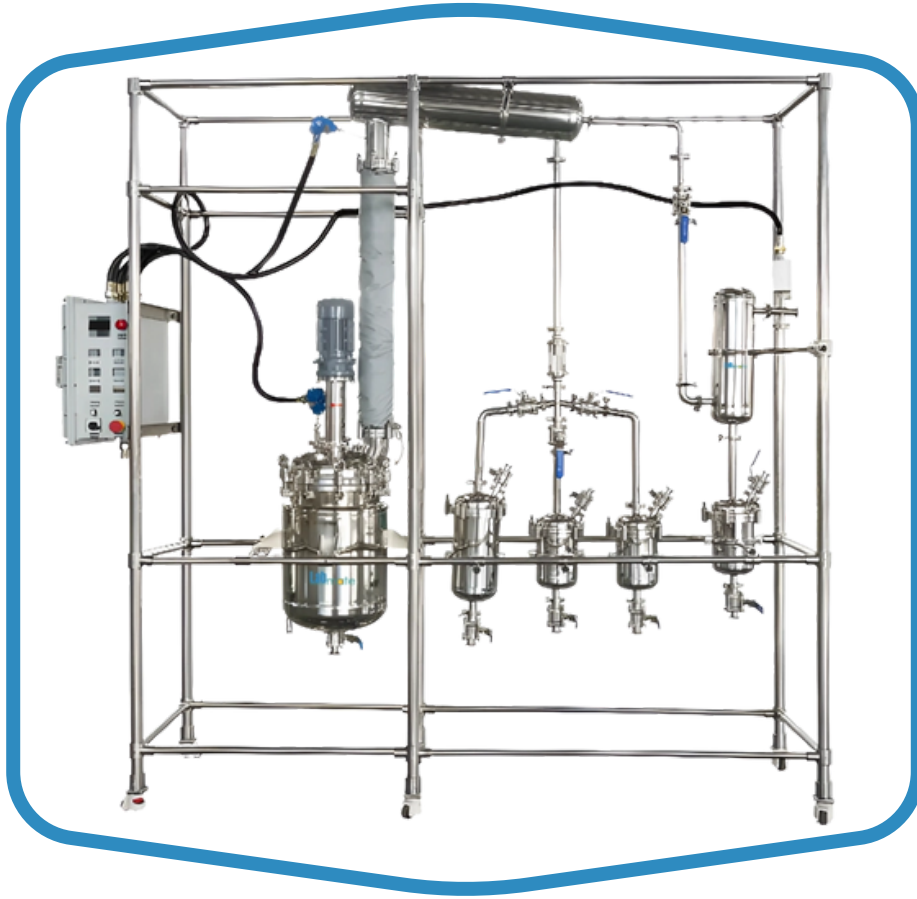




Stainless Steel Distillation Column LMSDC-A101

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1. Safety Measures

1.1 Safety Precautions

Sign	Name	Meaning
	Danger	Indicates an extremely hazardous situation that will result in death or serious injury.
	Warn	Indicates a hazardous situation that may result in death or serious injury.
	Prohibit	No rain or splashing.
	Notice	Indicates a hazardous situation that may result in personal injury.
	Notice	Watch out for high temperatures.
	Notice	Be careful not to approach rotating parts.

1.2 Important Notes

- 1) **Inspection Upon Receipt:** After receiving the goods, inspect the equipment immediately to ensure it is intact and undamaged.
- 2) **Packing List Verification:** Refer to the packing list to confirm that the equipment matches the products you ordered.
- 3) **Safety Regulations:** Always adhere to general safety regulations, including any applicable local safety procedures.
- 4) **Installation & Maintenance:** All installation and maintenance work must comply with current mechanical and electrical regulations.
- 5) **User Responsibility:** Users must operate the equipment according to the specified regulations. Regular maintenance and timely replacement of parts are required. If any abnormal operation or potential danger is observed, stop the equipment immediately.
- 6) **Safety Precautions:** During installation, operation, and maintenance, prioritize safety at all times. Use appropriate tools and wear necessary protective gear such as clothing, gloves, and goggles.
- 7) **Consequences of Non-Compliance:** Failure to follow the safety warnings and operating procedures may result in equipment damage and pose a serious risk of personal injury.

