

Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

Revision History

Version	Revision Description	Revision Date	Revised by
0	New add	20170911	Jia Jianping Wang Mingliang Ouyang Chenlu
1	Change pictures	20171221	Wang Mingliang

Document No.	NDT2920189	Version	1	Implementati on Date	20171221
-----------------	------------	---------	---	-------------------------	----------

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

# **NDQ5W Series Automatic Transfer Switching Equipment**

## **Installation and Operating Instructions**

(IPD-ENG-DEV-T03 A0 2014-04-01)

Prepared by	<u>Zhong Yunpan</u>	Date	<u>2017-12-21</u>
Reviewed by	<u>Wang Mingliang</u>	Date	<u>2017-12-21</u>
Countersign by	<u>Ren Shanbo</u>	Date	<u>2017-12-21</u>
Approved by	<u>Shi Wei</u>	Date	<u>2017-12-21</u>

Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

**Nader Electrical · Foresee the Future**  
**良信电器 · 预见未来**



## NDQ5W Series Automatic Transfer Switching Equipment Installation and Operating Instructions

**Nader 良信电器**

Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

# Contents

Overview .....	5
Operating Environment and Installation Conditions .....	7
Unpacking and Installation.....	9
Controller Display and Key Description .....	14
Controller Functions and Operation .....	15
Factory Set Value of Controller (Example of Type 3L Controller) .....	39
Technical Data List.....	40
Electric Circuit Diagram of the Automatic Transfer Switch .....	42
Outline and Installation Dimensions .....	48
Check and Maintenance .....	49
Ordering Notes .....	57

Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

## Overview

### ■ Purpose and Scope of Application

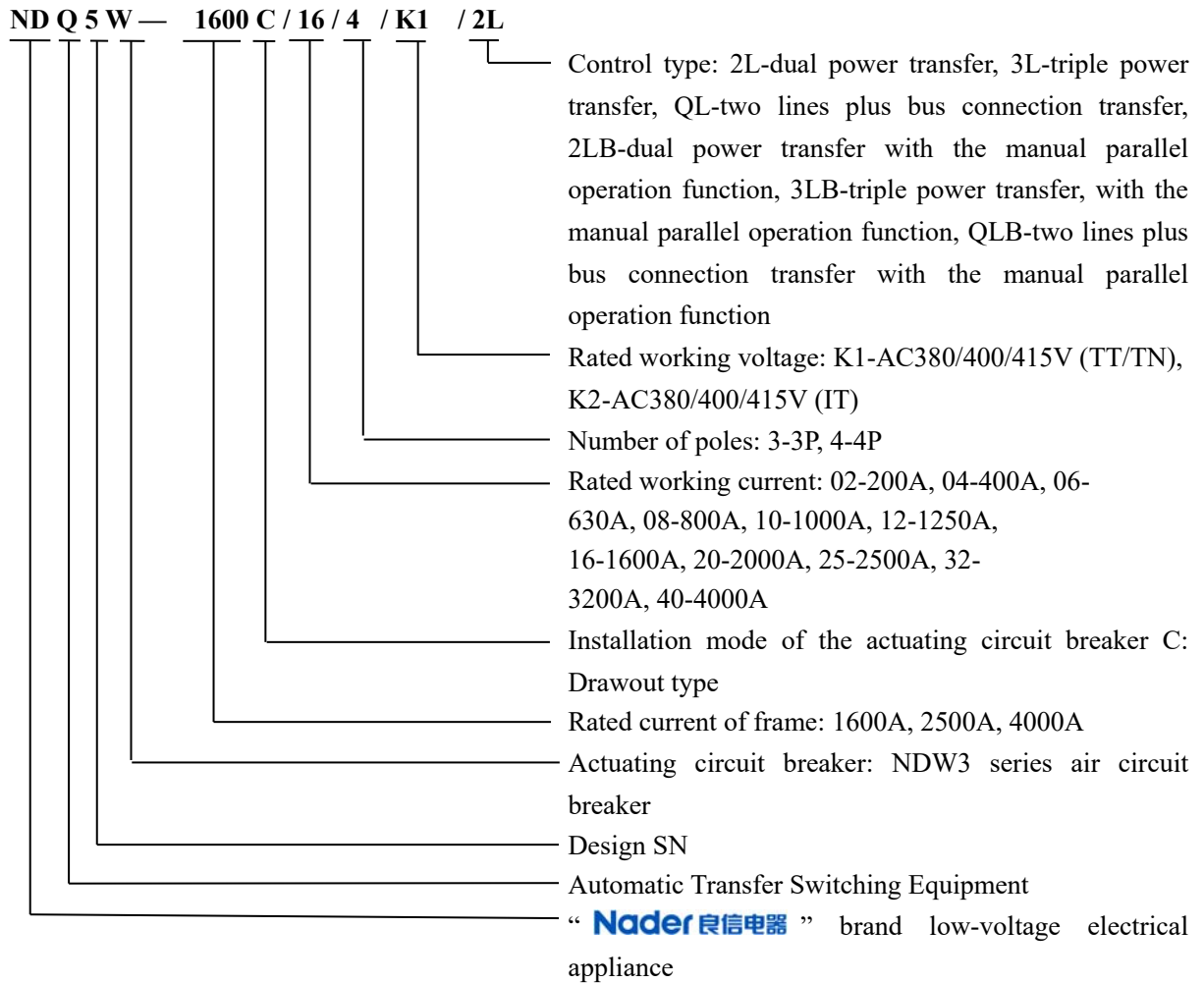
The NDQ5W series automatic transfer switching equipment can be applied to the power distribution system with the AC 50Hz/60Hz, the rated working current of 200A~4000A, the rated insulation voltage of 1000 V, the rated working voltage of AC415V and below for automatically disconnecting from one power supply and connecting to another power supply. The NDQ5W series automatic transfer switching equipment not only provides the dual power transfer system, but also provides the triple power transfer system and incoming power transfer system of “Two lines plus bus connection”. Besides the conventional transfer, it also provides the parallel transfer function, thus comprehensively guaranteeing the uninterrupted power supply at special occasions as well as safety and reliability of the load power supply.

The product complies with the following standards:

GB/T 14048.1-2012	Low-voltage Switchgear and Control Equipment - Part 1: General Rules
GB/T 14048.2-2008	Low-voltage Switchgear and Control Equipment - Part 2: Circuit Breaker
GB/T 14048.11-2016	Low-voltage Switchgear and Control Equipment - Part 6-1: Multiple Function Equipment - Transfer Switching Equipment
IEC 60947-1:2011	Low-voltage switchgear and controlgear-Part 1:General rules
IEC 60947-2:2006	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

Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

## ■ Models and Specifications



Note: Choose the same or different rated working current in the same frame.

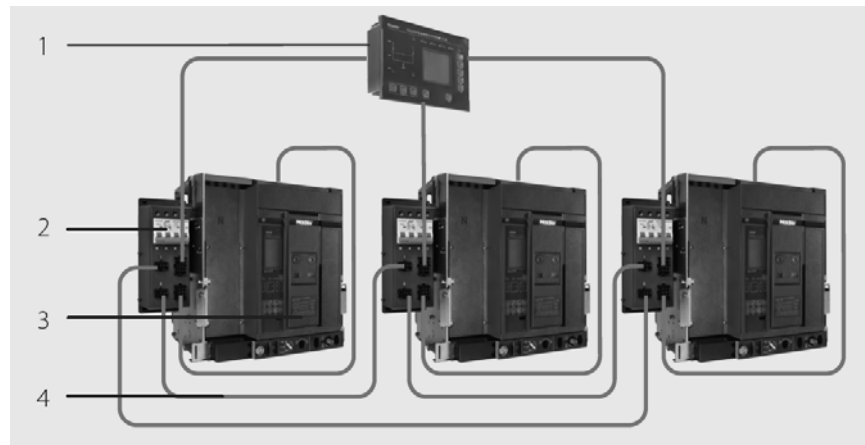
Example 1. NDQ5W-1600 C/16 /4/K1/2L (one type is possible for the same rated current)

Example 2. NDQ5W-2500 C/25 20 20/4/K1/3L (different types shall be indicated separately for the different rated current)

Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

## ■ Brief Introduction of Structure

The NDQ5W series automatic transfer switching equipment consists of controller, adapter, actuating circuit breaker, electric interlocking harness and mechanical interlock. As an independent accessory, the mechanical interlock is used with Type 2L, 3L and QL controllers.



1. Controller

2. Adapter

3. Actuating circuit breaker

4. Electric interlocking harness

## Operating Environment and Installation Conditions

### ■ Operating and Installation 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 circuit breaker with the ambient temperature of  $-25^{\circ}\text{C} \sim 45^{\circ}\text{C}$  can be specially customized. If the ambient temperature is higher than  $+40^{\circ}\text{C}$ , the user needs to reduce the capacity; for the reduced capacity coefficient, refer to the derating factor table in the product's actuator-air circuit breaker manual of the specific model.

#### ➤ Atmospheric environment condition

When the ambient air temperature is  $+40^{\circ}\text{C}$ , the relative humidity of atmosphere shall not be more than 50%. At low temperature, a higher relative humidity is allowed, for example, in case of  $+25^{\circ}\text{C}$ , the relative humidity of atmosphere can reach 90%. For condensation due to temperature change, dehumidification or corresponding measures should be taken.

#### ➤ Anti-corrosion level

Salt mist: Severe Level 2

#### ➤ Pollution level

Pollution level: 3

#### ➤ 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 4,000 m, it can be specially

Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

customized. For the working performance, refer to the correction value in the product's actuator-air circuit breaker manual of the specific model.

➤ **Shockproof requirement**

The automatic transfer switching equipment can ensure resistance to electromagnetic or mechanical shock, and has passed the IEC 60721-3-3 standard test.

- Amplitude:  $\pm 1\text{Mm}$  (2Hz~9Hz)
- Constant acceleration:  $5\text{M/s}^2$  (9Hz~200Hz)

➤ **Electromagnetic interference**

The automatic transfer switch can resist the following electromagnetic interference

- Electrostatic discharge immunity GB/T 17626.2 Level 2;
- Radiated radio-frequency electromagnetic field immunity (RFEMS) GB/T 17626.3 Level 3;
- Electrical fast transient pulse immunity GB/T 17626.4 Level 3;
- Surge (impact) immunity GB/T 17626.5 Level 4;
- Radio-frequency field conduction immunity GB/T 17626.6 Level 5.

➤ **Installation condition**

With the vertical gradient no more than  $5^\circ$ , the actuator-air circuit breaker shall be installed under the environment condition without explosion danger, conductive dust or the possibility of corroding metal and damaging the insulation.

➤ **Installation category**

The actuator-air circuit breaker's main circuit installation category is IV; the rest auxiliary circuit and control circuit installation category is III.

➤ **Protection class**

IP30 and IP40 (the actuating circuit breaker is installed in a cubicle and equipped with a protective door frame);

IP65 (the controller is installed in a cubicle and equipped with a waterproof rubber gasket).

➤ **Utilization category**

AC-33iB.

■ **Installation Notes**

Perform installation according to the following requirements; please read this manual carefully before installation.

- The product shall conform to the normal operating and installation conditions;
- Measure the insulation resistance value of the main circuit of each actuating circuit breaker with a 1000V megohmmeter before installation. When the ambient air temperature is  $20^\circ\text{C} \pm 5^\circ\text{C}$ , and the relative humidity is 50%-70%, the resistance value shall not be less than 10 mge; otherwise it shall be dried, which can be used until the insulation resistance meets the requirements;
- Well ventilated in the installation area;



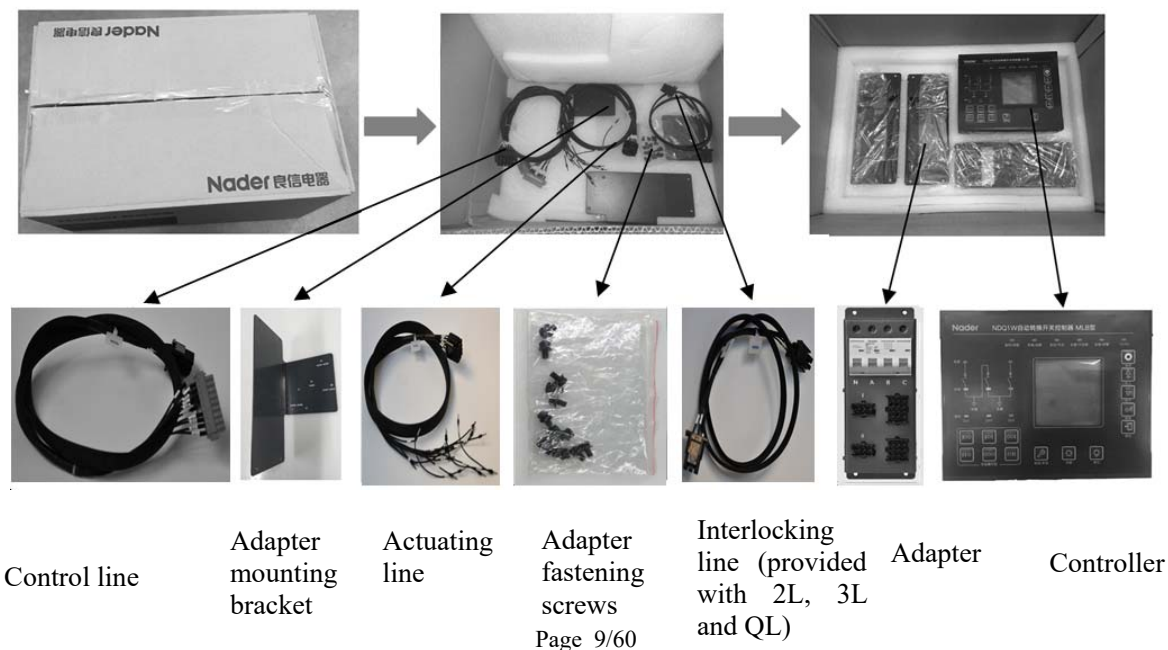
Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

- The main circuit wiring shall be proper and the power sampling line of the adapter must be connected with the main circuit power supply of the actuating circuit breaker properly to ensure the consistent phase sequence; for the 4P products in the TT/TN power distribution system, the N-pole of the different power supplies must be connected with that of each actuating circuit breaker of ATSE properly and reliably in the TT/TN power distribution system;
- 3P products must be connected to the zero line in the TT/TN power distribution system! The zero line shall be reliably connected to the N-pole of the miniature circuit breaker separately on the adapter adjacent to each set of actuating circuit breaker corresponding to the dual or triple power transfer system;
- For the adapter of the 3P products in the IT power distribution system, the 4P miniature circuit breaker is adopted for the power sampling and the N-pole of the miniature circuit breaker shall not be wired;
- The controller shall be wired correctly according to the electric circuit diagram;
- The product's terminal connections and fastening screws shall be tightened without loosening;
- The fault tripping buttons on all the actuating circuit breaker panels shall be in the reset state (un-ejected state) and flexible;
- The panel indicators of all the actuating circuit breakers shall be correct;
- The earthing terminals of all the actuating circuit breakers shall be reliably grounded;
- Clean the site and do not leave conductors, conductive parts, tools or dirt on (or around) the circuit breaker and switchgear.

## Unpacking and Installation

### ■ Unpacking

Diagram of controller unpacking steps:



Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

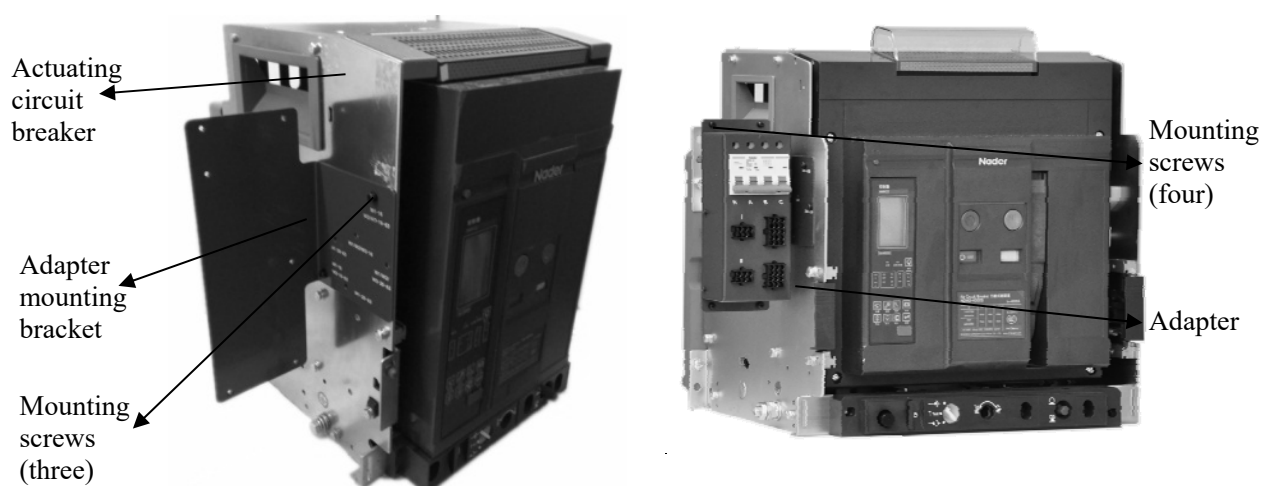
## Unpacking steps of the actuating circuit breaker:

Perform unpacking according to the unpacking step diagram specified in the installation and operating instructions of the specific actuating circuit breaker.

## ■ Installation

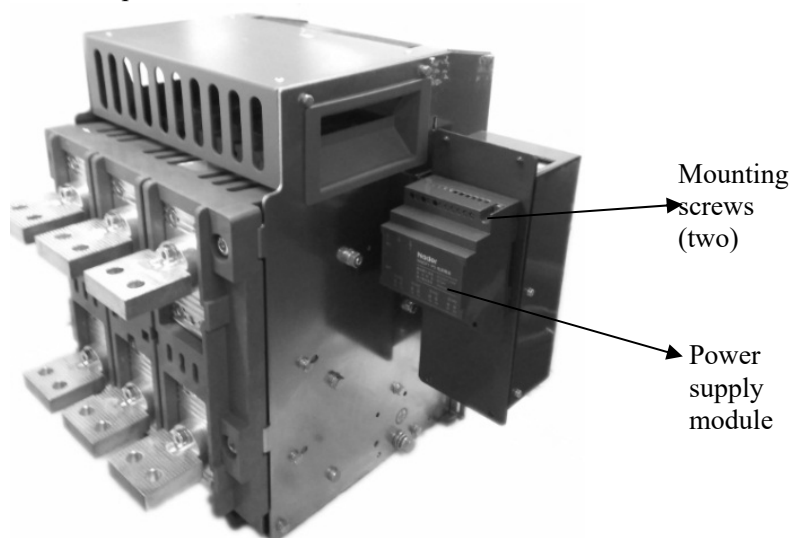
### Adapter installation

To install the adapter mounting bracket first, fix the mounting bracket on the left side of the circuit breaker with three M4 mounting screws. Location of the mounting hole varies with the shell frame level of the circuit breaker. If the location is slightly different, match it according to the specific actuating circuit breaker during installation. Then fix the adapter on the mounting bracket with four M4 screws.



