**Shanghai Liangxin Electrical Co., Ltd.**

**NDQ3H-4000 Automatic Transfer Switching Equipment (Three-level)**

# Product Specification

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

| | | | |
|---|---|---|---|
| Prepared by | Wang Mingliang | Date | November 10, 2020 |
| Reviewed by | Wang Mingliang | Date | November 10, 2020 |
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| Approved by | Wang Hui | Date | November 12, 2020 |

| Revision History | | | | | |
|---|---|---|---|---|---|
| Version | Revision Reason/Content | Implementation Date | Preparer | Reviewed by | Approved by |
| 0 | Newly added | October 10, 2020 | Wang Minglian g | Wang Minglian g | Wang Hui |
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## 1. Applicable scope and purpose

The NDQ3H-4000 automatic transfer switching equipment (ATSE) is applied to the automatic transfer between two power sources of the emergency power supply system with the rated AC working voltage of 415V or below, rated frequency of 50/60Hz and rated current of 800A - 4000A, to ensure continuous, safe and reliable operation of important loads. NDQ3H-4000, under the category of AC-33A, is a high-performance PC-level ATSE. It is particularly applied to data centers, financial buildings, telecommunications, rail traffic and other places that require automatic transfer of common and standby power sources, as well as the power supply mode of power grid - power grid/power grid - generator.

In addition to the general in-phase conversion mode, the NDQ3H-4000 ATSE provides the delayed conversion mode appropriate for safe transfer of inductive loads.

Besides the 3/4-pole product, the NDQ3H-4000 ATSE offers the N3 product which can overlap and convert neutral lines.

The product complies with the following standards:

GB/T 14048.11-2016 Low-voltage Switch Equipment and Control Equipment - Part 6-1: Multifunctional Electric Appliance and ATSE

IEC 60947-6-1:2013 Low-voltage switchgear and control gear - Part 6-1: Multiple function equipment - Transfer switching equipment

GB/T 2423.4-2008 Environmental Testing for Electric and Electronic Products - Part 2: Test Method - Test Db: Alternating Thermal-humidity (12h + 12h Cycle)

GB/T 4207-2003 Methods for the Determination of the Proof and the Comparative Tracking Indices of Solid Insulating Materials

GBT2423.18-2000 Electric and Electronic Product Environment Test - Part 2: Test Method - Test Kb salt mist: Alternating (Sodium Chloride Solution)

2. Picture of the product

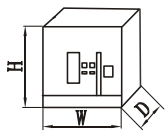
3. Specification and model description

| ND | Q | 3H - □ | / □ | / □ | / □ | / □ | / □ | / □ | / □ | / □ | / □ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |

| SN | SN name | Description |
|---|---|---|
| 1 | Enterprise code | Nader brand low-voltage electrical appliance |
| 2 | Product code | Q-automatic transfer switch |
| 3 | Design sequence | 3H-design sequence |
| 4 | Shell frame level current | 4000-4000A |
| 5 | Various types of controllers | D-LCD type |
| 6 | Rated working current | 08-800A, 10-1000A, 12-1250A, 16-1600A, 20-2000A, 25-2500A, 31-3150A, 32-3200A, 40-4000A |
| 7 | Number of poles | 3-3 poles, 4-4 poles, N3-4 poles (with neutral line overlapping and conversion function) |
| 8 | Switch position | III - three-level |
| 9 | Rated working voltage | 230-AC220/230/240V; 380-AC380V; 400-AC400V; 415-AC415V |

| | | |
|---|---|---|
| 10 | Wiring mode | Not marked - Horizontal wiring, J3-vertical wiring |
| 11 | Internal accessories | SF22 - key lock with double switches at the separating position (two locks and two keys)<br>A2 - two groups of auxiliary switch each for common and standby use |
| 12 | Accessories | G-phase partition |
| | | X- fire control module with DC24V constant voltage and pulse |
| 13 | Special notes | Special requirements of the customer |

## 4. Main technical parameters

| | | | | |
|---|---|---|---|---|
| Model and Specification | | NDQ3H-4000 | | |
| Rated working current Ie (A) | | 800, 1000, 1250, 1600, 2000 | 2500 | 3150, 3200, 4000 |
| Rated working voltage Ue (V) | | AC220/230/240, AC380/400/415 | | |
| Rated frequency f (Hz) | | 50/60 | | |
| Rated insulation voltage Ui (V) | | 1000 | | |
| Rated impulse withstand voltage Uimp (kV) | | 12 | | |
| Rated short-time withstand current Icw (kA) | | 55/1s | 80/1s, 100/60ms | |
| Rated short circuit making capacity Icm (peak value) (kA) | | 121 | 220 | |
| Rated conditional short-circuit current Iq (kA) | Fuse protection | 120 | 200 | |
| Contact conversion time max (ms) | | ≤200 | | |
| Action conversion time max(ms) | | ≤300 | | |
| Operating performance (time) | Mechanical life [2] | 12000 | | |
| | Electrical life [2] | 7000 | | |
| Level | | PC-level | | |
| Category | | AC-33A | | |
| Number of poles | | 3, 4, N3[1](the product with the function of neutral line overlapping and conversion) | | |
| Wiring mode | Back horizontal wiring | ■ | ■ | |
| | Back vertical wiring | □ | □ | ■ |
| Switch position | | Three-level | | |
| Structural form | | Split type | | |
| Work pattern | | Automatic switchover and restoring; automatic switchover, no automatic restoring | | |
| Power mode | | Power grid - power grid, power grid - generator | | |
| Outline dimension: W×H×D mm  | Number of poles - 3P | 590×715×331 | | |
| | Number of poles - 4P | 590×715×331 | | |
| | Number of poles - N3 | 590×715×331 | | |
| Net weight (kg) | Number of poles - 3P | 120 | 128 | 133 |
| | Number of poles - 4P | 132 | 142 | 149 |
| | Number of poles - N3 | 132 | 142 | 149 |

| Product certification | CQC and CB certification |
|---|---|
| ■- standard configuration; □- optional configuration<br>Note: 1. The N3 product with the function of neutral line overlapping and switchover has the type of in-phase conversion only.<br>2. The lifetime can be maintained. | |