2. Introduction

Stainless Steel Distillation Column LMSDC-A101 has 10 L tank capacity. Its compact construction ensures corrosion resistance and durability. Equipped with electric, thermal oil, or steam heating options for controlled and efficient temperature management. Integrated manual or automatic reflux ratio control enhances efficiency. Our Distillation Column is ideal for refining and extracting solvents and petrochemicals.

3. Features

- Ball milling port
- High vacuum conditions
- Feed measurement ports
- Heat loss prevention
- Batch and continuous modes
- Computer simulation integration

4. Specifications

Model No.	LMSDC-A101
Capacity	10 L
Operating Temperature Range	-20 to 200°C
Condenser Area	0.4 m ²
Reflux Ratio Control	Yes
Temperature Display	Yes
Pressure Display	Yes
Continuous Sampling	Yes
Power Supply	220V/50Hz,1P
Height	2 m

5. Applications

Stainless Steel Distillation Column LMSDC-A101 is ideal for extraction spice flavors, biofuel production, wine quality, solvent reuse, and petrochemical processing in pharmaceutical, chemical, and electronics fields.

6. Structure Introduction

Process principle and structure of the glass fractionation tower: The packed tower is filled with fillers of various shapes (called fillers) in the tower so that the liquid flows along the surface of the filler to form a liquid film, which is dispersed in the continuously flowing gas, and the gas-liquid two-phase contact surface is on the surface of the liquid film of the filler. Which is a film-like contact device. The packed tower uses fillers as the basic component of gas-liquid contact and mass transfer. The liquid flows from top to bottom in the form of a film on the surface of the packing, and the gas flows in a continuous phase from bottom to top with the liquid, and the gas and liquid exchange mass and heat between phases. The component concentrations and temperatures of the two phases vary continuously along the height of the tower.

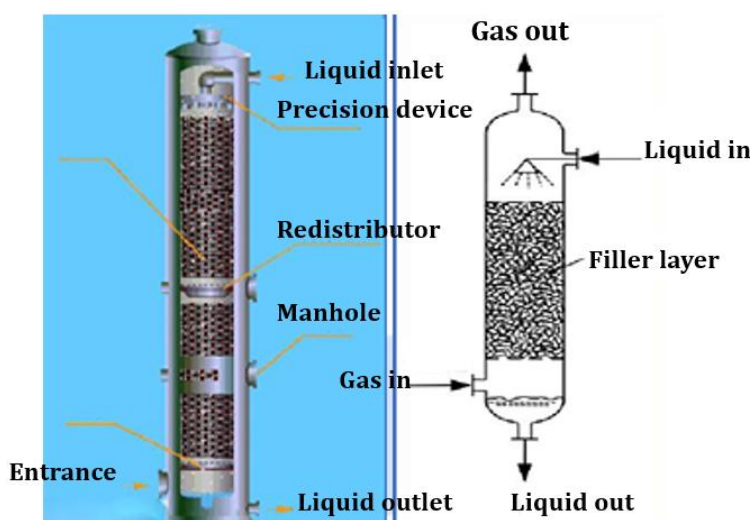


Figure-1

A complete set of glass fractionation towers includes

1. Heating pot
2. Tower reactor
3. Fractionation column
4. Gas riser pipe
5. Condenser
6. Refluxing ratio controller
7. Sampling section
8. Collecting flask
9. Protection cold trap
10. Vacuum pump
11. Control box
12. Cooling circulator
13. Heating circulator
14. Bracket, etc.

