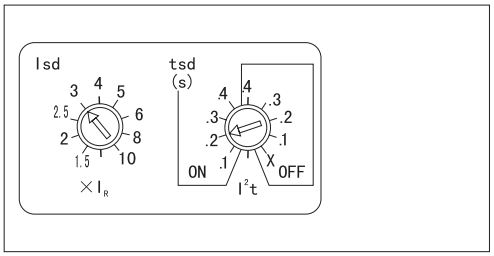
Rated current range [Isd]	Error	Current [I]	Operating time [tsd(s)]	Time error
(1.5～10)I_R ＋OFF(Power off)	±15%	<0.85Isd	No action	±15%
		>1.15Isd	Time-delay action	
		I^2t OFF	0.1 0.2 0.3 0.4	
		I^2t ON I>10IR	0.1 0.2 0.3 0.4	
		I^2t ON I≤10IR	anti-time-limit delay:$I^2Tsd=(10I_R)^2tsd$	

Explanation for parameter setting
Current of short-circuit short time-delay overcurrent protection :
Isd=(1.5-2-2.5-3-4-5-6-8-10)×IR, optional.

There are nine settings for the short-circuit short time-delay tripping time, wherein 4 settings represent the definite-time limit characteristic (i.e., I^2t OFF), 4 seetings the inverse-time limit characteristic, and 1 setting the function of closing the short-circuit short time-delay (X).

When the tripping time is set as definite-time limit operating characteristic (i.e., the arrow points at the off area), the tripping time can be selected as tsd=(0.1s-0.2s-0.3s-0.4s-x (i.e., the function of closing the short-time delay).

When the tripping time is set as inverse-time limit operating characteristic(i.e., I^2t ON), there are two cases: ①the case of 1 > 1.15Isd and 1 > 10IR represents the definite-time limit; ② the case of 1 > 1.15Isd and I≤10IR represents the inverse-time limit characteristic and the actual tripping time is calculated according to the formula $I^2Tsd=(10I_R)^2tsd$, wherein I is the line current, Tsd the actual tripping time, and tsd the setting tripping time. The method for setting the current and time for the short-circuit short time-delay overcurrent protection is similar to that for over long time-delay overcurrent protection. As shown in the figure, the current for the short-circuit short time-delay overcurrent protection is $3I_R$, and the tripping time is set as tsd=0.2s in the setting position of inverse time limit (I^2t ON).



Example 2: If it is known that the short-time delay setting current is Isd=$3I_R$,
then the tripping time is set as tsd=0.2s
in the setting position of inverse
time limit (I^2t ON). Now the current is $7I_R$
in the line current, then the short-time delay tripping time can be worked out by calculation:
$1.5Isd=1.15\times 3I_R=3.45I_R$
Then $I=7I_R>1.15Isd$
And because $I=7I_R<10I_R$
So accotding to $I^2\times Tsd=(10I)^2tsd$
$(7I_R)^2\times Tsd=(10I_R)^2\times 0.2$
Tsd=0.41s

7.6.3 Short-circuit instantaneous overcurrent protection

Rated current range [Ii]	Error	Line current [I]	Operating Characteristics
(2～15)In ＋OFF(Power off)	±15%	≤0.85Ii	no-action
		>1.15Ii	action

Explanation for parameter setting

Current of short-circuit instantaneous over current protection:
Ii=[2-3-4-6-8-10-12-15-OFF]×In, optional.

The method for setting the current of short-circuit instantaneous overcurrent protection is similar to that for long time-delay overcurrent protection setting. As shown in the figure, the instantaneous overcurrent protection current setting value is 8In.

