Shanghai Liangxin Electrical Co., Ltd

(NDQ5W automatic transfer switch equipment)

Product Specification

1. Security Information

Before using the NDQ5W automatic transfer switch, please carefully read this safety information. Failure to follow the instructions may cause product malfunction or even personal injury.

Only authorized electricians may install and maintain the automatic transfer switches. Do not attempt any installation or maintenance operations when the automatic transfer switch is connected to the main circuit power supply. Ensure the circuit breaker is in the open position before the electrical equipment is started.

This product has undergone insulation test before factory. Wrong dielectric test will damage the control system. It is strictly prohibited to carry out dielectric test with the controller!

Before installing the product, note the following:

The ambient environment is in line with the normal working conditions and installation conditions of the product;

Before installation, measure the insulation resistance of each circuit breaker with a 1000V megohmmeter. At 20±5℃ ambient temperature and 50-70% relative humidity, the resistance should be at least 10 megohms. If not, dry the insulation and wait until it meets the requirements before use.

The main circuit wiring must be properly installed. The adapter power sampling line and the main circuit power supply of the trip breaker must be correctly connected to ensure consistent phase sequence. For 4P products under TT/TN distribution systems, the N terminals of different power sources must be separately and reliably connected to the N terminals of each trip breaker in the ATSE. 3P products under TT/TN systems must be connected to the neutral line. The neutral line should be connected to the N terminals of small circuit breakers on the adapter beside each corresponding trip breaker in the dual or triple power conversion system, ensuring reliable connections.

Connect the NDQ5W controller and adapter correctly according to the electrical wiring diagram.

The product terminal connection and fixing bolt should be tightened without loosening;

All malfunction trip buttons on the circuit breaker panel must remain in reset (non-engaged) position and be flexible.

All circuit breaker panel indicators should be correct;

The grounding terminal of all the circuit breakers is reliably grounded;

All the operating circuit breakers should be turned to "test" or connection position respectively, and the manual energy storage and opening and closing operation of the circuit

breaker should be carried out 3~5 times to ensure the safety and reliability of opening and closing;

When optional mechanical interlock is selected, ensure that the mechanical interlock is installed correctly and the action is reliable;

Clean the site and do not allow wires, conductive parts, tools, or dirt to remain on or around the circuit breaker or switch cabinet.

2 Explanation of abbreviations

Table 1: explanation of abbreviations

Abbreviations	explaination
Qs1	ACB of S1 power
Qs2	ACB of S2 power
Qs3	ACB of S3 power
Qql	ACB of busbar tie
TT	Open action of the ACB
TD	Open delay
CT	Close action of the ACB
CD	Close delay
ES	Energy storage action of the ACB
SEBC	Save energy before closing
SEAC	Save energy after closing
ASAAR	Auto switch and auto recover
ASANR	Auto switch and non-auto recover
ASAHR	Auto switch and hand recover
UV	Under voltage
OV	Over voltage
UF	Under frequency
OF	Over frequency
Uibm	Voltage imbalance

3 Overview

3.1 Product Introduction

The NDQ5W series automatic transfer switch employs an air-operated circuit breaker as its core component. Designed for three-phase four-wire power distribution systems, it operates at 50Hz/60Hz with rated currents ranging from 200A to 6300A and voltages up to AC415V. This device automatically transfers power to a backup source when the common power supply fails, ensuring uninterrupted load operation.

The NDQ5W series automatic transfer switch provides both conventional and parallel switching solutions for dual power conversion, triple power conversion, and two incoming lines with one bus tie conversion systems.

3.2 Applicable standards

GB/T 14048.1-2023 Low-voltage switchgear and control equipment Part 1: General principles

GB/T 14048.2-2020 Low-voltage switchgear and control equipment Part 2: Circuit breakers

GB/T 14048.11-2024 Low-voltage switchgear and control equipment Part 6-1: Multifunctional electrical switchgear

IEC 60947-1:2020 Low-voltage switchgear and controlgear-Part 1:General rules

IEC 60947-2:2016 Low-voltage switchgear and controlgear-Part 2:Circuit-breakers

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

3.3 Model and Specifications

Table 2: NDQ5W Model Specifications

ND	Q	5	W	-	□	C	/	□	/	□	/	□	/	□
1	2	3	4		5	6		7		8		9		10

No.	Description		
1	Enterprise code	ND - Nader	
2	Product code	Q - Automatic transfer switch	
3	Design Serial Number	5	
4	actuator	W – Air-operated Circuit Breaker Series NDW2/NDW3	
5	current of shell frame(A)	1600、2500、4000、6300	
6	ACB installation method	C– drawer type	
7	rated operating current	1600	02-200A, 04-400A, 06-630A, 08-800A, 10-1000A, 12-1250A, 16-1600A
		2500	06-630A, 08-800A, 10-1000A, 12-1250A, 16-1600A, 20-2000A, 25-2500A
		4000	08-800A, 10-1000A, 12-1250A, 16-1600A, 20-2000A, 25-2500A, 32-3200A, 40-4000A
		6300	40-4000A, 50-5000A, 63-6300A
8	number of poles	3 – 3P, 4 – 4P	
9	rated operating voltage	K1 – AC380/400/415V	
10	Controller type	2L – Dual Power Conversion 2LB – Dual power conversion with parallel operation 3L – Three Power Conversion 3LB – Three power conversion units with parallel operation QL – Two incoming lines with one bus tie switch QLB – Dual incoming lines with single bus tie conversion, featuring parallel operation	

4 Specifications

4.1 Electrical Parameters

Table 3: NDQ5W Electrical Parameters

model		NDQ5W			
Current of shell frame (A)		1600	2500	4000	6300
N-pole rated operating current		100%Ie			
rated operating voltage Ue		AC380/400/415V			
nominal insulation voltage Ui		AC1000V			
Rated impulse withstand voltage Uimp		12kV			
Rated operating frequency f		50/60Hz			
Rated short-circuit breaking capacity Icn		55kA	85kA	100kA	120kA
Rated short-circuit making capacity Icm		121kA	187kA	220kA	264kA
Electrical life (cycles)		10000	10000	6000	6000 (4000A) 4000 (5000A) 2000 (6300A)
Mechanical life (times)	maintenance-free	15000	15000	12000 (3P) 10000 (4P)	7000 (3P) 45000 (4P)
	Maintained	30000	30000	15000	13000
Usage class		AC-33B			
Contact switching time		150ms±50ms			
Transfer operating time		350ms±50ms			

4.2 Working conditions

4.2.1 Ambient temperature

The applicable ambient temperature is-25℃ ~ +70℃, and the 24-hour average value does not exceed +35℃;

The operating temperature range of-25℃ to-45℃ can be customized. For applications exceeding +40℃, users must reduce the capacity. Refer to the capacity reduction coefficient table in the universal circuit breaker's user manual for specific values.

4.2.2 Atmospheric environmental conditions

When the ambient air temperature is +40℃, the atmospheric relative humidity does not exceed 50%;

Higher relative humidity is allowed at lower temperatures, for example, at +25℃,

atmospheric relative humidity can reach 90%. Dehumidification or corresponding measures should be taken for condensation caused by temperature changes.

4.2.3 Corrosion resistance grade

Salt spray severity level 2.

4.2.4 Pollution Levels

Pollution level: 3.

4.2.5 Altitude

The installation site shall not exceed 2000m above sea level;

The installation site altitude between 2000m and 5000m can be specially customized, and the working performance is based on the correction value in the instruction manual of the universal circuit breaker used in the product.

4.2.6 Vibration Protection Requirements

The automatic transfer switch is designed to withstand electromagnetic and mechanical vibrations, having passed the IEC 60721-3-3 standard test.

Amplitude: ±1mm (2-9Hz)

Constant acceleration: 5m/s2 (9-200Hz)

4.2.7 Installation Conditions

Execution body-The vertical inclination of universal circuit breaker shall not exceed 5°. The product shall be installed in an environment without explosion hazard, conductive dust, and sufficient to corrode metal and destroy insulation.

4.2.8 Installation Category

For the main circuit of the universal circuit breaker, the installation category is IV; for the auxiliary and control circuits, it is III.

4.2.9 Protection Level

IP30 and IP40 (ACB installed in the cabinet compartment and protective door frames added);

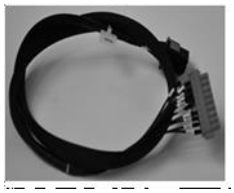
IP65 (controller installed in the cabinet compartment with waterproof gasket).

5 Installation

5.1 Accessories

Table 4: NDQ5W Product Accessories

Accessories Name	diagrammatic sketch (Actual items are subject to change)	quantity					
		2L	2LB	3L	3LB	QL	QLB
Frame Circuit Breaker		2		3			
NDQ5W controller		1					
adapter	Three-port with a MCB 	2	/	/	/	2	/
	Two-port with a MCB 	/	2	/	3	/	2
	Four-port with a MCB 	/	/	3	/	/	/
	Four ports with no MCB	/	/	/	/	1	/

Accessories Name	diagrammatic sketch (Actual items are subject to change)	quantity					
		2L	2LB	3L	3LB	QL	QLB
							
	Two ports with no MCB 	/	/	/	/	/	1
Adapter mounting bracket		2		3			
Adapter fixing screw		a surname					
Control line		2		3			
Actuating line		2		3			
Interlocking line		1	/	3	/	2	/

5.2 Accessories Installation

5.2.1 Adapter Installation

The adapter can be installed on the left side of the ACB or installed at other places in the

distribution cabinet with screws.

When installing the adapter on the left side of the ACB, first secure the mounting bracket to the breaker. Note that mounting holes vary by current of shell frame—refer to the bracket markings for alignment. Use three M4 screws (standard factory supply) to fasten the bracket, then attach the adapter using four M4 screws.

If the user chooses not to install it on the ACB, it can be installed elsewhere. The hole size is according to chapter 8.1. The adapter is secured with 4 M4 screws.

Figure 1: Adapter Installation

5.2.2 Controller Installation

Install the controller on the cabinet door by drilling the required opening size (see chapter 8.1). Remove the four back screws and four brackets from the controller's rear. Insert the controller into the door according to figure 2 below, then reinsert the brackets and secure them with screws.

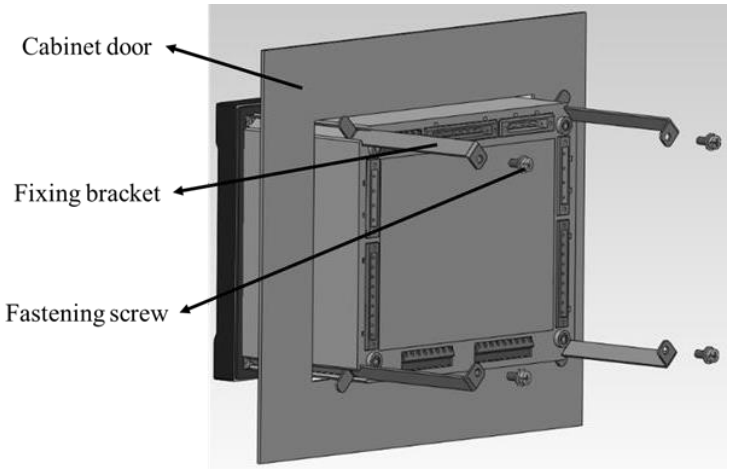


Figure 2: NDQ5W controller installation

5.2.3 Harness Connection

Connect the control line, interlocking line, and actuating line as shown in figure 3.

The 9-pin and 4-pin male connectors of the control lines must be plugged into their corresponding female connectors: the control line of the S1 power supply's ACB should be inserted into the Qs1 female connector, the one for the S2 power supply's ACB should be inserted into the Qs2 female connector, the control line of the S3 power supply's ACB should be inserted into the

Qs3 female connector, and the busbar tie ACB's control line should be inserted into the Qql female connector.

The actuating lines are pre-installed before delivery, eliminating the need for customer wiring.

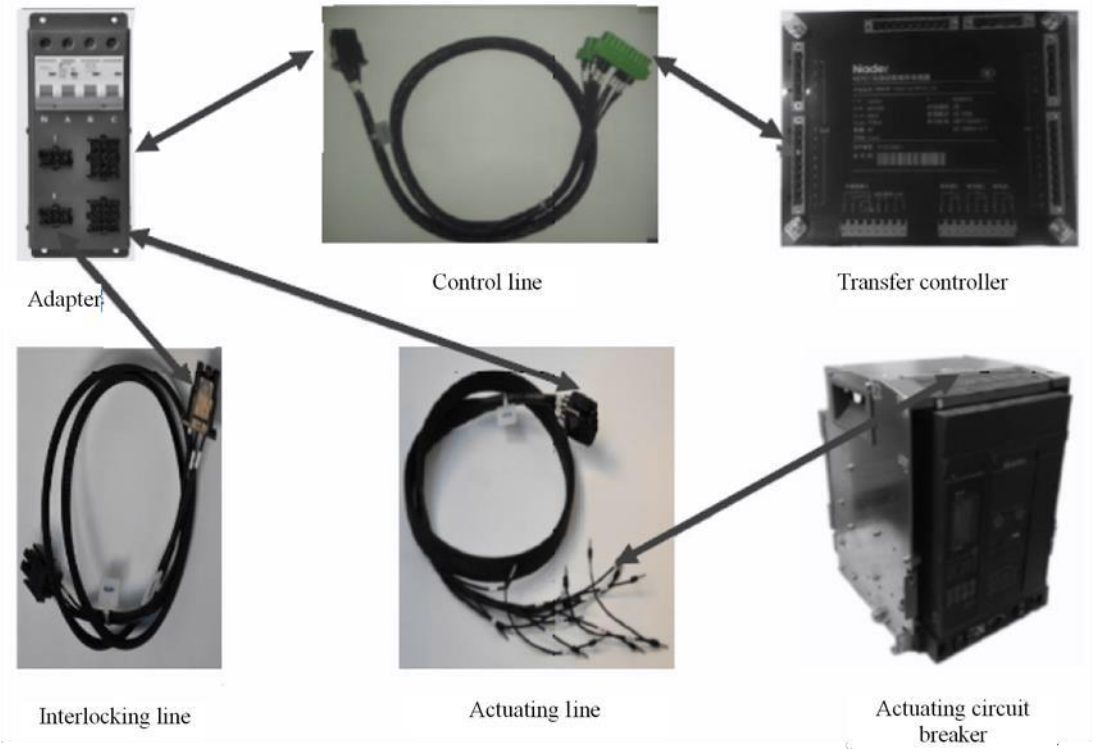


Figure 3: harness connection

5.2.4 Mechanical interlock installation

Mechanical interlocks are optional only for NDQ5W controllers with 2L,3L, or QL types. Available models include:

Table 5: Mechanical interlock selection table

code name	kind	applicable to NDQ5W type
SR11	Two groups of cables, one closes and one splits	2L
SR12	Three groups of cables, one closes and two split	3L
SR21	Three groups of cables, two close and one splits	QL

The mechanical interlock installation is as follows:

- 2L type - SR11

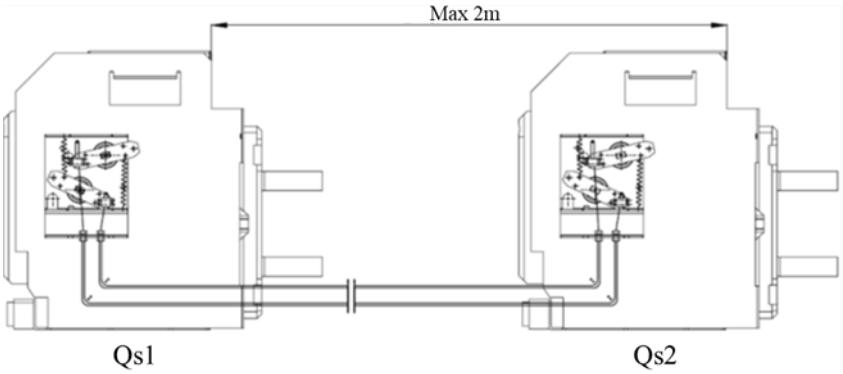


Figure 4: SR11 Installation

- 3L type - SR12

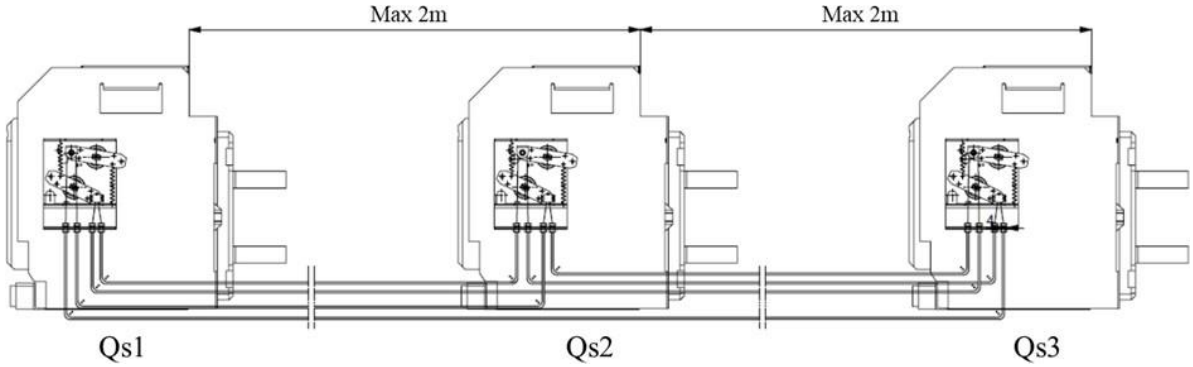


Figure 5: SR12 Installation

- QL type - SR21

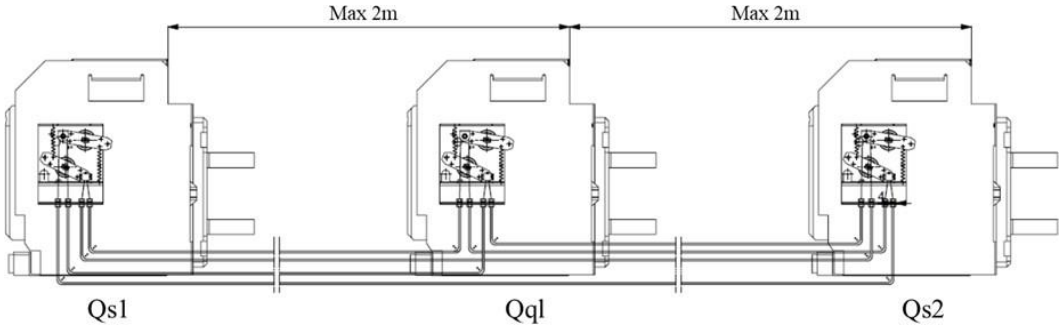


Figure 6: SR21 Installation

The mechanical interlock installation process is as follows:

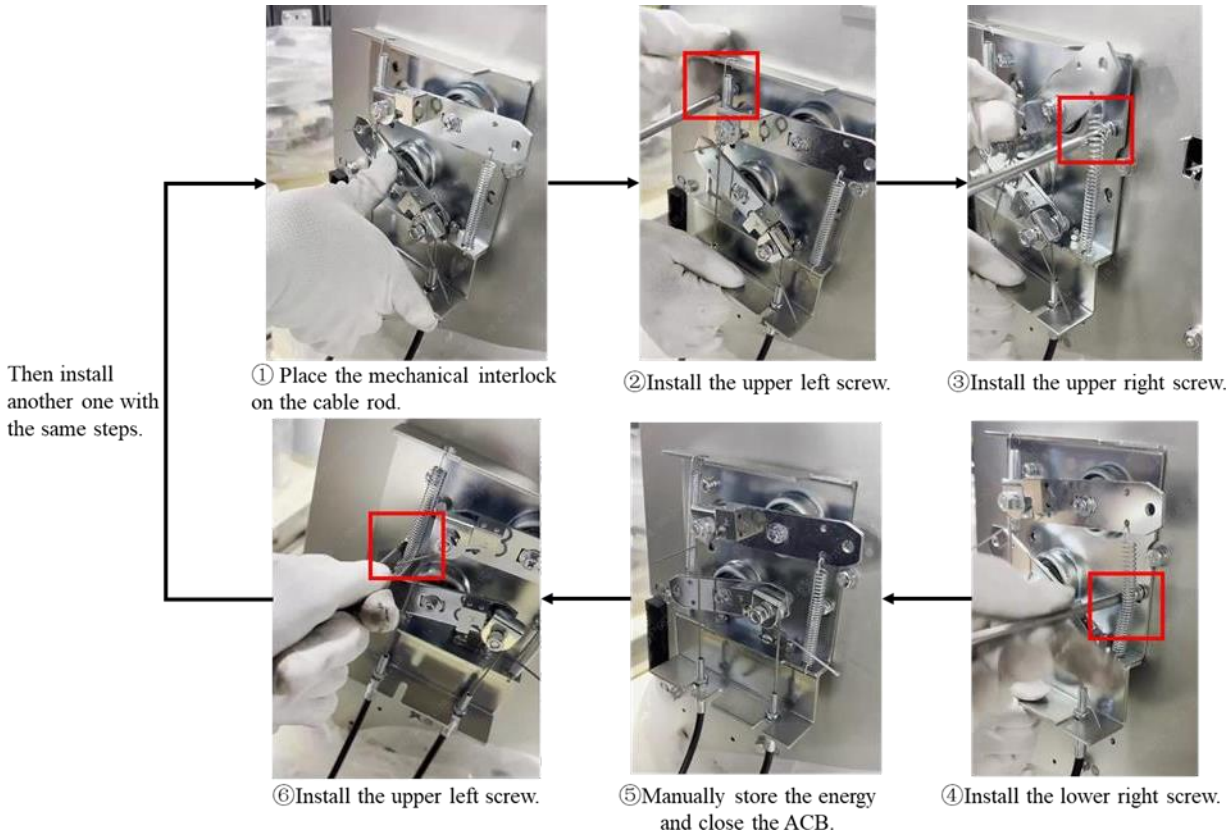


Figure 7: Mechanical interlock installation steps

5.2.5 Controller secondary terminal wiring

The NDQ5W controller terminals in the semi-transparent white frame at the bottom of the diagram are user-accessible terminals. Customers can customize their usage according to requirements, with programmable input/output settings detailed in Chapter 6.7.

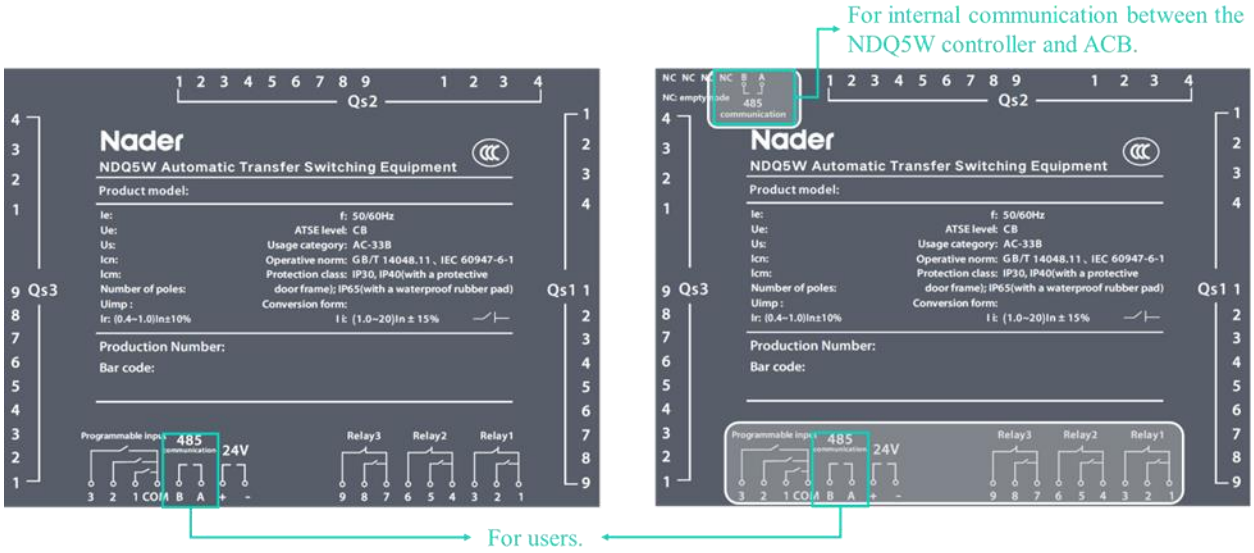


Figure 8: terminals of the controller (left: standard controller, right: dual-communication controller)

The communication port on the top of the controller (available only on dual-communication controllers) is exclusively for connecting the NDQ5W controller to the ACB interface or optional DIDO module, users cannot use it independently. The bottom communication port is for user access.

When wiring, use a flathead screwdriver to press the terminal into the corresponding yellow wire card slot, insert one end of the wire into the corresponding round hole, and then pull out the screwdriver to fix the wire.

Note: Terminal wire capacity is: rigid/flexible conductor (0.2~1.5)mm²/(0.2~1)mm²/(AWG) 24~16.

Flexible wire with cold-pressed head (0.25~0.75) mm^2;

Wire length: 8mm.

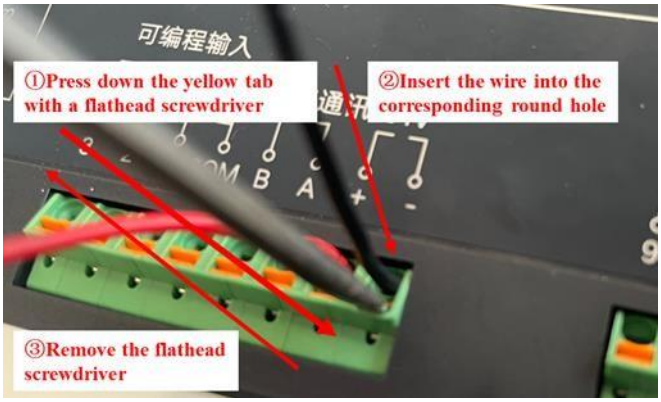


Figure 9: Secondary terminal wiring steps

6 Use the NDQ5W Controller

6.1 Overview

When one power supply is abnormal, the NDQ5W automatic transfer switch automatically switches to the backup power supply to maintain uninterrupted power delivery to the load.

