Kalstein

YR-Series Rotary Evaporators

Instruction Manual

Thank you very much for purchasing our YR-Series Rotary Evaporators.

Please read the “Operating Instructions” and “Warranty” before operating this unit to assure proper operation. After reading these documents, be sure to store them securely together with the “Warranty” at a hand place for future reference.

 Warning: Before operating the unit, be sure to read carefully and fully understand important warnings in the operating instructions.

Kalstein®

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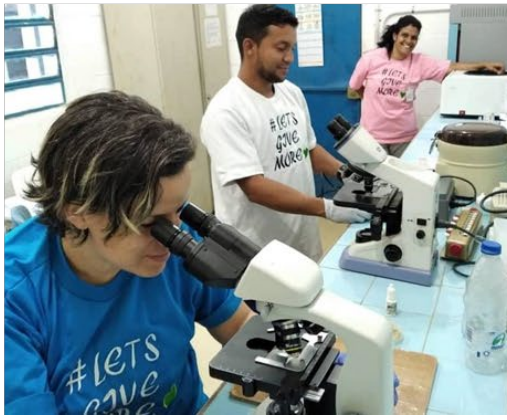

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We take care of all the necessary logistics for the dispatch of your goods, whether is by sea, land or.air.

Kalstein Worldwide

With more than 25 years growing with our customers, Kalstein's multiformat and modern content, is now present in more than 10 countries and increasing.

Name and model

YR-Series Rotary Evaporators YR02307, YR02308, YR02309, YR02310

Introduction

Thanks for using “Kalstein´s YR-Series Rotary Evaporators”. This operation manual stated the installation, using, maintaining and servicing of rotary evaporators. Before using this instrument, please ensure that you have read and understood this manual completely.

1. Safety

This chapter described the installation, safety rules in the process of using “Kalstein´s YR-Series Rotary Evaporators”. Users must grasp the related warning signs, strictly abide by the operation procedures to ensure the security of the equipment and personal and avoid the occurrence of accident.

1. User’s Qualification

Kalstein´s YR-Series Rotary Evaporators must be operated by the person who has the practical operating experiences and can grasp of the detailed requirements in this manual. Otherwise, it must be used under the guidance of the person who has the related technology skills.

2. Proper Use

This instrument is designed and manufactured for the use of laboratory work such as solvent extraction and mixing solution. It can be used for the following experiments or production：

a) Evaporation;

b) Distillation

c) Separation of chemical

d) Using the rotating bottle to dry the powder

e) Crystallization.

3. Improper Use

The operation which does not according to the related stipulations in this manual are regarded as improper use. Any damage caused by improper use are responsible by the users themselves.

Operating under the following conditions is prohibited:

a) Explosive gas environment or explosive dust environment

b) The places which the power supply is not in conformity with the requirements

c) Deal with hard and brittle materials (such as rock and soil samples, etc.), this might damage the evaporating flask;

d) Sample volume in the evaporating flask in excess of the prescribed limit

e) Used in high magnetic fields, corrosive environment.

4. Warning Signs

Sign	Description
	Danger It shows that the situation is very dangerous and will lead to death or serious injury.
	Warning It shows that the situation is very dangerous and will lead to death or serious injury
	Prohibit Get wet in the rain or splashing water.
	Note It shows that the situation is very dangerous and will lead to injury.

	Note Note high temperature
 Note	Note Do not close to the rotary parts
	Note Please wear protective equipment, otherwise may cause personal injury
Reminder	Reminder May cause equipment damage.

All warning signs must be noted excessively.

5. Hazards Related to the Instrument

Please pay attention to the following safety tips

 Danger	Danger ● Do not use it in explosive gas environment or explosive dust environment
 Warning	Warning ● Make sure that the power supply is in conformity with the requirements on the nameplate. ● Please place the equipment equipotential connection and earthed reliably. ● Before open the equipment enclosure for maintenance and repair, be sure to disconnect the power supply, then operate it after 5s, ensure the residual voltage release to safety value to avoid electric shock. ● Do not use the broken glass devices； ● If the solvent vapor accumulates in the instrument shell, there may be an explosion risk
 Prohibit	Prohibit ● Do not use it outdoor. Get wet in the rain or splashing water will cause electrification on metallic shell surfaces, and will cause casualties.
	Note ● High temperature may be on the surface of the parts, especially the surface of the bath and the evaporating flask, do not touch with the body directly, to avoid scald.
 Note	Note ● If there's any abnormal situation when using it, please disconnect the power supply immediately for troubleshooting or contact professional maintenance personnel. ● Beware of the damaged or broken glass.

	● Adding solvent or dry powder to the instrument through the feeding tube can produce static electricity.
Reminder	Reminder ● Please use it in the prescribed environmental conditions. Otherwise, it will affect the normal running and lifetime of the instrument. ● Keep good ventilation around the Instrument; ● Avoid to start the heating function in the case of no water in the bath ● Avoid using it in unattended situations.

6. Other Hazards

	● The sample added into the instrument or some solvents near it may form peroxides, high concentration of flammable solvents, etc ● If there's any corrosive material such as acid, alkali vapor around the equipment, the equipment insulation will be damaged and the components performance and service life will be impacted. ● Beware of the risk of explosion when dealing with dangerous substances or unknown components of the sample,

7. Safety Measures

	● Please wear personal protective equipment such as protective glasses, protective clothing and gloves when operating this instrument.

2. Instrument Introduction

Kalstein´s YR-Series Rotary Evaporators is the material separation or distilling device which a rotary flask is heated in a water bath while rotating at a predetermined speed at the same time to evaporate the solvent, and then cooled by a reduced-pressure cooling unit which composed of a condenser and a vacuum acquisition device. It usually works with water circulating vacuum pump and recirculating chiller as a whole system to meet the production and experimental conditions.

