



ZXJY

HM0.460.1802

OLTC Online Oil Filter Plant Type ZXJY Operation Instructions

Shanghai Huaming Power Equipment Co.,Ltd.

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1. General

1.1 Type ZXJY series 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.

1.2 There are two models of ZXJY series oil filter plant:

1.2.1 Type ZXJY-1: Mechanical and electrical section are located in the same cabinet.

1.2.2 Type ZXJY-3: Three sets of oil-filter plants can be controlled by one single control module, while each of the oil-filter plants can be commissioned separately and put into parallel operation.



ZXJY-1



ZXJY-3

1.3 Type ZXJY-1 can be mounted either on the transformer's tank side (referred to as "wall mounting type"), or on the ground (referred to as "ground type"). For type ZXJY-3, ground type is recommended.

1.4 For those projects that the transformer has been in service, and need to add the oil-filter plant (referred to as "retrofit project"), please specify the installation method. In case of "wall mounting type" installation, we will provide common steel bracket (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 supporting bracket (see appendix 6b) with extra charge.

2. Product feature

2.1 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.

2.2 SIEMENS LOGO control unit is adopted in type ZXJY with many functions such as manual operation, automatic operation, timing starting, operation time setting, etc., and also with other functions such as operation time recording, maintenance alarming, etc. In addition, type ZXJY-1 and ZXJY-3 are equipped with thermostat. If temperature goes below 5°C or humidity reaches 80%, heater begins to work, while if temperature reaches to 45°C, fan starts to operate; in this way the device can be normally operated in various environments to realize automatic operation without supervision of operator.

2.3 This type of plant is fitted with two-step filtering process, i.e. first to get rid of debris such as free carton etc, then to remove moisture from inside. Filtering core in the process is ordered particularly from USA according to OLTC's unique features. Currently, the plant is equipped with 3µm filtering core and alluminium-alloy made-in chamber as standard. Provided that higher accuracy filtering core in 1µm and stainless steel made-in chamber are required, please specify during order.

2.4 Standard plug connectors are provided with the oil-filter plant, such as: 380 V working power supply input connector; monitoring signal output connector; input connector of operation command of on-load tap changer. Length of the cable can be specified according to customer's requirement. During on-site operation, it is very easy to connect the cable plug after proper tightening. (Details of each connection terminal can be found in "operation instructions")

3. Technical data

Motor power: 0.37kW	Electric power: 380V/50Hz	
Rated flow: 9L/Min	Rated pressure: 0.5Mpa	
Oil inlet flange: DN25	Oil discharge flange: DN25	
Impurity-filter core model: 503M	Water-filter core model: 510AQ	
Filter core accuracy: ≤3µm	Media temperature: -20°C~100°C	
Ambient temperature: -25°C~70°C	Heater power: 30W	
Weight	ZXJY-1	90kg
	ZXJY-3	250kg

4. Installation & Test

4.1 Installation procedure

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

4.1.1 Please refer to Pic.1 and Pic 2 regarding two installation methods (take ZXJY-1 as an example).

The connection flange dimensions of the oil inlet and outlet of ZXJY oil filter plant are as same as type CV and CM on-load tap changers produced by Huaming for easy transformer design and installation.

① Wall mounting type



② Ground type



4.1.2 Design and produce the external connection pipe according to the location of the device on the transformer, which refer to Appendix I Schematic Installation.

4.1.3. Refer to Appendix I Schematic Installation, connect oil inlet and outlet pipes of the on-load changer to oil inlet pipe and outlet pipe of this device respectively by the manufactured connection pipe. (Notice: Don't mix up oil inlet and outlet)

4.1.4. Refer to appendix 1, oil filling and replacing devices must be installed securely in the oil path. Those include two units of stop valves (valve 1 and 2), two units of three-way connectors, two units of faucets (valve 3 and 4). These parts can either be prepared by customer or by Huaming if necessary through specifying the dimensions of relevant interface in the contract.

4.1.5 In case of retrofit project, we will provide all remaining oil filling and replacing device since the stop valves are present.

4.1.6 We recommend the transformer manufacturer to use hard pipe to connect oil filling and replacing device with online oil filter plant. For on-site retrofit project, we will provide the 1.5 meter long flexible pipe as previously agreed.

4.2. Test procedure (type ZXJY-1 for instance)

Special note: The transformer manufacturer should test the on-line oil filter plant in the factory by the following procedures in order to inspect the compatibility and the pipe leakage condition.

(Please refer to appendix 1 and 2 for the following instruction)

4.2.1 Connect power plug, monitoring & controlling plug and automatic signal plug which are all with suitable length of cables, respectively to sockets CX1, CX2 and CX3. 380V power can be supplied through cable CX1 from motor drive unit.

Caution: During connecting, wire “N” should be connected first.

4.2.2 Make circuit breaker QA and QA1, close control cabinet cover, connect to main power supply; press the option button according to procedure and select manual operation (Indicator light for manual operation will be on);

4.2.3. Press down the start button, indicator light for operation is on and motor works (If it fails to operate, please adjust power phases and try again);

4.2.4. Press down the stop button, indicator light for operation is off and motor stops;

4.2.5. Connect one end of PVC hoses with the outlets of valve 3 and 4 respectively, and inserting the other end of these hoses into the standby transformer oil drum;

4.2.6. Close valves 1 and 2 on oil-in and oil-out holes of on-load tap changer, opening valves 3 and 4; Operate oil pump to cycle the oil. After the device is filled with oil, open sampling valves to release gas (oil will drain out with gas at the same time during release, so please prepare a container to hold the oil). After the gas in the device is discharged completely, close the sampling valves. Switch off the device, opening valves 1 and 2, after the gas in the system is discharged completely, close valves 3 and 4. (Note: Please fill the pipeline from PVC hoses which connects with valve 3 to the inlet of the oil filter plant with oil before starting the oil pump. If oil does not cycle after operating the motor, please close the outlet valve of the filter plant and open it after oil is pumped in.)

4.3 Testing method of retrofit project. (ZXJY-1 for instance)

Special note: 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.

4.3.1 Follow the procedure of 4.2.1 to 4.2.4 to verify that there is no error in the local electric motor operation.

4.3.2. 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 3-way connection. Be sure to tighten completely so that the final position of the faucet is facing one flange of the 3-way connection.

4.3.3. Dismantle the original sealing plate and gasket located below the stop valve on the transformer. Put on a new gasket and install the 3-way connection pipe 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.

4.3.4. Connect the 3-way connection 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 hard pipes are allowed to connect between the 3-way connection and the flexible pipe. However, situation like this should be avoided since we don't provide such hard pipe.

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

4.3.6. According to appendix 1, open valve 2. Oil inside the on-load tap changer will force the air inside the pipe to be released from the bleeding plug screw and the sampling valve. Once the oil starts to bleed through the bleeding plug screw located on the top of the moisture-removing core, tighten the plug screw. Then, once the oil starts to bleed through the bleeding plug screw located on the top of the particle-removing core, tighten the plug screw as well. Close the sampling valve when the oil starts to flow out evenly through it.