## 5. Functions of controller

| Function | | DIII-type controller [1] |
|---|---|---|
| Protective function | Overvoltage protection | √ |
| | Undervoltage protection | √ |
| | Voltage unbalance protection | √ |
| | Open-phase protection | √ |
| | Overfrequency protection | √ |
| | Under-frequency protection | √ |
| | Phase sequence protection | √ |
| | Incorrect wiring warning | √ |
| | Fault interlocking | √ |
| | Adjustment of overvoltage and undervoltage return difference | √ |
| | Unload | ▽ |
| Measuring function | Voltage value | √ |
| | Frequency value | √ |
| | Voltage unbalance | √ |
| | Phase sequence | √ |
| Communication function | MODBUS-RTU protocol | √ |
| Node input/output | Fire protection signal input | √ |
| | Remote switch control input | ▽ |
| | Fault interlocking input | ▽ |
| | Auxiliary power supply input | √ |
| | Programmable port input | √ |
| | Common switch-on output | √ |
| | Standby switch-on output | √ |
| | Generator start output | √ |
| | Fault alarm output | √ |
| | Communication port output | √ |
| | Programmable port output | √ |
| | Switch-on state indication output | √ |
| Display (LED) | Common power state | √ |
| | Standby power state | √ |
| | Common switch-on state | √ |
| | Standby switch-on state | √ |
| | Automatic/manual mode | √ |

| | | |
|---|---|---|
| | Fire protection | √ |
| | RS485 communication | √ |
| | Remote/local | √ |
| | Fault/alarm | √ |
| Display (LCD) | 160*160 dot matrix | √ |
| | Common power information | √ |
| | Standby power information | √ |
| | Fault/alarm information | √ |
| | Set parameters | √ |
| Power mode selection | Power grid - power grid | √ |
| | Power grid - generator | √ |
| Work pattern selection | Automatic switchover and restoring | √ |
| | Automatic switchover, no automatic restoring | √ |
| Adjustment of time delay | Common separating delay | √ |
| | Common switch-on delay | √ |
| | Standby separating delay | √ |
| | Standby switch-on delay | √ |
| | Automatic switchover and restoring delay | √ |
| | Undervoltage delay | √ |
| | Overvoltage delay | √ |
| | Underfrequency delay | √ |
| | Overfrequency delay | √ |
| | Voltage unbalance delay | √ |
| | Generator start delay | √ |
| | Generator shutdown delay | √ |
| | Generator stability delay | √ |
| Threshold value of voltage protection | Undervoltage value adjustable | √ |
| | Overvoltage value adjustable | √ |
| Threshold value of frequency protection | Underfrequency value adjustable | √ |
| | Overfrequency value adjustable | √ |
| Threshold value of phase unbalance | Adjustable to a certain degree | √ |
| Key | Press the key to lock; unlock prior to entering | √ |
| | Setup key | √ |
| | Option key | √ |
| | Escape key | √ |
| | Reset key | √ |
| | Up key for parameter adjustment | √ |
| | Down key for parameter adjustment | √ |
| | Automatic/manual key | √ |
| | Common closing and standby separating key | √ |
| | Common separating and standby closing key | √ |
| | Common and standby separating key | √ |
| Others | Regular generator start test | √ |
| | Common and standby priority selection | √ |

| | | |
|---|---|---|
| | Rated frequency selection | √ |
| | Fault alarm | √ |
| | Three-level function | √ |
| | RTC time | √ |
| | Chinese-English shift | √ |
| | Event log | √ |
| | One-key calibration | √[2] |
| | When the two-way power source is abnormal, the customer may select to keep the product at the | √ |

Note: 1. "√" means the function is available, and "▽" means a optional function for the user;

2. With the input of high-precision supply voltage, when comparing the value calculated by the controller and the input value, input the calibration factor directly.

## 6. Working conditions

### 6.1 Normal conditions of use

#### 6.1.1 Ambient air temperature

The applicable ambient temperature is -25℃～+70℃; the average value within 24h shall not be more than +35℃. It should be stored at -40℃～85℃.

#### 6.1.2 Altitude

Altitude of the installation site shall not exceed 2,000 m. If the altitude of the installation site is between 2,000 m to 5000m, it can be specially customized.

#### 6.1.3 Atmospheric conditions

##### 6.1.3.1 Humidity

Meet the verification requirement of GB/T 2423.3-2016 - Test Cab for constant humidity and heat. At +55℃, when relative humidity is 95%, the time is 24h. A lower temperature allows a higher relative humidity. Special measures should be taken for the condensation occasionally produced by the change of temperature.

Meet the verification requirement of GB/T 2423.4-2008 - Test Db for alternating humidity and heat, 2 cycles, +55℃, method 2.

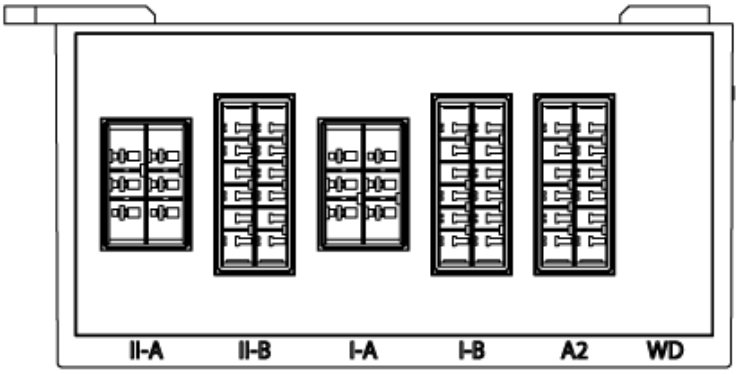
##### 6.1.3.2 Pollution level: 4

### 6.2 Installation conditions

Install the product under the environment condition without explosion danger, conductive dust or the possibility of corroding metal and damaging the insulation.

## 7. Definition of external interface

Illustration of NDQ3H-4000's overall junction box




I - A - Common power supply's sampling harness socket;

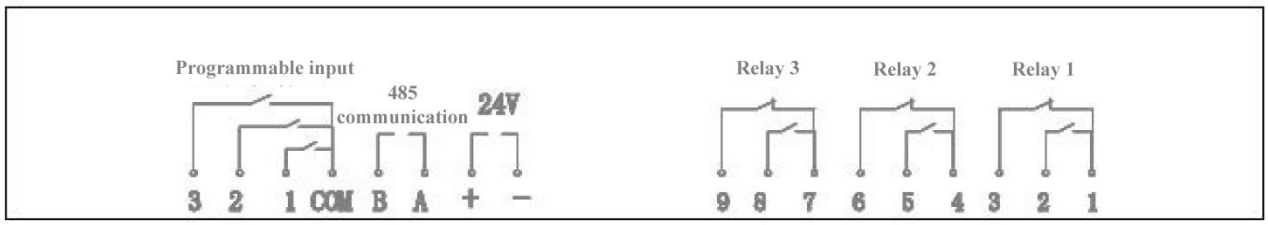
II - A - Standby power supply's sampling harness socket;

II - B - Common control line socket;

II - B - Standby control line socket;

A2 - Optional auxiliary switch's harness socket.

Illustration of NDQ3H-4000 controller's user port

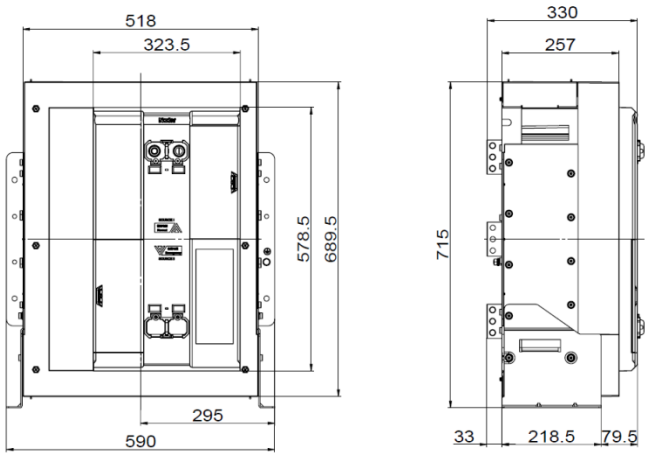



Note: The terminal capacities of relay 1, 2 and 3 are AC250V 5A;

## 8. Outline and installation dimensions

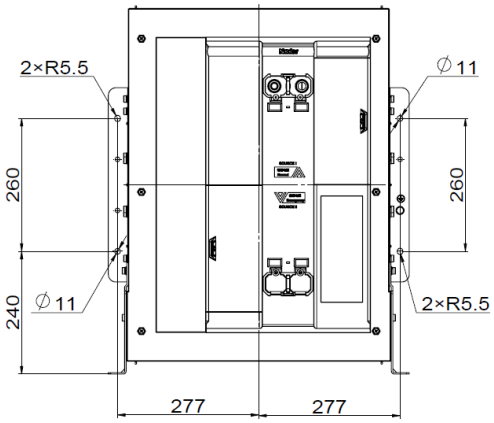
- **Outline dimensions**

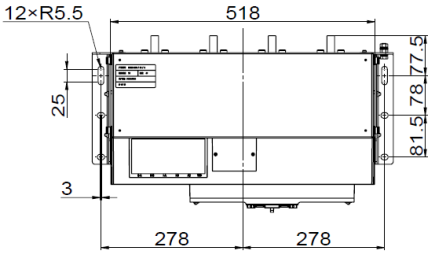
The NDQ3H-4000 automatic transfer switch body 800-4000A's outline is consistent.



➢ **Installation location**

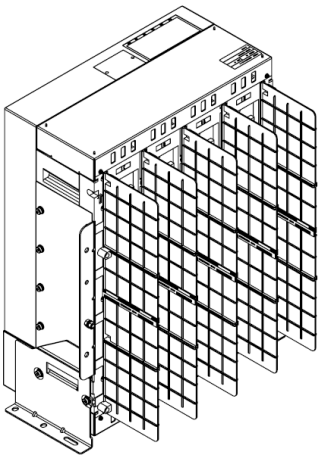
The location holes of the 3P/4P/N3 product are consistent. The gap between either the vertical guide rails or drawing racks installed on both sides of the body should be no less than 518mm.

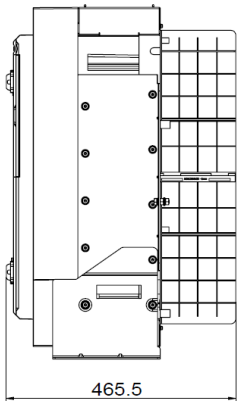



➢ **Phase partition**

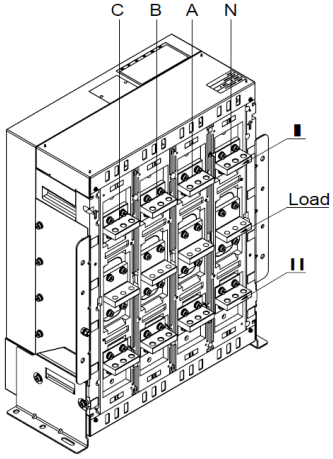
Outline dimension after the phase partition is added

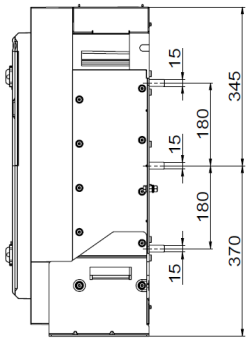


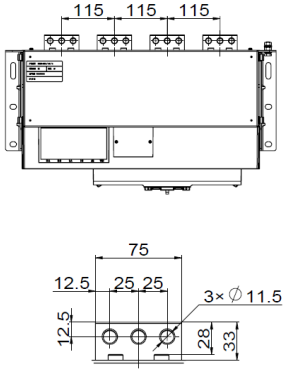



➢ **800-2000A horizontal connection**

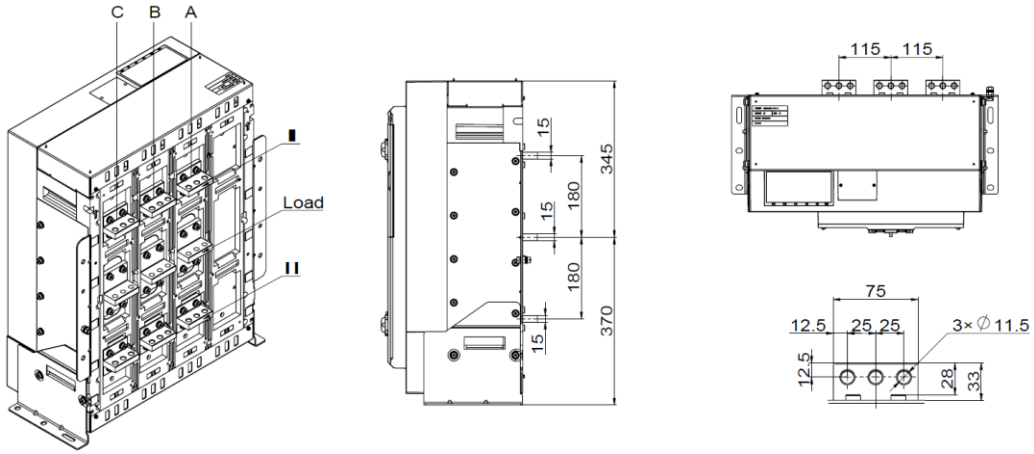
4P/N3 horizontal connection



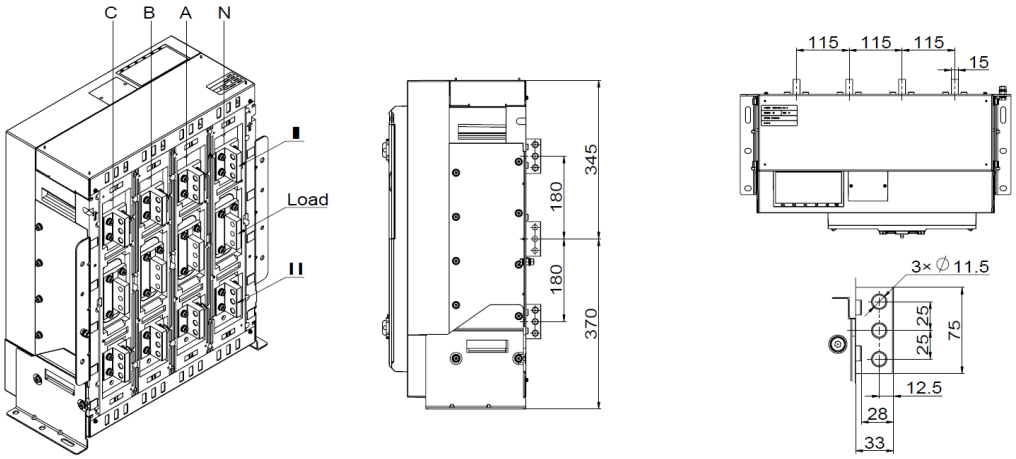



3P horizontal connection

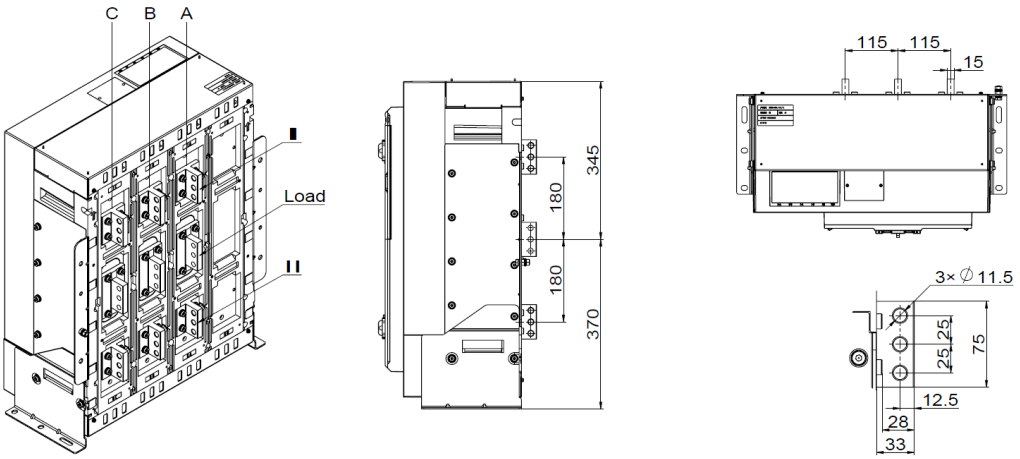



## ➢ 800-2000A vertical connection

4P/N3 vertical connection

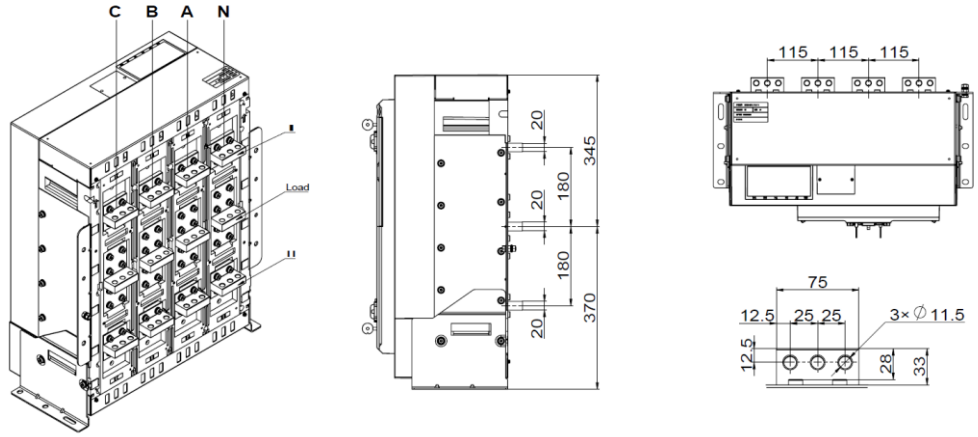



3P vertical connection

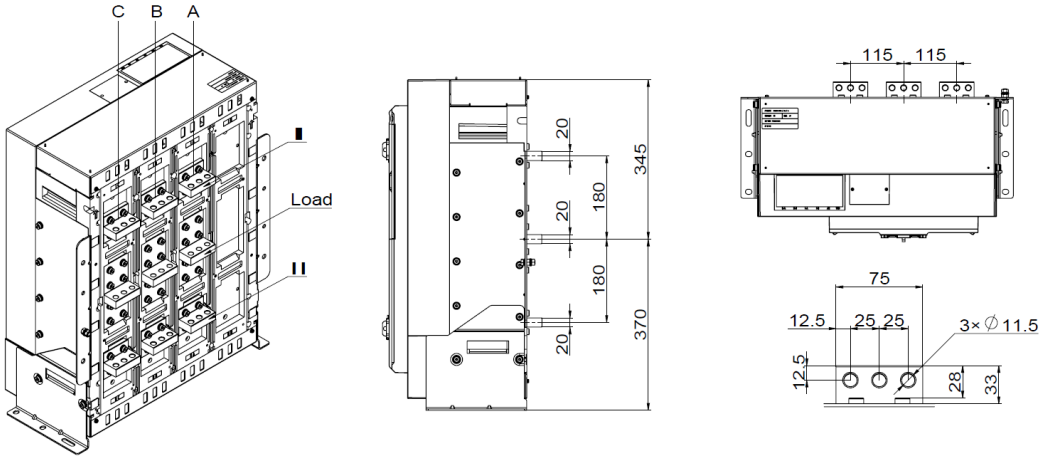


## ➢ 2500A horizontal connection

4P/N3 horizontal connection

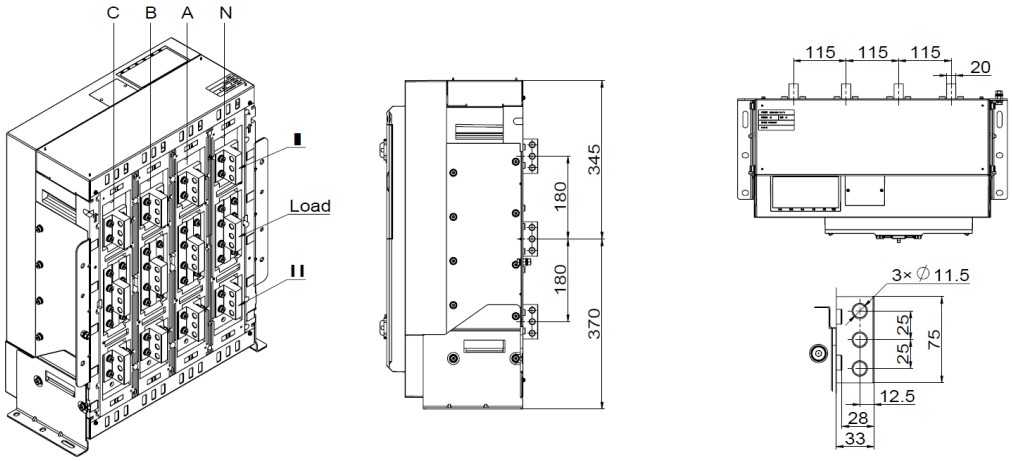



3P horizontal connection

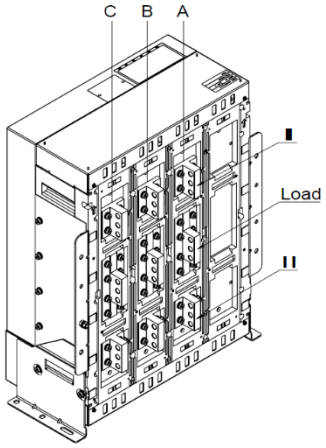


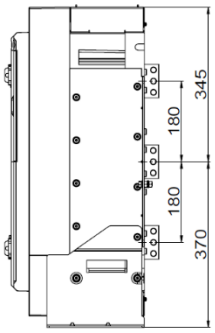

## ➢ 2500A vertical connection

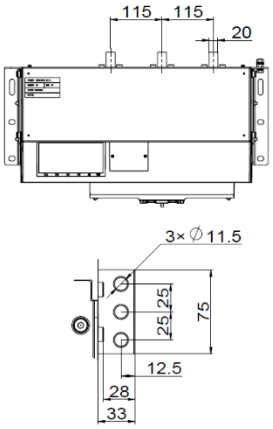
4P/N3 vertical connection



3P vertical connection

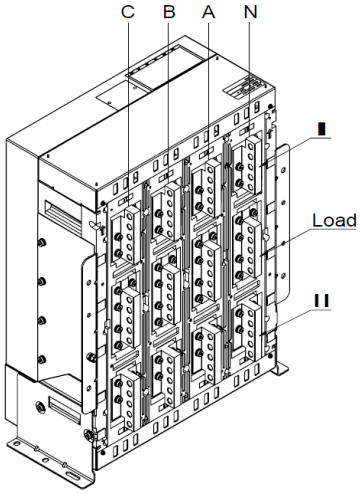


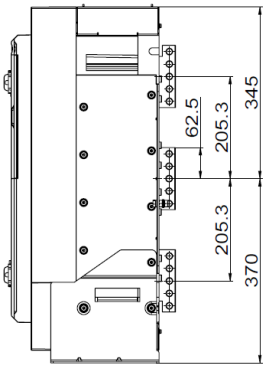



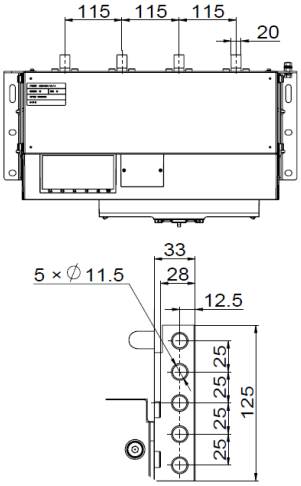




- **3150-4000A vertical connection**

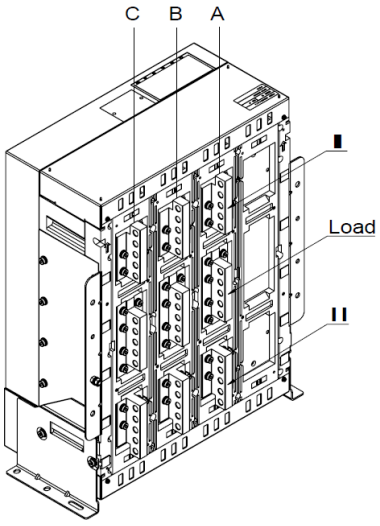
4P/N3 vertical connection

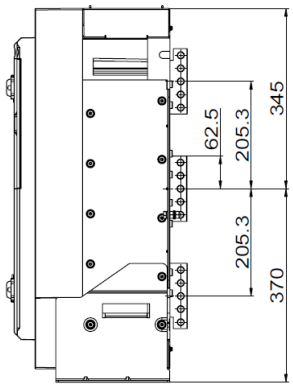


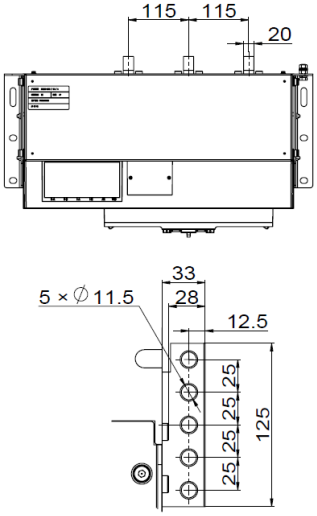



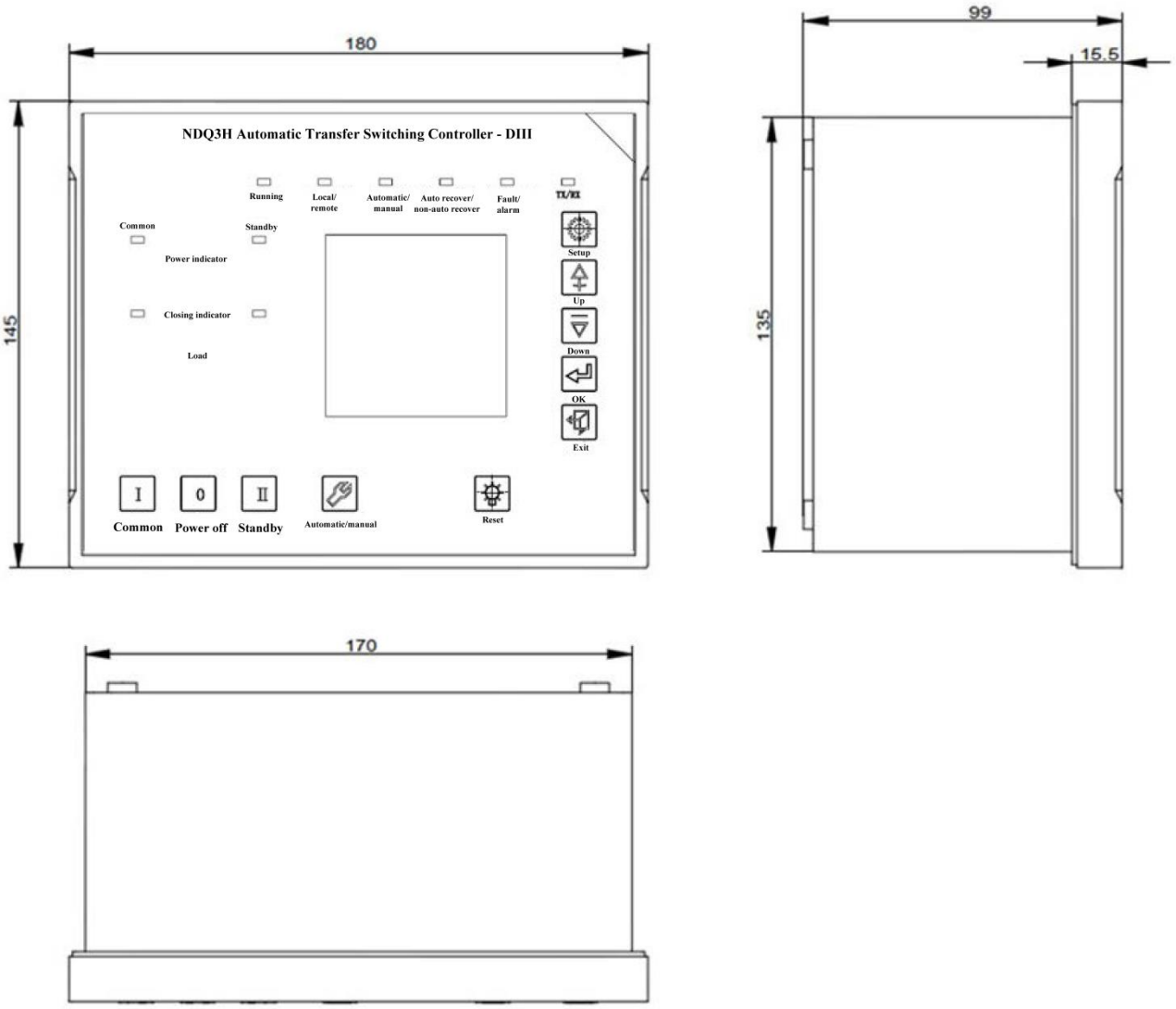

3P vertical connection



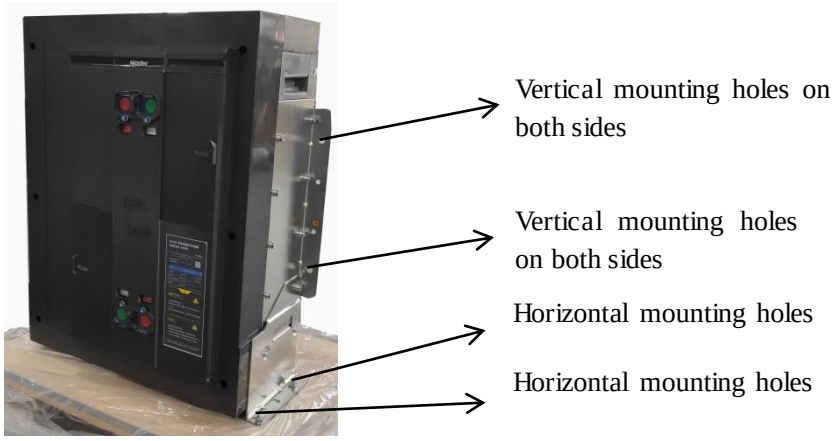
➢ **Outline dimension of the controller**



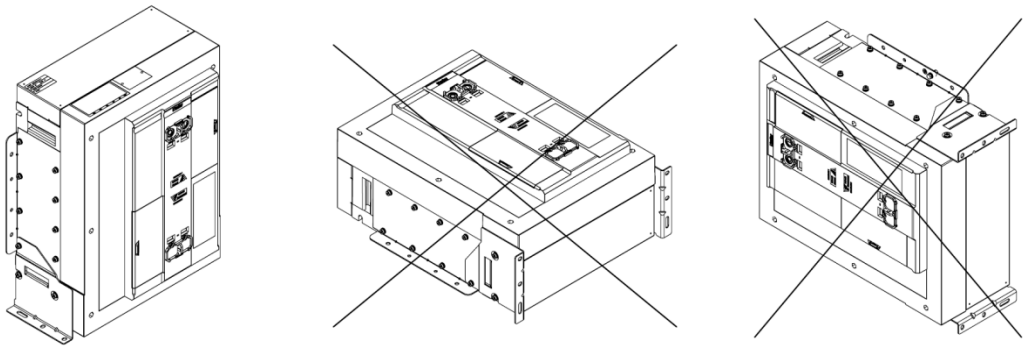

9. Installation mode

➢ **Installation of transfer switch body**

Install the NDQ3H-4000 transfer switch body in the distribution box. Depending on the method of installation, fasten it with 4/8 M10 bolts with gaskets, with the moment of force being 45N·m.




Mounting and operating position

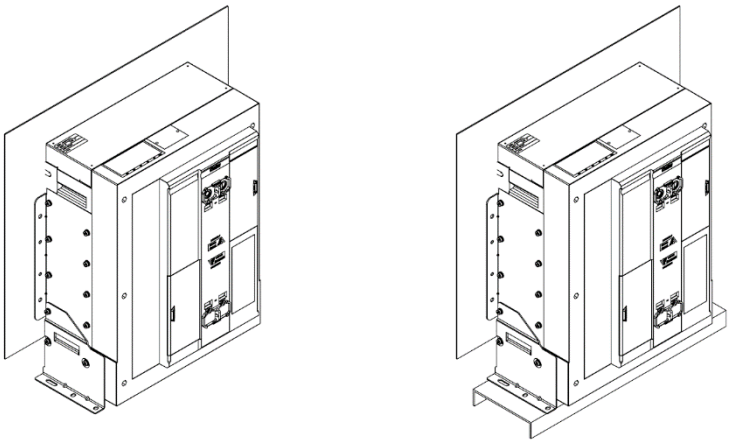


Positive installation and operation

The vertical gradient for installing the automatic transfer switch should be no more than 5°. NDQ3H-4000's transfer switch body can be installed with either of the two methods below:

1) Install it on the vertical guide rail or drawing rack, with the mounting surface being smooth (error of less than 2mm);

2) Install it on the vertical guide rail or drawing rack, and the horizontal guide rail or base plate, with the mounting surface being smooth (error of less than 2mm);



**Note: Do not switch on any power side when the automatic transfer switch body lies flat!**

## ➢ Installation of the transfer switch's wiring harness

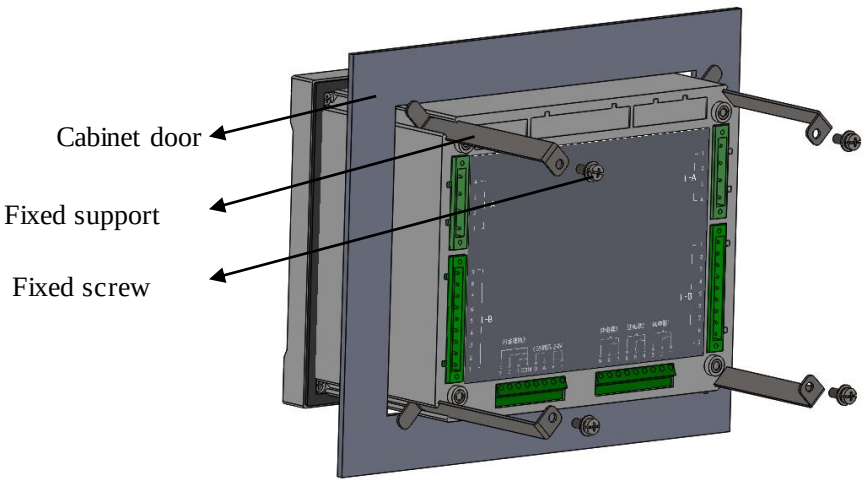
According to the electrical wiring diagram and the optional functions, insert corresponding harness marked with number into the overall junction box of the transfer switch body and corresponding terminal interface of the controller. The port identifier of the controller is on the back of the controller.

1) Tear off the film on the top of the overall junction box in the upper left of the body, take out the wiring harness of the controller, and insert the "I-A", "I-B", "II-A" and "II-B" port of the body and controller depending on the identifier on the label of at the harness end.

2) For the product with the optional auxiliary switch function, depending on the identifier on the label at the wiring harness end, insert the "A2" hollow port of the body at one end, and wire the other end as per the wiring diagram.

## ➢ Installation of controller

Install the controller on the cabinet door, open a hole on the door based on the hole size, unscrew the fixed screw at the four corners on the back of the controller, take down the fixed support, and then install the controller as shown in the figure below.



Leave a gap of at lease 100mm between the cabinet panel and internal articles for installation and wiring of the controller.

## ➢ Wiring of the controller's connection terminal

The two groups of yellow wiring slot are the secondary connection terminals provided for the customer. Wire them as per the secondary terminal signal input function on the controller's electrical circuit diagram, the controller's menu sheet, port programming output sheet and port programming input sheet with the following methods:

1. Press down corresponding yellow wiring slot in the terminal with a straight screwdriver;

2. Insert the corresponding line ends into the proper round holes and then remove the flathead screwdriver to fix the ends.

Note: 1. Connection capacity: rigid/flexible conductor (0.2-1.5) $mm^2$/(0.2-1) $mm^2$/(AW) 24-16;

Flexible conductor with cold pressure head (0.25-0.75) $mm^2$;

2. Wire stripping length: 8mm.

## ➢ Wiring method of the main circuit

Specification of Main Circuit Copper Bar

| Rated current In(A) | Copper bar specification | |
|---|---|---|
| | Number | Size (mm) |
| 800～2500 | 4 | 100×5 |
| 31500～4000 | 4 | 100×10 |

Note: 1. The table indicates the copper bar specifications adopted when the product is under the ambient temperature of +40℃ and the open wide installation under the heating condition meets the stipulation in GB 14048.11. If the temperature is higher than +40℃, the quantity of copper bar should be increased, or the capacity should be reduced.

2. The above data is calculated according to the test and theory, and for reference only.

3. The maximum permissible temperature of the copper bar is no more than 110℃.

## 10. Packaging and Storage

Cover a waterproof plastic bag over the switch body, and then vertically fix it on the bottom of the wooden case with screws. After covering a pearl wool liner for the controller, place it in the carton together with the wiring harness. (Optional) Cover a waterproof plastic bag over the phase partition, and place it in the wooden case together with the mounting screw box, controller box, product manual, certificate of inspection and the product body.

The product packed in case shall be placed in the storehouse with an environment temperature of -40℃～+85℃ and relative humidity of lower than 80% and there is no acid, alkaline or other corrosive gases surrounding. Under the above conditions, the storage period shall not exceed 18 months from the date of manufacture.

## 11. Compliance with the requirement for environmental protection

Comply with the requirement of ROSH instruction.

## 12. List of accessories and installation

List of appendices

| Category | Name | Configuration | Remarks |
|---|---|---|---|
| Signal output accessories | Auxiliary switch | Optional | Two groups of auxiliary switch each for common and standby use |
| Sigal conversion accessories | DC24V fire control module | Optional | Fire control module with DC24V constant voltage and pulse |
| Safety accessories | Phase partition | Optional | |
| Lock and interlocking device | Key lock with double switches at the separating position | Optional | |
| | Button lock | Standard | Padlock provided by the user |

List of mounting screws in the packing box

| SN | Model of Screw | Product Model | Quantity | Installation Site |
|---|---|---|---|---|
| 1 | M8×25 | General | 1 | Earthing screw |
| 2 | M8 gasket and nut | General | 2 each | Earthing screw |
| 3 | M4×14 | Optional | 16 | Screw for 3P phase partition (optional) |
| | | | 20 | Screw for 4P phase partition (optional) |
| 4 | M10×60, M10 spring, flat washer and nut | 800-2500A/3P | 27 each | Installation of external busbar |
| | | 800-2500A/4P | 36 each | |
| | | 3150-4000A/3P | 45 each | |
| | | 3150-4000A/4P | 60 each | |

## 13. Precautions

To ensure the safety of you and the electric equipment, before put the product into operation, users must:

- Carefully read this instruction before the installation and use of the product.
- Check whether the specification of the product is in line with the requirements before installation.
- Install the product under the environment condition without explosion danger, conductive dust or the possibility of corroding metal and damaging the insulation.
- Before installing and using the product body (except for the controller), measure the insulation resistance of the product with a 1000V megohmmeter. When the surrounding medium temperature is 20℃±5℃ and the relative humidity is 50%-70%, the resistance should not be less than 10 mge; otherwise it shall be dried until the insulation resistance meets the requirements.
- Prevent foreign matters from falling into the product when installing the product.
- Ensure the product is flat without additional mechanical stress when installing the conductive busbar.
- When installing the product, reliable earthing protection must be provided at the site where there is a clear earthing symbol.
- Carry out wiring of the control circuit according to the wiring diagram when installing the product, and then carry out the secondary circuit energizing.
- Both the terminal connection and fixed bolt shall be fastened.
- Never switch on the power of either side when the product lies flat.
- When both switches of the product are at the separating position, after the power mechanism of either side stores energy, press corresponding closing button (or power on) so that the power source can be closed under normal conditions. When the common or standby power source is closed, "I" or "II" will display on the panel.
- After the power source of either side is closed, press corresponding separating button (or power on) so that the power source can be separated under normal conditions. When the common or standby power source is separated, "I" or "II" will display on the panel.
- Before manually storing energy for the operating mechanism of either side, first push open the hidden door of the upper and lower handle of the face shield, and pull the handle upward and downward. When you hear a "click" sound, and "  " displays on the side panel of the common or standby power, which means the end of the energy storage process. After releasing energy, "  " will display on the panel.
- Bolts for installing NDQ3H-4000 busbar: M10×60, grade 8.8, using contact pad, tightening torque 45N·m.