3. Instrument Configuration

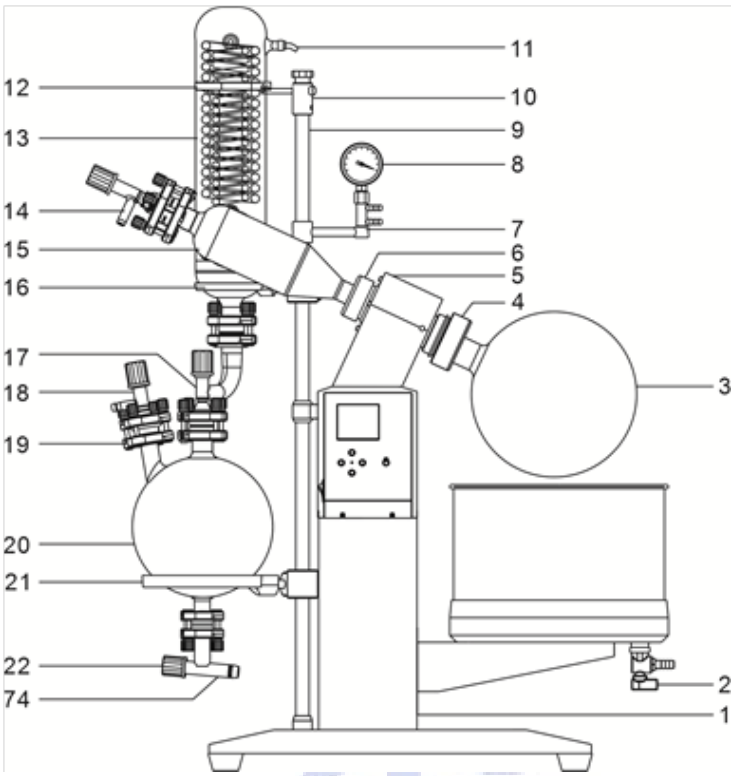


Figure 1 YR02307 machine configuration diagram

1.Main engine+ water bath
2.Angle valve（DN15）
3.Evaporating flask（5000mL）
4.Evaporating flask locknut
5.Rotation mechanism
6 .Three-way flask locknut
7.Vacuum gauge holder
8.Vacuum gauge
9.Upper pole
10.Condenser holder
11.Vacuum port
12.Silicone rubber shroud ring（16-200）
13.Condenser（100/455）
14.40# Feeding valve（40/300）
15.3-way flask （80/300）
16.Condenser support（Φ80）
17.Condenser /receiving flask connector（40/40）
18.Vacuum release valve
19.Flange sealing Kit
20.（3000ml）Receiving flask（3000ml）
21.Receiving flask support（Φ140）
22.15# cock
74 Discharge port 15#

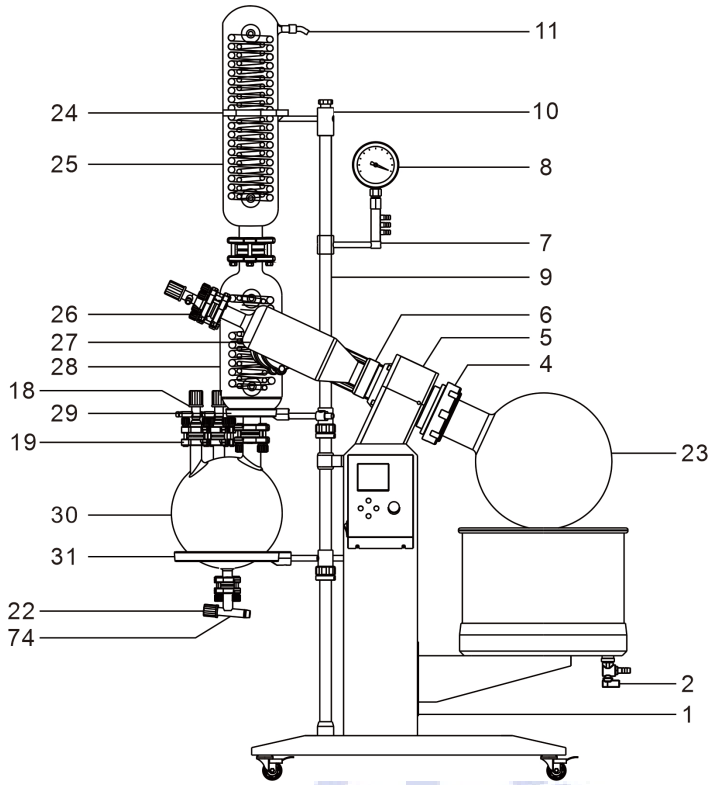


Figure 2 YR02308 machine configuration diagram

1.Main engine+ water bath
2.Angle valve（DN15）
4.Evaporating flask locknut
5.Rotation mechanism
6.Three-way flask locknut
7.Vacuum gauge holder
8.Vacuum gauge
9.Upper pole
10.Condenser holder
11.Vacuum port
18.Vacuum release valve
19.Flange Sealing Kit
21.Condenser support（Φ140）
22.15# cock
26.40# Feeding valve（40/365）
31.Receiving flask support（Φ190）
32.Evaporating flask（20000mL）
33.Silicone rubber shroud ring（20-315）
34.Main condenser（135/690）
35.3-way flask（100/358）
36.Auxiliary condenser（165/390）
37.Receiving flask（10000ml）
74 Discharge port 15#

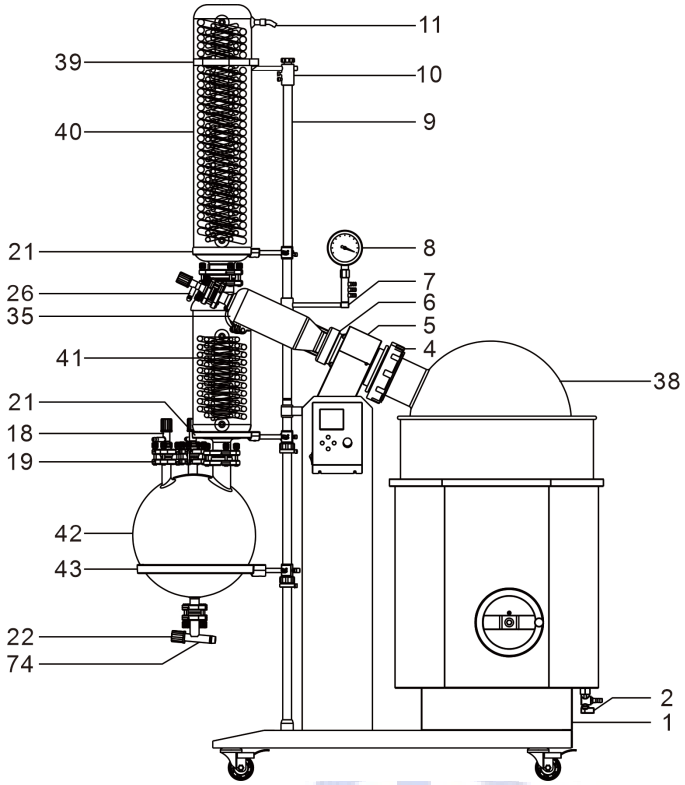


Figure 3 YR02310 machine configuration diagram

1.Main engine+ water bath
2.Angle valve（DN15）
4.Evaporating flask locknut
5.Rotation mechanism
6.Three-way flask locknut
7.Vacuum gauge holder
8.Vacuum gauge
9.Upper pole
10.Condenser holder
11.Vacuum port
18.Vacuum release valve
19.Flange Sealing Kit
21.Condenser support（Φ140）
22.15# cock
26.40# Feeding valve（40/365）
35.3-way flask（100/358）
38.Evaporating flask（50000mL）
39.Silicone rubber shroud ring（20-388）
40.Main condenser（165/780）
41.Auxiliary condenser（165/500）
42.Receiving flask （20000ml）
43.Receiving flask support（Φ290）
74 Discharge port 15#