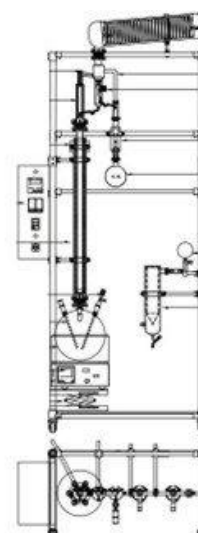


Figure-2

7. Installation

7.1 Installation and commissioning

Installation location: Locations must meet the following requirements. Intense heating can cause damage to the item.

- 1) No cables shall pass under the fractionation equipment.
- 2) The installation ground surface is horizontal and stable.
- 3) The site requirements shall not be smaller than the size of the instrument.
- 4) When working under vacuum, it must be equipped with vacuum equipment.

Assembly of the main frame of the fractionation tower: According to the equipment assembly drawings, assemble the pipe fittings and joints required for the main frame.

Installation of lifting table, magnetic stirring electric heating mantle, and fractionation tower: Place the lifting platform on the main frame tray according to the assembly drawing, place the electric heating mantle on the lifting platform, and place the tower flask in the electric heating mantle.

Installation of fractionation tower: Connect the fractionation tower column to the RS interface of the upper tower flask, fix the tower to the main frame with cross clamps, and add packing to the tower column.

Condenser installation: Connect the coil condenser to the interface of the upper fractionation tower column, and fix the condenser on the main frame with fixing clips (to ensure the verticality of the condenser and the tower column).

Installation of sampling valve, collecting flask, and protective cold trap: Align the sampling valve with the lower port of the condenser, and fix it with a U-shaped clamp (to ensure verticality); then align the glass liquid separation valve with the lower port of the upper sampling valve, and first fix the liquid separation valve on the main frame (to ensure horizontality), and then use the U-shaped clamp to connect and fix the liquid separation valve and the sampling valve; fix the collection flask to the lower port of the liquid separation valve with the U-shaped clamp; fix the cold trap on the frame with a cross clamp.

Pipeline installation: Connect the vacuum port of the liquid separation valve, the vacuum port of the condenser, the vacuum gauge port, and the vacuum pump with a vacuum hose.

7.2 Packaging and Storage Conditions

Pay attention to the risk of rupture due to improper activity.

- 1) Make sure that the equipment has been disassembled and all parts of the equipment are packaged in an anti-breakage way, and should be packed in the original packing box as much as possible.
- 2) Avoid a serious impact during transportation.
- 3) After transportation, check whether the equipment and all glass parts are damaged.
- 4) Due to the damage caused by transportation, the transportation should be notified.
- 5) Keep the packaging for future transportation.

Storage condition

- 1) Ensure compliance with product requirements and store in a dry, ventilated room.
- 2) Store the equipment in the original packaging as much as possible.
- 3) After storage, regularly check whether the equipment, all glass parts, and hoses are damaged, and replace them if necessary.