### Installation of power supply module (special for the 1600A shell frame product)

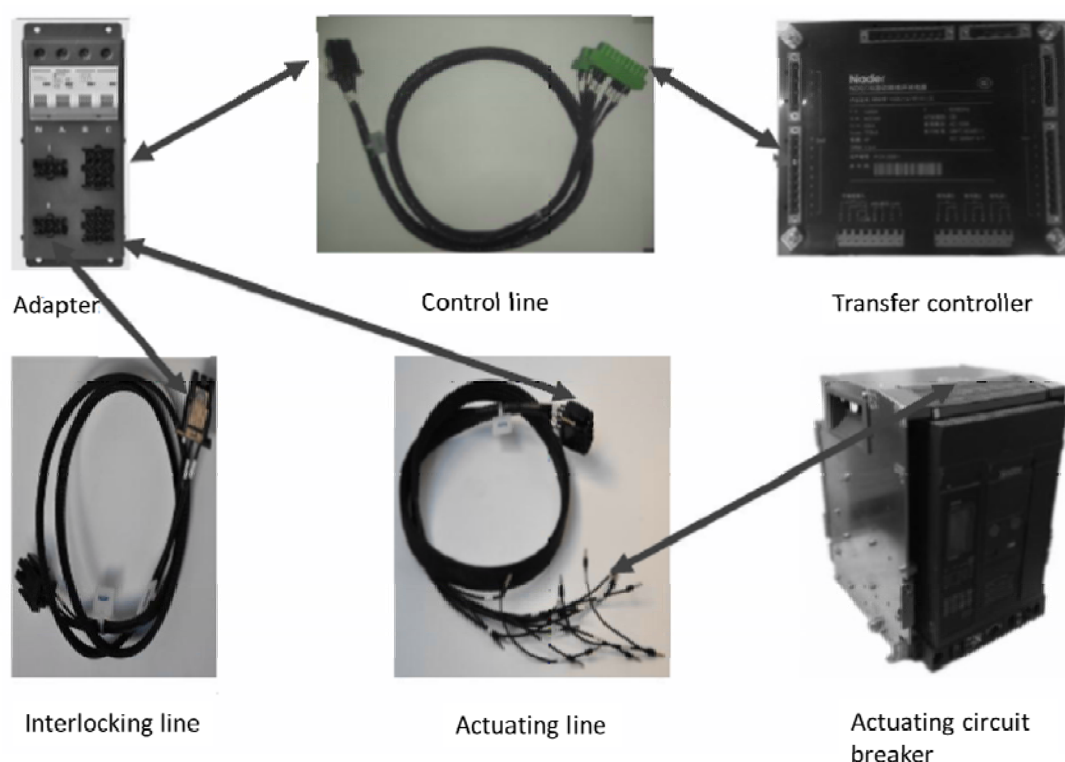
Fix the power supply module on the adapter mounting bracket with two M4 mounting screws, which is located on the back of the adapter.



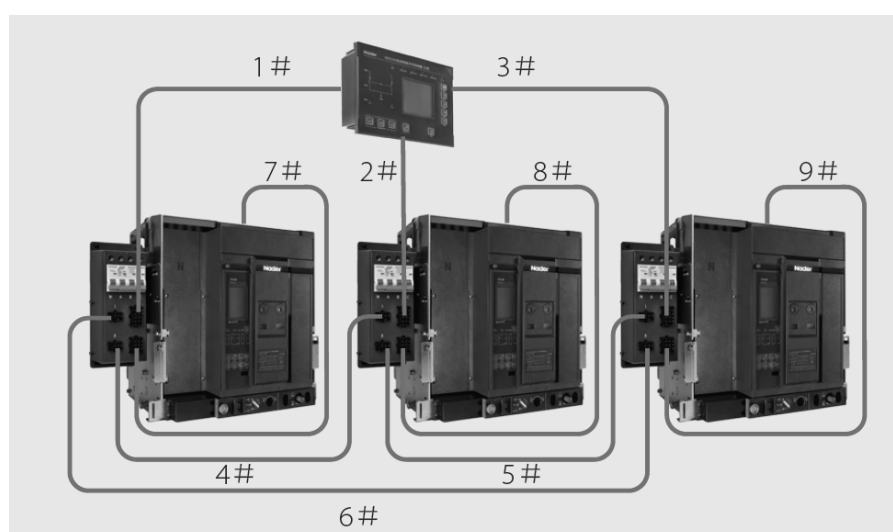
### Installation and connection of the actuating line

Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

For each set of the actuating circuit breaker installed with the adapter and power supply module (1600A shell frame), perform wiring of the actuating line according to the electric circuit diagram, harness installation schematic diagram and electric harness connection diagram as well as the matching table between controller and electric harness for each kind of controller. Insert the 15 labeled plugs in the actuating line and connected with the actuating circuit breaker into the round hole groove matched with the wiring terminal of the actuating circuit breaker in order; for the wiring methods, refer to the wiring terminal connection of the actuating circuit breaker.



Electric Harness Connection Diagram



Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

Matching table between controller and electric harness

Controller type	Standard harness code
2L	1 #, 2 #, 4 #, 7 #, 8 #
3L	1 #, 2 #, 3 #, 4 #, 5 #, 6 #, 7 #, 8 #, 9 #
QL	1 #, 2 #, 3 #, 4 #, 5 #, 7 #, 8 #, 9 #
2LB	1 #, 2 #, 7 #, 8 #
3LB	1 #, 2 #, 3 #, 7 #, 8 #, 9 #
QLB	1 #, 2 #, 3 #, 7 #, 8 #, 9 #

Note: 1 #, 2 #, 3 # harness is the control line; 4 #, 5 #, 6 # harness is the interlocking line; 7 #, 8 #, 9 # harness is the actuating line.

### Installation of the actuating circuit breaker

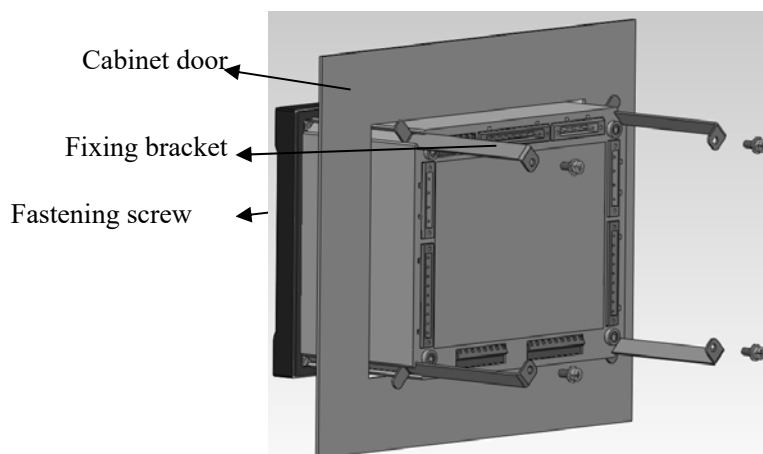
For each actuating circuit breaker completed with the above installation steps, perform installation according to the requirements specified in the installation and operating instructions of the specific actuating circuit breaker.

### Operation of the actuating circuit breaker

For the specific operation and use of the actuating circuit breaker, see the installation and operating instructions of the specific circuit breaker.

### Controller installation

To install the controller on the cabinet door, open a hole on the cabinet door according to the cabinet door opening dimensions of controller, unscrew the fastening screws at the four corners on the back of controller to remove the fixing bracket and install the controller shown as below.



### Installation and connection of the control line, interlocking line (special for 2L, 3L and QL)

Perform wiring of the control line and interlocking line according to the electric circuit diagram, harness

Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

installation schematic diagram and electric harness connection diagram as well as the matching table between controller and electric harness for each kind of controller, and insert the corresponding plugs into the sockets.

### Installation of the mechanical interlock (optional for 2L, 3L and QL)

When the controller type is 2L, 3L and QL in the NDQ5W series automatic transfer switching equipment, if the optional mechanical interlock is required, refer to the appendix of the installation and operating instructions of each specific actuating circuit breaker: Installation instructions for the cable interlocking device of the circuit breaker for installation.



Mechanical interlocking

### Secondary wiring terminal connection of controller



Two groups of yellow wiring card slots underneath are secondary wiring terminals provided to customers. Perform wiring according to the secondary terminal signal input function, controller menu table, port programming output table and port programming input table on the electric circuit diagram of the controller with the wiring methods as follows:

1. Press down the corresponding yellow wiring card slots with a flathead screwdriver;
2. Insert the corresponding line ends into the proper round holes and then remove the flathead screwdriver to fix the ends.

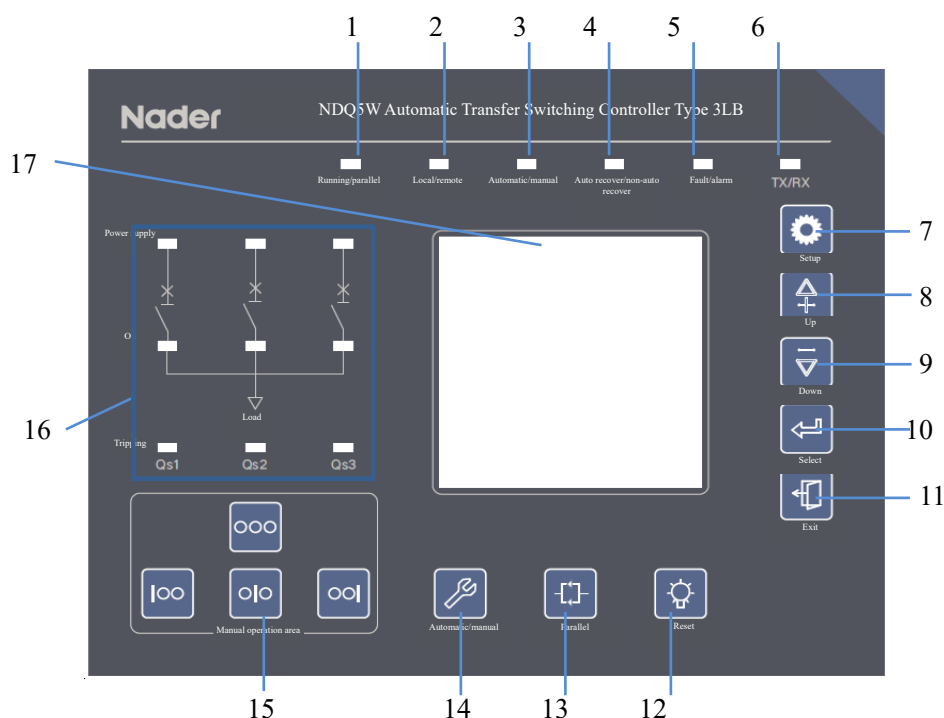
Note: 1. Connection capacity: Rigid wire/flexible wire (0.2-1.5) mm<sup>2</sup>/(0.2-1) mm<sup>2</sup>/(AWG) 24-16;

Flexible wire with a cold head (0.25-0.75) mm<sup>2</sup>;

2. Striping length: 8mm.

Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

## Controller Display and Key Description



Function	No.	Name	Color	Function description
Display	1	Running/parallel	Green	LED is “normally on” during normal program operation of the controller; it is “flashing” when it enters the parallel status
	2	Local/remote	Green	LED is “normally on” when the controller is in the local mode; it is “flashing” when the controller is in the remote mode
	3	Automatic/manual	Green	LED is “normally on” in the automatic mode; it is “flashing” in the manual mode
	4	Auto recover/non-auto recover	Green	When the auto switch and auto recover mode is selected as the operation mode of controller, LED is “normally on”; otherwise, it is “normally off”
	5	Fault/alarm	Red	LED is “normally off” during normal operation of the controller; it is “normally off” in case of abnormality
	6	TX/RX	Green	LED is “normally on” when the controller is in the communication mode
	16	Power supply	Blue	LED is “normally on” when the power voltage is normal; it is “flashing” when the power voltage is abnormal
		On	Green	When the actuating air circuit breaker is in the corresponding closing position, the corresponding on LED is “normally on” and the off LED is “normally off”
		Tripping	Red	In case of fault tripping of the actuating air circuit breaker, the corresponding LED is “on” and can only be “off” through tripping reset of the circuit breaker.
	17	LCD display		Display range of 83.8x76.5mm, display mode: black character

Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

			on white background, used to display the setting parameters and measure the parameter values
Keys	7	Setup	In the normal operation status, press this key for 2s to enter the setting menu
	8	Up	In the setting status, press this key to increase the setting parameter
	9	Down	In the setting status, press this key to decrease the setting parameter
	10	Select	It is valid in the setting status. Press this key to confirm the current setting parameter and save it into EEPROM
	11	Exit	It is valid in the setting status. press this key to return to the previous menu
	12	Reset	By pressing this key, the product performs the hardware reset when the controller restarts
	13	Parallel	In manual mode, press this key to implement the parallel power transfer
	14	Automatic/manual	Press this key to change the operation mode of controller to the “Automatic” or “Manual” mode
	15	Manual operation area of the power transfer	In manual mode, press the corresponding key to close the circuit breaker.   ○○-Qs1 closing; ○   ○- Qs2 closing; ○○   - Qs3 closing ○○○ complete isolation

Note 1: The No. 13 parallel key is applicable to 2LB, 3LB and QLB controllers;

Note 2: No. 15 in the table represents the manual operation area status of the power transfer for Type 3L and 3LB controllers; the manual operation area status of the power transfer for Type 2L and 2LB controllers is

| ○-Qs1 closing; ○ | - Qs2 closing; ○○- fully off; the manual operation area status of the power transfer for Type QL and QLB controllers is

| ○○-Qs1 closing; | ○ | - Qs1, Qs2 closing; ○○ | - Qs2 closing; | | ○Qs1, Qql closing; ○○○- fully off;

○ | | - Qql, Qs2 closing;

Note 3: The No. 16 display status varies according to the dual power transfer, triple power transfer, two lines plus bus connection transfer as well as the manual parallel operation function to be provided

## Controller Functions and Operation

### Controller Functions

Table of Controller Functions

Controller model		2L	2LB	3L	3LB	QL	QLB
Rated control supply voltage Us		AC230V [Ue= AC380V/400V/415V (TT/TN)], AC380V [Ue= AC380V/400V/415V (IT)]					
Auxiliary power supply		DC24V					
Applicable application mode	Grid-grid	■	■			■	■
	Grid-oil engine	■	■			■	■
	Grid-grid-oil engine			■	■		
	Grid-oil engine-oil engine			■	■		
Applicable	Dual power transfer	■	■				

Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

le type	Triple power transfer				■	■		
	Two lines plus bus connection transfer						■	■
Autom atic transfe r	Under-voltage protection	Power supply detected	S1/S2 three-phase		S1/S2/S3 three-phase		S1/S2 three-phase	
		Under-voltage start value	OFF+ Us * (75~95%)					
		Under-voltage return value	AC380V: Under-voltage start value + (6V~45V), AC230V: Under-voltage start value + (4V~30V)					
	Overvoltage protection	Power supply detected	S1/S2 three-phase		S1/S2/S3 three-phase		S1/S2 three-phase	
		Overvoltage start value	Us *(105%~125%)+ OFF					
		Overvoltage return value	AC380V: Overvoltage start value - (6V~45V), AC230V: Overvoltage start value - (4V~30V)					
	Open-phase protection	Power supply detected	S1/S2 three-phase		S1/S2/S3 three-phase		S1/S2 three-phase	
		Open-phase value	Us *25%					
	Underfrequency protection	Underfrequency start value	OFF+rated frequency * (90%~98%)					
		Underfrequency return value	Rated frequency * (95%~99%)					
	Overfrequency protection	Overfrequency start value	Rated frequency * (102%~110%) + OFF					
		Overfrequency return value	Rated frequency * (101%~105%)					
	Voltage unbalance protection	Voltage unbalance Start value	(3%~30%) + OFF					
		Voltage unbalance Return value	(2%-10%)					
	Phase order protection	Phase order mode	A-B-C (A-B-C, A-C-B, OFF)					
Power priority		Mode selection	Qs1, Qs2		Qs1, Qs2, Qs3		Qs1+Qs2 Qs1+Qql Qs2+Qql	
Energy storage setting			Energy storage before closing, energy storage after closing					
Operation mode			Auto switch and auto recover, auto switch and non-auto recover					
Manual key transfer	Manual transfer		■	■	■	■	■	■
	Manual parallel transfer			■		■		■



Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

Display	Supply voltage/frequency/unbalance parameter display	■	■	■	■	■	■
	Power open phase/abnormal/normal display	■	■	■	■	■	■
	Making, breaking and tripping status display of the circuit breaker	■	■	■	■	■	■
	Communication status display	■	■	■	■	■	■
	Power failure display	■	■	■	■	■	■
	Parameter setting display	■	■	■	■	■	■
Transfer delay		T1-T4	T1-T4	T1-T6	T1-T6	T1-T6	T1-T6
Communication function	Communication function	■	■	■	■	■	■
	Modbus protocol	■	■	■	■	■	■
Auxiliary functions	RTC real time	■	■	■	■	■	■
	Key locking function	■	■	■	■	■	■
	Generator starting/stopping control	■	■	■	■	■	■
	Load removal (optional)	■	■	■	■	■	■
	Fault locking	■	■	■	■	■	■
	Event recording	■	■	■	■	■	■
	Alarm function	■	■	■	■	■	■

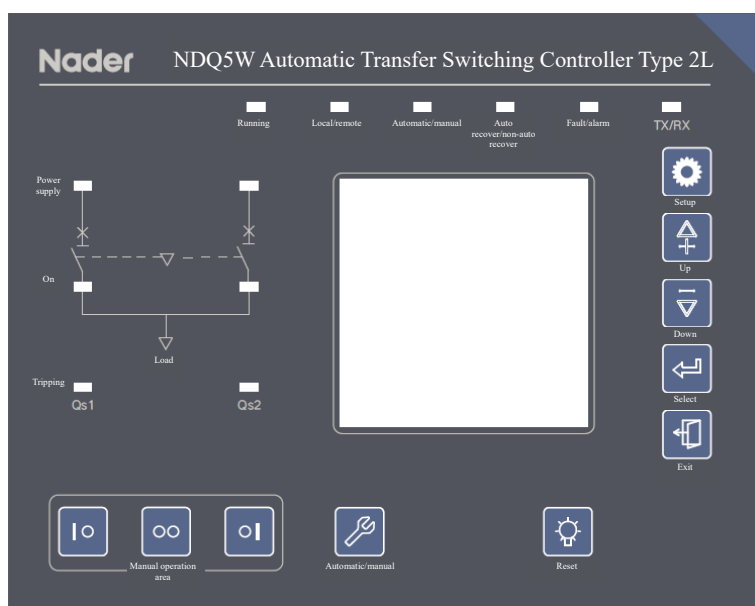
Note: ■ Standard configuration

## Introduction of Controller Functions

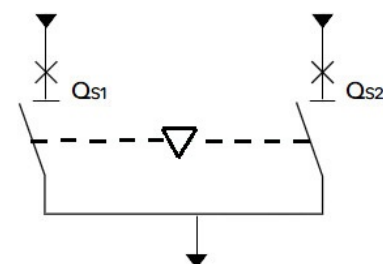
### ● Type 2L controller

Type 2L controller is mainly used in the automatic/manual transfer scheme of the dual power system. With the automatic judgment of the power status as well as the electric and mechanical interlocking, the dual power supply can be ensured not to be closed simultaneously by performing the automatic operation of the circuit breaker.

