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# 1 Brief Introduction

SOX606 fat analyzer is the full-automatic crude fat analyzer designed based on the principle of Soxhlet extraction .It is the ideal instrument of measuring the fat in the industry of food, oil and feed, and also is applied to the extraction or measurement of soluble compounds in the field of agriculture, environment and industry.

## 1.1 Features

1. The instrument working process really realizes the automation, and the user only weighs the mass of the sample;
2. The instrument adopts the large size touch color screen for displaying the operating system;
3. Five extraction ways: Soxhlet Extraction, Soxhlet Hot Extraction, Continuum Flow, Hot Extraction, Soxhlet CH Standard;
4. It will alarm automatically in case of ether leakage;
5. Monitoring Water Temperature and Flow;
6. Solvent automatic recovery;

## 1.2 Scope of application

- With measurement scope of 0.1-100%, it can measure the content of crude fat in food, feed, grain, seed and other samples;
- Extract the grease in the sludge;
- Extract the semi volatile organic compound in the soil, insecticide,

herbicide, etc.;

- Extract the plasticizer in the plastic, rosin in the paper and paper mold, grease in the leather, etc.;
- Conduct the digestion pretreatment of solid samples according to the gas and liquid chromatography;
- It can be used for other experiments of extracting the soluble compounds or measuring crude fat.

## 2 Technical Performance of Instrument

Technical parameters

1. Ultra wide temperature control range: The room temperature is +5°C - 300°C
2. Heating power: 1800 W
3. Rating power: 2000 W
4. Measure at most 6 samples at the same time
5. Solvent recovery rate: 85% (See page 30, 31)
6. Instrument recovery rate: 99%
7. Extraction speed: 1.5-2 hours, depending on the type of sample
8. Normal working conditions of instrument
  - a) Environmental temperature: (5 - 30)°C;
  - b) Relative humidity: Not more than 80%;

- c) Power supply: AC 220±10%V; (50/60±1) Hz;
  - d) Except for geomagnetic field, there is no interference of other electromagnetic fields;
  - e) Good ventilation or use in fume hood
  - f) Cooling water pressure:  $\geq 0.02$  Mpa; flow rate: 2L/min
  - g) Cooling water temperature: below 20 °C
9. Overall dimension of instrument (mm): 650×384×720
10. Weight (kg): 50kg

### 3 Instrument Structure



Figure 1

- 1 Heating module
- 2 Solvent cup ( figure 2)
- 3 PTFE sealing element
- 4 Extraction cup
- 5 Condenser pipe
- 6 Direction switch
- 7 Power switch
- 8 Color touch screen



Figure 2

Glass solvent cup

Fluorine plating solvent cup

Note: 1.If the heating temperature is less than 260 °C, please use the fluorine plating solvent cup which is easily cleaned.

If the heating temperature is more than 260°C, please use the glass solvent cup.

## **4 Instrument Use**

### **4.1 Instrument installation**

#### **4.1.1 Installation conditions**

1. Input voltage: AC 220±10%V; (50/60±1) Hz; Reliable grounding;
2. The instrument shall be installed in the place which is closer to the water source and drain basin and is equipped with power socket;
3. The power configuration shall conform to the requirements of the power supply for preventing electrical overload; It shall be equipped with grounding wire, and have the separate power supply switch and safety device for ensuring the electrical safety of Start personnel;
4. The instrument shall be installed in the place which is far away from large electric equipment and has no strong electromagnetic field interference;

5. The instrument should be installed in the fume hood or at a good vent.

#### 4.1.2 Installation steps

The instrument shall be placed on the Extraction bench steadily, the back of the instrument shall be 20cm distance from the wall, the power socket is not more than 1m distance from the instrument, and it is equipped with air switch and reliable ground wire. Water and electricity location are shown in figure 3, figure 4 below:

1. Right side of instrument,

- a. Location of power plug and fuse, switching on the power and replacing fuse;
- b. Power switch.
- c. Controller interface