The NDQ5W controller monitors the power supply status and can trigger the automatic transfer switch based on the user-defined protection threshold (see Chapter 6.5.4).

- Undervoltage Ue* (70%~95%) and overvoltage Ue* (105~125%)
- Under-frequency f* (90%~98%) and over-frequency f* (102%~110%)
- Phase loss
- Voltage imbalance 3%~30%
- phase sequence

Users can also set the hysteresis value of the return action to prevent the switch from switching repeatedly due to the fluctuation of the power supply voltage value.

The NDQ5W controller does not require an auxiliary power supply, as it draws its operating power from the common and backup circuits' A-phase.

When both power supplies lose phase A, all LED lights and LCD screens on the NDQ5W controller will turn off after 5 seconds, rendering the controller inoperable.

To ensure functionality, the following scenarios require DC24V auxiliary power supply:

- Using Modbus RS485 communication (but cannot remotely control the switch's opening/closing)
- When the power supply system includes a generator, the generator's delay function activates when the mains power phase A fails.

The NDQ5W controller supports multiple power supply modes. The 2L(B)/QL(B) models feature 'grid-grid' and 'grid-generator' mode, while the 3L(B) models offer 'grid-grid-generator' and 'grid-generator-generator' mode.

The NDQ5W controller allows independent power priority configuration. For 2L(B)/3L(B) models, Qs1 or Qs2 can be prioritized; for QL(B) models, Qs1+Qs2, Qs1+Qql, or Qs2+Qql can be prioritized.

In automatic mode, the system automatically switches to backup power when the common power source fails. You can set whether to switch back to the common power source automatically after it is restored. The following options are available:

- ASAAR - Automatically return to common power supply

- ASANR - not automatically return to the common power supply unless the backup power fails.
- ASAHR - not automatically return to the common power source unless you manually switch back using the panel buttons.

The NDQ5W controller can select the timing of ACB's energy storage:

- SEBC - Stores energy before issuing the closing command
- SEAC - automatically store energy after each closing operation to prepare for the next closing.

It should be noted that SEBC will add the time of motor energy storage to the whole conversion process. If the conversion time needs to be as short as possible, it is recommended to adjust to SEAC.

The NDQ5W controller is equipped with RS485 communication capability, utilizing the Modbus RTU protocol to enable four remote functions: remote adjustment, remote signaling, remote measurement, and remote control.

- Remote signaling function-Access the following information: the status of circuit breaker operation (open/closed), the status of circuit breaker fault tripping, the status of programmable I/O ports, and the status of parallel conversion conditions (available only for 2LB, 3LB, and QLB products)
- Telemetry function – Provides parameters such as power supply voltage, frequency, and imbalance, conversion process configuration parameters, and parallel conversion conditions including voltage difference, frequency difference, and phase angle difference (available only for 2LB, 3LB, and QLB products).
- Remote adjustment features – Modify the following parameters: under-voltage, over-voltage, under-frequency, over-frequency, imbalance, phase sequence protection thresholds and hysteresis, switching delay, power alarm judgment delay, generator start-stop delay, and parallel conversion condition thresholds (for 2LB, 3LB, and QLB products only).
- Remote control function – Enables operation of circuit breaker switching (still controlled by electrical interlock, preventing power loop formation)

The NDQ5W controller comes in two variants: standard and dual-communication. While they share identical front-end designs, the rear terminal configuration differs (see figure 10). Featuring multiple expansion capabilities including local control and intelligent load shedding, the system

requires a dual-communication variant for these functions, as detailed in Chapter 6.7.

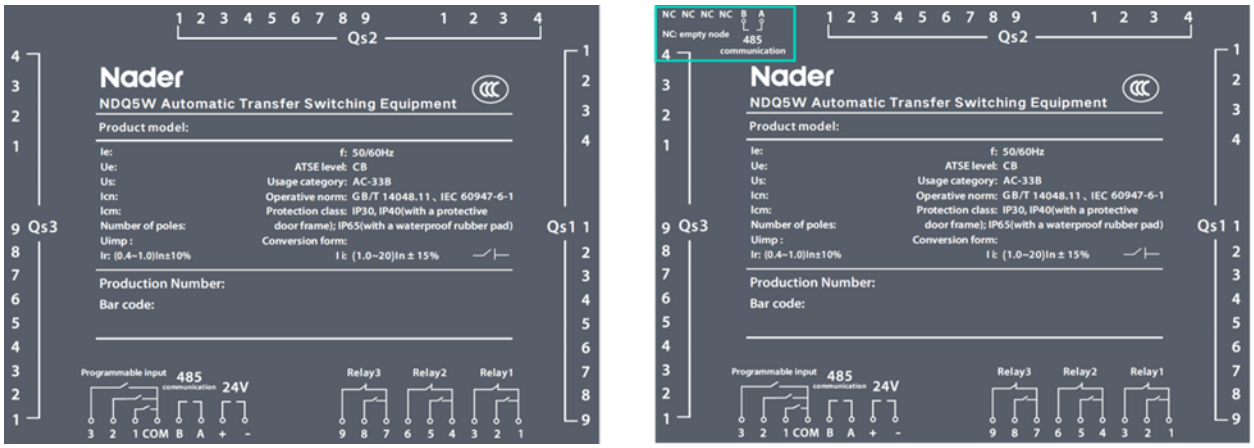


Figure 10: Back view comparison of standard controller and dual-communication controller

The priority order of control modes for the NDQ5W controller is: Exit>Fire> manual mode> local control> fault lockout> force closing by programmable input> remote communication> automatic mode.

6.3 NDQ5W Control Logic

The automatic control logic of NDQ5W includes the following delays:

Table 6: Delay Time Description

code name	Delay time	description
T1	Qs1 closing delay	Delay for closing Qs1 circuit breaker
T2	Qs1 Tripping Delay	After detecting a power failure, the S1 power circuit breaker will trip with a delay.
T3	Qs2 closing delay	Delay for closing Qs2 circuit breaker
T4	Qs2 Tripping delay	After detecting a power failure, the S2 power circuit breaker will trip with a delay.
T5	Qs3/Qql closing delay	Delay for closing Qs3/Qql circuit breakers
T6	Qs3/Qql Tripping delay	After detecting a power supply fault, the S3 power/bus tie circuit breaker will delay disconnection.
TAS	ASAAR delay	Auto-invest and auto-reinvest with delay
TGON	Engine start delay	After detecting a power failure, the generator starts with a delay
TGOF	Engine stop delay	After closing the common power circuit breaker, the delay before the diesel generator stops is activated.
TGS	Engine stable delay	After the generator starts, determine the time limit for the generator voltage to reach the normal range
TPA	Parallel delay	Parallel transfer count down

6.3.1 2L(B) Type Control Logic

The NDQ5W 2L (B) model is primarily used in automatic/manual switching systems with dual power supplies, featuring automatic power status detection, automatic circuit breaker energy storage, and automatic switching functions. The 2L model includes electrical interlocks to prevent simultaneous closing of both power circuits, while the 2LB model offers parallel switching capability to ensure uninterrupted power supply during the conversion process.

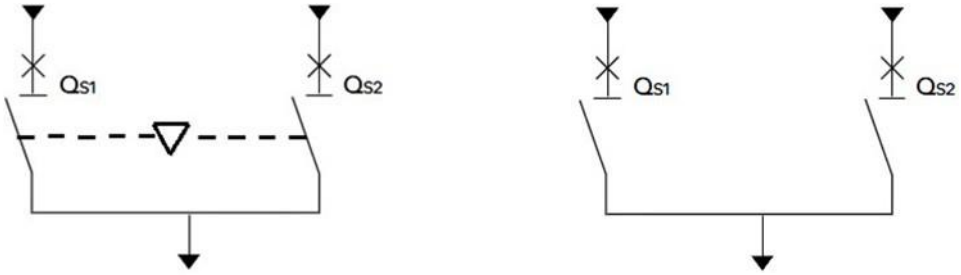


Figure 11: L-type (left) and 2LB-type (right) topology diagrams

- 2L(B) Type & Grid-Grid & ASAAR

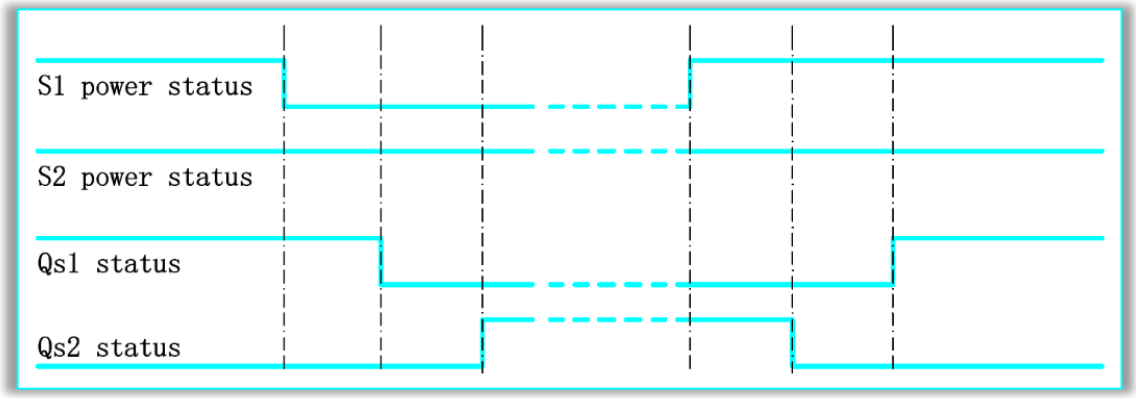


Figure 12: Timing Diagram of 2L(B) & ASAAR & Grid-Grid

- 2L(B) Type & Grid-Grid & ASANR

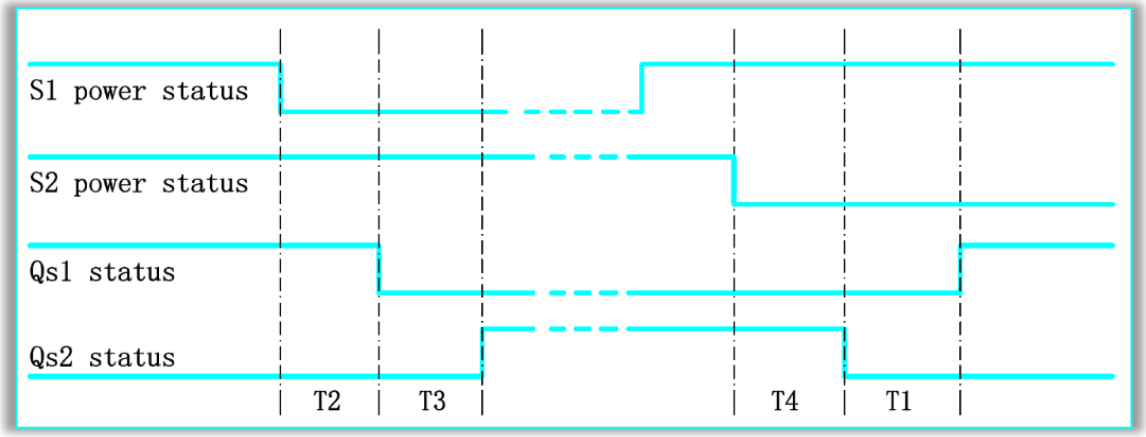


Figure 13: Timing Diagram of 2L(B) & ASANR & Grid-Grid

- 2L(B) Type & Grid-Generator & ASAAR

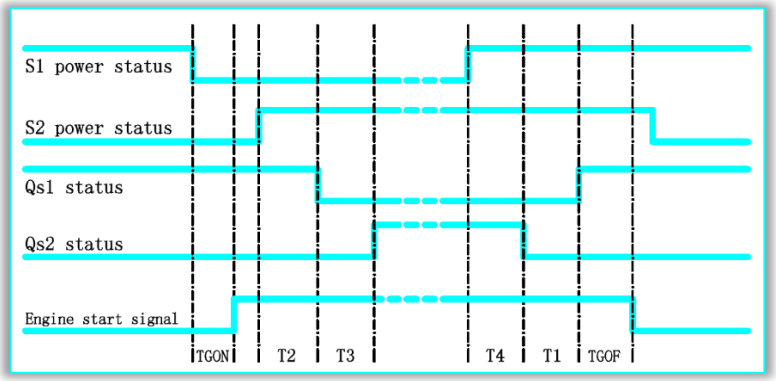


Figure 14: Timing Diagram of 2L(B) & ASAAR & Grid-Generator

Note: When the S1 power supply fault includes phase A loss and the controller lacks auxiliary power, the TGON delay is disabled, and the generator will start immediately.

6.3.2 3L(B) Type Control Logic

The NDQ5W 3L(B) model is primarily used in automatic/manual switching solutions for three-power systems, featuring automatic power status detection and automatic energy storage with circuit breaker operations. The 3L model includes electrical interlocks to prevent simultaneous closure of any two power sources, while the 3LB model offers parallel switching capability to maintain uninterrupted power supply during transitions.

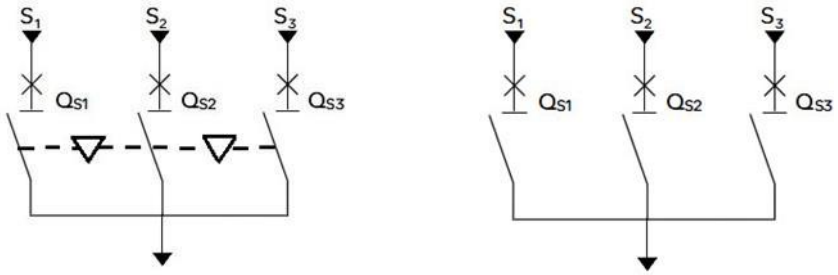


Figure 15: 3L type (left) and 3LB type (right) topology diagrams

- 3L(B) Type & Grid-Grid-Generator & ASAAR(S3 can be grid or generator)

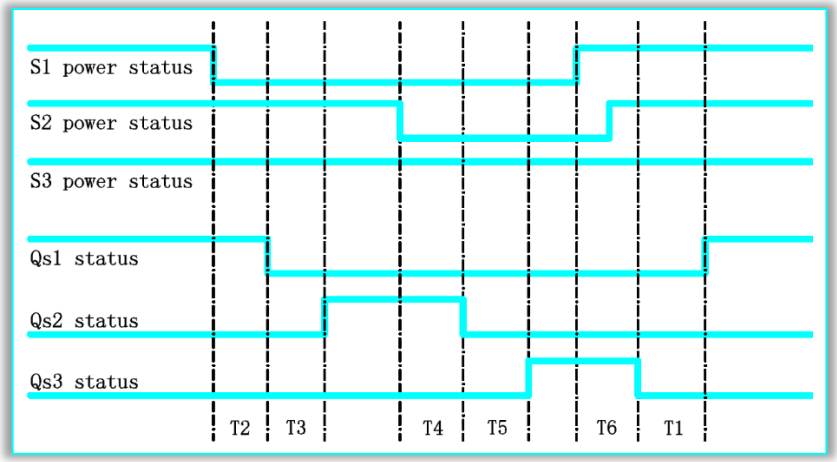


Figure 16: Timing Diagram of 3L(B) & ASAAR & Grid-Grid-Grid

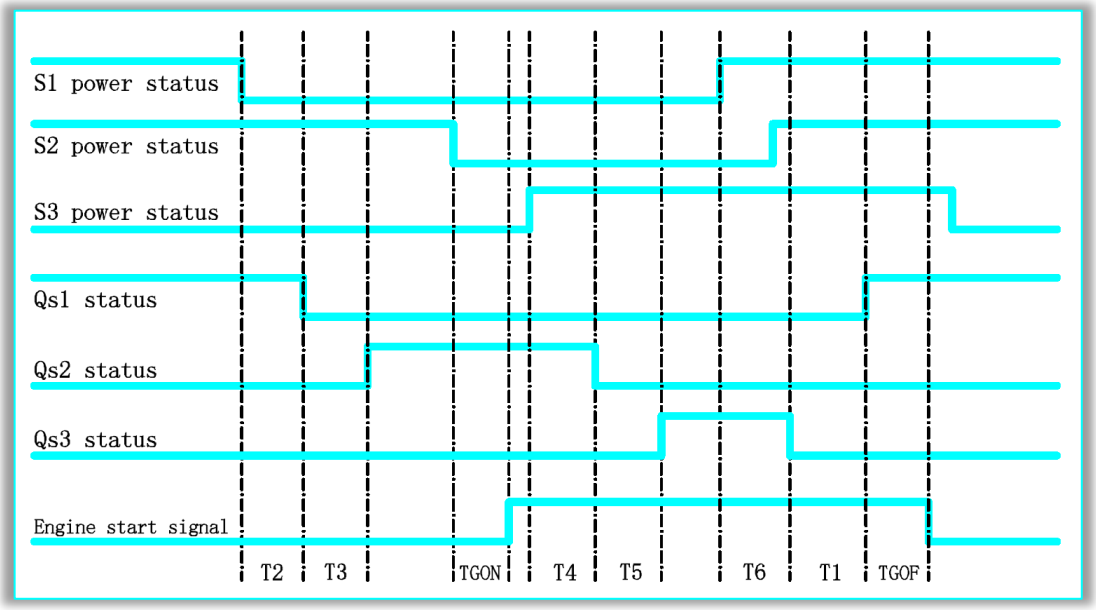


Figure 17: Timing Diagram of 3L(B) & ASAAR & Grid-Grid-Generator

Note: Although the power supply mode can only be set to "Grid-Grid-Generator", the S3 can also be connected to grid, and the relay 3 generator start signal can be left unconnected.

- 3L(B) Type & Grid-Grid-Grid & ASANR

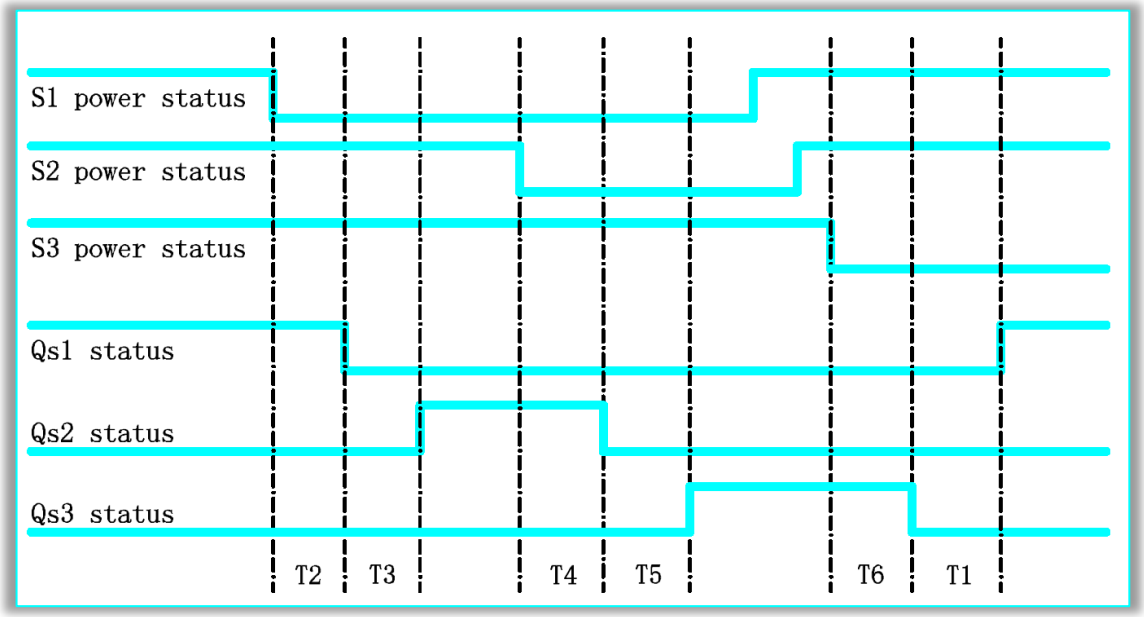


Figure 18: Timing Diagram of 3L(B) & ASANR & Grid-Grid-Grid

■ 3L(B) Type & Grid-Generator-Generator & ASAAR

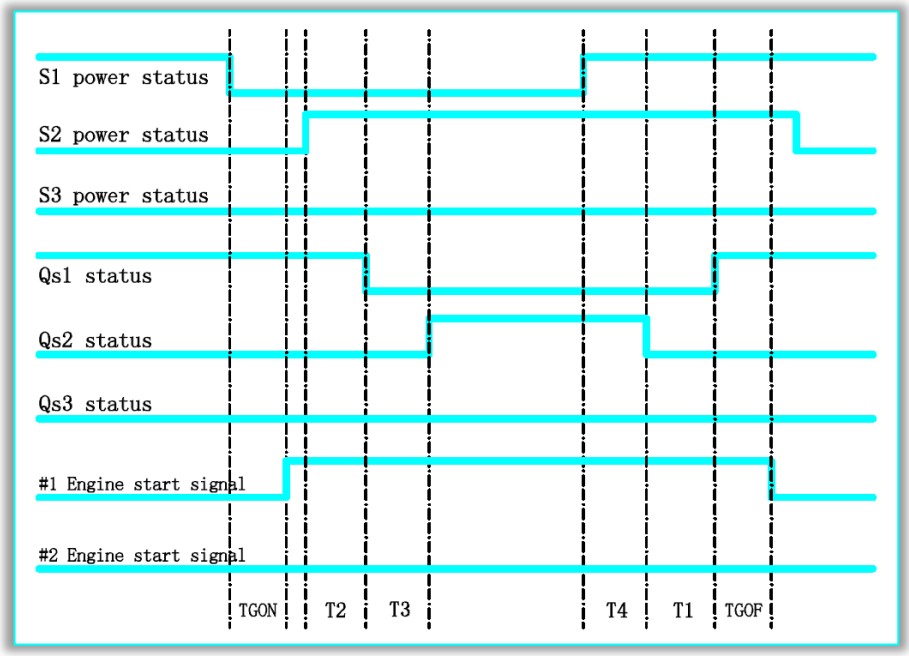


Figure 19: Timing Diagram of 3L(B) & ASAAR & Grid-Generator-Generator

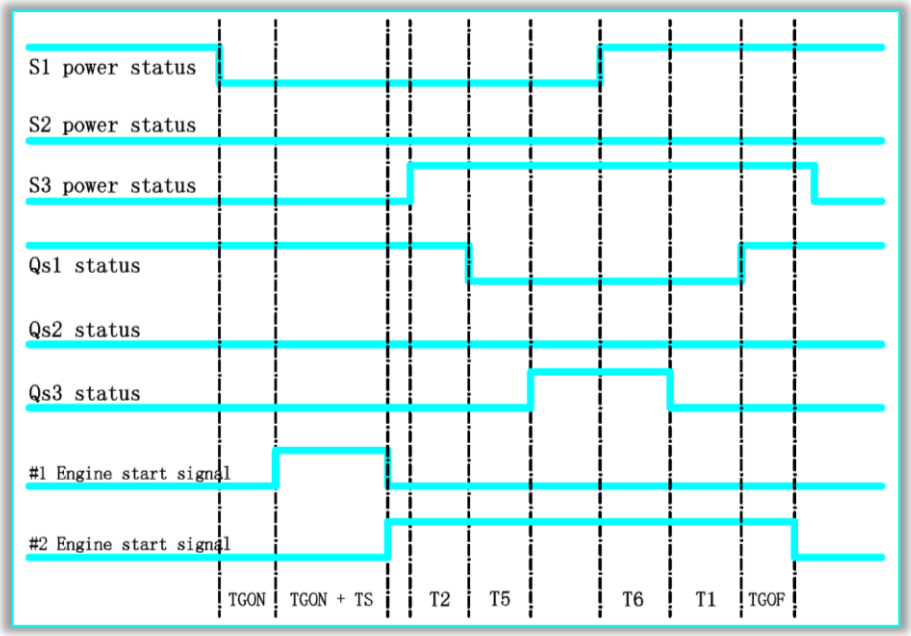


Figure 20: Timing Diagram of 3L(B) & ASAAR & Grid-Generator-Generator(generator 1 fails to start)

Note: In the "Grid-Generator-Generator" power supply configuration, Programmable Output Relay 2 is fixed to the "#1 Generator Start" function (corresponding to S2 power supply), while Programmable Output Relay 3 is fixed to the "#2 Generator Start" function (corresponding to S3 power supply). When S1 mains power fails, the system prioritizes triggering the "#1 Generator Start" signal to activate S2 generator. If S2 fails to reach the specified normal voltage range within the TGON+TS delay period, the system then activates the "#2 Generator Start" signal to activate S3 generator, simultaneously deactivating the "#1 Generator Start" signal.

6.3.3 QL (B) Type Control Logic

The NDQ5W QL (B) model is primarily used in automatic/manual transfer schemes for two-in-one-line, one-busbar power supply systems. It features automatic power status detection, automatic energy storage of circuit breakers, and automatic switching functions. The QL model includes electrical interlocks to prevent loop formation between dual power sources, while the QLB model offers parallel transfer capability to ensure uninterrupted power supply during switching.