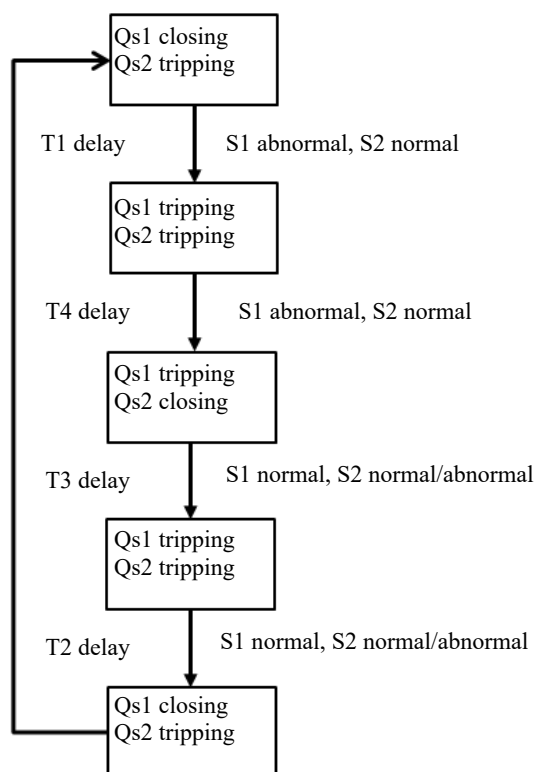
Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------



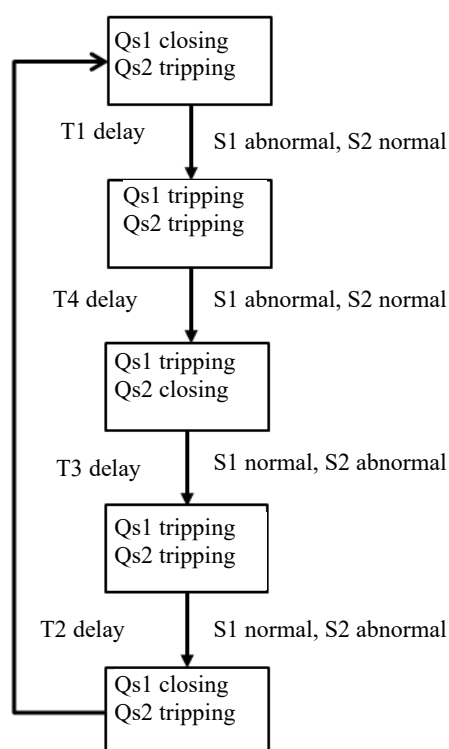
Type 2L controller interface



Transfer process of Type 2L controller:



Type 2L auto switch and auto recover



Type 2L auto switch and non-auto recover

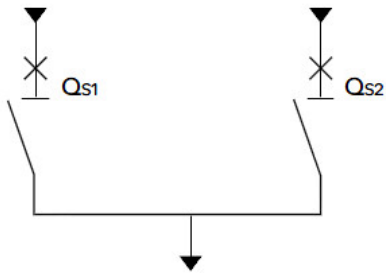
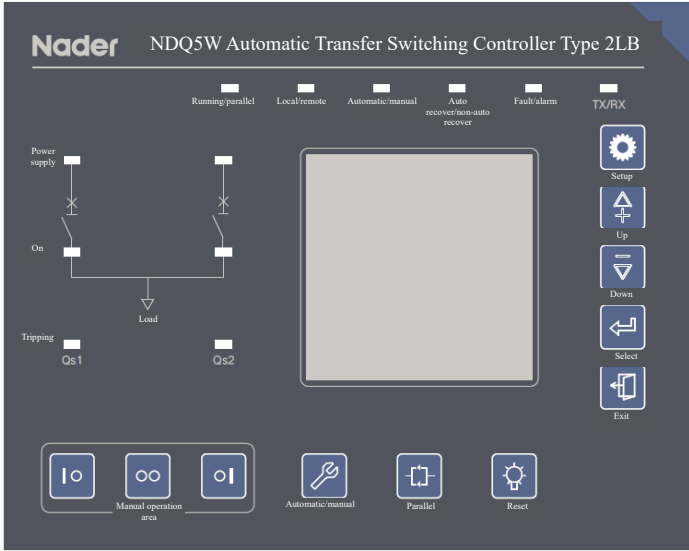
Note: The delay definition described in the controller is as follows:

T1:Qs1 tripping delay; T2:Qs1 closing delay; T3:Qs2 tripping delay; T4:Qs2 closing delay;  
T5:Qs3/Qq1 tripping delay; T6:Qs3/Qq1 closing delay.

## ● Type 2LB controller

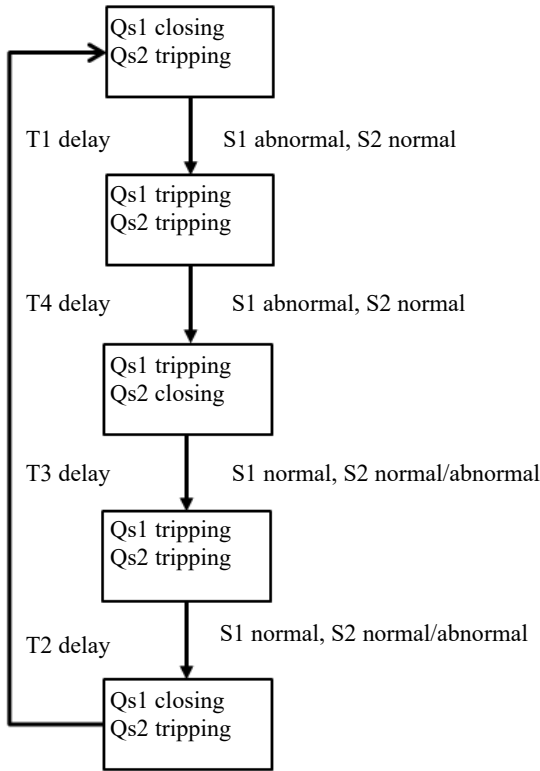
Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

Type 2LB controller is mainly used in the automatic/manual transfer scheme of the dual power system. With the automatic judgment of the power status, Type 2LB controller is provided with the parallel power transfer function during the manual operation by performing the automatic operation of the circuit breaker.

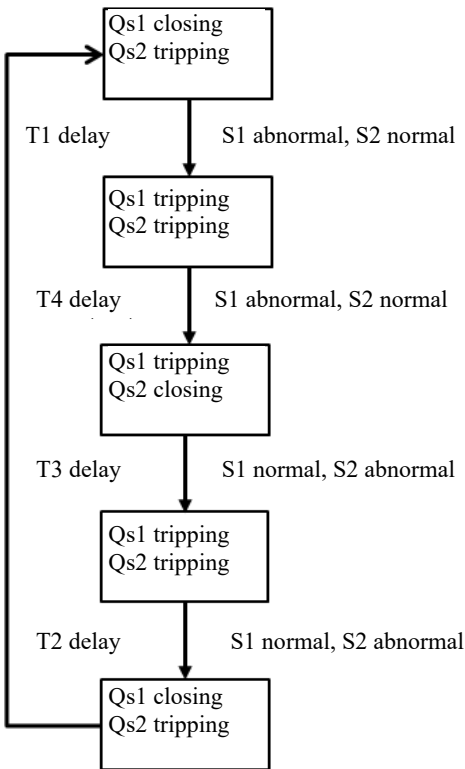


Type 2LB controller interface

Transfer process of Type 2LB controller:



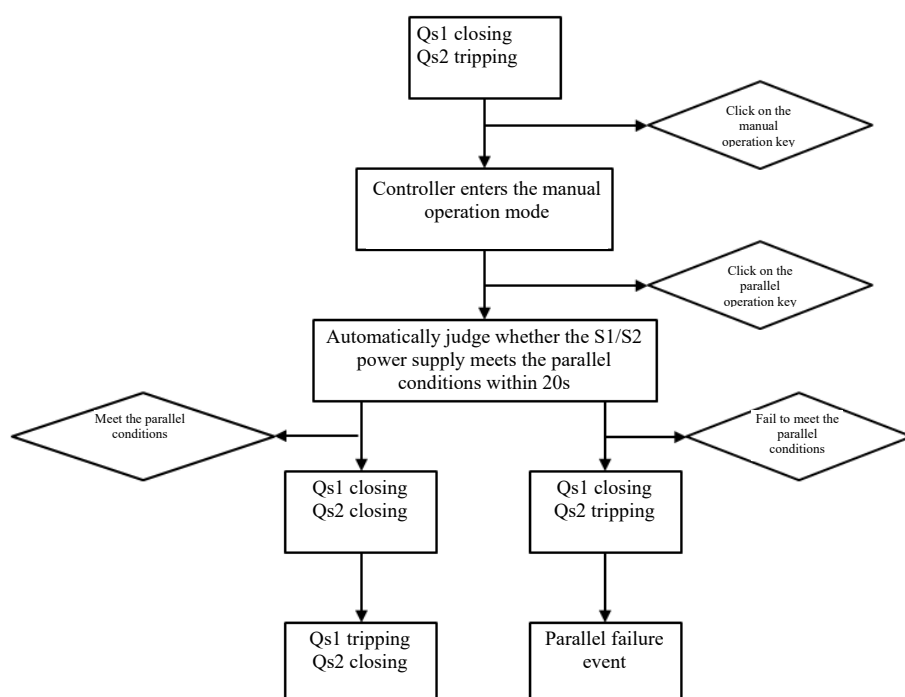
Type 2LB auto switch and auto recover



Type 2LB auto switch and non-auto recover

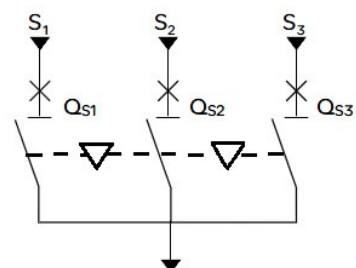
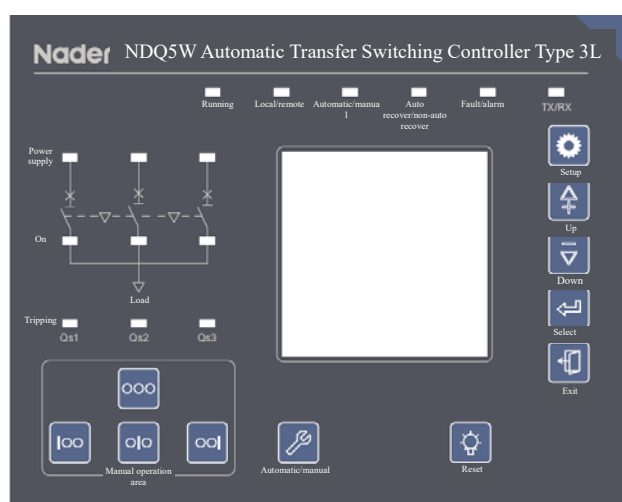
Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

Parallel operation process of Type 2LB controller:



## ● Type 3L controller

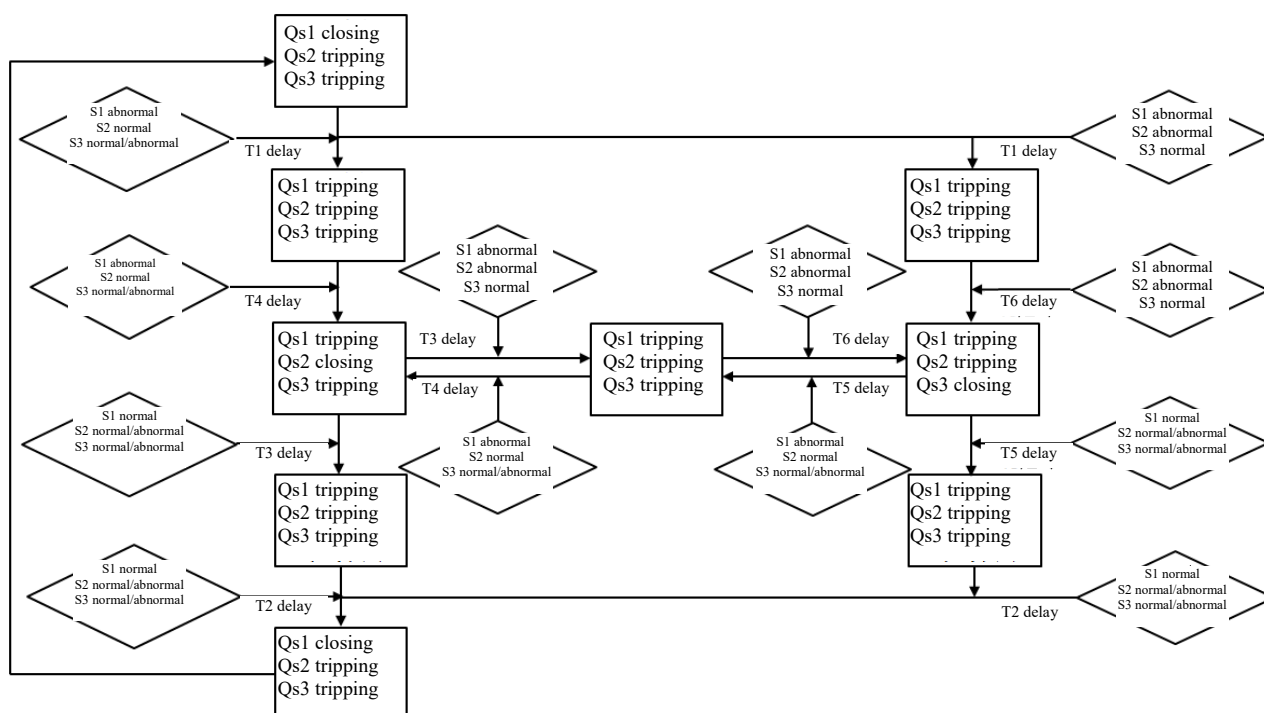
Type 3L controller is mainly used in the automatic/manual transfer scheme of the triple power. With the automatic judgment of the power status as well as the electric or mechanical interlocking, ensure that only one power supply shall be closed reliably by performing the automatic tripping, energy storage and closing operation of the circuit breaker.



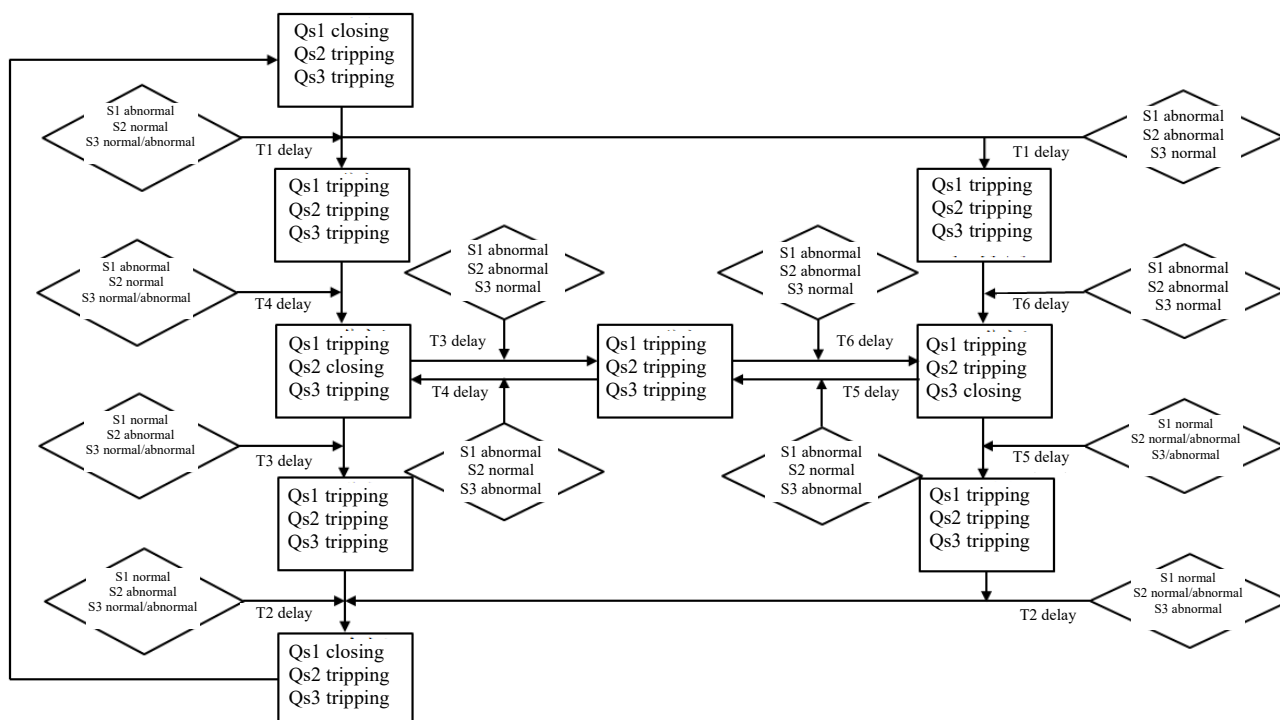
Type 3L controller interface

Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

Transfer process of Type 3L controller:



Type 3L auto switch and auto recover

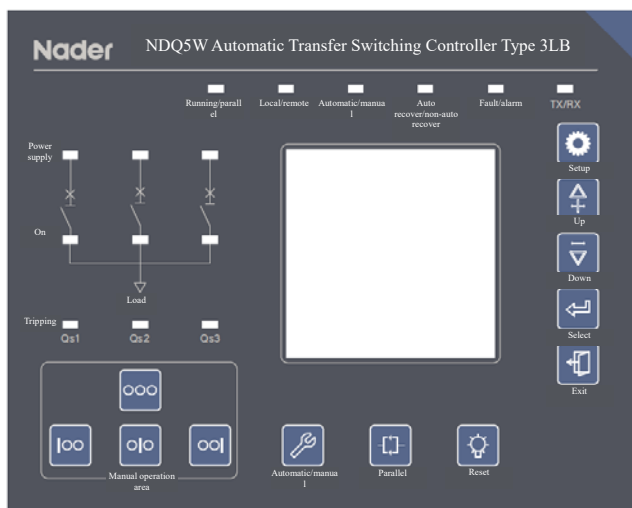


Type 3L auto switch and non-auto recover

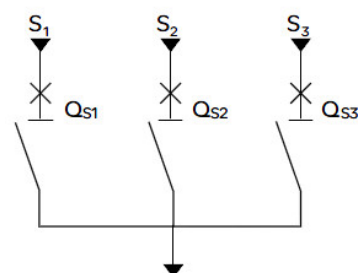
Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

## ● Type 3LB controller

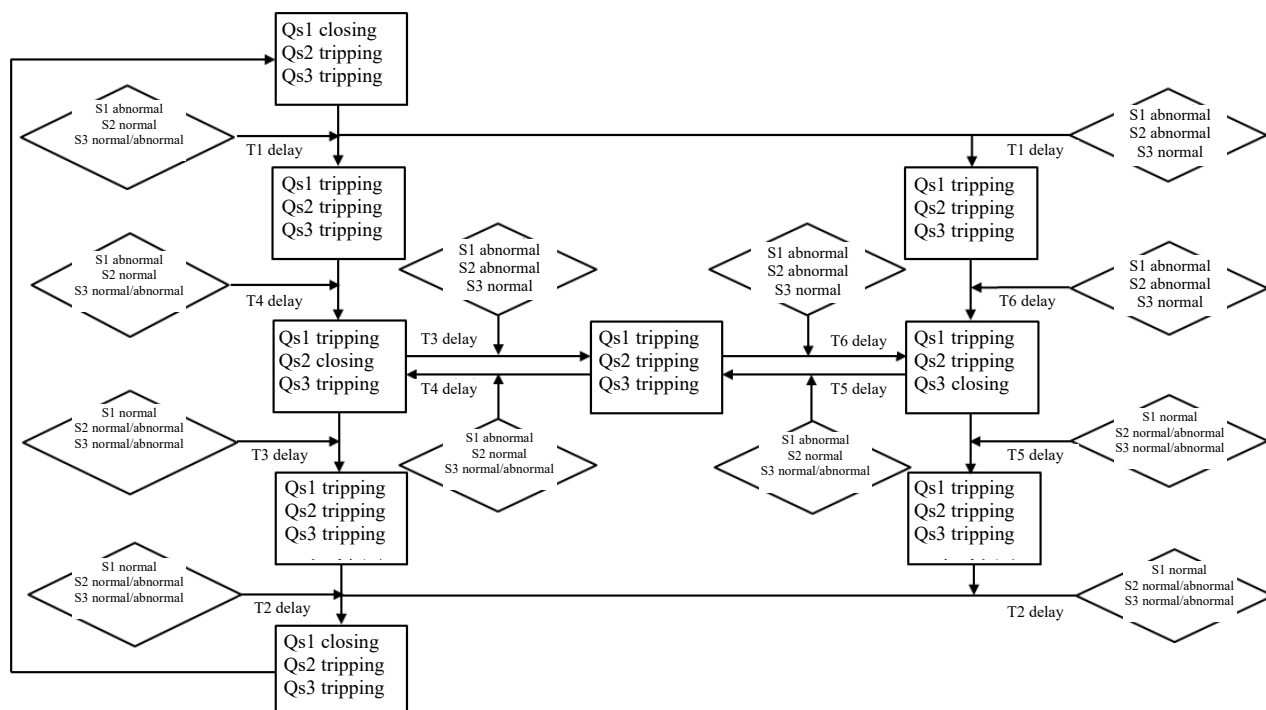
Type 3LB controller is mainly used in the automatic/manual transfer scheme of the triple power. With the automatic judgment of the power status, Type 3LB controller is provided with the parallel transfer function during the manual operation by performing the automatic tripping, energy storage and closing operation of the circuit breaker.



