

Shanghai Liangxin Electrical Co, Ltd.

NDQ5-4000 automatic transfer switching equipment

Product Specification

(IPD-ENG-DEV-T22 A1 2016-09-23)

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Approved		Date	



2020. 04. 24
试制

1、Application

NDQ5-4000 automatic transfer switch equipment is applicable for automatic transfer of the power supply for two circuits in emergency power supply system with the rated working voltage 415V, rated frequency 50/60Hz, rated current 400A to 4000A, to ensure continuous, safe and reliable operation of important loads. NDQ5-4000 is high-performance PC-level automatic transfer switch equipment with the category of AC-33A, particularly applicable for the field requiring automatic transfer between common power supply and standby power supply in data center, financial building, telecommunication and rail transit, and applicable for the power supply mode of grid-grid and grid- oil engine.

For NDQ5-4000 automatic transfer switch equipment, in addition to common in-phase transfer mode, the delay transfer mode suitable for full transfer of sensitive load is provided; in addition, to avoid the power interruption during the common transfer, the parallel transfer mode is provided to guarantee no intermittent power interruption due to transfer during the manual operation.

For NDQ5-4000 automatic transfer switch equipment, in addition to 3/4-pole products, and N3 products with the overlapping neutral transfer function are also provided.

The product complies with the following standards:

GB/T 14048.11-2016 Low-voltage Switchgear and Control Equipment - Part 6-1: Multiple Function Equipment - Transfer Switching Equipment

IEC 60947-6-1:2013 Low-voltage switchgear and controlgear-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

GBT2423.18-2008 Environmental Testing for Electric and Electronic Products. Part 2: Test Method Test Db: Damp Heat Salt Spray Test Method

2、Product pictures

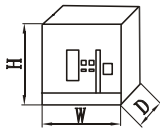


3、Model and implication

ND Q 5- □/□/□/□/□/□/□/□/□/□ 1 2 3 4 5 6 7 8 9 10 11 12 13												
Series Number	SN name	Description										
1	Enterprise code	Nader brand low-voltage electrical apparatus										
2	Product code	Q- Automatic transfer switch										
3	Design SN	5- Design SN										
4	Shell frame level current	4000-4000A										
5	Transfer type	S-In-phase transfer D-Delay transfer C-Parallel transfer										
6	Rated working current	04-400A, 05-500A, 06-630A, 08-800A, 10-1000A, 12-1250A, 16-1600A, 20-2000A, 25-2500A, 32-3200A, 40-4000A										
7	Rated working voltage	230-AC220/230/240V; 380-AC380V; 400-AC400V; 415-AC415V										
8	Number of poles	3-3 pole, 4-4 pole and N3- pole 4 with overlapping neutral transfer function										
9	Controller Optional function	WF-wifi (wireless communication) WD - Temperature alarm protection device BS - Fault lockout input										
10	Auxiliary switch	Not marked- transfer of one group, A3-transfer of three groups										
11	Internal Accessories	SF22- Dual-opening position key lock (two locks and two keys) HZ- Closing indicator lamp itself										
12	Wiring mode	Not marked - Horizontal wiring, J3 - Vertical wiring										
13	Special notes	Customer's special requirements										

4、Main technical parameters

ATSE Model		NDQ5-4000			
Rated working current Ie (A)		400、500、630	800、1000、1250、1600	2000、2500	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			
Number of poles		3, 4 and N3 ¹ (the product with overlapping neutral transfer function)			
Utilization category		AC-33A			
Rated short-time withstand current Icw (kA)	AC380/400/415V	66/3s			
		85/1s			

		100/60ms			
Rated short circuit making capacity Icm (peak value) (kA)	AC380/400/415V	220			
Transfer action time (ms)		≤500			
Contact switching time (ms)		≤300			
Operating performance (times)	Electrical life ²	10000	10000	8000	8000
	Mechanical life ²	20000			
Electrical equipment level		Dedicated PC class			
Transfer category		In-phase transfer/delay transfer/parallel transfer			
Position of main contact		Three-position			
Wiring mode	Rear horizontal connection	■	■	■	
	Rear vertical connection	□	□	□	■
Boundary dimension: W×H×D mm 	Number of poles (3P)	590×840×330			
	Number of poles (4P)	590×840×330			
	Number of poles-N3	590×840×330			
Weight (kg)	Number of poles (3P)	128			133
	Number of poles (4P)	142			149
	Number of poles-N3	142			149
■-Standard configuration; □-Optional configuration					
Note: 1. The product of N3 overlapping neutral transfer only has the in-phase transfer category					
2. Both are the maintainable life					

In which, pole N neutral transfer includes conventional neutral transfer (4P) and overlapping neutral transfer (N3):

- 1) The conventional neutral transfer is transfer of pole N and pole A/B/C.
- 2) In the overlapping neutral transfer, there is at least pole N of one circuit of power supply for connection with load in ATSE transfer of two circuits of power supply.

5、Working conditions

➤ Ambient temperature

Applicable ambient temperature is $-25^{\circ}\text{C} \sim +70^{\circ}\text{C}$. The average within 24 hours shall not be more than $+35^{\circ}\text{C}$.

The storage temperature range is $-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$.

➤ 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 5,000 m, it can be specially customized.

➤ Humidity



It is required to meet that in constant heat and humidity verification GB/T 2423.3-2016 test Cab, +55°C, relative humidity of air is 95% and the duration is 24h. The lower temperature allows for higher relative humidity, and for occasional dewing due to temperature change, it is required to take special measures.

It is required to meet the constant heat and humidity verification GB/T 2423.4-2008 test Db, 2 cycles, +55°C, with method 2.