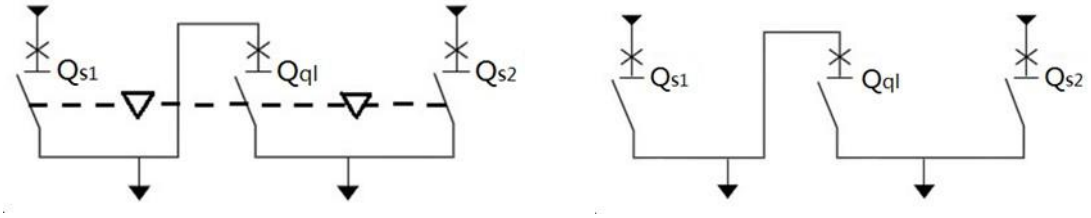


Figure 21: QL type (left) and QLB type (right) topology diagrams

- QL(B) Type & Grid-Grid & ASAAR & Qs1+Qs2 prior

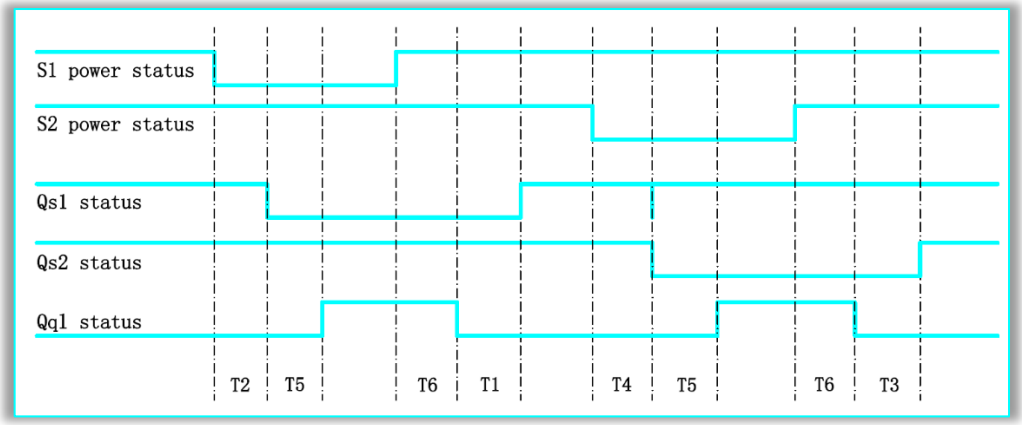


Figure 22: Timing Diagram of QL(B) & ASAAR & Grid-Grid & Qs1+Qs2 prior

- QL(B) Type & Grid-Grid & ASANR & Qs1+Qs2 prior

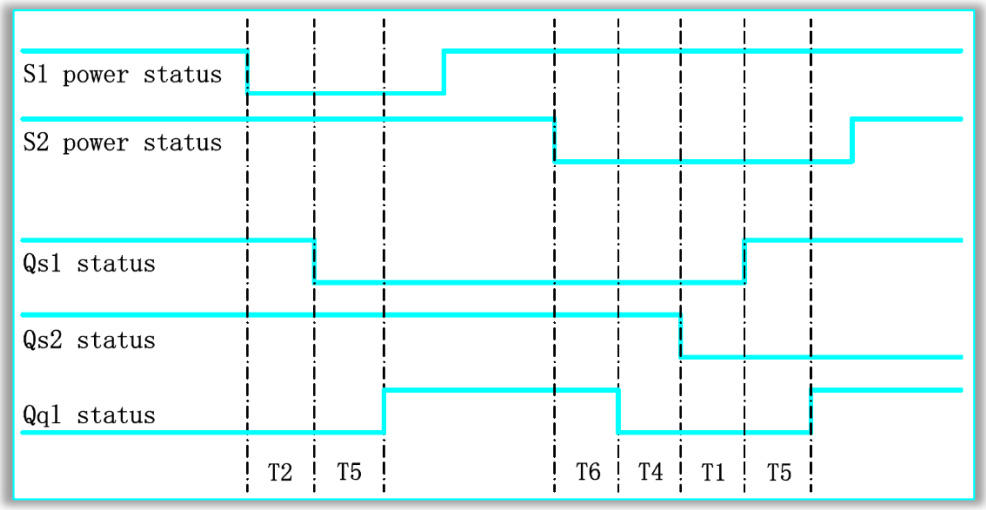


Figure 23: Timing Diagram of QL(B) & ASANR & Grid-Grid & Qs1+QS2 prior

- QL(B) Type & Grid-Grid & ASAAR & Qs1+Qql prior

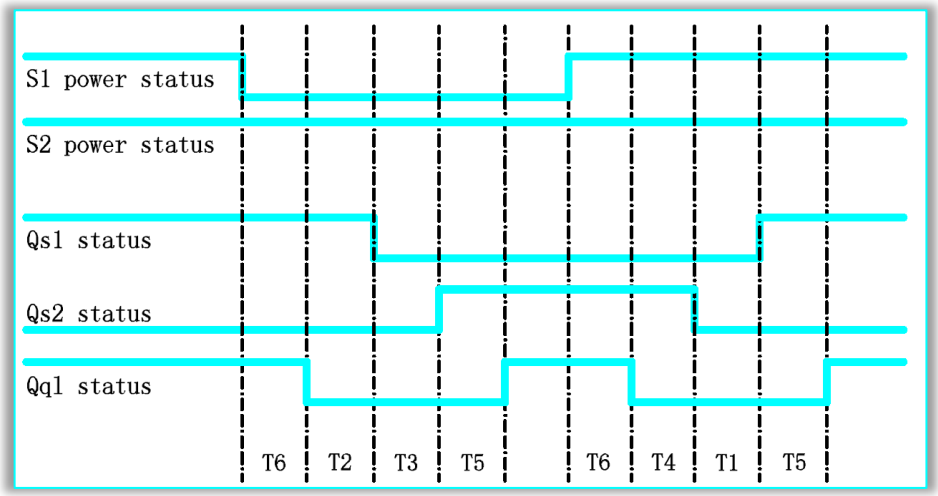


Figure 24: Timing Diagram of QL(B) & ASAAR & Grid-Grid & Qs1+Qql prior

- QL(B) Type & Grid-Grid & ASANR & Qs1+Qql prior

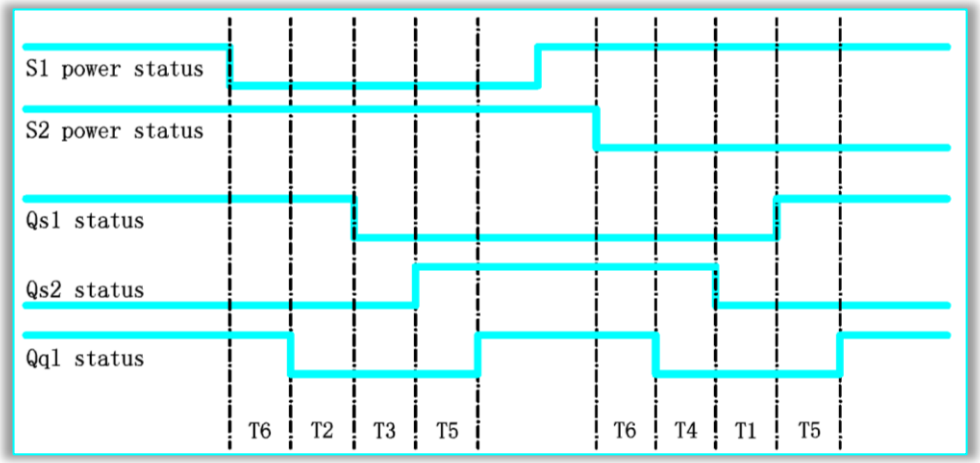


Figure 25: Timing Diagram of QL(B) & ASANR & Grid-Grid & Qs1+Qql prior

- QL(B) Type & Grid-Grid & ASAAR & Qs2+Qql prior

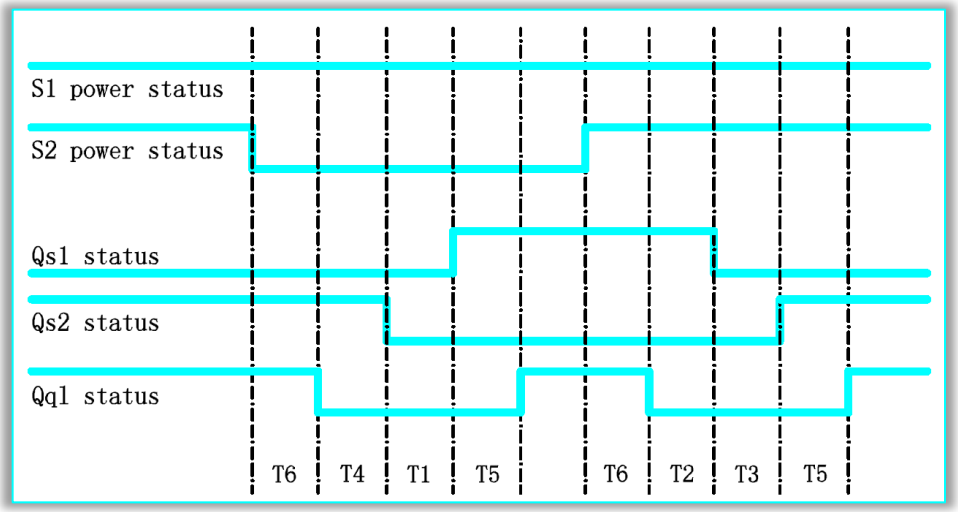


Figure 26: Timing Diagram of QL(B) & ASAAR & Grid-Grid & Qs2+Qql prior

■ QL(B) Type & Grid-Grid & ASANR & Qs2+Qql prior

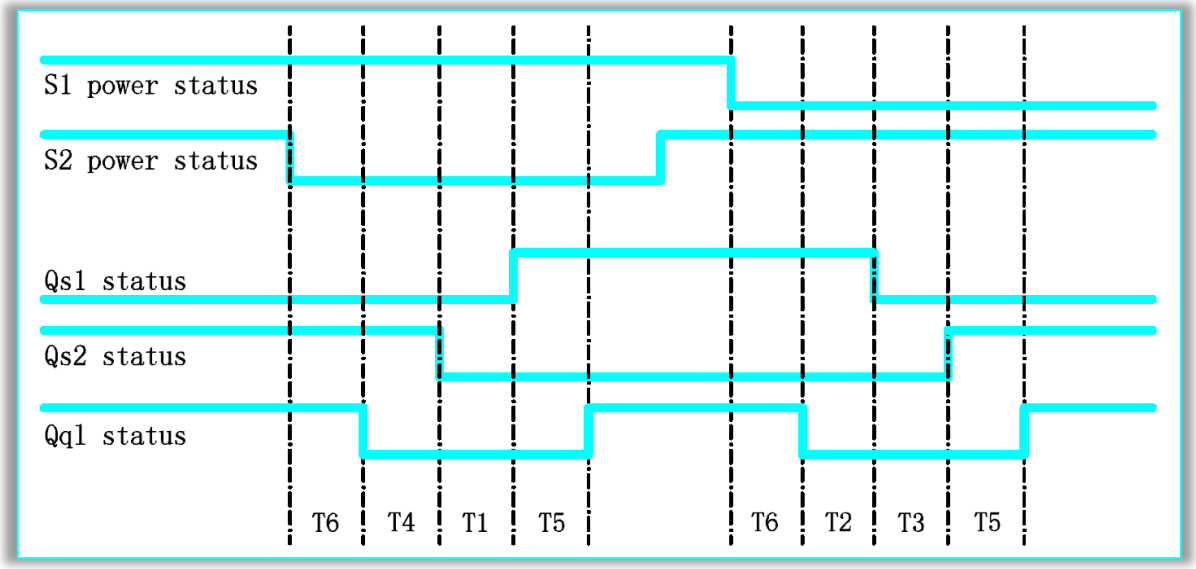


Figure 27: Timing Diagram of QL(B) & ASANR & Grid-Grid & Qs2+Qql prior

■ QL(B) Type & Grid-Generator & ASAAR & Qs1+Qs2 prior

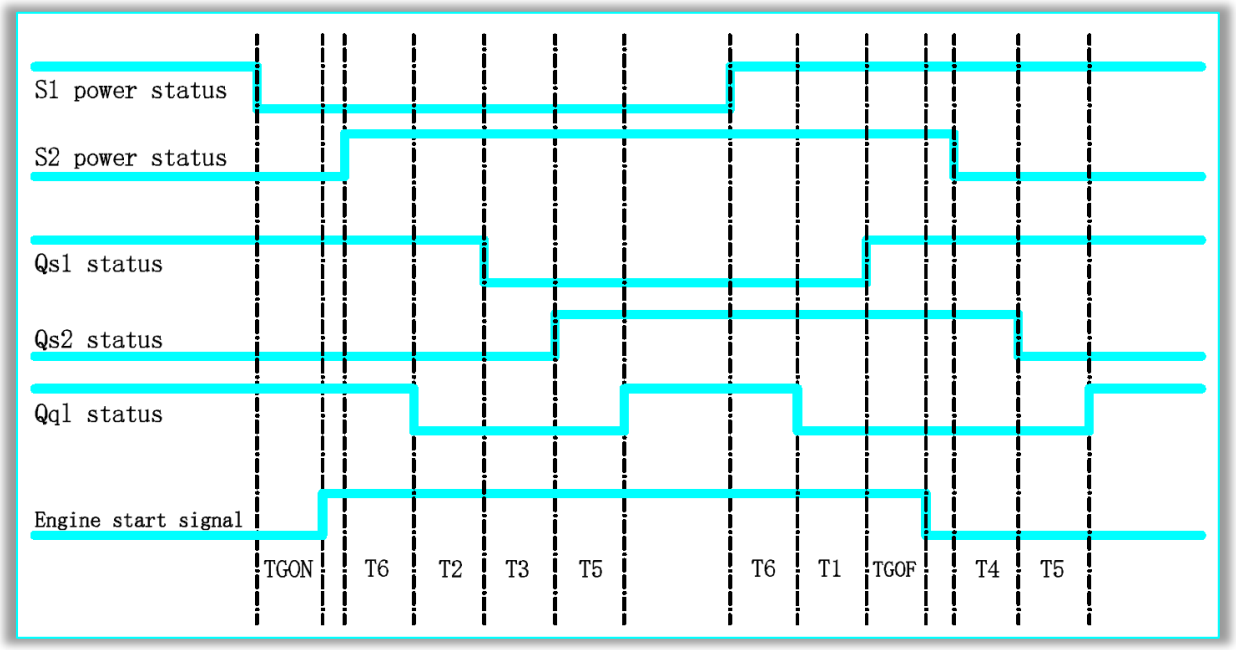


Figure 28: Timing Diagram of QL(B) & ASAAR & Grid-Generator & Qs1+Qs2 prior

6.3.4 Parallel transfer

The 2LB/3LB/QLB controllers enable parallel transfer of products, differing from the traditional "open first, then close" conversion mode. They allow two power supplies to merge into a loop for a brief period, achieving a "close first, then open" conversion method to ensure continuous power supply to the load.

Parallel conversion can be performed in both automatic and manual modes.

In manual mode, press the parallel button  to initiate parallel operation selection. Users select the corresponding icon in the manual operation area based on on-screen options. The system then enters a parallel delay countdown. During this process, the controller continuously monitors three parameters: voltage difference, frequency difference, and phase sequence difference between the two power supplies to ensure they remain within specified thresholds. If all parameters meet the criteria by the countdown's end, the parallel conversion is executed. Should any parameter exceed the threshold, the system determines the conversion conditions are unmet, resulting in a failed parallel conversion.

Automatic parallel conversion primarily occurs during the auto-recover process. By default, automatic parallel conversion is disabled. You can enable it in Settings -> Parallel Infor> Auto ParalleSet. There are two modes for automatic parallel conversion:

- Parallel + Normal: When the common power source recovers and the product requires auto-recovery, it prioritizes parallel conversion. During the parallel delay, it checks if both power sources meet the parallel conversion criteria. If qualified, it proceeds with parallel conversion; otherwise, it reverts to the standard "open then close" conversion mode.
- Parallel: When the common power source recovers and the product requires auto-recovery, it enters parallel conversion mode. During the parallel delay, the system checks whether both power sources meet the parallel conversion criteria. If the criteria are satisfied, the system performs the conversion; otherwise, no action is taken. The system periodically rechecks the parallel conversion conditions after 30 minutes.

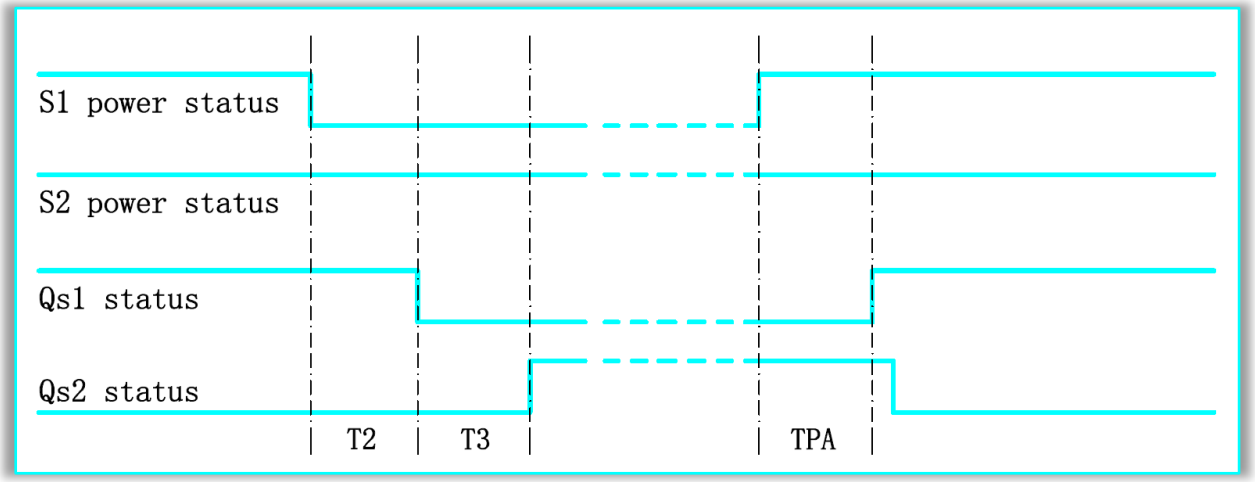


Figure 29: Timing Diagram of parallel transfer

6.4 Panel Indicator Lights and Button Instructions

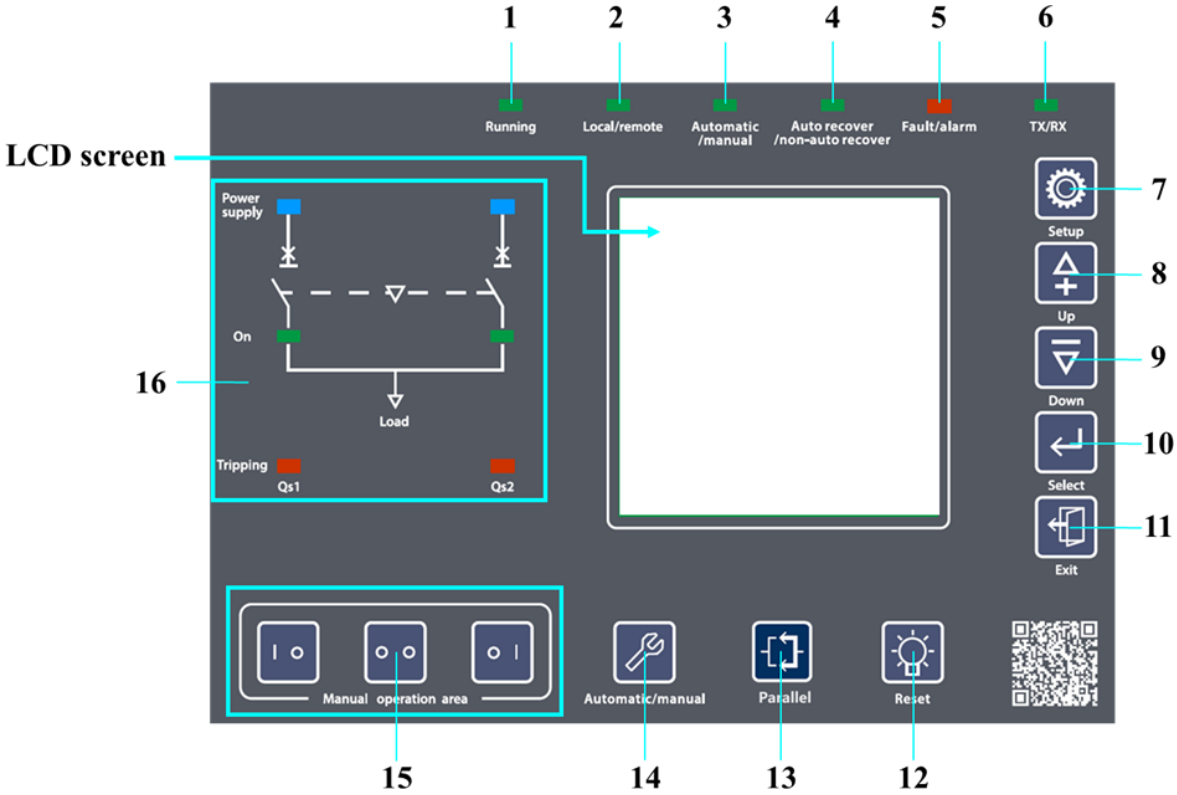


Figure 30: NDQ5W controller panel

6.4.1 NDQ5W Panel Indicator

Table 7: NDQ5W Controller LED Light Reference

No.	name	color	function description
1	Run/parallel	■	Controller operating mode indicator
2	Local/remote	■	Controller control mode indication
3	Automatic/manual	■	Controller manual/automatic mode indicator
4	Auto recover/non-auto recover	■	Controller working mode indicator
5	Fault/alarm	■	Product alarm status indicator
6	TX/RX	■	Controller communication status indicator
16	Power supply	■	Power supply status indicator
	On	■	Indicates the opening and closing status of the ACB
	Tripping	■	Fault tripping status indicator

- Run/parallel Indicator

The NDQ5W controller remains normally lit after power-on. When the parallel button  is pressed, the LED flashes and returns to normal illumination after the parallel mode ends.

- Local/remote indicator

When the NDQ5W controller is in automatic mode, the LED stays on. When using programmable inputs, communication, or local control, the LED flashes (Note: When the programmable input function: Exit is used, the LED turns off).

- Auto/manual indication

The NDQ5W controller stays on continuously in automatic mode, but flashes in manual mode. The manual power conversion function is disabled in automatic mode.

Switch between automatic and manual modes with the button  . When the controller is in automatic mode, press  to switch to manual mode; when in manual mode, press  to switch to automatic mode.

- Auto recover/non-auto recover

When the NDQ5W controller operates in ASAAR mode, the LED stays on; in ASANR or ASAHR mode, the LED turns off.

The working mode is configured in the parameter setting. For detailed instructions, refer to Chapter 6.5.1.

- Fault/Alarm Indicator

The product normally operates with intermittent shutdowns. When abnormal switching actions, ACB tripping, or N-phase sampling line wiring errors causing system voltage spikes occur, the indicator light remains on with a buzzer sound. These faults/alarm will be recorded in the 'Fault/Alarm', as detailed in Chapter 6.9.2.

After the fault is resolved, press the reset button  to clear the alarm, and the LED light will off.

- TX/RX indicator

The indicator light flashes when transmitting a communication message. It is normally off the rest of the time.

- power supply indicator

When the power supply is normal, the LED light stays on. When the power supply has abnormal conditions such as phase loss, over/under voltage, or over/under frequency, the LED light flashes.

- “On” Indicator

The LED stays on when the switch is closed and off when the switch is open.

- Tripping Indicator

When the ACB trips, the LED light stays on, along with the 'Fault/Alarm' indicator and a buzzer. These indicators only disappear after the circuit breaker resets.

6.4.2 NDQ5W Controller Panel Buttons

Table 8: NDQ5W Controller Panel Button

No.	name	Function description
7	Setup	Go to the main menu
8	Up	Move left or up to increase the parameter
9	Down	Move right or down to reduce the parameter
10	Select	Press to set parameters, then press again to confirm and save the current parameters.
11	Exit	Go to the parent menu
12	Reset	Press to reset the hardware and restart the controller
13	Parallel	Parallel conversion trigger button
14	Automatic/manual	Controller manual and auto mode toggle button
15	Manual operation area	In manual mode, the control executes the corresponding closing mode.

- Setup key 

When the controller is in standby mode, pressing it is invalid. Press and hold for 5 seconds to exit the controller standby mode and light up the LCD screen.

When the controller is lighted up, press it to enter the main menu to view the history and set parameters. See Chapter 6.5 for details.

- Reset key 

Press this button to reset the controller and restart it.

When the controller is in standby mode, pressing the button will exit standby mode and light up the LCD screen.

Note: Under normal operating conditions (non-fault state), restarting the controller does not change the switch status, whether in manual or automatic mode.

- Parallel key  (available only on 2LB/3LB/QLB controllers)

This key is invalid in auto mode. Press it in manual mode to enter the parallel conversion process.

- Manual operation area

This button is invalid in automatic mode. Press it in manual mode to control the corresponding ACB to close.

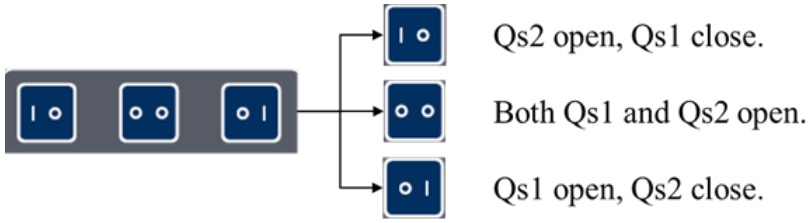


Figure 31: Manual operation area button instructions for 2L(B) type

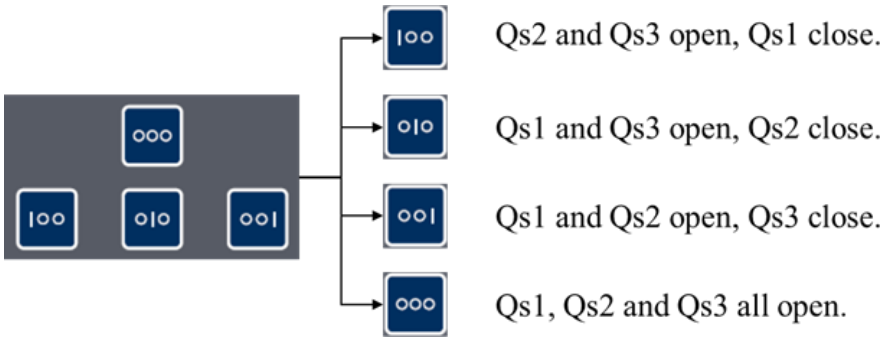


Figure 32: Manual Operation Area Button Instructions for 3L(B) type

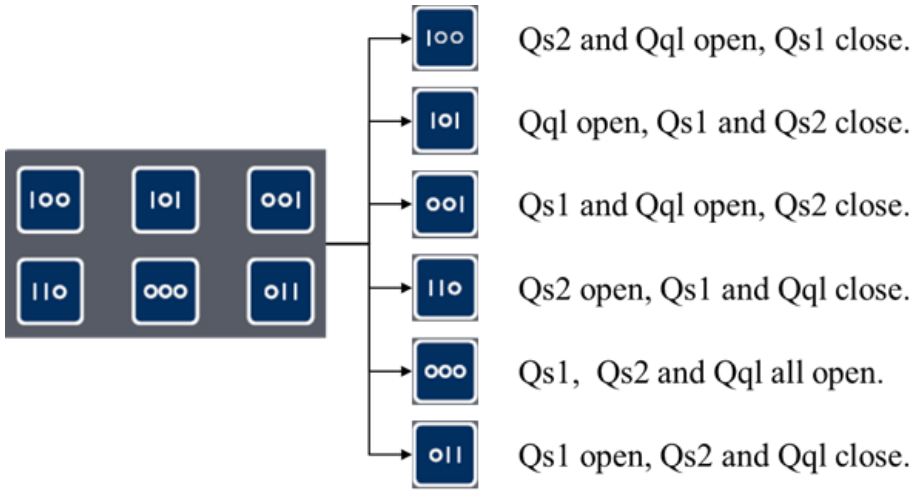


Figure 33: Manual Operation Area Button Instructions for QL(B) type

6.5 Controller LCD Display Instructions

The LCD display has a 83.8mm×76.5mm screen with a white background and black text, used to display parameters, conversion processes, and set function parameters.