PID Flow Chart

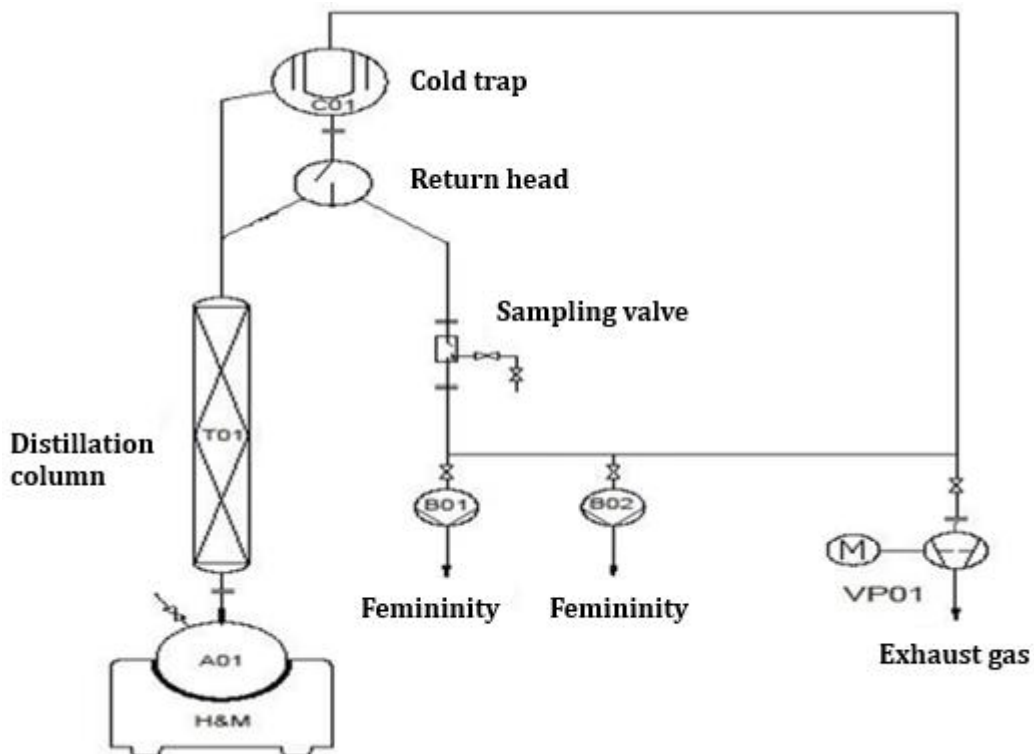


Figure-3

8. Operations

Equipment operation

8.1 Preparations

Check whether the reflux ratio controller, temperature control console, and each terminal are firm and whether the ground wire is connected well. Whether the connectors of each power line and signal line are in good condition (whether the terminals of the tower heating line and temperature measuring line are in good condition), assemble the fixed frame, and place the tower temperature control table and reflux ratio controller on the frame table.

8.2 Tower Installation

- 1) The tower heating device is placed in an appropriate place on the fixed frame platform (according to the actual situation, place the lifting platform).
- 2) Put the flask into the electric heating mantle and fix it on the frame. The middle flask mouth should be as vertical as possible.
- 3) At each interface of the tower, where there is a grinding mouth, it must be coated with vacuum grease, carefully installed with the flask, and clamped vertically in a straight line with a clip. Check whether the tower column is installed vertically so as not to affect the fractionation effect.
- 4) Apply high-vacuum silicone grease to the interface of the fractionation head and connect it to the fractionation column. Rotate the fractionation head to make the grinding mouth tightly connected and fix it with a clip (pay attention to the angle of the clip to prevent the left and right forces of the interface between the fractionation head and the fractionation column from damaging the interface), and connect the cooling water inlet and outlet hoses of the tower head. (The rubber hose is fixed with a wire tie to prevent accidental pulling of the rubber hose and damage to the water inlet and outlet port; when operating, pass the water first.)
- 5) Fix the electromagnet with a clip, facing and close to the pendulum, so that it can attract the pendulum when it is energized, and drain and extract.
- 6) Apply vacuum silicone grease to each grinding port of the multi-component connector, connect it to the outlet of the rectification head, slowly rotate the connector, and fix it with a clip (pay attention to the angle of the clip to prevent the fractionation head from being in contact with the vacuum connector and forcing each other to damage the interface), and connect the receiver: thermowell.
- 7) Apply vacuum silicone grease to the interface of the flask, install the thermowell and glass hollow plug, and add about 1/4 volume of methyl silicone oil into the
- 8) When operating under normal pressure, pay attention to the emptying of the system; when operating under vacuum, perform a vacuum leak test before operation. (!!! Be sure to perform a vacuum leak test before operation, and the experiment can only be carried out when the vacuum meets the experimental requirements.

Note: Put the temperature control and temperature measurement thermocouples of each part into the casing at the corresponding position.

8.3 Circuit Check

- 1) Plug in the circuit connectors on the operation table.
- 2) Check the intelligent fractionation temperature control console, the reflux ratio controller, and whether the circuit is disconnected, and then proceed to the temperature rise operation.
- 3) Connect the instrument to the protective ground! The power connection must have a reliable ground wire to ensure that the shell is safely grounded. Before connecting, please ensure that the power supply voltage meets the requirements of the instrument. If there is any damage caused by incorrect voltage connection, we will not accept any liability for compensation!
- 4) The electrical part must not enter the water, and it is strictly forbidden to be damp!