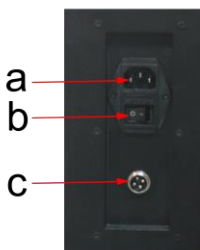


Figure 3

2. Left side of instrument,

- c. Condensate water inlet, connecting with inlet tube and tap water valve

d. Condensate water outlet, connecting with rubber tube and drain basin

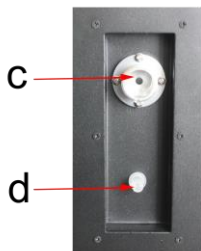


Figure 4



e. Solvent recovery port connected with PTFE pipe and solvent recovery bottle

#### 4.1.3 Solvent cup placement

1. Place at least 2 solvent cups. Place 2 solvent cups, preferably in positions 2, and 5;





2. Place 3 solvent cups, preferably in positions 2, 3, and 5;



3. Place 4 solvent cups, preferably in positions 2, 3, 4 and 5;



4. Place 5 solvent cups, preferably in positions 1, 2, 3, 4 and 5;



## 4.2 Function introduction

The instrument mainly has 5 fat extraction ways: Soxhlet Hot Extraction, Soxhlet Extraction, Continuum Flow and Soxhlet CH Standard. The different extraction way can be chosen according to the user's different requirements.

### 4.2.1 Starting

Switch on the power, turn on the power switch and controller switch successively, the instrument will start the self-checking, and later display the start image, as shown in figure 5.

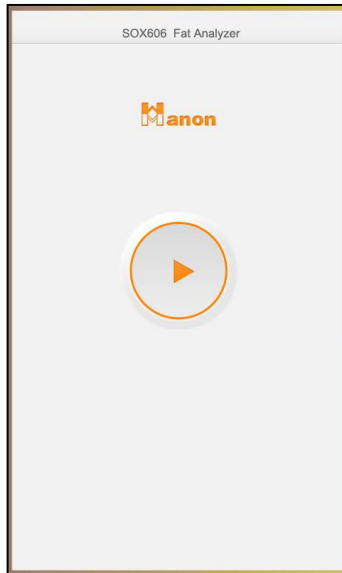



Figure 4

Click the start button  in the center of screen for entering the system, as shown in figure 6, which is called the initial state of the instrument. All Starts of the instrument start from here. There are 5 function menus - [Method], [Extraction], [Recovery], [Setting] and [Help] at the bottom. It is [Extraction] menu by default.

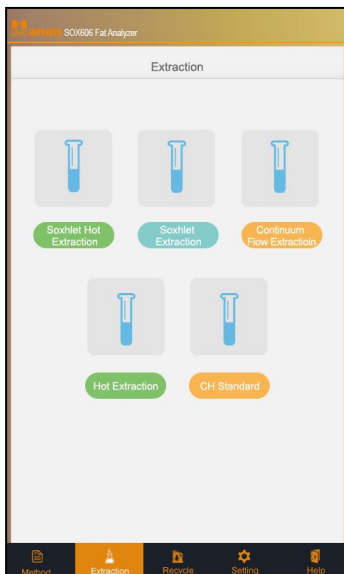


Figure 5

#### 4.2.2 Extraction

[Extraction] menu includes 5 items: Soxhlet Hot Extraction, Soxhlet Extraction, Continuum Flow and Soxhlet CH Standard, with interface display as shown in figure 6.

The user can choose the different experimental Method and different extraction way according to the different experimental requirements, and set up the extraction temperature, time and pre-drying time, and the experiment can be conducted. The interface of all extraction ways is as shown in figure 7-11:

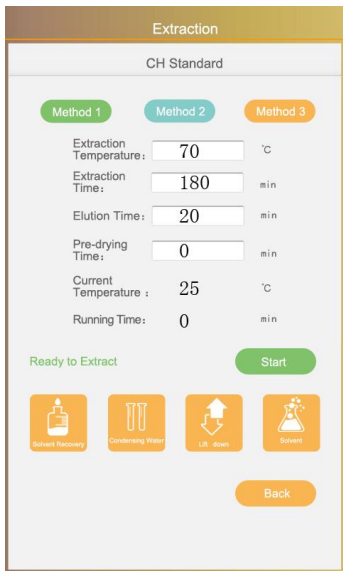


Figure 7

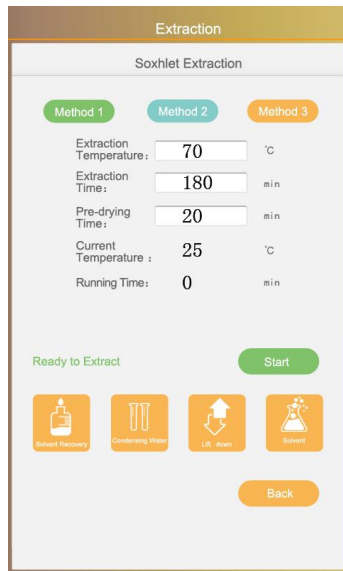


Figure 8

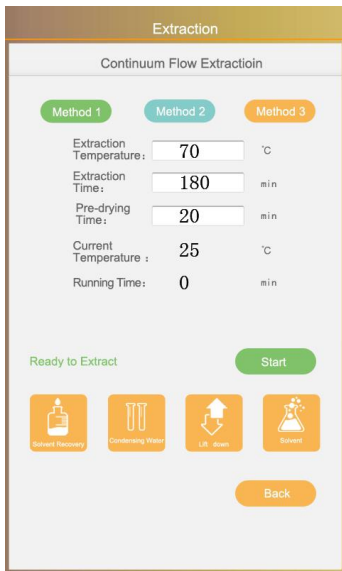


Figure 9

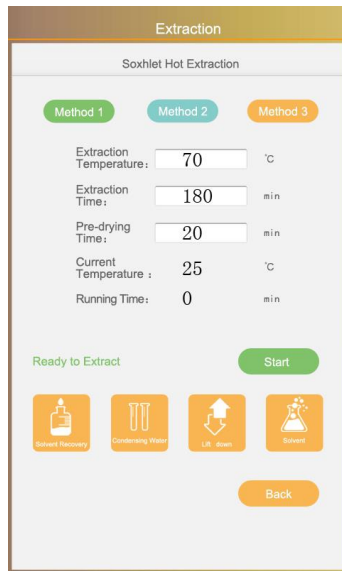


Figure 10

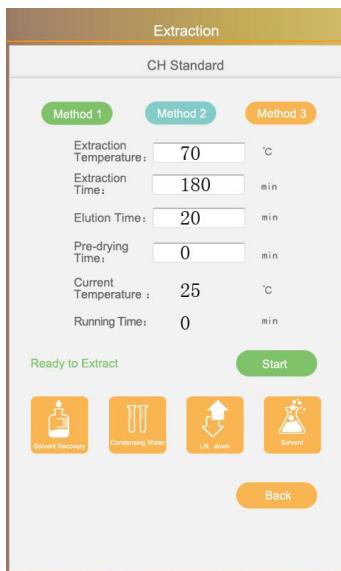


Figure 11

After setting up the corresponding parameters, click [START] button and enter the Extraction interface, as shown in figure 12. In the experimental process, press [Stop] button for stopping heating, as shown in figure 13. Press "START" again, it will heating again. After reaching the setting time, the interface is as shown in figure 14.