4. Instructions and Operations for Control Panel

Figure 4.1 Control panel

1- LCD display
2- “ ” key： Press this key to start or stop the rotation function
3- “▲”key：Press this key to make the bath rising intermittently, long press this key to make the bath rising continuously.
4- “ ” key： Press this key to start or stop the heating function
5- “▼” key： Press this key to make the bath descending intermittently, long press this key for more than 3s to make the bath descending continuously
6 Code switch： Press this button to set the temperature and velocity value; long press it for more than 3s until the upper display window shows the prompt "Lc", the lower display window shows"00", that is to enter the secondary control parameter setting state in the system

NOTE: The prompt "Lc" is the protection control character set for the secondary control parameter in the system.

Unpacking and Installation

1. Preparation before Unpacking and Installation

I. After unpacking the case, please read the operation manual carefully, and check whether the components are enough according to the packing list.

II. Please clean the glass parts to maintain its cleanliness to meet the test requirements before installation.

III. Prepare the tools such as allen wrench or screwdrivers etc

Note: Glass device is fragile, please be careful when unpacking

2. Components Installation

1. Vacuum gauge and supporting pole installation

a) Vacuum gauge installation:

Put the vacuum gauge holder(7)on the upper pole(9), adjust the vacuum gauge holder(7)position in order to read the vacuum meter display value accurately. Put the vacuum gauge(8) on the vacuum gauge holder(7), and tighten the screws.

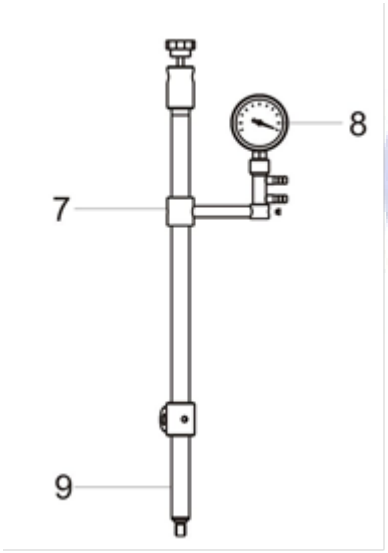
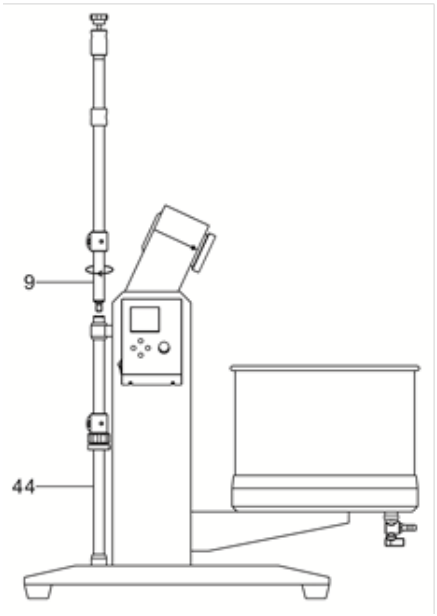


Figure Vacuum gauge installation

b) Supporting pole installation

Put the upper pole (9) into the upper hole of the lower pole(44),rotate the upper pole (9) clockwise to make them docking fixed.

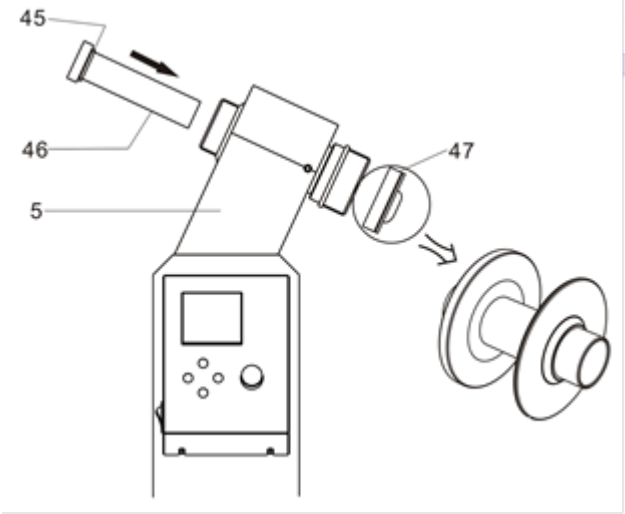


9 Upper pole
44 Lower pole

Figure Stand pole installation

2. Glass rotary axis installation

Note: The glass rotary axis has been installed in place before delivery.



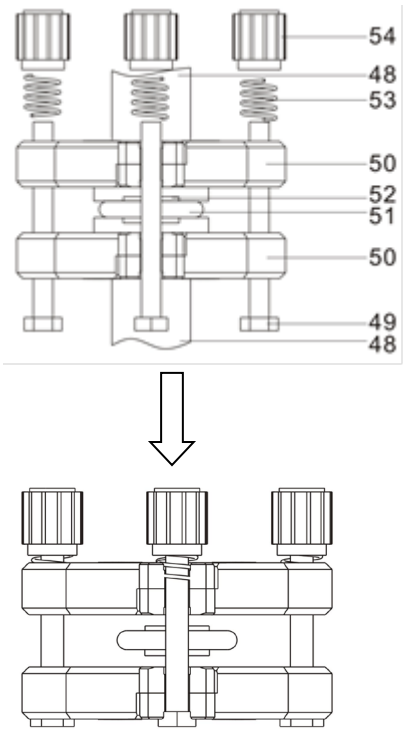
5 Rotation mechanism
45 O-ring
46 Glass rotary axis
47 Vacuum seal ring

Figure Glass rotary axis installation.