7.6.4 Single-phase earthing fault protection

Rated current range [Ig]	Error	Line current [I]	Operating time [tg(s)]	Time (delay) error
(A～J)In ＋OFF(Power off)	±10%	<0.9Ig	no-action	±15%
		>1.1Ig	time-delay action	
		I^2T OFF	0.1 0.2 0.3 0.4	
		I^2T ON I>J	0.1 0.2 0.3 0.4	
		I^2T ON I≤J	anti-time-limit delay $I^2Tg=(J)^2tg$	

Meaning of Ig

Rated current In	A	B	C	D	E	F	G	H	J	Note
In≤400A	0.3	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	×In
400A<In≤1200A	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	×In
1200A<In	500A	640A	720A	800A	880A	960A	1040A	1120A	1200A	

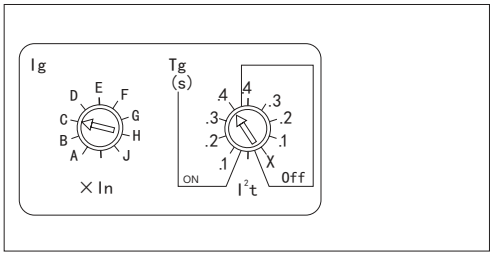
Explanation for parameter setting

Current of single-phase earthing protection :
Ig=(A-B-C-D-E-F-G-H-J)×In, optional.

There are nine setting positions for the protective delay tripping time, wherein 4 settings represent the definite-time limit characteristic (i.e., I^2t OFF), 4 settings the inverse-time limit characteristic (I^2t ON), and 1 setting the function of closing the single-phase earthing protection (X).

When the tripping time is set as definite-time limit operating characteristic (i.e., the arrow points at the OFF area), the tripping time can be selected as tg=0.1s-0.2s—0.3s-0.4s-x (i.e., the function of closing the single-phase earthing protection).

When the tripping time is set as inverse-time limit operating characteristic (i.e., I^2t ON), there are two cases:
① in the case of I>1.1Ig and I>J, the result of the automatic changeover process is the definite-time limit operating characteristic, tg=0.1s-0.2s-0.3s-0.4s;
② The case of the current meeting the condition of 1.1Ig<I≤J represents the inverse-time limit characteristic and the actual tripping time is calculated according to the formula $I^2Tg=(J)^2tg$.
In the formula, I is the circuit current, Tg is the actual operating time, J is the setting current, and tg is the setting tripping time.
The method for setting the parameter is similar to that for long time-delay current protection. As shown in the figure, the single-phase earthing protection current is C×In, and the tripping time setting is tg=0.4s in the setting position of inverse time limit (I2t ON).



Example 3: If it is known that the single-phase earthing protection setting current for the intelligent controller with rated current of In=800A is as the setting position of C, the tripping time is set as the inverse time limit 0.4s.
Now there is a failure in the circuit, the circuit current I=400A, then the actual tripping time can be worked out; it can be seen from the table that the result is
C=0.4
Ig=C×In=0.4×800=320A
So I=400A>1.1Ig
According to the formula $I^2T_g=(J)^2t_g$
$(400)^2\times T_g=(1.0\times800)^2\times0.4$
$T_g=1.6s$

Note: For the intelligent controller, the current settings for the long time-delay and the short-circuit short time-delay and the intantaueous overcurrent protection should not come across each other, and the condition of IR<Isd<Ii must be ensured.

7.7 Explanation for auxiliary functions

a. Explanation for test functions

When onsite adjustment, periodical inspection or overhaul is made with the controller supported by the breaker, breaking several times is necessary by using the test functions of the controller to check the cooperation of the controller and the breaker.

With the breaker on, press the test key, and the intelligent controller will trip instantaneously to cut off the breaker.

Note: ① This function can be used only when onsite adjustment or overhaul for the breaker is made, and shall not be used during the normal operation.

② Each time before the controller is switched on, it is necessary to press the reset button in the upper position of the controller panel so that the breaker can be switched on again for operation.

b. Explanation for fault memory

The controller still has the function of fault memory after reset or de-energized to keep a latest historical event for post analysis. Only when there is a new fault again, the original information is cleared with the current latest faulty data saved.

For the inquiry method, refer to the above explanation about fault display

7.8 Explanation for display function

When the rated current is greater than or equal to 400A, the primary current shall not be lower than 0.4In for single phase, and 0.2In for three phases for normal operation of the breaker.

