# NA8G Air Circuit Breaker

## 1. General

With a rated current from 200A to 6300A, and rated operational voltage 415V, 690V, 50Hz, the NA8G series air circuit breaker (hereinafter referred to as "breaker") is mainly used in the distribution network to distribute electric energy and protect lines and power equipment from being damaged by overload, under voltage, short circuit, single-phase grounding and other failures.

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

The product allows the wire to enter or enter from the lower port, and the open frame (draw-out) circuit breaker has isolation function.

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.

This product meets the requirements in IEC/EN 60947-2

## 2. Type designation

N A 8G - □/□

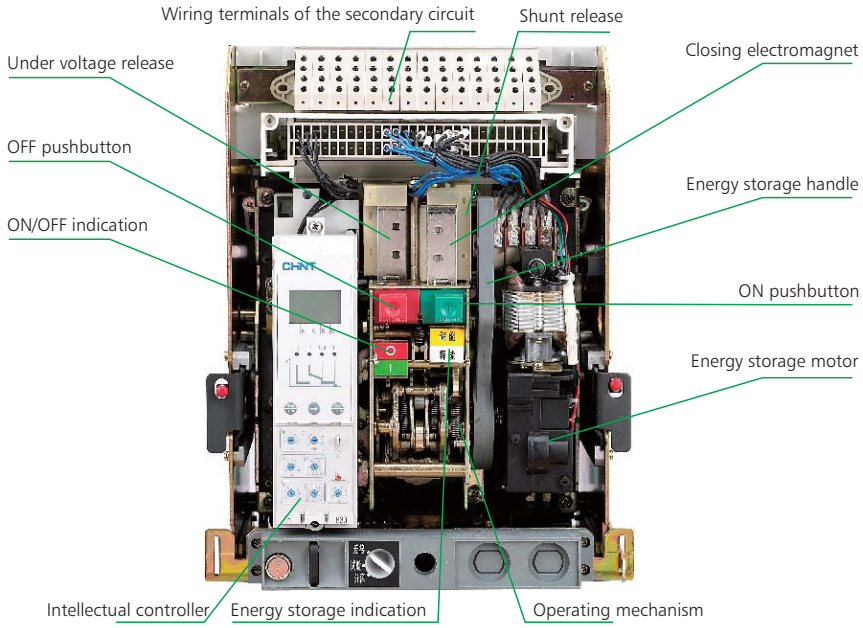
- No. of poles (pole 3 may be omitted)
- Frame size rated current
- Improved product code
- Design sequence number
- ACB
- Company code

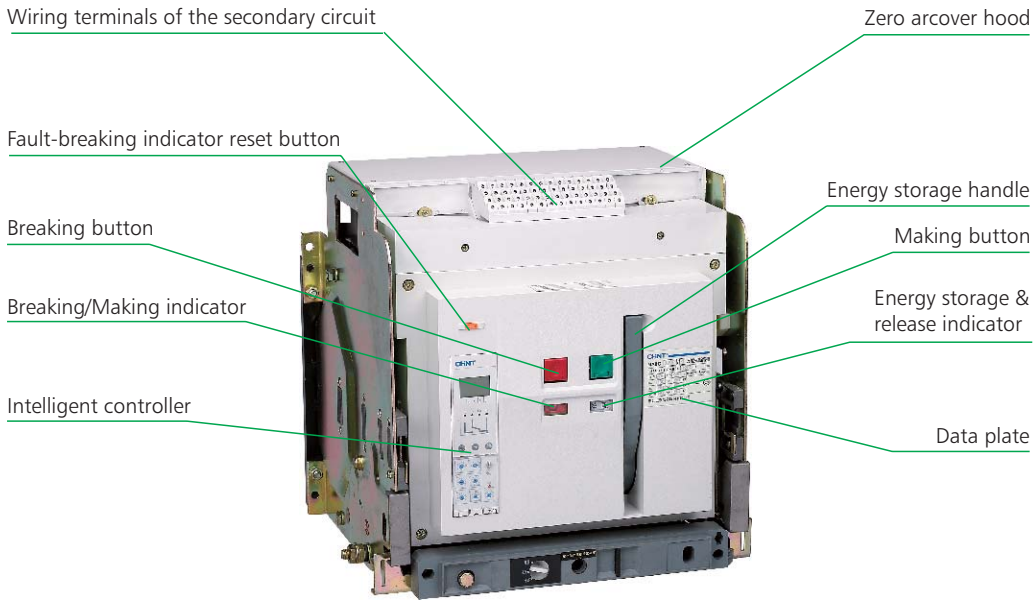
## 3. Operation conditions

3.1 When the ambient air temperature is -5℃ - +40℃, the mean value is no greater than +35℃ within 24 hours.
Note: If the upper limit is higher than +40℃ or lower limit lower than -5℃ in work, discussions shall be made between the user and the manufacturer.
3.2 Altitude: not higher than 2000m for the installation site.
3.3 When the ambient air temperature is +40℃, the relative humidity of the air shall not be higher than 50%; a higher relative humidity is allowed at a lower temperature; for example, for the wettest month, the maximum relative humidity averaged shall be 90% while the lowest temperature averaged in that month +20℃, and special measures shall be taken for the condensation occasionally produced due to temperature change.
3.4 Class of pollution: 3
3.5 The installation category of the breaker' main circuit is IV; when the rated operational voltage of the main circuit is less than or equal to AC400V, The installation category of the control circuit and auxiliary circuit is Ⅲ, apart from the similarity between the under voltage release coil and the intellectual controller's power transformer primary coil and the breaker;
When the rated operational voltage of the major loop is greater than AC400V and less than or equal to AC690V, it is necessary for the control circuit and auxiliary circuit to be isolated from the major loop, and the highest operational voltage of the control circuit and auxiliary circuit is AC400V, the installation category of the control circuit and auxiliary circuit being Ⅲ.

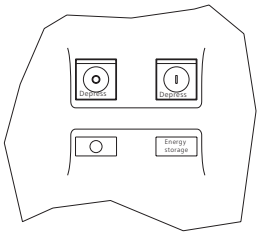
## 4. Product structure

Body structure

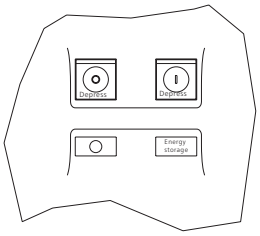


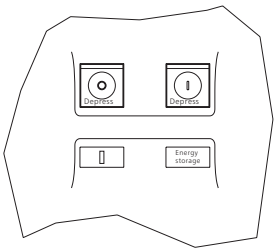
Breaker off and energy storage over



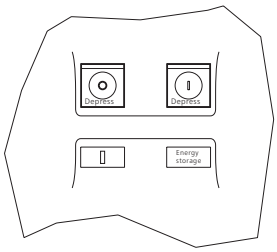

Breaker off and no energy storage



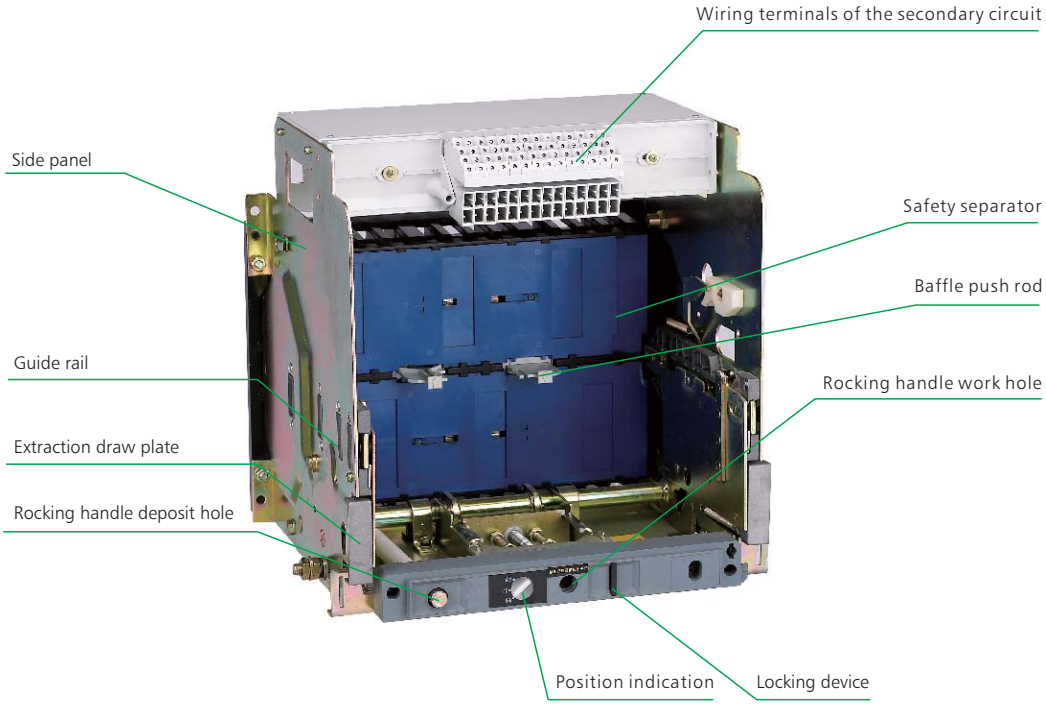

Breaker off and energy storage over

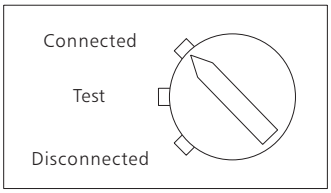



Breaker off and no energy storage

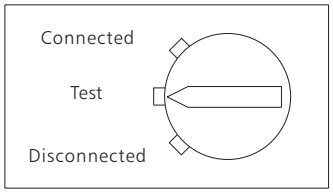



Drawout structure

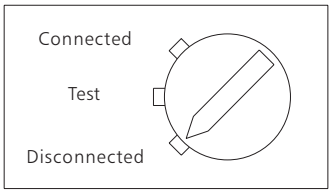




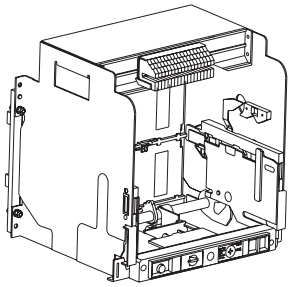

Connected: both main circuit and secondary circuit are connected



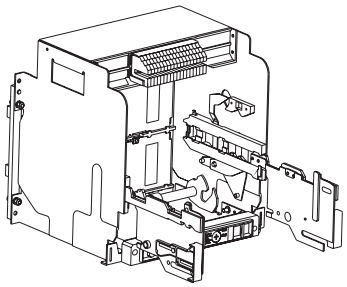

Test: the main circuit is disconnected,
the safety separator works well,
and the secondary circuit is connected.