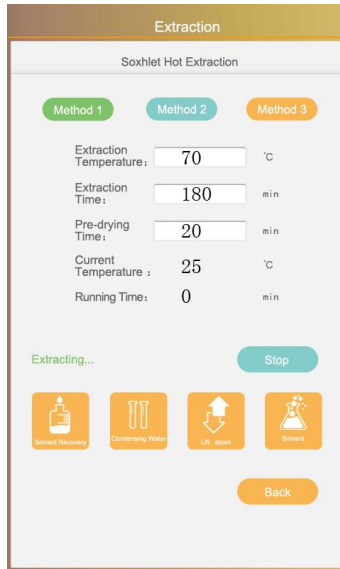


Figure 6

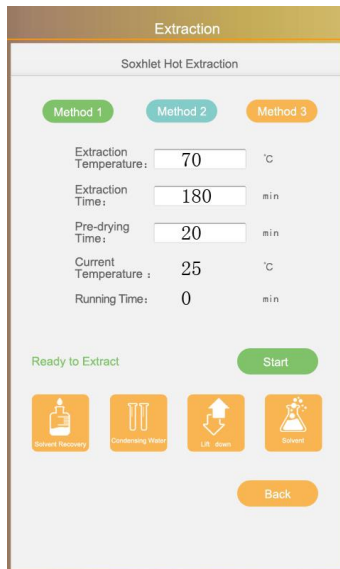


Figure 13

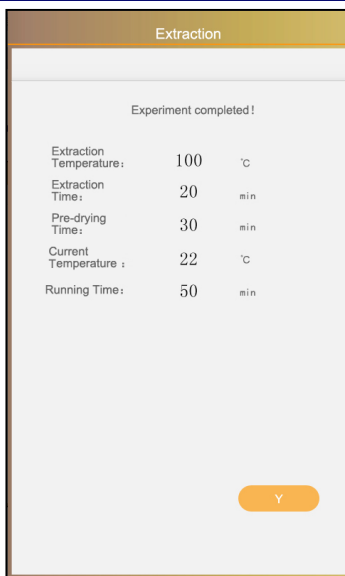










Figure 14

	Solvent Automatic Recovery Function Opened		Solvent Automatic Recovery Function Turn Off
	Cooling water flow is normal		Low flow of cooling water or no open cooling water
	The heating cup lifting in place		The heating cup lifting is not in place
	The solvent is not leaked		Solvent leakage

#### 4.2.3 [Method]

Click [Method] button for entering the interface as shown in figure 15-16, choose Method 1, 2 and 3 respectively for clicking the setting as the user's alternative Method, and avoid the repeated setting of each Extraction.



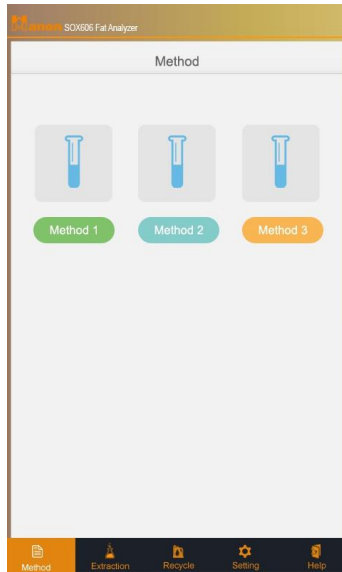


Figure 15

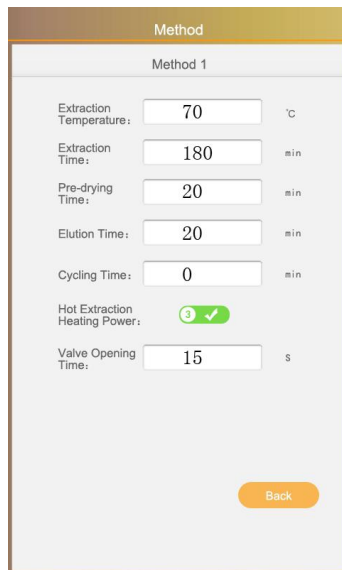


Figure 16

### 4.2.4 Settting

[Setting] menu includes 3 items: [Hardware Extraction], [System Setting], [System Calibration]. Under the main interface state, choose [Setting] item, with interface as shown in figure 17.

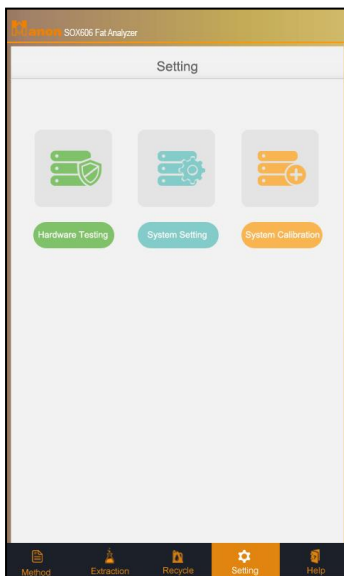


Figure 17

Choose the corresponding setting item for setting up the corresponding instrument parameters. The following is the specific setting Start of all parameters.

4.2.4.1 Choose [Hardware Testing] item, with interface as shown in figure 18. Click each item for checking whether all functions are normal.

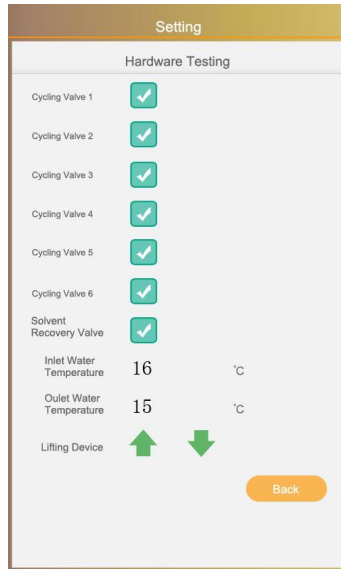


Figure 18

4.2.4.2 Choose [System Setting] item for entering the interface as shown in figure 19, display the working status of the functions of ether detection, water flow detection and automatic recovery

Ether detection: When the button is opened, the screen shows the alarm status of organic solvent leakage, but not when the button is closed.