When the rated current is less than 400A, the primary current shall not be lower than 0.8In for single phase, and 0.4In for three phases for normal operation of the breaker.

Note: When the AC220V ST power module is energized, and the voltage falls to AC120V, there will be no display on the controller

When the AC380V ST power module is energized, and the voltage falls to AC200V, there will be no display on the controller

a. Current display

Error range for current display: ±5%

b. Voltage display

Error range for voltage display: ±1.5%

8. Accessories

8.1 Under voltage release

When the under voltage release is not energized, neither power-driven nor manual operation can make the breaker on.

For the under voltage release, there are two varieties: instantaneous and time-delay operations.

The time for the under voltage time-delay release is Inm=1600A, the time can be selected from but not adjusted in the range of 0 – 7s; Inm=3200A or 6300A, the time can be selected from but not adjusted among 0.5s, 1s, 3s, and 5s. When, within 1/2 delay time, the power voltage returns to 85%Ue or above, the breaker will not get disconnected.

Operating characteristic:

Rated operational voltage Ue(V)	AC230 AC400
Operating voltage(V)	(0.35～0.7)Ue
Reliable switching voltage(V)	(0.85～1.1)Ue
Reliable not-switching voltage(V)	≤0.35Ue
Power dissipation(W)	20VA

Under-voltage release (Inm=1600A)

Under-voltage release (Inm=3200A, 6300A)

8.2 Shunt release

After the shunt release is energized, the breaker is switched off instantaneously to allow remote operation.

Operating characteristic:

Rated control supply voltage Us(V)	AC230 AC400	DC220 DC110
Operating voltage (V)	(0.7～1.1)Us	
Power consumption (W)	200VA	200W
Breaking time	50±10ms	

Shunt release (Inm=1600A)

Shunt release (Inm=3200A, 6300A)

8.3 Closing electromagnet

After the motor-driven energy storage is ended, energizing the closing electromagnet will make the energy storage spring force of the operating mechanism to be released instantaneously to rapidly switch the breaker on.

Operating characteristic:

Rated control supply voltage Us(V)	AC230 AC400	DC220 DC110
Operating voltage (V)	(0.85～1.1)Us	
Power dissipation (W)	200VA	200W
Closing time	50±10ms	

Closing electromagnet (Inm=1600A)

Closing electromagne (Inm=3200A, 6300A)

8.4 Motor-driven energy storage mechanism
The functions of motor-driven energy storage and automatic energy re-storage after the breaker comes on are available to ensure that the breaker can come on immediately after it gets disconnected.

Operating characteristic:

Rated control supply voltage Us(V)	AC230 AC400	DC220 DC110
Operating voltage (V)	(0.85～1.1)Us	
Power dissipation (W)	75/150VA	75/150W
Energy storage time	<4s	
Frequency of operation	At most 3 times in a minute	


(Inm=1600A)


(Inm=3200A, 6300A)

8.5 Auxiliary contact
Standard type:4 switch contact
Special type:5 switch contact
6 switch contact (Only for I_{nm}=1600A, and not available for DC)
3 N.O. and 3 N.C.
4 N.O. and 4 N.C.(I_{nm}=3200A and 6300A provided)


(Inm=1600A)


(Inm=3200A, 6300A)

Technical parameters:

Rated voltage(V)		Rated thermal current Ith(A)	Rated control capacity
AC	230 / 400	6	300VA
DC	220	6	60W

8.6 Phases barrier
Phases barrier is installed between the phases of the line bank to improve the insulating ability between the phases of the breaker.

8.7 Key lock
The OFF pushbutton of the breaker can be locked in the position of depress, and at this time, the breaker cannot be closed for operation; When the user selects the option, the factory provides locks and keys; One breaker is provided with one lock and one key for the lock; Two breakers are two provided with locks and one key for the locks; Three breakers are provided with three same locks and two same keys for the locks.
Note:
For the air circuit breaker with key lock, when the key has to be pulled out, it is necessary to first press the OFF key, turn the key anticlockwise, and then pull out the key.