8.4 Feeding

Open the feeding port or sampling port of the tower, add the rectified sample, and add a few ceramic rings or PTFE stirring bars (with a magnetic stirring electric heating mantle) at the same time to prevent bumping.

8.5 Warming up

- 1) Turn on the main power switch, and the intelligent rectification temperature controller will display a numerical value.
- 2) Turn on the tower heating temperature control switch to heat, and the detailed operation can be found in the operation instructions of the electric heating mantle.
Note: The set temperature of the tower heat temperature control instrument should be 20-30 °C higher than the boiling point temperature so that the heating has enough temperature difference for heat transfer. Its value can be selected according to the heat sensitivity of the material required by the experiment, and it can be adjusted while raising the temperature. When no steam rises into the tower head for a long time, it means that the heating temperature is not high enough and needs to be increased. If the temperature is too low, the evaporation will be small, and there will be no distillate; if the temperature is too high, the evaporation will be large, and it will easily cause liquid flooding. (It is also necessary to check again whether cooling water is passed to the tower head.) This operation must be carried out before the temperature rises. Water cannot be passed again when steam appears at the top of the tower, which will cause the tower head to burst.
- 3) When the tower has started to boil, the temperature of the fractionation column can be adjusted according to need, and the heating temperature needs to be adjusted according to the specific situation.

Note: The heating temperature should not be too high. If it is too large, it will cause overheating and become a heater due to the overheating of the tower wall. The reflux liquid cannot carry out gas-liquid phase equilibrium material transfer with the rising vapor, which will reduce the separation efficiency of the tower instead.

8.6 Distillation

- 1) After the temperature rises, observe the temperature change of the tower and the top of the tower. When the gas appears at the top of the tower and condenses in the head of the tower, the material can be discharged after a period of total reflux.
- 2) When there is a reflux ratio operation, the reflux ratio controller should be turned on for a given ratio (the ratio of the power-on time to the power-off time is usually measured in seconds, and this ratio is the ratio of the production volume to the reflux volume).

8.7 Stop operation

When the operation is stopped, the switches of each part should be turned off, and the cooling water is stopped when no steam rises.

Warning: If the fractionation device is not used for a long time, it needs to be disassembled and cleaned in time to prevent the joints from sticking and becoming disassembled.

Note: During the use of the whole set of rectification equipment, the power socket must have a good earth leakage protection device, and attention must be paid to the safety of electricity use.

9. Maintenance

9.1 Cleaning Requirement

During the distillation process, the fractionation tower and related equipment must be cleaned when:

- 1) Switching to a different product.
- 2) Operating for an extended period with the same product.

9.2 Safety Preparations Before Cleaning

- 1) Activate workshop ventilation systems to ensure proper airflow. Confirm that anti-static measures are in place and effective.
- 2) Operators must wear full personal protective equipment (PPE), including, but not limited to, gas masks, safety helmets, anti-static workwear, safety goggles, anti-static shoes, and gloves resistant to acids, alkalis, and organic solvents.
- 3) Inspect the equipment to ensure all pipelines are sealed—no running, leaking, or dripping. Ensure the equipment is powered and functioning properly.
- 4) Remove any nearby materials, solvents, or products to a warehouse or safe area. Place safety signage around the area and keep fire safety equipment—such as fire extinguishers, fire hoses, asbestos cloth, and fire sand—nearby.

9.3 Solvent Selection

Use water-soluble and volatile solvents (e.g., methanol, ethanol, petroleum ether, tetrahydrofuran, toluene) for cleaning. If water is used, ensure any residual moisture is promptly removed with a water-soluble solvent to prevent corrosion or product contamination due to electrochemical reactions.