3. Flange Sealing Kit、3-way Flask、Feeding Valve and 15# Valve Installation

a) Flange Sealing Kit installation

Choose the flange sealing kit according the glass device(48) flange size



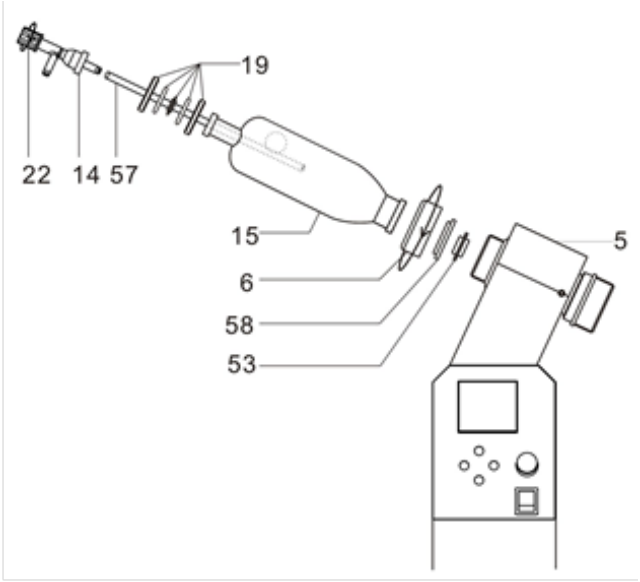
48 Glass device
49 Hexagon head bolt
50 Flange
51 O-ring coated PTFE
52 Arc ring
53 Spring washer
54 locknut

Figure Flange Sealing Kit installation

b) 3-way flask、Feeding valve and 15# Valve installation

Put the 3-way flask cap(6) into the lower hole of the 3-way flask(15) as shown in figure 2.2.3.2, put the 3-way flask locknut ring on the bottom bottlenecks of the 3-way flask, put the flange sealing ring (53)into the flange opening of the glass rotation axis, and then align the 3-way flask (15)and the flange sealing ring (53) concentrically, firmly tighten the 3-way flask cap(6) appropriately.

Put the feeding tube on the bottom of the 40# feeding valve. Put 15# valve on the top of the 40# feeding valve.40# feeding valve and 3-way flask are connected with flange sealing kit. Please refer to Figure 2.2.3.1 for specific installation.



5 Rotation mechanism
6 Evaporating flask locknut
14 40#Feeding valve（40/300）
15 3-way flask （80/300）
19 Flange Sealing Kit （35#）
22 15# valve
57 Feeding tube
58 3-way flask cap
53 Flange sealing gasket （40#）

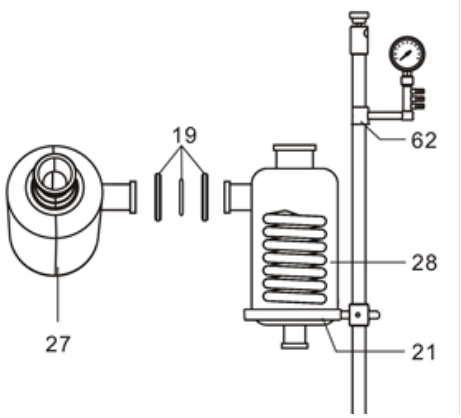
Figure 3-way Flask and Feeding Valve Installation for YR02310

Note: YR02308、YR02309、YR02310 type rotary evaporator’s three bottles and feeding valve installation is the same as YR02307 type rotary evaporator.

4. Auxiliary condenser and 3-way flask connection

a) YR02308 rotary evaporator’s auxiliary condenser and 3-way flask connection

Place the tray (21) on the pole, put the auxiliary condenser(28) on the tray(21), adjust the position of the cross clip to make the auxiliary condenser side interface and the 3-way flask surface at the same level, then fix the cross clip. Auxiliary condenser and 3-way flask are connected by flange sealing kit. Please refer to Figure 2.2.3.1 for specific installation.



19.Flange sealing kit
21.Condenser support
27.3-way flask（100/338）
28.Auxiliary condenser（135/395）
62.cross clip

Figure YR02308 Auxiliary condenser and 3-way flask connection

Note: The connection of YR02309 and YR02310 rotary evaporator's auxiliary condenser and 3-way flask is the same as YR02308.

b) YR02307 Rotary evaporator's condenser and 3-way flask connection

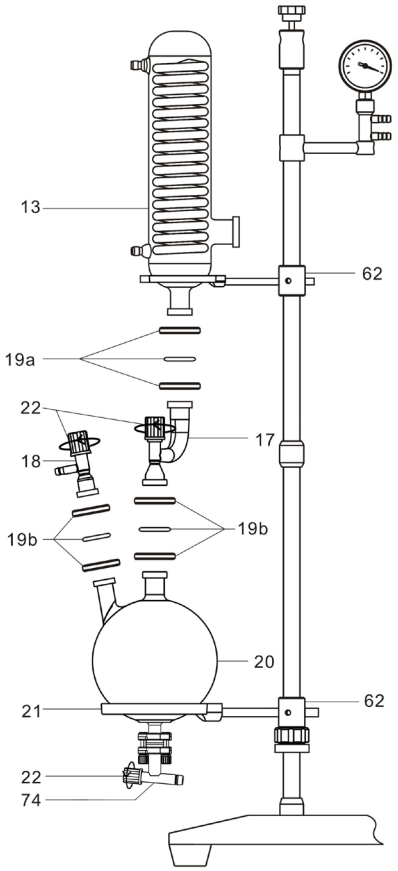
YR02307 rotary evaporator has no auxiliary condenser. The Condenser and 3-way flask are connected by flange sealing kit. Please refer to figure 2.2.3.1 for specific installation.

5. Receiving flask installation

a) YR02307 rotary evaporator's receiving flask installation

Connect the condenser connector(17) and condenser(13) by flange sealing kit(19a). Then fix the receiving flask support(21) by cross clip(62). Place the receiving flask(20) on the receiving flask support(21) and adjust the height of the cross clip (62). Connect the receiving flask(20) and condenser connector(17) by flange sealing kit(19a).

Note: Please refer to figure 2.2.3.1 for flange sealing kit installation.