LCD screens automatically lock the buttons after standby backlight delay (see Section 6.5.1). All buttons except the reset button remain inactive to prevent accidental operation and save power. The lock can be released by pressing the reset button or holding the setting button for 5 seconds.

6.5.1 Display of Operating Parameters

During normal operation, the LCD screen displays the main interface with running

parameters, or you can access them through the Main Menu → Operate. The parameters include: phase voltage values, line voltage values, imbalance and frequency value of each power supply, current power supply status, and system date and time.

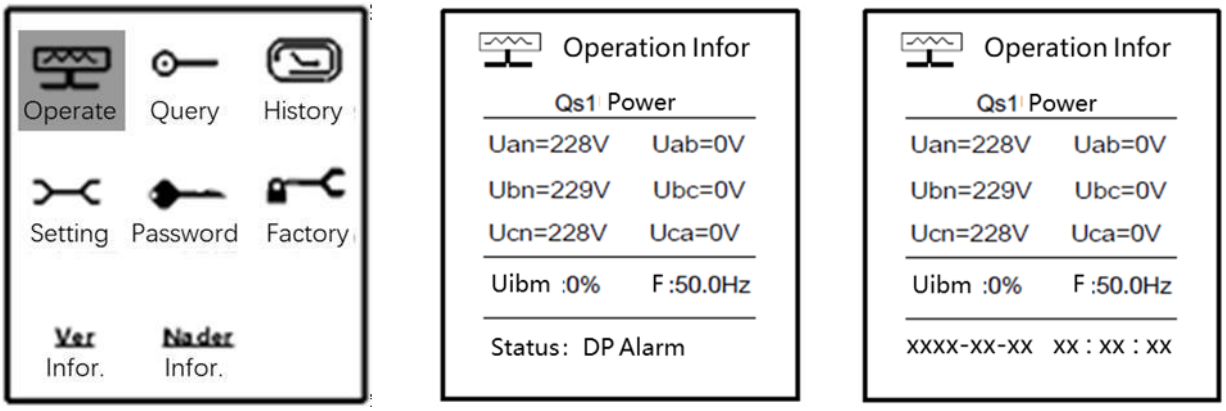


Figure 34: Main menu enter (left 1) and operation parameter display interface (right 1, 2)

6.5.2 Parameter Query

Press the Setup key to enter the main menu, then select "Query" to view the current controller parameters.

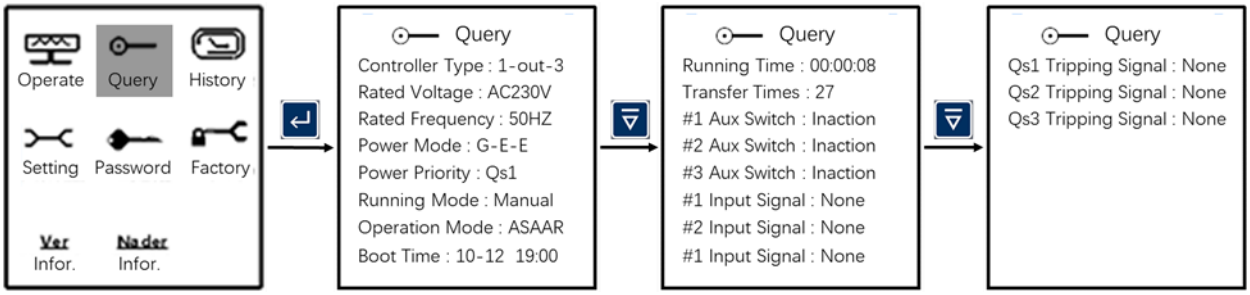


Figure 35: query parameter data (parameter content is subject to actual conditions)

6.5.3 History

Press the Setup key to access the main menu, then select "History" to view event recording (up to 96 entries, with overflow in chronological order) and alarm/fault record (up to 32 entries, with overflow in chronological order). For detailed event types, refer to chapter 6.9.1 and 6.9.2.

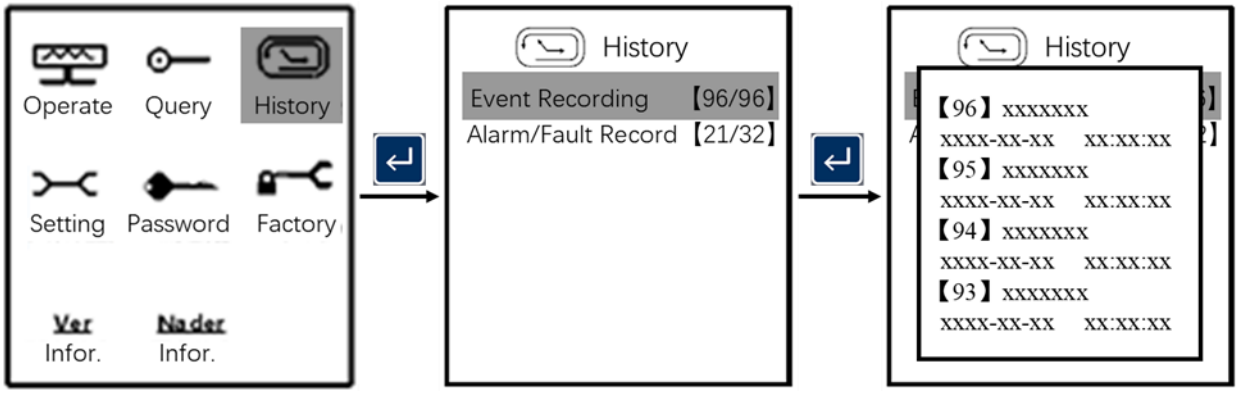


Figure 36: Historical record operation steps

6.5.4 Parameter Settings

Press the Setup key to access the main menu, then select "Setting". To enter this menu, you need to input a 4-digit password. Users can navigate the digits using the up and down keys, and select the desired option with the Select key to proceed.

The factory password for "Parameter Settings" is 1111. Users can change it themselves. See Chapter 6.5.5 for the method.

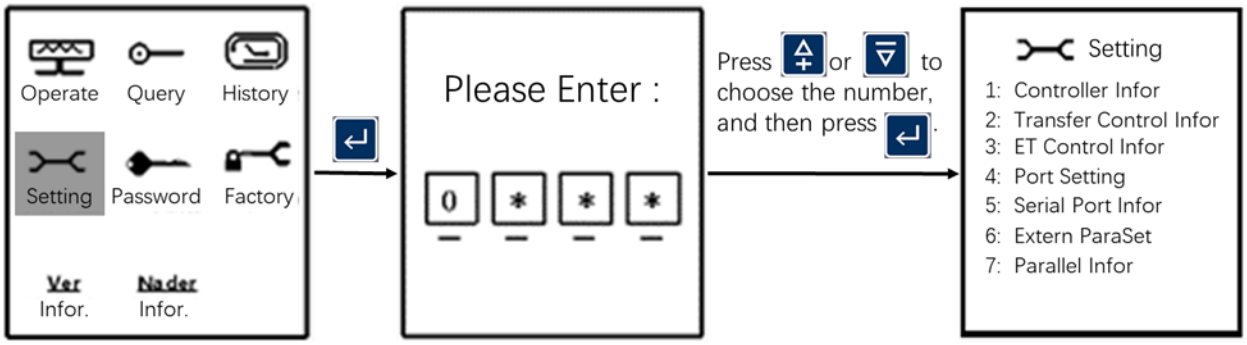


Figure 37: Steps to enter the parameter setting

■ Controller information

Table 9: Controller Information Settings

Parameter		Value (indicated by * in 【】 is factory default)
Rated frequency		【*】50Hz 【 】60Hz
Power Mode	2L(B)/ QL(B)	【 】G-G 【*】G-E
	3L(B)	【*】G-G-E 【 】G-E-E
Power Priority	2L(B)	【*】Qs1
	3L(B)	【 】Qs2
	QL(B)	【*】Qs1+Qs2 【 】Qs1+Qql 【 】Qs2+Qql
ES Setting		【*】SEBC 【 】SEAC
Operation Mode		【*】ASAAR 【 】ASANR 【 】ASAHR
Backlight Delay		【 】30s 【 】60s 【*】120s 【 】180s

System Date	XXXX-XX-XX (current date)
System Time	XX:XX:XX (Current time)
Language	【*】中文 【 】English

■ Transfer control information

Table 10: Transfer Control Information

parameter	value	step	Factory Settings
UV Start Value	OFF/161~218V	1V	187V
UV return value	UV Start Value + (4~30) V	1V	197V
OV start value	OFF/242~288V	1V	264V
OV return value	OV start value - (4~30) V	1V	254V
UF Start Value	OFF/45.0~49.0Hz	0.1Hz	45.0Hz
UF return value	UF Start Value + (2.5~4.5) Hz	0.1Hz	49.0Hz
OF start value	OFF/51.0~55.0Hz	0.1Hz	55.0Hz
OF return value	OF start value - (2.5~4.5) Hz	0.1Hz	51.0Hz
Uibm start value	OFF/3%~30%	1%	OFF
Uibm return value	2%~10%	1%	10%
Qs1 closing delay	0.0s~6400.0s	0.1s	5.0s
Qs1 tripping delay	0.0s~6400.0s	0.1s	5.0s
Qs2 closing delay	0.0s~6400.0s	0.1s	5.0s
Qs2 tripping delay	0.0s~6400.0s	0.1s	5.0s
Qs3/ML closing delay	0.0s~6400.0s	0.1s	5.0s
Qs3/ML tripping delay	0.0s~6400.0s	0.1s	5.0s
ASAAR delay	0.0s~6400.0s	0.1s	0.5s
UV alarm delay	0.0s~6400.0s	0.1s	0.5s
OV alarm delay	0.0s~6400.0s	0.1s	0.5s
UF alarm delay	0.0s~6400.0s	0.1s	0.5s
OF alarm delay	0.0s~6400.0s	0.1s	0.5s
Uibm alarm	0.0s~6400.0s	0.1s	0.5s
phase sequence	OFF/A-B-C/A-C-B	/	OFF
Remote save	Enable/Disable	/	close
WideFreqPte	Enable/Disable	/	close
LimitRsete	Enable/Disable	/	close
ResetstartT	00h~23h	01h	02h
ResetcloseT	00h~23h	01h	04h

ResetstadyT	0m~300m	1m	180m

- Engine TC information

Table 11: Engine TC Information

parameter	Value	step	Factory Settings
Engine start delay	0.0s~6400.0s	1s	3s
Engine stop delay	0.0s~6400.0s	1s	20s
Start stable delay	0.0s~6400.0s	1s	20s
Engine SI date	1~ 30	1	10
Engine SI time	00:00~23:59	01	12:12
Engine SI function	On/Off	/	Off

- Port setting

Table 12: Port Setting

parameter	price
#1 Relay Output Setting	Fault Alarm Transfer Action Fault Tripping fault Grid Alarm Qs1 Power Alarm Qs2 Power Alarm Qs3 Power Alarm #1 Engine Start #2 Engine start Fully Off event Parallel Transfer fail First unload Sec. unload Third unload Bus-tie SW Over Bus SW Over
#2 Relay Output Setting	
#3 Relay Output Setting	
#Do1 relay output setting	
#Do2 relay output setting	
#Do3 relay output setting	
#Do4 relay output setting	
#Do5 relay output setting	
#Do6 relay output setting	
#1 Input Setting	Fire Control Function Forced Qs1 Close Forced Qs2 Close Forced Qs3 Close Forced Qs1+Qs2 Close Forced Qs1+Qql Close
#2 Input Setting	
#3 Input Setting	
#Di1 input setting	

#Di2 input setting	Forced Qs2+Qql Close
#Di3 input setting	Fault Lock Function
#Di4 input setting	Bus-tie SW Over
#Di5 input setting	Bus SW Over
#Di6 input setting	Exit

- Serial port Setting

Table 13: Serial Port Setting

parameter	value	Factory Settings
Device Address	2~255	2
Baud rate	【*】9600 【 】19200	
Check mode	No (Cannot set)	
StopBit	1Bit (Cannot be set)	

- Extern ParaSet

Table 14: Extern ParaSet

function	value	step	Factory Settings
local control Smart Unload DIDO Enable	【 】ON 【*】OFF		
Bus-tie SW Over	【 】Lock 【*】NULL		
Bus SW Over	【 】Unload 【*】NULL		
Bus-tie SW Reset T	0m~240m	1m	90m
Bus SW Reset T	0m~240m	1m	90m
Bus-tie SW Over T	0m~240m	1m	0m
Bus SW Over T	0m~240m	1m	0m
First unload set	0%~120%	1%	90%
Sec. unload set	0%~120%	1%	70%
Third unload set	0%~120%	1%	50%
Smart unload T	0s~60000s	1s	5s
Smart reset T	0s~60000s	1s	5s

- Parallel information

Only 2LB/3LB/QLB mode can achieve.

Table 15: Parallel Conversion Parameter Settings

function	value	step	Factory Settings
voltage difference	2V~20V	1V	5V
F difference	0.1Hz~1.0Hz	0.1Hz	0.2Hz
Phase difference	3°~10°	1°	5°
Parallel delay	10s~360s	1s	20s
Auto paralleSet	【*】OFF 【 】Para + Norm 【 】Paralle		

6.5.5 Password Management

Press Setup key to access the main menu and select "Password". Here, users can change their password. The default password is 1111. New passwords can be changed by using ,, and .To complete the change, users must enter the old password, new password, and re-enter the new password. It will return to he main menu after the change.

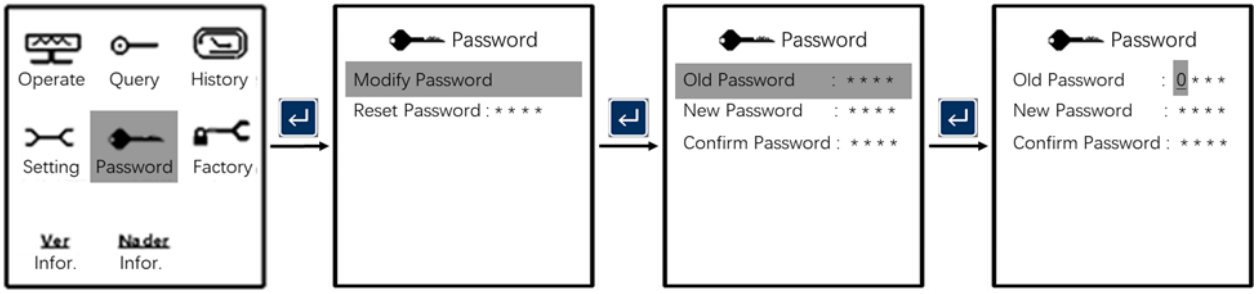


Figure 38: Password settings path

6.5.6 Manufacturer Maintenance

This interface is accessible only to the manufacturer. Users cannot configure it.

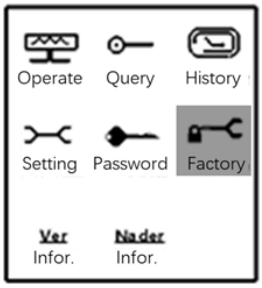


Figure 39: Manufacturer maintenance interface

6.5.7 Version and Manufacturer Information

The NDQ5W controller also provides version and manufacturer information for easy traceability.

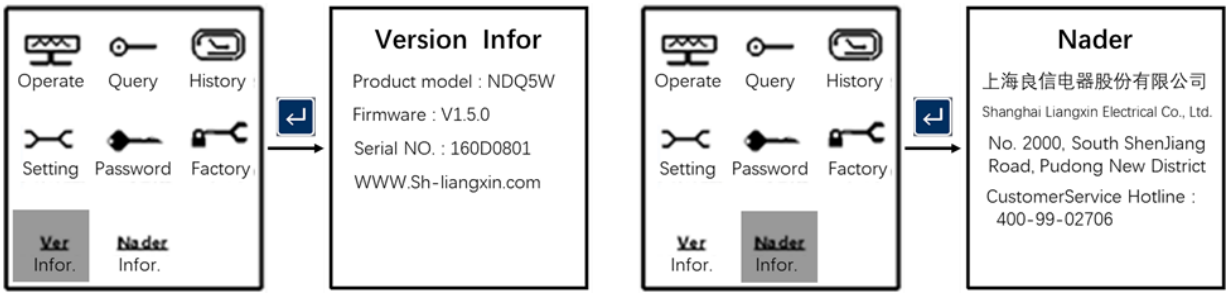


Figure 40: Viewing method for version information and manufacturer information

6.6 Accessibility Features

6.6.1 Remote Save

This can be enabled by setting status of remote save (see Chapter 6.5.4-transfer control information).

Remote communication is only available when this feature is enabled.

Use with fire protection function.

6.6.2 Fire Protection Full Function

This can be achieved by setting the programmable input to fire control function (see Chapter 6.5.4-port setting).

When a passive signal is input to the programmable Di port configured for 'Fire Control Function' mode, the device activates fire protection mode. All circuit breakers disconnect, and this state persists even after the Di signal is canceled. The system returns to automatic or manual mode only when the 'Manual/Automatic' or 'Reset' buttons are pressed.

This can be used with the 'Remote Save' feature. When 'Remote Save enabled', inputting a passive signal in the Di port activates fire mode. Even if the NDQ5W controller is powered off and restarted or the 'Reset' button is pressed, the product remains in fire mode. In this case, the status can only be restored by pressing the 'Manual/Automatic' button.

6.6.3 Wide Frequency Protection

This can be enabled by setting status of WideFreqPte (see Chapter 6.5.4-transfer control information).

When enabled, the over-frequency and under-frequency protection will be disabled. The frequency protection will be activated only when the power supply’s frequency exceeds the range of 40~70Hz, then enabling the product to switch.

6.6.4 Time-limiting of auto recovery

This can be enabled by setting status of LimitRsete (see Chapter 6.5.4-transfer control information).

Only valid when operating mode is ASAAR.

When this function is on and the product fits the conditions for auto recovery, the product

won't act immediately to return to the common power supply. The system initiates a ResetstadyT countdown after the common power supply recovered. If the countdown completes with the common power supply maintaining normal and the current time falls within the "ResetstartT" and "ResetcloseT" range, the switch will return to the common power supply. No action will be taken if any condition is not met.

6.6.5 Generator Self-Check

This can be enabled by setting status of Engine SI Function (see Chapter 6.5.4-Engine TC information).

When this function is enabled, the controller will send an Engine Start signal on its "Engine SI Date" and "Engine SI Time" each month, at the same time triggering a "Startup Stable Delay" countdown. If the countdown completes with the generator power supply normal, the event log will record "Normal generator Self-Check". If the power supply is abnormal, it will record "Generator Self-Check Failed".

6.6.6 Controller Exit

This can be achieved by setting the programmable input to exit (see Chapter 6.5.4-port setting).

When a passive signal is input to the programmable Di port configured for 'Exit' mode, the controller will cease all operations on the ACB, only monitor the status of the power supply and the ACB's opening or closing. Users can directly operate the circuit breaker via the frame's buttons. Once the signal is canceled, the controller resumes full control of the frame circuit breaker.

6.7 Programmable I/O Signals

The NDQ5W controller provides three programmable input ports (COM 1, 2, 3) and three programmable output ports (Relay 1-3, ports 1&2, 3&4, 7&8, 9) for user access.

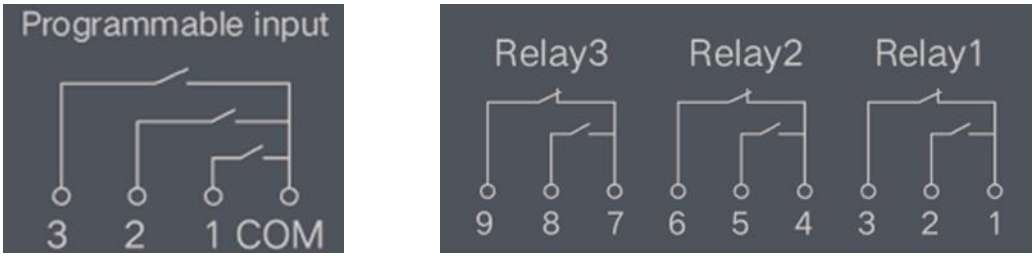


Figure 41: NDQ5W Programmable I/O (located on the back lower side of the controller)

6.7.1 Programmable Input Signals

There are three port groups sharing a common port. The controller allows users to freely configure programmable input functions. These functions activate when the port receives a continuous passive signal and deactivate when the signal is removed.

These belongs to remote control functions. When connected, the 'Local/Remote' LED on the panel flashes (Note: When set to 'Exit Control', the LED turns off).

Table 16: Programmable Input

function	effect
Fire Control Function	After receiving the signal, the system enters the "fire" mode, and all switches are disconnected. See chapter 6.6.2 for details.
Forced Qs1 Close	After receiving the input signal, the other switches open and Qs1 closes.
Forced Qs2 Close	After receiving the input signal, the other switches open and Qs2 closes.
Forced Qs3 Close	After receiving the input signal, the other switches open and Qs3 closes.
Forced Qs1+Qs2 Close	After receiving the input signal, the other switches open while Qs1 and Qs2 close.
Forced Qs1+Qql Close	After receiving the input signal, the other switches open while Qs1 and Qql close.
Forced Qs2+Qql Close	After receiving the input signal, the other switches open while Qs2 and Qql close.
Fault Lock Function	After receiving the input signal, all switches maintain their current open/closed status regardless of the power supply condition.
Exit	After receiving the input signal, “Exit” function activate, see chapter 6.6.6 for details.
Bus-tie SW Over	After receiving the input signal, “Bus-tie SW Over” function activate, see chapter 6.8.5 for details.
Bus SW Over	After receiving the input signal, “Bus SW Over” function activate, see chapter 6.8.6 for details.

6.7.2 Programmable Output Signals

The controller features three programmable output relays, each consisting of one NO contact and one NC contact, sharing a common terminal. Users can configure programmable output functions for each relay group within the controller. When the device meets the specified conditions, the corresponding NO contacts close while NC contacts open, delivering output signals for user acquisition.

Table 17: Programmable Output

function	effect
Fault Alarm	When the product has a “Transfer Action Fault”, a “Tripping Fault”, or a voltage exceeding 1.3Ue, the relay will operate.
Transfer Action Fault	When transfer action fails, the relay will operate.
Tripping fault	When the circuit breaker trips, the relay acts.

Grid Alarm	When any of the power supplies S1, S2, or S3 abnormal, the relay activates.
Qs1 Power Alarm	When the S1 power supply is abnormal, the relay operates.
Qs2 Power Alarm	When the S2 power supply is abnormal, the relay operates.
Qs3 Power Alarm	When the S3 power supply is abnormal, the relay operates.
Bus-tie Event	Only valid for QL(B) type. When bus-tie close, the relay operates.
Fully Off event	When all the ACBs open, the relay operates.
Parallel Transfer Fail	When parallel transfer action fails, the relay operates.
First unload	See chapter 6.8.3 for details.
Sec. unload	
Third unload	
Bus-tie SW Over	When the “Bus-tie SW Over” function activates, the relay operates.
Bus SW Over	When the “Bus SW Over” function activates, the relay operates.
#1 Engine Start	■ The controller is of type 2L(B)/QL(B). When the power supply mode is "grid-generator", relay 3 is fixed for this function and cannot be modified. When the S1 power supply is normal, relays 3:7 and 8 close, while ports 7 and 9 are open. When the S1 power supply is abnormal, the system activates immediately if phase A of S1 is disconnected: relays 3, 7, and 8 open, while relays 7 and 9 close. If phase A of S1 remains connected, the relays only activate after the generator start delay (see chapter 6.5.4). ■ The controller is 3L(B) type. When the power supply mode is "grid-grid-generator", relay 3 is fixed for this function and cannot be modified. When the S1 and S2 power supplies are normal, relays 3:7 and 8 close, while ports 7 and 9 are open. When S1 and S2 power supplies are abnormal, if the fault involves simultaneous phase loss in both A phases of S1 and S2, the relay activates immediately: Relays 3, 7, and 8 open, while relays 7 and 9 close. If the fault does not involve simultaneous phase loss in both A phases, the relays only activate after the generator start delay (see chapter 6.5.4). ■ The controller is 3L(B) type. When the power supply mode is "grid-oil generator-oil generator", relay 2 is fixed for this function and cannot be modified. When the S1 power supply is normal, relays 2:4 and 5 close, while relays 4

	and 6 open. When the S1 power supply is abnormal, the relay activates immediately if the fault involves phase loss of S1's A phase: relays 2: 4 and 5 open, while relays 4-6 close. If the fault does not involve A phase loss, the relays only activate after the generator start delay (see chapter 6.5.4).
#2 Oil machine started	■ Only when the controller is 3L(B) type and the power supply mode is "grid-oil generator-oil generator", relay 3 is fixed for this function and cannot be changed. When the S1 and S2 power supplies are normal, relays 3:7 and 8 close, while ports 7 and 9 are open. When S1 and S2 power supplies are abnormal, if the fault involves simultaneous phase loss in both A phases of S1 and S2, the relay activates immediately: Relays 3, 7, and 8 open, while relays 7 and 9 close. If the fault does not involve simultaneous phase loss in both A phases, the relays only activate after the generator start delay (see chapter 6.5.4).