Type 3LB controller interface

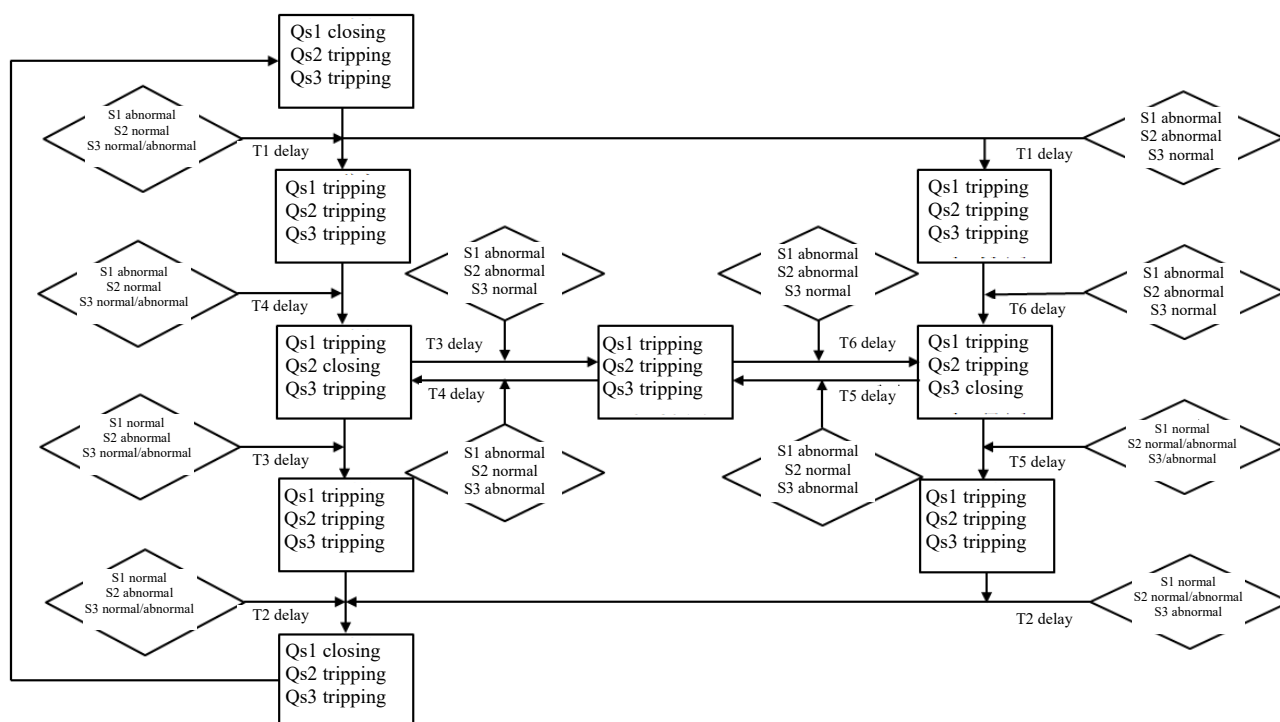


Transfer process of Type 3LB controller:



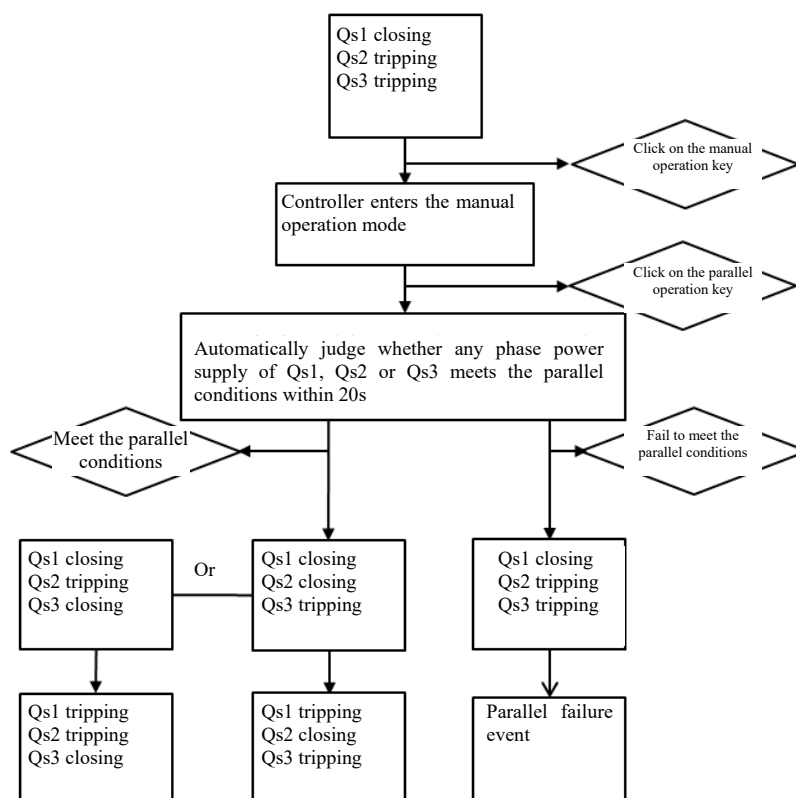
Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

### Type 3LB auto switch and auto recover



### Type 3LB auto switch and non-auto recover

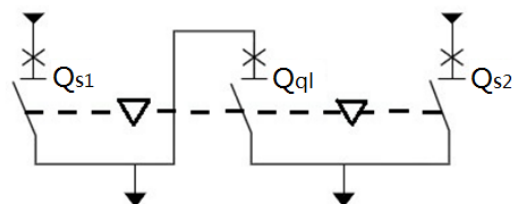
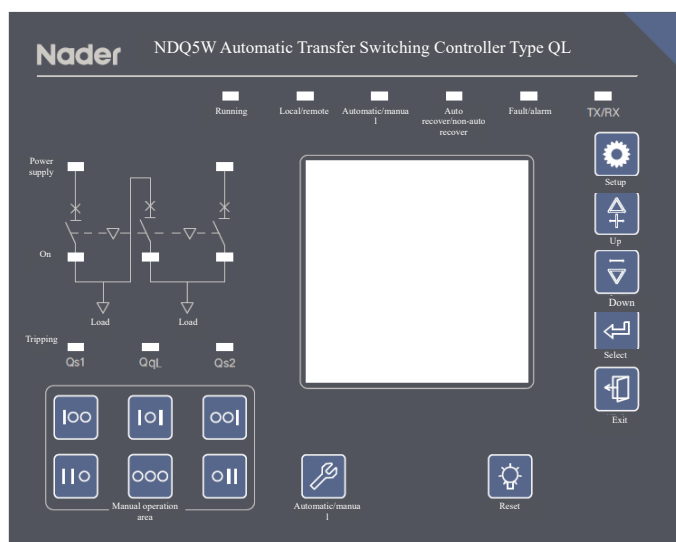
Parallel operation process of Type 3LB controller:



Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

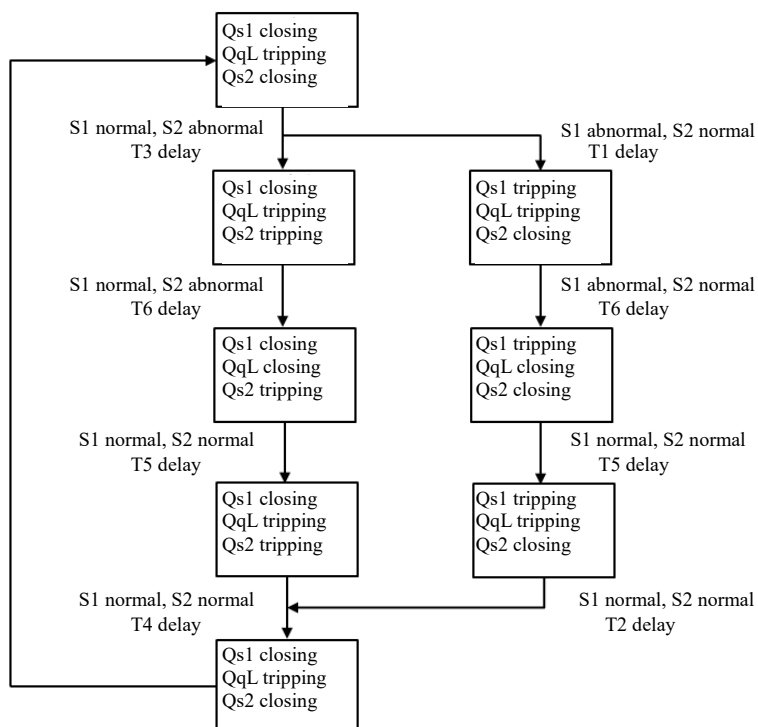
## Type QL controller

Type QL controller is mainly used in the automatic/manual transfer scheme of the two lines plus bus connection system. With the automatic judgment of the power status as well as the electric or mechanical interlocking, the dual power supply can be ensured not to be closed simultaneously by performing the automatic tripping, energy storage and closing operation of the circuit breaker.



Type QL controller interface

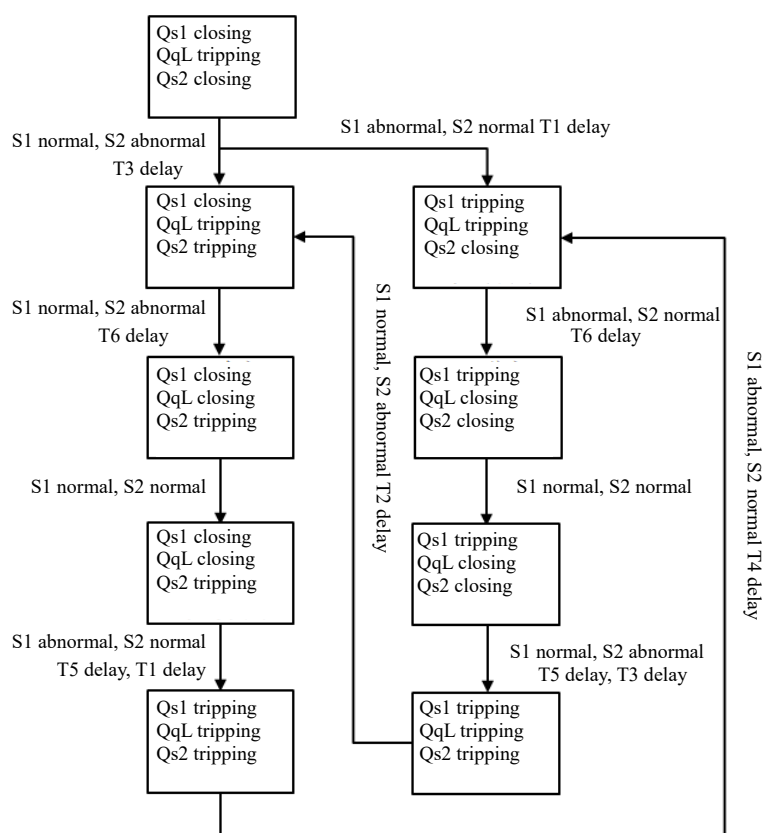
Transfer process of Type QL controller:





Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

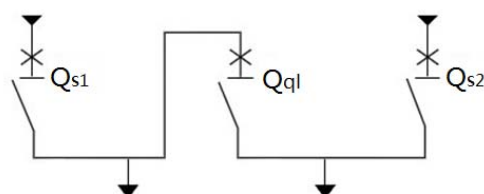
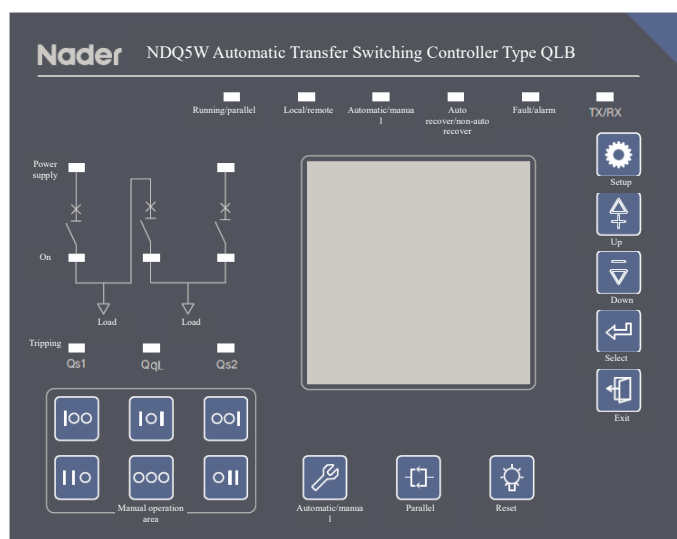
### Type QL auto switch and auto recover



### Type QL auto switch and non-auto recover

#### ● Type QLB controller

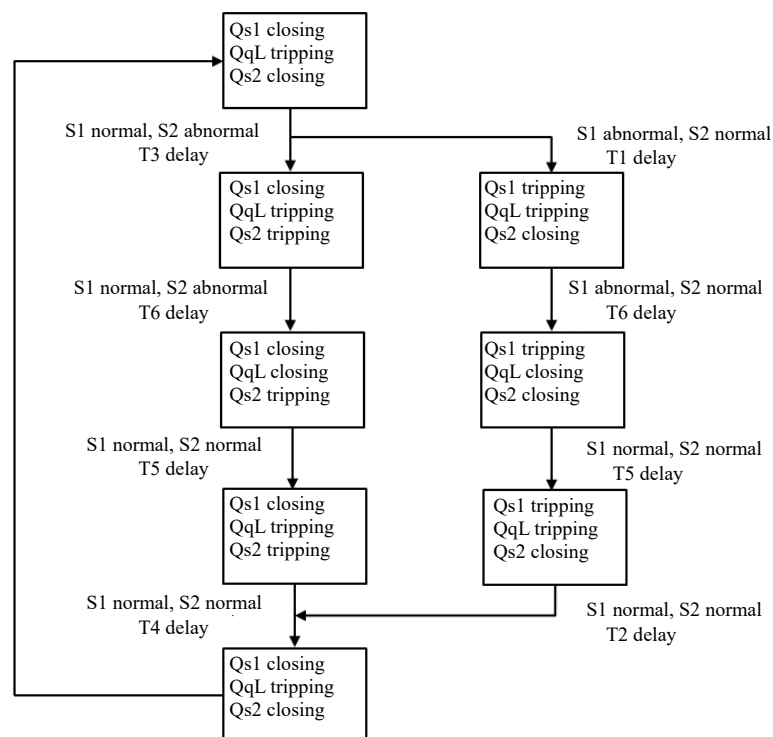
Type QLB controller is mainly used in the automatic/manual transfer scheme of the two lines plus bus connection system. With the automatic judgment of the power status, Type QLB controller is provided with the parallel transfer function during the manual operation by performing the automatic tripping, energy storage and closing operation of the circuit breaker.



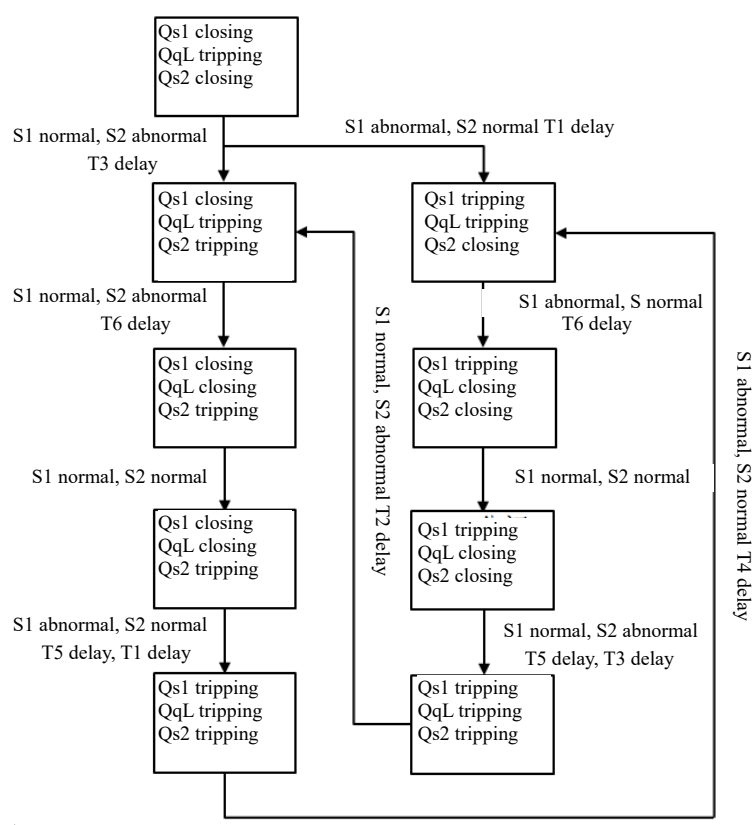
Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

## Type QLB controller interface

Transfer process of Type QLB controller:



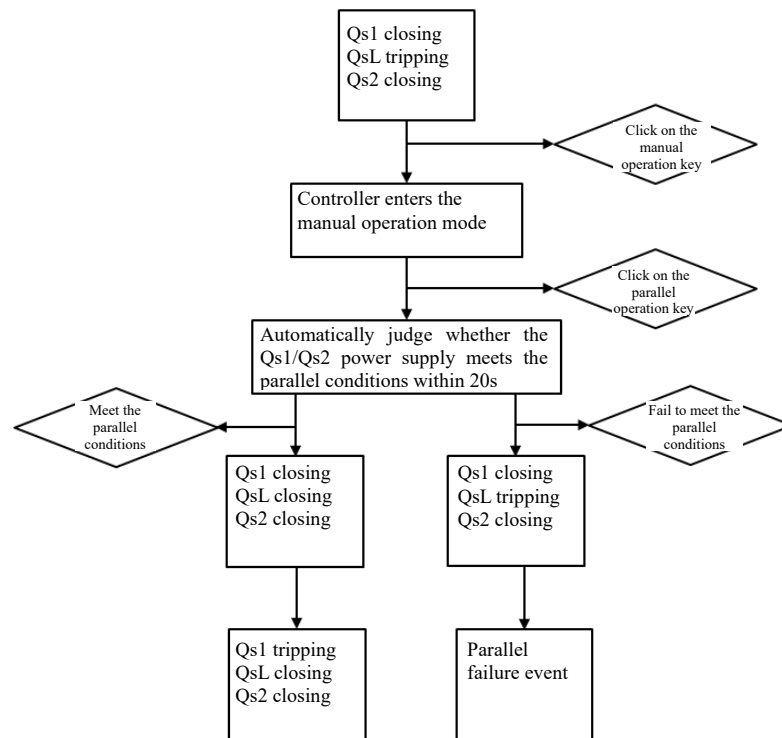
## Type QLB auto switch and auto recover



Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

### Type QLB auto switch and non-auto recover

Parallel operation process of Type QLB controller:



### ● Remote communication transfer

Six types of controller are all provided with communication modules, of which the function level can be used separately or in combination.

#### ◆ Status indication communication (remote communication)

The following information can be accessed with the communication module:

- ★ On/off status of the dual/triple actuating circuit breaker;
- ★ Fault tripping status of the actuating circuit breaker;
- ★ Programmable input/output status (including alarm, remote control);
- ★ Dissatisfactory status of the parallel transfer conditions (Type 2LB/3LB/QLB products);

#### ◆ Measurement value communication (remote measurement)

This function provides communication with all the measurement parameters:

- ★ Voltage, frequency, unbalance and other parameters of the dual/triple power supply;
- ★ Configuration parameters of the transfer process, etc.;
- ★ Voltage/frequency/phase angle difference of the parallel transfer conditions-operating power supply (Type 2LB/3LB/QLB products);

#### ◆ Operation management communication (remote regulating)

This function can modify the setting parameters:

Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

- ★ Under-voltage/overvoltage/overfrequency/underfrequency/unbalance degree/phase sequence and other protection setting values;
- ★ Closing/tripping/ auto switch and auto recover transfer delay of the dual/triple power supply;
- ★ Under-voltage/overvoltage/overfrequency/underfrequency/unbalance degree and other alarm judgment delay of the dual/triple power supply;
- ★ Generator starting/stopping delay;
- ★ Voltage/frequency/phase angle difference of the parallel transfer conditions-operating power supply (Type 2LB/3LB/QLB products);

◆ Command communication (remote control)

- ★ This function can control the on/off operation of each actuating circuit breaker;
- ★ Transfer mode priority:

Joggle the Remote Control (Including Fire Control/Forced) > Manual Control > Remote Communication Control > Automatic Control

Note: To ensure that the controller can still perform the remote communication (failure to realize the command communication) in case the power supply disappears, it is required to provide the extra DC24V power supply with the power supply capacity of DC24V, 1A.

◆ Communication protocol

Call the 400 technical support hot-line of our company for contents of the electronic communication protocol of the NDQ5W automatic transfer switching controller.

● Auxiliary functions of the controller

The NDQ5W series automatic power transfer system also has some unique auxiliary functions, which are used with the automatic/manual transfer function of the controller, thus making the product function more colorful.

◆ RTC real time

The NDQ5W controller can set the real time for site management;

With the real-time event logging function, when the transfer system acts and fails can be recorded.

◆ Event recording function

The 2L/2LB/3L/3LB/QL/QLB controller can record the power failure and power transfer action contents;

The controller can record the 96 events in the form of stack;

These events are described in two lines with the first line as the event code and the second line as the occurrence time of the event.

◆ Key locking function

Without any operation, the controller automatically enters the key locking status after the backlight delay (default 120s) to avoid user misuse and also play a power saving function.

In the locking status, the 2L/2LB/3L/3LB/QL/QLB controller is not allowed to perform the automatic mode selection/manual mode selection/manual key transfer/parameter setting operation.

If you need to unlock this function, hold the setup key for 2 seconds.


Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

◆ Generator starting/stopping control function

In case of the mains power failure (abnormal), NDQ5W controller can provide a group of generator start-stop control nodes to allow the automatic delay start of generator (external DC24V auxiliary power required). When the generator is operating normally, it will automatically put into the generator power; when the mains power is restored and returns to be supplied, the transfer status of the generator starting-stopping control node makes the generator to stop operation automatically.


## Controller Operation

● Operation example of Type 3L controller

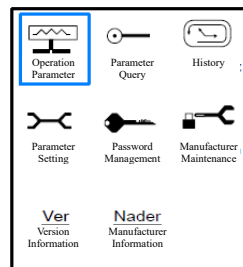
During all the operations, press  to return to the previous menu after each layer of menu is finished.


Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

#### ◆ Operation parameter operation

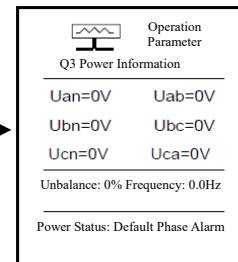
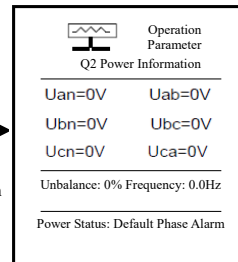
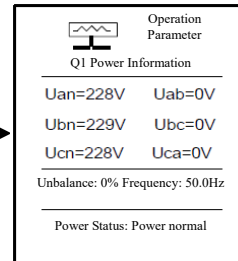
Press  for 2s to enter Level 1 menu:

Level 1 Menu



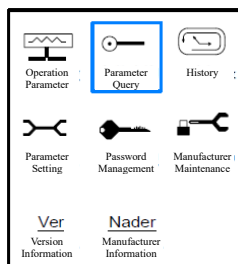
After selecting the "Operation Parameter", press the  key


Level 2 Menu



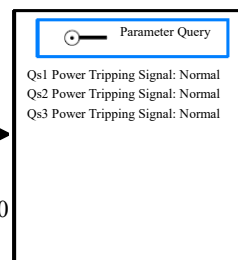
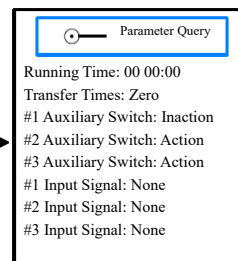
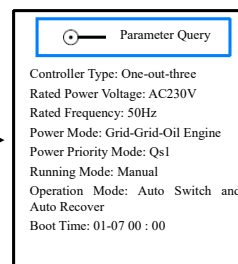
#### ◆ Parameter query operation

Level 1 Menu



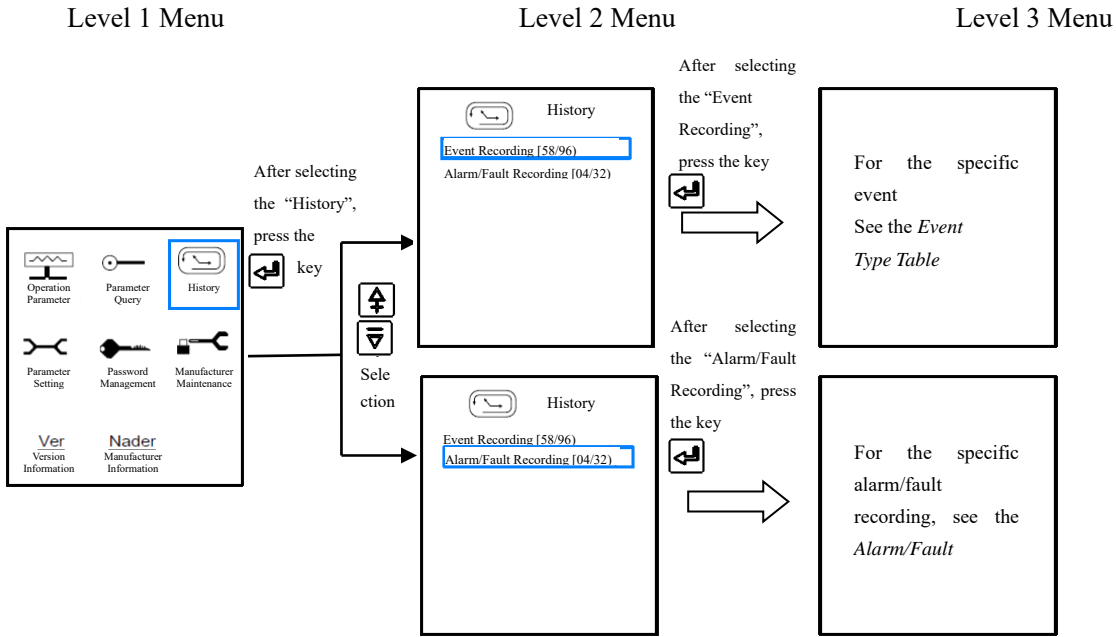
After selecting the "Parameter Query", press the  key

Level 2 Menu



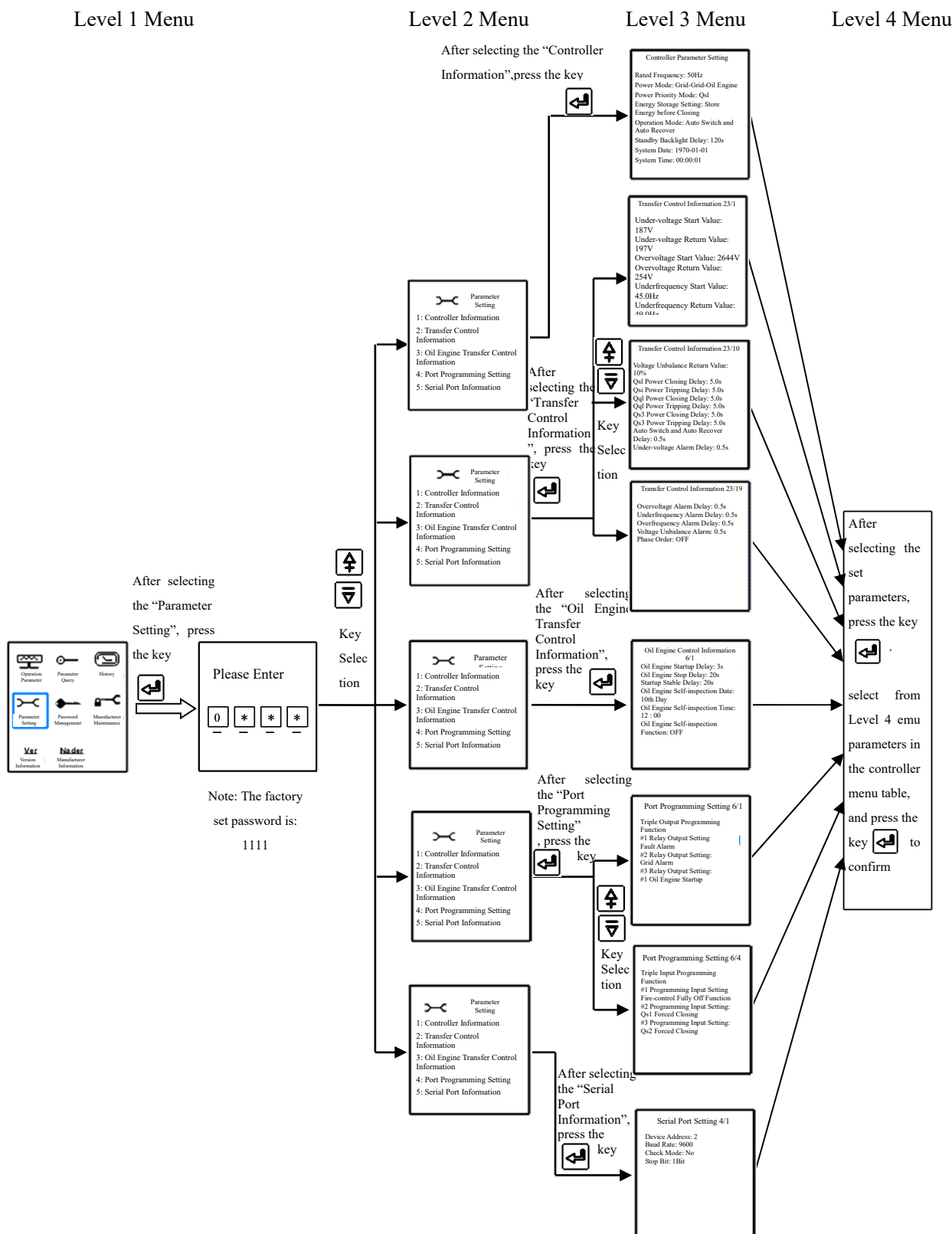
Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

◆ History operation



◆ Parameter setting operation

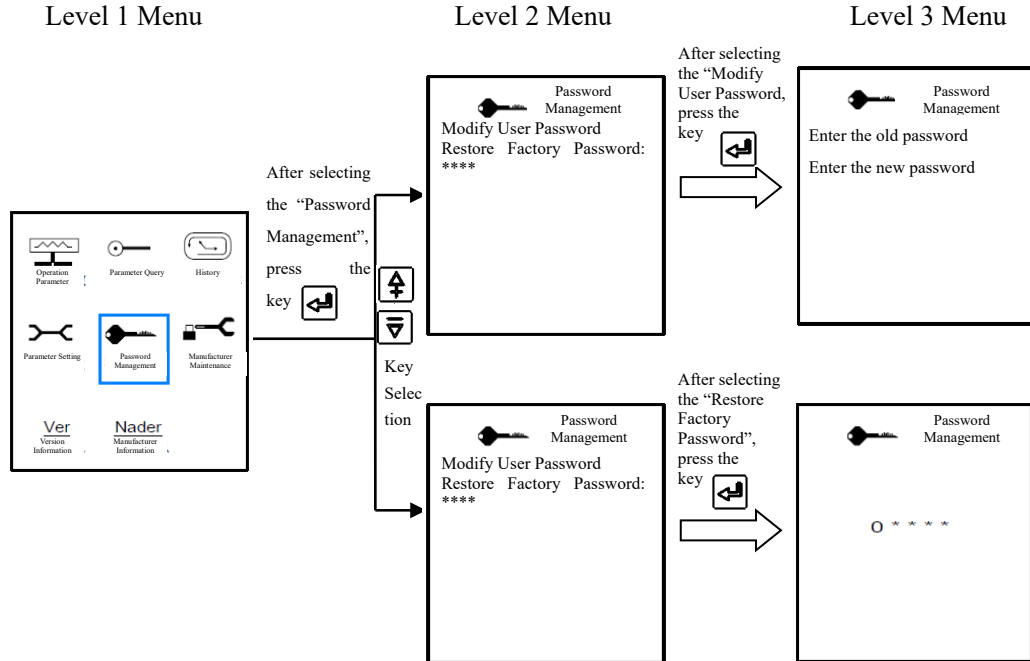
Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------





Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

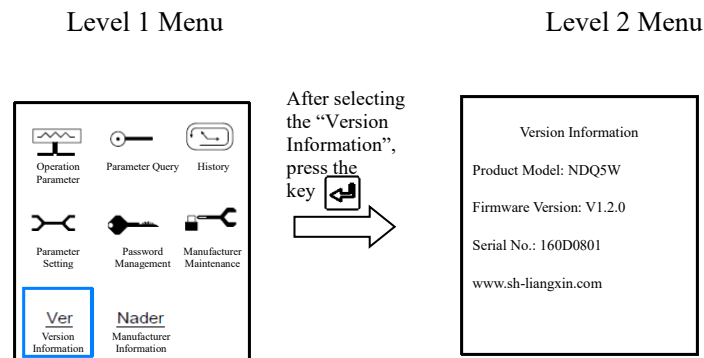
### ◆ Password management operation



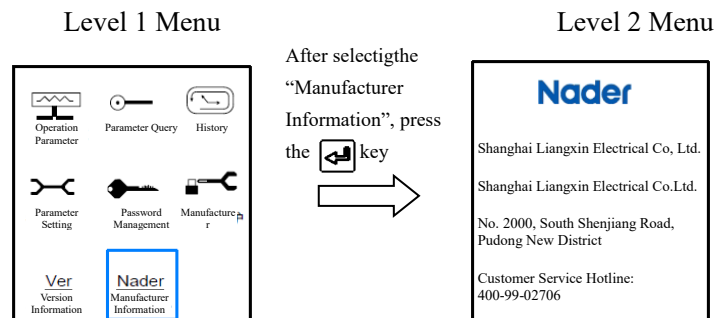
### ◆ Manufacturer maintenance operation

The user can not set this here.

### ◆ Version Information





### ◆ Manufacturer Information





Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

Note: The operation step of Type 2L, QL, 2LB, 3LB and QLB controllers is completely consistent with Type 3L except that the individual parameter settings are different from the displayed setting.

Controller Menu Table

Controller Menu			
Level 1 Menu	Level 2 Menu	Level 3 Menu	Level 4 Menu
 Operation Parameter	Qs1 power information	—	—
	Qs2 power information	—	—
	Qs3 power information	—	—
 Parameter Query (Query Only, Non-modifiable)	Controller Type: One-out-three/either/two-out-three (bus connection)	—	—
	Rated power voltage: AC230V/380V	—	—
	Rated frequency: 50Hz/60Hz	—	—
	Power supply mode: One-out-three: Grid-grid-oil engine/grid-oil engine-oil engine; Either/ two-out-three (bus connection): Grid-grid/ Grid-oil engine	—	—
	Power priority mode: One-out-three: QS1/QS2/QS3 Either: Qs1/Qs2 two-out-three (bus connection): QS1+QS2/QS1+Qql/QS2+Qql	—	—
	Running mode Manual/automatic/remote control	—	—
	Operation mode: Auto switch and auto recover/auto switch and non-auto recover	—	—
	Boot time: XX-XX XX:XX	—	—
	Running time: X X:XX	—	—
	Transfer times: X times (upper limit of 9,999 times)	—	—
	#1 Auxiliary switch: Action/inaction	—	—
	#2 Auxiliary switch: Action/inaction	—	—
	#2 Auxiliary switch:	—	—



Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

	Action/inaction		
	#1 Input signal: None/available	—	—
	#2 Input signal: None/available	—	—
	#3 Input signal: None/available	—	—
	Qs1 power tripping signal: Tripping/normal	—	—
	Qs2 power tripping signal: Tripping/normal	—	—
	Qs3 (or bus connection) power tripping signal: Tripping/normal	—	—
 History	Event recording (X/96)	For the specific event type, see the <i>Event Type Table</i>	—
	Alarm/fault recording (X/32)	For the specific alarm/fault recording, see the <i>Alarm/Fault Recording Table</i>	—
 Parameter Setting (Factory Password: 1111)	1. Controller information	Rated frequency	50Hz/60Hz
		Power supply mode	One-out-three: Grid-grid-oil engine/ Grid-oil engine-oil engine Either/ two-out-three (bus connection): Grid-grid/ Grid-oil engine
		Power priority mode	One-out-three: Qs1/Qs2/Qs3 Either: Qs1/Qs2 Two-out-three (bus connection): Qs1+Qs2/Qs1+Qql/Qs2+Qql
		Energy storage setting	Energy storage before closing/energy storage after closing
		Operation mode	Auto switch and auto recover/Auto switch and non-auto recover
		Standby backlight delay	30s/60s/120s/180s
		System date	XXXX-XX-XX
		System time	XX:XX:XX
	2. Transfer control information	Under-voltage start value	OFF/rated voltage * (75%~95%)
		Under-voltage return value	220V: Under-voltage start value + (4V~30V) 380V: Under-voltage start value + (6V~45V)
		Overvoltage start value	OFF/rated voltage * (105%~125%)

Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

		Overvoltage return value	220V: Overvoltage start value - (4V~30V) 380V: Overvoltage start value - (6V~45V)	
		Underfrequency start value	OFF/rated frequency * (90%~98%)	
		Underfrequency return value	Rated frequency * (95%~99%)	
		Overfrequency start value	OFF/rated frequency * (102%~110%)	
		Overfrequency return value	Rated frequency * (101%~105%)	
		Unbalance start value	OFF/(3%~30%)	
		Unbalance return value	2%-10%	
		Qs1 power closing delay	0.1s~640.0s	
		Qs1 power tripping delay	0.1s~640.0s	
		Qs2 (or Qql) power closing delay	0.1s~640.0s	
		Qs2 (or Qql) power tripping delay	0.1s~640.0s	
		Qs3 power closing delay	0.1s~640.0s	
		Qs3 power tripping delay	0.1s~640.0s	
		Auto switch and auto recover delay	0.1s~360.0s	
		Under-voltage alarm delay	0.1s~120.0s	
		Overvoltage alarm delay	0.1s~120.0s	
		Underfrequency alarm delay	0.1s~120.0s	
		Overfrequency alarm delay	0.1s~120.0s	
		Unbalance alarm delay	0.1s~120.0s	
		Phase sequence	OFF/A-B-C/A-C-B	
		3. Oil engine transfer control information	Oil engine startup delay	0s~3600s
			Oil engine stop delay	0s~3600s
			Startup stable delay	0s~3600s
			Oil engine self-inspection date	1 <sup>st</sup> ~30 <sup>th</sup> day
	Oil engine self-inspection time		00:00~23.59	
	Oil engine self-inspection function		OFF/ON	
	4. Port	Triple output	1# Relay output setting	For the specific setting, see the <i>Port</i>

Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

	programming setting	programming function	2# Relay output setting	Programming Output Table	
			3# Relay output setting		
		Triple input programming function	1# Programming input setting	For the specific setting, see the <i>Port Programming Input Table</i>	
			2# Programming input setting		
			3# Programming input setting		
	5. Serial port information		Device address:	2~255	
			Baud rate	9600/19200	
			Check mode	NO (no selection)	
			Stop bit	1Bit (no selection)	
	6. In-phase/parallel information (special for 2LB, 3LB and QLB)		Allowable voltage difference	2V~20V	
			Allowable frequency difference	0.1Hz~1Hz	
			Allowable phase difference	3°~10°	
			Parallel waiting delay	10s~360s	
 Password Management	Modify user password	Enter the old password	——		
		Enter the new password	——		
		Confirm the new password	——		
		Restore factory password	1111	——	
 Manufacturer Maintenance	The user can not set this here	——	——		
<u>Ver</u> Version Information	Version Information Product Model: NDQ5W Firmware Version: V1.2.0 Serial No.: 160D0801 www.sh-liangxin.com	——	——		
<u>Nader</u> Manufacturer Information	<b>Nader</b> Shanghai Liangxin Electrical Co, Ltd. Shanghai Liangxin Electrical Co.Ltd. No. 2000, South ShenJiang Road, Pudong New District Customer Service Hotline: 400-99-02706	——	——		

Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

Event Type Table

Event Type
Qs1 tripping event
Qs2/bus connection tripping event
Qs3 tripping event
Qs1 closing event
Qs2/bus connection closing event
Qs3 closing event
Qs1 energy storage event
Qs2/bus connection energy storage event
Qs3 energy storage event
Boot event
Manual-automatic event
Automatic-manual event
User login event
Administrator login event
Parallel closed-loop event
Transfer event end
Modified date event
Modified time event
#1 Relay output event
#2 Relay output event
#3 Relay output event
#1 External input event
#2 External input event
#3 External input event
Oil engine self-inspection OK
Oil engine self-inspection failure
Remote validity event
Remote off event

Alarm/Fault Recording Table

Alarm/Fault Recording
Transfer action fault
Qs1 tripping event
Qs2/bus connection tripping event
Qs3 tripping event
Qs1 wrong wiring alarm
Qs2 wrong wiring alarm
Qs3 wrong wiring alarm

Port Programming Output Table

Port Programming Output Settings
Fault alarm
Transfer action fault
Tripping fault
Grid alarm
Qs1 power alarm
Qs2 power alarm
Qs3 power alarm
#1 Oil engine startup
#2 Oil engine startup
Bus connection removal
Fully off event
Parallel transfer failure (parallel validity)

Port Programming Input Table

Port Programming Input Settings
Either:
Fire control function (complete isolation)
Forced Qs1 closing
Forced Qs2 closing
One-out-three:
Fire control function (complete isolation)
Forced Qs1 closing
Forced Qs2 closing
Forced Qs3 closing
Two-out-three (bus connection):
Fire control function (complete isolation)
Forced Qs1+Qs2 closing
Forced Qs1+Qql closing
Forced Qs2+Qql closing

Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

## Factory Set Value of Controller (Example of Type 3L Controller)

Performance Parameter		Factory Set Value
Setting of controller parameters	Frequency	50Hz
	Power supply mode	Grid-grid-oil engine
	Power priority mode	Qs1
	Energy storage setting	Energy storage before closing
	Operation mode	Auto switch and auto recover
	Standby backlight delay	120s
	System date	XXXX-XX-XX (specific manufacturing date)
	System time	00:00:01
Transfer control information	Under-voltage start value	220V:187V; 380V: 309V
	Under-voltage return value	220V:197V; 380V: 319V
	Overvoltage start value	220V:264V; 380V:437V
	Overvoltage return value	220V:254V; 380V:427V
	Underfrequency start value	50HZ:45; 60HZ: 54
	Underfrequency return value	50HZ:49; 60HZ: 58
	Overfrequency start value	50HZ:55; 60HZ: 66
	Overfrequency return value	50HZ:51; 60HZ: 61.2
	Voltage unbalance start value	OFF
	Voltage unbalance return value	10%
	Qs1 power closing delay	5.0s
	Qs1 power tripping delay	5.0s
	Qs2 power closing delay	5.0s
	Qs2 power tripping delay	5.0s
	Qs3 power closing delay	5.0s
	Qs3 power tripping delay	5.0s
	Auto switch and auto recover delay	0.5s
	Under-voltage alarm delay	0.5s
	Overvoltage alarm delay	0.5s
	Underfrequency alarm delay	0.5s
	Overfrequency alarm delay	0.5s
	Voltage unbalance alarm	0.5s
	Phase sequence	OFF
Oil engine control information	Oil engine startup delay	3s
	Oil engine stop delay	20s
	Startup stable delay	20s
	Oil engine self-inspection date	10 <sup>th</sup> day
	Oil engine self-inspection time	12:00

Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

	Oil engine self-inspection function		OFF
Port programming setting	Triple output programming function	1# Relay output setting	Fault alarm
		2# Relay output setting	Grid alarm
		3# Relay output setting	#1 Oil engine startup
	Triple input programming function	1# Programming input setting	Fire-control fully off function
		2# Programming input setting	Qs1 forced closing
		3# Programming input setting	Qs2 forced closing
Serial port information	Device address		2
	Baud rate		9600
	Check mode		NO
	Stop bit		1Bit
Parallel information	Allowable voltage difference		5V
	Allowable frequency difference		0.2Hz
	Allowable phase difference		5°
	Parallel waiting delay		20s

Note: The factory set value of Type 2L, QL, 2LB, 3LB and QLB controllers is similar to Type 3L except that the individual setting parameters are different from Type 3L.

## Technical Data List

Main Performance Indexes of the Product

Model	NDQ5W-1600	NDQ5W-2500	NDQ5W-4000
Number of poles	3, 4		
Rated working current I <sub>e</sub> 40℃ (A)	200, 400, 630, 800, 1000, 1250, 1600	630, 800, 1000, 1250, 1600, 2000, 2500	800, 1000, 1250, 1600, 2000, 2500, 3200, 4000
N-pole rated working current	100%I <sub>e</sub>	100%I <sub>e</sub>	100%I <sub>e</sub>
Rated working voltage U <sub>e</sub> (V)	AC380/400/415V	AC380/400/415V	AC380/400/415V
Rated insulation voltage U <sub>i</sub> (V)	AC1000V		
Rated impulse withstand voltage U <sub>imp</sub> (KV)	12		
Rated working frequency f (Hz)	50/60		
Rated short-circuit breaking capacity	55	85	100



Document No.	NDT2920189	Version	1	Implementation Date	20171221
Icn (kA)					
Rated short circuit making capacity Icm (peak value) kA		121	187		220
Rated short-time withstand current Icw (effective value) (kA 1s)		50	85		100
Electrical life (times)		6500	11000		6000
Mechanical life	Maintenance-free (times)	15000	15000		10000
	With maintenance (times)	30000	30000		15000
Contact switching time (ms)		200			
Transfer action time (ms)		500			
Outage time		200ms + delay time (0.1s~640s)			
Isolating function		Available	Available		Available
Electrical equipment level		Level CB			
Utilization category		AC-33iB			
Product certification		CCC, CB			

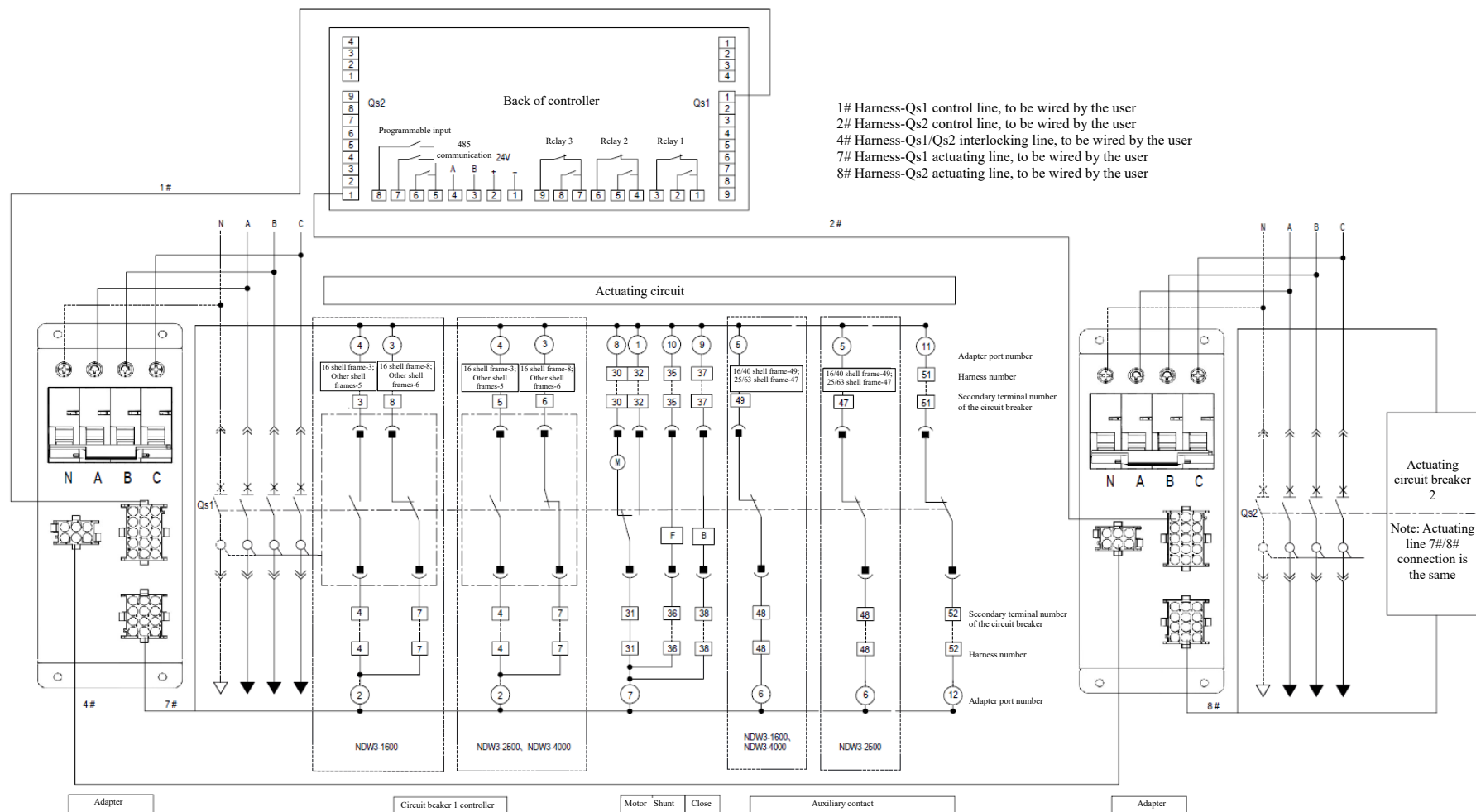
**Main Performance Indexes of the Controller**

Controller type	2L	2LB	3L	3LB	QL	QLB
Applicable product model	NDQ5W-1600\2500\4000					
Maximum power consumption Pmax (W)	3W~3.5W					
Working voltage range/frequency (V/Hz)	TT/TN system: AC230V±10%/50Hz/60Hz IT system: AC380V±10%/50Hz/60Hz					
Rated insulation voltage Ui (V)	AC400V					
Circuit implementation model	MK22FX512AVLQ12 (microprocessor) + relay					
Electromagnetic compatibility EMC	Level 2 (Level B)					
Structure form	Split type					

Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

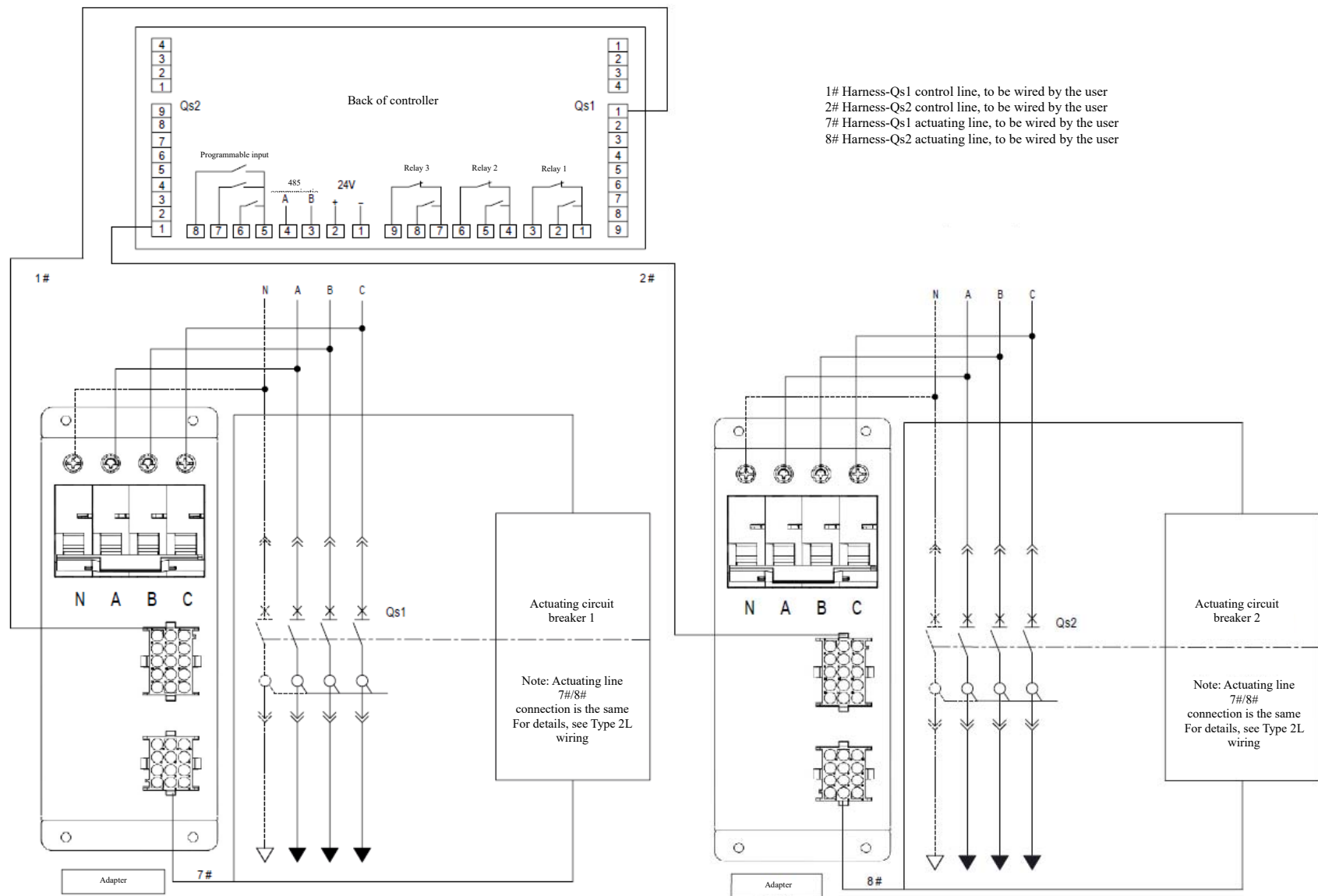
## Electric Circuit Diagram of the Automatic Transfer Switch