➤ Pollution level

The product is applicable in an environment with pollution class 4.

➤ Protection class

IP30 (transfer switch and the front side of the controller).

➤ Impact

The impact test meet the test Ea in GB/T 2423.5-1995.

➤ Vibration

Vibration test meets the test Fc in GB/T 2423.10-2008, 2-9Hz: amplitude $\pm 1\text{mm}$; 9-200Hz: constant acceleration 5m/s^2 .

➤ Salt spray-proofing level

Salt spray class meet the severity class 2 in GB/T 2423.18-2000.

➤ Electromagnetic compatibility

The product controller can meet and exceed the requirements in GB/T 14048.11-2016 automatic transfer switch equipment product standard, to ensure that there is no failure for power supply and controller operation in the electromagnetic interference below.

Interference immunity EMS

Series Number	Test Items	Implementing standards	Performance Indexes
1	Electrostatic discharge immunity test	GB/T17626.2	Contact discharge Level-4 (8kV) Contact discharge Level-4 (15kV)
2	Electrical fast transient/burst immunity test	GB/T17626.4	Level-4: Power end 4kV, signal end 2kV
3	Surge (impact) immunity test	GB/T17626.5	Level-4: Wire-to-wire 4kV, wire-to-earth 5kV
4	Radio-frequency field induced conduction interference immunity	GB/T17626.6	Level-3: test voltage 10V
5	Radiated radio-frequency electromagnetic field immunity test	GB/T17626.3	Level-3: test field strength 10V/m
6	Harmonic wave	GB/T17626.13	Level-3: test class 3
7	Voltage sag	GB/T17626.11	Level-3: 0% with the duration of 0.5 and 1 cycle 40% with the duration of 10 cycles 70% with the duration of 25 cycles 80% with the duration of 250 cycles
	Short-time interruption		Level-3: 0% with the duration of 250 cycles

Emission EMI

Series Number	Test Items	Implementing standards	Performance Indexes
1	Radio-frequency conduction and emission test	GB4824	Class A
2	Radio-frequency radiation conduction and emission test	GB4824	Class A

➤ Installation condition

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

6、Controller Functions

Characteristic Overview and Transfer Type

Rated control supply voltage U_e	AC220/230/240V, AC380/400/415V
Rated working frequency	50/60Hz
Applicable grounding system	TN/TT/IT
Auxiliary power supply	DC24V
Adaptive transfer type	In-phase/delay/parallel transfer

Function description

Function description		Controller ¹
Protection function	Overvoltage protection	√
	Undervoltage protection	√
	Voltage unbalance protection	√
	Open-phase protection	√
	Overfrequency protection	√
	Underfrequency protection	√
	Phase order protection	√
	Wrong wiring alarm	√
	Fault lockout	▽
	Overvoltage and undervoltage return difference regulating	√
	Load removal	√
Measuring function	Voltage value	√
	Frequency value	√
	Phase angle difference	√
	Voltage unbalance	√
	Phase sequence	√
Communication function	MODBUS-RTU protocol	√
Node input/output	Fire signal input	√
	Controller emergency stop-lock input	√

	Remote switching control input	√
	Fault lockout input	▽
	Auxiliary power supply input	√
	Programming port input	√
	Common closing output	√
	Standby closing output	√
	Oil engine starting output	√
	Fault alarm output	√
	Communication port output	√
	Programming port output	√
	Closing status indication output	√ ²
Display (LED)	Qs1 power status	√
	Qs2 power status	√
	Qs1 power closing status	√
	Qs2 power closing status	√
	Automatic/manual mode	√
	Parallel/non-parallel mode	√
	Firefighting	√
	RS485 communication	√
	Remote/local	√
	Fault/alarm	√
	Controller emergency stop-lock	√
Display (LCD)	160*160 lattice	√
	Common power supply information	√
	Standby power supply information	√
	Fault/alarm information	√
	Set parameter	√
Power supply mode selection	Grid- Grid	√
	Grid- Oil engine	√
Operation mode selection	Auto switch and auto recover	√ ³
	Auto switch and non-auto recover	√ ³
Delay adjustment	Qs1 power closing delay	√
	Qs1 power tripping delay	√
	Qs2 power closing delay	√
	Qs2 power tripping delay	√
	Auto switch and auto recover delay	√
	Voltage unbalance delay	√
	Under-voltage delay	√
	Overvoltage delay	√
	Underfrequency delay	√
	Overfrequency delay	√
	Oil engine startup delay	√
	Oil engine stop delay	√
	Oil engine stable delay	√

	Parallel waiting delay	√
Voltage protection threshold	Under-voltage value adjustable	√
	Overvoltage value adjustable	√
Frequency protection threshold	Underfrequency adjustable	√
	Overfrequency adjustable	√
Phase unbalancedness threshold	Adjustable within certain range	√
Keys	Key being locked. It shall be unlocked before entering	√
	“Set” button	√
	“Select” button	√
	“Exit” button	√
	“Reset” button	√
	“Parameter adjustment up” button	√
	“Parameter adjustment down” button	√
	“Controller emergency stop-lock” button	√
	Automatic/manual button	√
	Parallel/non-parallel button	√
	Common closing and standby opening button	√
	Common opening and standby closing button	√
	Common opening and standby opening button	√
Others	Regular oil engine start test	√
	Common and standby priority selection	√
	Rated frequency selection	√
	Fault alarm	√
	Resist more than 3 harmonic waves	√
	Segment III function	√
	Transfer second reading	√
	RTC real time	√
	Switching of the Chinese and English	√
	Event recording	√
	One-key calibration	√ ⁴
	NFC communication module	√
	Wifi communication module	▽
	Temperature testing module	▽
	In case that two circuits of power supply are abnormal, the product is maintained in the original position or dual-opening position, which may be chosen by the customer	√