6.8 Extended functions

NDQ5W provides the following extended features for users.

6.8.1 Prerequisites for Extension Functions

- This can only be achieved by purchasing the NDQ5W dual-communication controller.
- The frame circuit breaker must be equipped with communication function and configured with a communication address, which is connected in series with the NDQ5W controller interface as shown in the figure.

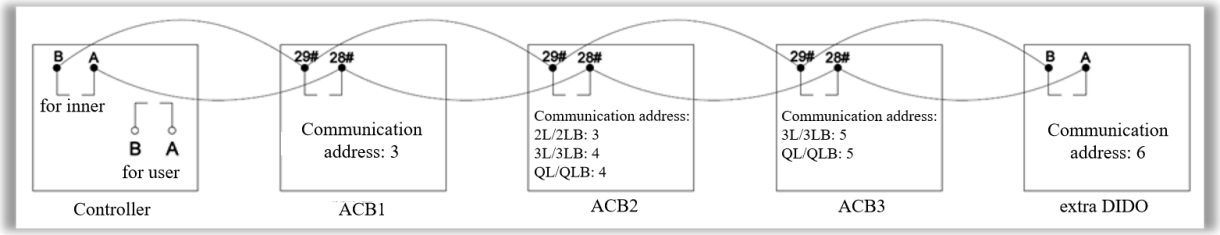


Figure 42: Extended Function Communication Wiring Diagram

- The frame circuit breaker controller must be lighted up.

6.8.2 Local control functions

As after the NDQ5W controller is activated, users are prohibited from operating the frame circuit breaker. To ensure convenient on-site operation, this function enables two external buttons to control the circuit breaker's closing and opening.

This feature requires the frame circuit breaker to be additionally equipped with an S3-

2DI2DO signal unit.

This feature has higher priority than Auto mode, but lower priority than Fire mode and Manual mode.

This function is still controlled by the NDQ5W controller, so the electrical interlock remains effective and no closed loop will be formed between the power sources.

The steps to implement the local control function are as follows:

- Chapter 6.8.1 All prerequisites must be completed;
- Set the "Local Control " parameter to ON in the NDQ5W controller;
- Connect the two terminal pairs in the secondary terminals of the ACB—18# and 19# (for local closing) and 16# and 17# (for local opening) to buttons mounted on the cabinet door. As this control signal requires a continuous signal, the buttons must have self-locking function. This is a passive signal; do not connect any active signal, as it may damage the ACB's controller.
- The NDQ5W controller is in "Auto" mode;
- When pressing the local control button of any frame circuit breaker, the NDQ5W controller automatically enters local control mode, with the "Local/Remote" LED indicator flashing. Once all local control signals are canceled, the controller reverts to automatic mode, with the switch being managed by the automatic control logic. To maintain local control mode, users must operate the two buttons for the same frame circuit breaker in the sequence: first closing then opening(e.g., using button 18# and 19# to close Qs1 circuit breaker locally, if users want to use button 16# and 17# to open the same circuit breaker, they should first press button 16# and 17#, the cancel button 18# and 19#).

6.8.3 Smart unload

The steps to implement the smart unload function are as follows:

- Chapter 6.8.1 All prerequisites must be completed;
- Set the "Smart Unload" in the NDQ5W controller to ON.
- The user can set the programmable output port to "First unload", "Sec. unload", or "Third unload" (see Chapter 6.7.2), and connect it to the corresponding load unloading device;
- The NDQ5W controller continuously monitors the maximum phase current of each circuit breaker in real-time through communication, calculating its ratio to the rated operating current. When this ratio exceeds the preset threshold, the system initiates an "Smart Unload T" and triggers the corresponding unload signal (for example, setting the Third Unload Set at 50% will activate the programmable relay configured for " Third Unload " when the ratio surpasses this level). Conversely, if the ratio falls below the preset threshold, the system performs an "Smart Reset T" and cancels the corresponding

signal.

6.8.4 DIDO Extension Module

When users require more than the standard 3 programmable I/O ports (Chapter 6.7) in the NDQ5W controller, they can add a DIDO extension module to extend both the input and output ports by 6 additional groups each.

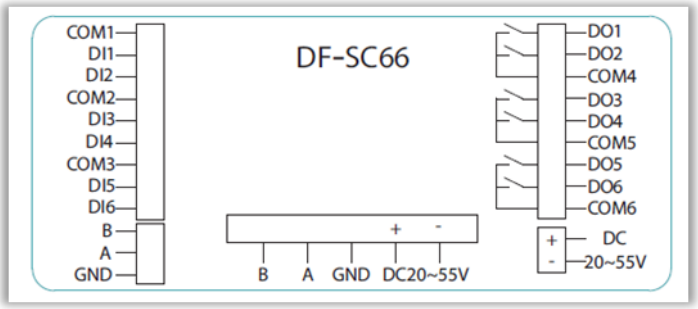


Figure 43: DIDO Module Wiring Diagram

The DIDO extension module usage steps are as follows:

- Chapter 6.8.1 All prerequisites must be completed;
- Set 'DIDO Enable' to ON in the NDQ5W controller.
- The module requires an external DC20~55V power supply.
- Both input and output are passive contact signals, with the DO relay rated at AC250V/DC30V, 2.5A.
- Configure the corresponding functions in Setup -> Settings -> Port Setting.

The module is installed on standard rails. See the chapter 8.4 for its external dimensions and installation specifications.

6.8.5 Overcurrent Lockout Function of the Bus-tie

The overcurrent lockout function of bus-tie's priority is higher than automatic mode but lower than bus tie overload release.

The steps to implement the mother loop overcurrent lockout function are as follows:

- Chapter 6.8.1 all prerequisites must be completed;
- Set the 'Bus-tie SW Over' in the NDQ5W controller to ON.
- When the NDQ5W controller detects an overcurrent signal from the bus-tie position frame circuit breaker, it triggers a 'Bus-tie SW Over T' delay and achieve the bus-tie overcurrent protection mode, automatically disabling the dual power transfer system. The system simultaneously sends a 'Bus-tie SW Over' signal (user-configurable) through its programmable output port. Once the overcurrent signal is cleared, after the 'Bus-tie SW Reset T' counts down, it will quit the mode and restoring the auto-control system.

6.8.6 Overload Bus-Tie Unloading Function

The overload bus-tie unloading function has higher priority than the bus tie overcurrent lockout, but lower priority than remote control.

The steps to implement the overload bus-tie unloading function are as follows:

- Chapter 6.8.1 All prerequisites must be completed;
- Set the 'Bus SW Over' in the NDQ5W controller to ON.
- When the NDQ5W controller detects a 'Bus SW Over' signal from the bus-tie position frame circuit breaker, it triggers a 'Bus SW Over T' delay. After this delay, the bus-tie switch disconnects and the automatic transfer system is locked out, halting all operations. Simultaneously, the controller sends a 'Bus SW Over' signal through a programmable output port (user-configurable). Once the overload signal is cleared, after the ‘Bus SW Reset T’ counts down, it will quit the mode and restoring the auto-control system.

6.9 Event and Fault Records

Press the Setup key to access the main menu, then select "History" to view event records (up to 96 entries, with overflow in chronological order) and alarm/failure records (up to 32 entries, with overflow in chronological order). Event types are detailed in Chapters 6.9.1 and 6.9.2.

6.9.1 Event Records

Table 18: Event Record Types and Descriptions

event type	explaination
Qs1 Open Event	Record the opening, closing, and energy storage actions of the corresponding switch.
Qs1 close event	
Qs1 ES Event	
Qs2 Open Event	
Qs2 close event	
Qs2 ES Event	
Qs3 Open Event	
Qs3 close event	
Qs3 ES Event	
ML Open Event	
ML close event	
ML ES Event	
Parallel event	Success to act a parallel transfer and records.
Transfer event end	Any opening and closing action is performed will be recorded.
Boot	Record after the controller is powered on or reset
Manual-Automatic	The controller switches from manual to automatic mode and records
Automatic-Manual	The controller switches from automatic to manual mode and records
User Login	After entering the password to access the "Settings" interface, the system will record the input.

Manager login	After entering the password to access the "Factory" interface, the system records the action.
Modify date event	After the user modifies the system date in "Setting" - "Controller Infor", the system records.
Modify time event	After the user modifies the system time in "Setting" - "Controller Infor", the system records.
#1Relay out	Record after the programmable output relay 1 is activated
#2Relay out	Record after the programmable output relay 2 is activated
#3Relay out	Record after the programmable output relay 3 is activated
#1 External Input	Record the signal received by the programmable input port 1
#2 External Input	Record the signal received by the programmable input port 2
#3 External Input	Record the signal received by the programmable input port 3
Engine SI normal	Record after the generator self-check and normal
Engine SI fail	Record after the generator self-check but fail

6.10.2 Alarm/Failure Records

Table 19: Alarm/Failure Record Type and Description

Event type	Explaination
Transfer Fault	Record after transfer action fails
Qs1 Tripping	Record after Qs1 ACB trips
Qs2 Tripping	Record after Qs2 ACB trips
Qs3 Tripping	Record after Qs3 ACB trips
Bus-tie Tripping	Record after Bus-tie ACB trips
Qs1 wrong wiring	Record after S1 any phase voltage exceeds 1.3 times of the rated voltage.
Qs2 wrong wiring	Record after S2 any phase voltage exceeds 1.3 times of the rated voltage.
Qs3 wrong wiring	Record after S3 any phase voltage exceeds 1.3 times of the rated voltage.