### ■ Type 2L controller



Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

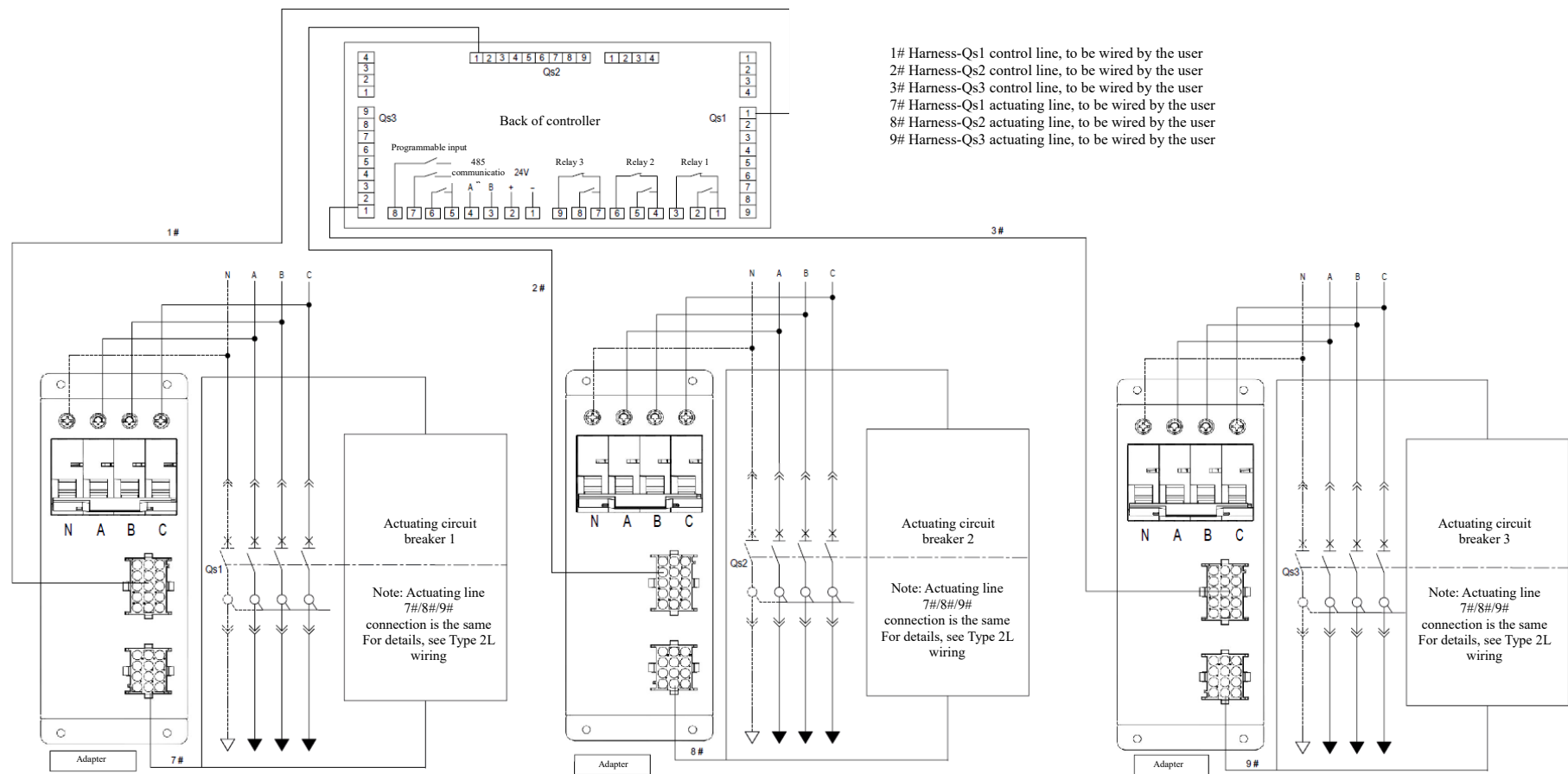
## Type 2LB controller





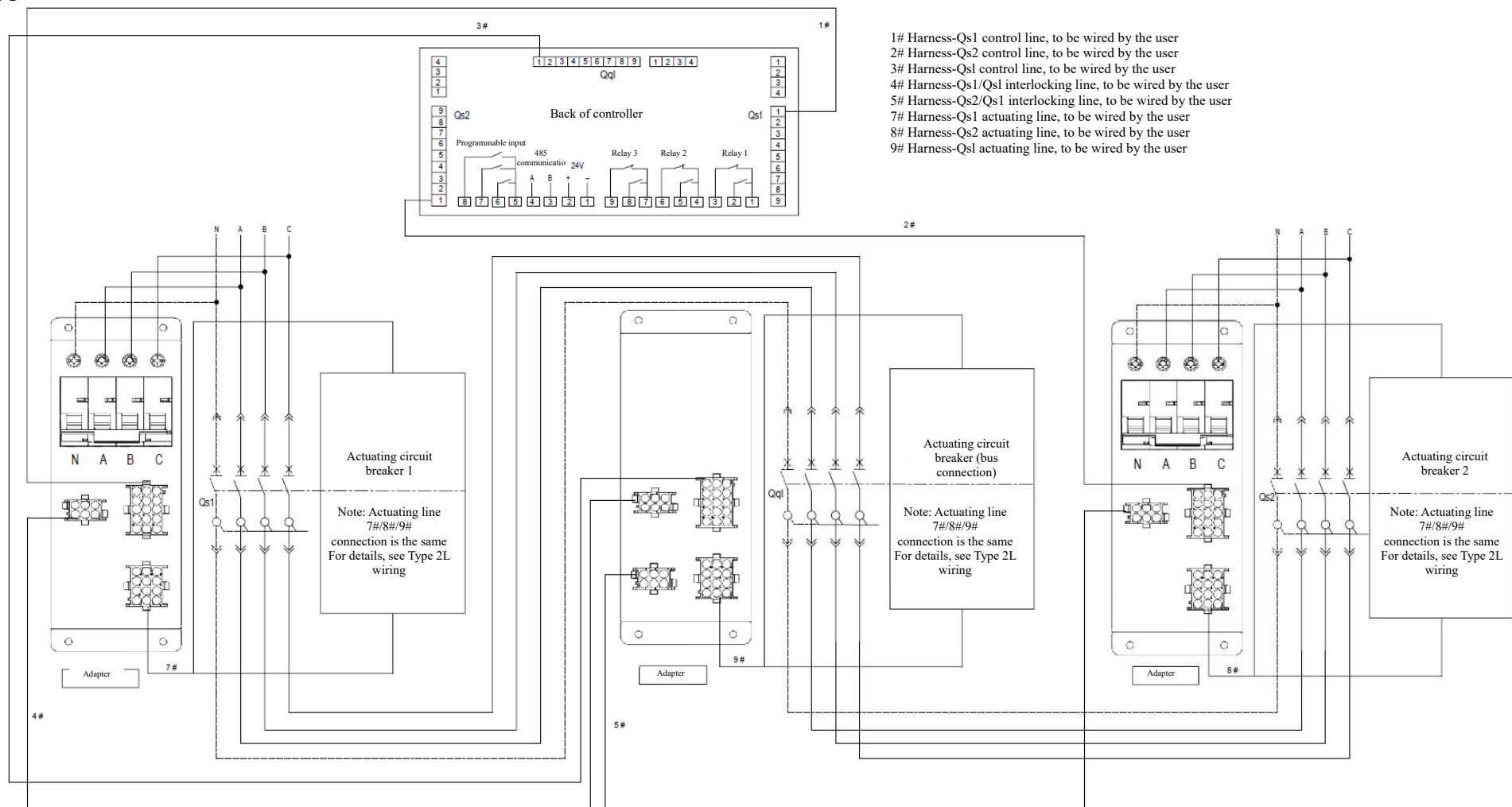
Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

## Type 3LB controller



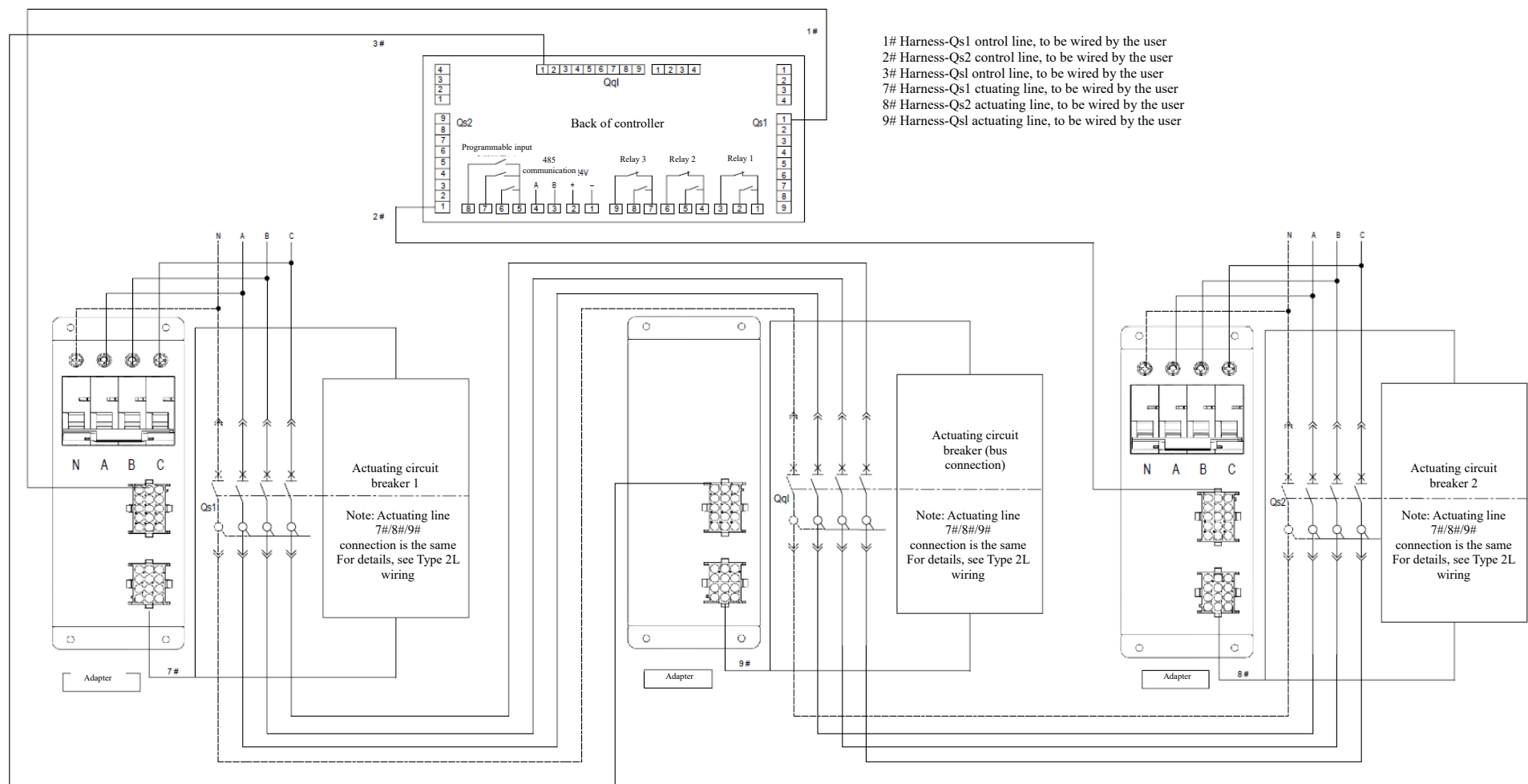
Document No.	NDT2920189	Version	1	Implementati on Date	20171221
--------------	------------	---------	---	----------------------	----------

## Type QL controller



Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

## ■ Type QLB controller

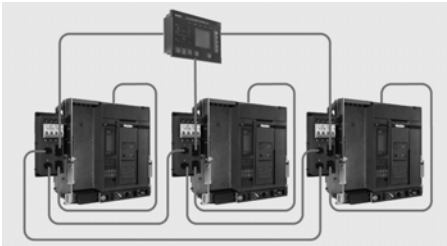


Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

# Outline and Installation Dimensions

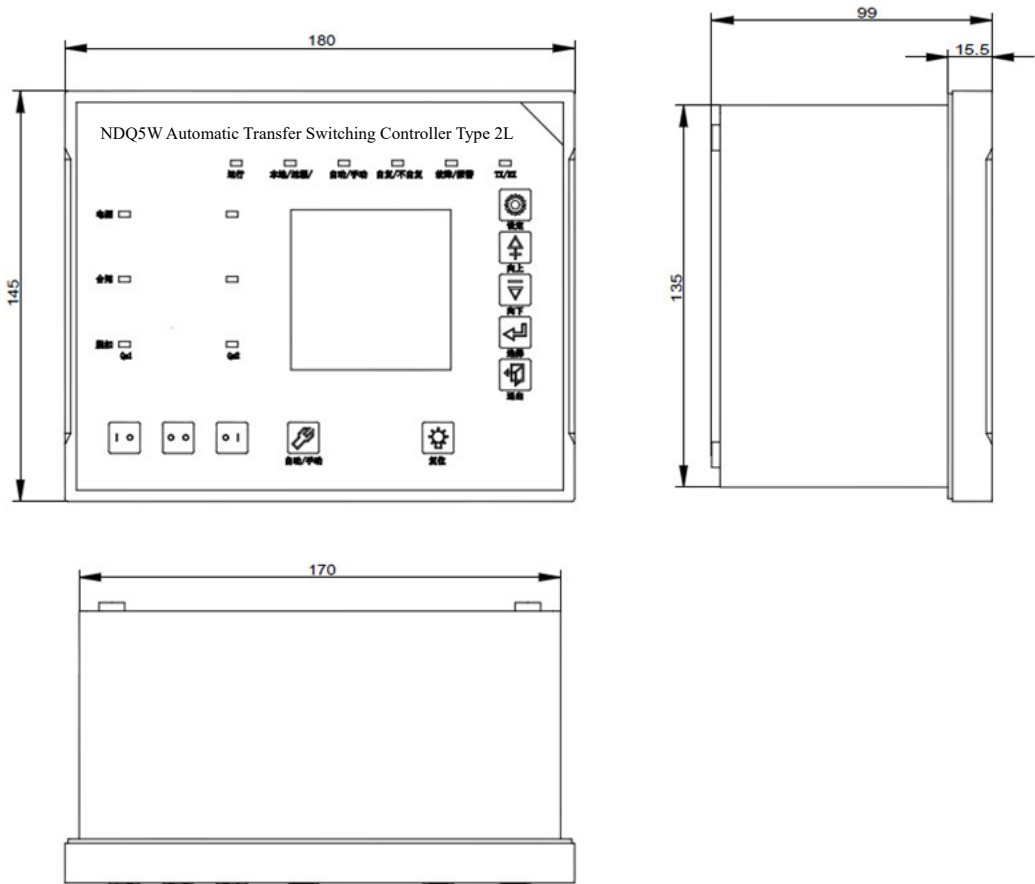
The NDQ5W series automatic transfer switching equipment consists of controller, adapter and actuating circuit breaker. The controller is installed separately on the instrument door of the power distribution cabinet; the adapter can be installed on the left side of the actuating circuit breaker, which can be installed freely by the user, while the actuating circuit breaker is installed in the power distribution cabinet. For external dimensions of the above product parts, see the following table (see the subsequent figure for the detailed dimensions).

Name	Model	External dimensions (W×D×H)
Controller	2L/3L/QL/2LB/3LB/QLB	180mm×99mm×145mm
Adapter	-	83mm×80mm×219mm
Actuating circuit breaker installed with an adapter	NDW3-1600/3P drawout type	363mm×356mm×351.5mm
	NDW3-1600/4P drawout type	433mm×356mm×351.5mm
	NDW3-2500/3P drawout type	457mm×480mm×432mm
	NDW3-2500/4P drawout type	552mm×480mm×432mm
	NDW3-4000/3P drawout type	517mm×495mm×432mm
	NDW3-4000/4P drawout type	632mm×495mm×432mm



Note: The controller dimension doesn't include the wiring terminal dimension.

## External dimensions of controller (in mm)

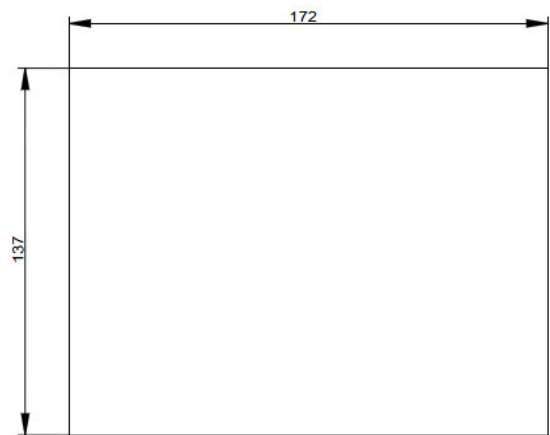


Note: External and installation dimensions of all controller models (2L, 3L, QL, 2LB, 3LB, QLB) are all the same.



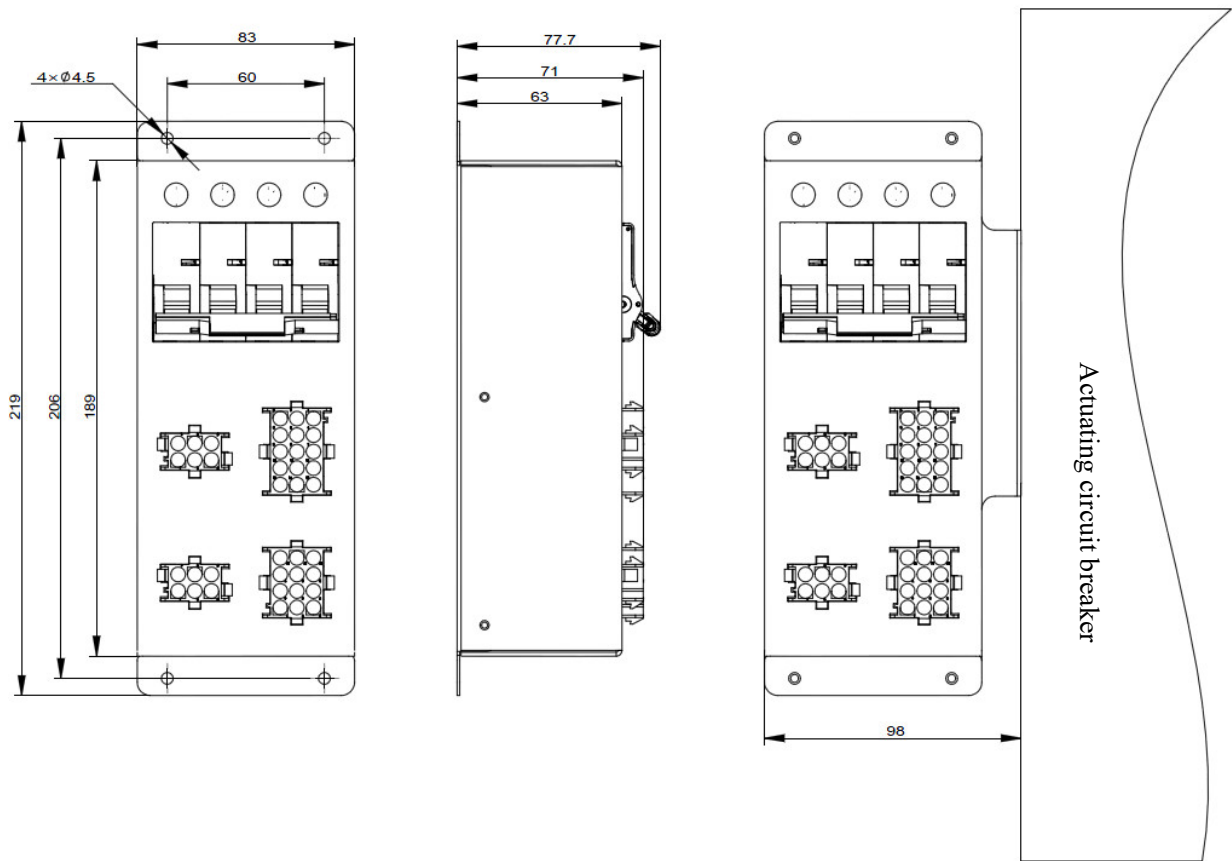
Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

Cabinet door opening dimensions of controller (in mm)



Note: The limit deviation of the opening dimensions is  $\pm 0.5$ .

External and installation dimensions of adapter (in mm)



External and installation dimensions of the actuating circuit breaker (in mm)

For the external and installation dimensions of the actuating circuit breaker as well as the cabinet door opening dimensions, installation pitch and safe distance, see the installation and operating instructions of the specific circuit breaker.

Check and Maintenance

- Inspection matters before test run

Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

Only have a test run after confirming that it is normal according to the table contents;

SN	Inspection items	Steps	Inspection
1	Control harness connection	Check the control harness connection and do not wire the control line, actuating line and interlocking line wrongly (note: For Type 3L controller, ports I and II of the interlocking line shall correspond to those of the adapter).	Perform inspection according to the electric circuit diagram
2	Wiring of the main circuit	For the TT/TN system, the N-line of each actuating circuit breaker can't be wired wrongly and must be wired reliably; the N-line of the different power supplies shall not be shared.	Perform inspection according to the electric circuit diagram
3	Connection of the adapter and main circuit	The phase sequence of the miniature circuit breaker on the adapter shall be consistent with that of the main circuit; for the 3P product of the TT/TN system, the N-line is directly connected to the N-phase of the miniature circuit breaker on the adapter.	Perform inspection according to the electric circuit diagram
4	Drawout type circuit breaker	Shake each actuating circuit breaker to "test" or "connection" for the closing and opening operation of the circuit breaker.	Check whether the on/off operation of the circuit breaker is reliable in the "test" or "connection" position.
5	Mechanical interlocking	When the mechanical interlock is optional, ensure that its installation is correct with reliable action.	Carry out the on/off operation on the circuit breaker and check whether the mechanical interlock can reliably lock the circuit breaker status.
6	Actuating circuit breaker's operating mechanism	Carry out the manual energy storage, closing and opening operation on each actuating circuit breaker for 3-5 times	Check whether the operating mechanism acts flexibly and that the on/off operation is normal.
7	Actuating circuit breaker's energy storage motor (electric operating mechanism)	Turn on the energy storage motor of each actuating circuit breaker and carry out the on/off operation for 3-5 times.	Check whether the energy storage motor is normal and free from abnormal sound; and that the energy storage indicator is correct.
8	Actuating circuit breaker's shunt release	After each actuating circuit breaker is closed, it shall be disconnected after turning on the shunt release.	Check whether the circuit breaker can be disconnected normally.
9	Actuating circuit breaker's closed electromagnet	After each actuating circuit breaker is disconnected and stores energy manually or electrically, turn on the closed electromagnet.	Check whether the circuit breaker can be closed normally.
10	Actuating circuit breaker's button lock	Lock the button lock device (self-equipped) after disconnecting from each actuating circuit breaker.	Check whether the circuit breaker is in the opening state and that the button lock is locked.

Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

## ■ Maintenance and Repair

Perform the following procedures before carrying out the maintenance and repair operation:

- a) Be sure to disconnect power from the main circuit and wiring terminal of the circuit breaker;
- b) Disconnect the actuating circuit breaker and check whether the operating mechanism spring is released;
- c) Disconnect the drawout-type actuating circuit breaker, pull out the circuit breaker body from the drawer seat, and check the performance of the circuit breaker body.

### Maintenance

- ◆ Check whether the surrounding meets the generally specified requirements;
- ◆ Check whether bolts between the actuating circuit breaker and the bus connection are tightened and that the contact is good;
- ◆ Check the dust accumulation of the actuating circuit breaker body and drawer-seat insulating part and clean it regularly;
- ◆ Check the wiring terminal for reliable connection;
- ◆ Check the transfer controller and the intelligent controller of the circuit breaker for proper display;
- ◆ Check whether the performance set value of the transfer controller and the protection feature value of the intelligent controller of the circuit breaker are correct;
- ◆ Check whether the on/off indication of the actuating circuit breaker is correct and reliable;
- ◆ Perform the regular lubrication maintenance on all the friction and moving parts.