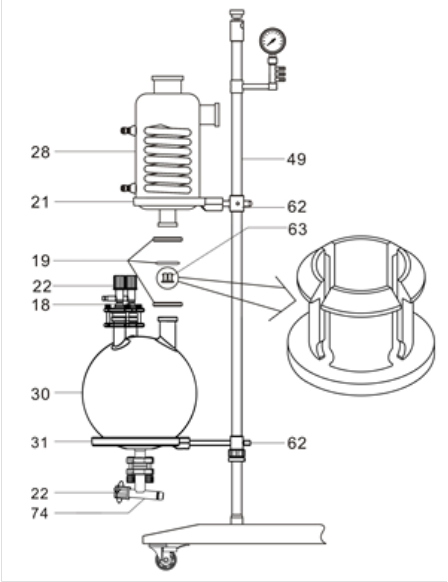


13 Condenser(100/455)
17 Condenser connector
18 Vacuum release valve
19a Flange sealing kit(40#)
19b Flange sealing kit(35#)
20 Receiving flask(3000ml)
21 Receiving flask support（Φ140）
22 15# cock
62 Cross clip
74 Discharge port 15#

Figure YR02307 receiving flask installation

b) YR02308、YR02309、YR02310 rotary evaporator’s receiving flask installation

YR02308 rotary evaporator’s receiving flask installation method: Fix the receiving flask support by cross clip(62), place the receiving flask(30) on receiving flask support(31), receiving flask and auxiliary condenser are connected by flange sealing kit. Please refer to figure 2.2.3.1 for specific installation. Adjust the height of the cross clip and fix it. Please note the installation direction of the automatic switch valve (63).



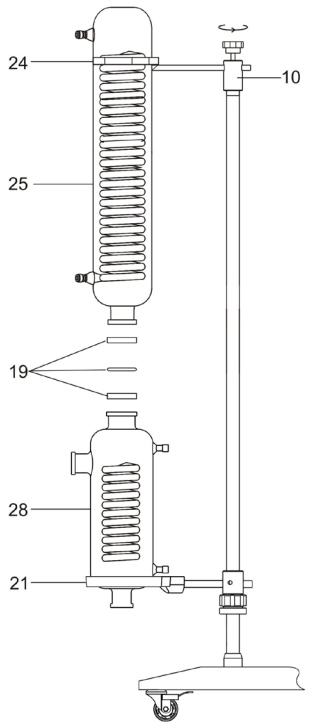
18 Vacuum release valve
19 Flange sealing kit
21 Receiving flask support（Φ140）
22 15# cock
28 Auxiliary condenser(135/395)
30 Receiving flask（5000ml）
31 Receiving flask support（Φ190）
62 Cross clip
63 Automatic switch valve
74 Discharge port 15#

Figure YR02308 receiving flask installation

Note: The installing method of YR02308、YR02310 rotary evaporator's receiving flask is the same as YR02308

6. Main and auxiliary condenser installation

1) The installation of YR02308, YR02308 main condenser and auxiliary condenser Main(25) and auxiliary(28) condenser are connected by flange sealing kit, please refer to figure 2.2.3.1 for specific installation. The condenser rubber shroud ring (24) is fixed on the main condenser (25). One end of the cross bar is inserted into the condenser shroud ring holder (10) and the other end is inserted into the shroud ring mounting hole (24).



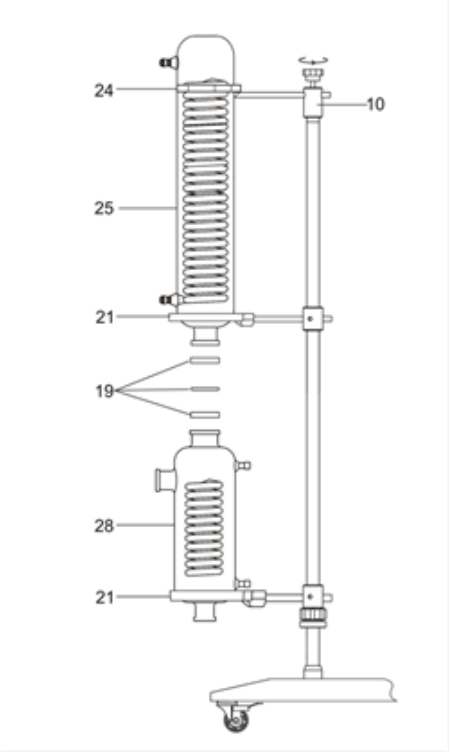
10 Condenser holder
19 flange sealing kit
21 Receiving flask support（Φ140）
24 Condenser shroud ring
25 Main condenser（120/525）
28 auxiliary condenser（135/395）

Figure YR02308 Main and auxiliary condenser installation

Note: The installing method of YR02309 rotary evaporator's main and auxiliary condenser is the same as YR02308

2) YR02310 main and auxiliary condenser installation: Fix the condenser support(21) on the pole, put the main condenser(25) on the condenser support(21), main(25) and auxiliary(28) condenser are connected by flange sealing kit(19), please refer to figure 2.2.3.1 for specific installation.

The condenser rubber shroud ring (24) is fixed on the main condenser (25). One end of the cross bar is inserted into the condenser shroud ring holder (10) and the other end is inserted into the shroud ring mounting hole (24).

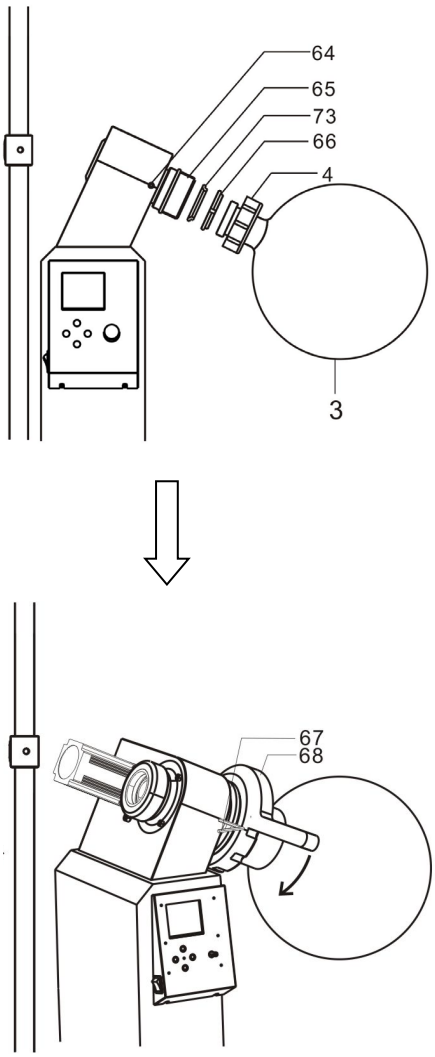


10 Condenser holder
19 Flange sealing kit
21 Condenser support（Φ140）
24 Condenser shroud ring
25 Main condenser（120/525）
28 Auxiliary condenser（135/395）

Figure YR02310 Main and auxiliary condenser installation

7. Evaporating flask installation

Place the evaporating flask locknut(4) and the evaporating flask locknut ring(66) on the neck of the evaporating flask in turn. Insert the allen wrench(67) into the rotation mechanism hole(64) and turn the coupling(65) to make the positioning hole on the rotary shaft coincide with the hole of the rotation mechanism. Use the allen wrench(67) to keep the position of the glass rotation axis. Place the rotary flask which has installed the nut and the retaining ring on the right side of the glass rotation axis. Use the evaporating flask cap spanner(68) to tighten the rotary flask locknut(4) and remove the allen wrench(67).



