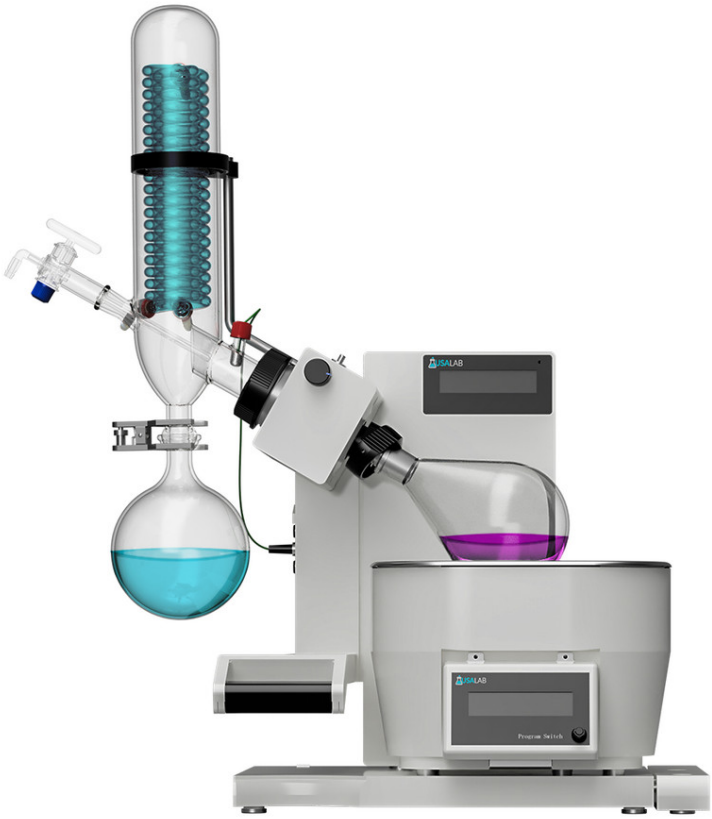
Rotary Evaporators

User Manual

Model: ULR-200



Original instructions

Read this manual before using the equipment

Retain this manual for future use

Document number: 1008

Published date: 09 January 2026

Document version: 1

Published on: 09 January 2026

Document ID: 1008 - 1

Purpose of manual

This manual enables safe and efficient use of the Rotary Evaporators. This manual is part of the equipment and must be stored where it is accessible to operating personnel at all times.

The operating personnel must carefully read and understand this manual prior to beginning any work. The basic prerequisite for safe work is compliance with all safety instructions and operating instructions in this manual.

The local occupational safety regulations and general safety regulations for the area of application of the equipment also apply.

Copyright

Contact information

USA Lab
12400 Belden Ct.
Livonia, MI
48150

support@usalab.com

tech@usalab.com

(734) 855-4890

www.usalab.com

Contents

This page is intentionally left blank

List of Figures

1 Safety information

This section provides an overview of all safety aspects for the protection of people as well as safe and uninterrupted operation. Other task-related safety instructions are included in the specific sections.

1.1 Safety notices

The following safety notice formats are used in this manual. Safety notices are used at the start of sections or embedded in operating instructions.

Ensure you fully understand and comply with the notices in this manual.

DANGER

Risk of death!

Indicates a hazardous situation which, if not avoided, will almost certainly result in death or serious injury.

WARNING

Risk of serious injury or death!

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

Caution

Risk of injury!

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

Notice

Indicates an important situation which, if not avoided, may seriously impair operations.

Additional information relating to the current section.

1.2 Special safety instructions

To draw attention to special hazards, this manual uses the following symbols.

Symbol	Meaning
	Electrical hazards and electrical shock hazards
	General warning
	Fire hazard
	Explosive materials
	Hot surface
	Heavy objects or equipment
	Corrosive substance
	Automatic starting equipment
	Trip hazard
	Non user serviceable parts

1.3 Intended use

The ULR-200 Rotary Evaporator is a laboratory device designed to gently and efficiently remove solvents from mixtures through the process of evaporation. It is primarily used in biological, pharmaceutical, chemical, and food-related industries for sample preparation, concentration, purification, and solvent recovery.

The evaporator works by rotating a boiling flask containing the sample, creating a thin film that promotes rapid and uniform evaporation under reduced pressure. The evaporated solvent vapors are then condensed and collected for reuse or disposal.

This equipment is intended for laboratory-scale processing and is not designed for continuous industrial production or for use with substances outside its specified operating parameters.

WARNING

Danger due to misuse!

Misuse of the device can result in hazardous situations.

- Only operate the device if it is in an undamaged and working condition.
- Never deviate from the prescribed maintenance intervals.
- Only use parts that are specified in the technical data and approved for this device.
- Never modify the device without consulting the manufacturer.
- Never allow untrained personnel to operate the device.
- Never operate the device in potentially explosive atmospheres.

1.4 General safety warnings

WARNING

Risk of serious injury or death!

Only use this equipment for its intended purpose.

Do not leave the equipment running unattended.

Do not wear loose clothing, jewelry, hair, or any other articles that can be trapped by moving parts.

Do not operate equipment if you are fatigued, emotionally stressed, or under the influence of drugs or alcohol.

WARNING

Risk of electrical shock!

All power sources must be turned off when the equipment is not being used.

Ensure you use the correct power source for the equipment. Refer to the electrical specifications for the equipment being used.

WARNING

Risk of injury from trips or falls!

There is a risk of tripping on cables or pipe connections.

Ensure that cables or pipework are routed safely and that they are not trapped or pinched during use.

WARNING

Risk of injury from lifting heavy objects!

Use proper lifting and transportation devices when moving equipment.

WARNING

Automatically moving mechanical parts

Take care when in the vicinity of equipment with moving mechanical parts that may start automatically and unexpectedly.

Read the manual!

You must read this manual before starting work and operating this equipment.

Where required, you must use appropriate PPE when using this equipment.

Wear ear protection!

You must wear ear protection.

Wear eye protection!

You must wear eye protection.

Wear safe footwear!

You must wear safe and sturdy footwear.

Wear gloves!

You must wear appropriate gloves or hand protection.

Wear safe and protective clothing!

You must wear appropriate safe clothing.

Before using the equipment, locate the nearest of these facilities and resources:

Fire extinguisher!

Before using this equipment, locate your nearest fire extinguisher and fire prevention resources.

First Aid!

Before operating this equipment, locate your nearest first aid station.

1.5 Safe operating area

A safe operating area around the equipment and work area should be maintained at all times. Non-operators and other persons should not approach the equipment or work area.

USA Lab recommends a safe area of at least 12-16" (300-400 mm) around the equipment.

Caution

Risk of damage to the equipment!

Do not obstruct the ventilation on the side of the equipment. This can cause poor performance or part failure. Always keep the operating area clean and organized to prevent injury or damage.

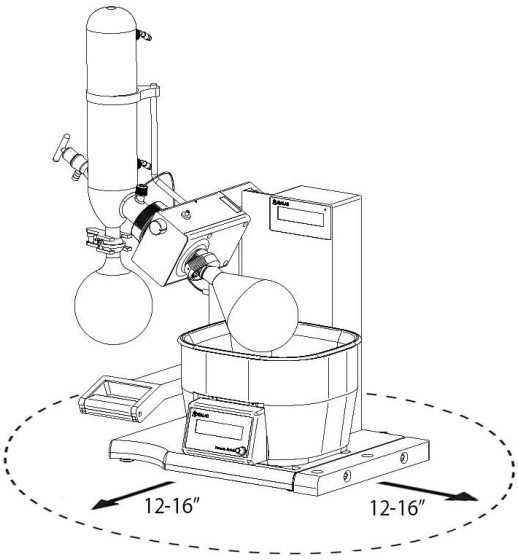


Figure 1 - Safe operating area around the evaporator unit

1.6 Safety warnings

The following warnings and notices are safety information specific to the Rotary Evaporators.

Notice

Ensure that all power sources are turned off when the machine is not in use. This includes electrical and pneumatic power.

Read the manual for any special operational instructions for each piece of equipment. All USA Lab authored manuals are typically included with each device as well as posted online at: https://help.usalab.com/knowledge-base.

WARNING

Risk of serious injury or damage!

- Only use distilled water in the heating bath. Damage to heating elements, sensors, or switches caused by other fluids is not covered under warranty.
- Never leave the evaporator unattended while operating.
- Always wear the required Personal Protective Equipment (PPE) when using the system.
- Follow all federal, state, and municipal laws, codes, and ordinances.
- This is not an explosion-proof evaporator. It must not be used in Class I, II, or III hazardous locations as defined by NFPA 70.

WARNING

Risk of electrical shock!

- Ensure the power connection matches the specified voltage (For more information, see *Technical specifications* on page 85).
- Use a properly grounded outlet. Do not modify the factory power cord.
- Do not unplug the evaporator while it is operating.
- Use a dedicated electrical circuit to avoid overloading from other equipment.

WARNING

Risk of fire or chemical hazard!

- Do not heat explosive, combustible, or highly flammable materials inside the evaporator.
- If flammable or organic solvents are used, clean spills immediately and follow all fire safety precautions.
- Keep the evaporator away from open flames, heat sources, and corrosive gases.
- Never clean the evaporator or glassware with flammable cleaners.

WARNING

Risk of breakage or performance loss!

- Inspect all glassware before use. Do not use cracked, chipped, or damaged components.
- Clean all glassware before use; wipe glass parts gently with a soft cloth. Do not use hard objects.
- All gaskets must be cleaned and greased regularly to prevent leaks and performance loss.
- Cooling water and vacuum lines must remain unobstructed and free of hard bends. Attach hoses securely by rotating and pushing them onto the barbs.

Not to be serviced by users!

All repairs must be done following advice and information from USA Lab or one of their representatives.

Any repairs must only be done by qualified electricians.

Contact USA Lab for details if your equipment needs repair.

1.7 Responsibility of the owner

The owner is the person who operates the equipment for commercial or business purposes or allows a third party to use the equipment and bears legal responsibility for the product during operation for the protection of the user, personnel or third party.

1.7.1 Owner responsibilities

The equipment is used for commercial purposes. The owner of the equipment is therefore subject to the legal responsibilities for occupational safety.

In addition to the safety instructions in this manual, the applicable safety regulations as well as occupational safety and environmental regulations must be implemented for the area of application of the equipment.

This applies to the following:

- The owner must be informed of the applicable occupational safety regulations and conduct a risk assessment to identify any additional risks that may arise due to the special working conditions at the equipment location.

- This information must be implemented in the form of operating instructions for the operation of the equipment .
- During the entire period of equipment use, the owner must ensure that the operating instructions created reflect the current state of policy and adjust them if necessary.
- The owner must clearly regulate and define the responsibilities for operation, troubleshooting, maintenance and cleaning.
- The owner must ensure that all persons who work with the equipment have read and understood this manual.
- The owner must also train and inform personnel of hazards at regular intervals.
- The owner must provide personnel with the required protective equipment and must ensure that personnel wear the required protective equipment.
- The owner must ensure adequate ventilation of the installation site around the equipment and work area.
- The owner is also responsible for ensuring that the equipment is always in good working order. The following therefore applies:
    - The owner must ensure that the maintenance intervals described in this manual are observed.
    - The owner must ensure that the required fire protection measures are always compliant and functional.

2 Hardware description

Before operating the equipment, you should be familiar with the location and names of all parts of the equipment. This will help you understand the operating procedures and assist with troubleshooting, if required.

2.1 Overview

The ULR-200 Rotary Evaporator is a high-capacity system designed for efficient and gentle solvent separation under vacuum. Typical applications include sample concentration, solvent recovery, purification, and extraction in the pharmaceutical, chemical, biological, and food industries.

The system operates by rotating an evaporating flask partially submerged in a thermostatically controlled water bath. Rotation creates a thin liquid film on the inner flask surface, which significantly increases the rate of evaporation while preventing localized overheating or sample degradation.

The generated vapors pass through the vapor duct into a vertical condenser, where they are cooled by a circulating fluid. Condensed solvent collects in the receiving flask for reuse or disposal. High-performance PTFE and Viton dual seals ensure maximum vacuum integrity and consistent performance.

By operating under reduced pressure, solvents such as ethanol, n-hexane, or water can be evaporated at significantly lower temperatures, preserving sample quality while improving efficiency and throughput.

2.1.1 Key features

Precise temperature control

- Integrated digital thermostatic water bath provides stable and accurate heating.
- Over-temperature protection automatically shuts off heating if limits are exceeded.
- Heating bath designed for distilled water use only, ensuring long-term reliability of sensors and heating elements.

Robust drive and sealing system

- High-torque rotary motor ensures smooth and consistent flask rotation.
- Dual PTFE and Viton sealing system maintains strong vacuum integrity and minimizes solvent loss.
- Built for continuous operation in demanding laboratory environments.

High-performance condenser

- Vertical coil condenser with large surface area for efficient vapor condensation.
- Compatible with a wide range of cooling fluids for flexible operation.
- Designed to minimize solvent loss and improve recovery yields.

Glassware

- Constructed from borosilicate 3.3 glass for excellent chemical resistance and durability.
- Standardized joint connections allow easy replacement and compatibility with common lab accessories.
- Evaporating and receiving flasks designed for maximum visibility and safety.

Durable construction

- Corrosion-resistant coated housing ensures long service life in laboratory conditions.
- Easy-to-clean surfaces to maintain hygiene and performance.

2.1.2 Safety features

Overheat protection

- Integrated digital thermostatic control monitors and regulates bath temperature.
- Over-temperature cut-off automatically shuts down heating if unsafe levels are reached.

Dry-run protection

- Heating bath includes a dry-run safety system that prevents operation without sufficient water, protecting the heating elements and sensors.

Electrical protection

- Overload protection built into the rotary drive motor prevents damage under excessive load.
- Grounded power design ensures operator safety when properly connected to a dedicated circuit.

Secure glassware mounting

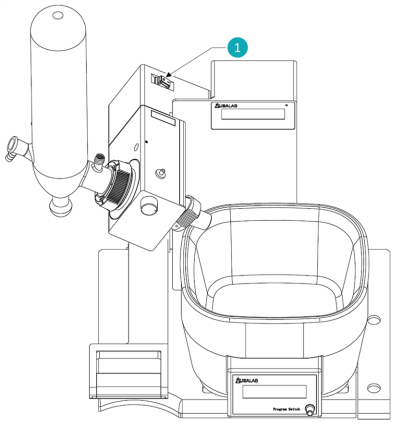
- Standard clamps and connectors securely hold evaporating and receiving flasks in place.
- Designed to reduce the risk of detachment during operation while allowing safe release when required.

2.2 Diagrams

2.2.1 Power switch

Power switch location for main body

The main body power switch is located on the top of the main body near the rear of the evaporator.

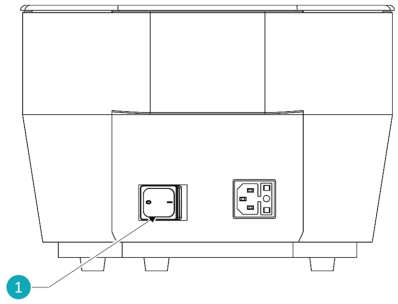


1	Main body power switch

Figure 2 - Main body power switch

Power switch location for water bath

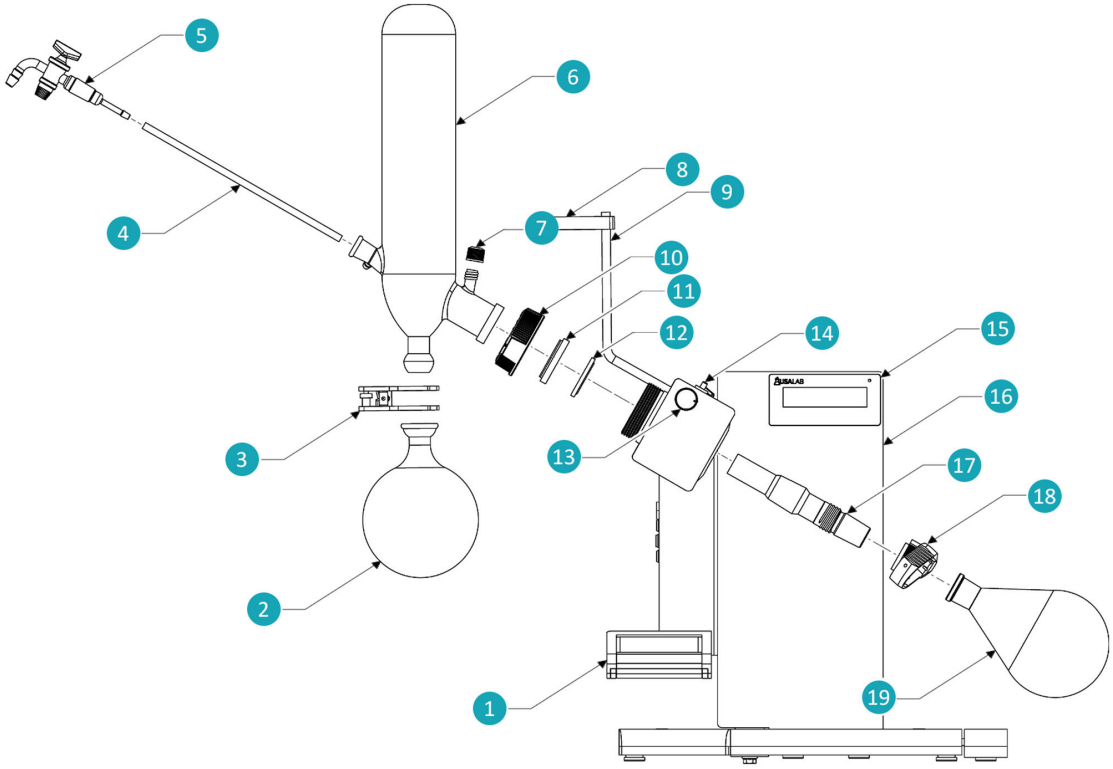
The water bath power switch is located on the back of the water bath near the bottom of the unit.



1	Water bath power switch

Figure 3 - Water bath power switch

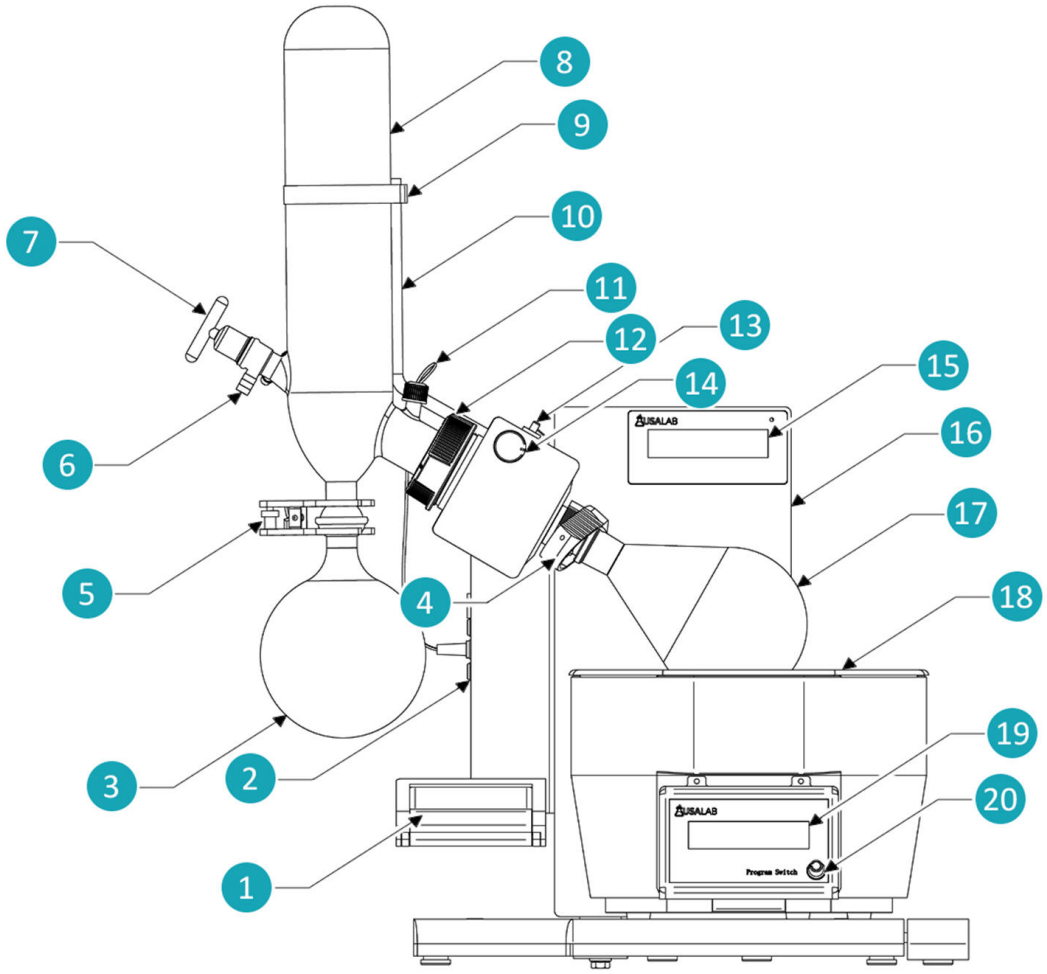
2.2.2 Exploded diagram of ULR-200



1	Height adjustment handle	11	Condenser split ring
2	Receiving flask	12	Oil seal
3	Receiving flask metal pinch clamp	13	Rotation speed controller knob
4	PTFE stem	14	Lock key for evaporating flask
5	Fluid/solvent inlet stopcock	15	LCD display
6	Condenser	16	Main body
7	Sensor GL cap	17	Vapor duct
8	Condenser strap	18	Evaporating flask clip
9	Condenser rod arm	19	Evaporating flask
10	Condenser screw		

Figure 4 - Exploded diagram of ULR 200

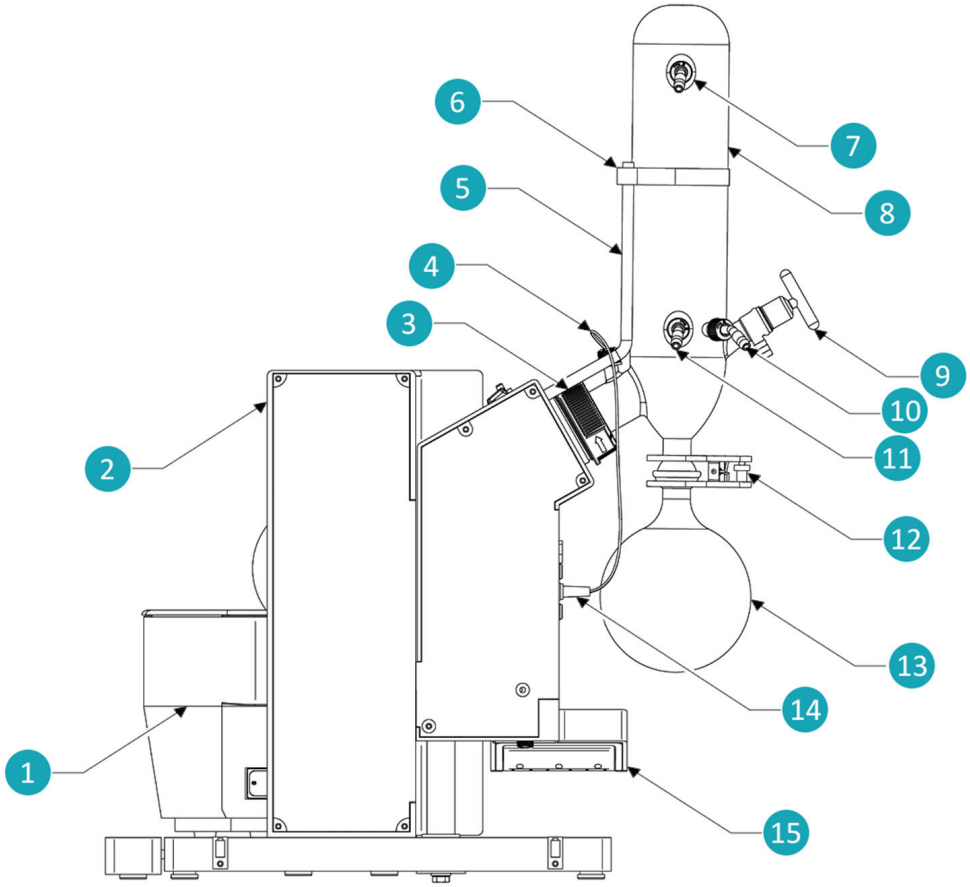
2.2.3 Diagram of ULR-200 - front view



1	Heigh adjustment handle	11	Temperature sensor
2	Temperature and vacuum controller ports	12	Condenser screw
3	Receiving flask	13	Lock Key for evaporating flask
4	Evaporating flask clip	14	Rotation speed controller knob
5	Receiving flask metal pinch clamp	15	LCD display
6	Fluid/solvent inlet port	16	Rotary evaporator main body
7	Fluid/solvent inlet stopcock	17	Evaporating flask
8	Condenser	18	Water bath
9	Condenser strap	19	Water bath LCD display
10	Condenser rod arm	20	Program switch

Figure 5 - Front view of ULR 200

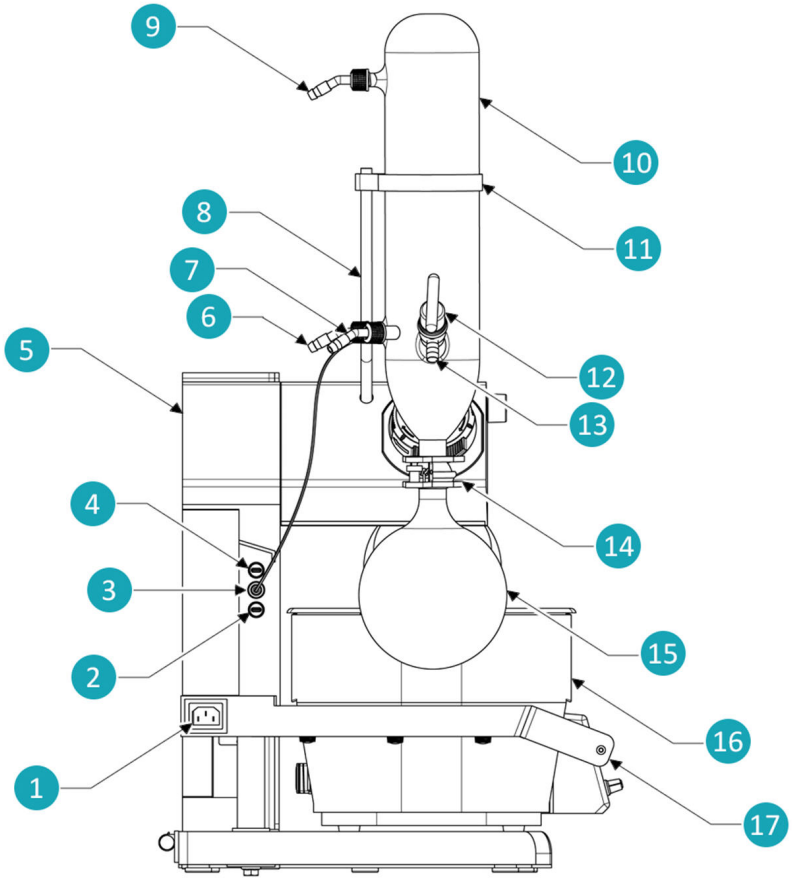
2.2.4 Diagram of ULR-200 - rear view



1	Water bath	9	Fluid/solvent inlet stopcock
2	Rotary evaporator main body	10	Vacuum GL14 barb
3	Condenser screw	11	Condenser fluid GL14 barb inlet
4	Temperature sensor	12	Receiving flask metal pinch clamp
5	Condenser rod arm	13	Receiving flask
6	Condenser strap	14	Temperature and vacuum controller ports
7	Condenser fluid GL14 barb outlet	15	Heigh adjustment handle
8	Condenser		

Figure 6 - Rear view of ULR 200

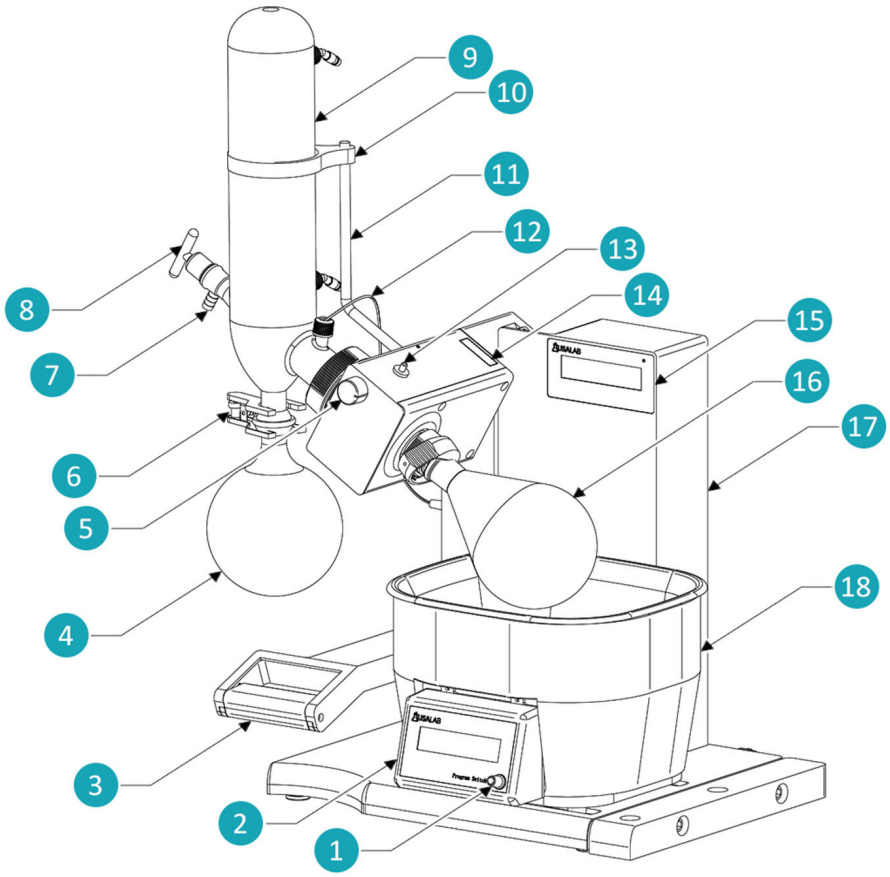
2.2.5 Diagram of ULR-200 - side view



1	Power supply for rotary evaporator main body	10	Condenser
2	Spart communications port	11	Condenser strap
3	Temperature sensor port	12	Fluid/solvent stopcock
4	Vacuum controller port	13	Fluid/solvent inlet port
5	Rotary evaporator main body	14	Receiving flask metal pinch clamp
6	Condenser fluid GL14 barb inlet	15	Receiving flask
7	CVacuum GL14 barb	16	Water bath
8	Condenser rod arm	17	Heigh adjustment handle
9	Condenser fluid GL14 barb outlet		

Figure 7 - Side view of ULR 200

2.2.6 Diagram of ULR-200 - top view



1	Program switch	10	Condenser strap
2	Water bath LCD display	11	Condenser rod arm
3	Height adjustment handle	12	Temperature sensor
4	Receiving flask	13	Lock key for evaporating flask
5	Rotation speed controller knob	14	Motor angle adjustment
6	Receiving flask metal pinch clamp	15	LCD display
7	Fluid/solvent inlet port	16	Evaporating flask
8	Fluid/solvent inlet stopcock	17	Rotary evaporator main body
9	Condenser	18	Water bath

Figure 8 - Top view of ULR 200

2.2.7 Electrical diagram

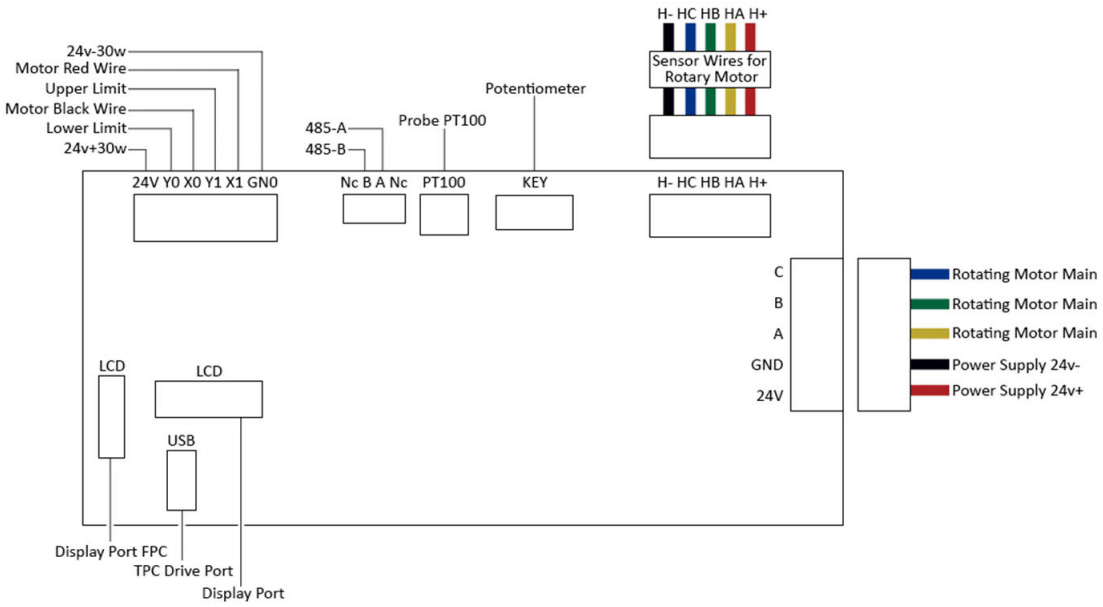


Figure 9 - Electrical diagram of ULR 200

2.3 Application with Ancillary Equipment

To achieve optimal performance, the ULR-200 Rotary Evaporator is best used in combination with the following USA Lab peripheral devices:

Heater/Chiller – USA Lab HC510 (UPC: 810047121534)

A versatile heating and cooling circulator designed to provide stable temperature control for the rotary evaporator's condenser and heating bath. The HC510 ensures consistent thermal transfer and improved distillation efficiency.

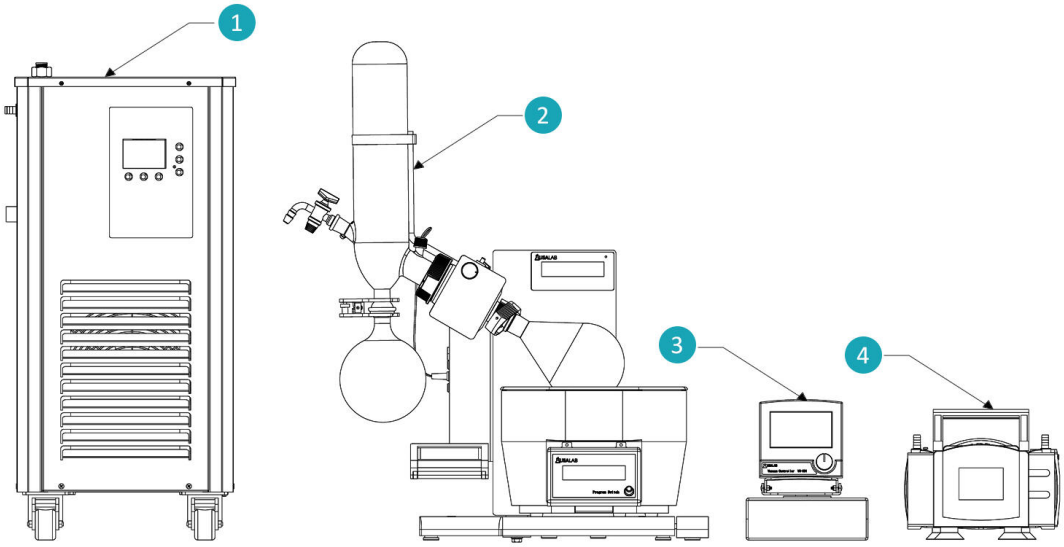
Vacuum Controller – USA Lab USA-VC-001 (UPC: 840215216113)

The digital vacuum controller regulates system pressure with precision, allowing users to maintain stable evaporation conditions. It also helps prevent bumping and provides safer operation with volatile or sensitive solvents.

Vacuum Pump – USA Lab USA-DVP-1.2 (UPC: 840215216120)

A chemically resistant diaphragm vacuum pump that provides reliable suction for most laboratory distillations. Designed for continuous operation with corrosive vapors, it pairs seamlessly with the USA-VC-001 controller to deliver smooth and efficient vacuum performance.

- When used together, the HC510, USA-VC-001, and USA-DVP-1.2 create a complete, integrated evaporation system with precise temperature control, stable vacuum regulation, and reliable solvent recovery.
- Optional cold traps may be connected to further protect the vacuum pump and improve solvent collection efficiency.



1	Heater/Chiller – USA Lab HC510 (UPC: 810047121534)
2	Rotary Evaporator – USA LAB ULR-200 (UPC: 810047122463)
3	Vacuum Controller – USA Lab USA-VC-001 (UPC: 840215216113)
4	Vacuum Pump – USA Lab USA-DVP-1.2 (UPC: 840215216120)

Figure 10 - Application with ancillary equipments - front view

2.4 Connection diagrams

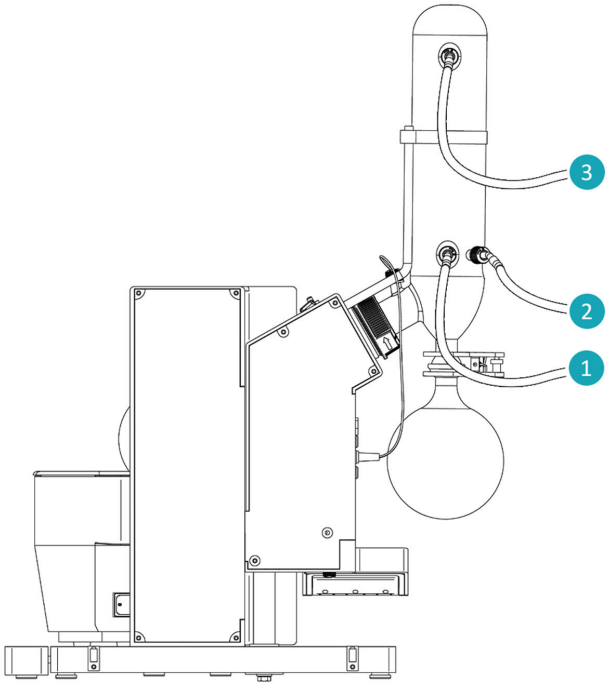
2.4.1 Connecting the vacuum and condenser tubing

To achieve optimum performance and consistent distillation, the ULR-200 Rotary Evaporator should be paired with a properly matched vacuum source and recirculating heater/chiller. Using a fully integrated system ensures stable operating conditions, reliable solvent recovery, and maximum equipment lifespan.

For best results, we recommend the following **USA Lab components**:

- **Heater/Chiller:** USA Lab HC510 (UPC: 810047121534)
- **Vacuum Controller:** USA Lab USA-VC-001 (UPC: 840215216113)
- **Vacuum Pump:** USA Lab USA-DVP-1.2 (UPC: 840215216120)

By using USA Lab-branded accessories, you ensure complete compatibility across your system, seamless integration, and industry-leading service and support.



1	Fluid inlet	3	Fluid outlet
2	Vacuum port		

Figure 11 - Vacuum and condenser tubing connection

2.4.2 Connection procedure

Condenser

- Connect the fluid inlet (1) and fluid outlet (3) on the condenser using GL14 cap nuts.
- There is no required orientation for flow and return lines; however, a consistent connection method is recommended to standardize setup and minimize user error.
- Ensure coolant lines are free of sharp bends or restrictions that may reduce flow rate.

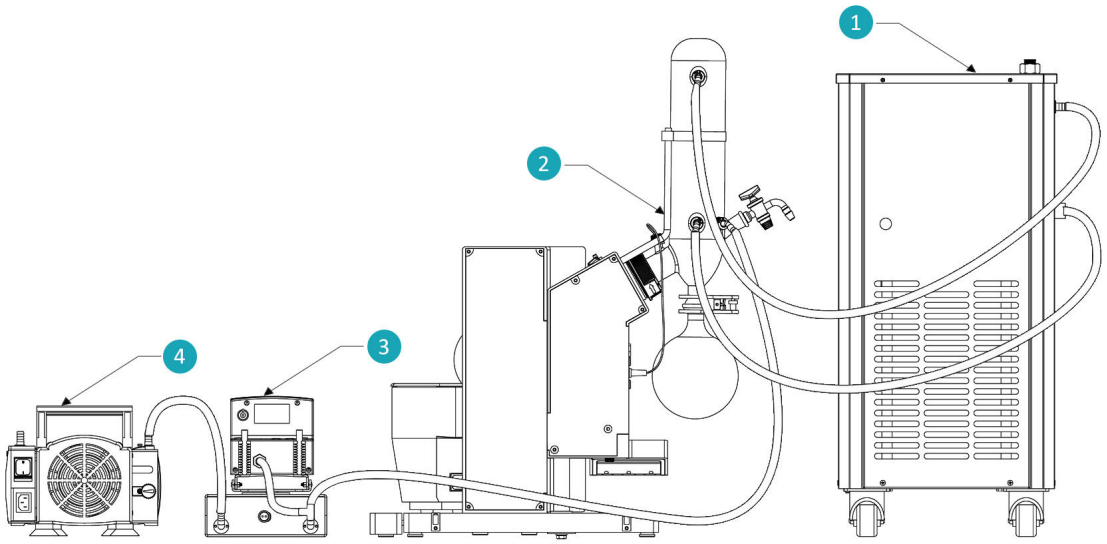
Vacuum

- Connect the vacuum port (2) to your vacuum controller or directly to the vacuum pump using the provided GL14 cap nuts.
- A vacuum controller (such as USA-VC-001) is strongly recommended for precise regulation, protection of samples, and energy efficiency.

2.4.3 Overview of connections

The diagram below illustrates the recommended connection of tubing and electrical leads for the ULR-200 Rotary Evaporator in conjunction with the following ancillary equipment:

1. **USA Lab HC510 Heater/Chiller** – provides circulation of heating or cooling fluid to the condenser for stable temperature control.
2. **USA Lab USA-VC-001 Vacuum Controller** – regulates system pressure, helping maintain steady evaporation conditions.
3. **USA Lab USA-DVP-1.2 Vacuum Pump** – generates vacuum for solvent evaporation and recovery.



1	Heater/Chiller – USA Lab HC510 (UPC: 810047121534)
2	Rotary Evaporator – USA LAB ULR-200 (UPC: 810047122463)
3	Vacuum Controller – USA Lab USA-VC-001 (UPC: 840215216113)
4	Vacuum Pump – USA Lab USA-DVP-1.2 (UPC: 840215216120)

Figure 12 - Connection with ancillary equipments - rear view

2.4.4 Electrical connections

The ULR-200 Rotary Evaporator requires a properly grounded power supply to ensure safe and reliable operation. Before connecting the unit, verify that the available power source matches the electrical requirements specified for your model.

► For more information, see *Technical specifications* on page 85.

WARNING

Electrical safety!

- The wall outlet must be installed by a licensed electrician and comply with local electrical codes.
- The ULR-200 requires two dedicated circuits to prevent overloading from other equipment.
- Always ensure the outlet is properly grounded.

Caution

Risk of equipment damage!

- Do not modify the supplied power or interconnect cables.
- Do not use extension cords, adapters, or unapproved replacement cables.
- Never unplug the evaporator while it is operating. Doing so may damage the electronics or create a shock hazard.
- Never use a powerstrip, always connect to a wall outlet. Doing so may damage the electronics or create a shock hazard.

Notice

Operator responsibility!

- Inspect all cables regularly for wear or damage. Replace immediately if compromised.
- Disconnect the system from the wall outlet before performing cleaning, inspection, or maintenance.

2.4.5 Plug type

- ULR-200 : Standard NEMA 5-15P (110V)

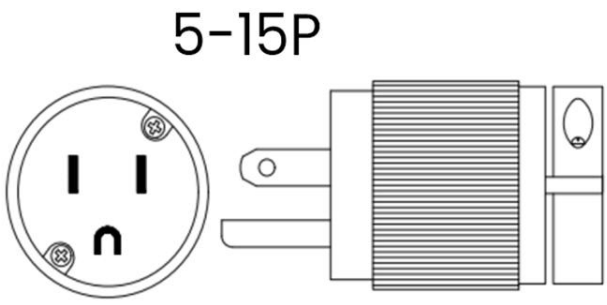
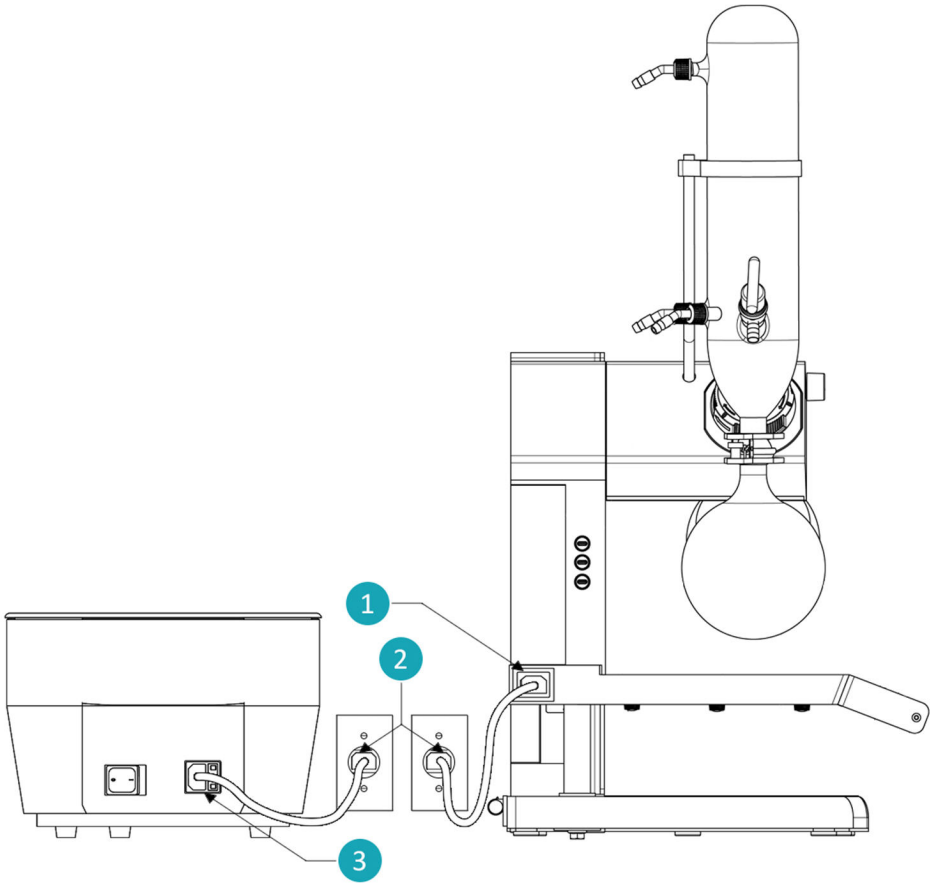


Figure 13 - Plug types used on evaporators

2.4.6 Water bath and main body electrical connections

To ensure safe and reliable operation, the ULR-200 Rotary Evaporator and its heating bath must be connected correctly. Refer to the diagram below when making electrical connections.



1	Main Body power socket
2	Grounded wall outlet
3	Water bath power socket

Figure 14 - Water bath and main body electrical connection

2.4.7 Power supply connection procedure

Warning:
The main body and bath must be on their own dedicated circuit. Failure to do so can damage the equipment.

Main body power supply

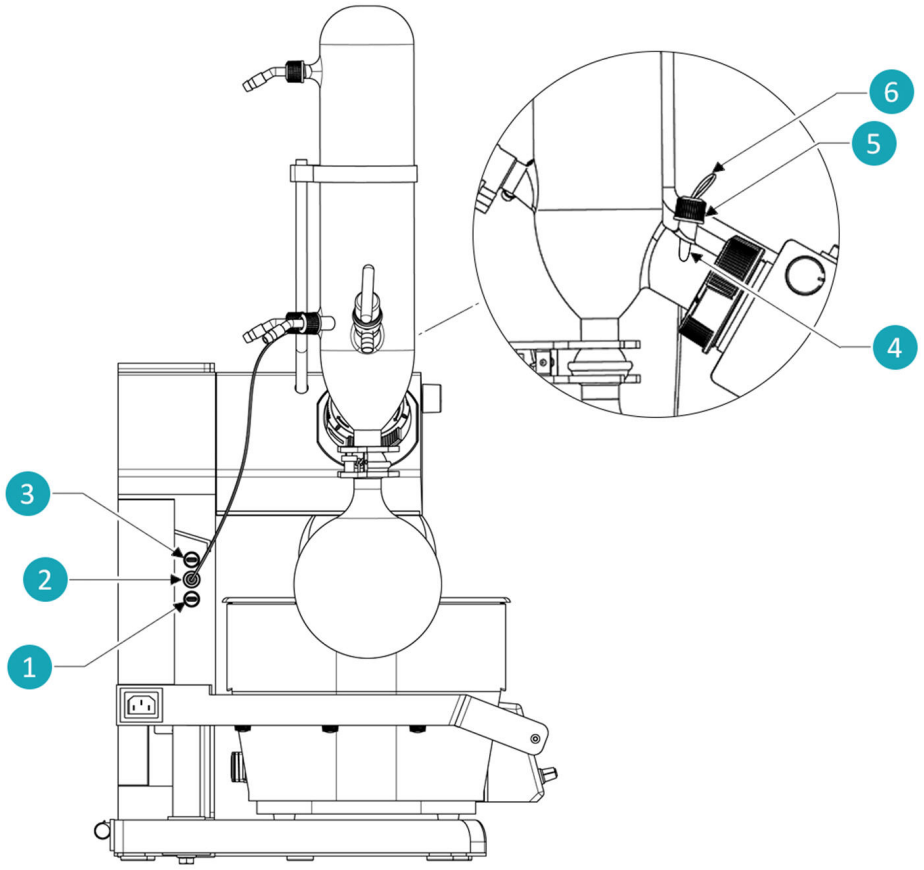
- Connect the main body power socket (1) to a properly grounded wall outlet (2) using the supplied power cable.

Water bath power supply

- Connect the bath power socket (3) to a properly grounded wall outlet (2) using the supplied power cable.

2.4.8 Temperature and auxiliary connections

The ULR-200 Rotary Evaporator includes auxiliary ports designed to enhance process monitoring and control. Proper installation of these connections ensures precise operation and long-term reliability. Refer to the diagram above for port locations.



1	Spare communications port	4	Sensor thermowell
2	Temperature sensor port	5	Thermowell GL cap
3	Vacuum controller port	6	Temperature sensor

Figure 15 - Temperature and auxiliary connections

Port functions

1. Spare Communications Port (1)

- Reserved for future accessories or upgrades.
- Not required for standard operation.

2. Temperature Sensor Port (2)

- Accepts an external probe (included) for real-time temperature measurement of the vapor path or solvent.
- Connects to the thermowell (4) on the condenser, near the motor assembly, and is secured using a GL cap (5).
- Provides highly accurate temperature feedback for process optimization and heat-sensitive applications.

3. Vacuum Controller Port (3)

- Designed for use with the USA Lab Vacuum Controller (USA-VC-001, UPC: 840215216113).
- Allows precise adjustment of vacuum levels to improve solvent recovery, reduce bumping, and maintain stable evaporation conditions.

Temperature sensor port installation

1. Remove the GL cap (5) from the thermowell port (4) located on the condenser near the motor housing.
2. Add a small amount of thermal transfer medium (recommended: silicone oil or glycol-water mix) inside the thermowell (4).
    - This ensures proper thermal contact between the temperature sensor (6) and the thermowell (4) surface.
    - Do not use solvents or flammable liquids inside the thermowell (4).
3. Carefully insert the temperature sensor (6) through the GL cap (5) and into the thermowell (4).
4. Secure the temperature sensor (6) in place with the GL cap (5) to ensure a leak-free and stable connection.
5. Route the temperature sensor (6) cable neatly to the temperature sensor port (2) on the main body and connect firmly.
6. Verify that the temperature sensor (6) is fully seated before operation to ensure accurate readings.

Vacuum controller port installation

1. Connect the vacuum line from the condenser vacuum barb to the inlet of the vacuum controller (USA-VC-001, UPC: 840215216113).
2. Attach the outlet of the vacuum controller to the vacuum pump (USA-DVP-1.2, UPC: 840215216120).
3. Connect the controller's signal cable to the vacuum controller port (3) on the ULR-200 main body.
4. Ensure all hose clamps and GL fittings are secure before applying vacuum.
5. Power on the vacuum controller and set vacuum parameters according to solvent type and application.

Safety and best practices

WARNING

Incorrect installation!

- Never force connectors into ports. Misalignment can cause permanent damage.
- Do not operate the unit if the temperature sensor probe is loose or improperly seated.

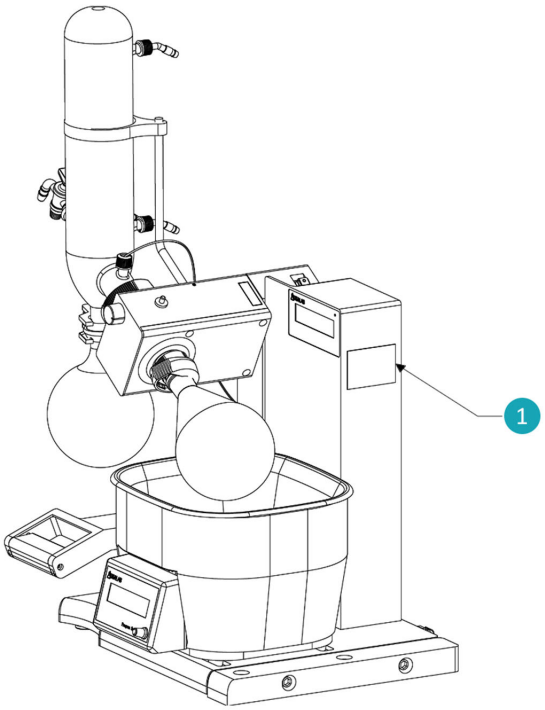
Caution

Sensor protection!

- Always use an inert thermal transfer fluid (silicone oil or glycerin).
- Never fill the thermowell with solvents or flammable liquids.
- Inspect the probe and GL cap regularly for wear or leaks.

2.5 Rotary evaporator identification

The ULR-200 identification label is located on the rear of the main body (see Figure 6 on page 22). This label provides the critical information needed for service, compliance, and technical support.



1	Identification tag

Figure 16 - Rotary evaporator nameplate location

The ULR-200 identification label provides the following information:

- Unit name
- Unit model
- Voltage / Frequency (V/Hz)
- Power (W)
- Rotation Range (rpm)
- Serial number / Batch number
- Manufacturing date

The location of the identification label may vary slightly depending on date of model. Always record your serial number and batch number before installation.

2.6 Transport and storage

Transport

Important

Risk of damage due to improper handling!

The ULR-200 Rotary Evaporator contains precision glassware and sensitive components. To prevent breakage or misalignment, always transport the unit with care.

- Fully dismantle all glassware and accessories before transport.
- Pack all components securely to avoid shock or vibration damage — the original packaging is strongly recommended.
- Avoid tilting, dropping, or subjecting the unit to sharp impacts during handling or shipping.
- After transport, inspect all glassware, seals, and fittings for cracks, chips, or leaks before reassembly.
- Any transit damage must be reported immediately to the carrier and USA Lab support.
- Retain all packing material for future transport or long-term storage.

Storage

To maintain the reliability and performance of the ULR-200 during extended storage periods:

- Store the device in a clean, dry, and climate-controlled environment.
- Whenever possible, keep the unit in its original packaging to protect sensitive components.
- Ensure that glassware is stored separately, supported, and cushioned to avoid breakage.
- After storage, thoroughly check all seals, gaskets, tubing, and glassware for signs of wear or damage before returning the unit to service.
- Replace any damaged or compromised parts immediately with genuine USA Lab components to ensure safety and performance.

This page is intentionally left blank

3 Installation and set up

Before operating the ULR-200 Rotary Evaporator, ensure that all components are present, clean, and ready for assembly. Proper preparation prevents damage and ensures safe operation.

- **Unpack completely:** Open all shipping cartons and verify that all parts listed in the packing slip are included.
- **Inspect components:** Carefully check all glassware, seals, and fittings for cracks, chips, or defects before assembly. Do not use damaged parts.
- **Clean and dry:** Ensure that every component — especially glassware and joints — is free from dust, debris, or moisture.
- **Prepare the workspace:** Place the rotary evaporator on a stable, level, vibration-free surface in a clean, well-ventilated laboratory environment.
- **Check power and utilities:** Confirm that electrical outlets, cooling water supply, and vacuum connections meet the requirements listed in the technical specifications.

Important

- Never attempt to assemble or operate the ULR-200 without first inspecting the components and preparing the installation site.
- The condenser may have saw dust or packing material inside to prevent shipping damage. This is best removed with compressed air.

3.1 What's in the box

The following parts are included in the package:

Table 1 - Packaging list

Part	Amount
Rotary evaporator main body	1 unit
Rotary evaporator water bath	1 unit
Evaporating flask	1 piece
Receiving flask	1 piece
Condenser	1 piece
Fluid inlet stopcock	1 piece
Vapor duct	1 piece
Condenser oil seal set	1 piece
Evaporating flask clip	1 piece
Condenser split ring	1 piece
Condenser screw	1 piece
Thermowell GL cap	1 piece
Condenser GL barbs	3 pieces
Receiving flask metal pinch clamp	1 piece
Condenser rod arm	1 piece
Condenser strap	1 piece
Temperature sensor	1 piece
Main body power supply	1 piece
Water bath power supply	1 piece

3.2 Unpacking and positioning the rotary evaporator

Proper unpacking and placement of the ULR-200 is essential to ensure safe installation and long-term reliability. Please read through the following guidelines before handling the unit.

Unpacking

- Place the shipping crate or cartons in a clean, open area with sufficient space to safely remove all components.
- Use appropriate personal protective equipment (PPE), such as cut-resistant gloves and safety glasses, when unpacking.
- Carefully remove all protective foam, cartons, and wrapping materials. Avoid sharp tools that may damage the equipment or glassware.
- The main body, water bath, and glassware are precision components and may be heavy or fragile. Always use two people to lift and move the equipment when necessary.
- Verify that all items listed in the packing slip are included. Report any shortages or damage to USA Lab immediately.
- Retain all original packaging for future storage or transportation.

Positioning

- Place the rotary evaporator on a stable, level, and vibration-free surface capable of supporting the full weight of the assembled system.
- Ensure there is adequate clearance around the unit for ventilation, operation, and service access.
- Position the evaporator in a clean, dry, and climate-controlled laboratory environment, away from direct sunlight, corrosive fumes, and flammable materials.
- Allow at least 12-16 inches (30-40 cm) of clearance around the water bath and condenser to prevent overheating and ensure proper airflow.
- Confirm that electrical outlets, vacuum pumps, and recirculating chillers are located within safe and convenient reach, in accordance with the technical specifications.

Notice

- Do not attempt to install glassware or connect utilities until the ULR-200 has been properly unpacked, inspected, and positioned.
- If you believe any parts are missing or damaged upon delivery, contact USA Lab Customer Support immediately. Retain all original packaging materials, as they are required should the unit need to be returned for service or repair. USA Lab is not responsible for providing replacement packaging for return shipments.

3.3 Greasing glass joints and oil seals

Notice

To ensure proper sealing, vacuum integrity, and long-term performance, always apply joint grease to all glass joints and oil seals prior to installation. This includes the vapor duct and oil seal sets. Failure to lubricate these contact surfaces can lead to air leaks, glass seizing, and premature wear.

Recommended grease

- Use high-vacuum silicone grease or equivalent laboratory-grade joint grease. We recommend DuPont Molykote High Vacuum Grease (Formerly Dow Corning) SKU:DOWCOR, UPC:077472132287.
- Do not substitute with petroleum-based or non-laboratory greases, as they may damage glass or contaminate samples.

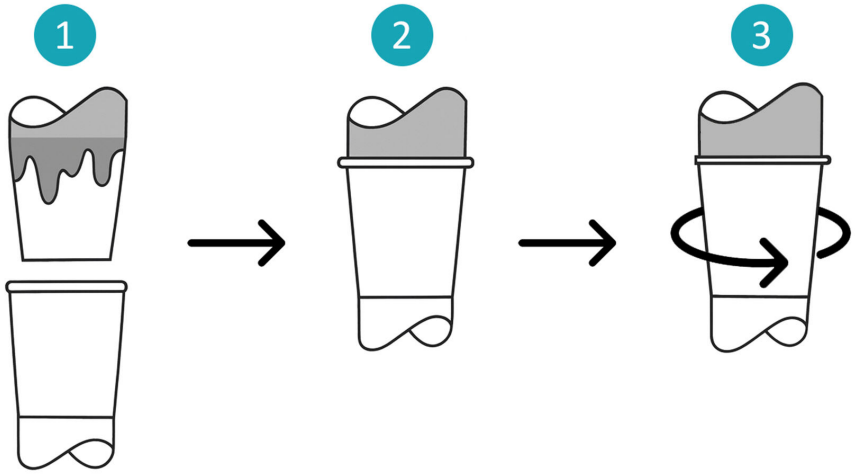


Figure 17 - Greasing glass joints

Application procedure for glass joints

Inspect the Joint and ensure both inner (male) and outer (female) glass joint surfaces are clean, dry, and free from chips or residue. Wipe the glass with a lint-free cloth or laboratory tissue if necessary.

1. **Apply a small amount**

- Place a pea-sized amount of grease on your fingertip or a clean applicator.
- Spread a thin, even layer around the top third of the inner joint (male side).
- Avoid over-application — excess grease can migrate into the vapor path or sample.

2. **Seat the joint**

- Insert the greased joint into its counterpart.

3. **Rotate the glass**

- Gently rotate the glass back and forth to evenly distribute the grease, creating a continuous vacuum seal.

4. **Check the seal**

- The joint should feel smooth and snug without sticking.
- A light, uniform “frosted” appearance indicates proper coverage.

3.4 Installation

3.4.1 Overview

The ULR-200 Rotary Evaporator is designed for straightforward assembly. The process involves positioning the main body and bath, installing the vapor duct and condenser, securing the evaporating and receiving flasks, and completing auxiliary and electrical connections. Once assembled, the unit can be adjusted for immersion depth and angle before operation.

Notice

This overview provides only a summary of the installation process. For step-by-step instructions with diagrams, refer to Section 3.5 *Detailed installation instructions* on page 47. Experienced operators may also use Section 1 *Quick assembly checklist* on page 1 as a fast reference.

Important

- Before beginning installation, ensure all glassware, seals, and joints have been properly greased as described in Section 3.3 *Greasing glass joints and oil seals* on page 42. Carefully inspect each part for cracks, chips, or defects.
- Assembly should always be performed on a clean, stable, level benchtop with sufficient clearance around the unit. Handle all glassware with care to prevent damage.

3.4.2 Installation steps

1. Position the main body and bath

- Place the rotary evaporator body on a level benchtop.
- Set the water/oil bath onto the platform, ensuring the bath feet are fully seated into the guide channels.

2. Install the vapor duct (pre-installed)

- Confirm the vapor duct is installed (pre-installed from USA Lab in most cases). If not installed, install into motor housing until you hear a click. Leave the screw side out towards the evaporating flask.

3. Attach the condenser

- Install the condenser screw over the condenser, attach the split ring to hold the condenser screw in place.
- Apply oil seal over vapor duct on condenser side.
- Secure the condenser to the motor arm using the condenser screw.
- Ensure the condenser is aligned vertically with the motor housing, adjust angle depending on need.

4. Install the Feed Valve

- Attach the supplied PTFE feed tube to the end of the valve stem.
- Insert the assembly into the designated condenser port, with the PTFE tube extending into the vapor duct.

5. Fit the receiving flask

- Attach the receiving flask to the bottom of the condenser.
- Secure with the spring clamp to ensure stability during operation.

6. Fit the evaporating flask

- Mount the evaporating (boiling) flask to the vapor duct.
- Secure it using the evaporating flask clip.

7. Adjust the Motor Angle and Immersion Depth

- Use the motor angle adjustment to align the flask vertically or tilt as needed.
- Use the height lift adjustment to align flask with the bath.
- Ensure a minimum clearance of 10 mm between the flask joint and bath surface when in operating position.

8. Connect the temperature probe

- Insert the probe into the condenser thermowell using the GL cap.
- Route the cable neatly to the temperature sensor port.

9. Connect the vacuum controller or vacuum pump

- Attach the vacuum line from the controller or pump to the condenser vacuum port.
- Verify a tight seal to maintain vacuum integrity.
- Connect the vacuum controller cable to the vacuum controller port on the main body.

10. Connect chiller supply and return lines

- Connect the inlet and outlet hoses from the recirculating chiller to the condenser fittings.
- Secure with hose clamps to prevent leaks.

11. Electrical connections

- Connect the rotary evaporator body to the bath using the supplied power cord.
- Plug the bath into a dedicated wall outlet installed by a qualified electrician.
- Verify that all power connections are secure before use.

3.5 Detailed installation instructions

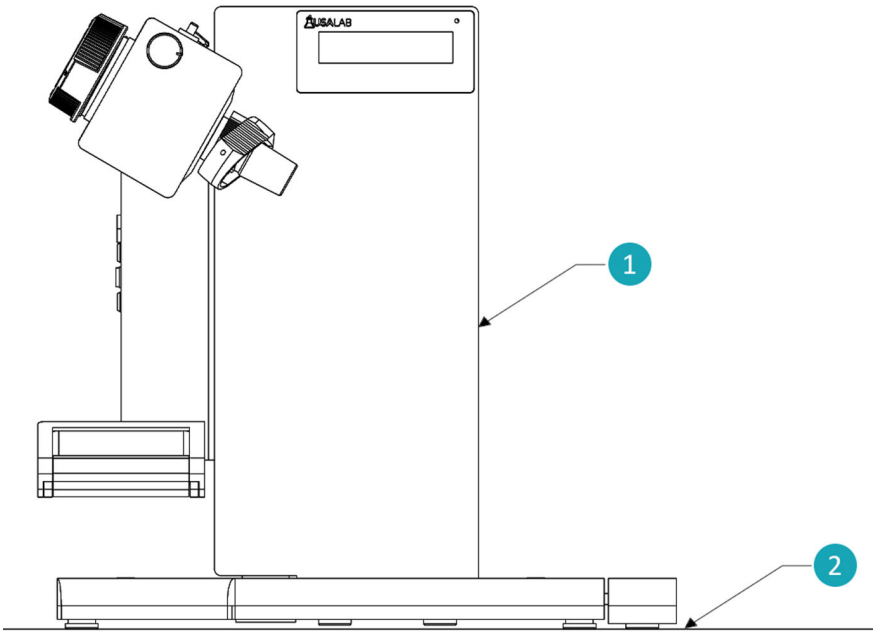
The following instructions expand on the Installation Overview and Quick Assembly Checklist, providing step-by-step guidance with safety notices and best practices. Refer to the diagrams in this section for visual references.

Important

- Before beginning installation, ensure all glassware, seals, and joints have been properly greased as described in Section 3.3 *Greasing glass joints and oil seals* on page 42. Inspect all parts for cracks, chips, or defects.

3.5.1 Position the main body

Place the rotary evaporator body (1) on a stable, level benchtop (2). Ensure the surface can support the full weight of the unit and provides enough clearance for glassware installation and safe operation.



1	Rotary evaporator main body
2	Stable, level benchtop

Figure 18 - Positioning the main body

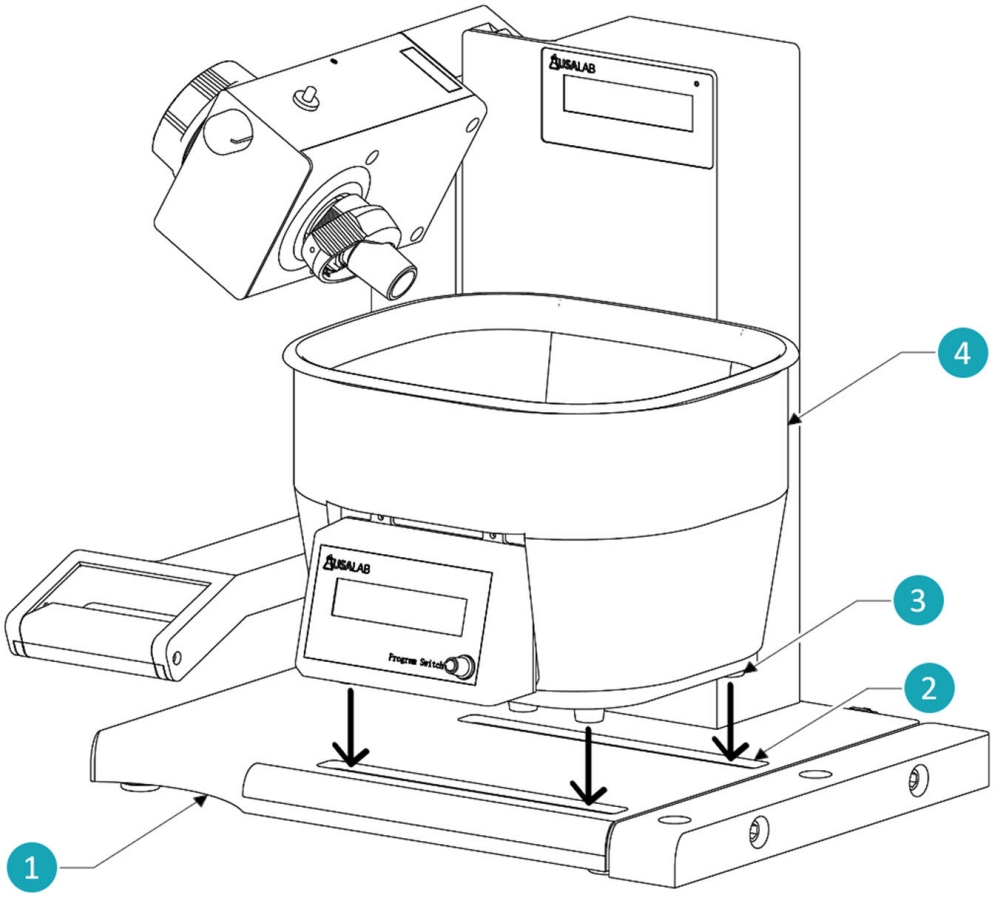
3.5.2 Placing the water bath

Set the water bath (4) onto the platform (1), ensuring the bath feet (3) are fully seated into the guide channels (2).

Important

Bath placement!

Improper seating may cause instability or misalignment of the evaporating flask during operation.



1	Platform	3	Water bath feet
2	Guide channels	4	Water bath

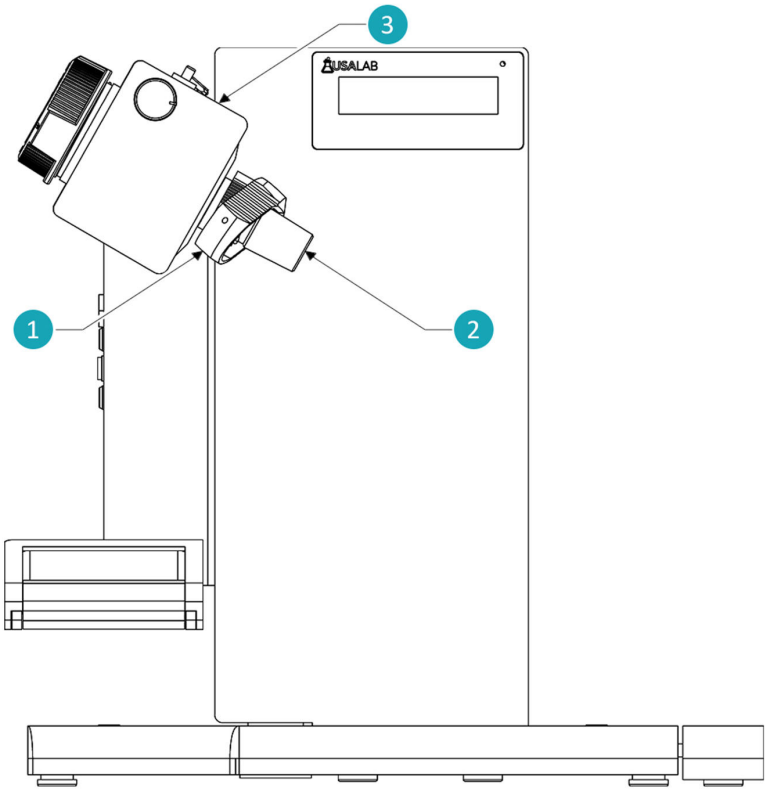
Figure 19 - Placing the water bath

3.5.3 Verify vapor duct installation (Pre-installed)

- The vapor duct (2) and flask clip (1) are factory pre-installed. Confirm they are securely seated in the motor housing (3).
- If not installed, insert the vapor duct (2) into the motor housing (3) until it clicks, with the clip (1) side facing the evaporating flask.
- To remove the vapor duct (2), pull gently until it is removed from the locking mechanism and hear a click.

Notice

Check that the vapor duct (2) is properly lubricated with vacuum grease to maintain vacuum integrity.



1	Evaporating flask clip	3	Motor housing
2	Vapor duct		

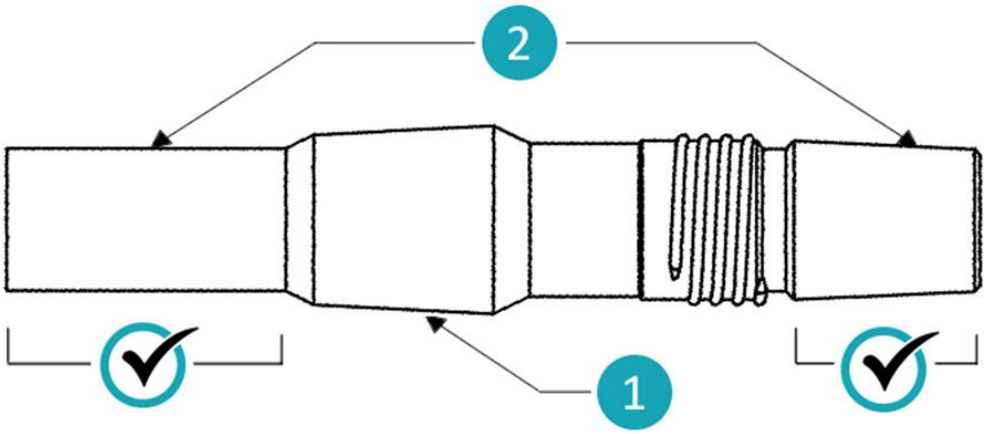
Figure 20 - Vapor duct installation verification

3.5.4 Greasing the vapor duct

Apply a thin, even layer of vacuum grease only to the jointed areas (2) of the vapor duct (1).

Notice

Do not over-apply grease, as excess material may enter the vapor path and contaminate your sample.



1	Vapor duct
2	Male joints

Figure 21 - Greasing the vapor duct

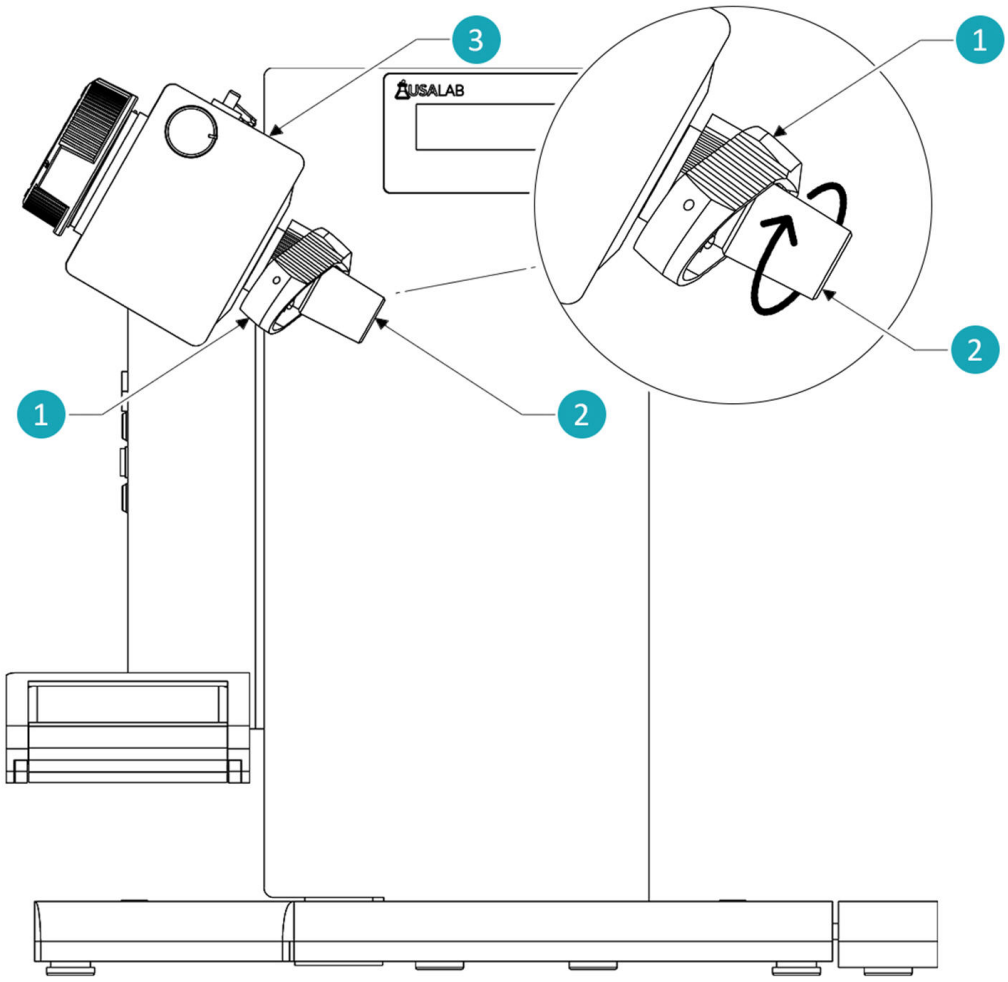
3.5.5 Installing the evaporating flask clip

Rotate the clip (1) clockwise onto the vapor duct (2) threads until it is secure.

Hand tighten only — do not overtighten, as this may stress the glassware.

Notice

Always verify that the clip (1) is fully seated and attached before starting rotation.



1	Evaporating flask clip
2	Vapor duct
3	Motor housing

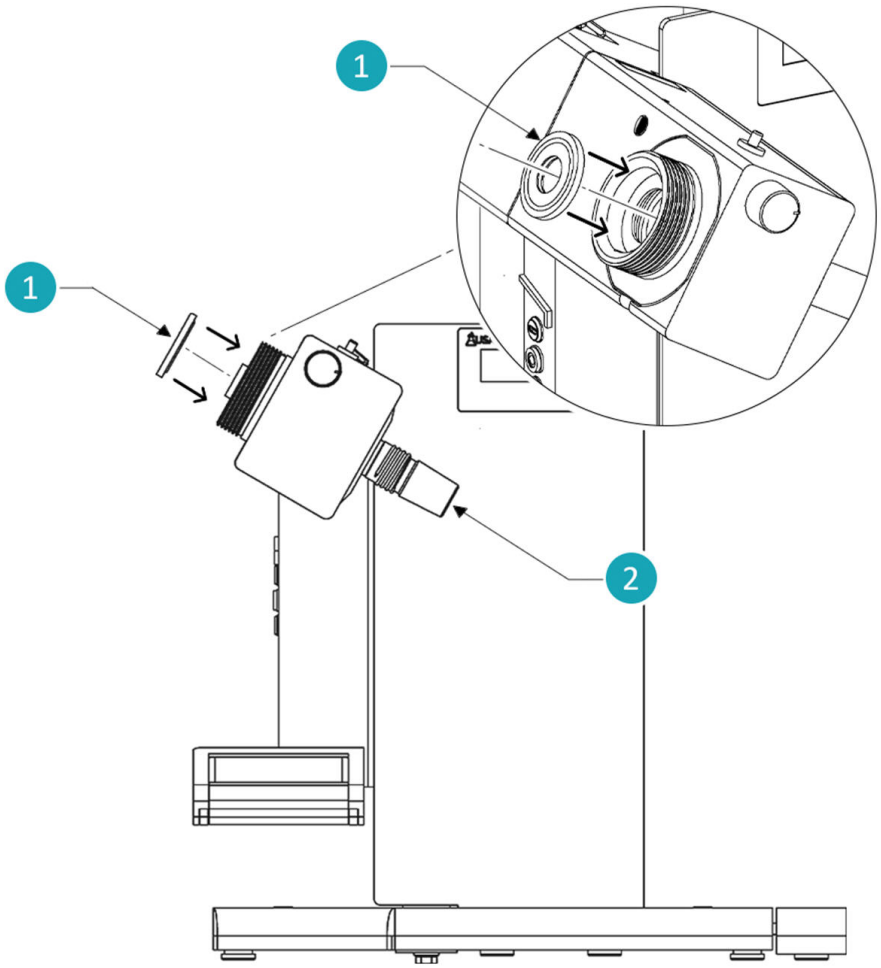
Figure 22 - Installing evaporating flask clip

3.5.6 Installing the oil seal

- Apply a thin, even layer of vacuum grease to the oil seal (1). Position the oil seal over the vapor duct (2) on the condenser-side motor housing.
- Ensure the seal (1) is oriented correctly, with the sealing O-ring surface facing the condenser.
- Gently press the seal (1) into place over the vapor duct.

Caution

Incorrect orientation of the oil seal will cause vacuum leaks or reduced performance. Always inspect the seal for damage or wear before installation.



1	Oil seal
2	Vapor duct

Figure 23 - Installing the oil seal

3.5.7 Attach the condenser

Attach the condenser rod arm and condenser strap to the arm.

Slide the condenser screw over the condenser and place the split ring to secure the screw in place.

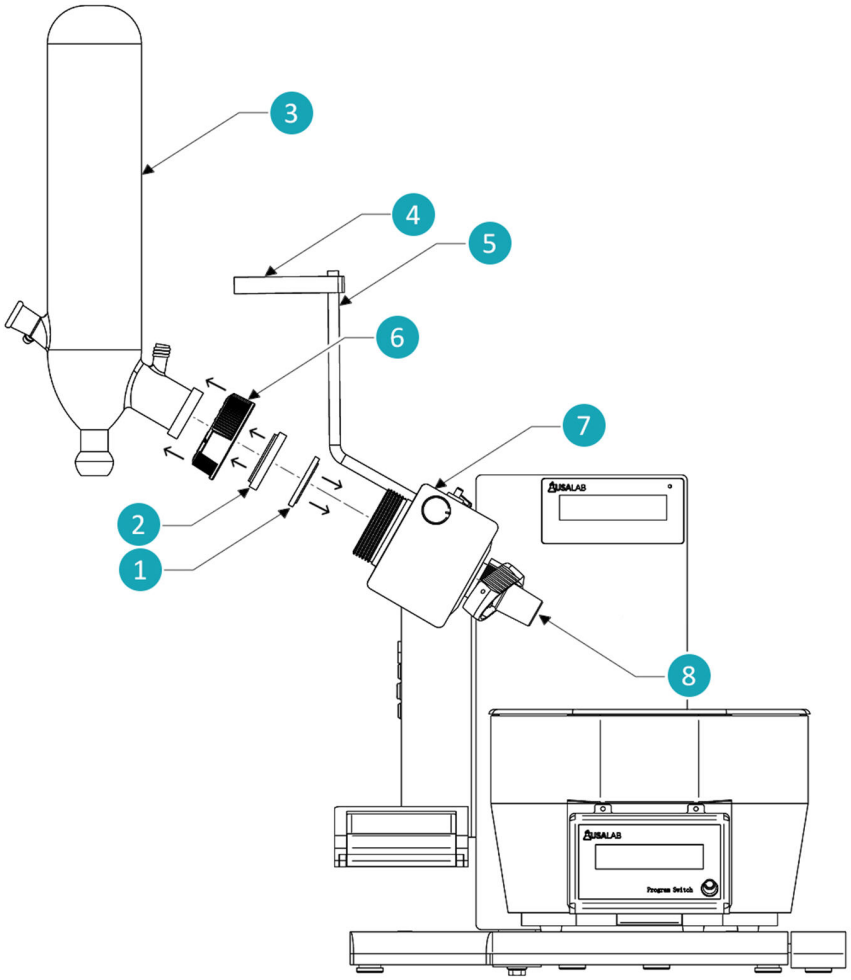
Position the condenser onto the vapor duct and secure it to the motor arm using the condenser screw.

Align vertically with the motor housing and attach condenser strap.

Caution

Glass stress!

Do not overtighten the condenser screw. Hand-tighten only until secure. Excessive force may damage the glass.

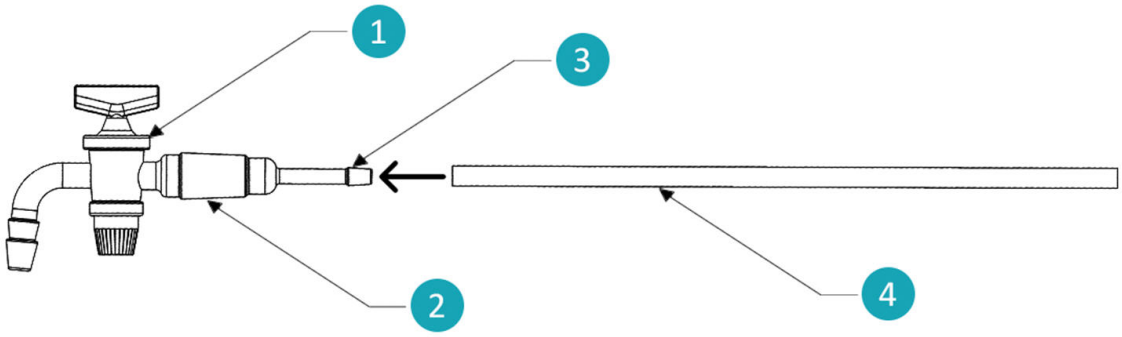


1	Oil seal	5	Condenser rod arm
2	Condenser split ring	6	Condenser screw
3	Condenser	7	Motor housing
4	Condenser strap	8	Vapor duct

Figure 24 - Installing condenser

3.5.8 Install the feed valve

- Attach the supplied PTFE feed tube (4) to the end of the valve stem (3).
- Lightly grease the feed valve stopcock male joint (2).



1	Stopcock valve	3	Stopcock stem
2	Stopcock male joint	4	PTFE feed tube

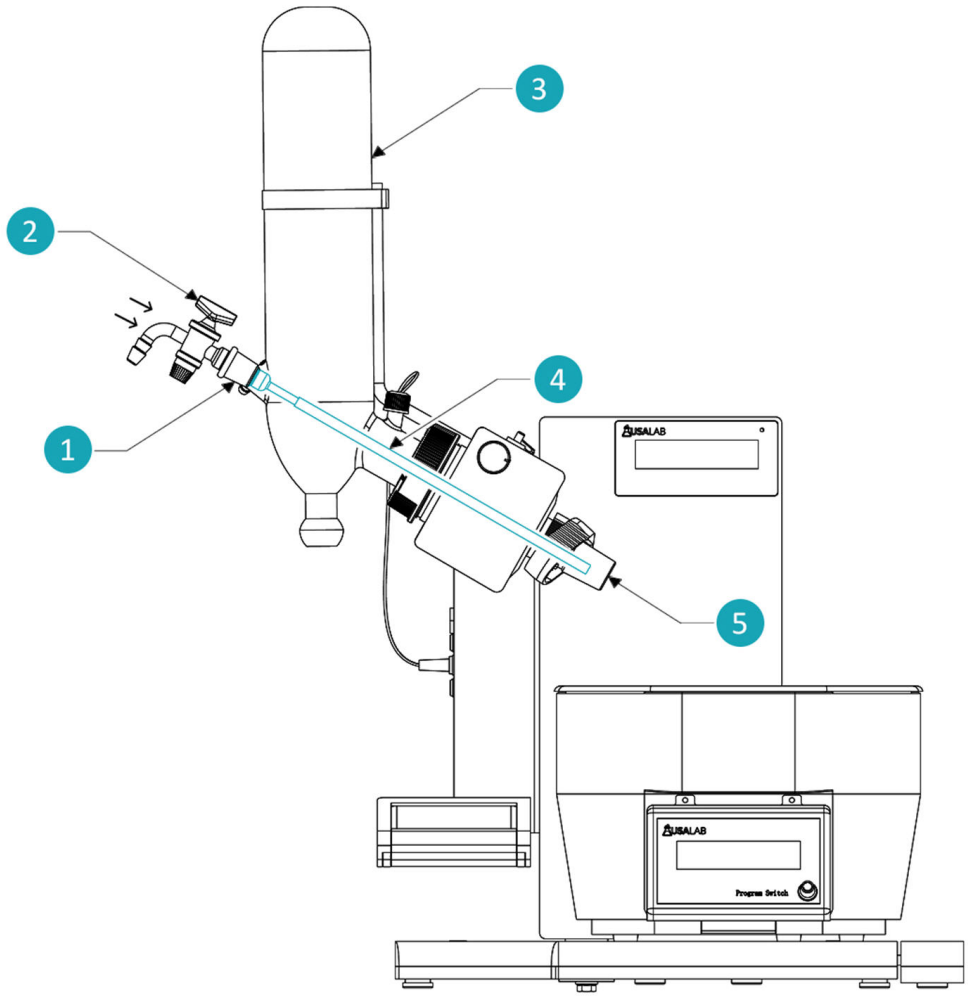
Figure 25 - Installing feed valve

- Insert the feed valve assembly (2) into the small side condenser port (1), ensuring the PTFE tube (4) extends into the vapor duct (5).

Important

Tube position!

Verify the PTFE tube rests inside the vapor duct, not against the glass wall. Incorrect positioning may obstruct vapor flow or damage glassware.



1	Condenser side port	4	PTFE feed tube
2	Feed valve Assembly	5	Vapor duct male joint
3	Condenser		

Figure 26 - Feed port in condenser

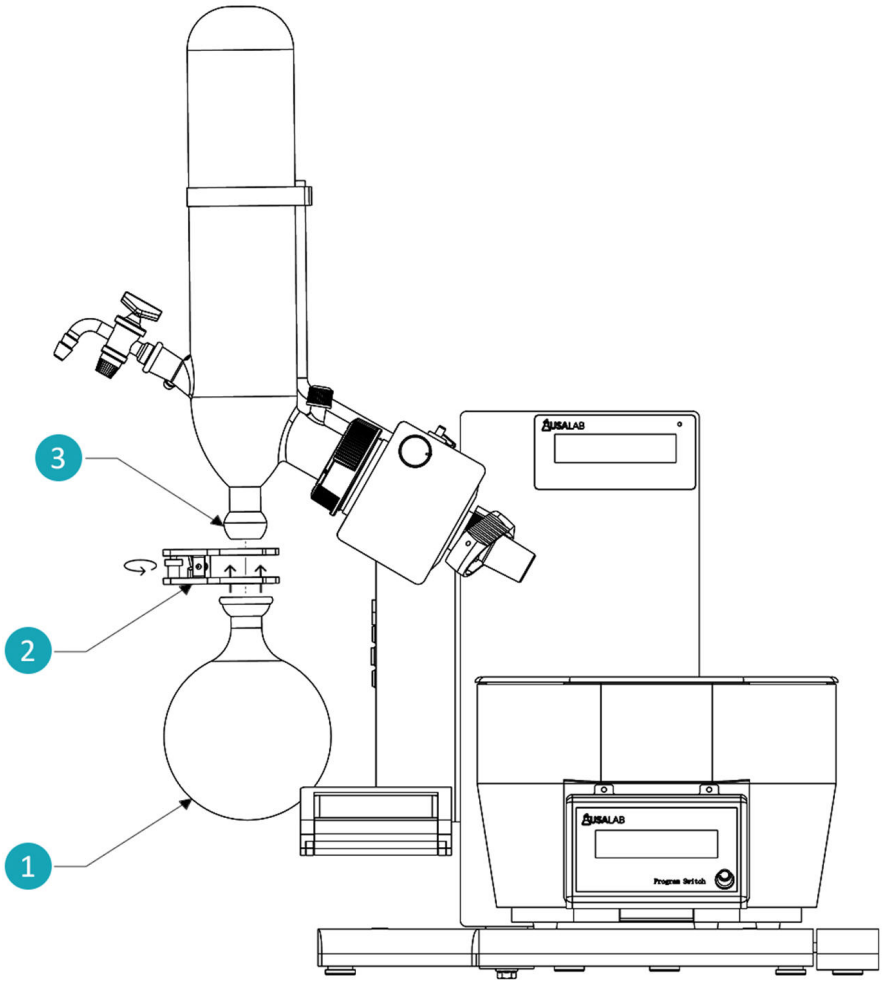
3.5.9 Fit the receiving flask

- Lightly grease the spherical joint (3) at the condenser base.
- Attach the receiving flask (1) from below, move the flask around to spread the grease.
- Secure with the spring clamp (2) until snug. Rotate the knob to tighten.

Caution

Risk of breakage!

Hold the flask firmly while securing the clamp. Do not overtighten.

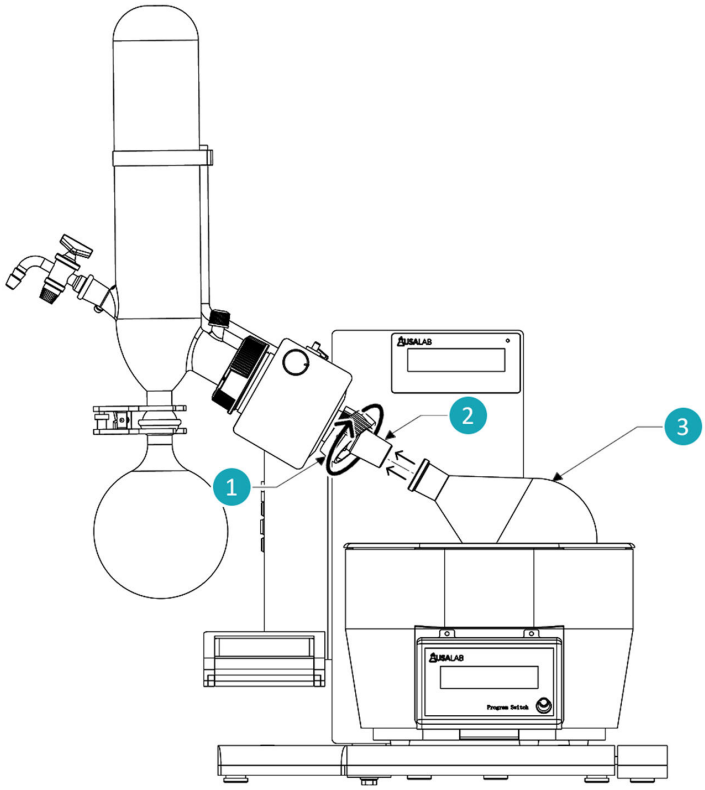


1	Receiving flask
2	Receiving flask metal pinch clamp
3	Condenser bottom spherical joint

Figure 27 - Installing receiving flask

3.5.10 Fit the evaporating flask

- Lightly grease the vapor duct male joint (2).
- Mount the evaporating (boiling) flask (3) onto the vapor duct joint (2).
- Secure with the evaporating flask clip (1) by rotating clockwise until hand tight.



1	Evaporating flask clip
2	Vapor duct male joint
3	Evaporating flask

Figure 28 - Installing evaporating flask

3.5.11 Adjust the motor angle and immersion depth

- Press down the motor angle adjustment button (2) to align the flask vertically or at a tilt.
- Use the lifting handle (1) to raise or lower the motor assembly. Rotate the handle away from the evaporator to raise the assembly. Rotate the handle toward the evaporator to lower the assembly.

Important

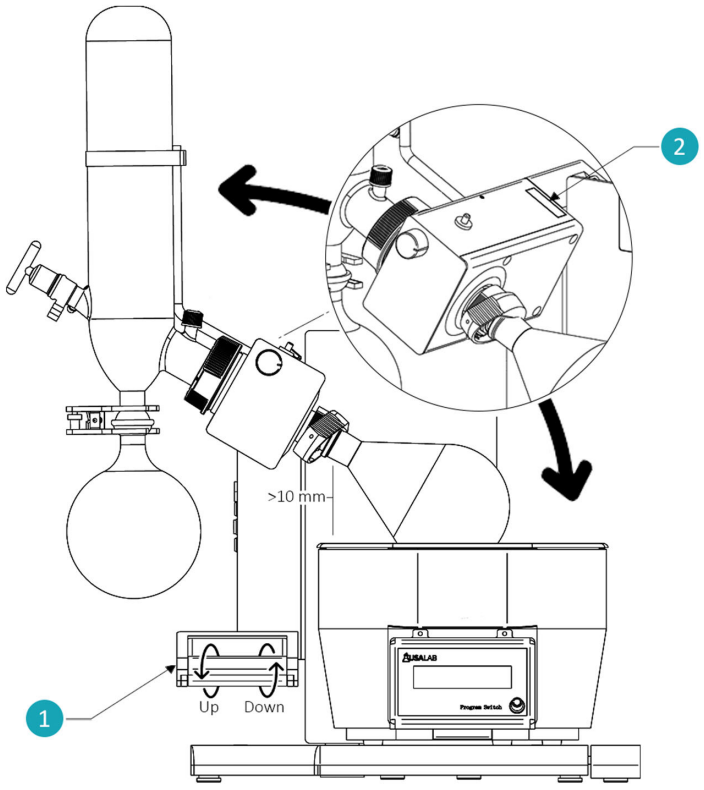
Flask clearance!

Ensure the flask is not in contact with the bath or condenser during installation. Allow for a 10mm gap from the flask to the bath.

Caution

Safe handling!

Adjust only when the bath is cool and the system is unpressurized.



1	Height adjustment handle
2	Motor angle adjustment button

Figure 29 - Adjusting the motor angle and immersion depth

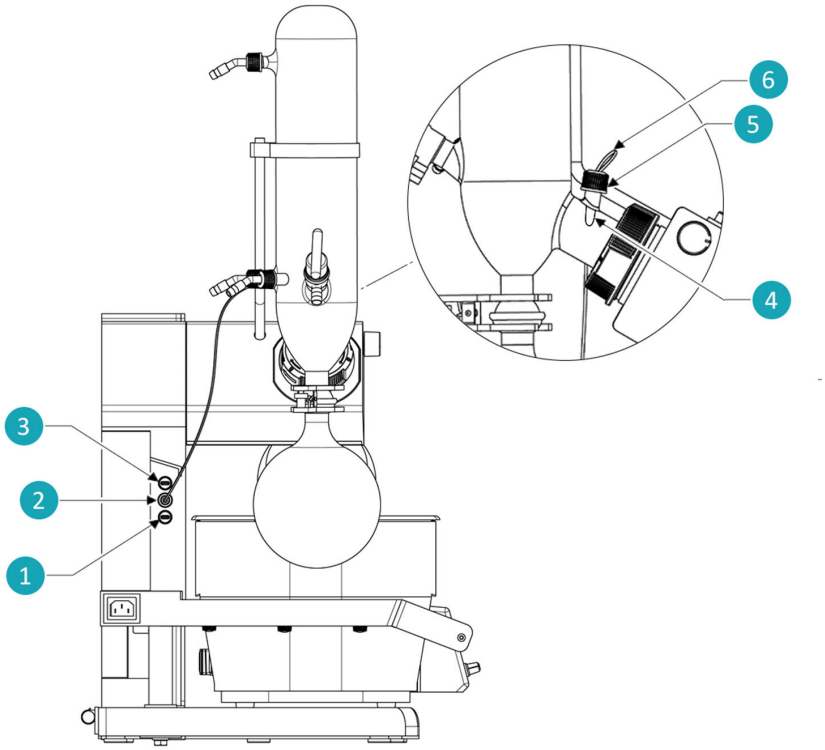
3.5.12 Connect the temperature probe

- Remove the GL cap (5) from the thermowell (4) on the condenser near the motor housing.
- Add a small amount of thermal transfer medium (silicone oil or glycol/water mix).
- Insert the temperature probe (6) through the GL cap (5) and secure with the GL cap (5).
- Route the cable neatly to the temperature sensor port (2) on the main body.

Important

Probe installation!

Do not use solvents or flammable liquids as thermal transfer media.



1	Spare communications port	4	Sensor thermowell
2	Temperature sensor port	5	Thermowell gl cap
3	Vacuum controller port	6	Temperature sensor

Figure 30 - Installing the temperature probe

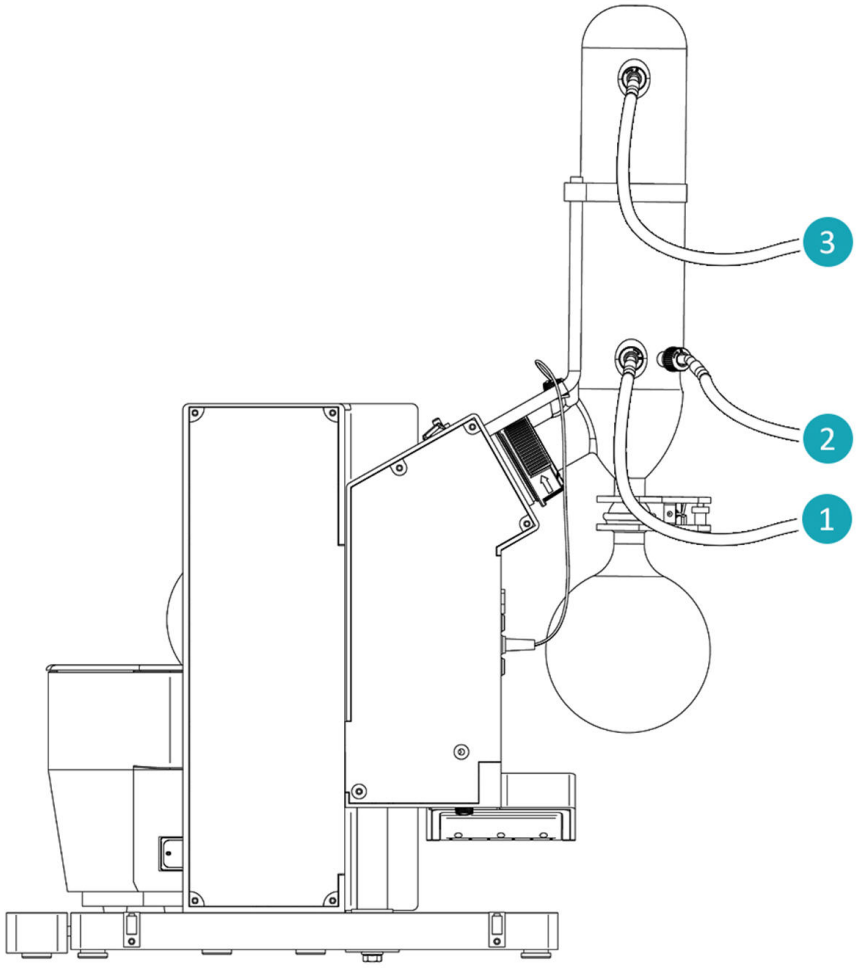
3.5.13 Connect the vacuum and chiller lines

- Attach vacuum tubing from the pump/controller to the condenser vacuum port (2).
- Verify a tight seal at all joints.
- If using the USA Lab Vacuum Controller (USA-VC-001), connect the controller cable to the vacuum controller port on the main body.

> **Notice**
>
> A secure vacuum seal is essential for proper evaporation. Leaks may cause bumping, poor recovery, or extended process times.

- Attach the inlet (1) and outlet (3) hoses from the chiller to the condenser barbed fittings.
- If leaking occurs, tighten hosing with hose clamps to prevent leaks.
- Confirm proper direction of flow (inlet (1) at the lower port, outlet (3) at the upper port).

> **Important**
>
> **Cooling Media!**
>
> Always use clean coolant. Avoid debris or hard water that may clog the condenser coils.



1	Fluid Inlet
2	Vacuum Port
3	Fluid Outlet

Figure 31 - Fluid and vacuum connection

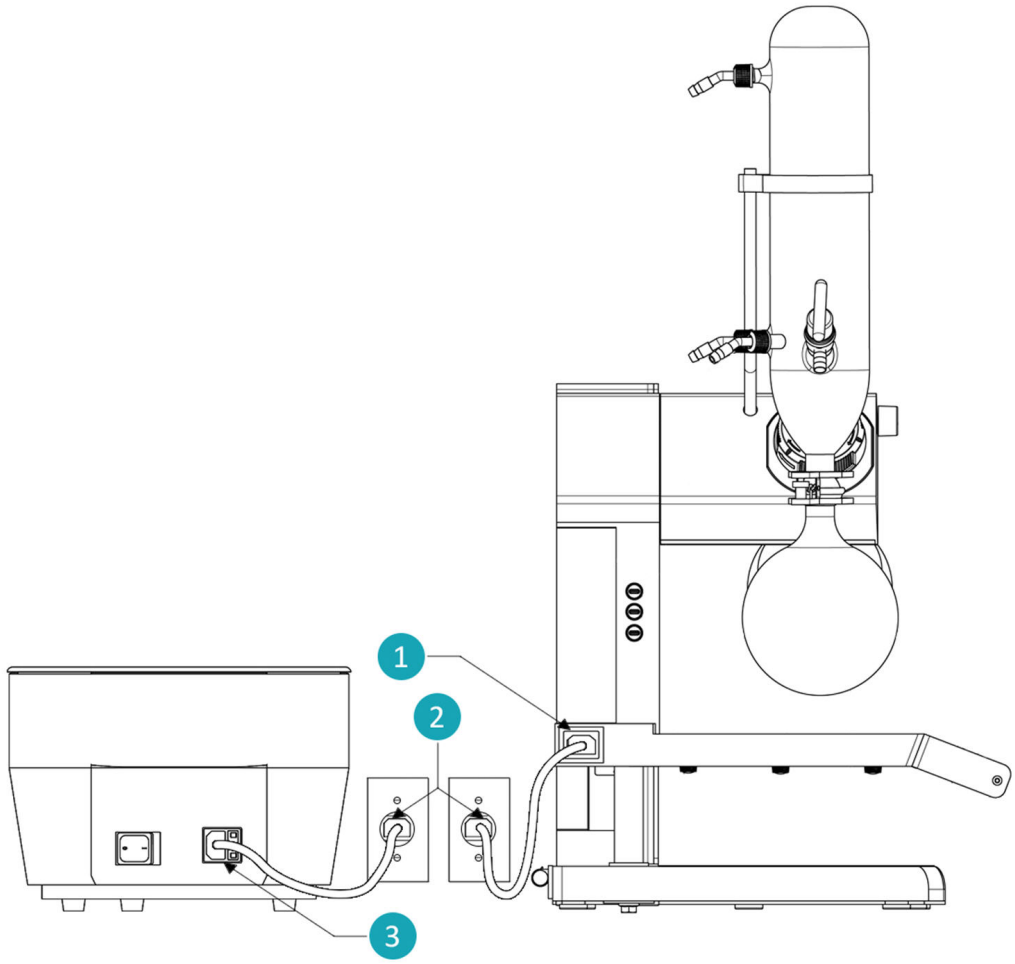
3.5.14 Electrical connections

- Connect the main body power socket (1) to a properly grounded wall outlet (2) using the supplied power cable.
- Connect the bath power socket (3) to a properly grounded wall outlet (2) using the supplied power cable.

Caution

Electrical safety!

Never operate the system on shared or overloaded circuits. Use only grounded outlets rated for the equipment's specifications.



1	Main body power socket
2	Grounded wall outlet
3	Water bath power socket

Figure 32 - Electrical connection

At this point, the ULR-200 Rotary Evaporator is fully assembled and ready for operation.

For first-time use, proceed to Section 4.2 *Preparing and filling the heating bath* on page 64 for instructions on filling the bath, setting vacuum and temperature parameters, and starting operation.

4 Operations

This section describes common tasks required for the operation of the Rotary Evaporators.

4.1 Detailed operation

The following section provides detailed guidance on the safe and effective operation of the ULR-200 Rotary Evaporator. Always follow the outlined precautions and recommendations to ensure long-term reliability and safe use.

4.1.1 General safety precautions

Caution

Risk of burns and glass breakage!

- Surfaces of the heating bath, vapor duct, and glassware can reach high temperatures.
- Always allow components to cool before handling.
- Handle glassware with care — impacts, scratches, or uneven tightening can lead to breakage under vacuum.

Caution

Risk of electrical hazards!

- Ensure the unit is plugged into a properly grounded outlet installed by a qualified electrician.
- Never operate with damaged cables, plugs, or connectors.

Caution

Risk of vacuum implosion!

- Inspect all glassware before use; do not operate with cracks, chips, or visible defects.
- Always secure evaporating and receiving flasks with the provided clips or clamps.

4.2 Preparing and filling the heating bath

The heating bath must be filled with a suitable fluid before operation. The choice of bath fluid depends on your application temperature and desired longevity.

Recommended heating bath fluids

Fluid type	Recommended use	Advantages	Limitations / Warnings
Distilled / Deionized Water	Standard lab use up to ~80 °C	• Prevents mineral scaling • Cleaner bath and heating element	• Can cause corrosion over long-term use • Add 1–2 g of sodium borate per liter of water as a corrosion inhibitor
Tap Water (filtered if possible)	General use up to ~80 °C	• Less corrosive than pure DI • Readily available	• Mineral content causes scale buildup on bath surfaces • Shortens heating element life
50:50 Mix Tap + Distilled	Balanced option up to ~80 °C	• Reduces scaling vs. tap • Reduces corrosion risk vs. DI	• Still requires periodic cleaning • Not as effective as DI + sodium borate
High-Glycol Water Mix (≈90% Glycol)	High-temperature operation ~80–95 °C	• Reduces corrosion • Lower evaporation at high temp	• Lower heat transfer vs. water • Not needed below ~80 °C
Silicone Oil	High-temp operation (>80 °C up to ~95 °C)	• Stable at high temp • Excellent longevity	• Messy if spilled High viscosity slows heating • Burns risk if splashed

4.3 Water bath fluid level

Fill the bath up with a suitable fluid. Maintain a fluid level > 1–2 cm (0.4-0.8 in) below the rim to prevent overfilling or splashing of hot fluid.

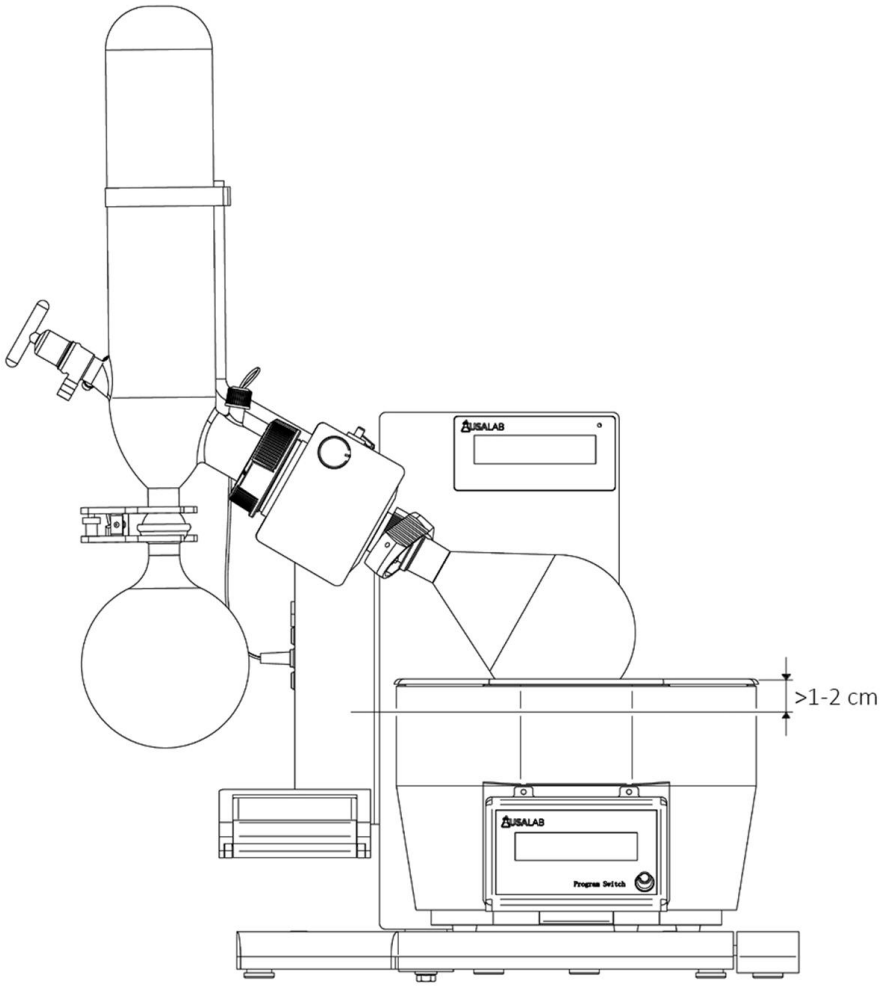


Figure 33 - Water bath fluid level

Important

Safety notes!

- Leave expansion space — never fill the bath to the top.
- Never pour water into hot oil. Always fill before heating.
- Replace fluids regularly (interval depends on fluid type and workload).
- Always allow the bath to cool before draining or refilling.
- Never run the bath when it is empty. This will damage the heating element.
- Do not put your hands near or inside the hot fluid.

4.4 Setting bath temperature

1. Use the bath temperature knob (1) to set the desired temperature. Press once to start/stop heating, a “stop” and “start” will show on the screen (2) when heating. Rotate the knob (1) to adjust the set temperature.

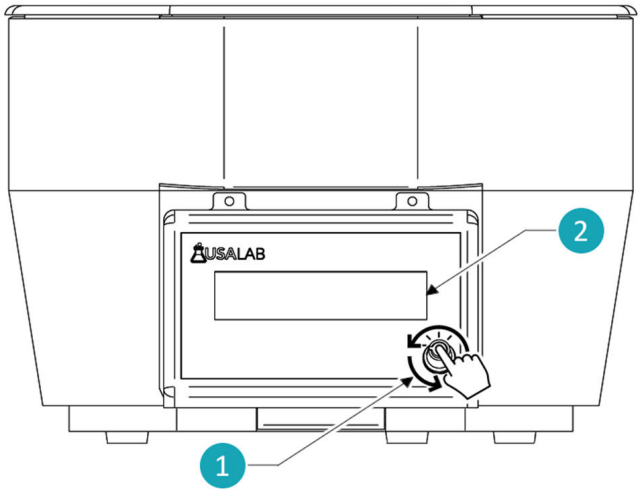
   For recommended temperature ranges and fluid types, refer to Section *Recommended heating bath fluids* on page 64.

2. Always pre-heat the bath before starting distillation for stable operation.

Caution

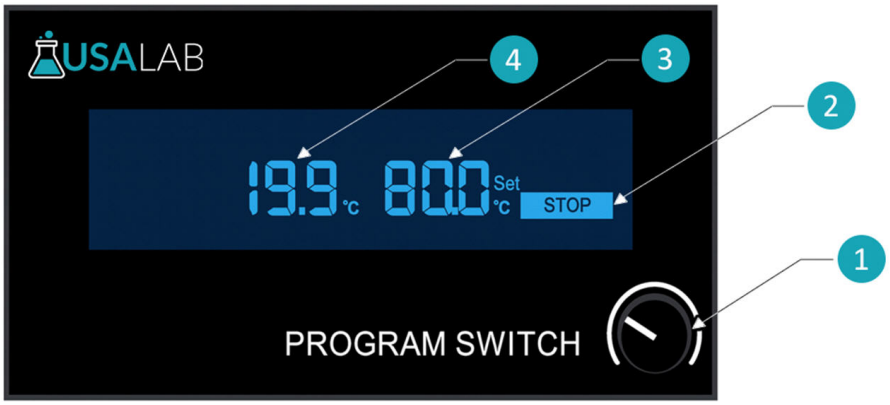
Burn hazard!

- Do not place hands in the bath.
- Do not move or touch the bath when filled with hot liquid.



1	Temperature knob
2	LCD display

Figure 34 - Setting the bath temperature



1	Program switch
2	Start / Stop bath heating label
3	Bath temperature setting
4	Bath temperature reading

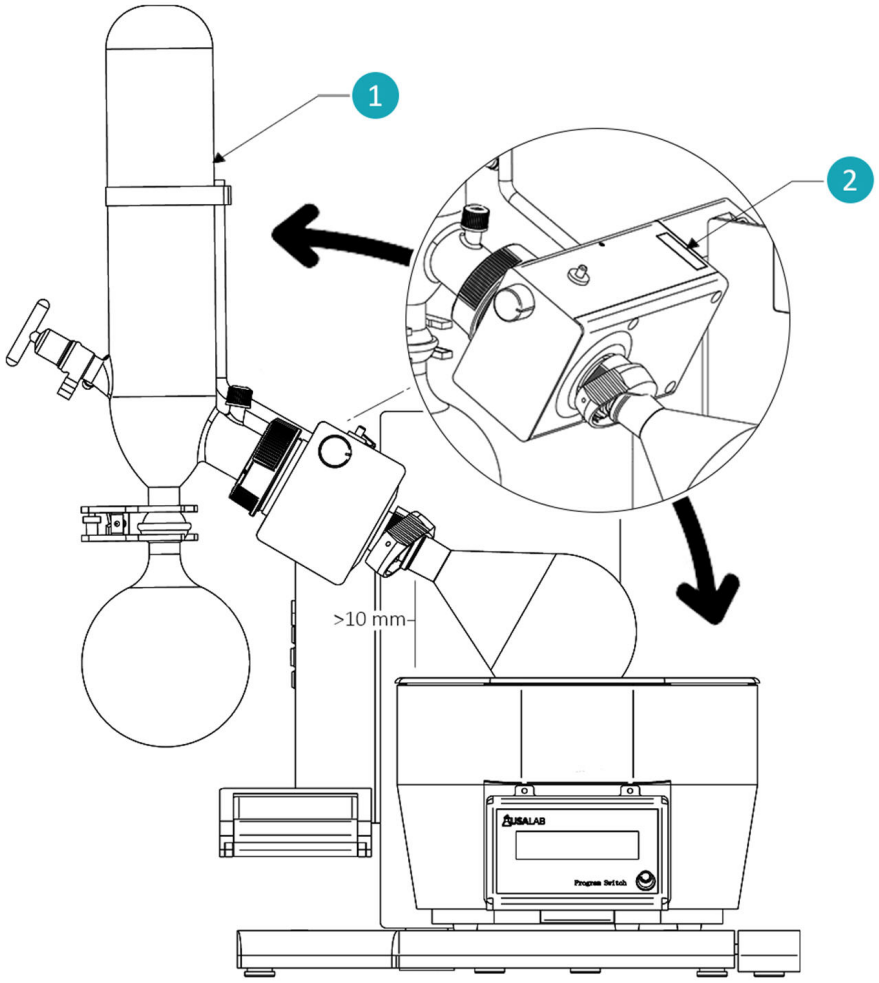
Figure 35 - Controller diagram for bath

4.5 Adjusting the immersion angle

1. Switch off the rotary drive.
2. Support the condenser (1) with one hand and push the motor angle button (2) with the other.
3. Adjust to the desired tilt (vertical or angled).
4. Lock back into place by letting go of the button (2).

Notice

Ensure a minimum clearance of 10 mm between the flask bottom and bath surface.



1	Condenser
2	Motor angle adjustment button

Figure 36 - Adjusting the immersion angle

4.6 Vertical adjustment of the flask

1. Use the lifting handle (1) to raise or lower the motor assembly (2) with attached glassware.
2. Rotate the handle (1) away from the evaporator to raise the assembly.
3. Rotate the handle (1) toward the evaporator to lower the assembly.
4. Adjust so that the evaporating flask (3) is properly immersed in the bath (4).

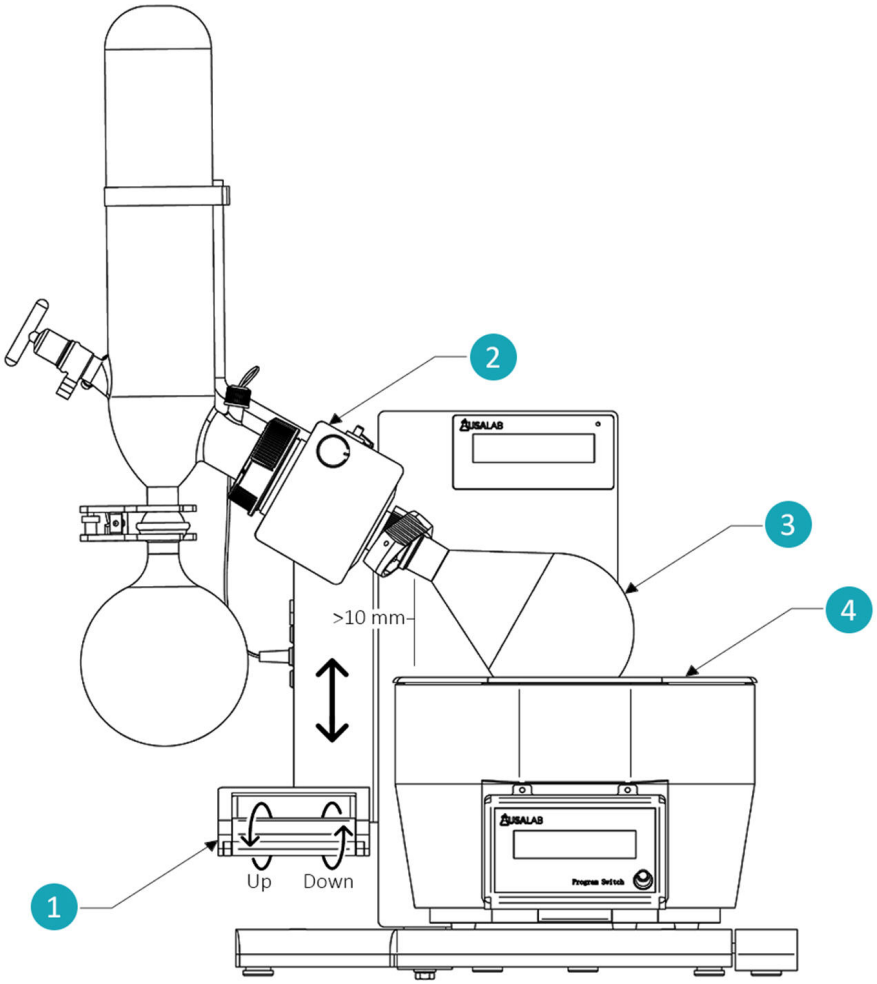
Important

Leave a minimum 10mm gap between the flask and the bath edge.

Caution

Risk of injury!

- Keep fingers away from moving parts when raising or lowering.
- Ensure tubing has enough slack and is not under strain after adjustment.



1	Height adjustment handle	3	Evaporating flask
2	Motor housing	4	Water bath

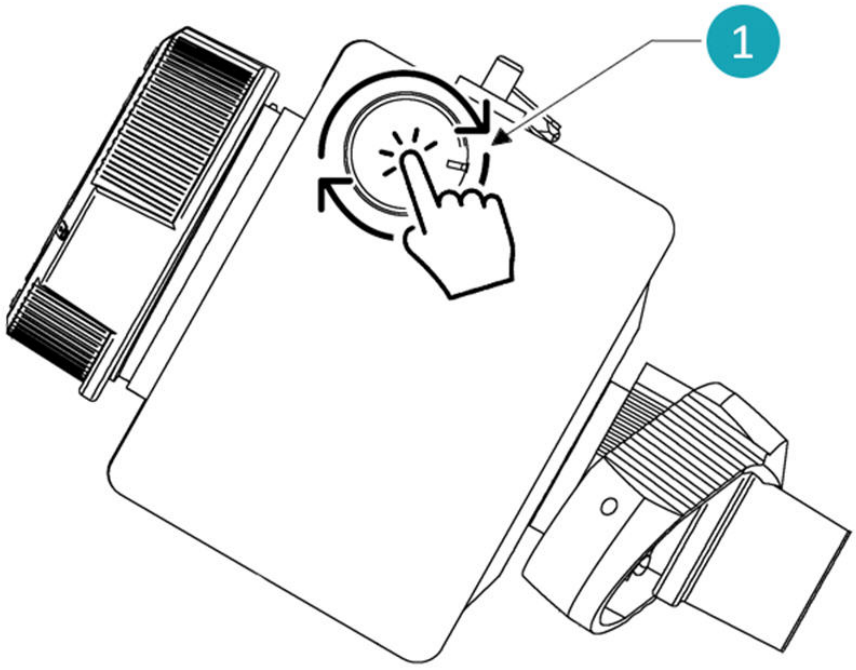
Figure 37 - Vertical adjustment of the flask

4.7 Adjusting rotation speed

1. Press the control knob (1) once to start flask rotation, press again to turn off rotation.
2. Double press to change the rotation direction (clockwise or counterclockwise).
3. Triple press to activate alternating rotation mode (clockwise/anticlockwise cycling).
4. Turn the knob (1) clockwise to increase speed, counterclockwise to decrease.
5. Monitor solvent behavior — increase speed gradually to avoid bumping.

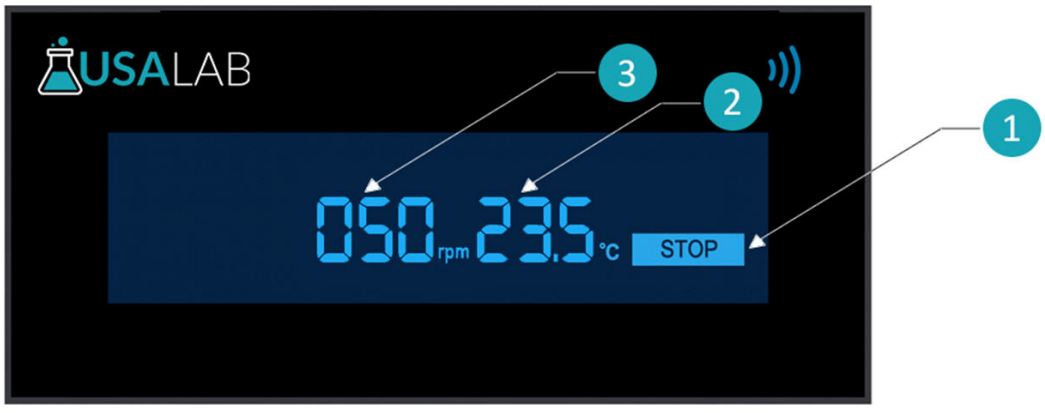
Caution

Do not exceed safe rotation speeds for large or partially filled flasks, as excessive speed may cause bumping, splashing, or glassware stress.



1	Evaporating flask rotation knob

Figure 38 - Adjusting the rotation speed



1	Start / Stop rotation label
2	Vapor temperature
3	Motor set rotation setting

Figure 39 - Controller diagram for main body

4.8 Performing evaporation and solvent recovery

The ULR-200 Rotary Evaporator is designed for the safe and efficient removal of solvents under reduced pressure. To ensure reliable operation, follow the procedure below and observe all warnings.

Safety precautions

Danger

Explosion risk!

- Do not distill unknown or explosive mixtures.
- Keep ignition sources away from the system.
- Ensure all glassware is properly installed and rated for vacuum operation.

Danger

Risk of hazardous vapors!

- Always operate the evaporator in a fume hood or well-ventilated area.
- Never inhale vapors. Check Safety Data Sheets (SDS) for all solvents before use.
- If vapors escape from joints or fittings, immediately stop operation and inspect seals.

Warning

Burn hazard!

- The heating bath, vapor duct, and glass flasks may reach very high temperatures.
- Wear protective gloves when handling glassware after distillation.

Warning

Excessive internal pressure!

- Never allow system pressure to exceed atmospheric pressure.
- Always operate with a connected vacuum pump and controller.

4.8.1 Standard distillation procedure

1. Prepare the cooling system

- Start the recirculating chiller (recommended: USA Lab HC510).
- Maintain coolant temperature at ≤ 20 °C.
- Recommended flow rate: ≥ 25 L/h.

2. Load the evaporating flask

- Fill the flask with solvent to no more than 50–60% of total volume.
- Secure flask using the lock key and evaporating flask clip.

3. Secure the receiving flask

- Install the receiving flask at the base of the condenser.
- Lock with the spring clamp.

4. Close the feed valve

- Ensure the glass stopcock is closed before operation.

5. Start rotation

- Press the rotation button and gradually adjust speed.
- Begin at low RPM to prevent bumping, then increase as needed.

6. Apply vacuum

- Slowly reduce system pressure using the USA Lab VC-001 Vacuum Controller.
- Adjust vacuum so that the boiling point of the solvent is ~20 °C below the bath temperature.

7. Immerse flask in heating bath

- Use the lifting handle to lower the rotating evaporating flask into the heating bath.
- Maintain at least a 10 mm clearance between the flask joint and the bath edge to prevent damage.

8. Monitor distillation

- Within 1–5 minutes, vapor should form and condense in the condenser coil.
- Adjust vacuum and bath temperature to keep condensate level between ½ and ¾ of the condenser coil.

4.9 Optimizing distillation

For maximum efficiency:

- Maintain ΔT of ~20 °C between bath temperature and vapor temperature.
- Maintain another ΔT of ~20 °C between vapor temperature and condenser temperature.
- Ensure condensate never covers more than three-quarters of the condenser coil.

If condensation is too low (<½ coil) → increase vacuum or raise bath temperature.

If condensation is too high (>¾ coil) → decrease vacuum or lower bath temperature.

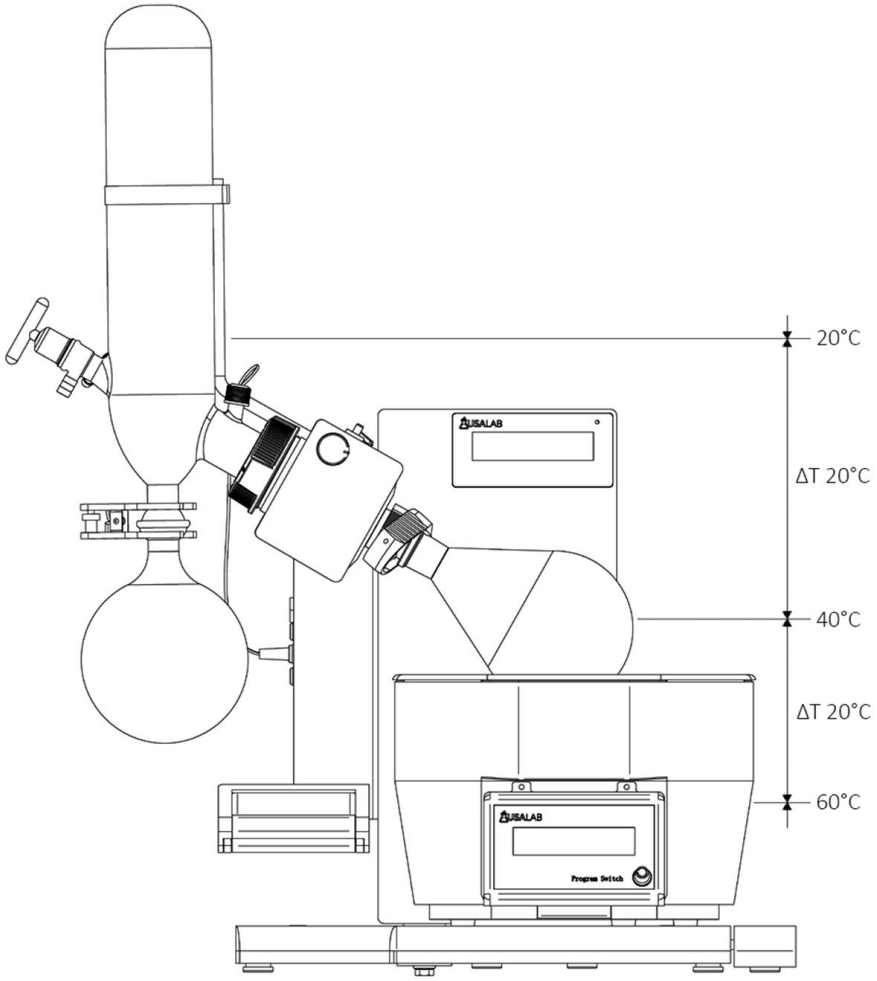
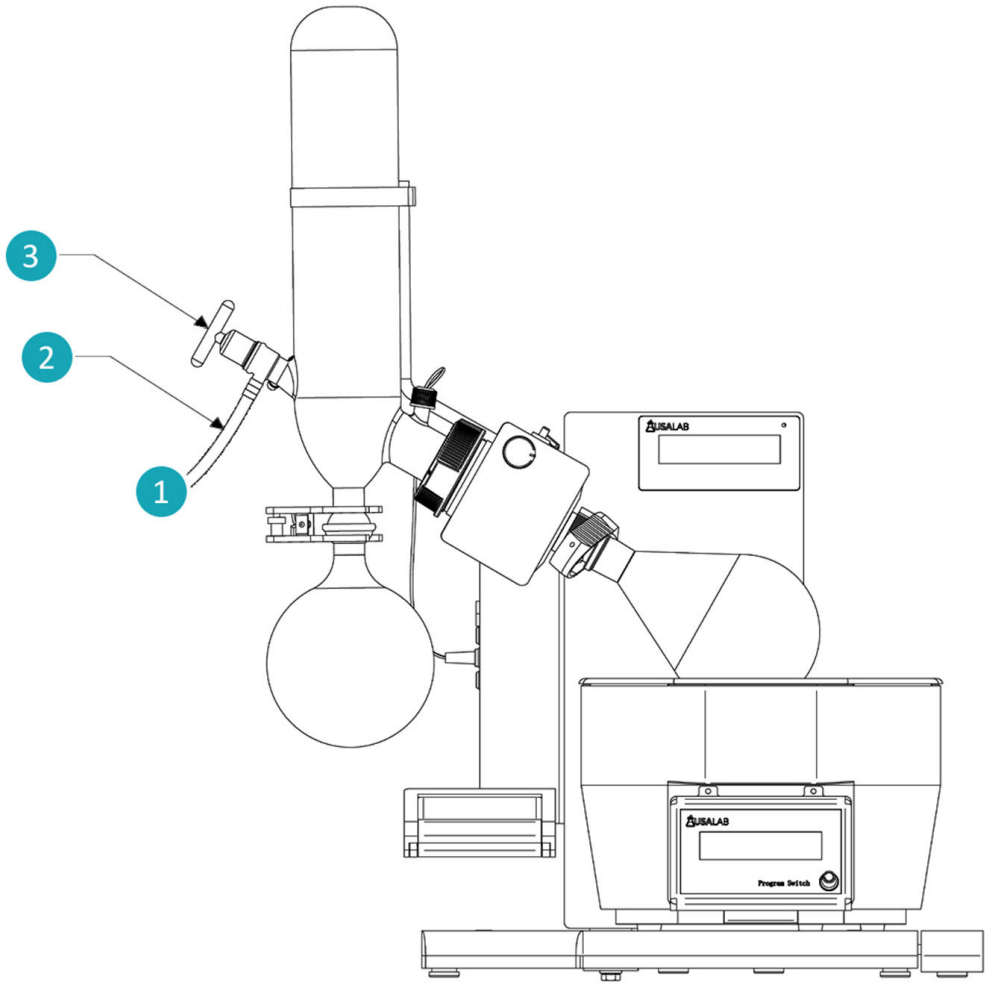


Figure 40 - Optimizing distillation

4.10 Feeding solvent during operation

- Ensure vacuum pump is running.
- Attach supply tubing (2) to the feed valve (3).
- Immerse tubing (2) into solvent container.
- Open stopcock (3) briefly to draw solvent into evaporating flask, then close.
- Do not exceed 50-60% volume in the evaporating flask.



1	Solvent/fluid inlet
2	Solvent/fluid inlet tubing
3	Feed stopcock

Figure 41 - Solvent feeding

4.11 Completing distillation

1. Raise the Evaporating Flask using the lift handle.
2. Vent the System slowly to release vacuum.
3. Stop Rotation by pressing the control knob.
4. Switch Off Heating Bath and allow to cool.
5. Remove Flasks:

- Evaporating flask: unlock clip by rotating counter clockwise and remove carefully.
- Receiving flask: release clamp and remove.

6. Turn Off Chiller & Vacuum Pump.
7. Dry & Clean all glassware and components before storage.

Caution

Burn hazard

Always allow glassware and the heating bath to cool before handling.

5 Cleaning, Maintenance, and Servicing

5.1 Part maintenance

Regular cleaning and preventative maintenance are essential for ensuring long-term performance of the ULR-200 Rotary Evaporator. The following procedures can be carried out by the user. For repairs beyond these operations (e.g., motor replacement, electrical work), please contact USA Lab Service at support@usalab.com.

> **Important**
>
> Always disconnect power and allow the heating bath and glassware to cool completely before beginning any cleaning or maintenance work.

5.2 General maintenance schedule

- **After every run:** Empty receiving flask, rinse glassware, wipe down housing.
- **Weekly:** Inspect seals, grease joints as needed, check vacuum integrity.
- **Monthly:** