



# **ZXJY-II OLTC On line Oil Filter Operation instructions**

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**Shanghai Huaming Power Equipment Co.,Ltd.**

## **Preface**

1. It contains all technical information for installation and operation of ZXJY-II, read the operation instructions before operation
2. The equipment maintenance shall be carried out by professional engineer.
3. HM reserves the right to revise this document due to the product innovation

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## 1. Safety

### 1.1 Safety mark

1.1.1 All personnel engaged in installation, operation and maintenance of tap changer and on-line oil filter must be qualified professionals by manufacturer and obey all rules stipulated in operation instructions.

1.1.2 Violation may lead harm to users, malfunction of motor drive unit or damage to other assets.

1.1.3 Three types of marks are applied to emphasize different kind important information.



### **Warning**

This information stands for particular damage to human life. Ignoring this can lead to serious or lethal damage.



### **Attention**

This stands for risks of damaging this device and other assets. It may cause potential damage to human life.



### **Note**

It stands for other important things that requires your attention.

### 1.2 Specified application



### **Attention**

The installation, connection and adjustment of on-line oil filter can only be carried out by professional engineer following this instruction. The on-line oil filter must be applied in specified scope

## 2. General:

2.1 1.1 Type ZXJY-II online oil filter plant for on-load tap changer is designed by Huaming's R&D team with patented technology. This device is mainly used for circulating and filtering of on-load tap changer insulating oil. It can remove free carbon and metal debris, as well as reduce water content in the tap changer oil during normal operation of transformer system ensuring the breakdown voltage and service life of the oil, improving the safety and reliability of on-load tap changer, which consequently extends the maintenance intervals.

2.2 ZXJY-II on-line oil filter: the mechanical and electrical components are installed in the same cabinet.



2.3 Type ZXJY-II can be mounted either on the transformer's tank side (referred to as "ON tank type"), or on the ground (referred to as "ground type"). The on tank type is recommended. .

2.4 For those projects that the transformer has been commissioned, and need to add the oil-filter plant (referred to as "retrofit project"), please specify the installation method. In case of "on-tank mounting type" installation, we will provide universal steel support (see appendix 6a) due to the variation of site condition and transformer tank shape. In case of "ground type" installation, we will be able to provide stainless steel support (see appendix 6b) with extra charge

## 3. Feature

3.1 Main oil channel is designed with a compact integrated plate style, eliminating pipe connection, Thus reduce the sealing area. All the main sealing sections are designed with double sealing style to increase the sealing factor.

3.2 HM PLC control unit is adopted in ZXJY-II with many functions such as manual operation, automatic operation, timing starting, operation time setting, etc., and also with other functions such as operation recording, total time consumption record and maintenance alarming, etc. In addition, type ZXJY-II is

equipped with thermostat. If temperature goes below 5°C or humidity reaches 80%, heater begins to work, while if temperature reaches to 40°C or humidity is lower than 50%, heater stops operating; in this way the device can be normally operated in various environments to realize automatic operation without supervision of operator.

3.3 This type of plant is fitted with two-step filtering process, i.e. first to get rid of debris such as free carbon etc and then to remove moisture from inside. Filtering insert in the process is special designed according to OLTC's unique features. Currently, the plant is equipped with 3µm filtering insert. Provided that higher accuracy filtering Insert is required, please specify in technical specification.

3.4 Standard terminals are provided with the oil-filter plant, such as: 380 V operating power supply; monitoring signal output terminal; input terminal of operation command. Length of the cable can be specified according to customer's requirement.

During on-site installation, just connect the cables according to the diagram (Details of each connection terminal can be found in "operation instructions")

## 4. Technical data

|                                   |                                   |
|-----------------------------------|-----------------------------------|
| Motor Power: 0.37kW               | Power supply: 380V/50Hz           |
| Rated flow: 9 L/min               | Rated pressure: 0.5Mpa            |
| Inlet, outlet flange: DN25        | Debris filtering accuracy: ≤ 3 µm |
| Ambient temperature: -25°C ~ 70°C | Medium temperature: -20°C ~ 100°C |
| Heater Power: 100W                | Net weight: 75Kg                  |

## 5. Installation and adjustment

### 5.1 Installation

The device is filled with certain amount of compressed Nitrogen gas before delivery in order to keep it dry. Before installation, please release it by opening sampling valve.

The inlet and outlet flange dimension is the same with CV, CM connecting flange's dimension

#### 5.1.1 On-tank type On-line oil filter installation

The installation base thickness is 10mm, the installation hole is 4xφ15. For details, please refer to the Appendix 3. The user shall prepare four M12 bolts and gaskets. The bolts length is decided by the thickness of support on transformer tank.



### Warning

The installation plane shall be flat, make sure four bases are fixed on the base on same time. Adjust the gasket to make the difference within 1mm



**Attention**

If the transformer undergoes severe vibration, antivibration measures shall be taken accordingly.

5.1.2 Grounding type On-line oil filter installation

The installation base thickness is 10mm, the installation hole is 4xφ15. For details, please refer to the Appendix 3. The user shall prepare four M12x80 bolts and gaskets. The grounding support installation details can refer to Appendix 6(b)

5.1.3 the grounding bolt of cabinet locates at right corner as appendix 3.

The bolt is M12X25. The user can adjust to other three locations



**Attention**

All electric components in the cabinet are connected to the cabinet, no grounding device is needed inside the cabinet.



**Warning**

Users can not connect other equipments' grounding device to the filter's device

5.1.4 Based on the filter location and appendix 1 installation diagram, users shall design the connecting pipes.

5.1.5 Connecting the filter with tap changer by these pipes as shown in Appendix 1



**Attention**

Do not mix the inlet and outlet

5.1.6 Refer to appendix 1, the oil filling device shall be installed in the oil circulation. It shall include two stop valves (valve 1, valve 2) two T-cocks two faucets\_ Valve3, valve 4) Users can install filling device themselves as specify it in technical specifications

5.1.7 For retrofit project, since the stop valve already exists, HM will supply other oil filling components

5.1.8 As for two pipes connecting the filling oil device and filter, users shall adopt strong material tubes; HM will provide 1.5m strong material tube for retrofit projects.

## 5.2 Adjustment at OEM factory



### Attention

OEMs shall do adjustment at their factory as following process to check the installation and connection

(Refer to appendix 1 and 2)

5.2.1 Connecting the power, monitor signal and automation signal into relevant terminal, the 380V power supply can be taken from MDU



### Attention

The null line N shall be connected first

5.2.2 Turn on Air switch Q1 and Q2, select Manual operation by pressing Model/setting button

5.2.3 Press button to start the motor; time, temperature, humidity and remaining working time will be displayed on indicator



### Notice

Idle or over load operation for 5 seconds will be shut down and give alarm; the flow abnormal light on is indication of shutting down and restart; Operate the oil filter only when the tap changer oil compartment is filled with oil.

5.2.4 Stop the Motor by pressing the button, the remaining time at indicator will be “— —:— —”;

5.2.5 Connect Valve 3 and valve 4 separately, the other end shall be put into the transformer oil.

5.2.6 Close valve 1 and 2, open valve 3 and 4. Running the pump to fill the tap changer with oil. Drain the gas inside and close the sampling valve. Open valve 1 and 2. Close valve 3 and 4 after drain the gas. (Notice: fill the PVC connecting to valve 3 with oil before operating pump.



### 5.3 Adjustment for retrofit project



#### **Warning**

During on-site installation of oil filter plant, make sure that the transformer is de-energized. Otherwise, it is considered to violate the operation safety regulation and will not be able to completely release the gas inside the pipes which will jeopardize the normal safe operation.

5.3.1 Check local operation as specified in 5.2.1-5.2.4

5.3.2 According to appendix 5, apply the seal tape to the taps of the faucet following the direction of tightening with proper layer thickness. Then, screw the faucet into the T-cock connection. Be sure to tighten completely so that the final position of the faucet is facing one flange of the T-cock connection.

5.3.3 Dismantle the original sealing plate and gasket located below the stop valve on the transformer. Put on a new gasket and install the T-cock with the faucet on it. Make sure that the faucet is facing downwards and both the faucet handle and stop valve handle can be freely turned without hitting each other.

5.3.4 Connect the T-cock and the main body of the filter plant with the weather-proof flexible pipe; make sure that the sealing on both ends is good and tight. If limited by the on-site physical space and the main body has to be moved to a farther location, some strong material pipes are allowed to connect between the T-cock connection and the flexible pipe. However, situation like this should be avoided since we don't provide such hard pipe.

5.3.5 According to appendix 2, loosen the plug screw located on the upper portion of the filtering core. Open the discharge outlet of the sampling valve, and then find a proper container to collect oil from the sampling valve

5.3.6 According to appendix 1, open valve 2. Oil inside the on-load tap changer will drain the air out of the pipe . When the sampling oil flows at stable speed, close the valve

5.3.7 According to appendix 1, open the valve 1. Then screw the small cap off the connecting pipe on the top head of the on-load tap changer. Release the gas by loosening the bolt. Once the oil flows out through the bolt instead of air bubble, tighten the bolt and the small cap

5.3.8 Manually operate the online oil filter plant, release the gas from the gas relay of the on-load tap changer every ten minutes. Put the plant into operation after the gas completely released.



#### **Warning**

On-line operation is not allowed if the plant is not filled with oil;



### Attention

The valves on oil outlet must be open before starting



### Notice

Retrofit project shall clearly specify whether the connecting pipe of the tap changer is lead down. If not, the user should notify us in advance and prepare enough work time.

## 6.Operating instructions

### 6.1 Function descriptions of buttons on the panel of control cabinet (Please refer to section 10 of Supplement)

6.1.1 There are three buttons on control cabinet panel of oil filter plant: model/setting, start and stop.

6.1. 2 There are three programs on model/setting button, they are: manual, timing and automatic.

6.1.2.1 If selecting manual mode: Press the starting button to start oil filter plant while press the stop button to stop it. (If the stop button is not pressed, the oil filter plant will stop automatically according to the time setting in the system which is 4 hours default setting by manufacturer before delivery).

6.1.2.2 If selecting the timing mode: The oil filter plant operates automatically within the time set in the system. (Start and stop automatically) (The set time ex-works is from 0:00 to 4:00 AM every day).

6.1.2.3 If selecting automatic mode: The oil filter plant will automatically operate when receive voltage-regulating signal from on-load tap changer. (The setting value before delivery is one hour filtering for each tap changing operation)

### 6.2 Cable and terminal

ZXJY-II on-line oil filter is terminal type, CX1 terminal– Input interface 380V/3PH/50Hz for 380V working power supply (standard length of cable is 10 meters

Input interface for controlling signal (standard length of cable is 10 meters);

(Input normally-open independent potential-free contact signal, Contact capacity: DC 24V, 1A)

Monitor signal output (30 m cable as standard) RS485

(Output normally independent potential-free contact signal, Contact capacity AC 220V, 1A)

| Terminal No.of X1 | Description |
|-------------------|-------------|
| X1-1              | PE          |
| X1-2              | L1          |
| X1-3              | L2          |
| X1-4              | L3          |
| X1-5              | N           |



### Notice

380V working power can be supplied by motor drive unit. If there is no three-phase 380V power supply in the unit (such as SHM-1 motor drive unit), please connect the power in another way and corresponding cable length please refer to the technical specification.

| Terminal | Instruction  |
|----------|--|
| X2-1     | Signal output terminal of motor operation  |
| X2-2     |  |
| X2-3     | Operation signal input terminal of the changer, connected to X1-31, 32 terminals of CMA7 or CMA9. For SHM intelligent motor drive unit, please connect to X3-40, 41. if connected to motor drive unit made by other company, user shall connect a pair of normally-open potential-free contacts) |
| X2-4     |  |
| X2-5     | RS485(+)   |
| X2-6     | RS485(-)   |
| X2-7     | PE   |



### Attention

Cable connected to CX1 shall not be less than 1.5mm<sup>2</sup>;  
Cables for CX2 and CX3 shall not be less than 1mm<sup>2</sup>.



### Notice

If tap changer is not equipped with independent motor drive unit, i.e. it can not provide a pair of normally-open potential free contacts, then “automatic mode” of ZXJY will not work (such as ZXJY equipped with SY□ZZ tap changer).

## 6.3 Controller Program adjustment instruction

Timed operation period, manual operation period, automatic operation period and viewing operation time's record can be set in LOGO. Operation period is set before delivery, which are respectively as follows:

Timed operation period: 0:00 ~ 4:00 each day

Manual operation period: 4 hours for each starting (If do not press the stop button)

Automatic operation period: Automatic operation for one hour after receiving each operation signal from the tap changer (During operation process, if several action signals received from the tap changer, the continuous operation period will last to one hour after receiving the last signal)

To avoid malpractice, in case the setting program ex-works cannot satisfy user's requirement, please specify it in technical specification.

## **7. Maintenance**

Maintenance of on-line oil filter plant should be according to DL/T 574-95 "Maintenance guide of on-load tap changer". Maintenance of tap changer which equips with on-line oil filter should be according to DL/T 573-95 "Maintenance guide of power transformer".

For guaranteeing the service life and safe operation of the equipment, one examination per day is required during the first week operation, and then two examinations per month after one week of trial operation. If there is some abnormal operation sound and leakage found during observation, please immediately stop the device, inspect and solve the problems. In addition, after a long period of operation, the filter core shall be replaced if pressure difference alarms. The operations of daily maintenance including sampling oil, oil refill and changing filter cores are described as follows: (Please refer to Appendix 1 and 2 for the descriptions)

### **7.1 Sampling operation**

Open control cabinet of on-line oil filter plant, shut down power supply first, sampling from valve 3 on oil replacement device. After sampling, close valve, turn on power supply and close cabinet door. Notice: In the condition that the on-line oil filter plant is in service, there should be no dead corner and polluted oil in oil outlet pipe of tap changer oil compartment, so sample can be taken directly from sampling valve 3 of oil outlet pipe.

### **7.2 Oil refill operation**

Open door of on-line oil filter plant, press mode button of control cabinet and select manual operation, connect valve 3 with PVC transparent hose. In order to release the air in PVC hose completely, raise the end of PVC hose and open oil outlet pipe (cock) valve 1. When the PVC hose filled with oil, insert it into oil drum and observe if there is any air in the PVC hose. After completely discharging air in the hose, close oil outlet pipe valve 1 and switch on on-line oil filter plant, refill oil flowing into tap changer oil compartment through PVC hose and on-line oil filter plant (Please pay attention to prevent oil entering PVC hose). After oil refill, close valve 3, open valve 1, press pattern selection button of control cabinet, select timing or automatic operation, then close cabinet door.

### **7.3 Changing filter core**

After a long period of operation, carbohydrates, impurities, water and etc. in the oil will block filter core, which will cause pressure difference between oil inlet and outlet of the filter core. If the pressure

difference reaches 0.35 Mpa, the system will alarm to inform that the filter core shall be changed with a new one (There is a control and monitor output terminal on oil filter plant, which can be directly connected to control display screen). The procedure for changing the core is: shut down power supply of the oil filter plant, close valve 1 and 2 (see pic.1 & 2) on the oil inlet and outlet pipes of the on-load tap changer oil compartment, screw off filter cores (see pic.3 & 4); fill the filter cores with qualified transformer oil, screw on the new filter cores; open valve 1 and 2 on oil inlet and outlet of oil compartment, open discharge valve until oil overflowing, then close discharge valve and switch on power supply of oil filter plant.



Drawing 1



Drawing 2



### Attention

For low temperature region, the cold-proof measure has to be employed on the pipes exposure to the environment. Or the frozen oil in pipe will fail the ZXJY-II.



### Notice

1. New filter core shall be dried under  $90\pm 5^{\circ}\text{C}$  for 2~4 hours in advance before application, especially for the filter core for removing moisture;
2. In the condition that the system pressure keeps continuously at 0.5 Mpa and above, or moisture content in oil remains at high level for a long time, even if there is no alarm, proper inspection and fault resolution are still necessary, even sometimes change the impurity-removing core or moisture removing core;
3. Before oil refill, changing filter core or conducting other adjustment for on-line oil filter plant, it is necessary to inspect if there is any air within the gas relay of the tap changer. If air exists obviously, it shall be discharged.

## 8. Trouble shooting

| Trouble                                     | Cause  | Solution   |
|---|--|--|
| No Signal on Indicator                      | <ol style="list-style-type: none"> <li>1. Power supply is not connected</li> <li>2. Circuit breaker not make</li> </ol>  | <ol style="list-style-type: none"> <li>1. Connect power supply</li> <li>2. Close circuit breaker</li> </ol>  |
| Automation, manual or timing lamp is off    | <ol style="list-style-type: none"> <li>1. No power supply</li> <li>2. Air switch is off</li> <li>3. Lamp is broken</li> </ol>  | <ol style="list-style-type: none"> <li>1. Correctly power supply</li> <li>2. Turn on air switch</li> <li>3. Replace with a new button</li> </ol>   |
| Missing phase lamp is on                    | <ol style="list-style-type: none"> <li>1. Phase missing protection</li> </ol>  | <ol style="list-style-type: none"> <li>1. Check circuit</li> </ol>   |
| False phase sequence lamp is on             | <ol style="list-style-type: none"> <li>1. False phase sequence protection</li> </ol>   | <ol style="list-style-type: none"> <li>1. Correctly connect each phase</li> </ol>  |
| Filter insert blocking lamp is on           | <ol style="list-style-type: none"> <li>1. The carbon filter or water filter is blocked</li> <li>2. Low oil temperature</li> </ol>  | <ol style="list-style-type: none"> <li>1. Replace the insert</li> <li>2. Heat the oil</li> </ol>   |
| Abnormal Flow indication lamp               | <ol style="list-style-type: none"> <li>1. Operation overload or no-load</li> <li>2. Filter insert blocked</li> </ol>   | <ol style="list-style-type: none"> <li>1. Turn off power and turn it on</li> <li>2. Make sure all valve are open</li> </ol>  |
| The oil surge relay of tap changer operates | <ol style="list-style-type: none"> <li>1. Malfunction inside the tap changer</li> <li>2. Filter blocked or worn out</li> <li>3. Bubble inside the pipes</li> <li>4. Improper arrangement of pipes</li> </ol> | <ol style="list-style-type: none"> <li>1. Check the tap changer</li> <li>2. Change the insert</li> <li>3. Drain the gas from the relay</li> <li>4. Check pipes</li> <li>5. Reset it to timing</li> </ol> |

## 9. Appendix

**Appendix 1 Installation**

**Appendix 2 Structure**

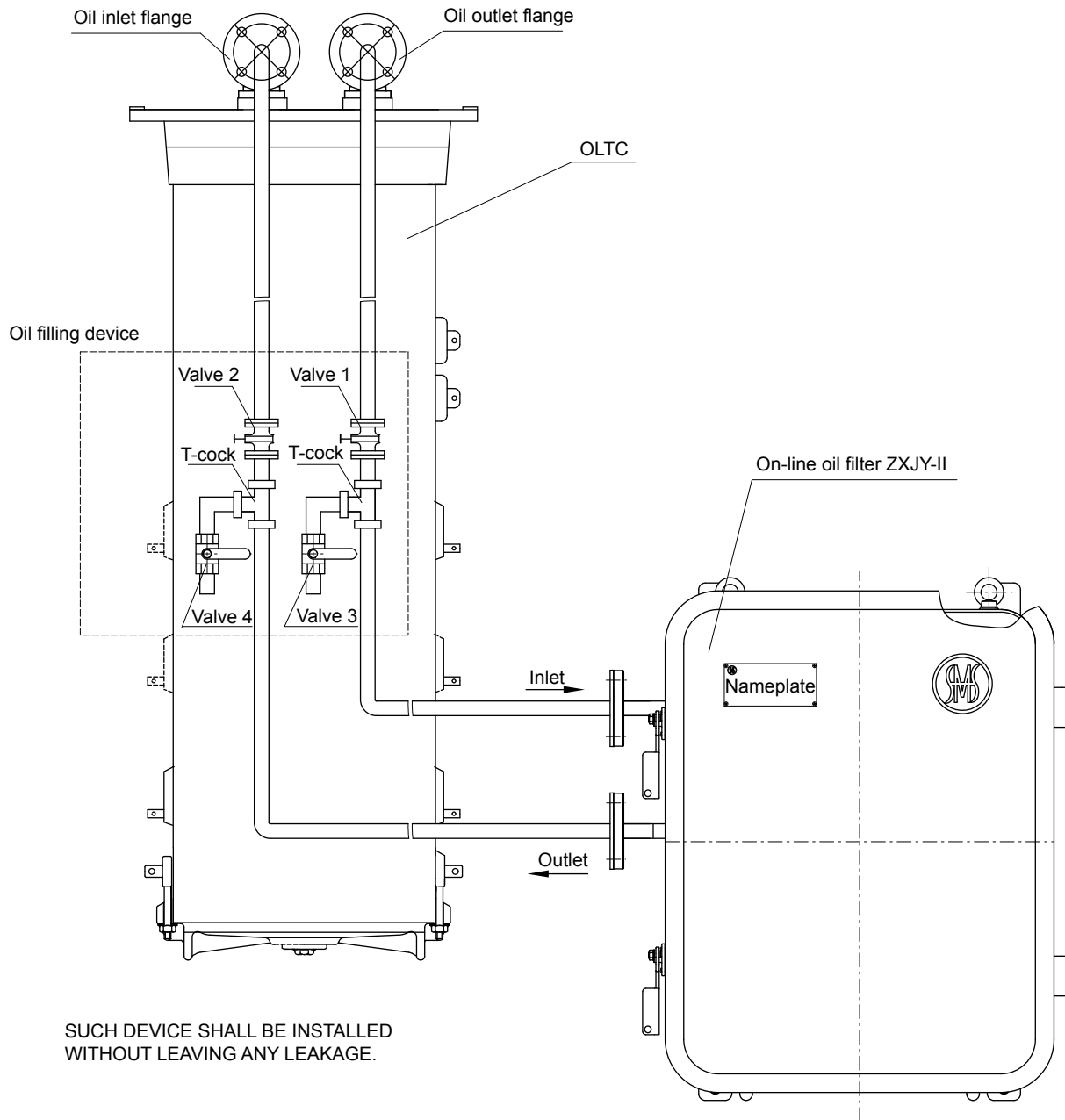
**Appendix 3 Overall dimensions**

**Appendix 4 Circuit diagram**

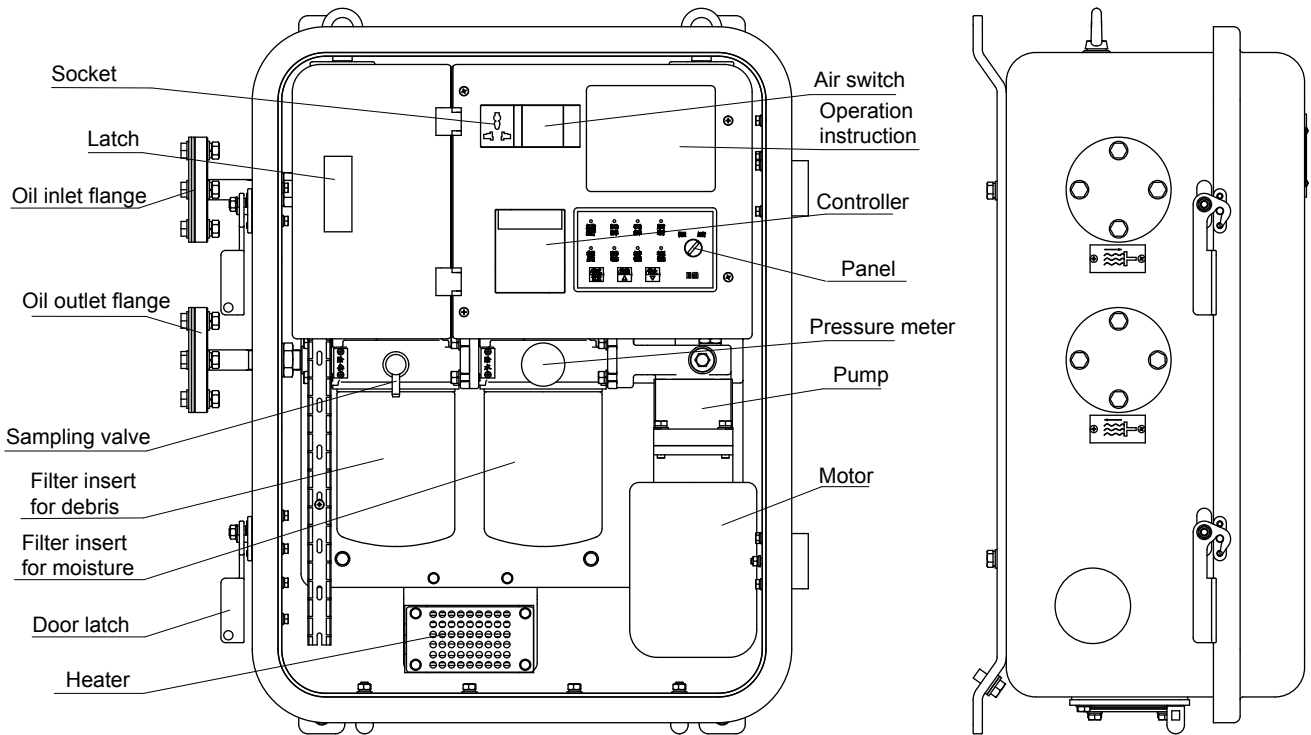
**Appendix 5 Oil filling device installation**

**Appendix 6 Support for retrofit**

Appendix 1 ZXJY-II Installation diagram

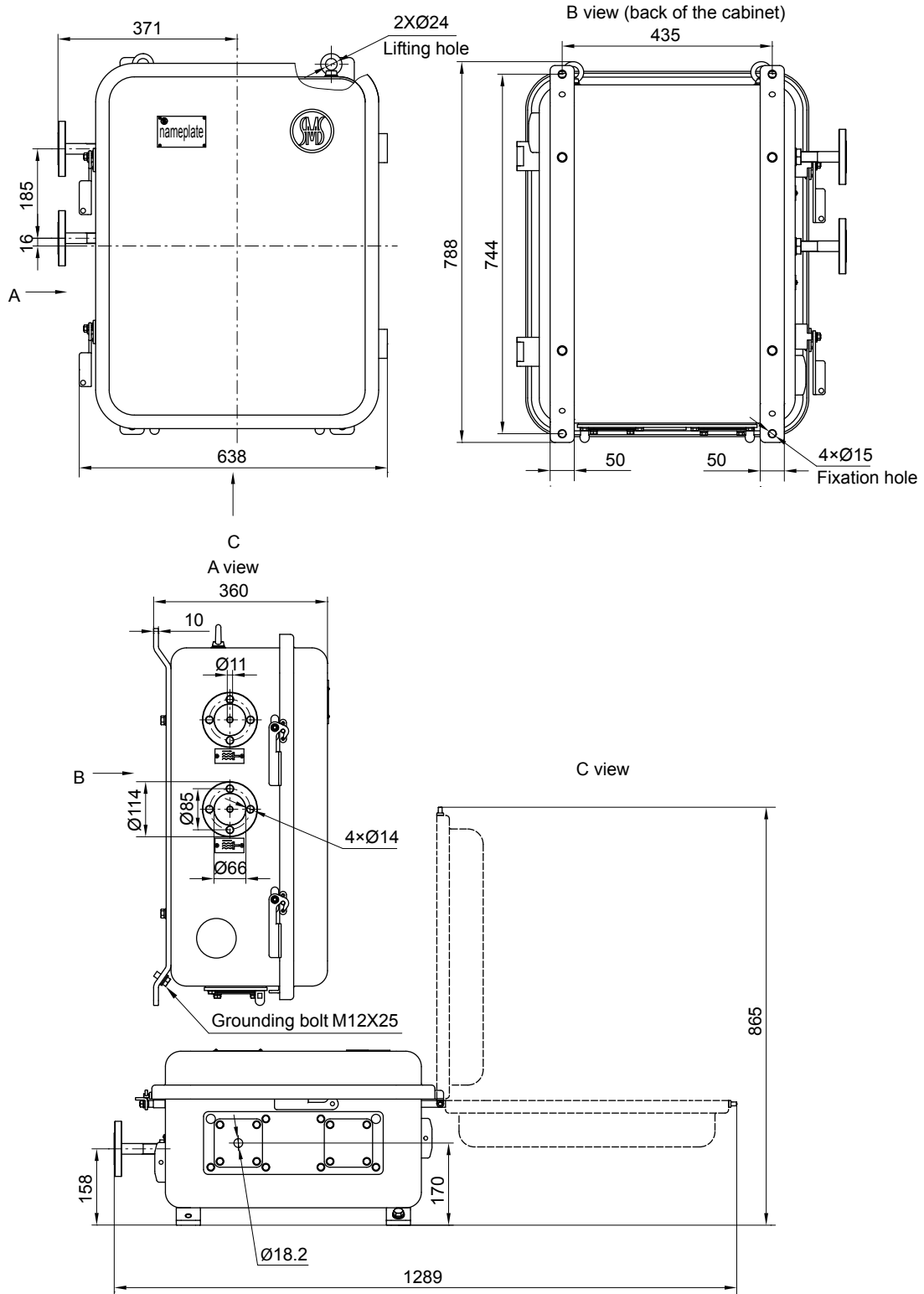


### Appendix 2 ZXJY-II Structure arrangement



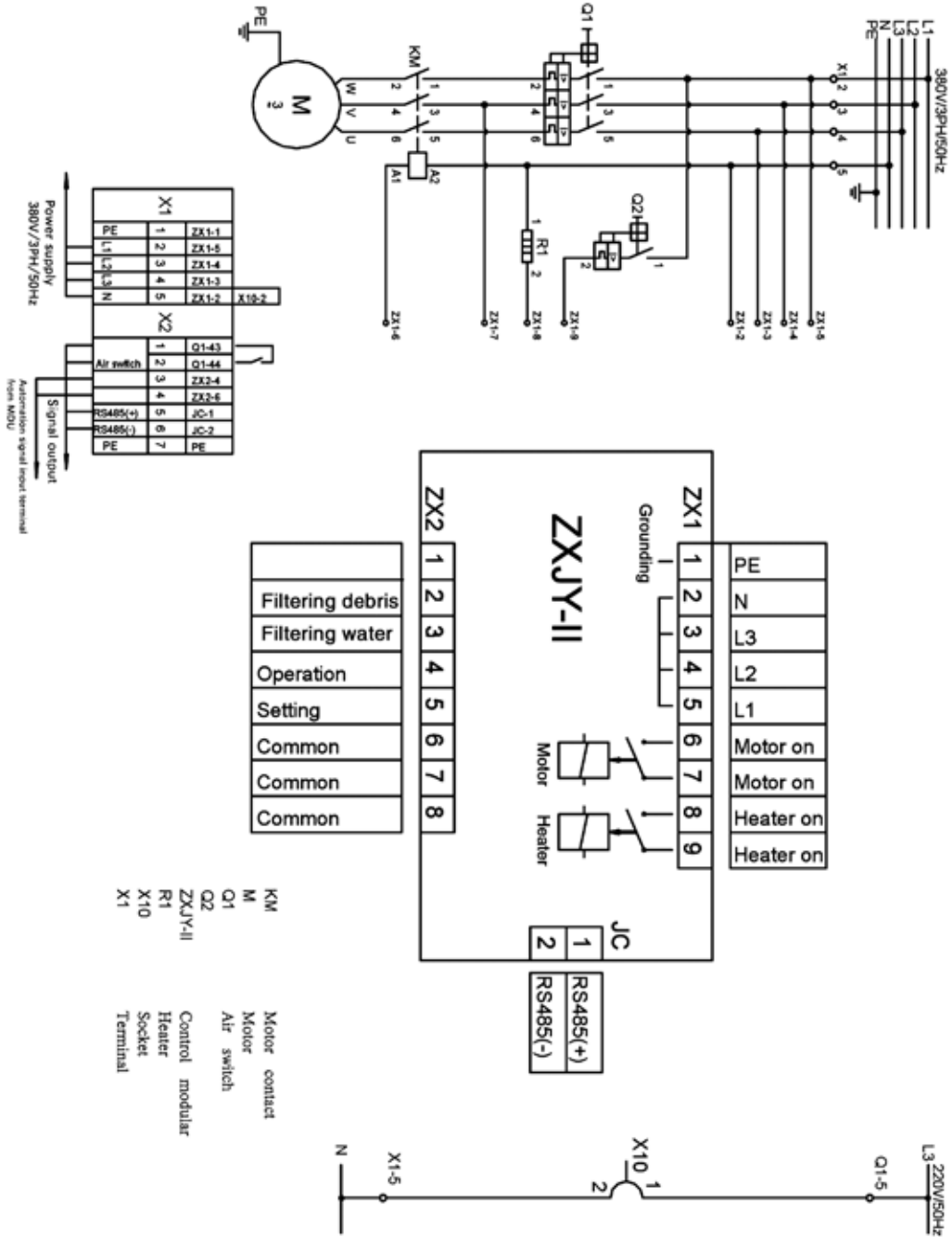