7 Electrical wiring diagram

7.1 2L type

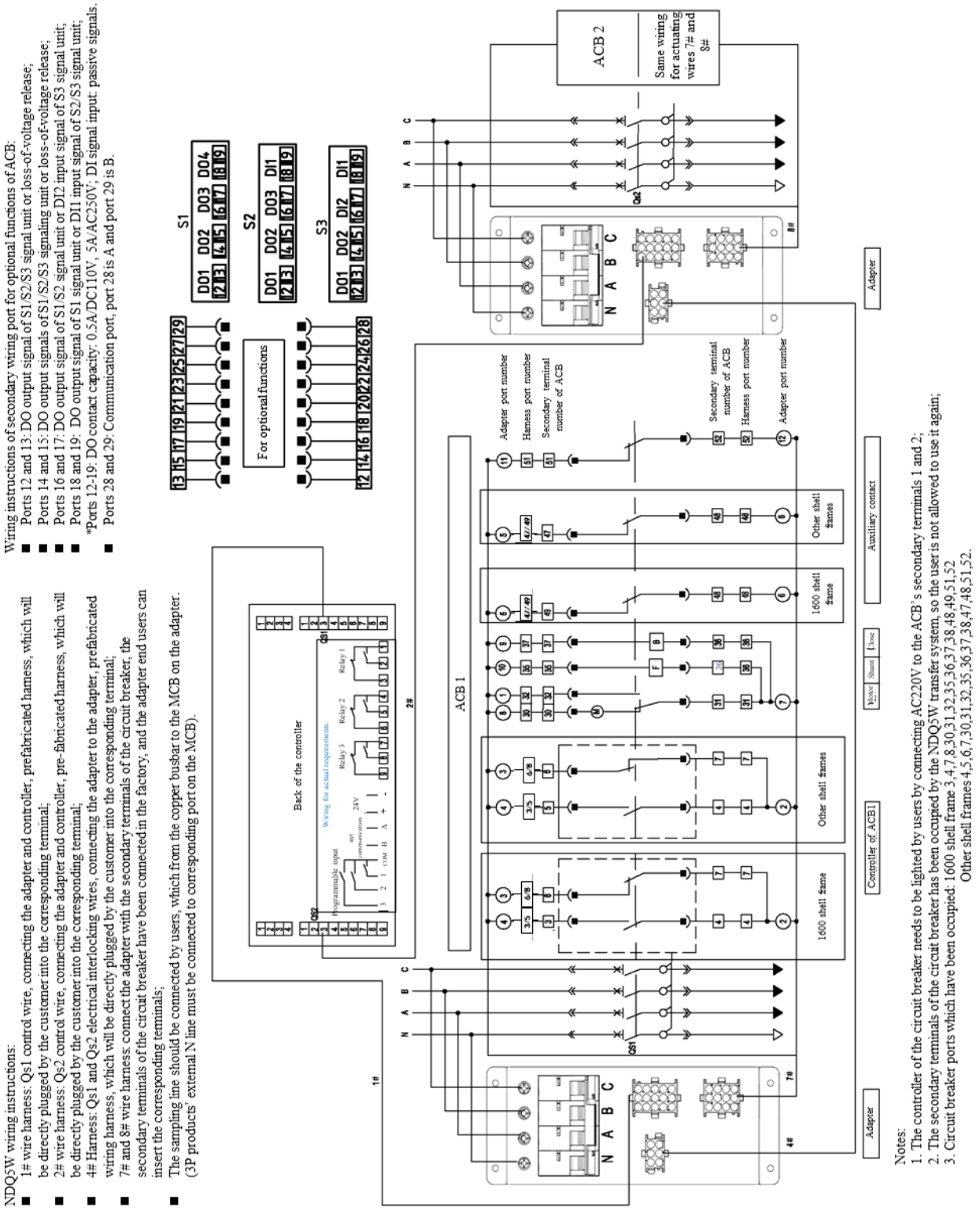


Figure 44: 2L type electrical wiring diagram

7.2 2LB type

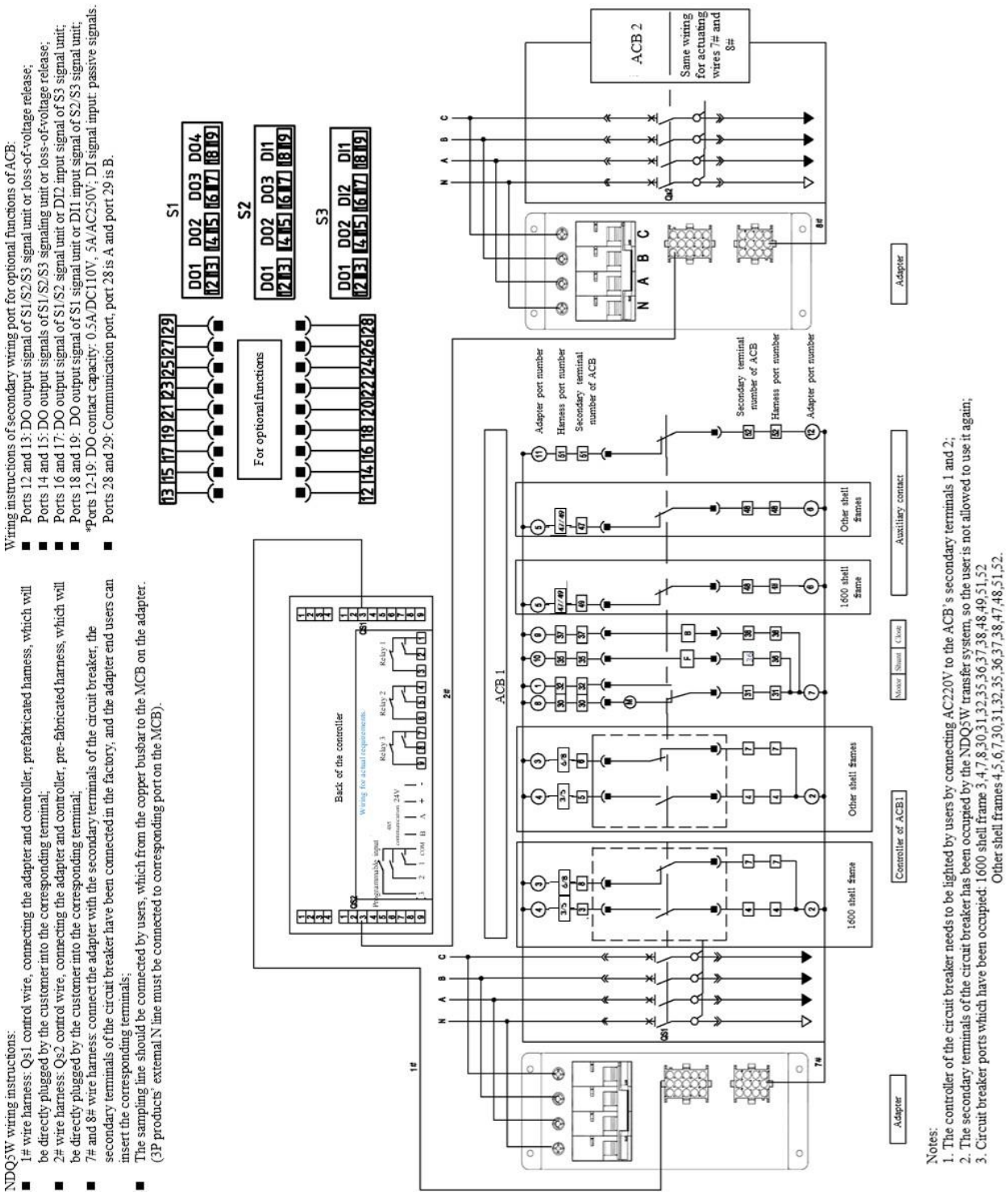


Figure 45: 2LB type electrical wiring diagram

7.3 3L type

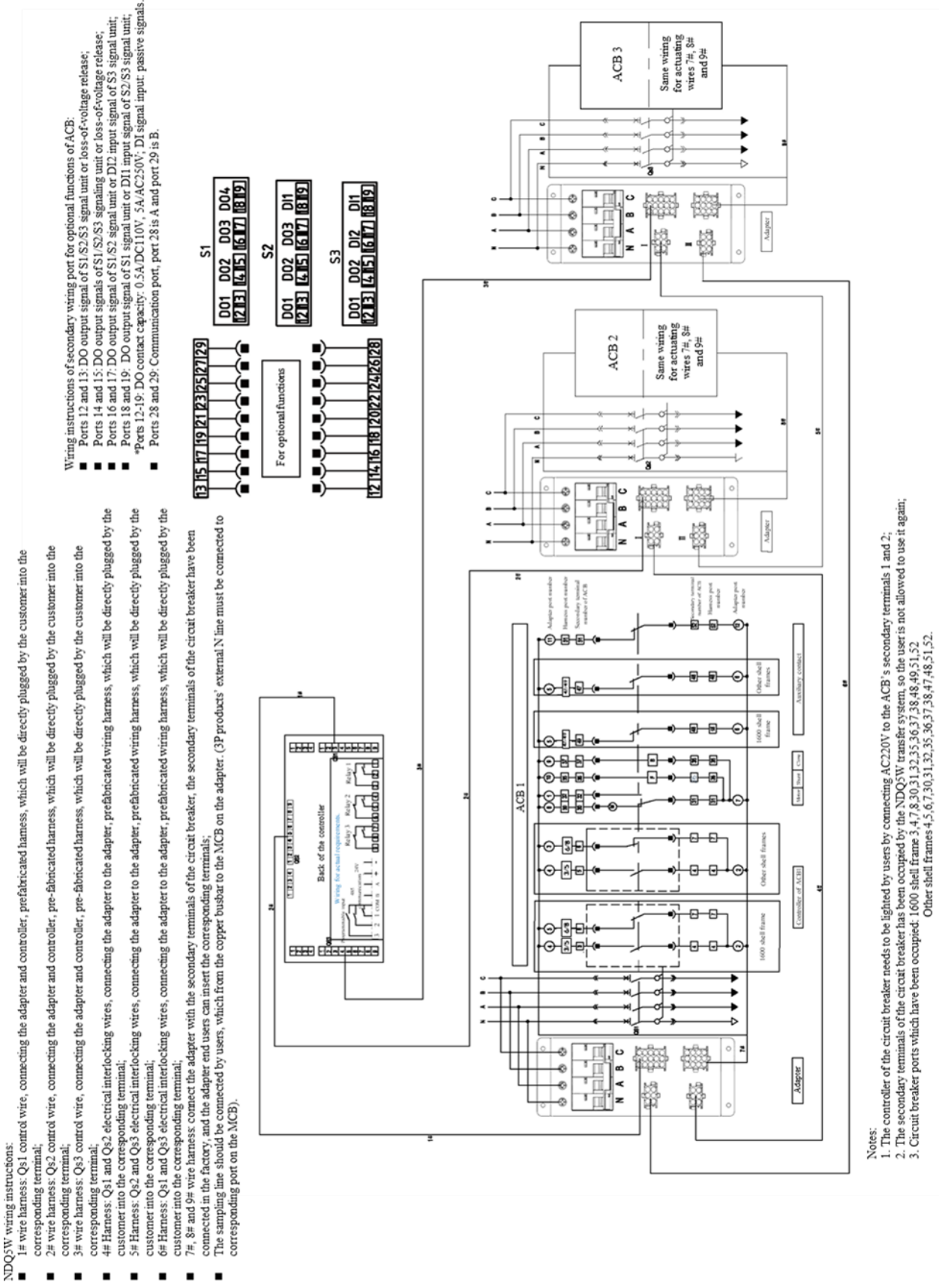


Figure 46: 3L type electrical wiring diagram

7.4 3LB type

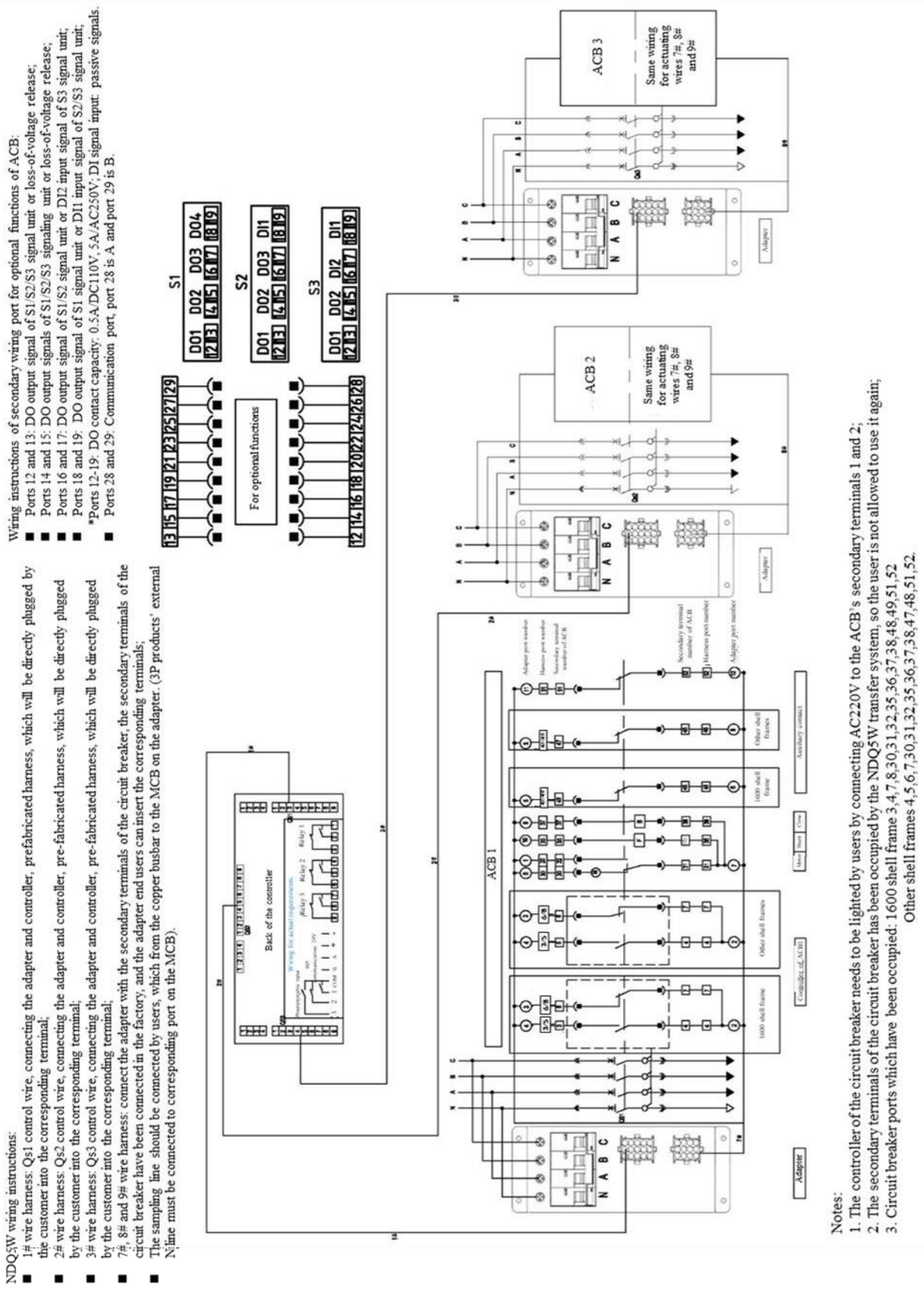


Figure 47: 3LB type electrical wiring diagram

7.5 QL type

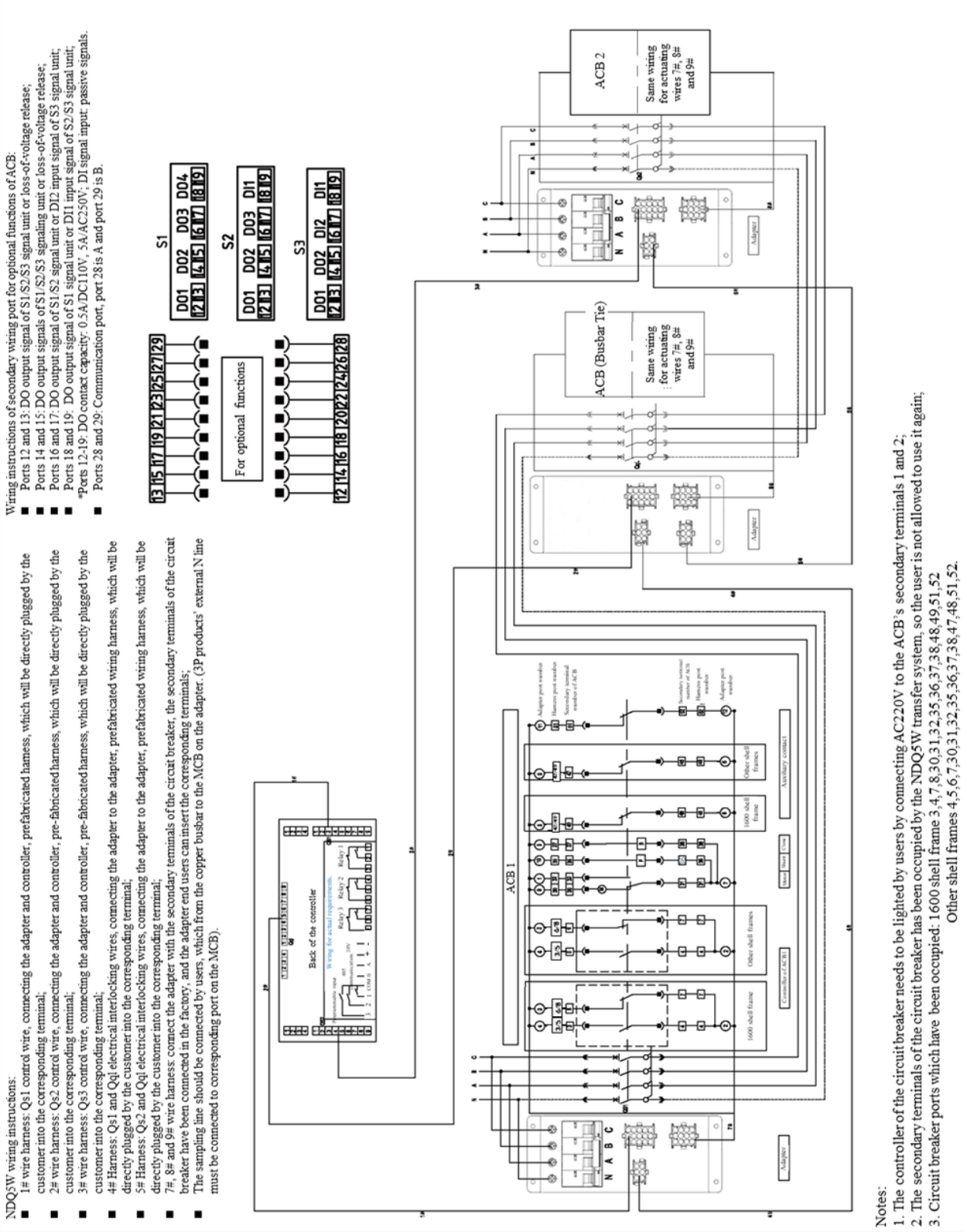


Figure 48: QL type electrical wiring diagram

7.6 QLB type

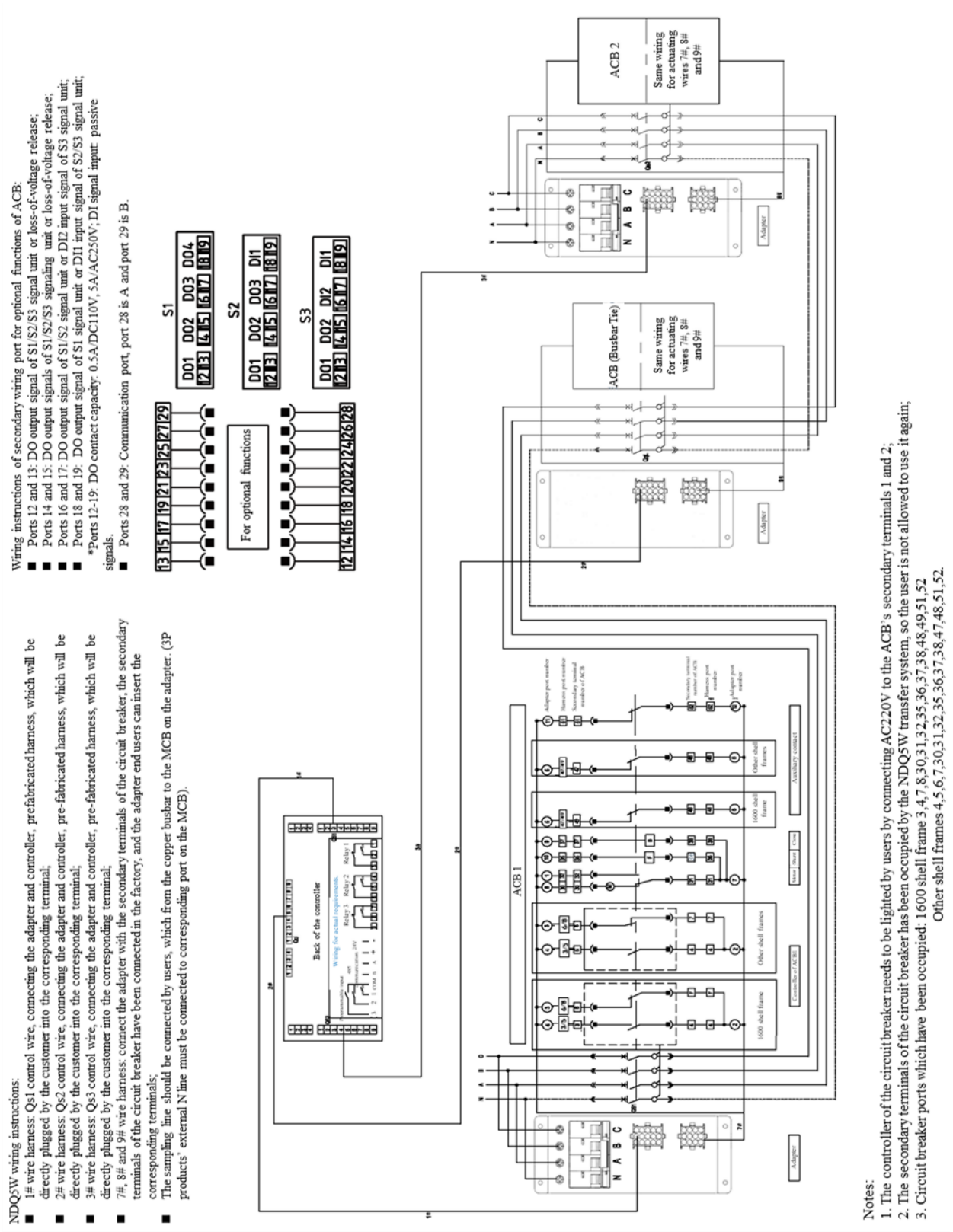


Figure 49: QLB type electrical wiring diagram

8 Outline and installation dimensions

8.1 Outline and installation dimensions of NDQ5W controller (Unit: mm)

All models of 2L(B)/3L(B)/QL(B) controllers share identical dimensions and mounting specifications.

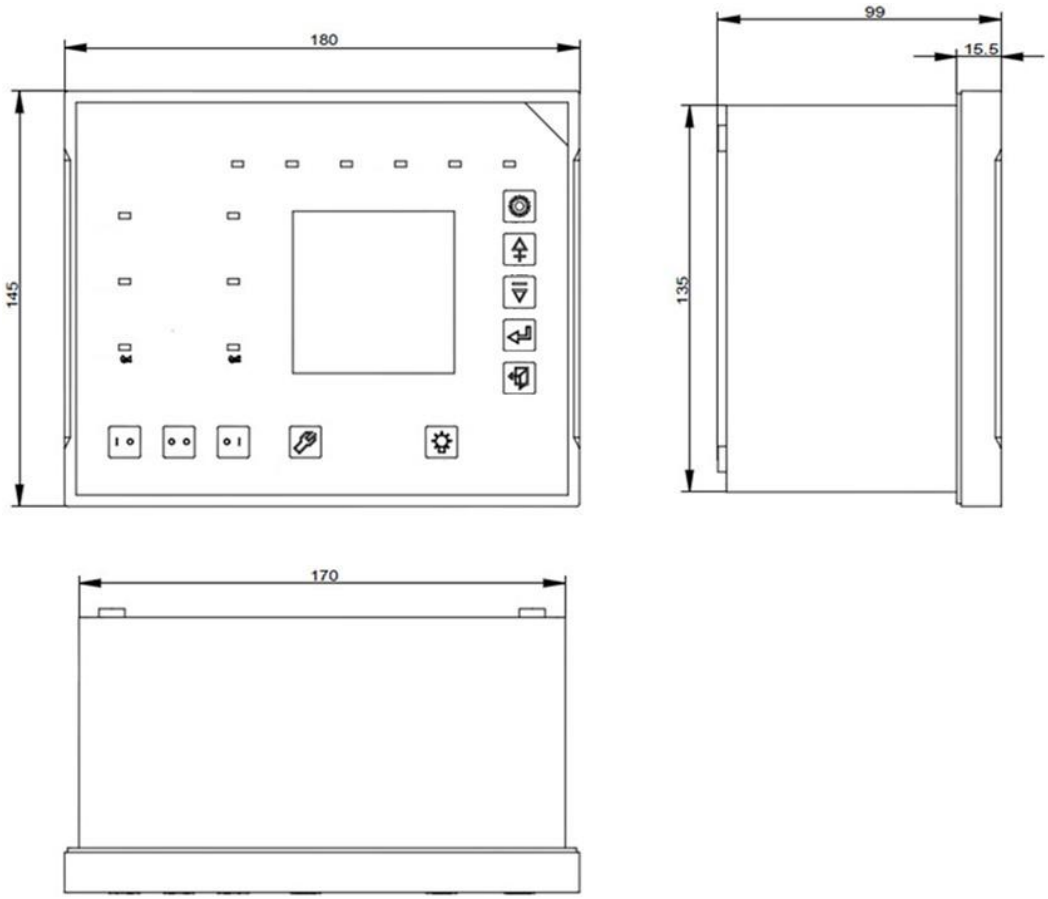


Figure 50: NDQ5W controller dimensions

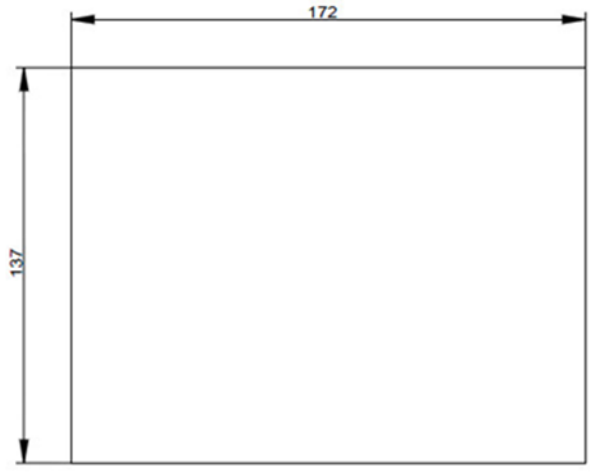


Figure 51: Door Opening Dimensions for NDQ5W Controller Installation Cabinet

Note: The maximum deviation of the hole size is ±0.5.

8.2 Outline and installation dimensions of adapter(Unit: mm)

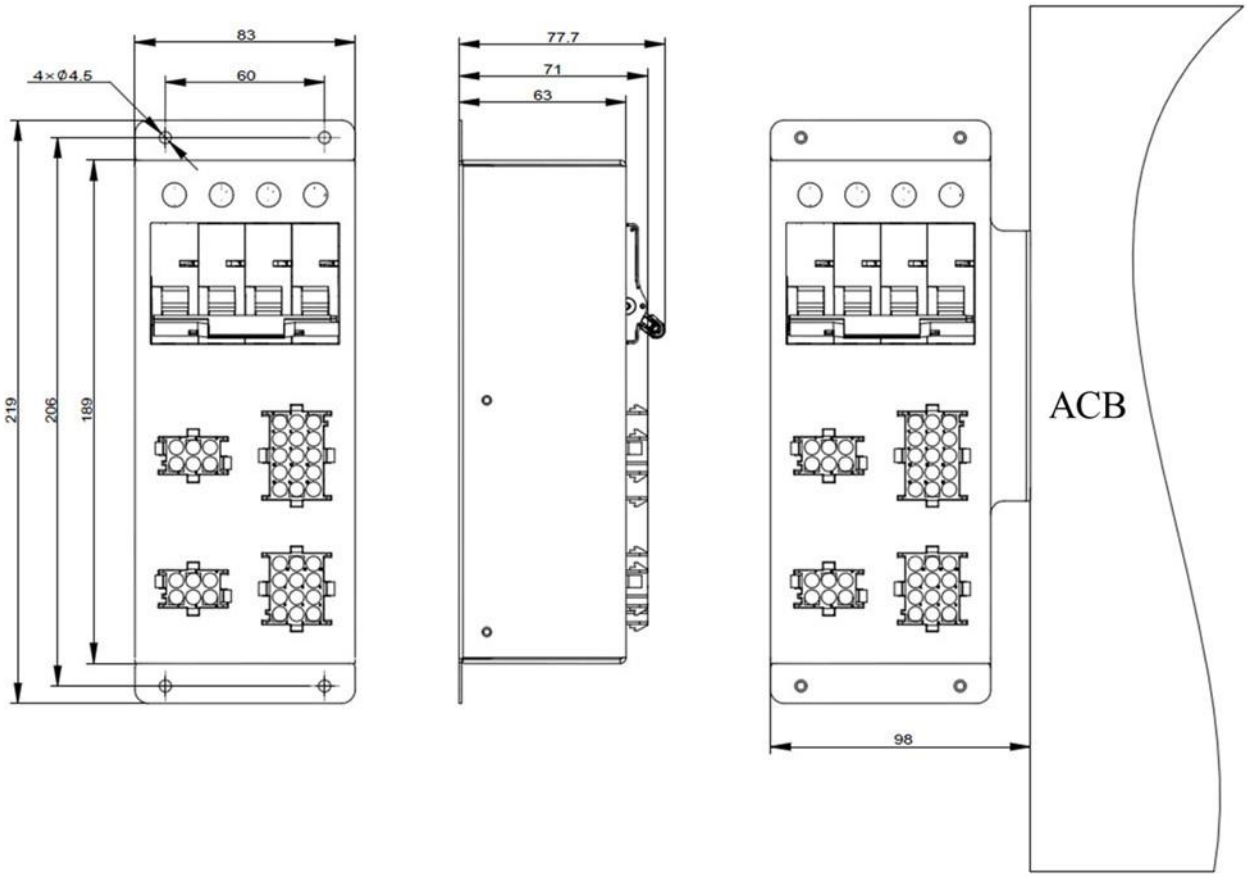


Figure 52: Adapter outline and installation dimensions

8.1 Outline and installation dimensions of ACB (Unit: mm)

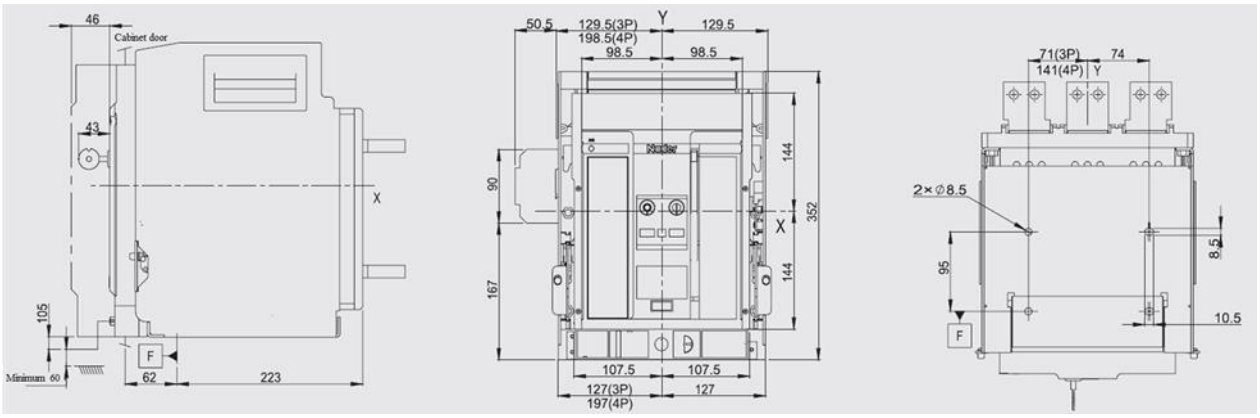
Since the adapter can be installed on the left side of the circuit breaker, the size of the circuit breaker after installation is:

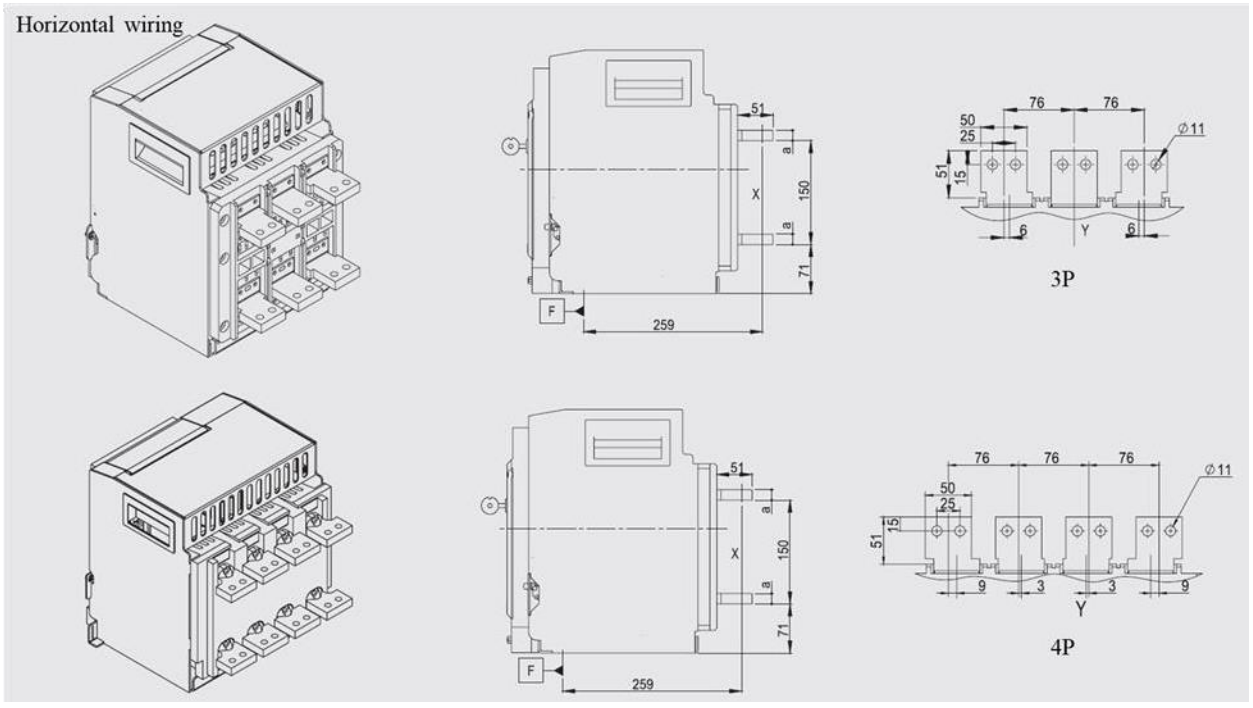
Model	Dimensions: length × depth × height
Adapter (with bracket backplate)	98mm×80mm×219mm
NDW2-1600/3P drawer	354.5mm×355mm×352mm
NDW2-1600/4P drawer	424.5mm×355mm×352mm
NDW2-2000/3P drawer	457mm×430mm×432mm
NDW2-2000/4P drawer	552mm×430mm×432mm
NDW2-4000/3P drawer	517mm×442.5mm×432mm
NDW2-4000/4P drawer	632mm×442.5mm×432mm
NDW2-6300/3P drawer	891.5mm×446.5mm×475mm
NDW2-6300/4P drawer	1121.5mm×446.5mm×475mm
NDW3-1600/3P drawer	363mm×356mm×351.5mm

NDW3-1600/4P drawer	433mm×356mm×351.5mm
NDW3-2500/3P drawer	457mm×480mm×432mm
NDW3-2500/4P drawer	552mm×480mm×432mm
NDW3-4000/3P drawer	517mm×495mm×432mm
NDW3-4000/4P drawer	632mm×495mm×432mm
NDW3-6300/3P drawer	891.5mm×446.5mm×475mm
NDW3-6300/4P drawer	1121.5mm×446.5mm×475mm

The following are the dimensions of the frame circuit breaker without an adapter:

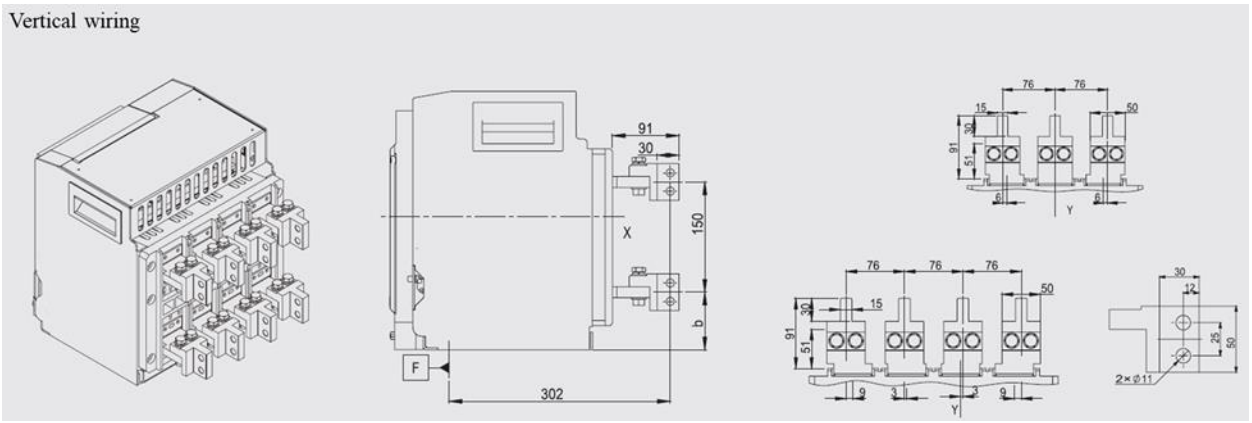
8.3.1 Dimensions and installation dimensions of NDW2-1600 Drawer (Unit: mm)



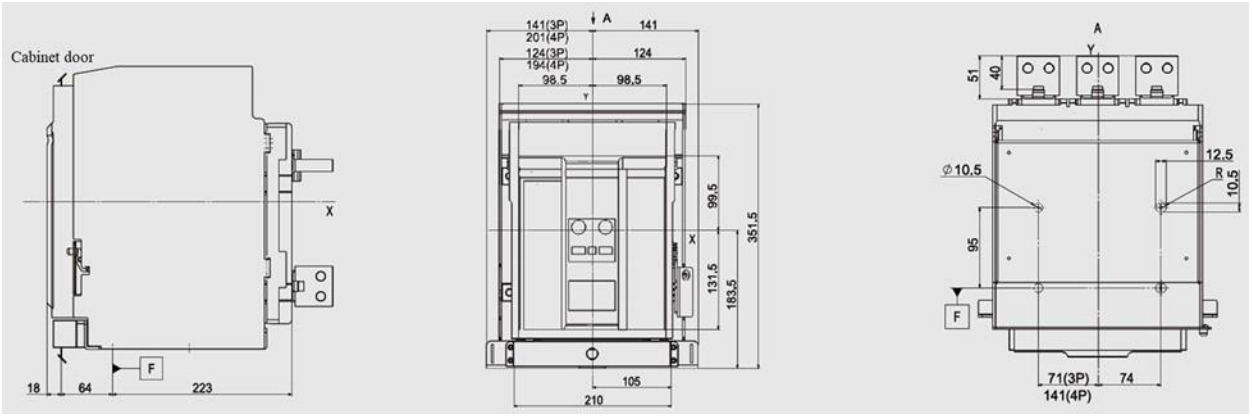


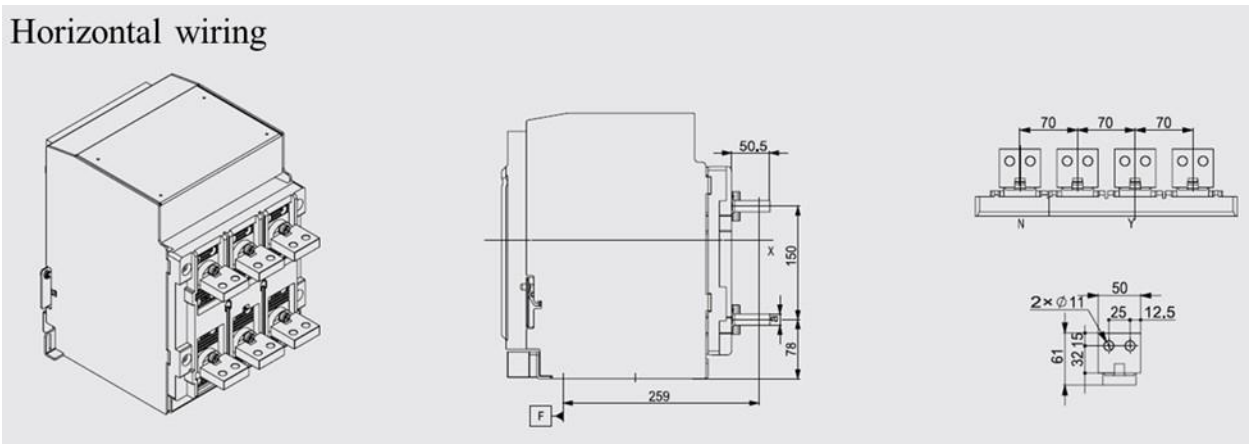
Busbar and terminal connection bolts	Torque when using flat washers
M10	45 N·m

