# OPERATION AND MAINTENANCE FOR 10L LPE LIQUEFIED GAS EXTRACTION EQUIPMENT

# TABLE OF CONTENTS

# USER MANUAL

## 1. KIT CONTENT

1. Extraction unit 1X10L volume – 1 pc.
2. Filter bag 10L, 34 microns – 2 pc.
3. Filter bag frame - 1 pc.
4. Metal distance plate – 1 pc.
5. Dynamometric wrench – 1 pc.
6. Load solvent hose - 1 pc.
7. R134a tank connection adapter - 1 pc.
8. Sector wrench - 1 pc.

## 2. BASIC PARAMETERS

1. Extractor volume 1 x 10 L
2. Solvent type: tetrafluoroethane (R134a)
3. Maximal solvent content – 32 kg
4. Maximal extraction pressure – 16 bar
5. Electric supply 220 - 240 VAC
6. Maximal electrical load – 4 kW
7. Dimensions L x W x H – 1080 x 780 x 1550 mm
8. Weight – apr. 450 kg

## 3. BASIC ELEMENTS

1. Refrigerating Unit - Heat pump, - 1 pc
2. Air vacuum pump, - 1 pc
3. Solvent pump Extractor - 10L, with heater - 1 pc
4. stainless steel, flange cover - 1pc
5. Air compressor – 100 PSI Oilless - 1 pc
6. Evaporator – 32 l, stainless steel, flange cover, with electric heater - 1 pc
7. Frame – stainless steel frame with panels - 1 pc
8. Solvent receiver – 30 L volume, stainless steel - 1 pc
9. Air-driven valve - pneumatic rotary actuator - 1 pc
10. Level switch - on when filled/off when empty – 2 pcs;
11. Temperature sensor surface type - 3 pcs;
12. Pressure sensor – 4 pcs;
13. Valve position sensor – 9 pcs;

## 4. BEFORE START

The machine may require the Internet to work. At the back side of the machine, on the right side of the electric cable, there is an RJ-45 female connector - Fig. 1. The operator should connect an Ethernet cable between this RJ-45 connector (the orange arrow) and the local red, which

connects to the Internet. Additional settings for the red and the machine are required. Those will be made with your help, a computer, and our specialists remotely.

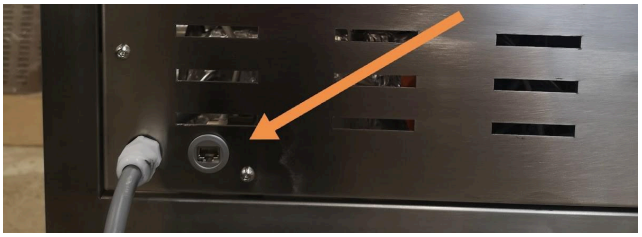

Fig.1. ( RJ-45)

# 5. GENERAL PROCEDURES

## 5.1. MANUAL PROCEDURES

### 5.1.1. EXTRACTOR LOADING

Grind the raw material in an appropriate grinder/cutter.
Place the metal case inside the filter bag, then add the desired amount of fraction to the filter bag (Fig. 1a). Close the top of the bag with a strip tie or zip tie (Fig. 1b). Next, place the metal distance plate (Fig. 1c) on the bottom of the extractor. Load the filter bag with raw material in the extractor (clip up). Place the upper flange on the extractor following the orientation (Fig.2). Tighten the extractor flange bolts with a wrench (tight position) using a diagonal pattern (Fig.2).
**The torque wrench must be set to 90 Nm ( 67 ft.lbs)**

Fig. 1a Fig. 1b Fig. 1c

Fig. 1

Switch the “**Main switch**” on the electrical box to the **ON** position. Start extraction procedures from the main screen for the beginning of extraction cycles - **Start Extractor** (see 5.2.3).