8.8 Button locking device
It is used to lock the button for opening and closing the breaker with the padlock used for such a purpose. (Padlock is provided by users themselves)

8.9 Doorcase
They are installed on the door of the distribution cabinet room to seal it with a protection level of up to IP40.

8.10 “Disconnected” pation locking device for the draw-out.
For the “separation” position of the open frame (draw-out) circuit breaker, a lock rod can be pulled out to lock the matter, and the breaker locked will be unable to be turned towards the TEST or CONNECTION position. Padlocks have to be provided by users themselves.

8.11 Three-position locking device for the draw-out.
After the breaker body is locked automatically in any working position, it is necessary to turn the key to unlock the matter so that the break body can be moved to the next working position by turning the handle. (this function available for 3200 to 6300).

8.12 Door interlock
Door interlock for the breaker status
When the breaker is closed, the cabinet door must not be opened; when the breaker is switched off, the cabinet door is allowed to be opened.
Door interlock for the breaker position
When the breaker is in the position of connection and test, the cabinet door must not be opened; when the breaker is the separation position, the cabinet door is allowed to be opened.

8.13 Mechanical interlock
It can realize the interlock of two horizontal or vertical-installed,three poles or four poles, drawout or fixed breakers.

9. Installation

9.1 Following items to be checked before installation

Check the label plate on the breaker panel to see if it is conform to the specifications of the ordered goods.

a.Rated current
b.Under voltage release voltage and delay time
c.Shunt release voltage
d.Closing electromagnet voltage
e.Motor voltage

9.2 Before installation, operation, maintenance and inspection, you shall read this manual, and consult the manufacturer for questions, if any.

9.3 Preparations before installation

Before the breaker is installed, check the insulation resistance of the breaker by using a 1000V megohmmeter according to regulations; when the surrounding media temperature is 25℃±5℃ and the relative humidity 50% - 70%, the insulation resistance shall not be less than 20 megohm.

The place with the insulation resistance to be tested includes: the place between various phases and between various phases and the frame when the breaker is closed; the place between in- and out- lines of various phases.

9.4 Installation of the fixed type breaker

Place the breaker into the distribution cabinet, and fasten it by using 4 pieces of M6(In=1600A) or M10(In=3200A or more) bolts and washers. The breaker shall be installed stably with no additional mechanical stress to avoid damage of the breaker or bad contact of the main bus bar.

9.5 Installation of the open frame (draw-out) circuit breaker

Take the breaker body out of the draw-out socket, and install the socket in the distribution cabinet, and fasten it by using 4 pieces of M6(In=1600A) or M10(In=3200A or more) bolts and washers; the breaker shall be installed stably with no additional mechanical stress to avoid damage of the breaker or bad contact of the main bus bar. After the work is completed, mount the body into the draw-out socket.

9.6 The specifications of the wiring copper bars for the primary circuit of the breaker shall meet the copper bar specifications used under the conditions of conventional heating in IEC/EN 60947-2

9.7 The breaker shall be grounded substantially.

10. Common faults and troubleshooting

Listed below are the problems which users may encounter during installation, adjustment, and operation of the breaker, and the possible reasons and elimination methods.