Water Flow Detection: When the button is turned on, the screen will show whether the cooling water has been detected. When this button is turned off, it will not be displayed

Automatic recovery: When the button opens, the screen shows that the current state is solvent automatic recovery, and when the button closes, solvent manual recovery.

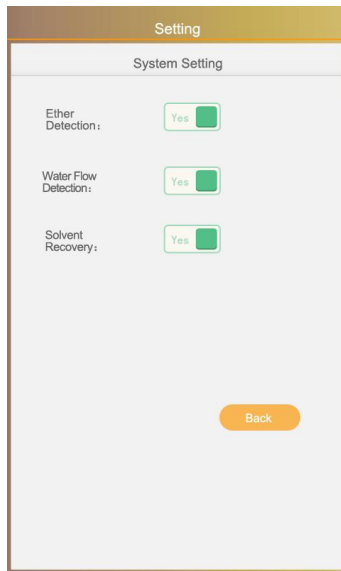


Figure 19

4.2.4.3 Choose [System Calibration] item, with interface as shown in figure 20.

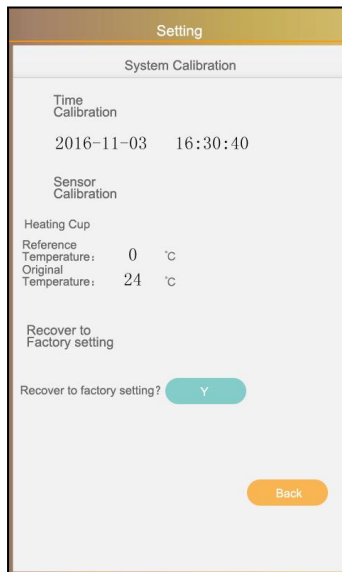


Figure 20

Choose "sensor calibration" item in the "system calibration" interface, with interface as shown in figure 21.



Figure 7

The user can correct the temperature of heating cup and finally press the OK, and the instrument will return to "system calibration" interface.

Choose "system initialization" in the "system calibration" interface, with interface as shown in figure 22. After clicking "Yes", all system parameters of the instrument will be restored to the factory value.

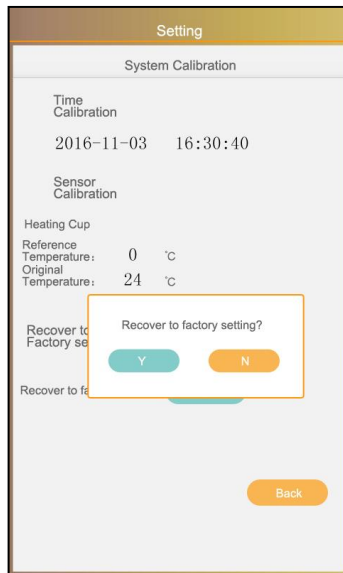


Figure 8

4.2.4.4 Choose "Time Calibration" item, with interface as shown in figure 23. Input the correct time through the digital interface.

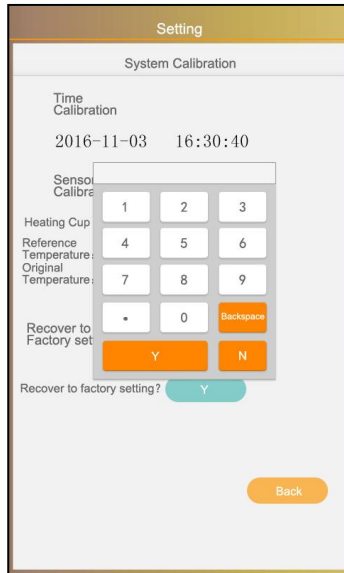


Figure 9

#### 4.2.7 Help

Choose [Help] item under the initial interface, with interface as shown in figure 24.