Appendix 3 ZXJY-II overall dimensions

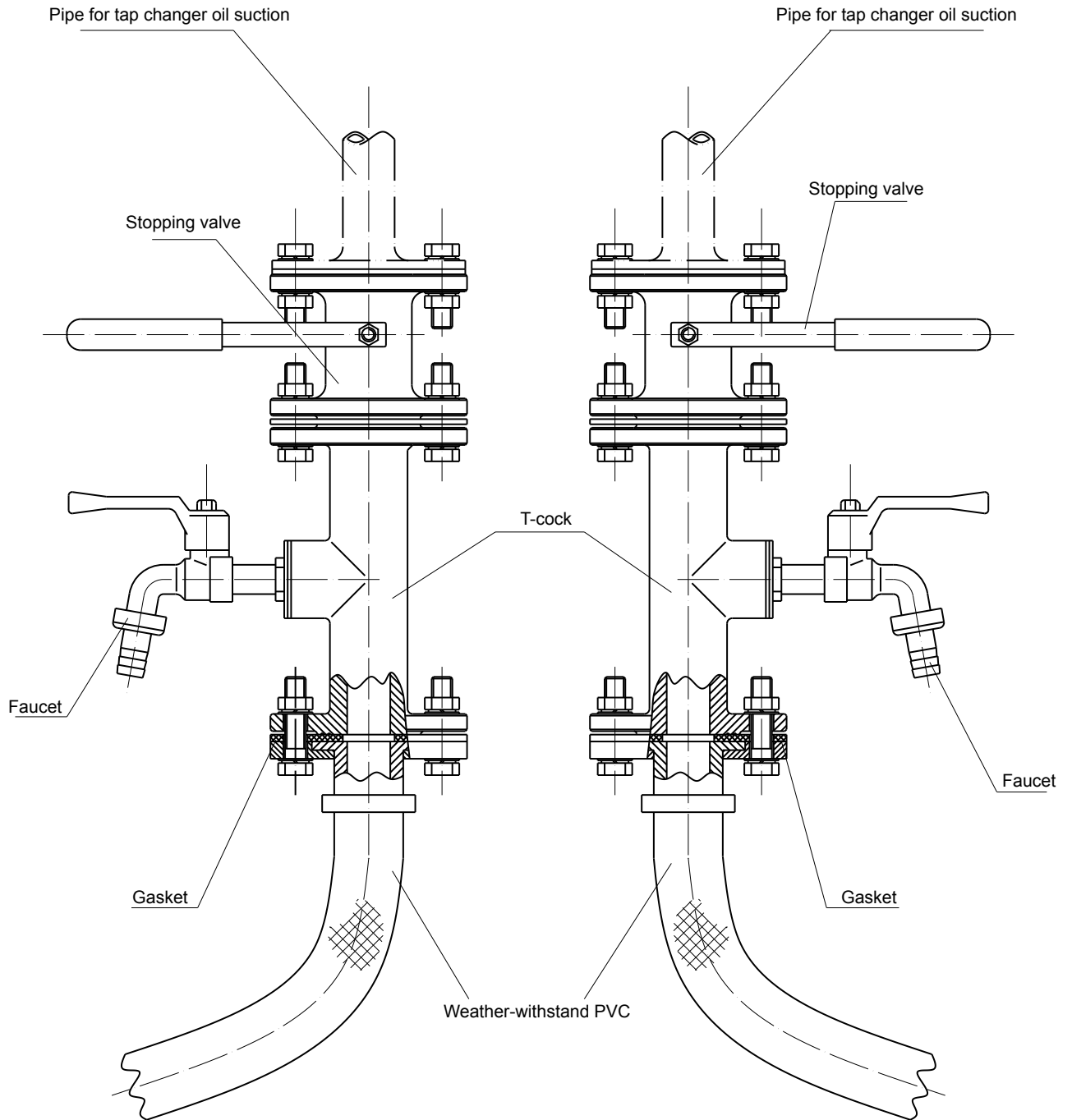


Unit: mm

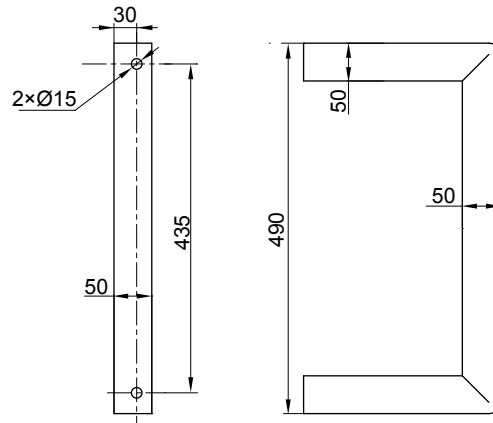
### Appendix 4, Circuit diagram of ZXJY-II