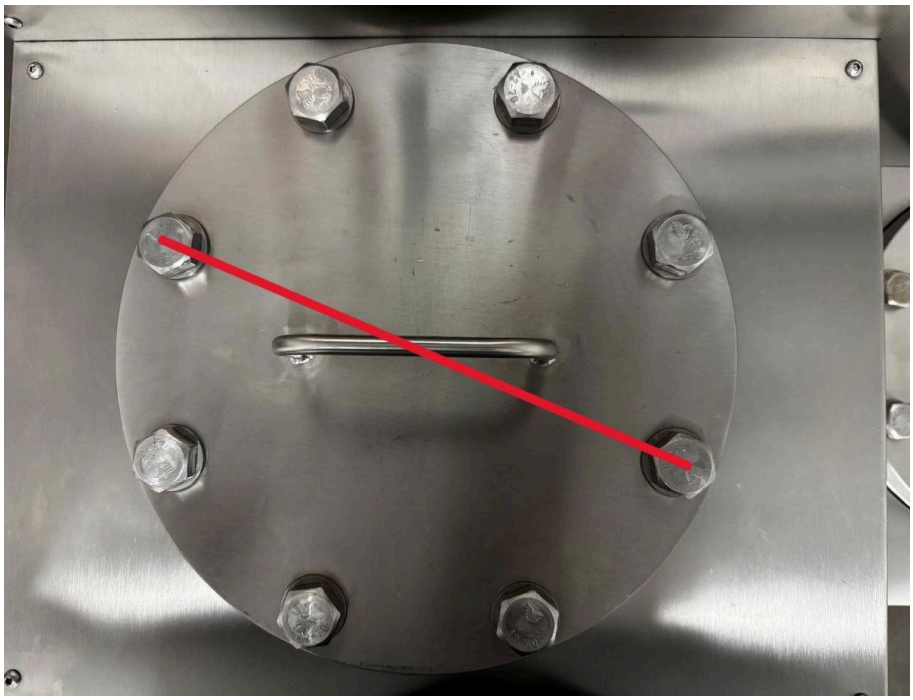

Fig. 2

### 5.1.2. EXTRACTOR RESIDUE DISCHARGE

After the extraction is finished, release the extractor flange bolts with a wrench (in the release position) using a diagonal pattern (Fig. 2). Then, remove the flange from the extractor. Remove the filter bag with residue from the extractor.

### 5.1.3. EXTRACT DRAINAGE

After the extraction cycle is finished, a message will appear on screen “**Remove Extract and Press NEXT” (The message will disappear when pressing the “NEXT” button or when all the running processes are complete)**. In case of collecting different fractions for each cycle, place a suitable container below the evaporator and gently open the drain valve at the bottom of the evaporator. The extract will start flowing in the vessel due to pressure. After completing the extract drainage, close the valve and store the product. After that, or in case of common extract collection, press the **“NEXT”** button on the touch screen for the subsequent automated operations.

Depending on the raw material used, the liquid or viscous material may be drained with or without pressure. If your extract is viscous or liquid but cold, you could drain by pressure. However, if you work with liquid and/or hot extract, it is recommended to drain the extract after completion of all automation processes. First, perform the OPEN EVAPORATOR procedure to recover all freon vapors from the evaporator and lower the pressure to 0 Bar. Then, proceed with *draining*.

***IMPORTANT NOTE*: The extract must be drained (collected) every 24 hours (when the machine runs 24/7) or after every 10 started extractors!**

### 5.1.4. INTERNAL EQUIPMENT CLEANING

For this purpose, the machine must have completed all the processes.
First, run the “Open Evaporator” procedure from the main menu, if it has not already been done. Once it is completed, remove the flange from the evaporator, manually scrape the remaining extract from the internal surface, and collect it. Wipe the evaporator off with a paper towel wetted with alcohol or acetone. Remove the extraction bags and the distance plates from the extractor and wipe them off with a paper towel wetted with alcohol or acetone. Close the extractor with the flanges and all the bolts tied up, close the evaporator with the flange and all the bolts tied up. For cleaning the system pipes, start one empty extraction for 5 min. at 45*C degrees.

This procedure transfers solvent from the receiver to the extractor, then from the extractor to the evaporator, and back to the receiver, thereby cleaning up the system.

After completing the automated cleaning procedure, manually clean the inner surface of the extractors and the evaporator. Use a wetted mop or paper towel with alcohol or other organic (alcohol or acetone) suitable solvent to remove residues of contamination!

***IMPORTANT NOTE*: Between two different raw materials, clean internal surfaces of equipment well! This involves carefully cleaning extractor and separator.**

### 5.1.5. BAG CLEANING

Release the stripe tight and pour the residue into a plastic bag for disposal or further treatment. In the case of the same raw material extraction, carefully remove the residue particles from the filter bag by hand. For other types of raw material extraction, after particle removal, wash the bag thoroughly with plenty of water (without detergent) until the inner side of the bag is clean. Then dry the bag. The bag is ready for use after total dryness. Skip the washing procedure if the same type of raw material will be used. The bag must be kept clean to prevent the extract from particles. The bag can be cleaned with alcohol if it becomes dirty.

### 5.1.6. EVAPORATOR CLEANING

After the final extract is removed, the bottom valve should be closed. If pressure in the Evaporator is over 0.3 Bar, start the procedure **“Open Evaporator”** from the main screen.

When it is ready to be opened, a message - **“EVAPORATOR READY FOR OPEN, PRESS NEXT TO CONTINUE“**
will appear. This procedure removes solvent vapours, and a manual cleaning procedure can be done. For the final stage of cleaning, surfaces should be wiped clean with alcohol or other (alcohol or acetone) organic solvent to remove residues of contamination! Remove the flange of the Evaporator, pour in 100 ml of organic solvent, and leave for soaking for at least 15 minutes. After that, drain the solvent in a vessel by opening the extract drain valve. Open and close the valve several times continuously to clean its ball. Leave the flange open and the extract drain valve till total drying of surfaces.

After the separator is cleaned, close the drain valve, tighten all bolts, and start the **“Close Evaporator”** procedure from the main screen.

### 5.1.7. LOAD SOLVENT

This is a procedure for adding a solvent to the system. To be done after every 30 loads is a must. This will prevent problems during the extraction process. After every 30 extractor runs, a message **“Please start procedure LOAD SOLVENT”** appears**.** This procedure must be completed before the machine can operate normally. For this, prepare a tank of R134a refrigerant with a minimum volume of at least 7 kg.

***IMPORTANT NOTE: Keep the R134A tank with the charging valve UP! The solvent pump works only with gas phase!***

Connect the charging hose to the tank firstly and after that to the charging valve **“SF-valve“** shown (Fig.3). Open the valve on the refrigerant tank and be sure to remove air in the hose by releasing it for few seconds before tighten the connection to the **“SF-valve“**, Thigh the connection firmly then open the charging valve and select button **“LOAD SOLVENT”** which is placed on the third menu named “Extraction Status” (Fig. 7) When the message **”Connect R134 tank to SF valve, open and press NEXT“** appears and you already have connected the tank to the system press “**NEXT”** to continue. To fasten the procedure of loading the solvent, the solvent tank might be placed into warm water. If is necessary to switch the R134a tank with new one before Load Solvent procedure is complete, simply close **SF valve,** then the tank valve, disconnect the empty tank, connect the new R134a tank, remove air in the hose and open the tank valve and the **SF valve** to continue loading solvent until the procedure is complete.

***IMPORTANT NOTE: Do not forget to close SF valve while switching an empty R134a tank with a full one during the LOAD SOLVENT procedure. This will prevent air from entering the system and solvent leak!***

When the message **“Close SF valve, disconnect the bottle, and press NEXT“** appears on

screen, this procedure is complete. Close the **SF valve,** then close the tank valve. Disconnect the charging hose from the extraction unit.


Fig. 3

## 5.2. AUTOMATED PROCEDURES

### 5.2.1. Functions

Fully automatic Programmable Logic Controller (PLC) touch screen interface (Fig. 4). The PLC controls the regular operation of the machine, shows information on screen and enables interaction with the Operator.

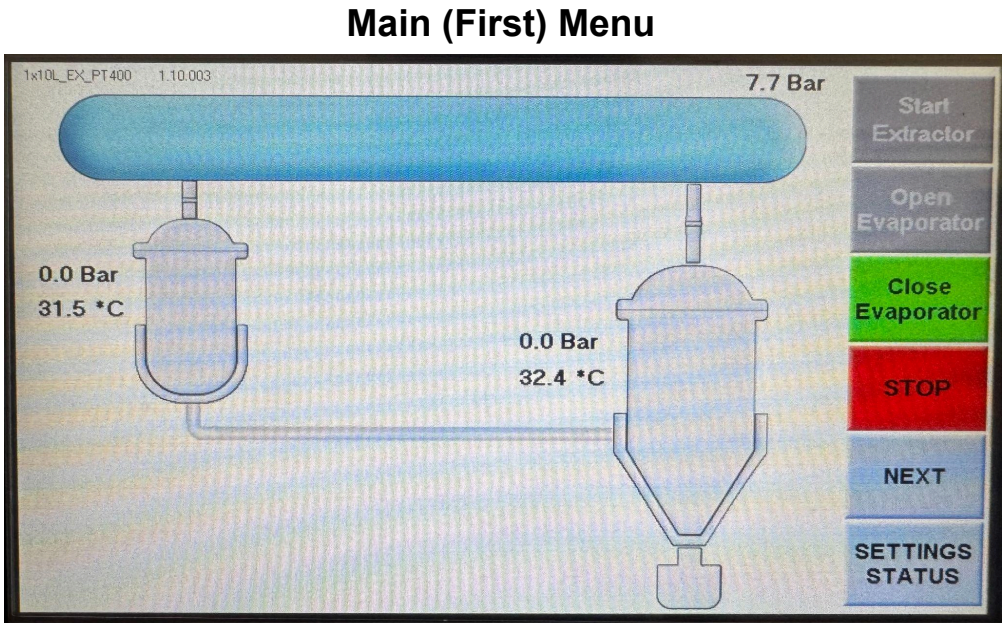


Fig. 4

### 5.2.2. Safety Precautions

Pressure transducers monitor system pressure and shut down the system to prevent accidental over-pressurization.

### 5.2.3. Running the software

#### 5.2.3.1. Initial states

Tight the flanges to the extractor (raw material loaded) and the evaporator.
All valves closed.
Main switch (Fig. 5) position - **ON (1)**.


Fig. 5

**MAIN SWITCH** (Fig. 5) - This switch has two positions.

**OFF -> 0** The power supply is OFF.
**ON -> 1** The power supply is ON.

#### 5.2.3.2. Selection of extraction parameters.

Before starting the extraction process, Operator should enter the desired extraction and operational parameters. Once entered, they stay in memory and no need to be re-entered before each start. Press the **"SETTINGS STATUS"** button at the Main menu (Fig. 4) then a second menu "**PARAMETERS"** will appear. (Fig. 6)

## Parameters (second) menu

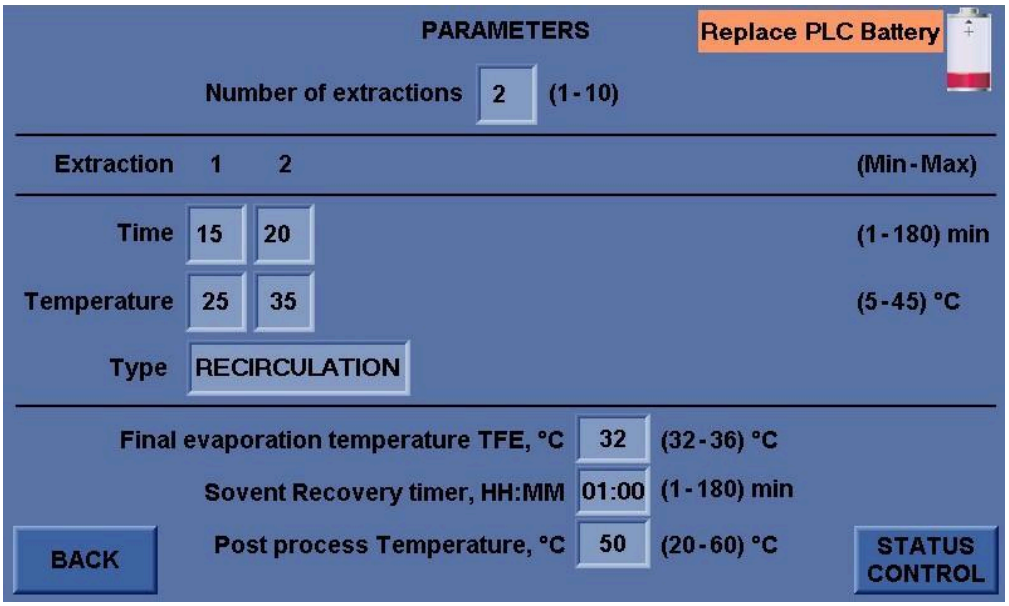


Fig. 6

Select the extraction parameters:

- Number of extractions (1 - 10), **mandatory**
- Time for extraction (1 - 180 min), **mandatory**
- Temperature of extraction (5 - 45° Celsius), **mandatory**

Select optional parameters:

- Final evaporation temperature TFE, °C (32 - 36 °C), ***optional***
- Solvent recovery timer (1 - 180 min), ***optional***
- Post Process Temperature, °C (20 - 60°C), ***optional***
- Number of extractions set from 1 to 10 cycles for one load;
- Time for extraction is the time for each extraction.
- The temperature of extraction is the temperature in °C for each extraction.
- Final evaporation temperature is the temperature in the Evaporator vessel that is due to be achieved during the final evaporation of each extractor.
- The solvent recovery timer is the time allocated for drying the material after extraction. It could be changed depending on the raw material used; No need to change from the default value, and *highly recommended not to lower it less than 1 hour*.
- Post-process temperature refers to the temperature maintained in the Evaporator vessel after all processes are complete, ensuring the viscosity of the oil is maintained, making it easier to drain.

Touch **“Back”** to return to the Main menu (Fig. 4).

#### 5.2.3.3. Preparing the Evaporator

When the evaporator is clean, the drain valve is closed and the flange is tied with all bolts, press the **"CLOSE EVAPORATOR"** onscreen button. This procedure will evacuate the air out of the evaporator and prepare the unit for operation. Start Extractor button is not visible if **CLOSE EVAPORATOR** procedure is needed but not done. When procedure is completed, **"Evaporator Closed, press NEXT to continue"** message appears on screen waiting for confirmation.

#### 5.2.3.4. Extraction

When the extractor is loaded and the flange is tied with all the bolts, Evaporator is closed previously (If Evaporator has been previously opened, after its flange is tightened, first thing to do is close its drain valve and press **Evaporator Close** button), press **"START EXTRACTOR"** from the Main menu (Fig 4). After the extractor is started, next to it on the main screen will appear a warning sign **DO NOT OPEN**. This sign will disappear when the extractor is complete and when it is safe to be opened for cleaning or to be reloaded.
This button initiates a sequence of processes that can be traced in the STATUS screen (third menu). To navigate to this screen from the Main screen, touch the **"SETTINGS/STATUS"** button from the Main screen - that will take you to the Second Screen - Parameters, press the **"Extraction status"** button (Fig. 6). Once this button is pressed, the Extraction status (third) menu (Fig. 7).
Currently active operation(s) are visualized by green dot(s). The inactive ones are visualized by red dots, in addition to their names.
When the cycle is finished, in the message box: **"Remove extract and press NEXT"** (The message will disappear after pressing the "NEXT" button or when all the running processes are completed).
When the process of extraction is complete, in the message box: **"OPEN EXTRACTOR"** (The message will disappear after pressing the "NEXT" button or when all the running processes are complete), at this point, the extractor can be opened for cleaning or to be reloaded.

If necessary or suspected a problem, the system allows immediate suspension of process through the **"STOP"** button. In that case, in the message box will appear a message **"Machine Stopped! Press NEXT to continue".**
If accidently pressed **"STOP"** button, automation can be restored by pressing **"NEXT"** from the Main screen or **"CONTINUE"** button from the Status (third) screen. This will resume the machine in the stage(s) it was before the **"STOP"** button was pressed.
If power interruption occurs during automation, the machine continues its automation after the power is restored. If needed by on screen message, confirm by "**NEXT"** or **"Continue".**
To reset the program, touch **"STOP"** to stop the automation process, **"RESET ALL"** button (Fig.7) when the machine has no running processes. This will reset all internal states and processes except the settings and the Parameters (second) menu (Fig 5).

***IMPORTANT NOTE**: Reset the software every time before initially starting the machine and every time after the machine has completed all the processes - all dots are red (at the end of the work day). To do this, go to Extraction status (third) menu (Fig 7), press "STOP" button first and then the button "RESET ALL". Resetting the software will ensure smooth work with the machine.*

## Extraction status (third) menu

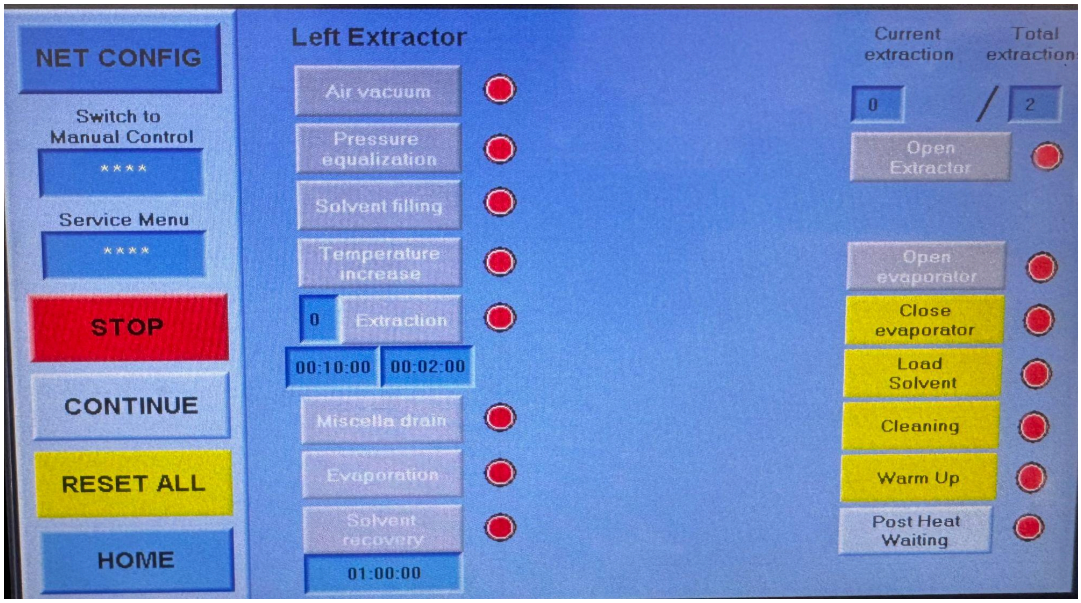


Fig. 7

### 5.2.3.5. Open evaporator

After the extraction is finished and the product is removed, the evaporator can be prepared for opening by using the procedure **"OPEN EVAPORATOR"**. The algorithm includes removing the solvent vapors from the evaporator taking them to the receiver. When the process is complete, the message **"EVAPORATOR READY, PRESS NEXT TO CONTINUE"** will appear. Now the evaporator can be opened manually.
Once the evaporator is cleaned up and the flange tied up with all the bolts and the drain valve closed, **"Close Evaporator"** procedure ***MUST*** be done. Otherwise no **Start Left Extractor** and **Start Right Extractor** buttons will be activated and the machine could not operate.

### 5.2.3.6. Open Extractor

For some Raw Material, it is possible to have the next situation: after finishing all automatic procedures and the machine is left with the material inside the extractor for some time (possibly

during night), pressure in extractor could rise because of the small amount of solvent inside. This procedure is made to recover all vapors from material before opening the extractor. Could be started if no other automatic procedure for extractor is running.

# 6. SAFETY MEASURES

1. **Read the instruction manual carefully before starting work.**
2. **DO NOT OPEN VESSELS WITH LABELS "DO NOT OPEN" BEHIND THE RIGHT COVER. They can only be opened after authorization by the manufacturer - Fig. 8**

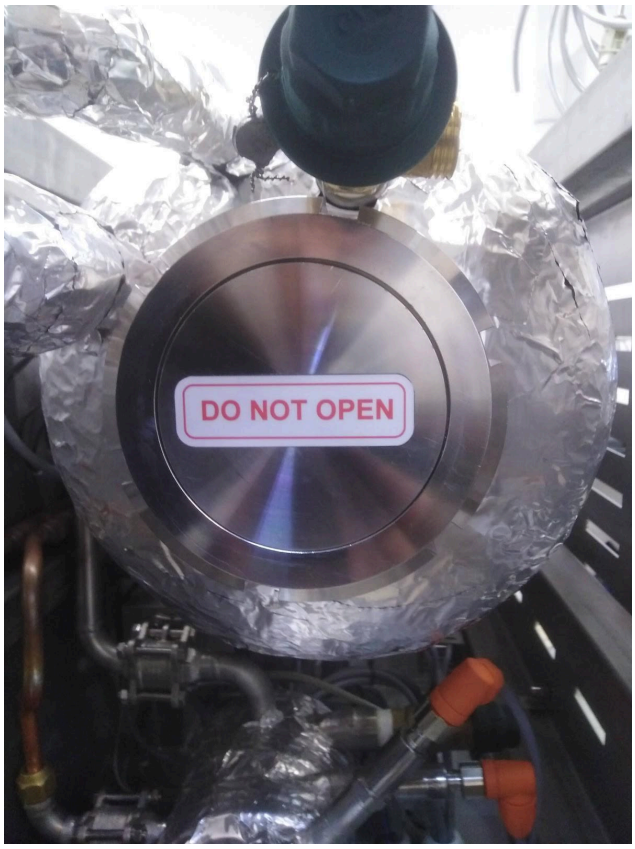


Fig. 8

3. **Do not open the electrical cabinet until you have turned off the main switch and unplugged it from the power outlet.**
4. **Install equipment in well ventilated rooms at temperatures 15-30°C. It is not recommended to operate in rooms below ground level because working gas is heavier than air.**
5. **Do not tighten or release flanges bolted under pressure in vessels!!!**
6. **Do not open the back door until extraction is in operation.**
7. **Do not touch hot surfaces like air vacuum pump, heat pump, electric heaters and top flanges of extractor and separator.**
8. **Use safety goggles for extract drainage and equipment cleaning procedures.**

9. **For air vacuum pump, air compressor, heat pump follow safety measures from their manufacturer instructions.**
10. **Be careful of touching sharp edges.**