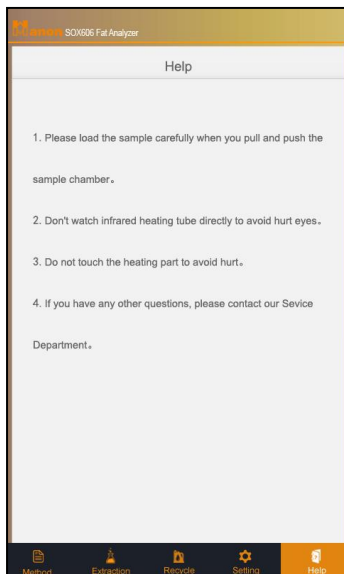


Figure 10

## 4.3 Sample pretreatment

### 4.3.1 Food sample pretreatment:

4.3.1.1 Solid samples: Take at least 200g representative sample, and crush with mortar, grind and mix the sample evenly, and place it in the airtight glass container;

For sample which is not easily crushed and ground, cut (shear) it into fine particle, and place it in the airtight glass container.

4.3.1.2 Powdery samples: Take at least 200g representative sample (for larger particle, grind with mortar), mix it evenly, and place it in the airtight glass container.

4.3.1.3 Pasty samples: Take at least 200g representative sample, mix it evenly, and place it in the airtight glass container.



4.3.1.4 Solid and liquid samples: Take at least 200g representative sample according to the solid-liquid ratio, and crush it with kinematica.

4.3.1.5 Meat products: Take at least 200g representative sample with inedible part removed, and grind it with meat grinder for twice, and mix it evenly, and place it in the airtight glass container.

#### **4.3.2 Feed sample pretreatment:**

4.3.2.1 If the sample has been crushed or fat content is lower, refer to 4.3.1 for treatment.

4.3.2.2 If the sample is not easily crushed, or fat content is high (exceeding 200g/kg), extraction in advance shall be conducted. (If adopting such experimental steps, pay attention to add the fat mass removed in this experimental step in the experimental data processing process)

#### **4.4 Sample Extraction**

4.4.1 Install the instrument, and connect the pipeline.

4.4.2 According to the experimental requirements, take sample  $m$ , and weigh the mass of drying solvent cup  $m_0$ ; Place the sample in the filtration paper cylinder of the instrument, put the filtration paper cylinder on the sample holder, and place it in the extraction room.

4.4.3 Measure the solvent required by the proper volume with measuring cylinder, and add it to the extraction room, and place the solvent cup in the heating plate.

4.4.4 Open the condensate water, and start the instrument. Set up the

extraction temperature, extraction time and pre-drying time. After setting up the extraction cycle time in the system setting, start the experiment. In the Extraction process, the solvent inside the solvent cup will volatilize and condense inside the condensate pipe after being heated by heating plate and flow back to the extraction room. After reaching the set extraction cycle time, the solenoid valve will be opened, and the solvent in the extraction room will flow into the solvent cup, forming an extraction cycle.

4.4.5 After finishing the experiment, the lifting device will fall down, and solvent cup will be moved. Dry in the drying oven, place in the dryer for cooling to the room temperature, and weigh the mass of solvent cup containing crude fat  $m_1$ .

4.4.5 Place the proper container in the heating plate, and open the solenoid valve with the corresponding number for recovering solvent.

4.4.6 Calculate the fat content (self-calculation or input the instrument for calculation)

$$X = \frac{m_1 - m_0}{m} \times 100 \%$$

Wherein:

X - crude fat content in the sample (g/100g);

$M^1$  - mass of solvent cup and crude fat (g);

$M^0$  - mass of drying solvent cup (g);

M - mass of sample (for the sample after the moisture analysis, calculate according to the mass before the moisture analysis) (g).

## 5 Common fault and handling methods of instrument

No.	Fault cause	Reason analysis	Troubleshooting way
1	No electricity for the complete machine	Fuse blown Power line fails to be fixed solidly	Replace the fuse Plug the power line
2	Solvent gas leaks in the experimental process	1. Condensate water flow is insufficient or flow switch is damaged 2. Photoelectrical limit switch location is wrong or the switch has the failure 3. Condenser pipe is damaged 4. Seal washer is aged	Increase water flow or replace flow switch Adjust the photoelectrical limit switch location or replace the switch Replace the condenser pipe Change the seal washer
3	The instrument in the experiment doesn't lift down or the location is wrong	The lifting system is damaged Limit switch location is wrong	Replace the lifting parts Adjust the limit switch location
4	Touch screen is abnormal	Touch screen has the failure	Restart the instrument for experiment, indicating the touch screen damage under the abnormal situation