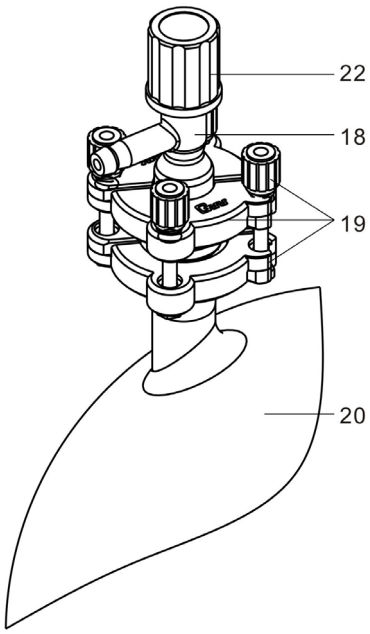
3 Evaporating flask（5000ml）
4 Evaporating flask locknut
64 Rotation mechanism hole
65 Coupling
66 Evaporating flask locknut ring
67 Allen wrench
68 Evaporating flask cap spanner
73 Tapered ring

Figure Evaporating flask installation

8. Vacuum release valve installation

The installation of YR02307 rotary evaporator vacuum release valve:

Place the 15# cock(22) on the upper port of the vacuum release value(18) and tighten it. Connect the vacuum release valve (18) and receiving flask(20) by flange sealing kit(19).

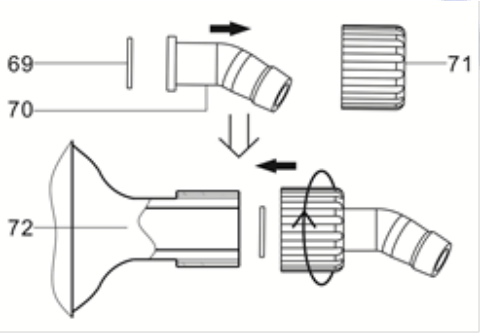


18 Vacuum release valve
19 Flange sealing kit
20 Receiving flask(3000ml)
22 15# valve

Figure YR02307 vacuum release valve installation

Note: The installation of YR02308, YR02309 and YR02310 vacuum release valve is the same as YR02307.

9. Vacuum port and Glass parts installation

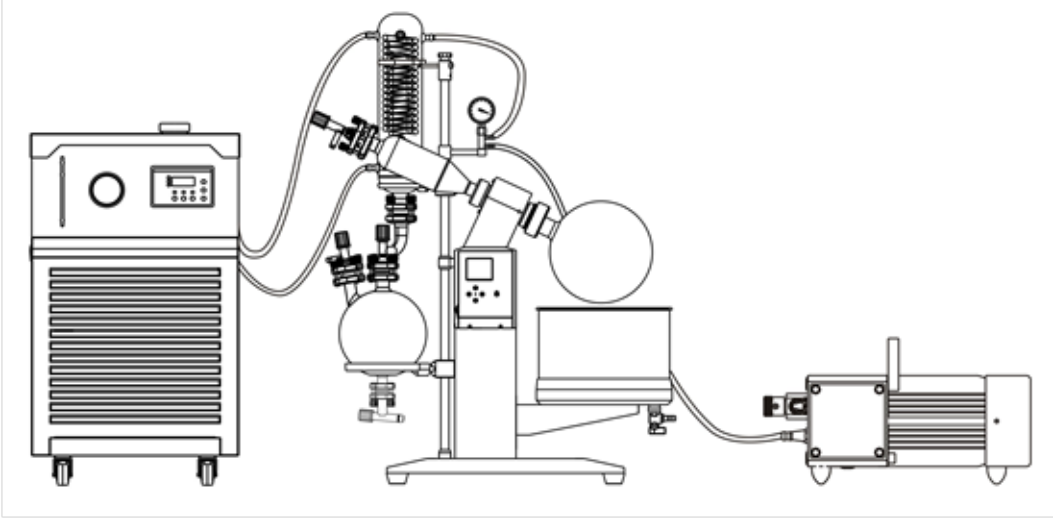


69 Plain Washer
70 Vacuum port
71 Vacuum port cap
72 Glass parts

Figure Vacuum port and Glass parts installation

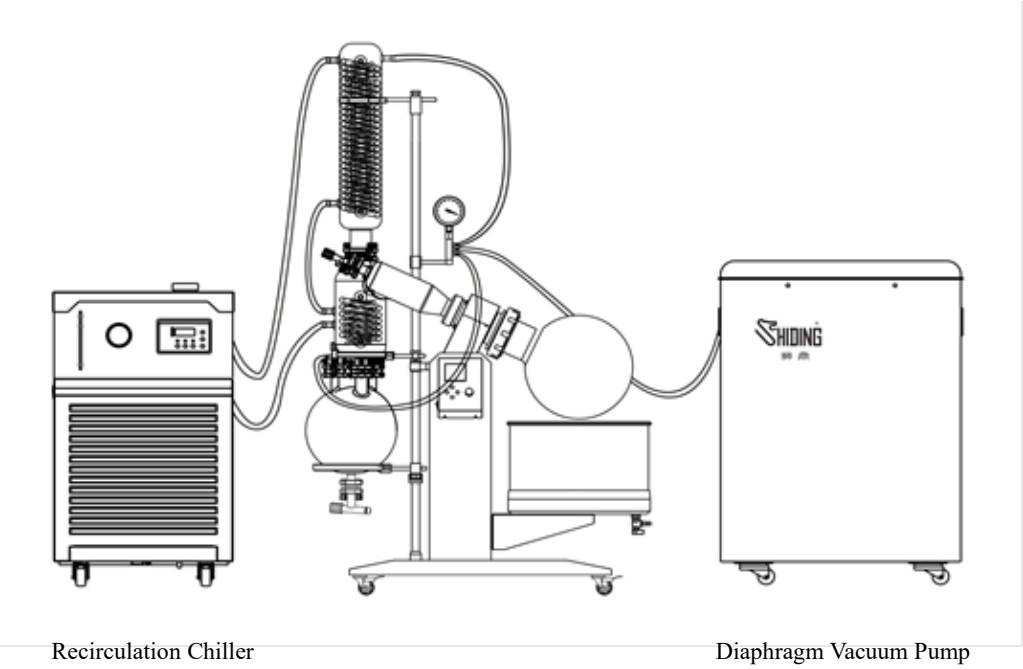
3. Pipeline connection

Please follow the instructions shown in Figure 2.3.1 and Figure 2.3.2 to connect the instrument system pipeline properly.



Recirculation Chiller Diaphragm Vacuum Pump

Figure YR02307 pipeline connection



Recirculation Chiller Diaphragm Vacuum Pump

Figure YR02309, YR02310 pipeline connection

4. Power Supply Connection

Please supply the power according to the nature of the power required in the instrument nameplate and shall meet the following requirements:

1）The power supply must be grounding reliably.

2）When using single-phase AC220V, 60Hz power supply, the user's power supply

point must be supporting the leakage protector (action current setting value is I △ n = 30mA).

3）Make sure that no spark is generated inside or around the instrument, otherwise it will damage the instrument.

4）Please refer to the instrument identification for the instrument power cord connection requirements.

Technical specifications

Model		YR02307	YR02308		YR02309	YR02310
Rotate speed of main engine (rpm)		20～140	20～130			20～110
Vacuum seal ability		Vacuum system pressure boost rate ≤ 2kPa / h				
Using ambient temperature (℃)		5～35				
Relative humidity (%)		≤65				
Power supply		220-240V～，50/60Hz				-
		-			3～，380V，50Hz	
Speed regulation of main engine		Digital direct current stepless speed regulation				
Temperature control (℃)		Digital temperature control, constant temperature -99℃				
Evaporating flask(L)		5	10		20	50
		Flange mouth Ø50mm	Flange mouth	Ø95mm	Flange mouth Ø125mm	Flange mouth Ø125mm
				Ø125mm		
Receiving flask (L)		3.0	5.0		10.0	20.0
Condenser pipe		Vertical dual coil pipe	Vertical, main condenser + auxiliary condenser, efficient tri-backflow condenser pipe			
Evaporating capacity (L/h)	Water	2.0	3.2		5.0	9.0
	Ethanol	5.4	8.6		14.3	24.5
Water bath material		SUS304				
Lifting function		Electric lifting				Electric + manual lifting
Lifting stroke (mm)		0～150	0～160		0～190	0～180
Heating power (kW)		2.0	3.5		*4.0/6.0	6.0
Overall power (kW)		2.3	3.8		**4.3/6.3	6.3
Dimension W×D×H (mm)		835×400×1090	990×550×1655		1165×600×1775	1345×770×2140
Total weight （kg）		35	61		90	140

Note: Ultimate vacuum 100Pa, which depends on the vacuum device.

* The heater power of 1 ~, 220V, 50Hz / 1 ~, 220V, 60Hz rotary evaporator is 4.0 kW;

The heater power of 3～，380V，50Hz rotary evaporator is 6.0kW.

**The overall power of 1 ~, 220V, 50Hz / 1 ~, 220V, 60Hz rotary evaporator is 4.3 kW;

The overall power of 3～，380V，50Hz rotary evaporator is 6.3kW.

Table 3　YR series of common rotary evaporator of technical specifications

Operations

1. Preparing and parameters setting

I. Pour the deionized water into bath slowly until the distance between the liquid surface and the upper edge to 30mm.

II. Close the power switch, the temperature display shows “CC2P”, the speed display shows “S1.1”, all identifier lights; after 4 seconds entering the normal display.

III. Temperature、speed setting

a）Press the “code switch” button, the temperature display window flashes to display the temperature setting value, press the "code switch" again, the speed display window flashes to display the speed setting value. Rotate the "Code Switch" to modify the setting value (turn right to increase, turn left to decrease). After the required parameter setting is completed, click "Code Switch", the setting value will be saved automatically, the controller will exit the setting state.

b）Press the “ ” key to start heating control, “〇S” identifier light, when there’s heating output, the ‘HEAT’ identifier lights, and then press the “ ” key, the heating is stopped , and the "〇S" indicator extinguished.

c）Press the “ ” key to start the speed control, the evaporating flask start rotating, “RUN” identifier lights, and then press the “ ” key to stop the speed control, evaporating flask stops rotating, “STOP” identifier lights.

d） System self-tuning

Press “ ” key to start heating control. In the non-state，press “code switch” button for 3 seconds， temperature window displays the password prompt “Lc”， speed window displays the password value. Rotate “code switch” button to modify the password to “58”, then press “code switch” to enter into the self-tuning selection state, the temperature window displays the prompt “AT”, the speed window displays value. Rotate “code switch” can modify the parameters, if modify the value from “0” to “1”, press “code switch” button, then enter the self-tuning, “AT NOW” identifier lights, self-tuning ends, “AT NOW” identifier extinguished; If modify the value from “1” to “0”, press “code switch” button can stop self-tuning.

When the temperature control effect is not ideal, the user can start system controlling parameters self-tuning function.

Note: There may be a large temperature fluctuation in the process of self-tuning of the system controlling parameters. Please pay attention to it before enabling the auto-tuning function. When it appears over-temperature alarm during the system self-tuning process, "ALM1" indicator lights, heating protection relay action, disconnect the heating circuit power automatically.

2. Starting and Running

I. Open the matched recirculating chiller.

II. Open the matched vacuum pump. Pump the rotary evaporator to the negative pressure state according to the process requirement. Deliver the material into the evaporating flask through the feeding valve(Recommended volume of

1/3).Close the feeding valve after feeding the materials. Rising the height of the bath to make the liquid surface to 1/2 of the evaporating flask.(It can be feeding continuously during operation)

III. Turn on the rotate speed control

IV. Turn on the temperature control

Follow the above steps in turn; the system will enter normal operation.

3. Discharging

For YR02307, close the 15# cock(22a) and open the 15# cock(22b), and then open the 15# cock(22c) to discharge the materials.