No.	Technical problems	Possible causes	
1	Breaker tripping (fault indicator on)	Overload fault tripping (long time delay indicator on)	Diagnosis and trouble shooting 1 Check the breaking current and operating time on the intelligent controller 2 Analyze the operation of the load and power network 3 Promptly find and shoot the trouble if overload is confirmed 4 For lack of match between the actual running current and the long time delay operating current, please modify the long time-delay operating current setting for a proper match and protection according to the actual running current 5 Press the reset button to close the breaker again
		Short-circuit fault tripping (short time-delay or instantaneous overcurrent indicator on)	1 Check the breaking current and operating time on the intelligent controlle 2 Promptly find and shoot the trouble if overload is confirmed 3 Check the setting value of the intelligentcontroller 4 Check to see whether the breaker is in good condition, and determine whether it can be closed for operation 5 Press the reset button to close the breaker again
		Earthing fault tripping (earthing fault indicator on)	1 Check the breaking current and operating time on the intelligent controller 2 Promptly find and shoot the trouble if it is confirmed that there is a earthing fault 3 If no earthing fault is detected, please determine whether the earthing fault current setting is proper, and can be well matched with the actual protection; if not, the setting shall be modified 4 Press the reset button to close the breaker again
2	Breaker fails to close	Under voltage release Tripping	1 Check to see if the power voltage is lower than 70%Ue 2 Check the under voltage release and control unit for fault
		Mechanical interlock action	Check the working condition of two breakers equipped with mechanical interlock.
		Under voltage release No attracting	1 Whether the under voltage release has been energized 2 Whether the power voltage is lower than 85%Ue 3 Whether the under voltage release or control unit malfunctions, if so, the release shall be replaced.
		Reset button fails to reset	Press the reset button to close the breaker again.
		Open frame (draw-out) circuit breaker fails to be put to the righ t position by rocking	Check the contract status of the secondary circuit, and shoot the trouble, if any
		Open frame (draw-out) circuit breaker Bad contact for the secondary circuit	1 Check the motor control power supply and see if it is well providing power, and the voltage must be ≥85%Us 2 Check the status of the motor energy storage mechanism.
		Breaker fails to pre-store energy	Put the open frame (draw-out) circuit breaker to the right position by rocking (with it locked in the connected position)
		Closing electromagnet trouble	1 Check the power voltage of the closing electromagnet, and it must be higher than or equal to 85%Us 2 If there is any trouble in the closing electromagnet to enable the attracting, it shall be replaced.

No.	Technical problems	Possible causes	
3	Breaker trips after closed	Tripping immediately Delay tripping	1 There may be short circuit current when the matter is switched on, and in this case you shall find and shoot the trouble 2 Check to see if there is any overload current in the circuit, find and shoot the trouble 3 Check the setting value of the intelligent controller for reasonability, and a re-setting process is necessary if not reasonable 4 Press the reset button to close the breaker again
4	Breaker fails to open	The breaker fails to break in power-driven modeThe breaker fails tobreak in manual mode	1 Check the shunt release circuit for reliable connection and the shunt release for trouble, and the release shall be replaced if the fault is confirmed 2 Check the operating mechanism for mechanical fault.
5	Breaker fails to store energy	Energy failed to be stored in power-driven mode	1 Check the motor-driven energy storage mechanism control power voltage, and the voltage shall be ≥85%Us; check the status of the circuit connection 2 Check the motor
		Energy failed to be stored in manual mode	Check the operating mechanism for mechanical fault
6	Breaker fails to be pulled out when the open frame (draw-out) circuit breaker is in the SEPARATION position	Rock rod fails to be pulled out Breaker fails to completely reach the SEPERATION position	Pull out the rock rod Put the breaker completely to the “disconnected” position by rocking
7	Open frame (draw-out) circuit breaker fails to be put to the CONNECTION position by rocking	The "drawer” has seized up for foreign matters fall in it; damage in the mechanism for putting in by rocking or the gear thereof; Position locking device fails to be unlocked	Check it for foreign matters and for condition of the rack and gear Turn the key on the “drawer” to unlock the matter
8	No display on the intellectual controller screen	Intelligent controller fails to be energized by power supply: Improper input voltage for the auxiliary power supplyImproper secondary output voltage for the transmitter Unreliable connection between the secondary output terminal of the transmitter and the controller	1 Check to see if the intelligent controller power supply is well be connected and works well 2 Cut off the intellectual controller control power supply, and then connect the power supply; If the fault is still present, there may be some troubles in the controller which has to be replaced

11. Ordering specification

User		Order amount	Order date	Tel	
Type and size		☐NA8G-1600	☐NA8G-3200	☐NA8G-4000	☐NA8G-6300
Rated current (In)A		☐200 ☐400 ☐630 ☐800 ☐1000 ☐1250 ☐1600	☐1600 ☐2000 ☐2500 ☐2900 ☐3200	☐ 1000 ☐ 1250 ☐ 1600 ☐ 2000 ☐ 2500 ☐ 2900 ☐ 3200 ☐ 3600 ☐ 4000	☐4000 ☐5000 ☐6300(don't have 4P)
Installation mode		☐draw-out type ☐Fixed type (no such products for over 4000A)			
Connection mode		☐Horizontal connection ☐Vertical connection ☐Front connection ☐mixed connection (connection mode to be noted)			
Number of poles		☐3P ☐4P			
Intelligent controller	Setting of the protection parameter	Factory's setting values: I_R=1In, t_r=2s@6I_R; I_{sd}=8I_R, inverse-time protection,t_{sd}= 0.4s; I_i=12I_n;OFF(If on, when I_n>1200A I_g=800A; when I_n≤1200A I_g=0.5I_n) If the user has some requirements different from the defaulting, please write the numerical values on the line below			
		Long-time delay protectionIR	Operating current setting_____In (0.4,0.5,0.6,0.7,0.8,0.9,0.95,0.98,1) Operating time setting_____s (1,2,4,8,12,16,20,24,30)		
		Short-circuit short-time delay protectionIsd	Operating current setting_____IR (1.5,2,2.5,3,4,5,6,8,10) Operating time setting ☐inverse time_____s (0.1,0.2,0.3,0.4,OFF)		
		hort-circuit instantaneous protectionIi	Operating current setting_____In (2,3,4,6,8,10,12,15,OFF)		
		Ground protectionIg	Operating current setting_____In Operating time setting ☐inverse time_____s ☐Definite-time limit_____s		
	Selecting the type	☐Standard type ☐Multifunctional type			
	Power input	☐AC400V ☐AC230V ☐DC220V ☐DC110V ☐DC24V			
	Basic function	Three-section protection against over current Neutral line or grounding fault protection Voltage measurement Test function Fault inquiry/memory function Self-diagnostic function			
	Optional function (this function to be added as required by the user, and to be matched with the controller type)	☐Over voltage protection ☐Under voltage protection ☐Over frequency protection ☐Under frequency protection ☐Voltage unbalance measurement ☐Phase sequence protection ☐Voltage measurement ☐Frequency measurement ☐Measurement of harmonic current ☐Power factor measurement ☐Power measurement ☐Phase sequence detection ☐Voltage unbalance rate measurement ☐Electric energy measurement ☐Contact equivalent ☐MCR make/break function ☐Load monitoring function ☐Signal contact output function ☐Communication function ☐ZSI regional interlocking protection			
	Note: when the product is a multifunctional controller as arranged by the user, the communication function and the like are the basic function configuration				
Accessories for standard configuration	Under voltage release	☐Instantaneous ☐Time delay_____s (1-2-3-4-5-6-7s provided for frame 1600, optional but not adjustable; 0.5-1-3-5s for frame 3200 and 6300l, optional but not adjustable) ☐AC400V ☐AC230V			
	Shunt release	☐AC400V ☐AC230V ☐DC220V ☐DC110V			
	Closing electromagnet	☐AC400V ☐AC230V ☐DC220V ☐DC110V			
	Energy storage motor	☐AC400V ☐AC230V ☐DC220V ☐DC110V			
	Auxiliary contact	☐4 switch contact ☐5 swith contact ☐6 switch contact(Only for frame 1600,and not available for DC) ☐3 N.O. and 3 N.C. ☐4 N.O. and 4 N.C.(Frame 3200 and 6300 provided)			
Accessories for optional configuration	OFF locking device	☐One breaker is provided with one lock and one key ☐Two breakers is provided with two same locks and one key ☐Three breakers is provided with three same locks and two keys			
	Mechanical interlock	Mechanical interlock ☐Steel cable interlock ☐Connecting-rod interlock			
	☐Button locking device ☐Three-position locking device for the draw-out socket ☐Door interlock ☐Phases barrier				

Note: Extra costs are needed for the optional functions, optional accessories and the like for the breaker.