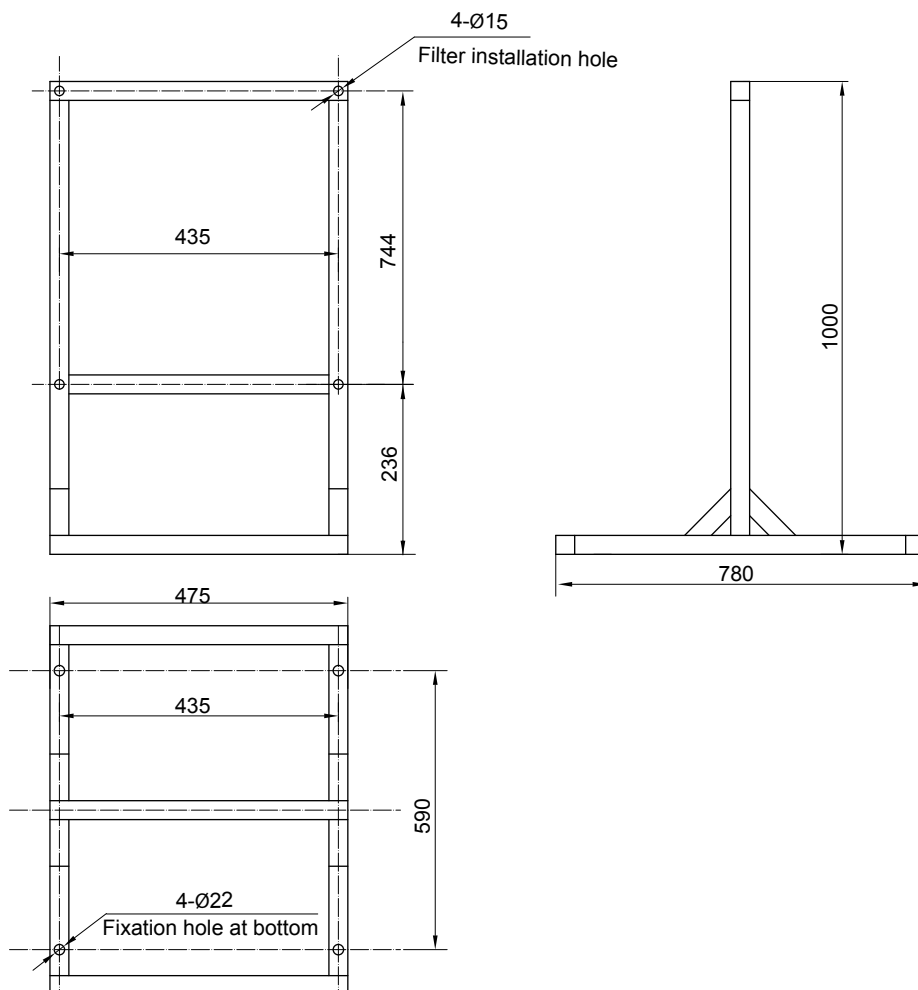
Appendix 5 Oil filling device arrangement



### Appendix 6 a On-tank type universla support overall dimensions



### Appendix 6 b Grounding support overall dimensions

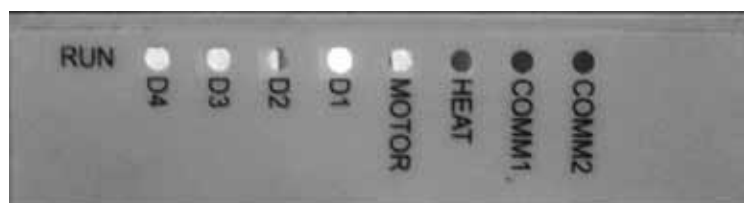


Unit: mm

## 10. Supplement

### 10.1 Indication

Four indication lamps on the controller from left to right is D4, D3, D2, D1



Following pictures indicates the Time, temperature, humidity and rest operation



1. For time, 10 : 26 is 10:26 am
2. For temperature, 28.6 is 28.6°C
3. For humidity, 27 means 27%RH
4. For the rest operation time, 01:34 means the operation will finish after another hour and thirty-four minutes
5. The filter is off load.

### 10.2 The lamp and button on the controller



10.2.1 There are three buttons on the controller, namely Mode/setting, on, stop

10.2.2 For the eight lamps, the above four lamps is for function indication; the below four is for failure indication

| Lamp                  | Function  |
|-----------------------|---|
| Operation             | Working status  |
| Automation            | Auto status   |
| Manual                | Manual operate status   |
| Timing                | Timing status   |
| Abnormal flow         | Operate without load or overload; actual flow is under the setting value, failure alarm |
| Filter insert blocked | Either the debris filter or the water filter is blocked                                 |
| Flase phase sequence  | The phase sequence is abnormal  |
| Missing phase         | The power phase is wrong  |

### 10.3 Setting



After switching to setting, the time setting will be shown on the indicator as 13:16. The 13 will flicker, press start $\Delta$  or stop  $\nabla$  to adjust the data. Enter next setting by pressing model/setting.

1.  $\square \blacksquare \square \square$  (Note: the black square means this number flickers)

Reset time: press start $\Delta$  or stop  $\nabla$  to reset the hour and then press model/setting button, the hour setting will be saved and come to minute setting. Repeat the same process to reset the minute;

2.  $\square \blacksquare \square \blacksquare$

Enter the heater temperature-on control panel by pressing the mode/setting button, reset the temperature by pressing press start $\Delta$  or stop  $\nabla$

3.  $\square \blacksquare \blacksquare \square$

Enter the heater temperature-off control panel by pressing the mode/setting button, reset the temperature as 2 displays

4. □■■■

Enter the heater humidity-on control panel by pressing the mode/setting button, reset the temperature as 2 displays

5. ■□□□

Enter the heater humidity-off control panel by pressing the mode/setting button, reset the temperature as 2 displays

6. ■□□■

Temperature difference setting: difference is due to the installation location, normally setting at 8 ex-works. To reset this value, you can enter the temperature difference setting panel as the process indicated in 2

7. ■□□□

Humidity difference setting: difference is due to the installation location, normally setting at 1 ex-works. To reset this value, you can enter the humidity difference setting panel as the process indicated in 2

8. ■□■■

Enter Operation duration setting for manual operation model, follow the process of 2 to reset the value.

9. ■■□□

Enter Operation duration setting for timing model, follow the process of 2 to reset the value.

10. ■■□■

Enter Operation setted duration for timing model, follow the process of 2 to reset the value.

11. ■■■□

Enter Operation duration setting for automation model, follow the process of 2 to reset the value.

12. ■■■■

Enter Operation duration setting for Filter Operating Frequency setting(after certain operations at MDU, the filter will operate once) follow the process of 2 to reset the value.

After all settings are complete, switch the mode into operation. All revisions will be saved.

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