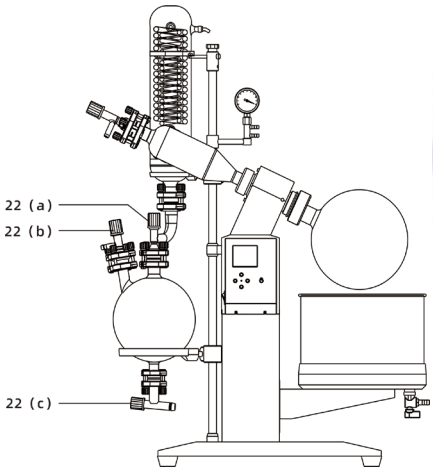


Figure YR02307

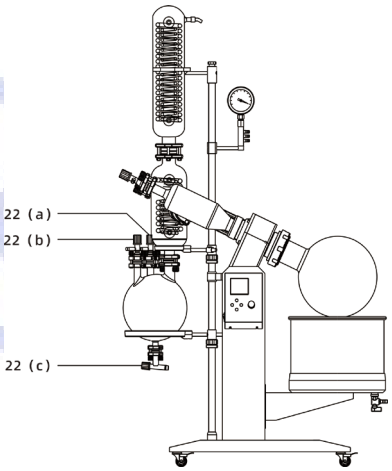


Figure YR02308

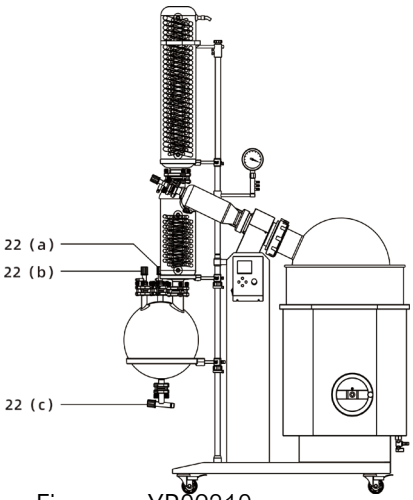


Figure YR02310

4. Shut Down

1）Set the bath temperature below room temperature, press the " " button on the control panel to stop heating.

2）Set the speed setting value to the minimum, press the " " button on the control panel to stop speed control.

3）Turn the cock on the feed valve counterclockwise to release the system vacuum.

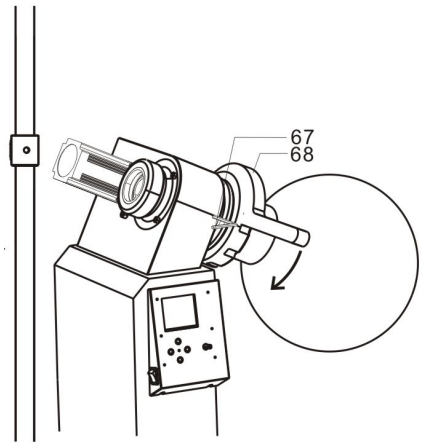
4）Close the matched vacuum system.

5）Close the matched recirculating cooling system.

Note: Do not turn off the recirculation valve of the cooling system.

6）Remove the evaporating flask.

Use an allen wrench (67) to insert into the rotation mechanism seat hole (left direction) as shown in figure 4.3, keep the evaporating flask position , use the allen wrench (68) to loosen the evaporating flask locknut, remove the evaporating flask and remove the allen wrench.



67 Allen wrench

68 Evaporating flask cap spanner

Maintenance and Management

- **Maintenance**

Please follow following recommendations to keep the normal operation of the instrument and extend its service life and ensure personal safety:

1）When moving the instrument, avoid violent vibration, or to seek professional help

2）The material added into the evaporating flask must not exceed 65% of its volume

3）If found the component aging or damage, please replace it timely according to the original specifications.

- **Cleaning**

1）Before cleaning the unit, disconnect the power cord. Otherwise, it may cause and electric shock or fire hazard;

2）To clean the unit, a neutral detergent and soft cloth is recommend;

3）Do not use water, benzene, gasoline, alcohol and acid to clean the instrument, otherwise it may cause the body surface fade or damage;

4）Cleaning of evaporating flask and glass condenser should be done according to the laboratory regulations;

5）If a hazardous substance leaks on the surface of the instrument or enters it, it should be handled in an appropriate manner.

6）Do not use detergents or disinfectants that react chemically with the material contained in the instrument parts or equipment;

7）If there’s any doubt on the compatibility of the detergent or disinfectant with the materials contained in the instrument and the equipment, please consult the

manufacturer or their agent.

8）If the water bath and the evaporating flask surface temperature is high, please disconnect the power until it is fully cooled and then do cleaning;

9）In order to avoid damage of components, please do not press the monitor and knob forcedly when cleaning them.

- **Troubleshooting**

Failure	Cause	Troubleshooting
Connect the power supply, LCD panel does not light.	Check the power line and find out	Connect the
	Failure of power switch.	Stop using immediately and contact us.
	Failure of circuit board.	
Rotation allows identifier ”RUN” lights, but rotating mechanism does not rotate.	Failure of motor.	
	Failure of circuit board(X2).	
"HEAT" indicator light, but not warming up	The solid state relays(KF1) fault.	
	Heating element fault.	
The temperature display shows “Er-1”，ALM1 identifier lights.	Bath temperature sensor failure or improper wiring	
The temperature display shows “Er-2”，ALM1 identifier lights.	Bath overtemperature protection sensor failure or improper wiring.	
The temperature display shows “Er-3”，ALM1 identifier lights.	Bath over temperature protection sensor exceeds the protection settings.	Restart the power switch.
The speed display shows “Er-1”，ALM2 identifier lights.	Power module fault.	Stop using immediately and contact us.
The speed display shows “Er-2”，ALM2 identifier lights.	Motor stall.	
The speed display shows “Er-3”，ALM2 identifier lights.	Holzer logic error.	
The speed display shows “Er-4”，ALM2 identifier lights.	Power supply voltage is too low.	Check the power supply voltage value.
The speed display shows “Er-5”，ALM2 identifier	Power supply voltage is too high.	

The speed display shows “Er-6”， ALM2 identifier lights.	Serial communication fault	Stop using immediately and contact us.
Abnormal noise.	Abrasion of seal ring.	Replace the seal
	Abrasion of internal gear.	Stop using immediately and contact us.
	Lack of oil in drive part.	
	Failure of motor.	
Vacuum reduction.	Abrasion of glass rotary shaft.	Replace the
	Abrasion of seal ring.	Replace the seal
	Improper installation of seal	Remount the
	Aging of the seal ring of pressure-relief	Replace the air
	Aging of vacuum hose.	Replace the
Lifting unit is not working.	Failure of circuit board(X3) or lifting	Stop operating immediately and contact us.
	Abrasion or rusting of sliding bearing.	

Table Failure phenomenon and troubleshooting