Note: 1. “√” represents this function is available; “▽” represents optional functions for users;

2. The inching switch output signal for the switch itself is used, and the output with relay is not used;

3. When the power mode is selected as “grid- grid”, there is automatic switch and automatic recovery as well as automatic switch without automatic recovery available for choice; if the power mode is selected as “grid-oil engine”, then the selection of automatic switch and automatic recovery as well as automatic switch without automatic recovery is invalid,

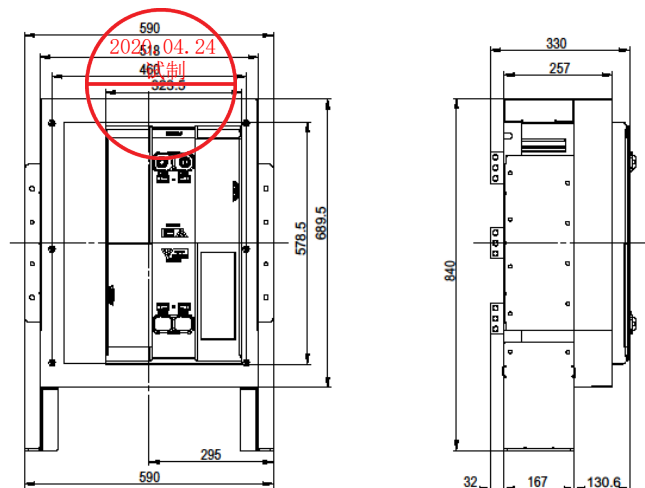
and automatic switch and automatic recovery mode is defaulted. When power grid is normal, it shall return to the power grid side;

4. In the input of high-precision power voltage, the calculation value of the controller is compared with the input value, and the calibration factor is directly written.

7、Outline and installation dimensions

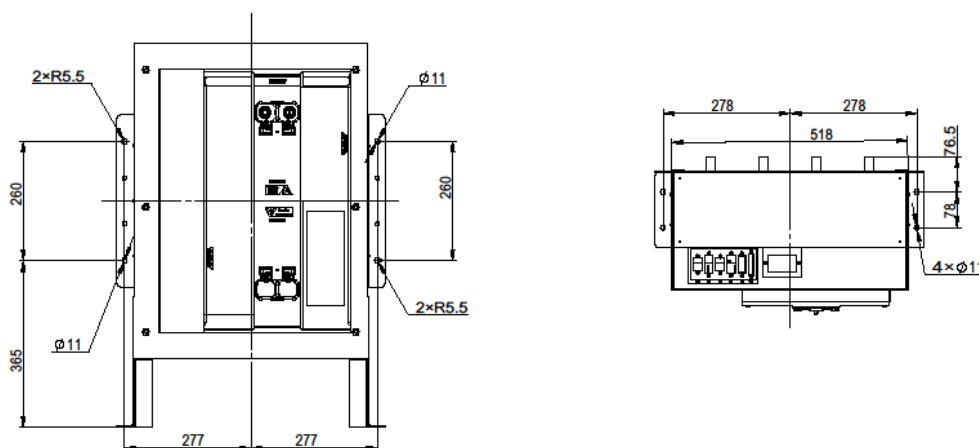
➤ Outline dimensions

NDQ5-4000 automatic transfer switch 400-4000A has the consistent outline dimensions.



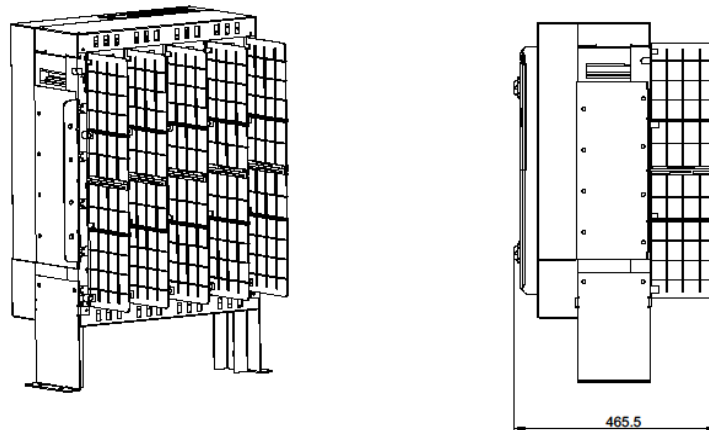
➤ Installation positioning

3P/4P/N3 product has the consistent hole dimensions, distance between vertical guide rail or pulling frame which installed on the two sides of the transfer switching should be larger than 518mm .



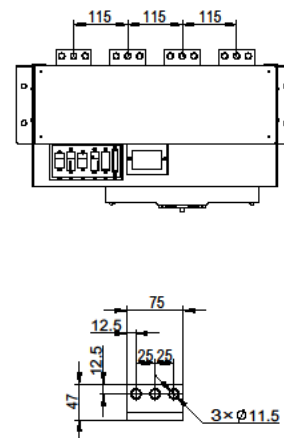
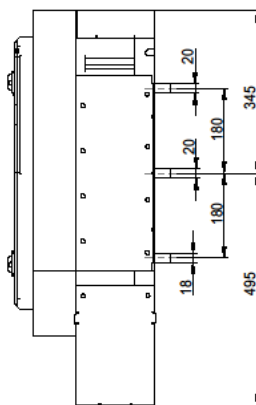
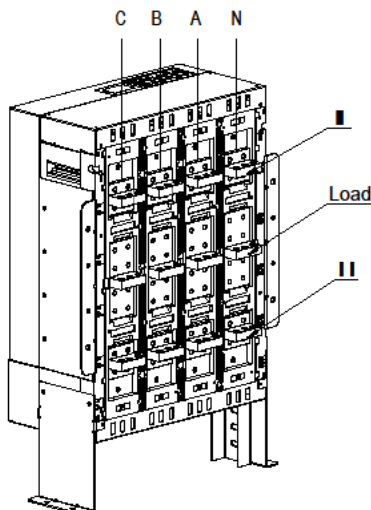
➤ Interphase insulating barrier

Increase the outline dimensions with interphase insulating barriers

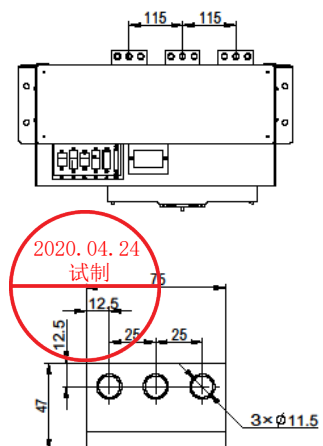
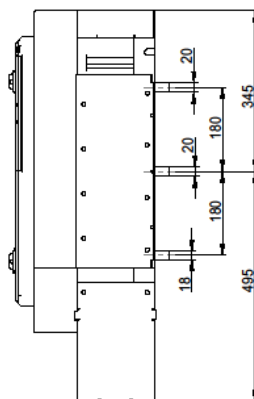
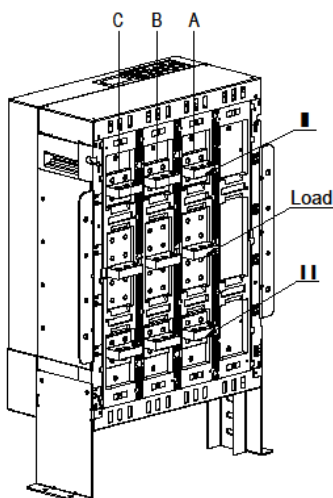


➤ 400-2500A Horizontal connection

4P/N3 horizontal connection

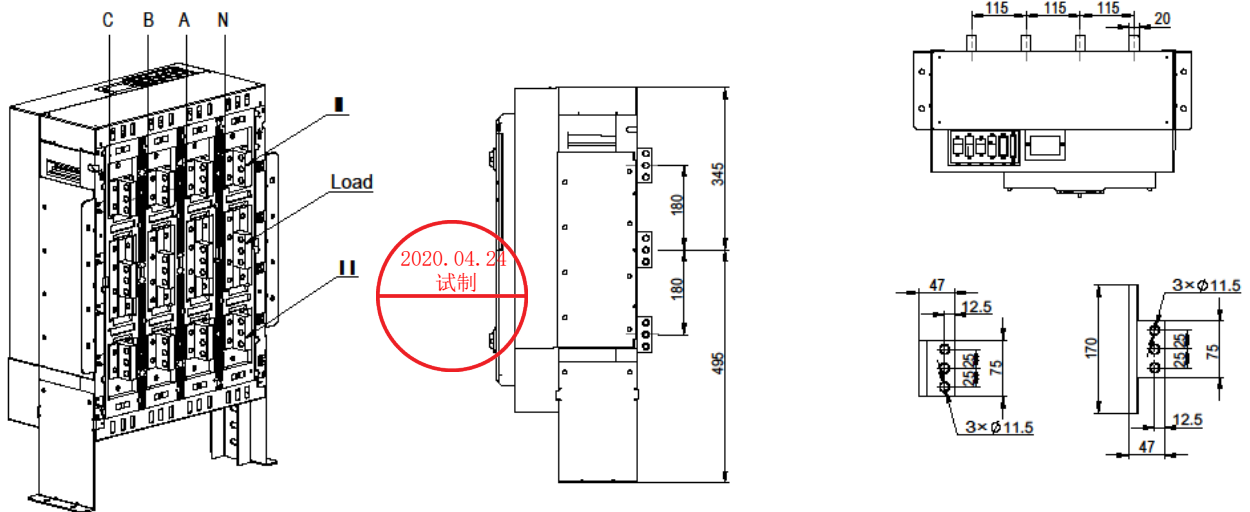


3P horizontal connection

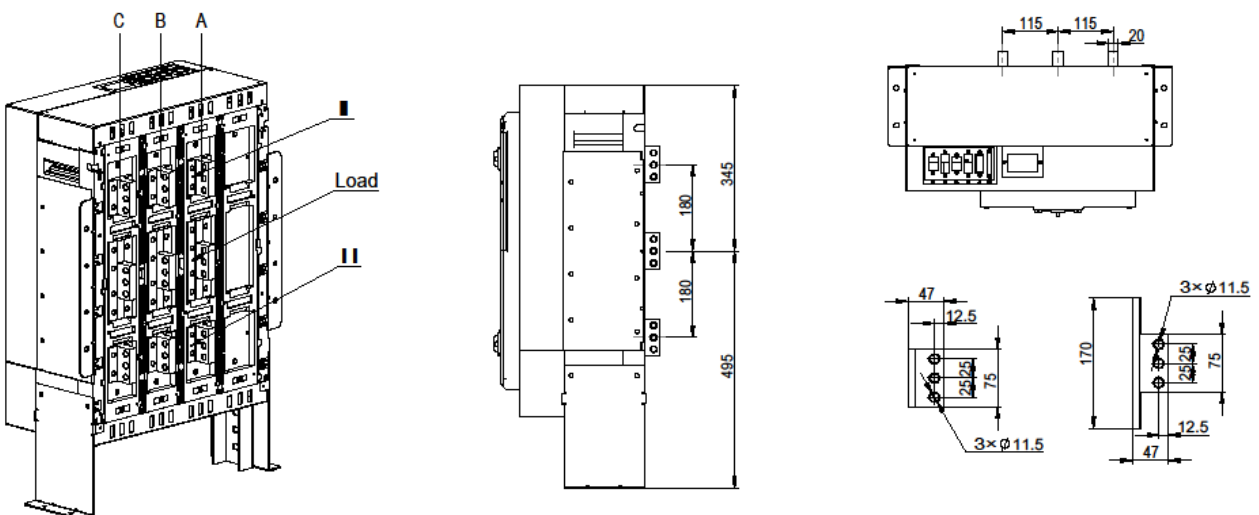


➤ 400-2500A vertical connection

4P/N3 vertical connection

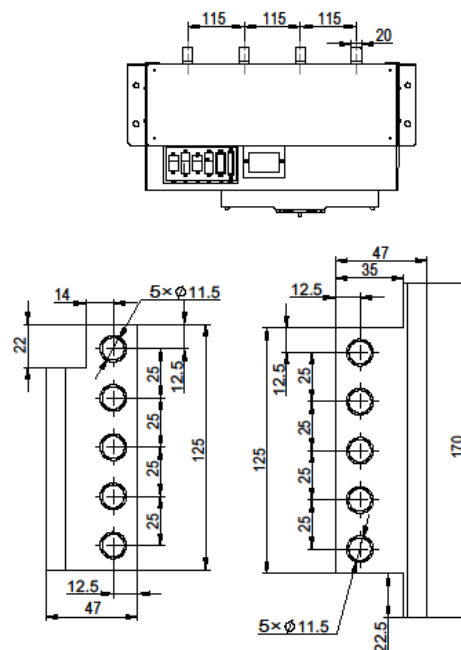
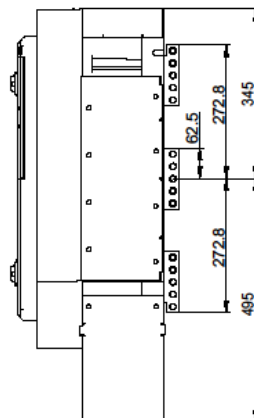
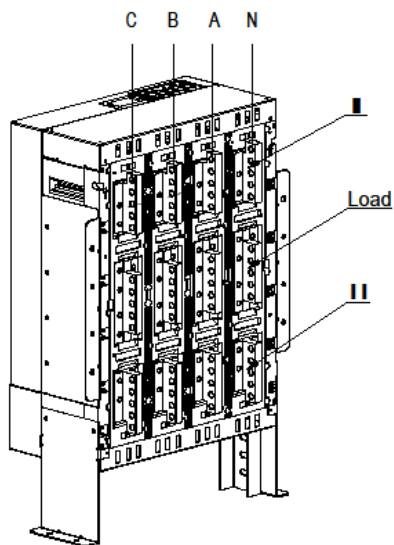


3P vertical connection

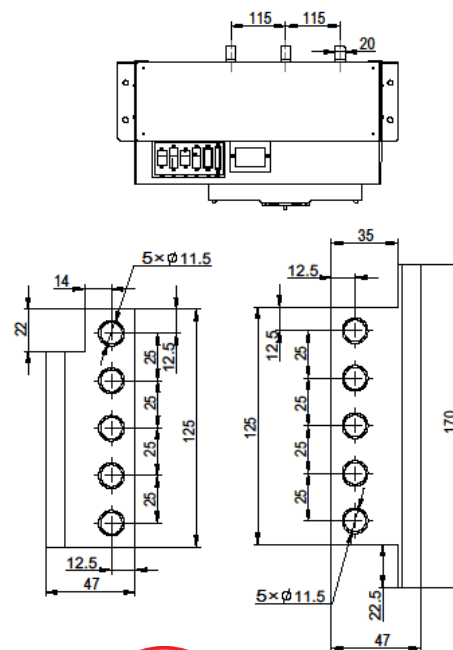
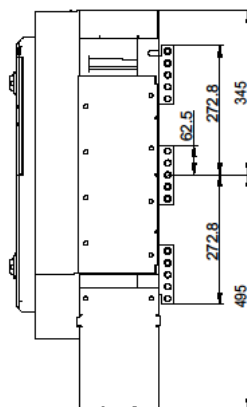
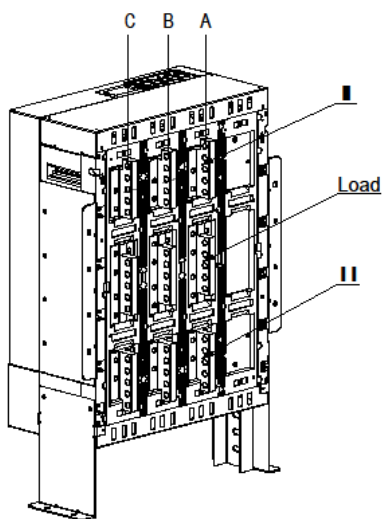


➤ 3200-4000A vertical connection

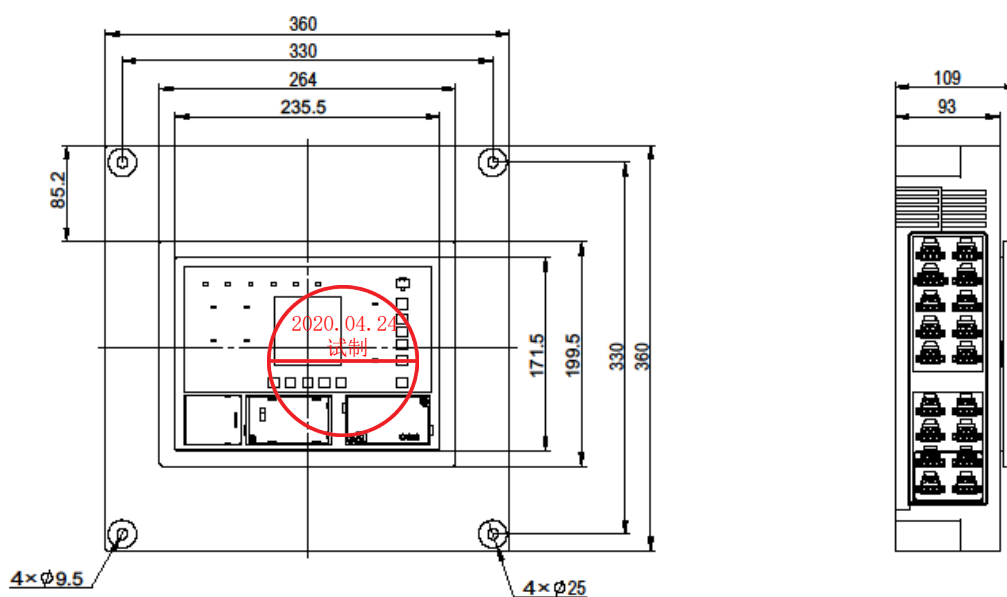
4P/N3 vertical connection



3P vertical connection



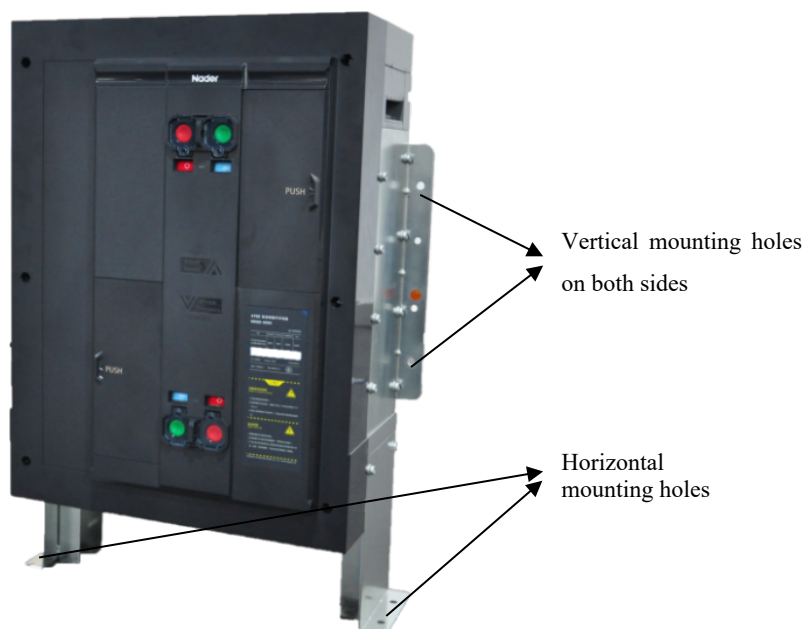
➤ Outline dimensions of controller



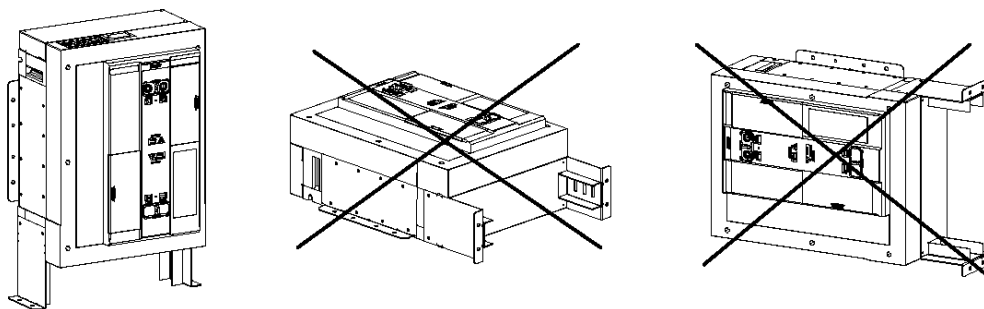
8、Installation method

➤ Installation of the transfer switch body

Install the NDQ5-4000 transfer switch body in the power distribution cabinet and fix it with 4/8 M10 bolts with washer according to the installation mode, with the mounting torque of 45N·m.



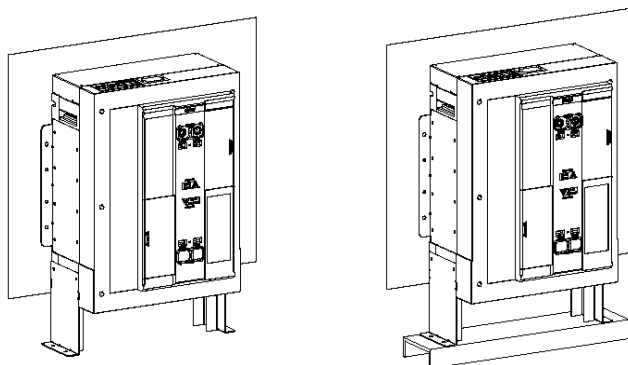
Allowed installation and operation positions



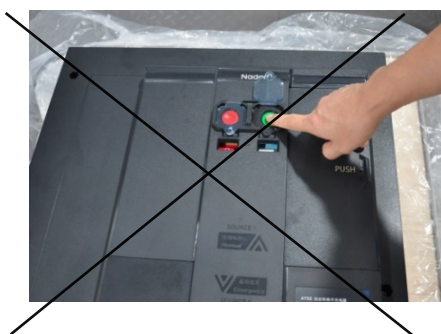
Forward installation and operation

The vertical inclination of automatic transfer switch is no more than 5° , and NDQ5-4000 transfer switch is provided with two installation means:

- 1) It is installed on vertical guide rail or pulling frame, and the installation surface shall be flat (error within 2mm);
- 2) It is installed on vertical guide rail or pulling frame and installed on horizontal guide rail or base plate, and the installation surface shall be flat (error within 2mm).



Note: it is prohibited to carry out the closing operation on any power supply when the automatic transfer switch is in the horizontal status!

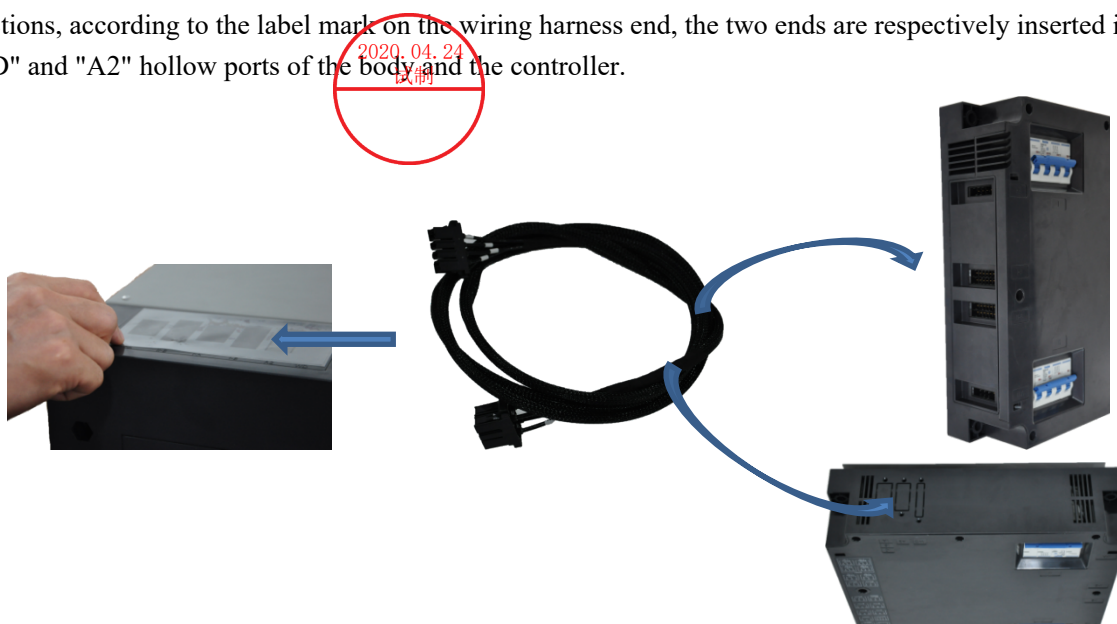


➤ **Installation of the transfer switch wiring harness**

According to the product's electrical wiring diagram and optional functions, insert the corresponding numbered wiring harness into the main junction box of the transfer switch body and the corresponding terminal interface of the controller in turn with the controller port mark on the back of controller.

1) First remove the top film of the main junction box at the upper left end of the body, and take out the control harness. According to the label mark on the end of the harness, insert the two ends into the “ I -A”, “ I -B”, “ II -A”, “ I -B” ports of the body and controller ends.

2) For products with the optional temperature alarm protection and three groups of optional auxiliary switch functions, according to the label mark on the wiring harness end, the two ends are respectively inserted into the "WD" and "A2" hollow ports of the body and the controller.



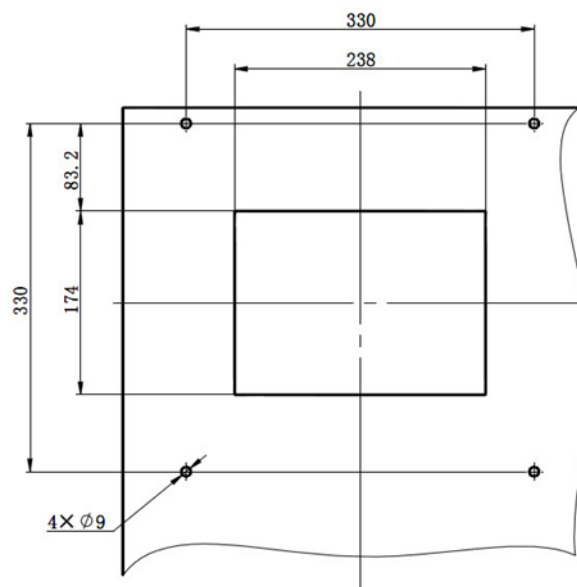
➤ Controller installation

The controller is installed on the front panel of the cabinet, and fixed with the installation hole on the controller. M8 bolt may be fixed by welding in the inner side of the front panel, or fixed by making M8 bolt (bolt length >50mm, no more than 60mm) run through the hole in the front panel. The controller is heavy (about 6kg). It is required to notice the thickness and load-bearing capacity of the cabinet panel.

There shall be the space of at least 50mm between the front panel of the cabinet and the object in it, for the controller installation and wiring. Finally, the door frame of the controller is tightly clasped around the main control panel area of the controller.

Hole is made in the front panel of the cabinet, and the main control panel area is exposed.

Hole size in installation panel of the controller



➤ Wiring method of the main circuit

Specification requirements of main circuit copper bar

Rated current In (A)	Copper bar specification	
	Number	Dimension (mm)
400~2500	4	400~2500
3200, 4000	4	3200, 4000

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/T 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℃

➤ User Wiring Way

The controller provides multiple groups of user wiring terminals to realize the advanced functions. The user wiring terminal is on the left side of the controller, and the back corresponds to the wiring signboard. The minimum wiring section area for the wiring terminal is 0.6mm² and the maximum wiring section area for is 2.5mm².



Name	Terminal number	Terminal capacity
DC24 power supply	A1/A3	The power capacity is no less than 1A
Firefighting signal (passive or DC24V)	A4/A6	
Communication RS485	A7/A8/A9/A10	
Remote emergency stop-lock	A11/A13	
Programming input DI1	B1/B3	
Programming input DI2	B4/B6	
Programming input DI3	B7/B9	
Programming input DI4	B10/B12	
Programming output DO1	C1/C3	AC250V 3A
Programming output DO2	C4/C6	AC250V 3A
Programming output DO3	C7/C9	AC250V 3A
Programming output DO4	C10/C12	AC250V 3A
Standby auxiliary II-T2	D1/D2/D3	AC250V 16A (resistance) AC250V 4A (sensitivity)
Common auxiliary I-T2	D4/D5/D6	AC250V 16A (resistance) AC250V 4A (sensitivity)
Standby auxiliary II-T5	D7/D8/D9	AC250V 16A (resistance) AC250V 4A (sensitivity)
Common auxiliary I-T5	D10/D11/D12	AC250V 16A (resistance) AC250V 4A (sensitivity)
Standby auxiliary II-T6	D13/D14/D15	AC250V 16A (resistance) AC250V 4A (sensitivity)
Common auxiliary I-T6	D16/D17/D18	AC250V 16A (resistance) AC250V 4A (sensitivity)

9、Packaging and storage

The transfer switch body covered with a waterproof plastic bag shall lie low on the wooden case and clamped with setscrews. Product specifications, certificates and wiring harness separately covered waterproof plastic bags shall be stuffed into EPE linings along with controller and packaged with special carton. Interphase insulating barriers covered with a waterproof plastic bag shall be stuffed into wooden case along with setscrews carton, controller carton and transfer switch body.

Products should be stored in a warehouse with the ambient temperature of -40℃ ~+85℃ and the corresponding relative humidity below 80% without acidic, alkali or other corrosive gas in the surrounding air. Under the conditions above, the storage period shall be no more than 18 months since the manufacturing date.

10、Environment

Comply with the requirements of RoHs directives.

11、Accessory list and installation

Accessories List

Accessory category	Accessory name	Configuration	Remarks
Signal output accessories	Auxiliary switch	Standard configuration (transfer in one group)	Optional configuration (transfer in three groups)
Related accessories of controller	Temperature alarm module	Optional	
	Wifi wireless communication module	Optional	
	Closing indicator lamp itself	Optional	
Safety accessories	Phase partition	Standard configuration	
Lock and Interlocking Device	Dual-opening position key lock	Optional	
	Button lock	Standard configuration	The padlock to be prepared by user
	Mechanical interlocking device	Standard configuration	Applicable for the non-parallel products

The list of mounting screws in the packaging box

Series Number	Screw Model	Product Model	Quantity	Installation Position
1	M8×25	General	1	Grounding screw
2	M8 washer and nut	General	2 each	Grounding screw
3	M4×14	General	20	Phase partition screw
4	M10×60 M10 spring, flat washer and nut	400-2500A/3P	27 each	External bus installation
		400-2500A/4P	36 each	
		3200-4000A/3P	45 each	
		3200-4000A/4P	60 each	



12、Notices

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.
- The product body (except the controller) measure the insulation resistance of the product with a 1000V megohmmeter before installation and use. When the surrounding medium temperature is $20^{\circ}\text{C}\pm 5^{\circ}\text{C}$ the relative humidity 50%-70% should not be less than 10 mge; otherwise it needs to be dried, and it can be used 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.
- Conduct reliable grounding protection when installing the product. The grounding place of the product has an obvious grounding symbol.
- In the product installation, the wiring of the control circuit is carried out according to the wiring diagram, and then the secondary circuit is energized.
- The terminal connections and fastening screws shall be tightened without loosening.
- It is prohibited to carry out the opening and closing operations for the power supply on any side when the product is laid horizontally.
- When the product is in off position on any side, after energy storage for the oil engine of power supply on any side, press the related closing button (or motorized), so that the power supply can be normally closed, and when the common or standby power supply is closed, the panel is displayed as “I” or “II”.
- After the closing of power supply on any side, press the related closing button (or motorized), so that the power supply can be normally opened, and when the common or standby power supply is opened, the panel is displayed as “O”.
- Except the parallel products, after the closing of on any side of common or standby power supply, press the closing button on the other side (or motorized), while the power supply on the other side cannot be closed.
- Before storage energy for the actuator on any side in manual, it is required to push aside the concealed door of upper and lower handles on the hood, turn the handle up and down. When hearing “click” voice, the panel on the common or standby power supply displays “”, thus energy storage is ended., After the energy release, the panel displays “”.
- The bolts for installation of NDQ5-4000 bus: M10×60, Class 8.8, with the contact pad, and the tightening torque 45N•m.