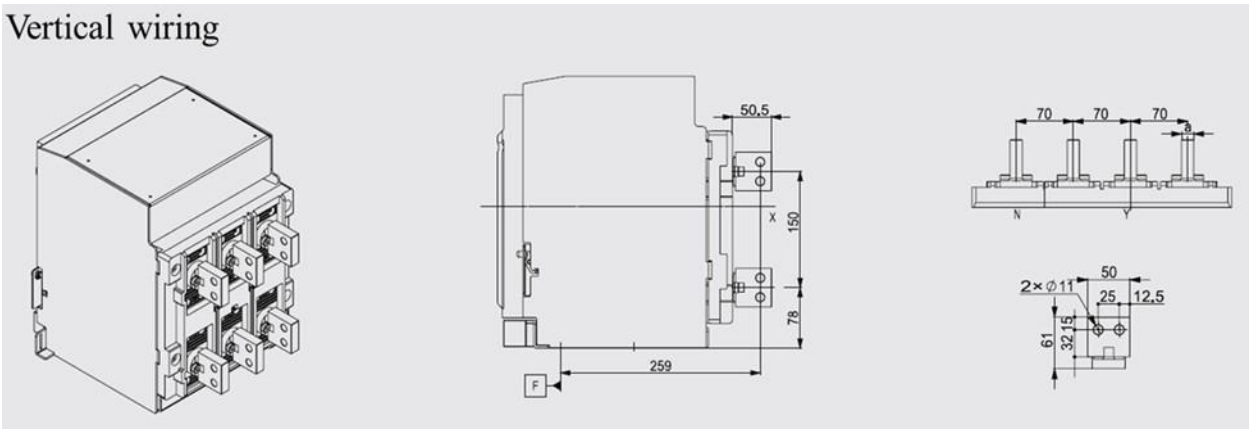
rated current (A)	Busbar size a
200, 400, 630, 800, 1000	10mm
1250, 1600	15mm



8.3.2 Dimensions and installation dimensions of NDW3-1600 Drawer (Unit: mm)



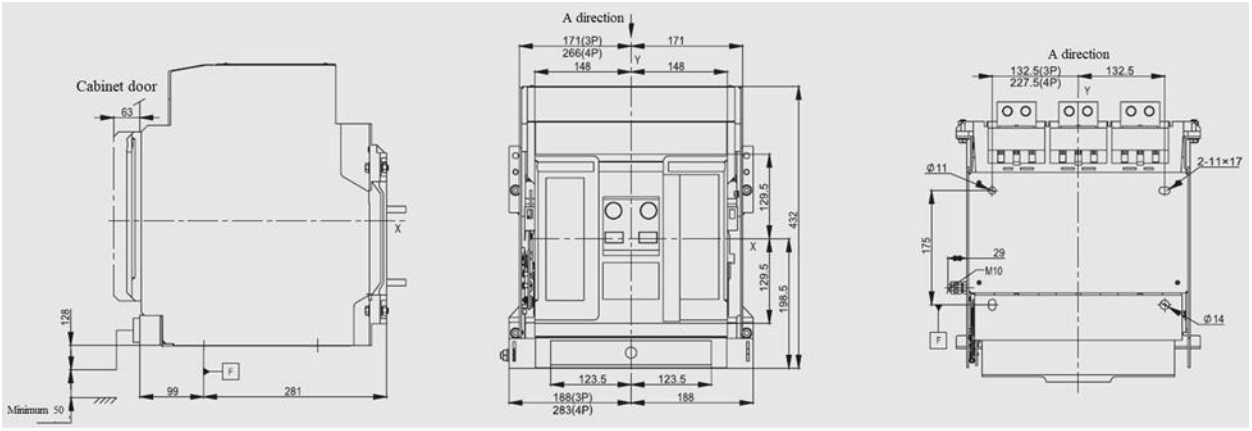




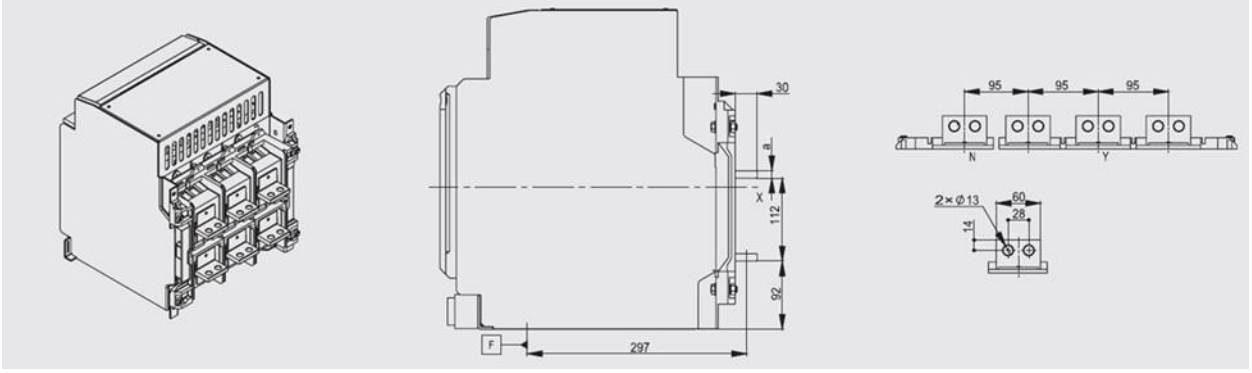
Note: X and Y are the symmetry axes of the front panel.

rated current (A)	Busbar size a
200, 400, 630	10mm
800, 1000, 1250, 1600	15mm

8.3.3 Dimensions and installation dimensions of NDW2-2000 Drawer (Unit: mm)



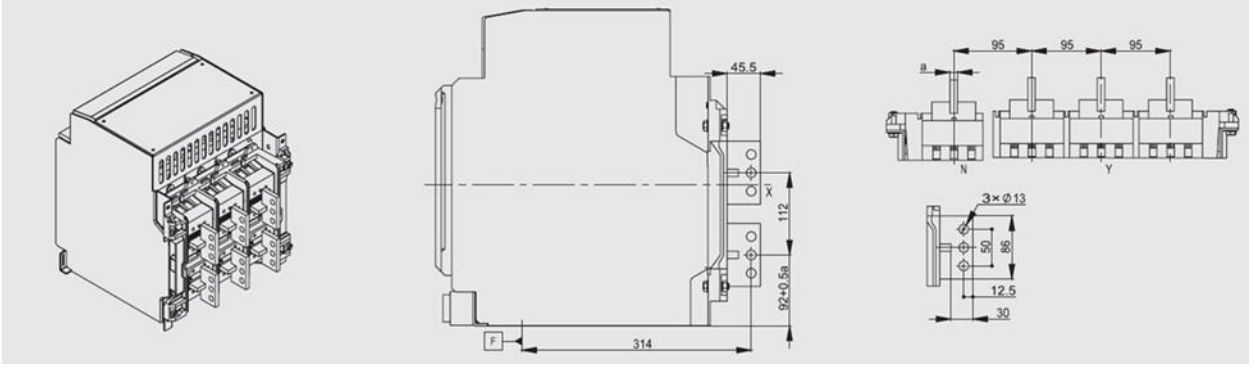
Horizontal wiring



Busbar and terminal connection bolts	Apply torque when using flat washers
M12	60 N·m

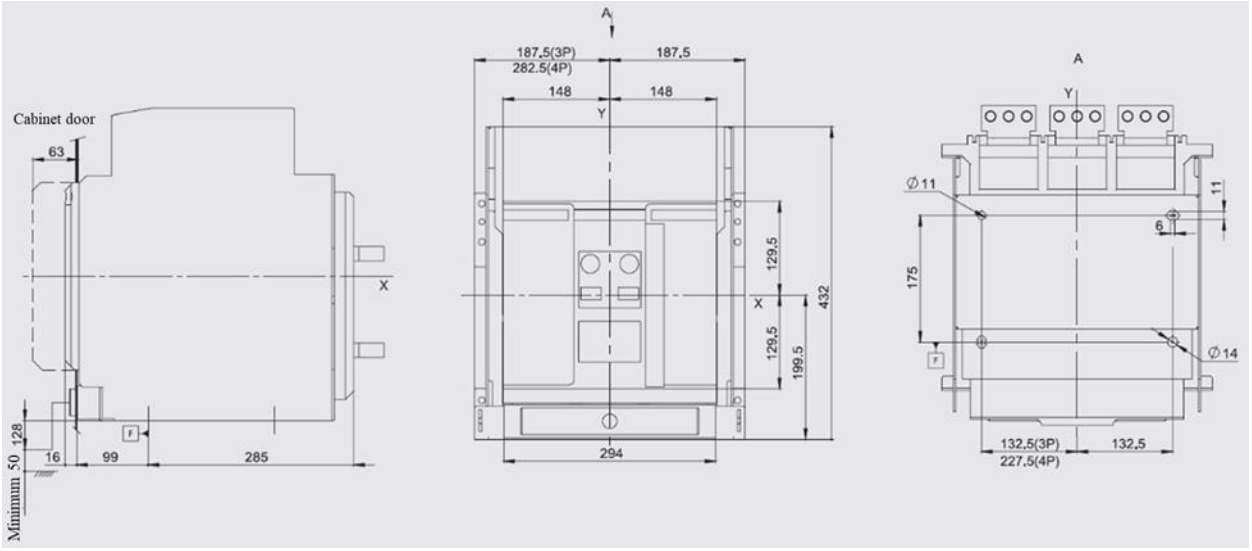
rated current (A)	Busbar size a
400, 630, 800, 1000	10mm
1250, 1600	15mm
2000	20mm

Vertical wiring

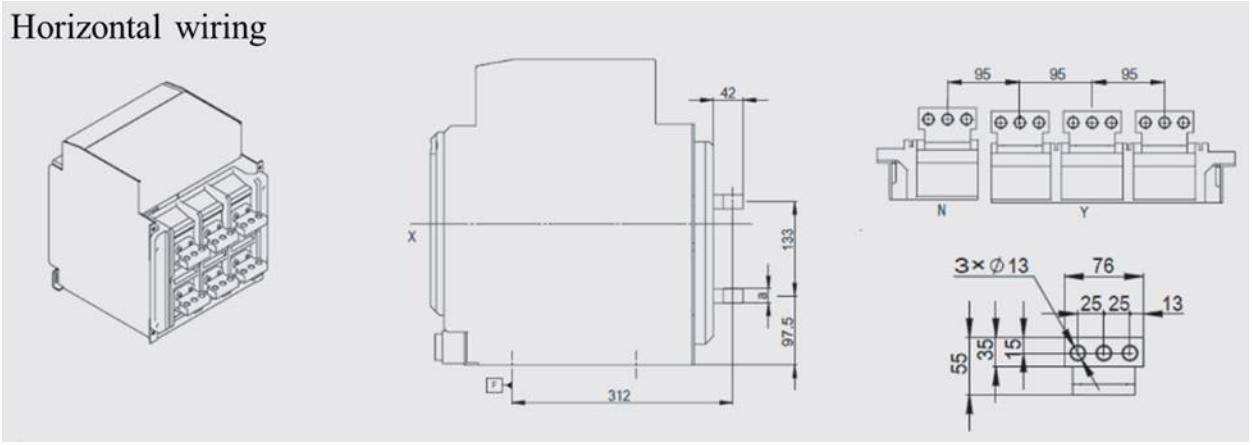


rated current (A)	Busbar size a
400, 630, 800	10mm
1000, 1250, 1600	15mm
2000	20mm

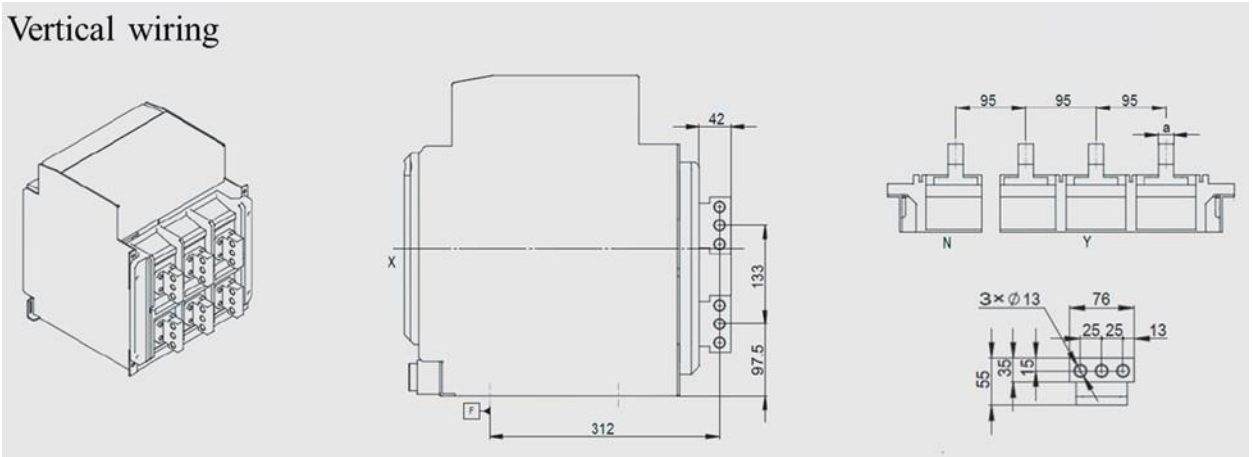
8.3.4 Dimensions and installation dimensions of NDW3-2500 Drawer (Unit: mm)



Horizontal wiring



Vertical wiring



X and Y are the symmetry axes of the front cover;

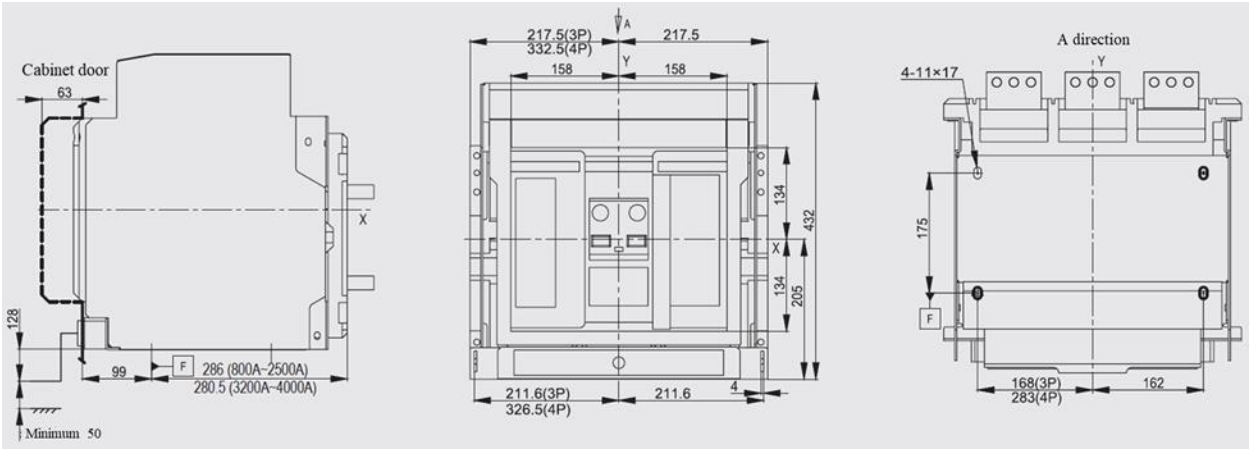
rated current (A)	Busbar size a

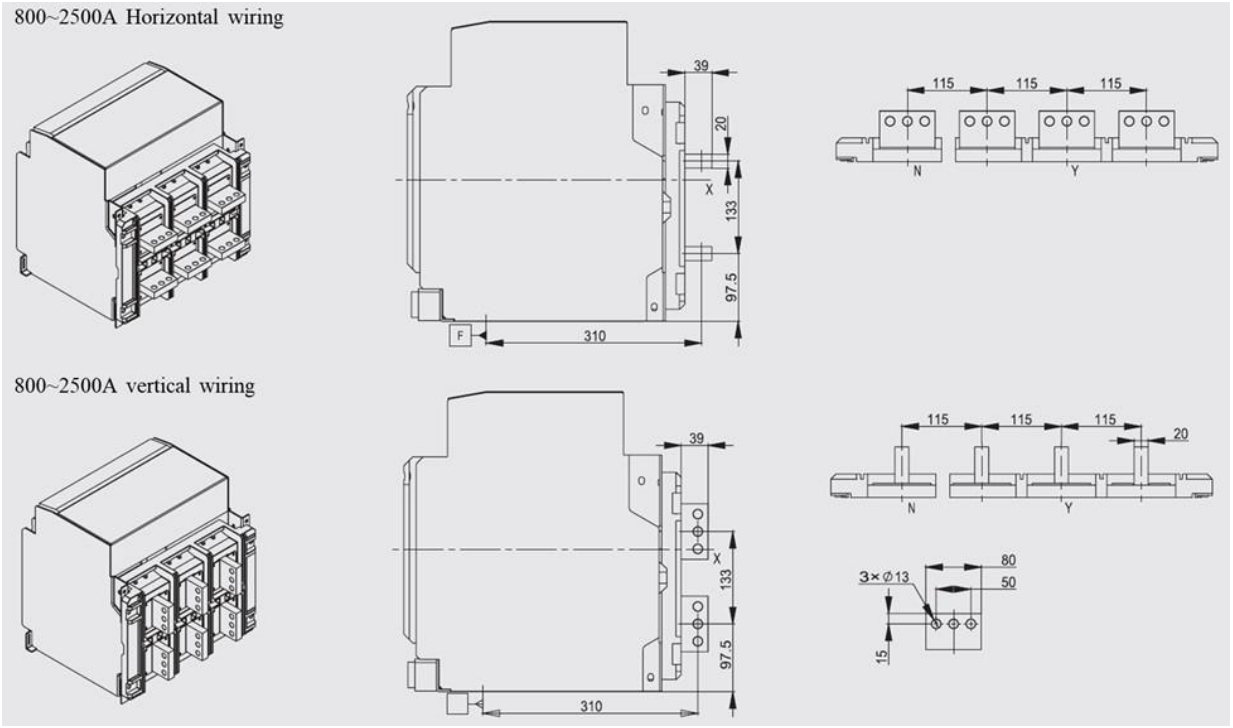
It is recommended to use connecting screws: M12 grade 8.8 with contact washers.

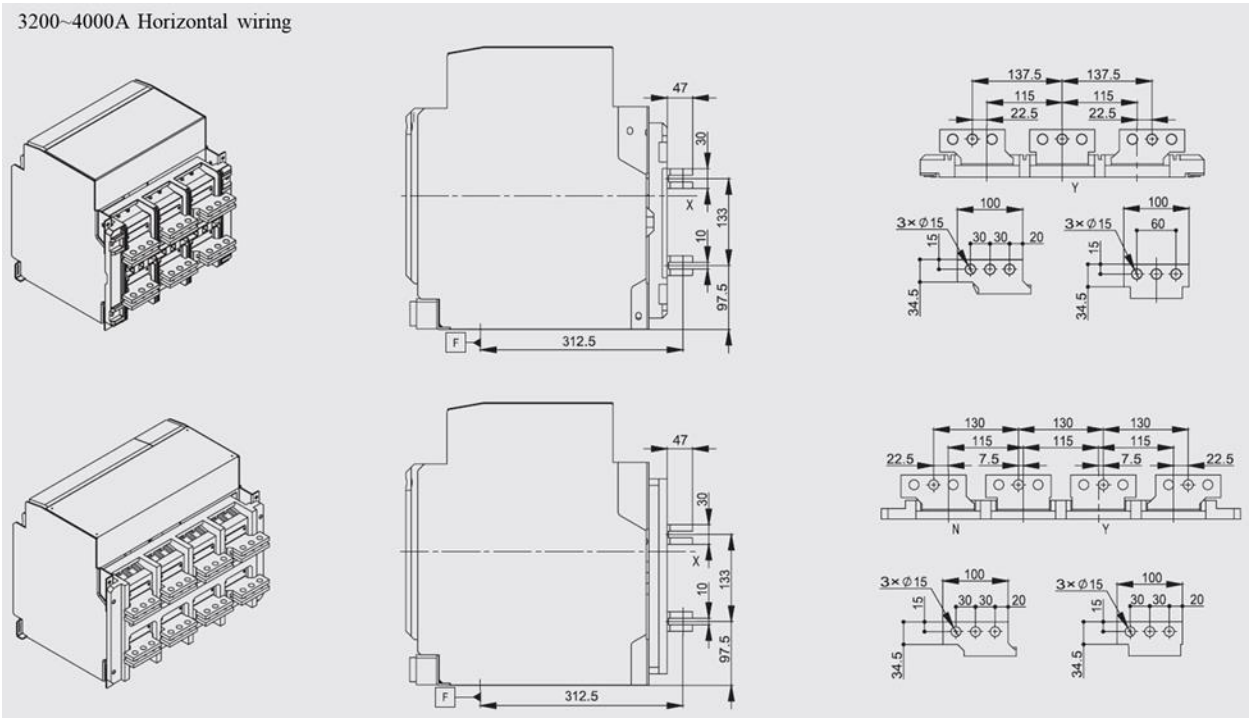
Torque: 60N·m.

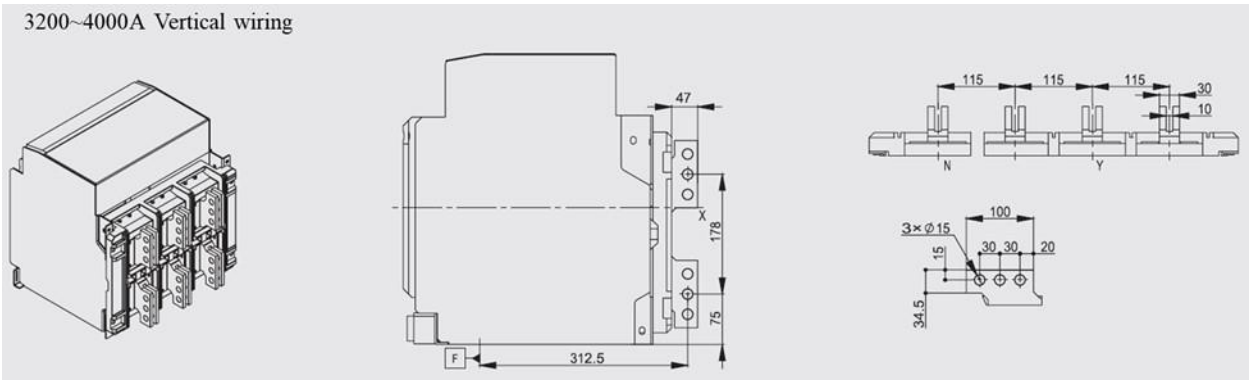
630, 800, 1000, 1250	15mm
1600, 2000, 2500	20mm

8.3.5 Dimensions and installation dimensions of NDW2-4000 Drawer (Unit: mm)





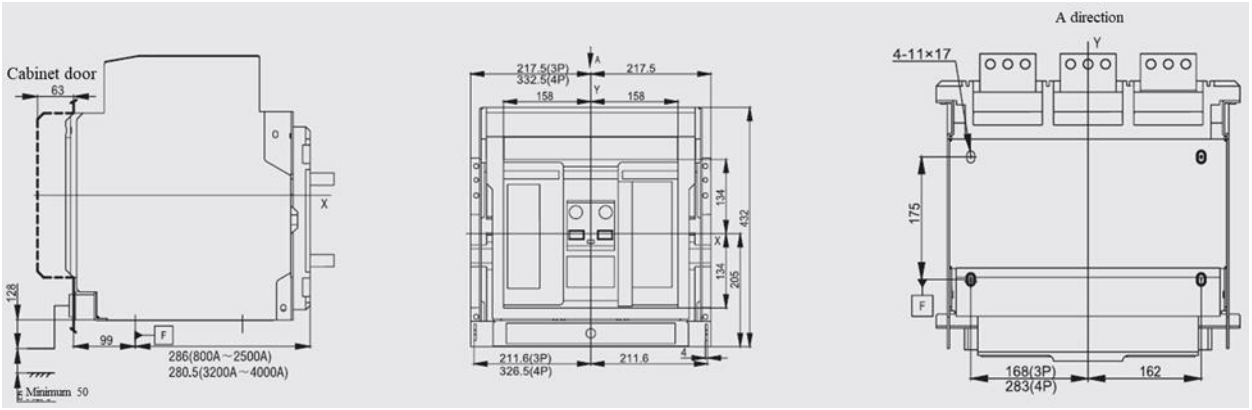




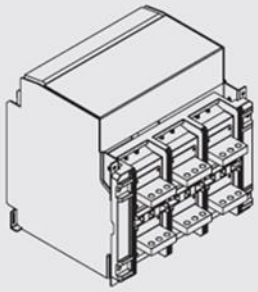
Busbar and terminal connection bolts	Apply torque when using flat washers
M12(800~2500A)	60 N·m
M14(3200~4000A)	97 N·m

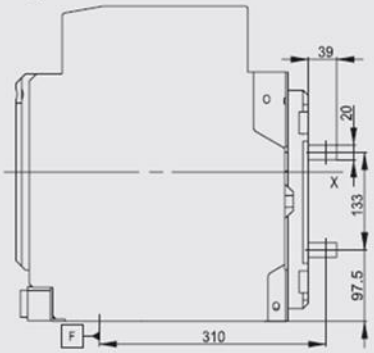
The X and Y axes are the symmetry axes of the front cover.