5	The instrument works abnormally and shuts down	Check whether there is high magnetic field or strong electrical field interfering with the instrument	Press the reset or close the instrument, and move away the interference source and restart the instrument
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## 6 Daily Maintenance of Instrument

1. Because the instrument shall be heated during working, there shall be good ventilation and heat emission conditions;
2. The same kind of solvent shall be used within the same set of extraction system within the short time as far as possible for preventing the solvent from cross contamination;
3. Pay attention to the cleaning of receiving barrel and extraction barrel, and clean them regularly.

## 7 Supplementary Provisions

The product will be offered with one-year warranty period from the selling date (the issued invoice date shall prevail), except for the following conditions:

1. Beyond the warranty period;
2. Damage caused by the improper use;
3. Damage caused by the disassembly without the manufacturer's permission;
4. Damage caused by the improper transportation and safekeeping.

## 8 Notes

1. There is glass ware in the instrument, so be careful during the handling;
2. Shut down and plug out the power line, and wait for the cooling of heating system when repairing the internal instrument parts;
3. Condensate water outlet is lower than the instrument for guaranteeing the smooth emptying of condensate water;
4. Empty the solvent in the condensate pipe when the instrument is out of use for a long time;
5. The same kind of solvent shall be used within the same set of extraction system within the short time as far as possible for preventing the solvent from cross contamination;
6. The instrument carried out the Extraction before the factory, and it is normal phenomenon to have effusion;
7. Prevent liquid from flowing into inner instrument;
8. Don't touch the platform with hands during the heating state to avoid hurt;
9. The staff shall not leave the laboratory in the Extraction process.

## 9 Safety Statements



### Notes:

**If the user doesn't use the method specified by the manufacturer for Start during the Start, the protection of this instrument may be weakened.**



1. Carefully pick and place all kinds of solvents in the analysis process in strict accordance with the safety specifications of the laboratory. Select the proper material for picking and placing the solvent according to the safety instructions in the solvent manual, and pay attention to protecting the eyes during the Start.



2. There may be explosion hazard when picking and placing the organic solvent, and the operator shall avoid the solvent from being exposed to the open flame and electrostatic environment.



3. The cover or panel can only be opened by the professionals.



4. The equipment is equipped with three-phase plug, and requires to be connected to the qualified and matched grounded electric socket.



5. The stainless steel surface and solvent cup of the instrument may be relatively hot during the heating for avoiding scald.



6. Disconnect the power supply before replacing the fuse.

## 10 Temperature Value Reference

Due to the impact from heating indoor temperature, heating plate to solvent cup heat transfer efficiency, make the proper adjustment when setting up the extraction temperature.

The drop liquid speed under the proper temperature is about 3-5 drops /second.

<b>Solvent</b>	<b>Extraction temperature (°C)</b>
30-60petroleum ether	70
60-90 petroleum ether	100
90-120petroleum ether	130
Ether	50
Acetone	80
Dichloromethane	60
N-hexane	110
Methyl alcohol	120
Ethyl alcohol	120
Chloroform	82
Benzene	100

### Solvent recovery rate

No.	Experiment condition	Time	Solvent	Recovery	Pre-drying (automatic solvent recovery) time
1	Environment temperature: 25°C Environment humidity: 50% Cooling water temperature : 15°C Cooling water pressure: 0.3Mpa	90min	30-60petroleum ether	≥85%	20min

2	Environment temperature: 25°C Environment humidity: 50% Cooling water temperature : 15°C Cooling water pressure: 0.3Mpa	90min	60-90petroleum ether	≥85%	20min
3	Environment temperature: 25°C Environment humidity: 50% Cooling water temperature : 15°C Cooling water pressure: 0.3Mpa	90min	90-120petroleum ether	≥85%	25min

## 11 Transportation Instructions

Empty the solvent and cooling water in the instrument before the transportation. The method of emptying the cooling water in the instrument is as follows:

1. The water inlet is ventilated, and then the cooling water can automatically discharge from water outlet until full discharge.
2. After emptying all cooling water, turn off the instrument power and then conduct the packing.