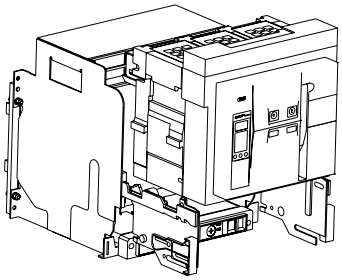

Disconnected: neither main circuit nor secondary circuit is connected



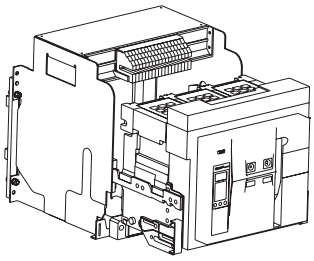
(1)Draw-out socket placed horizontally



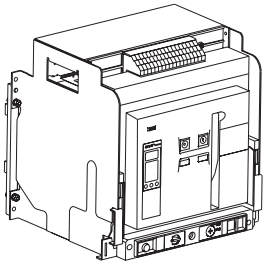
(2)Pull out the guide rail



(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 working position

## 5. Main technical parameters

5.1 Main technical parameters

| Shell grade rated current Inm A | | 1600 | 3200 | 6300 | |
|---|---|---|---|---|---|
| Rated current In A | | 200,400,630,800, 1000,1250,1600 | 1600,2000,2500, 2900,3200 | 4000,5000 | 6300 |
| Nominal insulation voltage Ui V | | 690 | 1000 | 1000 | |
| Rated operational voltage Ue V | | 415 690 | 415 690 | 415 | |
| Rated ultimate short circuit breaking capacity Icu kA | | 50 25 | 100 65 | 120 | |
| Rated service short circuit breaking capacity Ics kA | | 40 20 | 80 65 | 100 | |
| Rated short time withstand current Icw,1s kA | | 40 20 | 80 65 | 100 | |
| Number of poles | | 3P 4P | 3P 4P | 3P 4P | 3P |
| Frequency of operation (number of times/h) | | 20 | 10 | 10 | |
| Number of operations | Mechanical life | 3000 | 3000 | 2000 | |
| | Electrical Life | 1000 | 1000 | 500 | |
| Flashover distance mm | | 0 | 0 | 0 | |
| Line 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 | |
| Net weight (3 poles/4 poles) | fixed type kg | 22/26.5 | 52.5/66.5 | - | |
| | draw-out type kg | 42.5/55 | 98/121 | 210/233 | 233 |
| Size(3 poles/4 poles) Height × width × depth | fixed type | 320×(254/324)×258 | 406×(422/537)×329 | - | |
| | draw-out type | 351×(282/352)×352 | 439×(435/550)×445 | 439×(835/928)×501 | 439×928×501 |

5.2 Capacity-reducing usage

5.2.1 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 |
| 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 |

5.2.2 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 |

5.3 Power loss

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

| Power loss<br>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-6300 | 4000 | 550 | - |
| | 5000 | 590 | - |
| | 6300 | 950 | - |

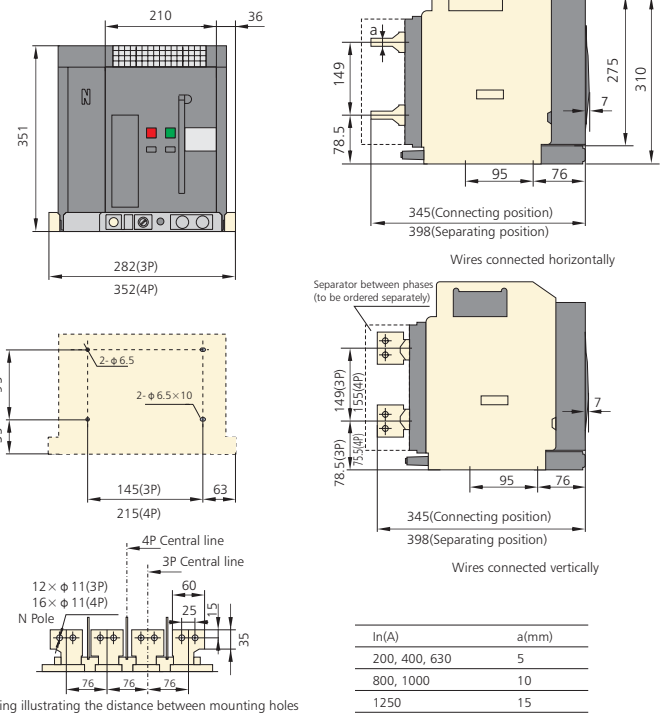
Note: The data and parameters in the above technical documentation results from tests and theoretical calculation, and can only be used as a general type selection guide.They cannot replace industrial practical experience or proof test.

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

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

## 6. Dimensions and connection

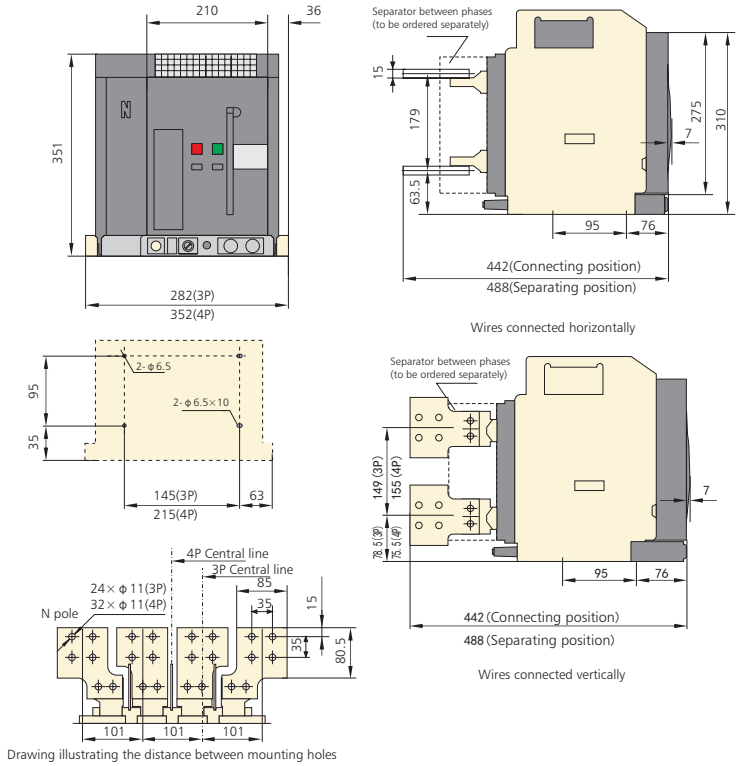
NA8G-1600 (In=200A ~1250A) Draw-out type
(horizontal connection is the default by the factory, vertical one to be made by users themselves).




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

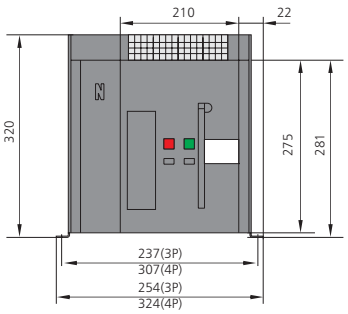
Note: If users intend to change the horizontal connection into vertical one on site, they need to replace the upper and lower buses on both sides with the same one as the central bus.

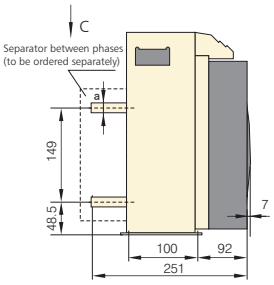
NA8G-1600 (In=1600A) Draw-out type
(horizontal connection is the default by the factory, vertical one to be made by users themselves).



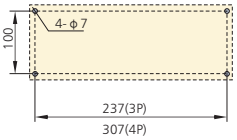

Note: If users intend to change the horizontal connection into vertical one on site, they need to replace the upper and lower buses on both sides with the same one as the central bus.

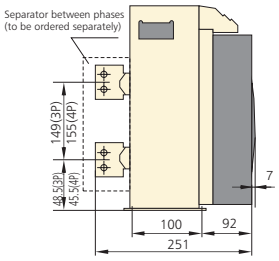
## NA8G-1600 (200A~1250A) Fixed type
(horizontal connection is the default by the factory, vertical one to be made by users themselves).



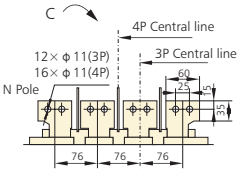




Wires connected horizontally




Wires connected vertically

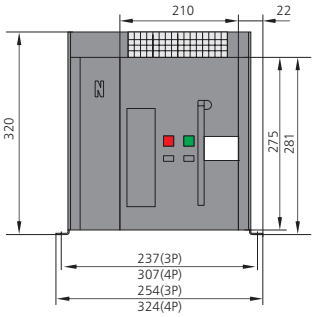


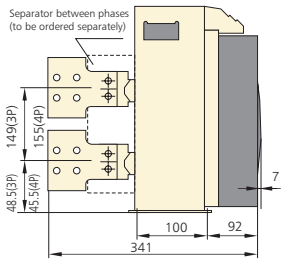

Drawing illustrating the distance between mounting holes

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

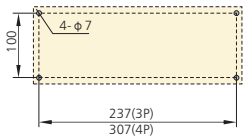
Note: If users intend to change the horizontal connection into vertical one on site, they need to replace the upper and lower buses on both sides with the same one as the central bus.

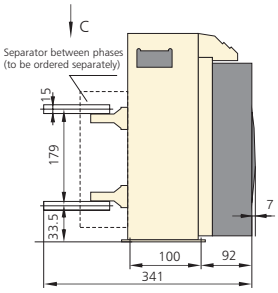
## NA8G-1600 (In=1600A) Fixed type
(horizontal connection is the default by the factory, vertical one to be made by users themselves).



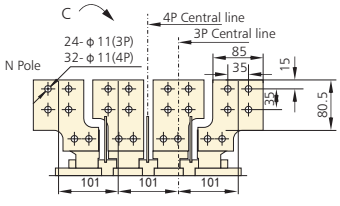




Wires connected vertically



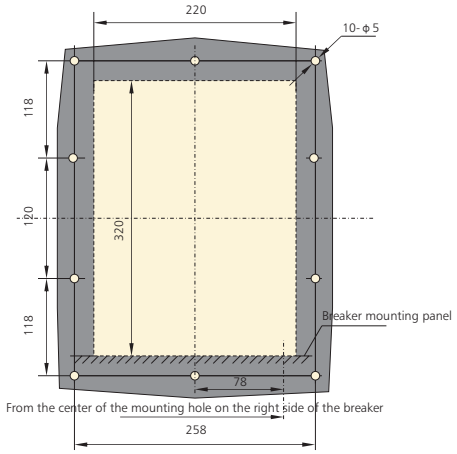

Wires connected horizontally



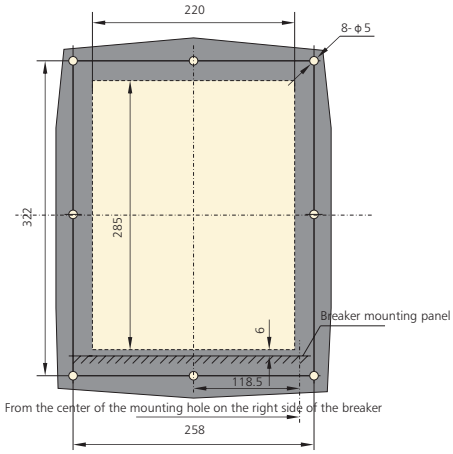

Drawing illustrating the distance between mounting holes

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

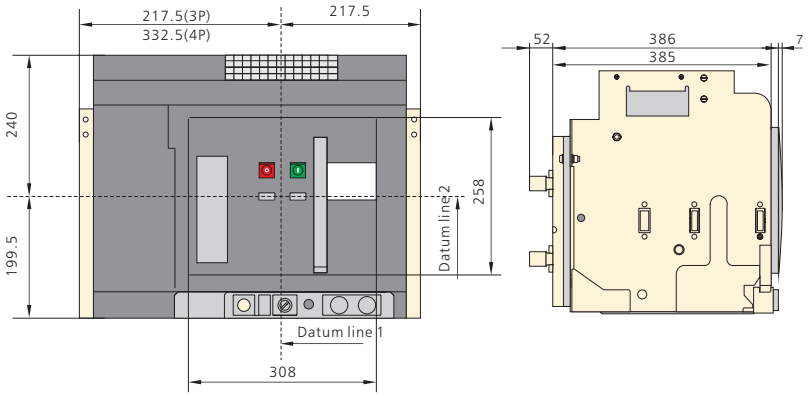
NA8G-1600 Draw-out type
Size of the hole to be drilled on the panel

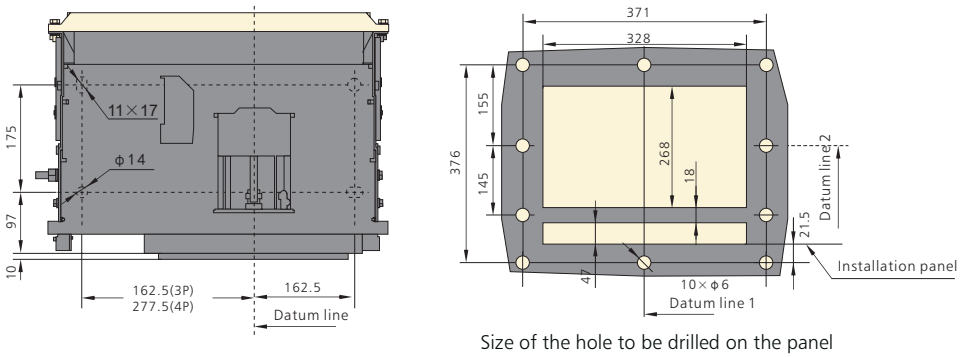



NA8G-1600 Fixed type
Size of the hole to be drilled on the panel



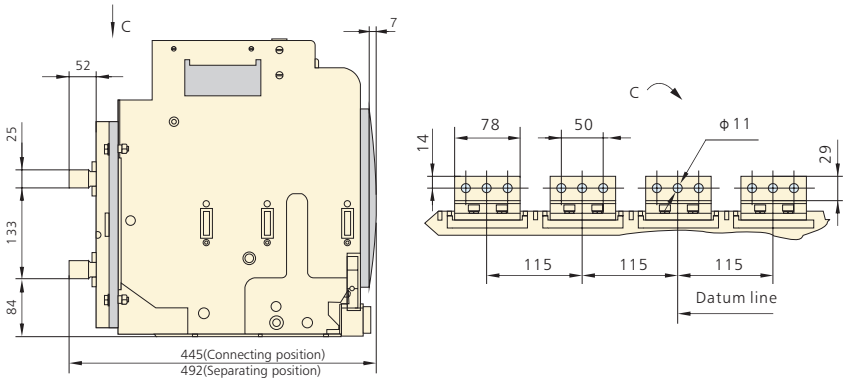

NA8G-3200 Draw-out type
size of the hole to be drilled on the panel



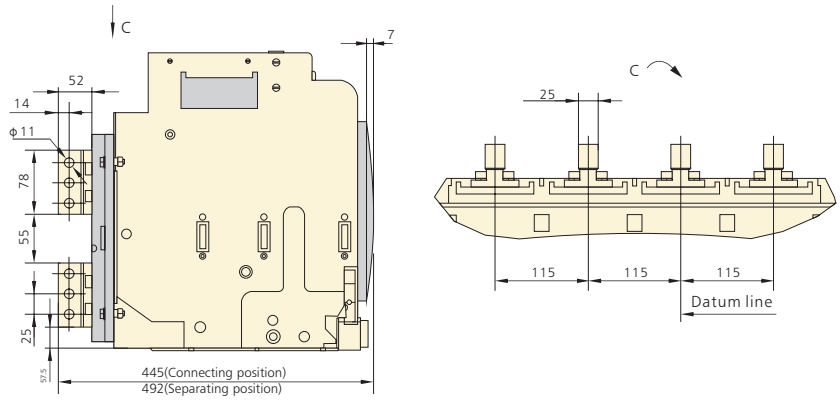

Size of the hole to be drilled on the panel

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



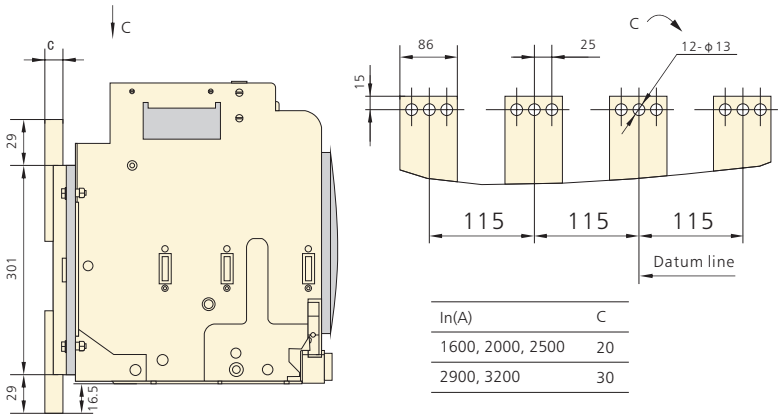

Note: If users want to change the horizontal connection into vertical one on site, they only have to turn the bus by 90°

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



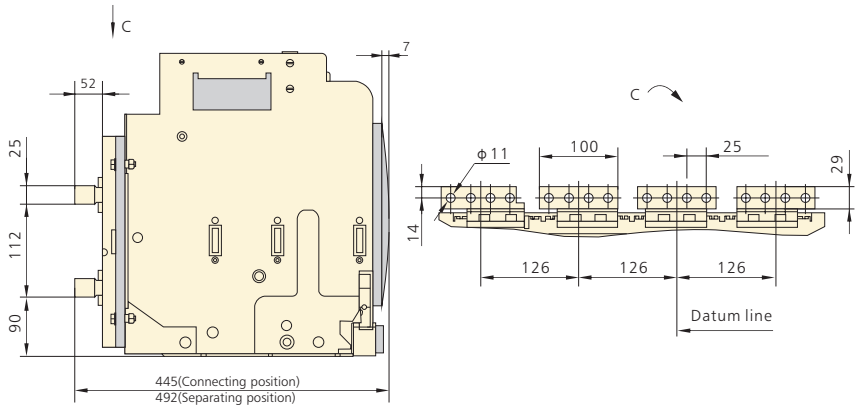

Note: If users want to change the vertical connection into horizontal one on site, they only have to turn the bus by 90°

NA8G-3200 Draw-out type; Front connection

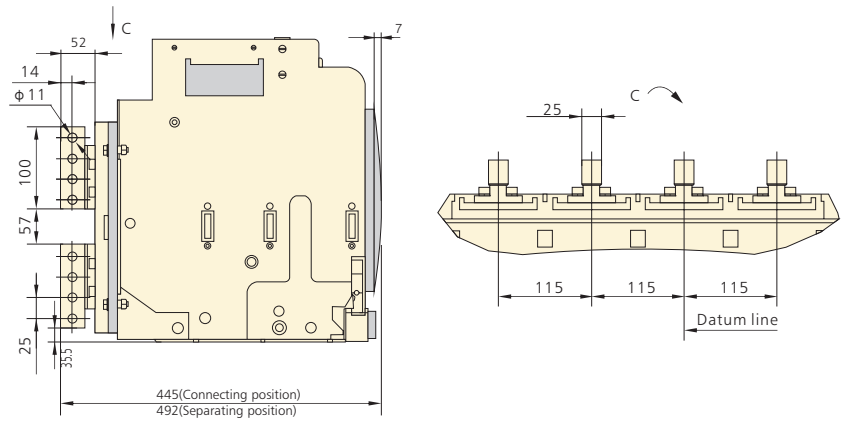



| In(A) | C |
|---|---|
| 1600, 2000, 2500 | 20 |
| 2900, 3200 | 30 |

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

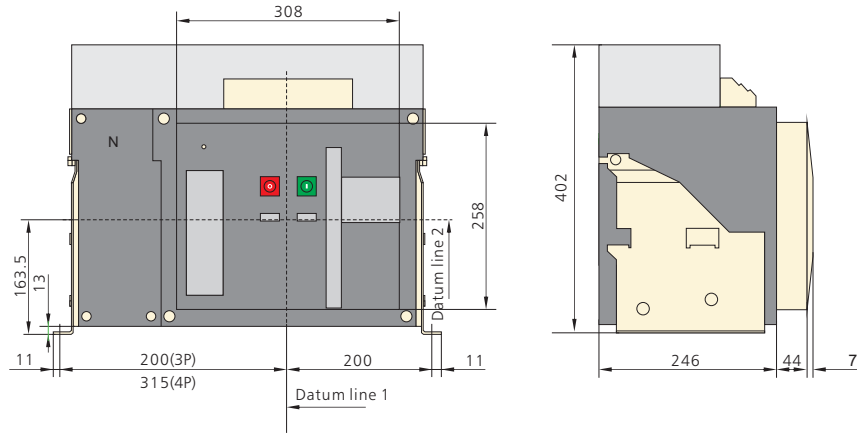



NA8G-3200(In=2900、3200A) Draw-out type (vertical connection to be made by users themselves)

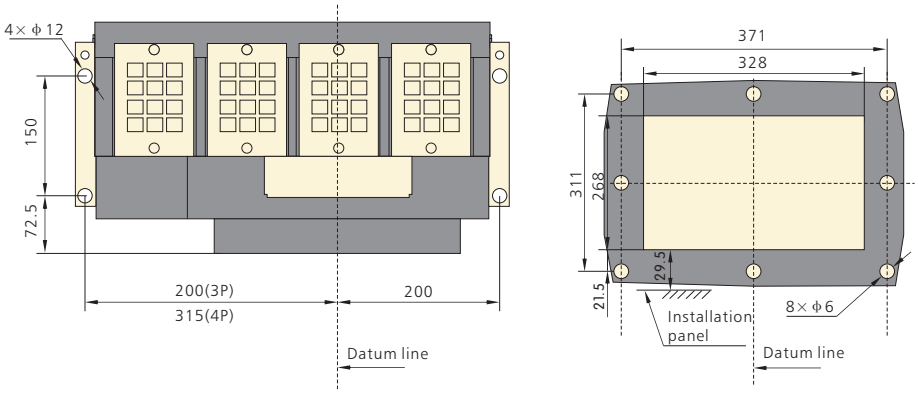



Note: If users want to change the horizontal connection into vertical one on site,
it is necessary to replace the upper and lower buses for the N and B phases with the same one as the A and C phases.

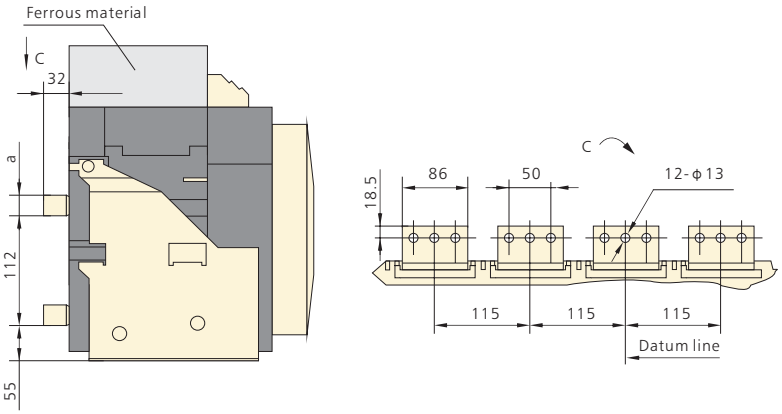
NA8G-3200 Fixed type



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



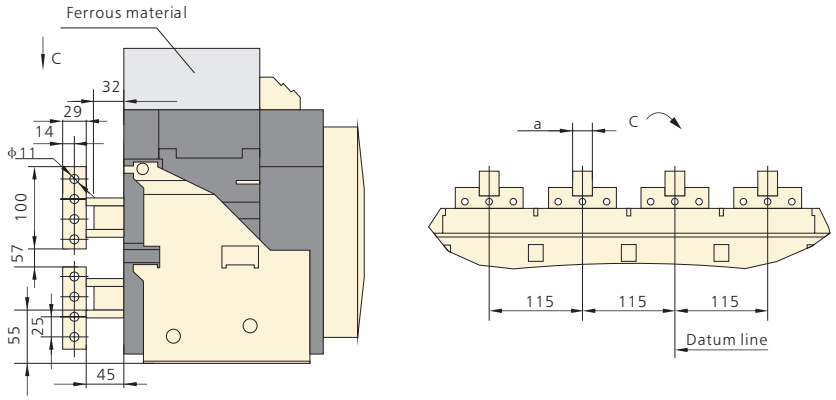

NA8G-3200 Fixed type (horizontal connection is the default by the factory)




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

Note: If users want to change the horizontal connection into vertical one on site, they only have to additionally install a vertical bus.

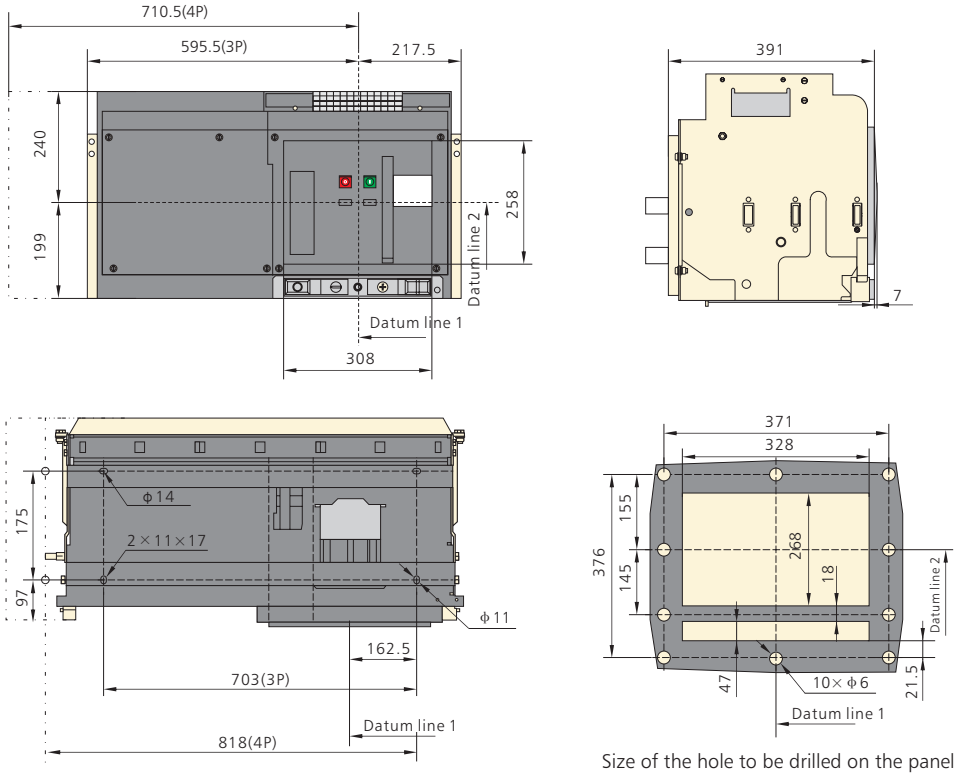
NA8G-3200 Fixed type (vertical connection to be made by users themselves)




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

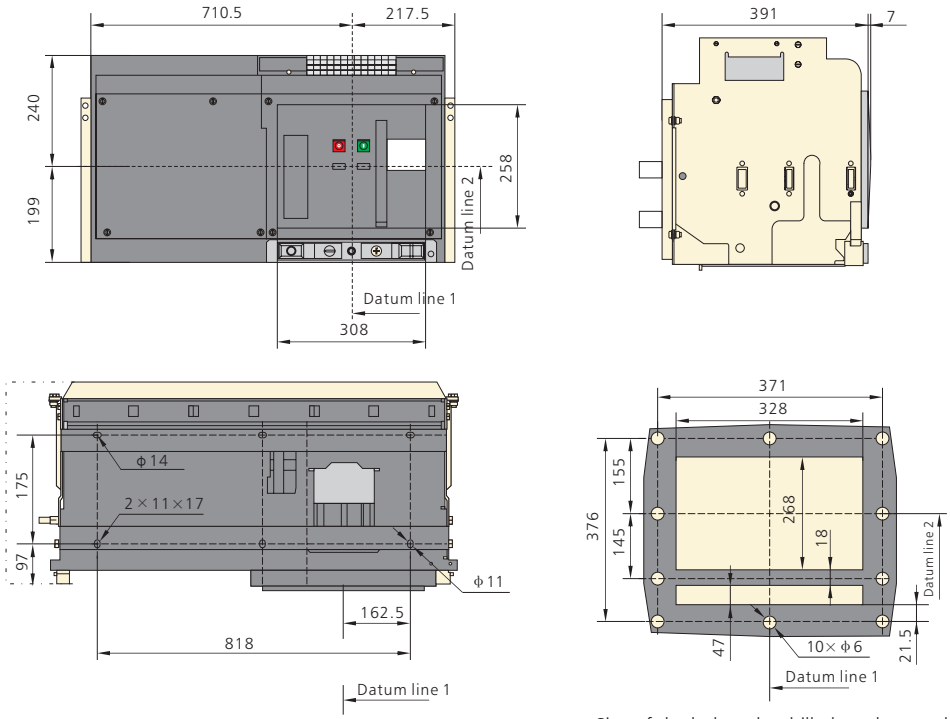
Note: If users want to change the horizontal connection into vertical one on site, they only have to additionally install a vertical bus.

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



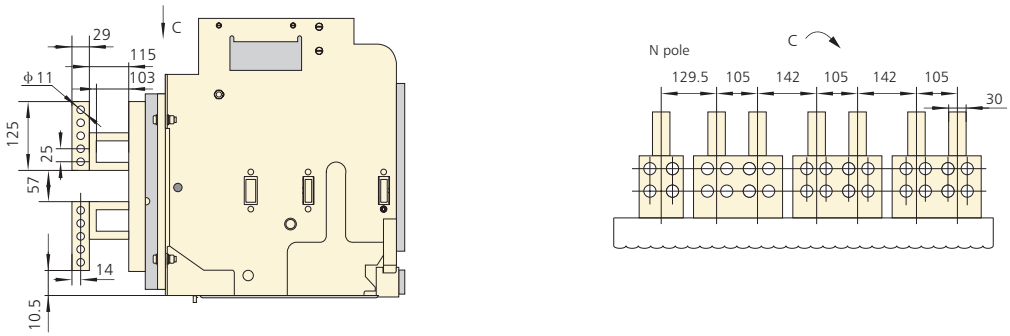

Size of the hole to be drilled on the panel

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



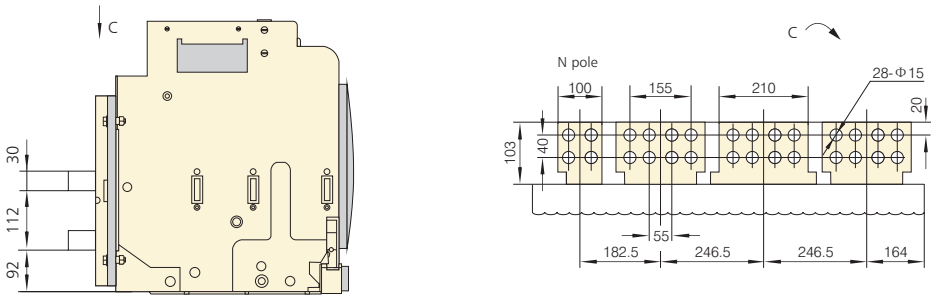

Size of the hole to be drilled on the panel

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



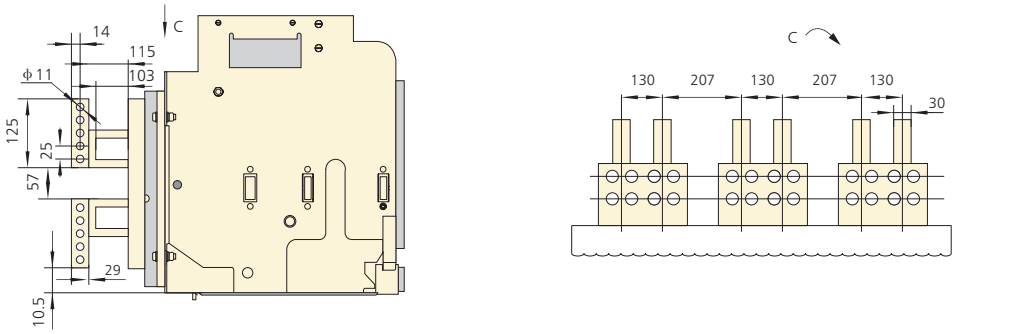

Note: If users want to change the horizontal connection into vertical one on site,
they only have to additionally install a vertical bus.

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



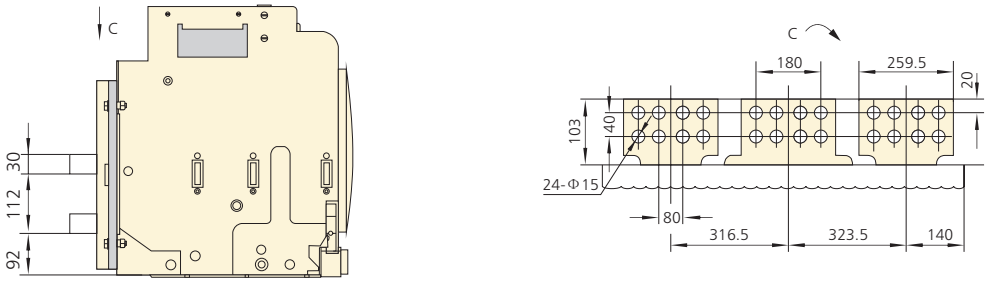

Note: If users want to change the horizontal connection into vertical one on site,
they only have to additionally install a vertical bus.

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




Note: If users want to change the horizontal connection into vertical one on site,
they only have to additionally install a vertical bus.

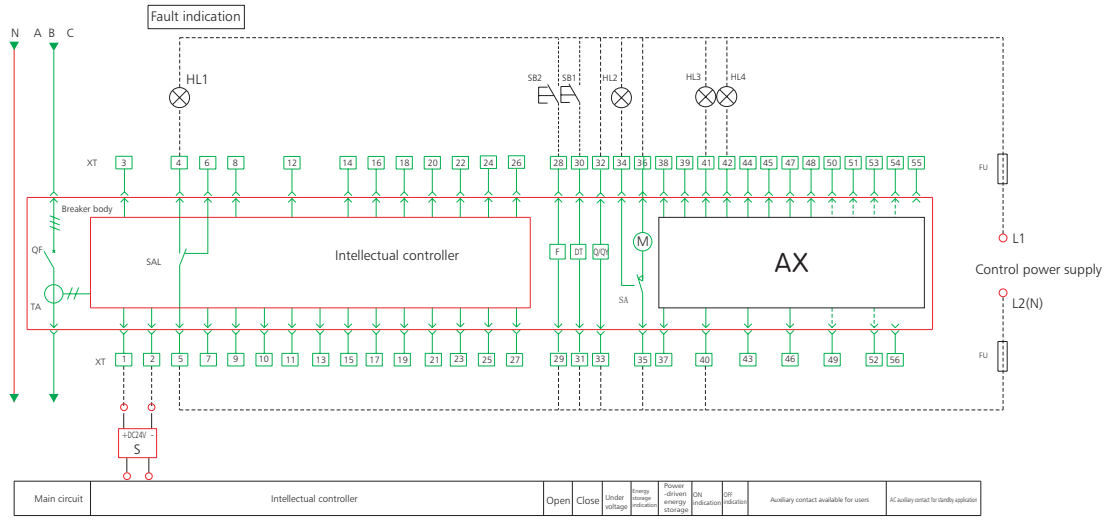
NA8G-6300(In=63000A) Draw-out type
horizontal connection is the default by the factory




Note: If users want to change the horizontal connection into vertical one on site,
they only have to additionally install a vertical bus.

## 7. Secondary circuit wiring

Connection diagram for the secondary circuit of the NA8G-1600 optional standard type intellectual controller

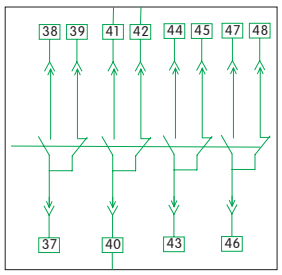



DT——closing electromagnet
SA——travel switch
SB1～SB2——pushbutton
QF——breaker
F——shunt release
M——energy storage motor
HL1～HL4——indicator light
S——power module
Q/QY—under voltage release
DF1 - DF12—auxiliary contact
XT—connection terminal
AX—Auxiliary contact
SAL—sensitive switch
FU—fuse
TA—current transformer

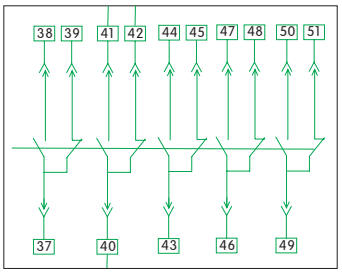
#1 and #2: input (terminals) for intellectual controller auxiliary power supply
#4, #5 and #6: faulty tripping contact output (#5 is the common terminal, AC250V 5A)

The auxiliary contact mades for customer use

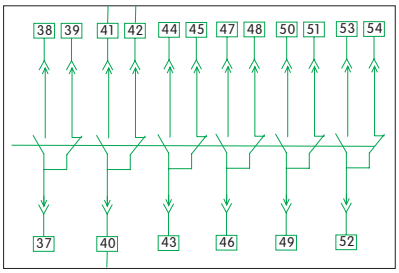
Ⅰ Four switch contact (acquiescence)



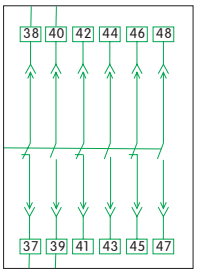

Ⅱ Five switch contact




Ⅲ Six switch contact

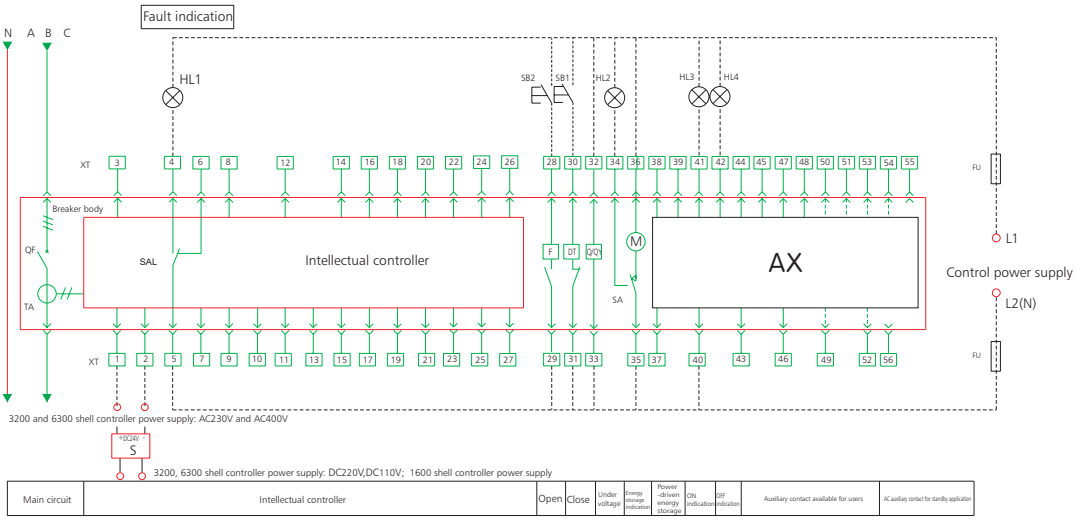



Ⅳ Three open and three close contact




Notes: 1. Four open (contacts) and four close from DF1 to DF8 with a common point available conventionally, two open and two close from DF9 to DF12 with a common point available additionally for Inm = 1600 when special order is made for alternating current, four open and four close from DF1 to DF8 with a common point available only for Inm = 1600 in case of direct current, contact capacity (DC220V 0.5A).
2. Various control voltages of the 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.

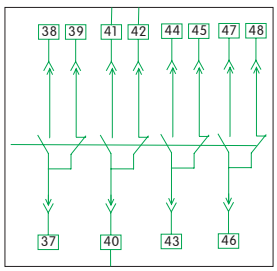
Connection diagram for the secondary circuit of the NA8G-3200 to 6300 optional standard type intellectual controller



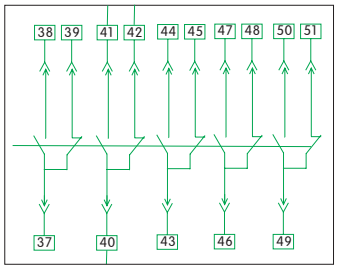

DT——closing electromagnet
F——shunt release
Q/QY—under voltage release
SAL—sensitive switch
SA——travel switch
M——energy storage motor
DF1 - DF12—auxiliary contact
FU—fuse
SB1～SB2——pushbutton
HL1～HL4——indicator light
XT—connection terminal
TA—current transformer
QF——breaker
S——power module
AX—Auxiliary contact

#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 mades for customer use

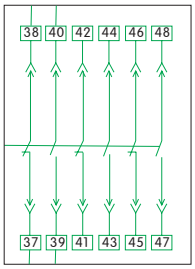
Ⅰ Four switch contact (acquiescence)



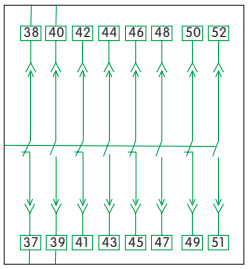

Ⅱ Five switch contact




Ⅲ Three open and three close contact

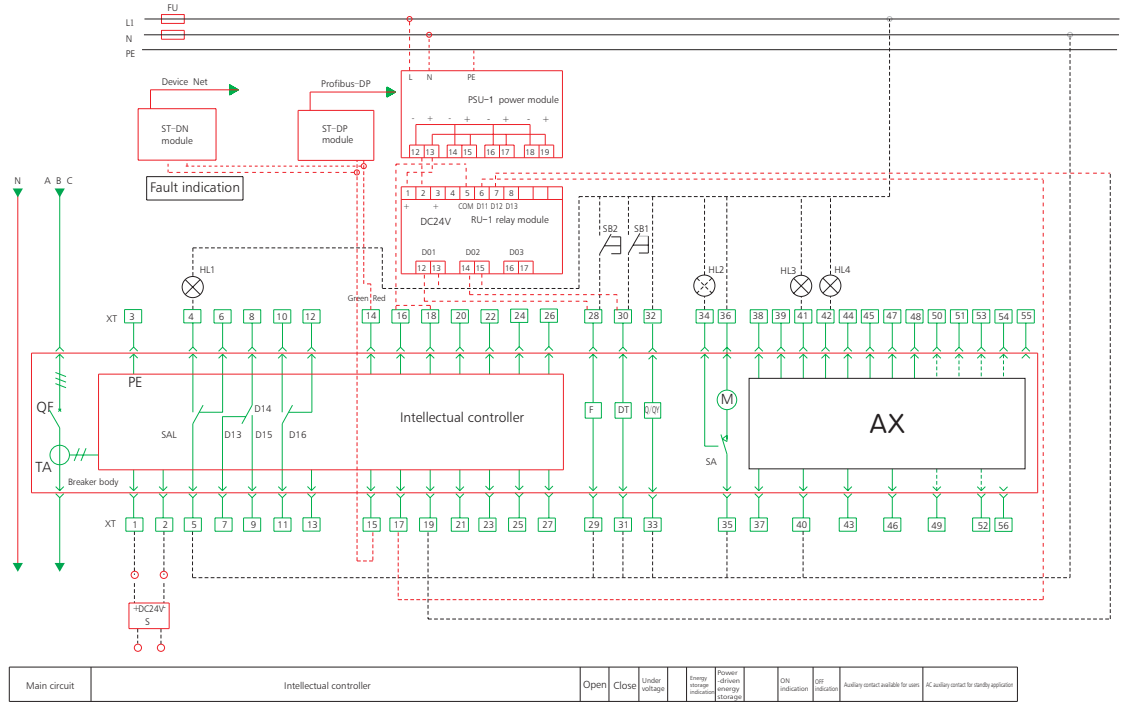



Ⅳ Four open and four close contact




Notes: 1. Four open (contacts) and four close from DF1 to DF8 with a common point available conventionally, one open and one close from DF9 to DF10 with a common point available additionally, contact capacity (DC220V 0.5A)
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 dashed lines shall be made by users.

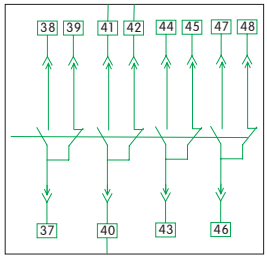
Connection diagram for the secondary circuit of the NA8G-1600 optional type multifunctional controller



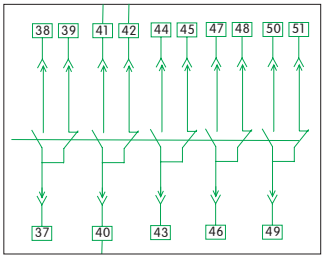

DT——closing electromagnet
F——shunt release
Q/QY—under voltage release
SAL—sensitive switch
SA——travel switch
M——energy storage motor
DF1 - DF12—auxiliary contact
FU—fuse
SB1～SB2——pushbutton
HL1～HL4——indicator light
XT—connection terminal
TA—current transformer
QF——breaker
S——power module
ST-DP —communication module
RU-1—relay module (optional)
PSU-1——power module (optional)
AX—Auxiliary contact
ST-DN—communication module

#1 and #2: input (terminals) for intellectual 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 mades for customer use

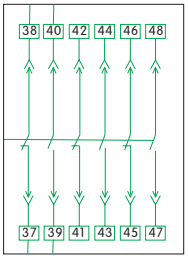
Ⅰ Four switch contact (acquiescence)




Ⅱ Five switch contact

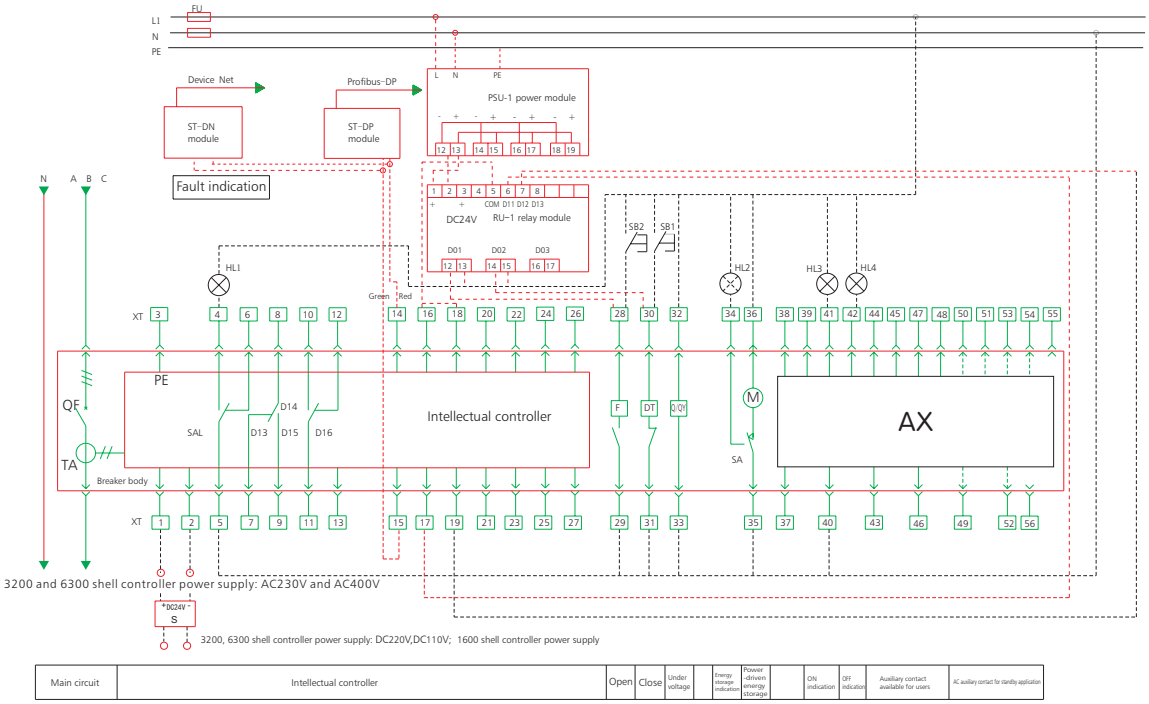



Ⅲ Three open and three close contact




Notes: 1. Four open (contacts) and four close from DF1 to DF8 with a common point available conventionally, two open and two close from DF9 to DF12 with a common point available additionally for Inm = 1600 when special order is made for alternating current. Four open (contacts) and four close from DF1 to DF8 with a common point available only for Inm = 1600 in case of direct current, contact capacity (AC250V 5A).
2. The wiring of the part indicated by dashed lines to be made by users.

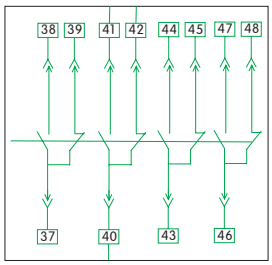
Connection diagram for the secondary circuit of the NA8G-3200 and 6300 optional type multifunctional intellectual controller



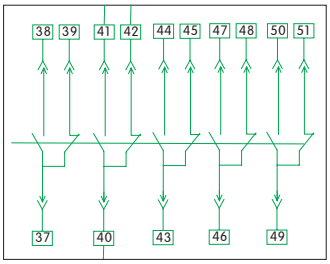

Dt——closing electromagnet F——shunt release Q/QY—under voltage release SAL—sensitive switch
SA——travel switch M——energy storage motor DF1 - DF12—auxiliary contact FU—fuse
SB1～SB2——pushbutton HL1～HL4——indicator light XT—connection terminal TA—current transformer
Qf——breaker S——power module ST-DP —communication module RU-1—relay module (optional)
PSU-1——power module (optional) AX—Auxiliary contact ST-DN—communication module

#1 and #2: input (terminals) for intellectual 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 mades for customer use

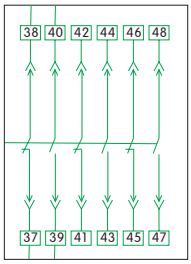
Ⅰ Four switch contact (acquiescence)




Ⅱ Five switch contact



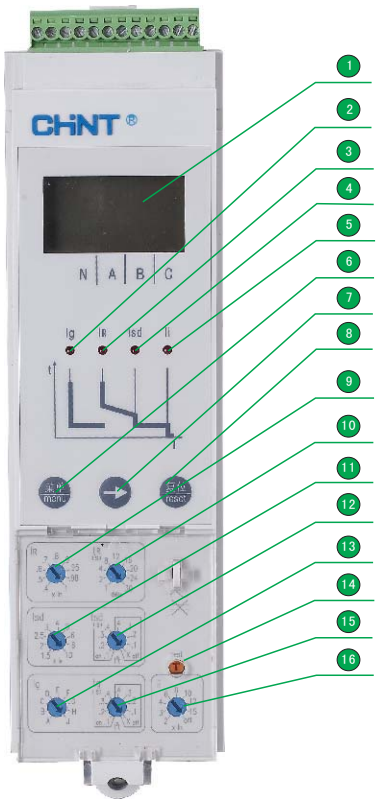

Ⅲ Three open and three close contact




Notes: 1. Four open (contacts) and four close from DF1 to DF8 with a common point available conventionally, one open and one close from DF9 to DF10 with a common point available additionally when special order is made for alternating current. Contact capacity AC250V 5A
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.

## 8. Intelligent controller and protective characteristics

8.1 User interface of the standard type controller

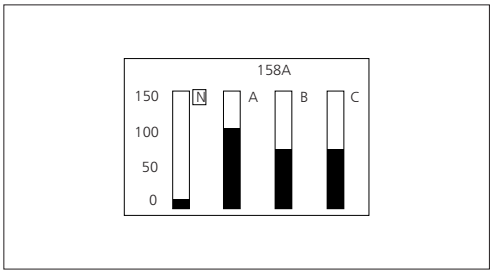



| | |
|---|---|
| 1 LED window | LCD window capable of showing the current for each phase, various setting parameters, rated current, fault current, tripping time, and the like |
| 2 " Ig " limp | Asymmetric grounding, neutral line fault indication |
| 3 " IR " limp | Over current long time delay fault indication |
| 4 " Isd " limp | Short-circuit short-time delay fault indication |
| 5 " Ii " limp | Short-circuit instantaneous fault indication |
| 6 " MENU " Pushbutton | Successively access to submenus at various levels by pressing the MENU key |
| 7 " → " Pushbutton | To inquire the current for each phase at present: recurrently select the contents in the menus at various levels |
| 8 " RESET " Pushbutton | Return to previous menu; the intellectual controller software is reset; 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 over current long time delay current multiple setting |
| 10 " tR " Knob switch | There are (1, 2, 4, 8, 12, 16, 20, 24, 30)s, nine settings altogether, for the over current long time delay time setting 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 short-circuit short-time delay current multiple setting |
| 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 asymmetric grounding (neutral line) current multiple setting For the typical numerical values thereof, see the characteristic parameter table |
| 14 " test " Pushbutton | Button for simulating instantaneous tripping test |
| 15 " tg " Knob switch | For the asymmetric grounding (neutral line) time setting, 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 asymmetric grounding (neutral line) |
| 16 " Ii " Knob switch | Short-circuit instantaneous current multiple setting. |

8.2 Default interface and menu structure 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 "→")

Operation method: Press MENU to go to the primary menu, then press "→" selection menu, and than press MENU Go to the secondary menu, press "→" selection menu or modify the parameter, press RESET to return to the previous menu

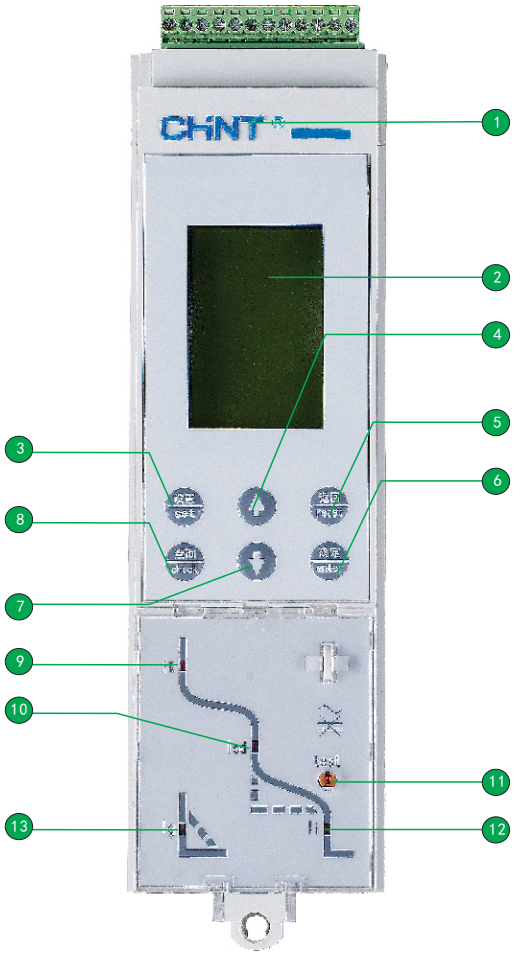
Default interface for the standard type controller




| Primary menu | Secondary menu | Third menu | |
|---|---|---|---|
| Magnitude of current | Instantaneous value | Ia= 1000A | |
| | | Ib= 1001A | |
| | | Ic= 998A | |
| | | In= 0A | |
| | | Ig= 0A | |
| | Maximum | Ia= 1300A | Simultaneously press MENU and "→" to reset |
| | | Ib= 1400A | |
| | | Ic= 1380A | |
| | | In= 200A | |
| | | Ig= 0A | |
| | Current thermal capacitance | 0% | |
| Protection parameter | Long time delay setting current Ir=1600A and long time delay setting time tr=Is@6Ir | | |
| | Short time delay setting current Isd=9600A short time delay setting time tsd=0.4s | | |
| | Instantaneous setting current Ii=16000A | | |
| | Grounding setting current Ig=1600A grounding setting time tg=OFF | | |
| | Long time delay thermal capacitance cooling time = instantaneous | Instantaneous<br>10min<br>20min<br>30min<br>45min<br>1h<br>2h<br>3h | |
| | Long time delay protection = open | Open<br>Close | |
| Fault recording | For example, long time-lag tripping Note: Up to 8 times of failures can be recorded | For example: Long time-lag tripping Ib=2894A actuation time 12.06s Ir=1600A the event having taken place, the time being 0:21 on the date of 0 | |
| Self-diagnostic alarm | Alarm free | | |
| Contrast adjustment | 45 (default) note: adjustable range from 35 to 60 | | |

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

8.3 User interface of the multifunctional controller

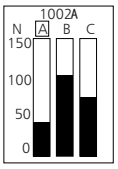



| | | |
|---|---|---|
| 1 | Brand | "CHINT" Brand |
| 2 | LED window | LCD window capable of showing the current for each phase, various setting parameters, rated current, fault current, tripping time and the like |
| 3 | SET key | Switch to the set default menu (left arrow key, when it is necessary 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 | Over current long time delay fault indication |
| 10 | " Isd " limp | Short-circuit short-time delay fault indication |
| 11 | " test " | Button for simulating instantaneous tripping test |
| 12 | " Ii " limp | Short-circuit instantaneous fault indication |
| 13 | " Ig " limp | Asymmetric grounding, neutral line fault indication |

8.4 Default interface and menu structure for the multifunctional controller

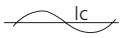
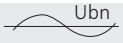
The multifunctional controller provides 4 title menus (measurement menu, parameter setup menu, protection parameter setup menu, and history record and maintenance menu) and 1 default menu.

Default interface for the multifunctional controller




8.4.1 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<br>Ic, In |  Ia | |
| | | |  Ib | |
| | | |  Ic | |
| | | |  In | |
| | | Uan, Ubn<br>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%<br>0.0%<br>3 5 7 9 11...31) |
| | | | Ib(3, 5, 7...31) | Ib FFT THD=0.0%<br>0.0%<br>3 5 7 9 11...31) |
| | | | Ic(3, 5, 7...31) | Ic FFT THD=0.0%<br>0.0%<br>3 5 7 9 11...31) |
| | | | In(3, 5, 7...31) | In FFT THD=0.0%<br>0.0%<br>3 5 7 9 11...31) |
| | | U(3, 5, 7...31) | Uab(3, 5, 7...31) | Uab FFT THD=0.0%<br>0.0%<br>3 5 7 9 11...31) |
| | | | Ubc(3, 5, 7...31) | Ubc FFT THD=0.0%<br>0.0%<br>3 5 7 9 11...31) |
| | | | Ubc(3, 5. 7...31) | Ubc FFT THD=0.0%<br>0.0%<br>3 5 7 9 11...31) |
| | | | Uca(3, 5, 7...31) | Uca FFT THD=0.0%<br>0.0%<br>3 5 7 9 11...31) |

8.4.2 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<br>=locking | |
| | | (input) user password<br>=0000 | User password (change)<br>=0000 | |
| Communication setting | Address | =3 | | |
| | Baud rate | =9.6K | | |
| I/O setting | Function setting | =DO1<br>=regional interlocking | | |
| | Executive mode | =DO1<br>=N.O. pulse<br>=360s | | |
| | I/O state | I/O state<br>DO1 DO2 DO3 DI1<br>1 1 1 1 | | |

8.4.3 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 | |

8.4.4 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 | | |
| | IContact wear | e.g.: 20(ACK key, reset) | | |
| Product information | Zhejiang CHINT electrics co., LTD | | | |
| Tripping record | e.g.:<br>1 Under voltage tripping<br>2004/06/17 | Under voltage tripping<br>T=0.20s<br>Umax=0V<br>11:24:59<br>6/17 | | |
| | | F=0.00Hz<br>Uab= 0V<br>Ubc= 0V<br>Uca= 0V | | |
| | ..... | ..... | | |

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

8.5 List of the controller functions
Standard configuration

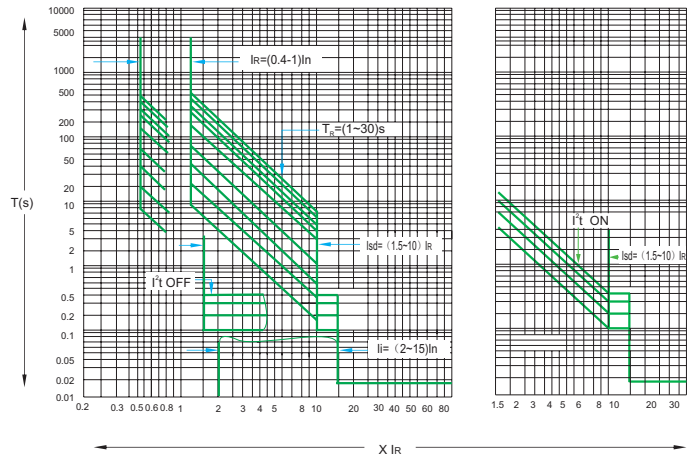
| Standard type (M type) | Multifunction type (H type) |
|---|---|
| 1.Quadruple over current protection (for overload, short-time delay time, instantaneous, grounding); grounding corresponds to vector sum (T type);<br>2.Parameter setup: fixed value setting position setting function<br>3.Current measurement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

Heat capacity measurement

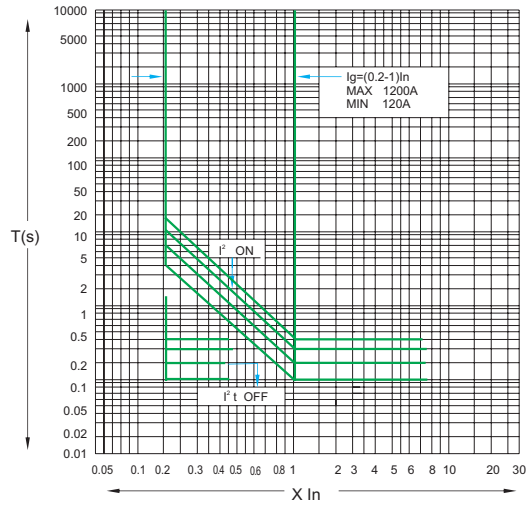
| Standard type (M type) | Multifunction type (H type) | |
|---|---|---|
| | P Function | H Function |
| None | 1.Voltage measurement;<br>2.Voltage unbalance measurement;<br>3.Frequency measurement;<br>4.Phase sequence measurement;<br>5.Electric energy measurement;<br>6.Power measurement;<br>7.Power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

## 8.6 Characteristic parameters of the standard type intelligent controller

Over current protection characteristics




Neutral line (grounding) fault protection characteristic



8.6.1 Over current long time delay characteristic

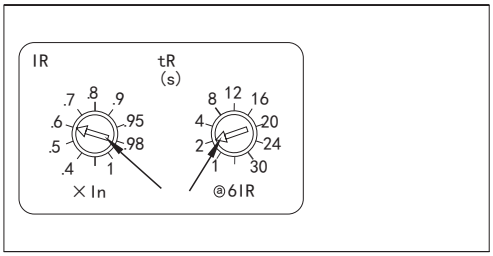
| Rated current range IR | Error | Line current I | Operating time tR(s) | | | | | | | | | Time (delay) error |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (0.4~1)In | ±10% | ≤1.05IR | No actuation within 2h | | | | | | | | | |
| | | >1.30IR | <1h and then actuate | | | | | | | | | |
| | | 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

Long-time delay operating current adjustable:
IR=(0.4-0.5-0.6-0.7-0.8-0.9-0.95-0.98-1)×In,
and there are nine settings for option.

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 6IR: tR=(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 IR=0.6In, and the delay tripping time is 2s (in the condition of 6IR).




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

8.6.2 Short-circuit short-time delay inverse-time or definite-time limit protection

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

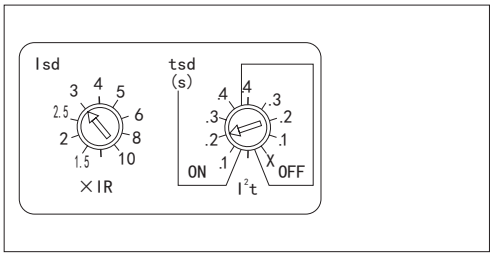
Explanation for parameter setting

The short-circuit short-time delay protection operating current adjustable: Isd=(1.5-2-2.5-3-4-5-6-8-10)×IR, and there are nine settings for option.

There are nine settings for the short-time delay tripping time, wherein 4 settings represent the definite-time limit characteristic (i.e., I2t OFF), 4 settings the inverse-time limit characteristic, and 1 setting the function of closing the 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., I2t ON), there are two cases: ① the case of I>1.15Isd and I>10IR represents the definite-time limit; ② the case of I>1.15Isd and I≤10IR represents the inverse-time limit characteristic and the actual tripping time is calculated according to the formula I2Tsd=(10IR)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 protection is similar to that for over current long time delay protection. As shown in the figure, the current for the short-circuit short-time delay protection is 3IR, and the tripping time is set as tsd=0.2s in the setting position of inverse time limit (I2t ON).




Example 2: If it is known that the short-time delay setting current is Isd=3IR, then the tripping time is set as tsd=0.2s in the setting position of inverse time limit (I2t ON). Now the current is 7IR in the line current, then the short-time delay tripping time can be worked out by calculation:
1.5Isd=1.15×3IR=3.45IR
Then I=7IR>1.15Isd
And because I=7IR<10IR
So according to I2×Tsd=(10I)2tsd
(7IR)2×Tsd=(10IR)2×0.2
Tsd=0.41s

8.6.3 Short-circuit instantaneous protection

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

Explanation for parameter setting

The instantaneous protection operating current is adjustable: Ii=[2-3-4-6-8-10-12-15-OFF]×In, and there are nine settings for option.

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


8.6.4 Single-phase grounding fault protection

| Rated current range Ig | Error | Line current I | Operating time tg(s) | Time (delay) error |
|---|---|---|---|---|
| (A～J)In<br>＋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<br>I>J | 0.1 0.2 0.3 0.4 | |
| | | $I^2T$ ON<br>I≤J | anti-time-limit delay $I^2Tg=(J)^2tg$ | |

Meaning of each setting position for 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 | |

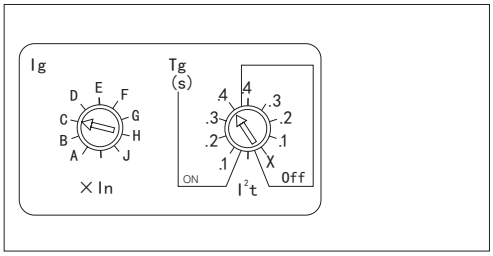
Explanation for parameter setting

The single-phase grounding protection operating current is adjustable: Ig=(A-B-C-D-E-F-G-H-J)×In, and there are nine settings for option.

There are nine setting positions for the protective delay tripping time, wherein 4 settings represent the definite-time limit characteristic (i.e., I2t OFF), 4 settings the inverse-time limit characteristic (I2t ON), and 1 setting the function of closing the grounding 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 grounding protection).

When the tripping time is set as inverse-time limit operating characteristic (i.e., I2t 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 I2Tg=(J)2tg. In the formula, I is the line current, Tg the actual operating time, J the setting current, and tg the setting tripping time. The method for setting the parameter is similar to that for over current long time delay protection. As shown in the figure, the grounding 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 grounding fault protection setting current for the intellectual controller with a 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 line 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 intellectual controller, the current settings for the long- and the short-time delay and the instantaneous protection should not come across each other, and the condition of IR＜Isd＜Ii must be ensured.

8.7 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 T key, and the intellectual 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

8.8 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%

## 9. Accessories

9.1 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 consumption(W) | 20VA |

Under-voltage release (Inm=1600A)

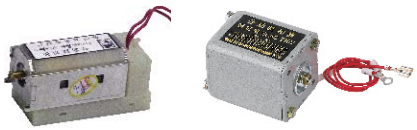
Under-voltage release (Inm=3200A, 6300A)

9.2 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)

9.3 Closing electromagnet

After the motor 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 consumption (W) | 200VA | 200W |
| Closing time | 50±10ms | |

Closing electromagnet (Inm=1600A)

Closing electromagne (Inm=3200A, 6300A)

9.4 Power operating mechanism
The functions of motor 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 consumption (W) | 75/150VA | 75/150W |
| Energy storage time | <4s | |
| Frequency of operation | At most 3 times in a minute | |


(Inm=1600A)


(Inm=3200A, 6300A)

9.5 Auxiliary contact (with a common point)
4 groups of changeover contacts (2 N.O. and 2 N.C.) are provided for the standard form of auxiliary contacts, and 6 groups of changeover contacts (3 N.O. and 3 N.C.) for the special form (Inm=1600A not available for DC).


(Inm=1600A)


(Inm=3200A, 6300A)

Technical parameters:

| Rated voltage(V) | | Rated thermal current Ith(A) | Rated control capacity |
|---|---|---|---|
| AC | 230<br>400 | 6 | 300VA |
| DC | 220 | 6 | 60W |

9.6 Separator between phases
The separator is installed between the phases of the line bank to improve the insulating ability between the phases of the breaker.

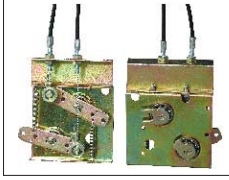
9.7 Key lock
The OFF pushbutton of the breaker can be locked in the position of depress, and at this time, the breaker cannot be closed for operation; after the user selects the option, the factory provides locks and keys; one breaker is provided with one independent lock and one key for the one lock; two breakers, two independent locks and one key for the two locks; three breakers, three same locks and two same keys for the three locks.
Note:
a.For the air circuit breaker with key interlock, 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.
b.The key for the 1600 does not work for the 3200 and 6300 shell breakers and vise versa, so be on guard against the distinction between them.

9.8 Pushbutton lock
It is used to lock the button for opening and closing the breaker with the padlock used for such a purpose. (Padlocks to be provided by users themselves)

9.9 Door frame and lining pad
They are installed on the door of the distribution cabinet room to seal it with a protection level of up to IP40.

9.10 Drawer type of air circuit breaker “separation” position locking device
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.

9.11 The drawer type of air circuit breaker about any working position locking device
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).



9.12 Interlock with the door
Interlock with the door 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.
Interlock with the door 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.

9.13 Mechanical interlock
It can realize the interlock of two horizontal or vertical-installed,three poles or four poles, drawout type or fixed type circuit breaker.

## 10. Installation

10.1 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

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

10.3 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.

10.4 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.

10.5 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.

10.6 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

10.7 The breaker shall be grounded substantially.

## 11. 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<br>1 Check the breaking current and operating time on the intellectual controller<br>2 Analyze the operation of the load and power network<br>3 Promptly find and shoot the trouble if overload is confirmed<br>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<br>5 Press the reset button to close the breaker again |
| | | Short-circuit fault tripping (short time delay or instantaneous indicator on) | 1 Check the breaking current and operating time on the intellectual controlle<br>2 Promptly find and shoot the trouble if overload is confirmed<br>3 Check the setting value of the intellectual controller<br>4 Check to see whether the breaker is in good condition, and determine whether it can be closed for operation<br>5 Press the reset button to close the breaker again |
| | | Grounding fault tripping (grounding fault indicator on) | 1 Check the breaking current and operating time on the intellectual controller<br>2 Promptly find and shoot the trouble if it is confirmed that there is a grounding fault<br>3 If no grounding fault is detected, please determine whether the grounding fault current setting is proper, and can be well matched with the actual protection; if not, the setting shall be modified<br>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<br>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<br>2 Whether the power voltage is lower than 85%Ue<br>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 f ails to be put to the right 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<br>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 connection position) |
| | | Closing electromagnet trouble | 1 Check the power voltage of the closing electromagnet, and it must be higher than or equal to 85%Us<br>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<br>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<br>2 Check to see if there is any overload current in the circuit, find and shoot the trouble, if any<br>3 Check the setting value of the intellectual controller for reasonability, and a re-setting process is necessary if not reasonable<br>4 Press the reset button to close the breaker again |
| 4 | Breaker fails to open | The breaker fails to open in power-driven mode<br>The breaker fails to open 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<br>2 Check he operating mechanism for mechanical fault. |
| 5 | Breaker fails to store energy | Energy failed to be stored in power-driven mode | 1 Check the motor energy storage mechanism control power voltage, and the voltage shall be ≥85%Us; check the status of the circuit connection<br>2 Check the motor |
| | | Can' t achieve manual energy storage | Energy storage mechanism malfunction |
| 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<br>Breaker fails to completely reach the SEPERATION position | Pull out the rock rod<br>Put the breaker completely to the SEPERATION 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<br>Turn the key on the "drawer" to unlock the matter |
| 8 | No display on the intellectual controller screen | Intellectual controller fails to be energized by power supply:<br>Improper input voltage for the auxiliary power supply<br>Improper secondary output voltage for the transmitter<br>Unreliable connection between the secondary output terminal of the transmitter and the controller | 1 Check to see if the intellectual controller power supply is well be connected and works well<br>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 |

## 12. Specifications for ordering

| User | | Order amount | Order date | Tel |
|---|---|---|---|---|
| Type and size | ☐NA8G-1600 | | ☐NA8G-3200 | ☐NA8G-6300 |
| Rated current (In)A | ☐200 ☐400 ☐630 ☐800<br>☐1000 ☐1250 ☐1600 | | ☐1600 ☐2000 ☐2500<br>☐2900 ☐3200 | ☐4000 ☐5000<br>☐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: IR=1In, 2s(6IR); Isd=8IR, inverse-time limit 0.4s; Ii=12In; In>1200A Ig=800A; In≤1200A Ig=D×In, OFF<br>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)<br>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)<br>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 See Manual, p. 24<br>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<br>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<br>☐Voltage unbalance measurement ☐Phase sequence protection ☐Voltage measurement ☐Frequency measurement<br>☐Measurement of harmonic current ☐Power factor measurement ☐Power measurement ☐Phase sequence detection<br>☐Voltage unbalance rate measurement ☐Electric energy measurement ☐Contact equivalent<br>☐Power network history parameter recording function ☐MCR make/break function ☐Load monitoring function<br>☐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 the 1600 shell, optional but not adjustable; 0.5-1-3-5s for the 3200 and 6300 shell, optional and adjustable) ☐AC400V ☐AC230V | |
| | Shunt release | ☐AC400V ☐AC230V ☐DC220V ☐DC110V | |
| | Closing electromagnet | ☐AC400V ☐AC230V ☐DC220V ☐DC110V | |
| | Energy storage motor | ☐AC400V ☐AC230V ☐DC220V ☐DC110V | |
| | Auxiliary contact | ☐2 NO and 2 NC ☐3 NO and 3 NC(Inm=1600not available for DC) | |
| Accessories for optional configuration | OFF locking device | ☐One breaker is provided with one lock and one key<br>☐Two breakers is provided with two same locks and one key (the same key/lock not available for the 1600 and 3200/6300 shell breakers)<br>☐Three breakers is provided with three same locks and two keys (the same key/lock not available for the 1600 and 3200/6300 shell breakers) | |
| | Mechanical interlock | Two-breaker interlock solution ☐Steel cable interlock ☐Joint rod | |
| | ☐BUTTON locking device ☐Three-position locking device for the draw-out socket ☐Door interlock<br>☐Separator between phases ☐Door frame ☐Auxiliary power module | | |

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