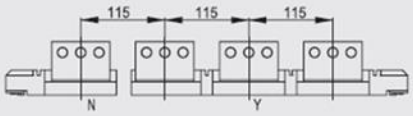
8.3.6 Dimensions and installation dimensions of NDW3-4000 Drawer (Unit: mm)



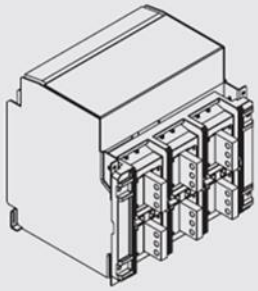
800~2500A Horizontal wiring

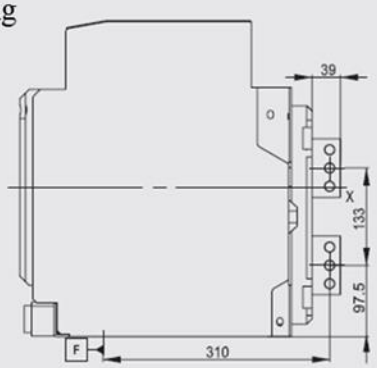


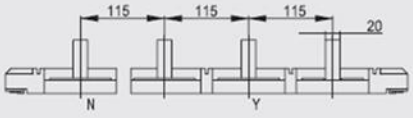


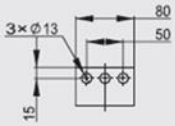


800~2500A vertical wiring

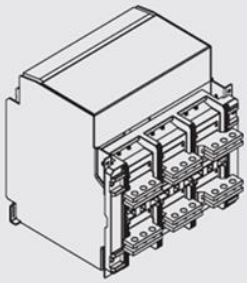


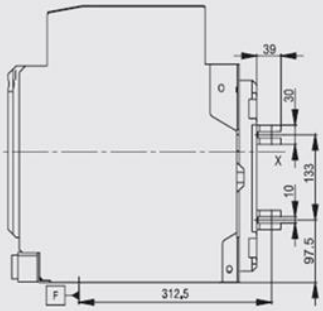


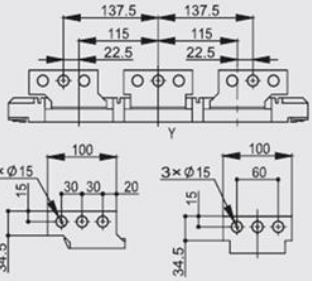


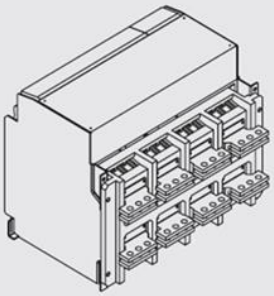


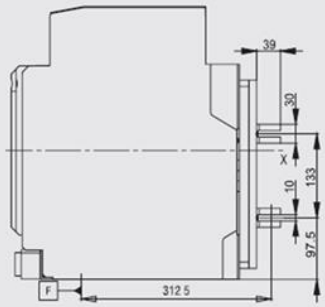
3200~4000A Horizontal wiring

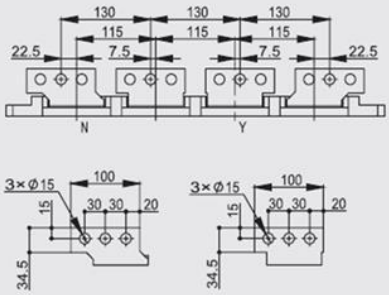


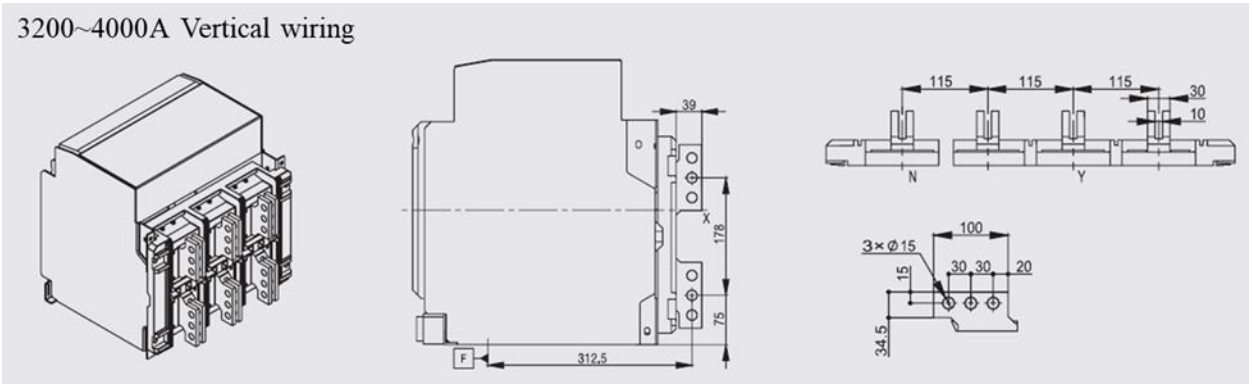






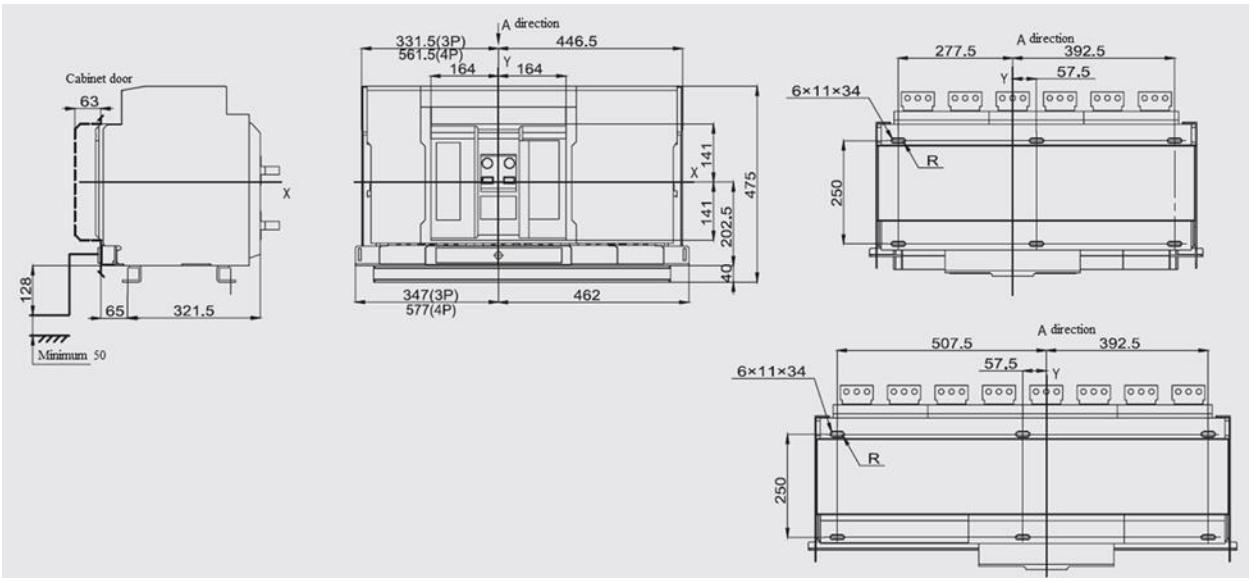


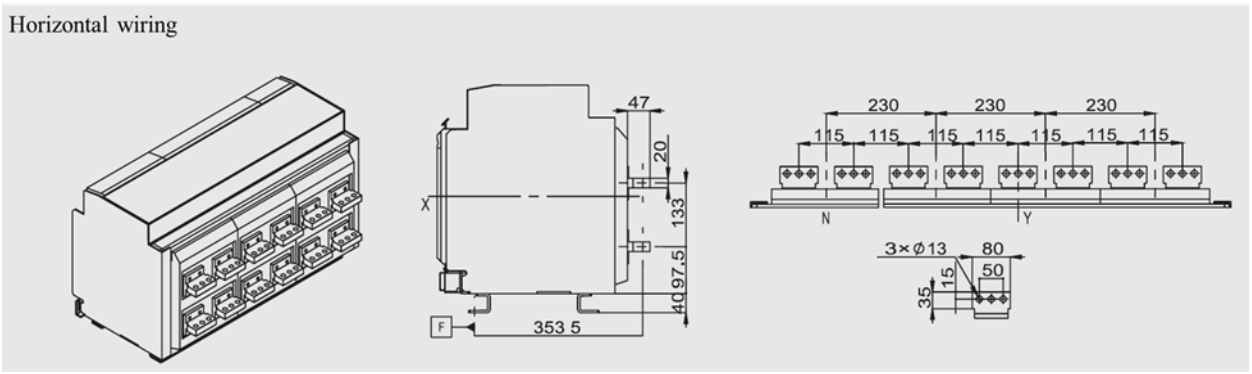


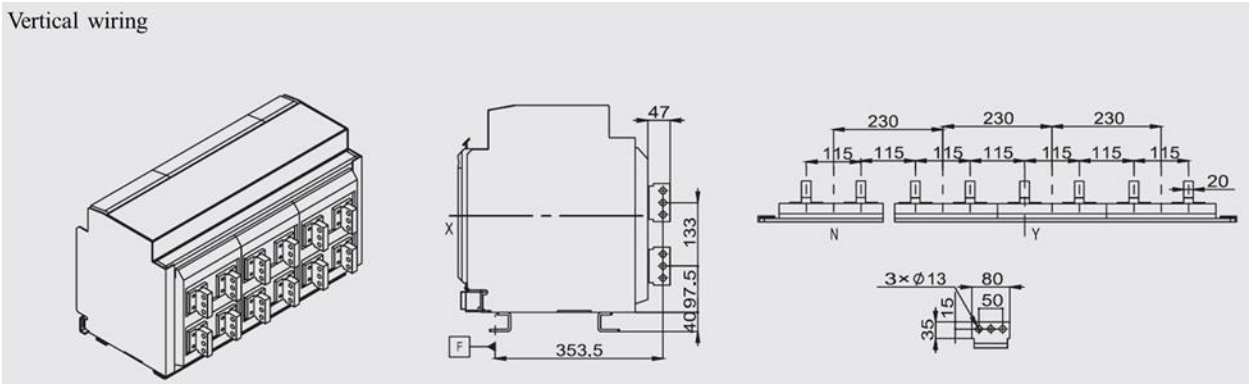


Note: The X and Y axes are the front hood's symmetry axes.

8.3.7 Dimensions and installation dimensions of NDW2-6300 Drawer (Unit: mm)

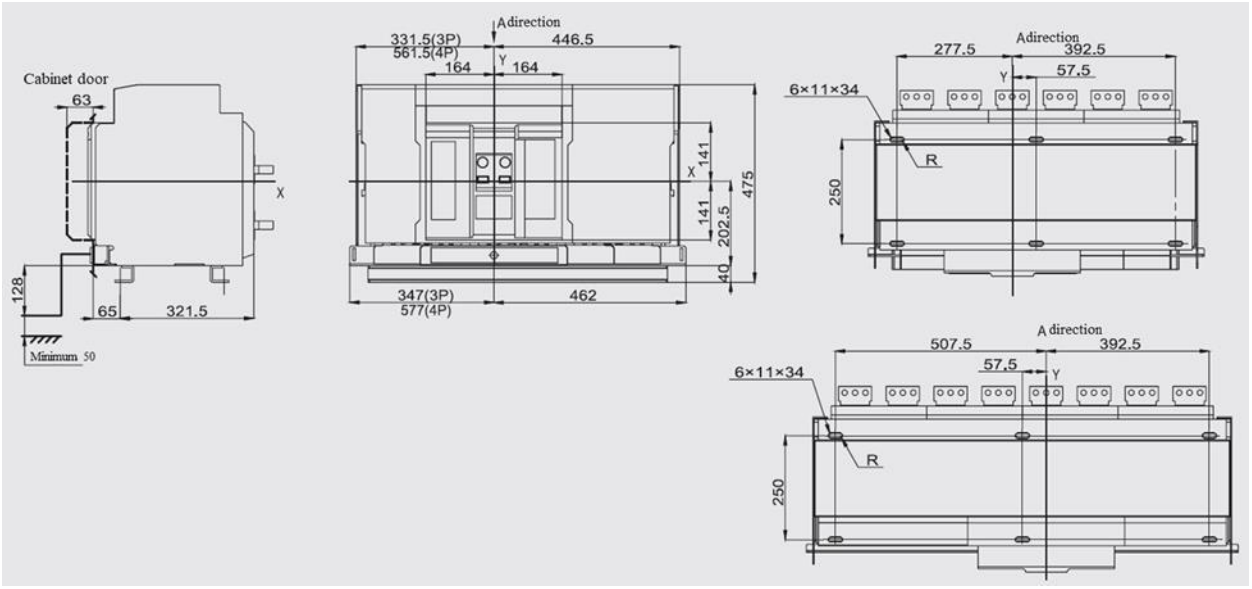




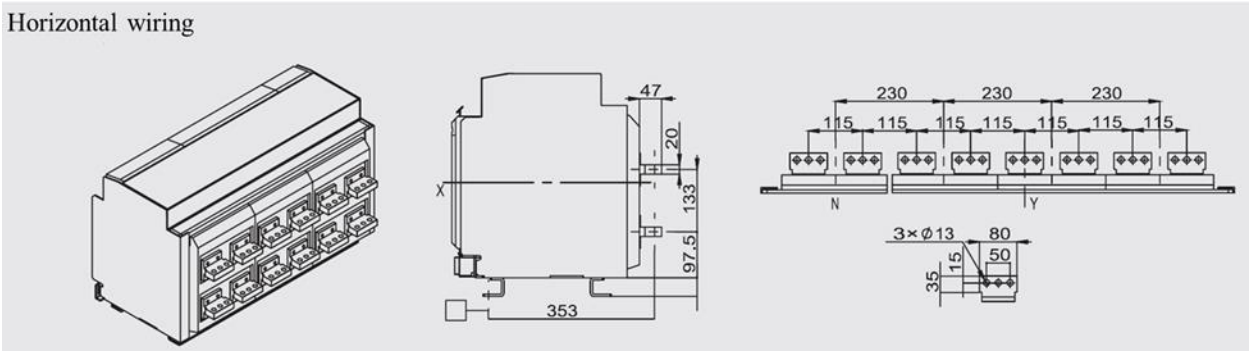


Note: The X and Y axes are the front hood's symmetry axes.

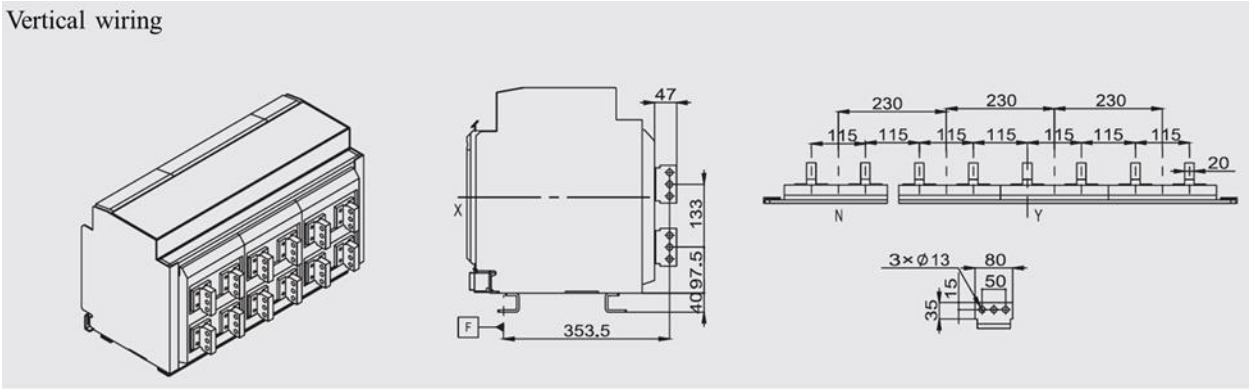
8.3.8 Dimensions and installation dimensions of NDW3-6300 Drawer (Unit: mm)



Horizontal wiring

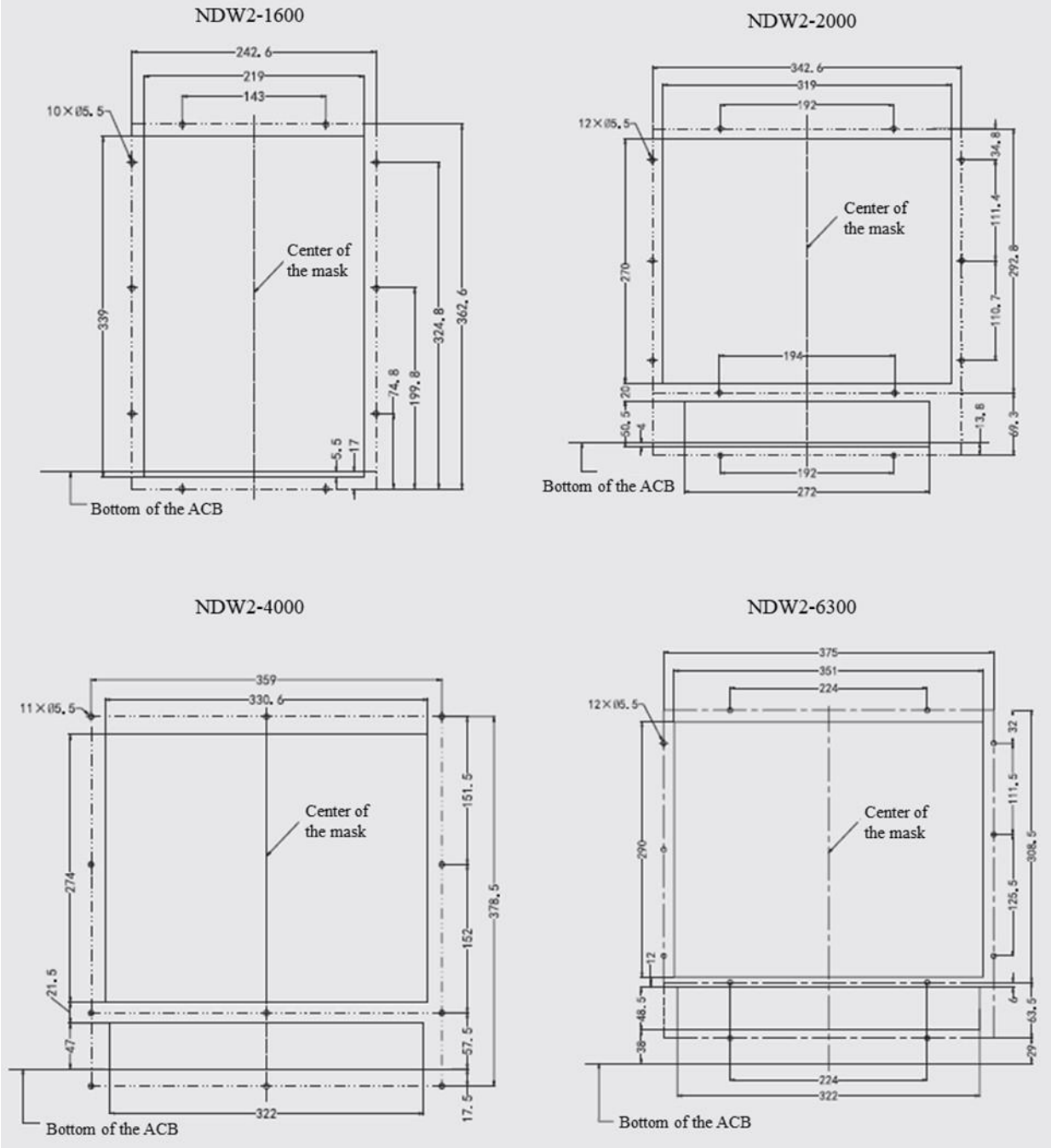


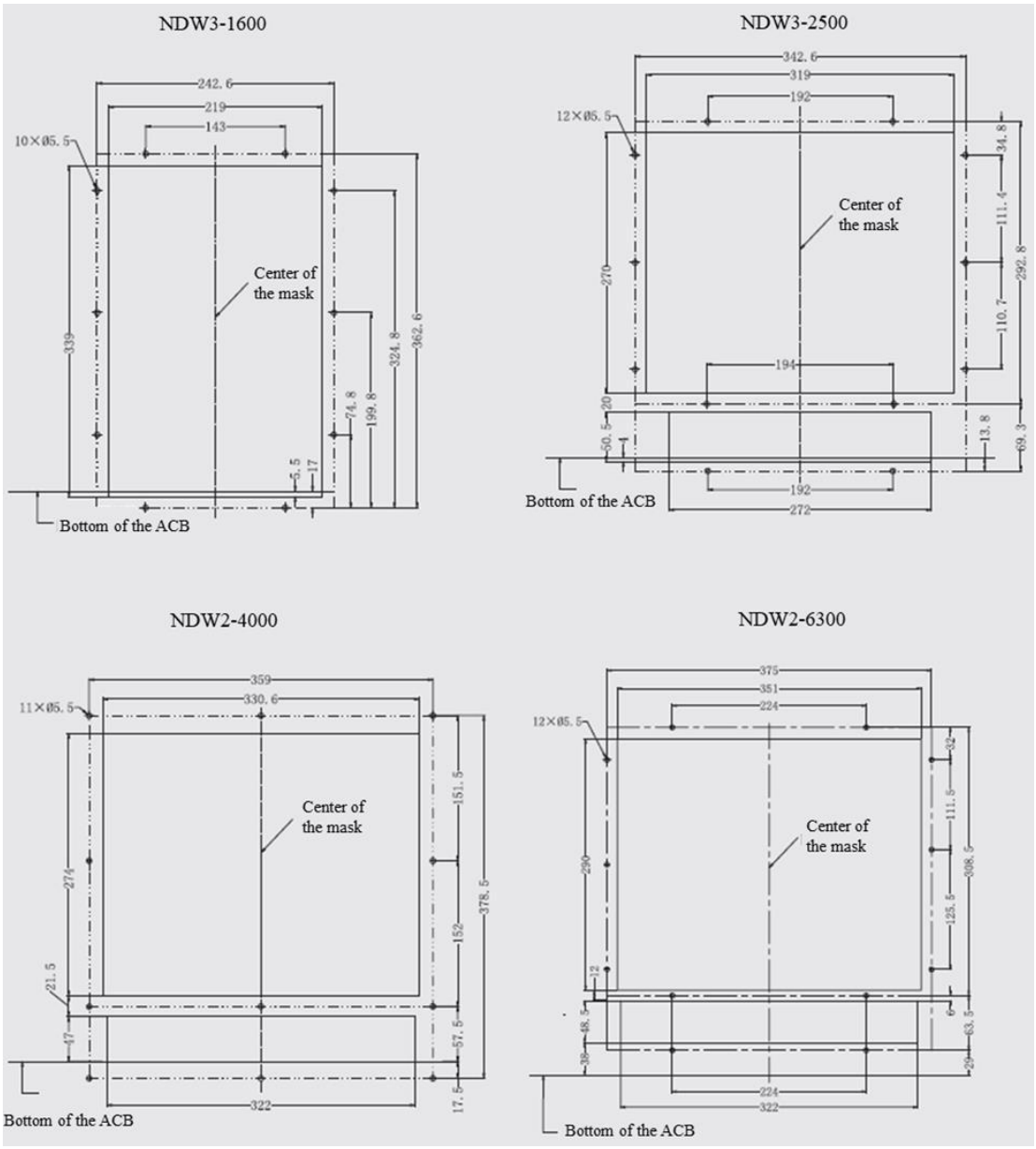
Vertical wiring



Note: The X and Y axes are the front hood's symmetry axes.

8.3.9 Clearance Distance Between Door Holes and Installation Holes in Cabinet (Unit: mm)





8.4 Outline and installation dimensions of extension DIDO module (Unit: mm)

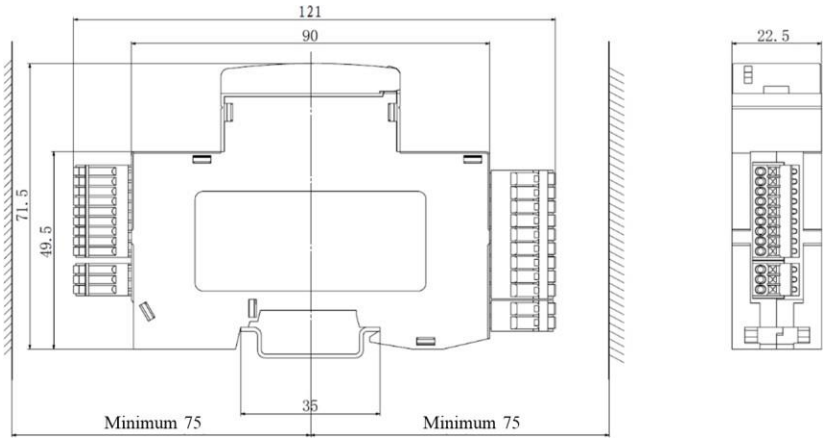


Figure 53: outline and installation dimensions of DIDO

9 Maintenance and Repair

Before maintenance and repair, the following procedures must be performed in sequence:

- Set the NDQ5W controller to manual mode.
- Disconnect all MCB on the side adapter of the circuit breaker.
- Open the circuit breaker and confirm that the stored energy has been released;
- Disconnect the main circuit and terminal blocks of the circuit breaker.

9.1 Maintenance

- Check whether the surrounding environment meets the general requirements;
- Check whether the bolts at the connection between the circuit breaker and the busbar are tightened and whether the contact is good;
- Check the dust accumulation status of the circuit breaker body and drawer seat insulation parts, and clean them regularly;
- Check whether the terminal wiring is reliable;
- Check whether the display of the check controller and intelligent circuit breaker controller is correct.
- Check whether the performance setting value of the control converter is correct and whether the protection characteristic value of the intelligent circuit breaker controller is correct.
- Check whether the indicator of the circuit breaker closing and opening is correct and reliable;
- All friction and moving parts should be lubricated regularly.

9.2 Repair

- Check whether all parts of the circuit breaker are intact and clean, such as the insulation parts such as the housing;
- Check whether the circuit breaker is fastened and there is no vibration during operation;
- Manually operate the circuit breaker to engage and disengage. The "connected, tested, and isolated" positions must be correct, and the interlocks must be reliable.
- The manual closing and opening mechanism of the circuit breaker shall be flexible and without jamming, and the auxiliary contact conversion of the terminal shall be reliable and correct;
- When energized, the circuit breaker's terminals must ensure the tripping mechanism and closed electromagnetic arm operate as specified in the product specifications, while the energy storage motor must function properly. Manual operating mechanisms should operate smoothly without jamming, and the auxiliary contacts of the terminals must

reliably and accurately switch.

- The contact system in the arc extinguishing chamber of the circuit breaker should be intact, in the correct position, the silver coating should be intact, and the arc extinguishing chamber should be cleaned (note: do not operate the circuit breaker when opening the arc extinguishing chamber);
- The circuit breaker to be executed shall be reliably connected to the busbar, and the bolts shall be tightened;
- Keep the contact surface between the circuit breaker body and the drawer seat clean and tidy, and clean it regularly to ensure reliable connection;
- After maintenance, use a 1000V megohmmeter to check the insulation resistance of the circuit breaker. Under ambient temperature of 20℃±5℃ and relative humidity of 50%-70%, the insulation resistance should not be less than 200 megohms.
- Check the setting values of the intelligent circuit breaker controller's protection features.
- Check the converter's performance setting values.