### Repair

- ◆ Check whether each part of the actuating circuit breaker is complete and clean, such as housing and other insulating parts;
- ◆ Check whether the actuating circuit breaker is tightened and free from vibration during operation;
- ◆ Shake the actuating circuit breaker body in and out manually. The “Connection, Test, Separation” position shall be correct and the interlocking shall be reliable;
- ◆ The manual on/off mechanism of the actuating circuit breaker shall be acted flexibly without blockage, and the auxiliary contact transfer of the wiring terminal shall be reliable and correct;
- ◆ When the wiring terminal of the actuating circuit breaker is energized, action of the shunt release and closed electromagnet shall conform to the technical requirements of the product and the energy storage motor shall act normally. The manual on/off operating mechanism shall be acted flexibly without jamming, and the auxiliary contact transfer of the wiring terminal shall be reliable and correct;
- ◆ The contact system in the arc extinguishing chamber of the actuating circuit breaker shall be complete in correct position; the silver coating shall be intact and the arc extinguishing chamber shall be cleaned

(Note: Do not perform the on/off operation when the arc extinguishing chamber is opened);

- ◆ The actuating circuit breaker shall be reliably connected with the connecting busbar and bolts

Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

shall be tightened;

- ◆ Keep the contact surface between the actuating circuit breaker body and the drawer seat clean and tidy, and clean it regularly to ensure reliable connection;
- ◆ After completion of repair, check the insulation resistance of the actuating circuit breaker with a 1000V megohmmeter. When the surrounding medium temperature is  $20^{\circ}\text{C}\pm 5^{\circ}\text{C}$  and the relative humidity is 50%-70%, the resistance should not be less than 200 mge;
- ◆ Check the protective feature setting value of the intelligent controller of the actuating circuit breaker;
- ◆ Check the performance set value of the transfer controller.

### ■ Fault Analysis and Troubleshooting

SN	Common faults or phenomena	Possible reasons	Troubleshooting methods
1	The actuating circuit breaker fails to store energy	1. It has already completed the energy storage. 2. The storage capacity shall be larger with a half of the manual energy storage. 3. The control power voltage of the electric energy storage device is less than 85%Us.	1. Confirm that the energy storage is not complete and increase the storage capacity. 2. Check whether the control power voltage of the electric energy storage device is no less than 85%Us.
2	The drawout-type actuating circuit breaker rocker fails to be inserted into the circuit breaker.	1. The drawer rail or circuit breaker body isn't pushed in completely. 2. The padlock handle of the drawer seat is pulled out and locked.	1. Push the guide rail or circuit breaker body completely. 2. Open the padlock to push into the padlock handle.
3	As the drawout-type actuating circuit breaker is in the separation position, the circuit breaker fails to be pulled out.	1. The rocker isn't removed. 2. The circuit breaker doesn't reach the "Separation" position completely.	1. Remove the rocker. 2. Shake the circuit breaker to the "Separation" position completely.

Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

SN	Common faults or phenomena	Possible reasons	Troubleshooting methods
4	The drawout-type actuating circuit breaker can't be shaken to the "disconnection", "test" or "connection" position.	<ol style="list-style-type: none"> <li>1. There are some foreign matters falling into the drawer seat, which may cause jamming of the shaking mechanism or slippage of the mechanism.</li> <li>2. If the circuit breaker with a three-position locking and unlocking device is adopted, continuous operation is impossible without unlocking</li> </ol>	<ol style="list-style-type: none"> <li>1. Check and eliminate the foreign matters; if shaking is still impossible, contact with the manufacturer.</li> <li>2. Unlock the three-position locking device of the drawer seat (only by pressing the red unlock button); if operation is still impossible, contact with the manufacturer.</li> </ol>
5	The actuating circuit breaker fails to be closed	The reset button of the circuit breaker controller fails to be reset (red button protruding from the panel).	Push the reset button to reclose the circuit breaker.
		The operating mechanism fails to store energy in place.	The operating mechanism stores energy.
		<ol style="list-style-type: none"> <li>1. The operating position of the drawout type circuit breaker is not correct;</li> <li>2. Poor contact of the secondary terminal.</li> </ol>	<ol style="list-style-type: none"> <li>1. Shake the drawout-type circuit breaker to the "connection" position.</li> <li>2. Check the secondary terminal for reliable connection.</li> </ol>
		<ol style="list-style-type: none"> <li>1. The rated control supply voltage of the closed electromagnet is less than 85%Us.</li> <li>2. A fault occurs to the control circuit of the closed electromagnet.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check whether the rated control supply voltage of the closed electromagnet is no less than 85%Us.</li> <li>2. Check whether the control circuit of the closed electromagnet is connected normally.</li> </ol>
		Due to the mechanical interlock action, the circuit breaker has been locked.	Check the working state of two sets of circuit breakers with mechanical interlock.
6	The actuating circuit breaker fails to be broken	The shunt release acts.	Check whether the control circuit of the shunt release is connected normally.
		Electric opening of the circuit breaker is impossible: <ol style="list-style-type: none"> <li>1. A fault occurs to the mechanical operating mechanism.</li> <li>2. The control power voltage of the shunt release is less than 70%Us.</li> <li>3. The shunt release is damaged.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the mechanical operating mechanism; for any fault (such as run over), contact with the manufacturer.</li> <li>2. Check whether the control power voltage of the shunt release is more than 70%Us.</li> <li>3. Replace the shunt release.</li> </ol>
7	No display for the intelligent controller screen of the actuating circuit breaker.	The circuit breaker controller isn't connected to the power supply.	<ol style="list-style-type: none"> <li>1. Users shall check whether the controller has been connected to the power supply; if not, turn on the control power supply.</li> <li>2. Turn off the controller control power</li> </ol>

Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

			supply and then turn it on again. If the fault still persists, contact with the manufacturer.
8	The fault indicator of the intelligent controller of the actuating circuit breaker is on even after the clear button is pressed.	A fault occurs to the circuit breaker controller.	Switch off the controller control power supply and then turn it on again. If the fault still persists, contact with the manufacturer.
9	The fault indicator of the intelligent controller of the actuating circuit breaker is on.	<ol style="list-style-type: none"> <li>1. First observe which fault indicator is on;</li> <li>2. Inquire the fault data.</li> </ol>	<p>By means of faulty query:</p> <ol style="list-style-type: none"> <li>1. Break the current value and action time, and analyze the load and grid condition. In case of overload, short-circuit and ground faults, seek them and perform troubleshooting.</li> <li>2. If the actual running current doesn't match with the setting value, modify the current setting value according to the actual running current;</li> </ol> <p>Reclose the circuit breaker after the reset button is pushed.</p>
10	The actuating circuit breaker trips after being closed (fault indicator is on).	<ol style="list-style-type: none"> <li>1. Immediate trip.</li> <li>2. The short-circuit current is closed.</li> <li>3. The transient current is large during closing (such as motor start).</li> <li>4. Delayed trip.</li> <li>4. The overload current is closed.</li> </ol>	Check the breaking current value and action time of the controller: In case of short circuit, seek and eliminate the short circuit fault; in case of overload, seek and eliminate the overload fault. Check the intact state of the circuit breaker; modify the current setting value of the controller. Push the reset button to reclose the circuit breaker.
11	Frequent trip of the actuating circuit breaker.	<ol style="list-style-type: none"> <li>1. The field overload causes the overload protection trip.</li> <li>2. The protection parameter settings of the circuit breaker are not correct.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the line, remove the overload or analyze the overload reasons and eliminate faults.</li> <li>2. Reset the protection parameters of the circuit breaker.</li> </ol>
12	Parallel transfer failure of the product	The phase sequence, phase, frequency and voltage of the two-phase power supply are beyond the setting range, which fail to reach the parallel requirements	Confirm the reasons according to the display menu during the parallel transfer process and modify the setting requirements for performing the parallel operation again.

Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

SN	Common faults or phenomena	Possible reasons	Troubleshooting methods
13	Closing failure of the actuating circuit breaker	If the air circuit breaker is closed in place, check whether the secondary terminals (6, 7, 8) of the air circuit breaker are transferred? Whether the harness connection is reliable?	Detect the on/off signal (6, 7, 8) contact; check whether the harness connection is reliable?
		If the air circuit breaker isn't closed, have you heard the relay pick-up sound? If there is an indication that the control command is sent, but there isn't response from the closing release, check whether the electric interlocking line and terminal connection are reliable? If there is no sound, it indicates that the control fault or power voltage doesn't conform to the requirements;	Find the fault point according to the above analysis, exchange elements and adjust the harness.
14	Breaking failure of the actuating circuit breaker	If the air circuit breaker is tripped in place, check whether the secondary terminals (6, 7, 8) of the air circuit breaker are transferred? Whether the harness connection is reliable?	Detect the on/off signal (6, 7, 8) contact; check whether the harness connection is reliable?
		If the air circuit breaker isn't tripped, have you heard the relay pick-up sound? If there is an indication that the control command is sent, but there isn't response from the tripping release, check whether the harness and terminal connection are reliable? If there is no sound, it indicates that the control fault or power voltage doesn't conform to the requirements;	Find the fault point according to the above analysis, exchange elements and adjust the harness.
		If the circuit breaker fails to store energy, have you heard the relay pick-up sound? If there is an indication that the control command is sent, the motor coil is damaged or the connection is poor. If there is no sound, it indicates that the control fault or power voltage doesn't conform to the requirements;	Find the fault point according to the above analysis, exchange elements and adjust the harness.

Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

SN	Common faults or phenomena	Possible reasons	Troubleshooting methods
15	Energy storage failure of the actuating circuit breaker	<p>If the air circuit breaker stores energy in place, check whether there is rated voltage applied on the secondary terminals (30, 32) of the air circuit breaker? If there is no indication that the location switch of the energy storage motor is damaged, check whether the harness and terminal connection are reliable if there is indication?</p> <p>If the circuit breaker fails to store energy, have you heard the relay pick-up sound? If there is an indication that the control command is sent, the motor coil is damaged or the connection is poor. If there is no sound, it indicates that the control fault or power voltage doesn't conform to the requirements;</p>	<p>Find the fault point according to the above analysis, exchange elements and adjust the harness.</p> <p>Find the fault point according to the above analysis, exchange elements and adjust the harness.</p>
16	Wrong wiring alarm of the transfer controller	Wrong wiring leads to the too high phase-to-phase voltage	Carry out wiring according to the correct phase sequence
17	Fault alarm of the transfer controller	Except for the reasons indicated in SN 12~16, there are some reasons, including tripping alarm of the air circuit breaker and self-locking of the transfer controller; after troubleshooting of the air circuit breaker, the reset controller is valid	Eliminate the short circuit or overload and other fault points, clear the red reset button of the frame controller and reset the transfer controller again to clear faults
18	Automatic/manual control failure of the transfer controller	The remote operation is valid, including programmable input control and remote communication control	Clear the programmable input, and clear the remote control command or reset controller
19	Communication failure of the transfer controller	Reverse connection of the RS485 communication line and mismatch of the communication address or baud rate setting	Set and confirm the communication address and baud rate to confirm the correct wiring and then perform a test again
20	Oil engine control failure of the transfer controller	Confirm whether the power supply mode includes the oil engine type? Whether wiring of the programmable output to the oil engine is correct?	Check the oil engine type of the controller, whether the programmable output type is matched to the oil engine and that the relay output contact (NO, NC) is correct? Whether the line connection is correct?



Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

## NDQ5W Ordering Notes (Please fill in numbers in \_\_\_\_, and check ☒ in ☐.

Related contents can be found in the Manual)

User unit		Number of units ordered:			Date of ordering:	
Controller model and the corresponding harness code of the control circuit		<input type="checkbox"/> 2L 1#, 2#, 4#, 7#, 8#	<input type="checkbox"/> 2LB 1#, 2#, 7#, 8#	<input type="checkbox"/> 3L 1#, 2#, 3#, 4#, 5#, 6#, 7#, 8#, 9#	<input type="checkbox"/> 3LB 1#, 2#, 3#, 7#, 8#, 9#	<input type="checkbox"/> QL 1#, 2#, 3#, 4#, 5#, 7#, 8#, 9#
Control circuit harness	Type	<input type="checkbox"/> Conventional	<input type="checkbox"/> Extended	<input type="checkbox"/> Special	Code of lines	
	Length corresponding to the harness code of the control circuit	3m	4m	6m	Length of 1# control line	
		3m	4m	6m	Length of 2# control line	
		3m	4m	6m	Length of 3# control line	
		2m	3m	6m	Length of 4# interlocking line	
		2m	3m	6m	Length of 5# interlocking line	
		4m	5m	6m	Length of 6# interlocking line	
		1m	2m	4m	Length of 7# actuating line	
		1m	2m	4m	Length of 8# actuating line	
1m	2m	4m	Length of 9# actuating line			
Shell frame level		<input type="checkbox"/> NDQ5W-1600 <input type="checkbox"/> NDQ5W-2500 <input type="checkbox"/> NDQ5W-4000				
Rated current (A)		<input type="checkbox"/> 200 <input type="checkbox"/> 400 <input type="checkbox"/> 630 <input type="checkbox"/> 800 <input type="checkbox"/> 1000 <input type="checkbox"/> 1250 <input type="checkbox"/> 1600				1600 shell frame
		<input type="checkbox"/> 630 <input type="checkbox"/> 800 <input type="checkbox"/> 1000 <input type="checkbox"/> 1250 <input type="checkbox"/> 1600 <input type="checkbox"/> 2000 <input type="checkbox"/> 2500				2500 shell frame
		<input type="checkbox"/> 800 <input type="checkbox"/> 1000 <input type="checkbox"/> 1250 <input type="checkbox"/> 1600 <input type="checkbox"/> 2000 <input type="checkbox"/> 2500 <input type="checkbox"/> 3200 <input type="checkbox"/> 4000				4000 shell frame
		Note: The default current is the same if a single item is checked; if multiple items are checked, remark ×2 behind it if the current of 2 sets is the same, such as: <input checked="" type="checkbox"/> 800×2				
Rated working voltage (V)		<input type="checkbox"/> AC380/400/415V (TT/TN) <input type="checkbox"/> AC380/400/415V (IT)				
Number of poles		<input type="checkbox"/> 3 (3-pole) <input type="checkbox"/> 4 (4-pole)				
Installation structure		C drawout type				
Wiring mode		<input type="checkbox"/> Horizontal wiring <input type="checkbox"/> J3-Vertical wiring				1600 shell frame
		<input type="checkbox"/> SP conventional horizontal wiring <input type="checkbox"/> CZ conventional vertical wiring				2500 shell frame
		<input type="checkbox"/> Horizontal wiring <input type="checkbox"/> J3-Vertical wiring				4000 shell frame
Actuating circuit breaker						
Required Accessories (Standard configuration)	Intelligent controller	<input type="checkbox"/> KM-NWK31 (digital screen) <input type="checkbox"/> KY-NWK32 (LCD)				1600 shell frame
		<input type="checkbox"/> 1 (AC380V/400V) <input type="checkbox"/> 2 (AC220V/AC230V) (standard power supply module)				
		<input type="checkbox"/> KM1-NWK21 (AC380V/AC400V) <input type="checkbox"/> KM2-NWK21 (AC220V/AC230V)				2500/4000 shell frame
		<input type="checkbox"/> KY1-NWK22 (AC380V/AC400V) <input type="checkbox"/> KY2-NWK22 (AC220V/AC230V)				
	Auxiliary contact	A6-Six-group conversion				1600 shell frame
		A66-Six normally opened and six normally closed				2500 shell frame
		A6-Six-group conversion				4000 shell frame
	Electric operating mechanism	<input type="checkbox"/> D1 (AC380V/AC400V) [Ue= AC380/400/415V (IT)] <input type="checkbox"/> D2 (AC220V/AC230V) [Ue= AC380/400/415V (TT/TN)]				
	Shunt release	<input type="checkbox"/> F1 (AC380V/AC400V) [Ue= AC380/400/415V (IT)] <input type="checkbox"/> F2 (AC220V/AC230V) [Ue= AC380/400/415V (TT/TN)]				
	Closed	<input type="checkbox"/> B1 (AC380V/AC400V) [Ue= AC380/400/415V (IT)]				

Document No.	NDT2920189	Version	1	Implementation Date	20171221
--------------	------------	---------	---	---------------------	----------

	electromagnet	<input type="checkbox"/> B2 (AC220V/AC230V) [Ue= AC380/400/415V (TT/TN)]		
	Phase partition	G phase partition		
	Door frame	M door frame		
	Dust cover	F dust cover		
	Three-position locking device	CS drawout triolocation lock and unlock devices		
	Button lock	<input type="checkbox"/> S1	1600 shell frame	
<input type="checkbox"/> S2		2500/4000 shell frame		
Optional functions of the intelligent controller	Function	<input type="checkbox"/> V - Voltage measurement and protection type <input type="checkbox"/> P - Harmonic measurement and protection type		
	Communication functions	<input type="checkbox"/> H (Modbus)		
	Contact equivalent	<input type="checkbox"/> J-Contact wear equivalent, operation times query (optional for NWK31 or NWK21)		
	Signal element	<input type="checkbox"/> S1-4DO <input type="checkbox"/> S2-3DO, 1DI <input type="checkbox"/> S3-2DO, 2DI		
	Remote reset	<input type="checkbox"/> Z2-AC220V/AC230V		
	Earthing function	<input type="checkbox"/> Alarm <input type="checkbox"/> Tripping <input type="checkbox"/> Closing		
	Overload pre-alarm function	<input type="checkbox"/> Overload pre-alarm function		
	Load monitoring function	<input type="checkbox"/> Load monitoring function (optional for NWK31 or NWK21)		
	Regional selective interlocking function	<input type="checkbox"/> Regional selective interlocking function (optional for NWK32 or NDWK22)		
Optional function Accessories	Signal output function	<input type="checkbox"/> BX - Closing ready	<input type="checkbox"/> SWZ - Drawout three-position signal output function	
	Power supply module	ST - Conventional power supply module	<input type="checkbox"/> ST-IV1 (AC380V/AC400V) <input type="checkbox"/> ST-IV2 (AC220V/AC230V) <input type="checkbox"/> ST-IV3 (DC220V) <input type="checkbox"/> ST-IV4 (DC110V)	Note: To be used with ST201
		P1 - Special power supply module	<input type="checkbox"/> DC24V	
	Relay module	<input type="checkbox"/> ST201 (Note: To be used with the power supply module, for the "four remote" function.)		
	Counter function	<input type="checkbox"/> JS - Counter		
	Drawer seat function	<input type="checkbox"/> CM1-Right door interlock <input type="checkbox"/> CM2-Left door interlock		
	Mechanical interlocking	Cable type	<input type="checkbox"/> SR11- Two groups, one for closing and one for opening (Type 2L) <input type="checkbox"/> SR12-Three groups, one for closing and two for opening (Type 3L) <input type="checkbox"/> SR21-Three groups, two for closing and one for opening (Type QL)	
Special requirements				
Note: 1. If you have special requirements, please carry out the special contract review; 2. In case of no special requirements for the intelligent controller of the actuating circuit breaker, the corresponding current and time				

Document No.	NDT2920189	Version	1	Implementati on Date	20171221
-----------------	------------	---------	---	-------------------------	----------

setting values shall be set according to the factory setting;

Document No.	NDT2920189	Version	1	Implementati on Date	20171221
-----------------	------------	---------	---	-------------------------	----------



Shanghai Liangxin Electrical Co, Ltd.  
Shanghai Liangxin Electrical Co., Ltd.  
No. 2000, South Shenjiang Road, Pudong New District  
No.2000 South ShenJiang Road,  
Pudong New District,Shanghai,201315,China  
T/021-68586699 F/021-23025796  
E/liangxin@sh-liangxin.com