Note: Avoid ketones, chlorinated hydrocarbons, low-molecular-weight lipids, strong polar solvents, and nitro-organic compounds, unless necessary, as they can cause FKM gaskets to swell, degrade, and lose sealing integrity. Replace gaskets if degradation is suspected.

9.4 Cleaning Process

- 1) Choose the appropriate solvent based on the material properties, process conditions, safety, and environmental requirements.
- 2) Perform cleaning at normal pressure, adjusting parameters such as temperature and feed rate.
- 3) The main heating temperature should be set around the solvent's boiling point $\pm 10\text{--}20^\circ\text{C}$.

9.5 Cleaning Validation

- 1) Repeat solvent cleaning until the solvent becomes clear and free of visible contaminants.
- 2) Submit a sample for inspection.
- 3) Approve the cleaning based on production standards.
- 4) For the same product batches, follow the specific production process requirements for intermediate cleaning.

9.6 Post-Cleaning Drying

- Remove the solvent.
- Set the insulation, internal cooling, and heating temperature to 60–80°C.
- Dry the system for 2–4 hours.
- Optionally connect a water-jet vacuum pump to accelerate drying. Do not use oil-based vacuum pumps (e.g., rotary vane or Roots pumps), as solvents may damage the pump oil and internal components.
- In the absence of vacuum-assisted drying, open all valves to increase evaporation speed.

9.7 Vacuum Testing

- 1) After drying, reinstall all accessories and check one-way valves and sealing rings (replace if damaged).
- 2) Use a vacuum system to test the sealing performance.
- 3) Ensure the vacuum holds to meet production requirements.
- 4) If a leak is detected, inspect connections and gaskets. Repair or replace components as needed, then retest until the required vacuum level is achieved.

9.8 Equipment Maintenance

- 1) Check all connections for looseness. Tighten them as needed with the power off.
- 2) Maintain a clean appearance of the equipment.
- 3) Stop the machine immediately if abnormal noises are detected and perform an inspection.
- 4) Regularly clean dust from the exterior of electrical equipment and tighten all power connections.
- 5) Periodically inspect auxiliary equipment (e.g., cooling circulator, vacuum pump) and add or replace refrigerant, pump oil, etc.

10. Troubleshooting

The instrument does not light up after the main power supply is turned off.

- 1) Check whether the plug of the power cord is correct, whether there is any bad contact, and whether the socket is powered.
- 2) Check whether the input terminal of the relay is connected to 220V or 380V and whether there is any error.
- 3) Check whether the switch is in poor contact and whether the main circuit is correct.

After turning on the heating switch of the rectification temperature control platform, there is no heating.

- 1) Check the setting of the control instrument of this road; the setting temperature should be higher than the measured temperature, and the red light on the instrument panel should be flashing.
- 2) Check whether the rectification temperature control platform is damaged.

The temperature control accuracy of a certain circuit is not enough, or the temperature fluctuation and hysteresis are particularly serious.

Check whether the instrument setting is correct; see the instrument manual for operation.

The column temperature is out of control or continuously heating.

- 1) Check whether the temperature setting value is wrong. If the setting value is too high and the actual measured temperature does not reach the set value, the instrument will continue to heat up.
- 2) Observe whether there is any change in the measured value. If there is a reading on the rectification temperature control station, but the temperature does not rise, it is also possible that the thermocouple is damaged.
- 3) Check whether the relay is burned through. Turn off the main power supply, disconnect the output line at the terminal of the circuit, and use a multimeter to check whether the two terminals of the solid-state relay and the voltage regulator in the circuit are conducting. If conducting, it proves that it has broken down and needs to be replaced.
- 4) Check whether the instrument is self-tuning and whether the control parameters of the instrument have been modified by someone and can be restarted in self-tuning.

The sound of continuous operation cannot be heard after the electromagnetic return switch is turned on.

- 1) Check whether the reflux ratio controller has been set correctly.
- 2) Check whether the electromagnetic coil is close to the return ratio.

11. Circuit Diagram

Electrical Diagram