4.3.7. According to appendix 1, open the valve 1. Then screw off the small cap of 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.

4.3.8. 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.

Attention:

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

2. The valves on oil outlet must be open before starting;

3. 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.

5. Operating instruction

5.1 Function descriptions of buttons on the panel of control cabinet (Please refer to section 9 of Supplement)

5.1.1. There are three touch film buttons on control cabinet panel of oil filter plant: mode, start and stop.

5.1.2 There are three programs on mode selection button, they are: manual, timing and automatic.

5.1.2.1 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).

5.1.2.2 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 before delivery is from 0:00 to 4:00 AM every day).

5.1.2.3 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)

5.2. Explanation of aviation plug terminals

5.2.1. Type ZXJY-1 oil filter plant offers three sockets for user, which are:

CX1 terminal– Input interface 380V/3PH/50Hz for 380V working power supply (standard length of cable is 10 meters);

Terminal No. of CX1	Description
1	L1
2	L2
3	L3
4	N

Note: 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 agreement.

CX2 terminal – Output interface for monitoring and controlling signal (standard length of cable is 30 meters);

(Output normally-open independent potential-free contact signal, Contact capacity: AC220V, 1A)

Terminal No. of CX2 Description

Terminal No. of CX2		Description
Regular 5 core	Special 7 core	
1	1	Signal output terminal of motor operation
2	2	Alarm signal output terminal of filter core pressure difference (Alarm indicators on control cabinet panel will indicate which one is in trouble)
5	3	Common terminal for signal output
	5	Remote Start (user provide electrical independent contact)
	6	Remote Stop (user provide electrical independent contact)
	7	Remote Common terminal (user provide electrical independent contact) (user provide potential-free contact)

Note: Please specify in the contract if remote control function is requested.

CX3 terminal – Input interface for operation command of tap changer (standard length of cable is 10 meters).

(Input normally-opened electrical independent contact signal, Contact capacity: DC24V, 1A)

Terminal No. of CX3	Description
1, 2	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)

Notes: Cable connected to CX1 shall not be less than 1.5mm²; Cables for CX2 and CX3 shall not be less than 1mm².

Special notes: 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).

5.2.2 Connection wire of type ZXJY-3 oil filter plant is terminal block; details please refer to schematic diagram.

5.3. Description for LOGO program adjustment

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)

Recording method for reviewing the operation times:

Press ESC button

Press V button and select Set Param

Press OK button

Press V button until display the following:

B23: Pa Lim=999999 Cnt=000025

(Lim=999999 is the maximum recording times set in the system. If operation times is over 999999, recount; Cnt=000025 is its operated times)

In addition, the program for setting relevant operation period has been write-protected before delivery in order to avoid program losing in LOGO and malfunction of the device which are caused by mishandling. Please make special notes during ordering if you think the program set by manufacturer is not suitable for your operation.

5.4 Description of oil path

Because Huaming adopts special integrated plate for the oil-filter plant, the pipe layout can not be revealed in appearance. Therefore oil path diagrams are provided for reference (see appendix 7).

6. 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 Supplement 1 and 2 for the descriptions)

6.1 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.

6.2 Oil refill operation

Open cover of on-line oil filter plant, press pattern selection 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.

6.3 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.

Attentions:

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.

6.4 Please do certain cold-proof measures for the exposed pipes between on-line oil filter plant and tap changer oil compartment in cold area. Otherwise, oil in the pipe may solidify and it will affect normal operation seriously.



Pic. 1



Pic. 2



Pic. 3



Pic. 4

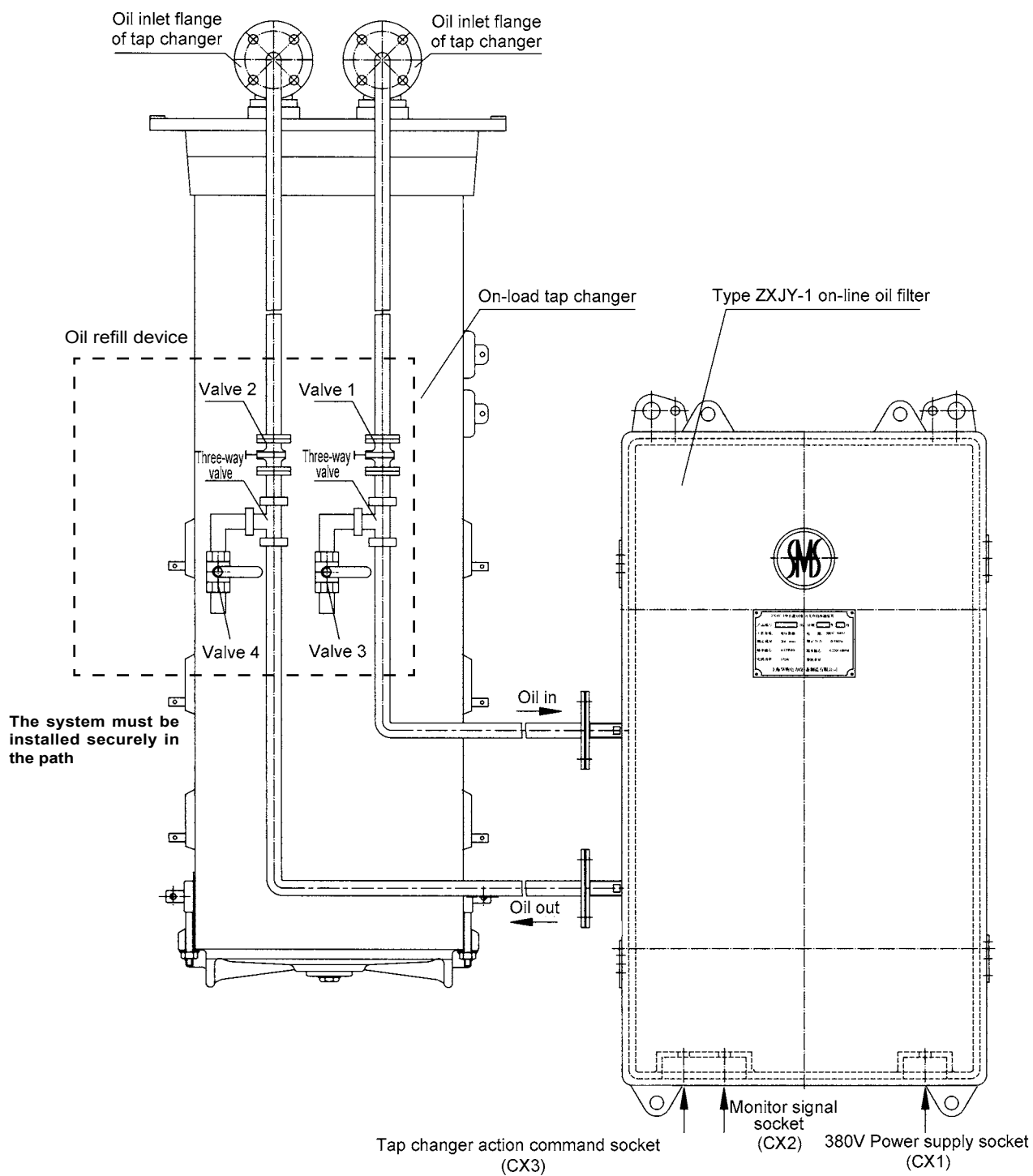
7. Troubleshooting

Trouble	Causes	Solution
Power light is not on	<ol style="list-style-type: none"> 1. Power supply is not connected 2. Circuit breaker not make 3. Power light is broken 	<ol style="list-style-type: none"> 1. Connect power supply 2. Close circuit breaker 3. Replace with a new button
Does not operate after pressing start button	<ol style="list-style-type: none"> 1. Open phase, wrong phases 2. Wrong operation mode 3. Button is broken 	<ol style="list-style-type: none"> 1. Correctly connect each phase 2. Select manual mode 3. Replace with a new button
Alarm of impurity removing lights	<ol style="list-style-type: none"> 1. Impurity removing filter core jams 2. Low oil temperature 	<ol style="list-style-type: none"> 1. Change with a new filter core 2. Raise oil temperature
Alarm of water removing lights	<ol style="list-style-type: none"> 1. Water removing filter core jams 2. Low oil temperature 	<ol style="list-style-type: none"> 1. Change with a new filter core 2. Raise oil temperature
Protective relay alarm of tap changer	<ol style="list-style-type: none"> 1. Tap changer failure 2. Filter core jams or it is almost out of work 3. There are some bubbles in the pipes 4. Eddy flow caused by illogical arrangement of pipes 	<ol style="list-style-type: none"> 1. Repair the tap changer 2. Change with a new filter core 3. Discharge the gas from tap changer gas relay 4. Check the pipe. 5. Select "timing" mode

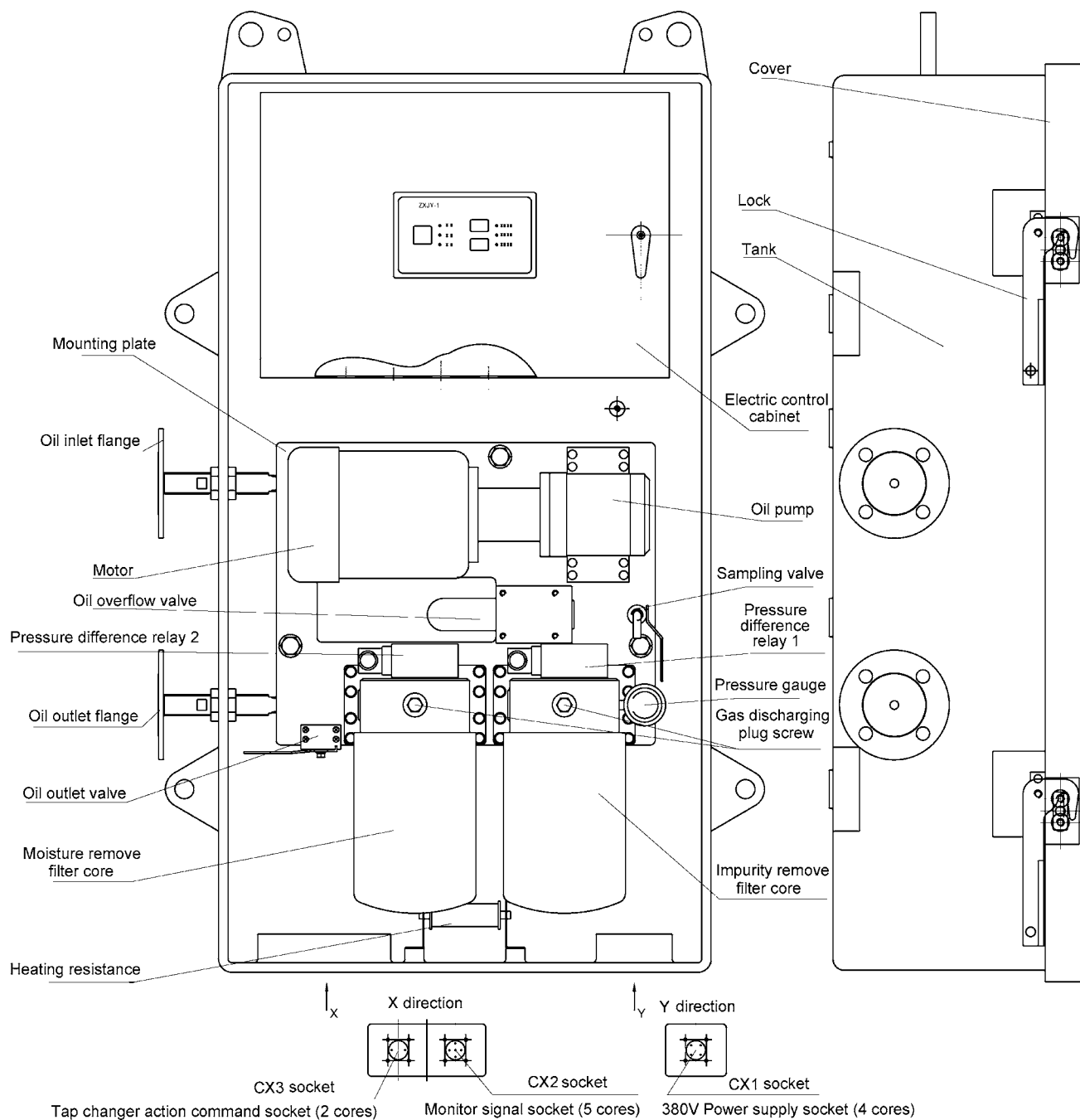
8. Appendix

- a) Appendix 1 Installation sketch map
- b) Appendix 2 Structure diagram
- c) Appendix 3 Overall dimension drawing
- d) Appendix 4 Circuit diagram
- e) Appendix 5 Oil refill diagram
- f) Appendix 6 Overall dimension of supporting bracket
- g) Appendix 7 Oil path diagram

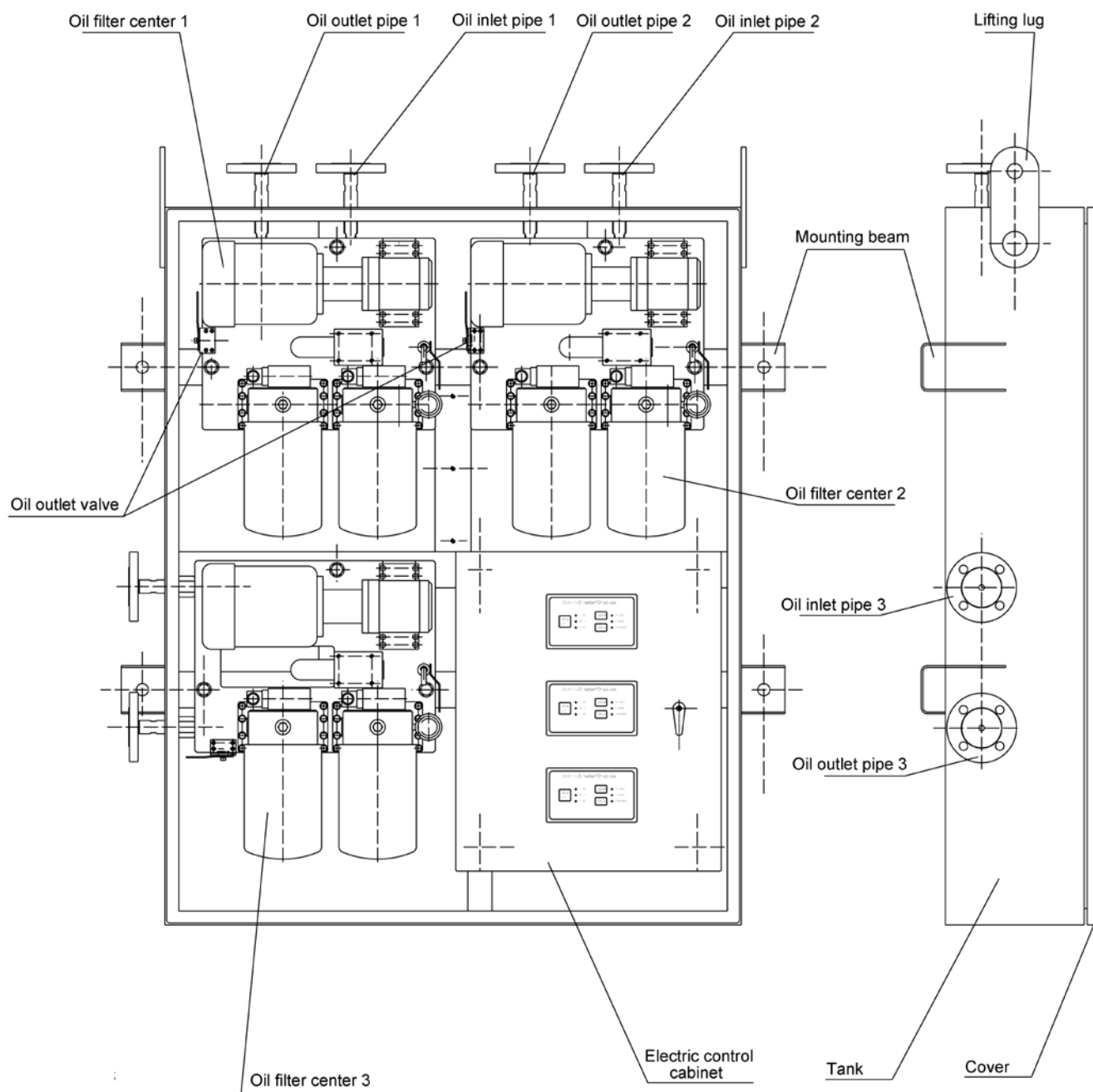
Appendix 1 Installation sketch map of type ZXJY on-line oil filter plant (Type ZXJY-1 for instance)



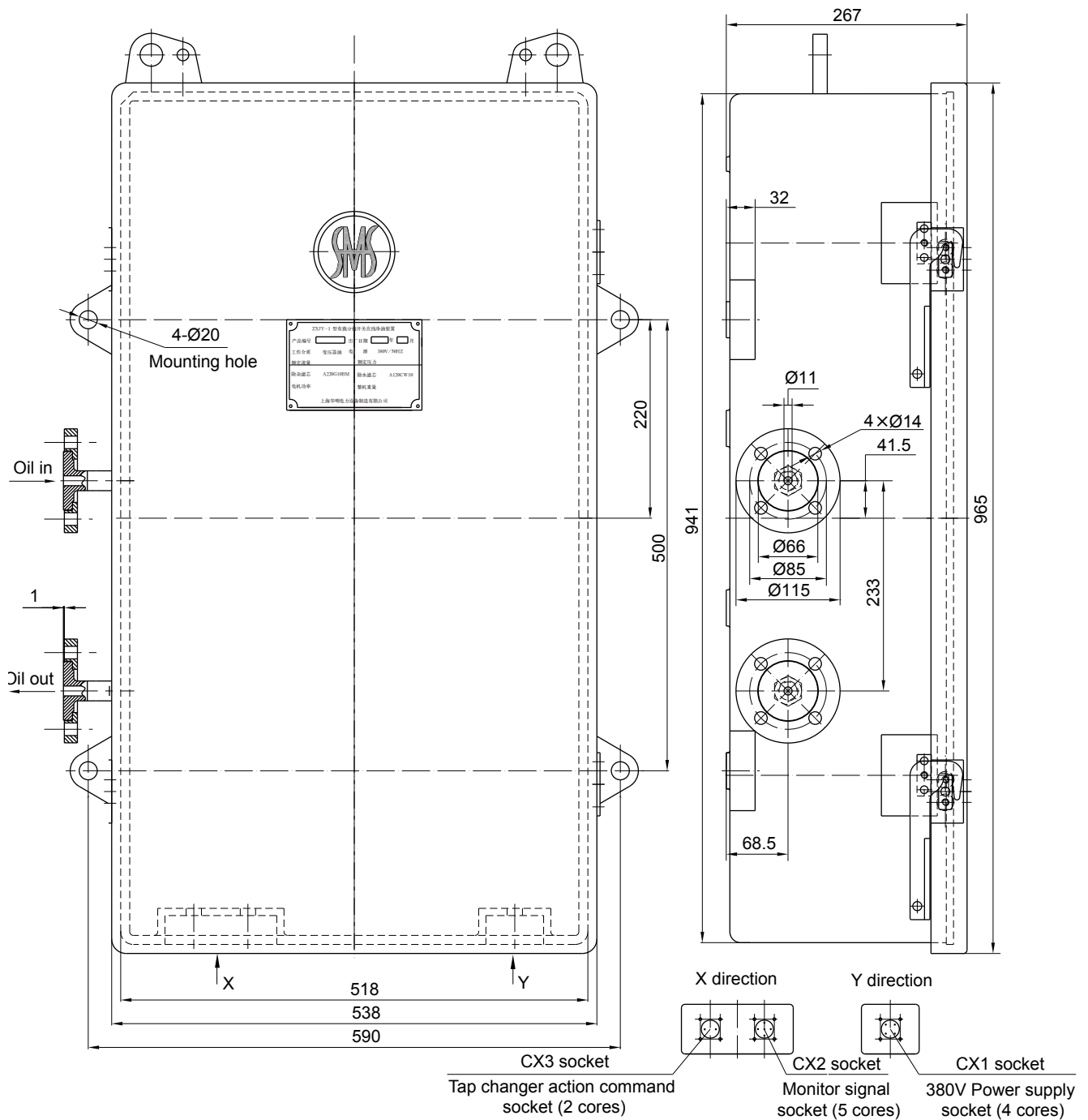
Appendix 2a. Structure drawing of type ZXJY-1 on-line oil filter plant

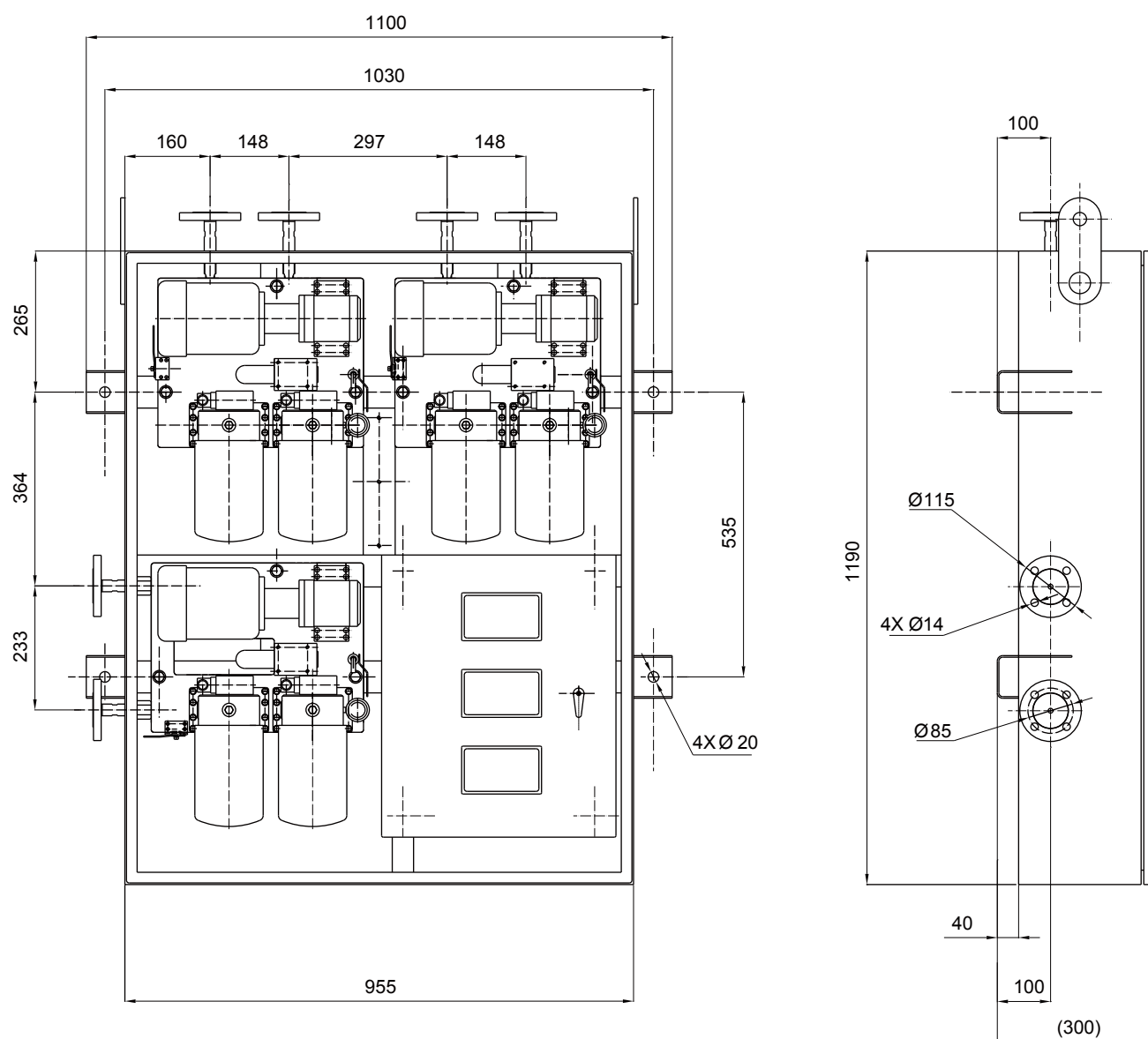


Appendix 2b. Structure drawing of type ZXJY-3 on-line oil filter plant



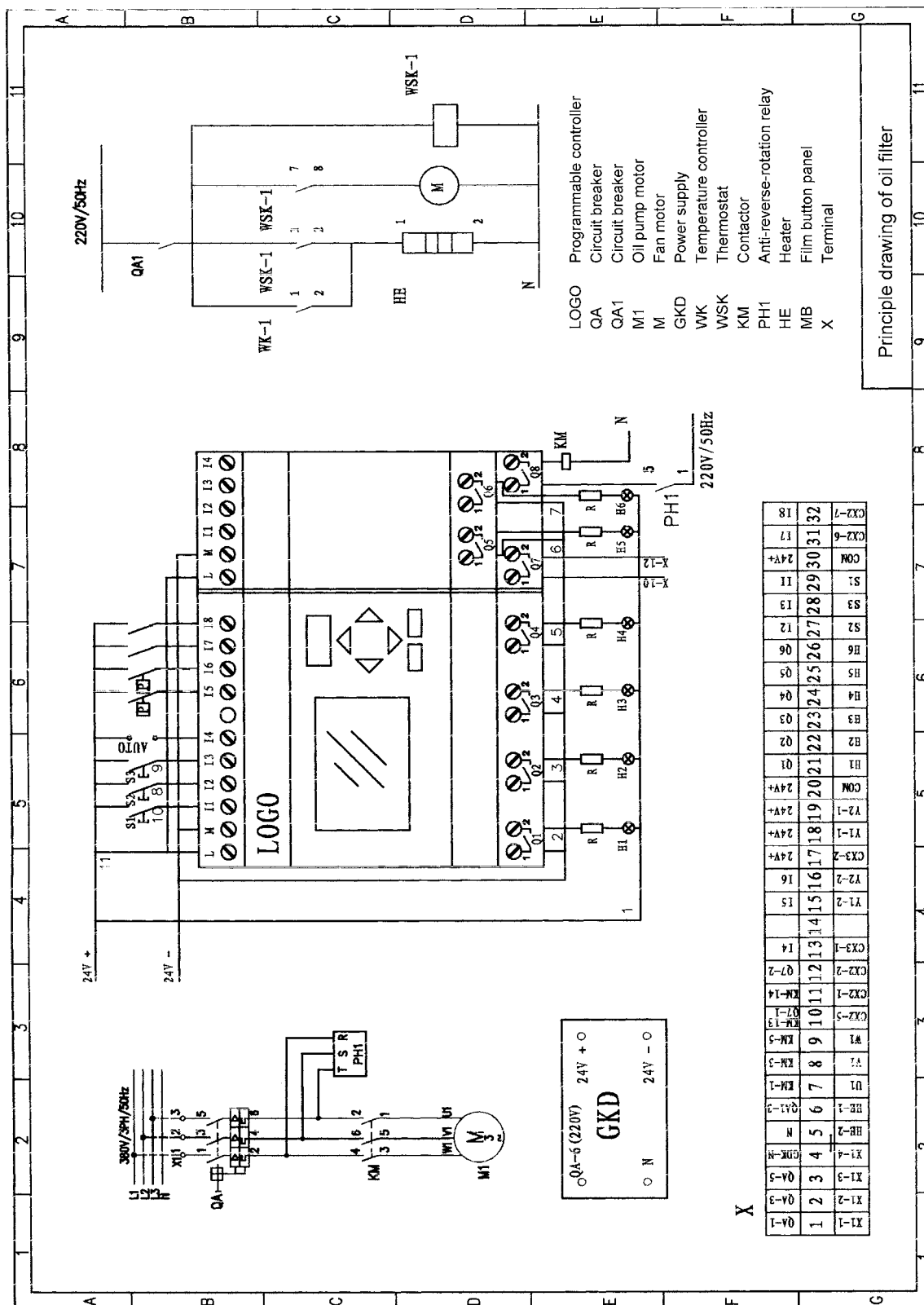
Appendix 3a. Overall dimension drawing of type ZXJY-1 on-line oil filter plant



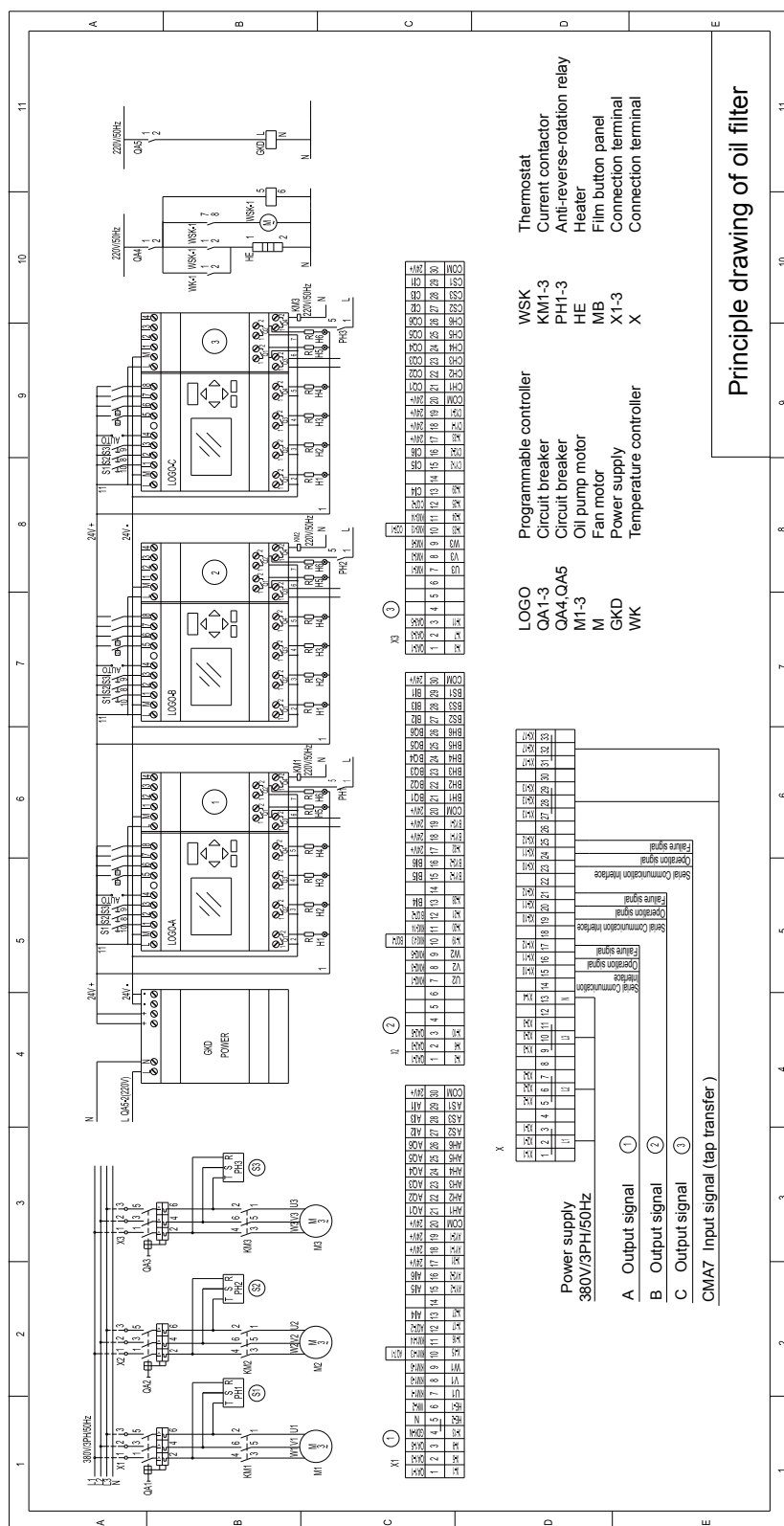
Appendix 3b. Overall dimension drawing of type ZXJY-3 on-line oil filter plant

Unit: mm

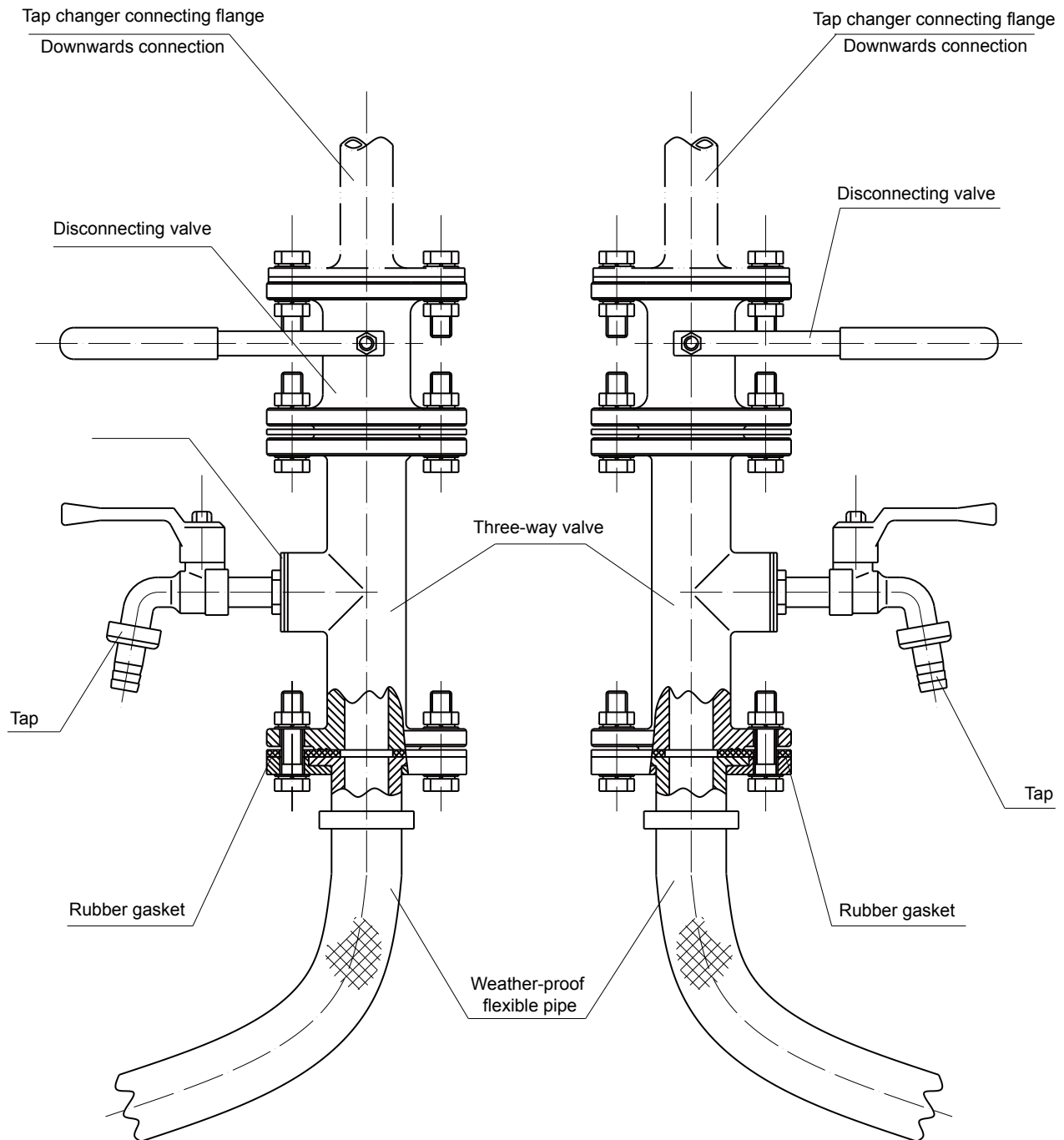
Appendix 4a. Circuit diagram of type ZXJY-1 on-line oil filter plant



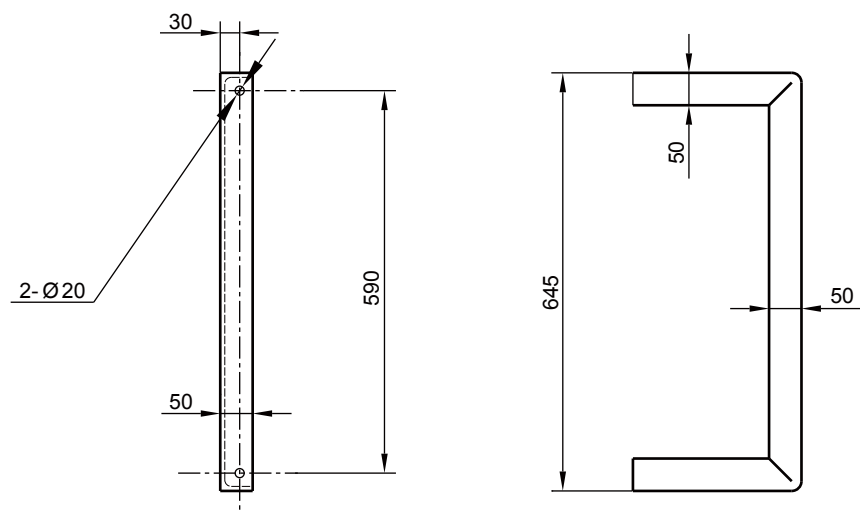
Appendix 4b. Circuit diagram of ZXJY-3 on-line oil filter plant



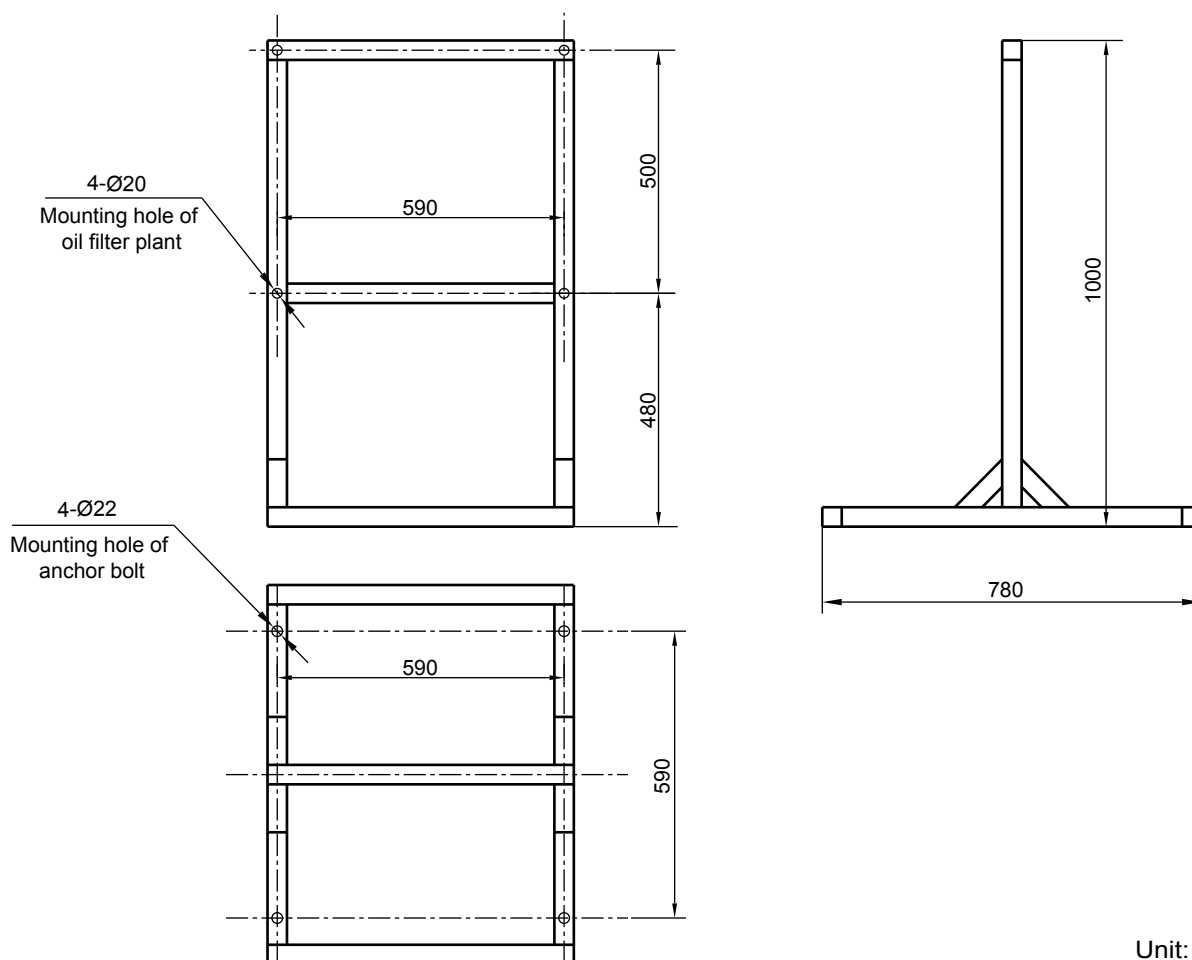
Appendix 5. Gateway of oil refill device



Appendix 6 a. Overall dimension of common steel bracket

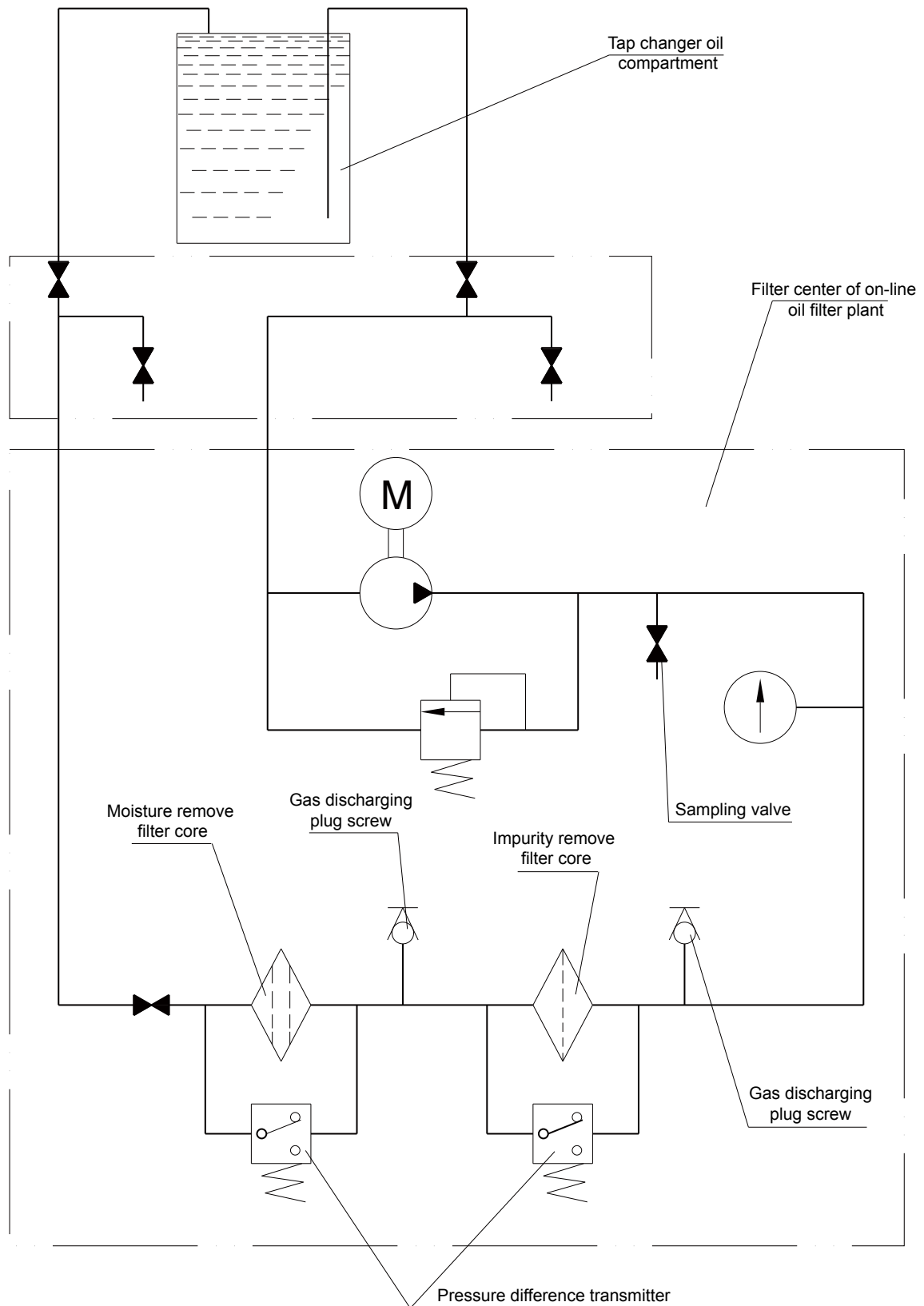


Appendix 6 b. Overall dimension of floor stand



Unit: mm

Appendix 7. Oil path diagram



9. Supplement

Don't enter any other modes except mode "Set param" and "Set clock" when setting the operating time, otherwise it will cause program chaos and malfunction of the on-line oil filter plant.

1. If LOGO loses power for continuous 48 hours, the time will disappear and re-setting is required.

The setting method is as following:

Press ESC button

Press V button and select Set Clock

Press OK button

The following will display

Set clock
SU 00:00
YY.MM.DD
0000.01.01

Press \wedge V < > to set current time

Press OK button to confirm

Press ESC to exit

2. Set the operating time

The setting method is as following:

Press ESC button

Press V button and select Set Param

Press OK button

The following will display

B11:T
T=04:00h
Ta=00:00

B11: operating time module for timing and manual mode

T: continuous operating time

T_a: elapsed runtime of current operation

Press OK button

Press \wedge V < > to set required work time

Press OK button to confirm

Press ESC to exit

3. Set the timing start of on-line oil filter plant (default setting is 0:00 every morning)

The setting method is as follows:

Press ESC button

Press V button to select Set Param

Press OK button

The following will display

B11:T
 T=04:00h
 Ta=00:00

Press V button until the following displays:

B14:No1
 D=MTWTFSS
 On=00:00
 off=00:01

B14: Clock set module for timing start

***the setting time for OFF should be 1 minute longer than ON**

Press OK button, then Press \wedge V < > to set required time

Example: Start at 23:00 on every Mon, Wed, Fri, Sat, Sun

B14: No1
 D=M-W-FSS
 On=23:00
 off=23:01

***the setting time for OFF should be 1 minute longer than ON**

Press OK to confirm, then press ESC to exit

4. Frequency setting of the tap changer operation which triggers the automatic operation of the on-line oil filter plant (The default setting is one cycle of oil filtering for each tap changing operation)

The setting method is as following:

Press ESC button

Press V button and selecting Set Param

Press OK button

The following will display

B11:T
 T=04:00h
 Ta=00:00

Press V until it displays the following:

B24:Par
 On=000001
 off=000001
 Cnt=00000

B24: Counter module of start times

***the setting value of OFF should be as same as ON**

Press OK button

Press \wedge V < > to set required times

Example: One cycle of filtering for every three tap changing operations

B24:Par
On=000003
off=000003
Cnt=000000

***the setting value of OFF should be as same as ON**

Press OK button to confirm

Press ESC to exit

5. Setting the time of automatic operation (The default setting is 1 hour)

The setting method is as following:

Press ESC button

Press V button and select Set Param

Press OK button

The following will display

B11:T
T=04:00h
Ta=00:00

Press V until the following is shown:

B19:T
T=30:00m
Ta=00:00

B19: Timing module of automatic operation

T: continuing operating time

T_a: elapsed runtime for the current operation

Press OK button

Press \wedge V < > to set required length of time

Press OK button to confirm

Press ESC to exit

Example: Set 60 minutes for each oil filtering

B19:T
T=30:00m
Ta=00:00

Press OK to confirm

Press ESC to exit

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Printing: October 2010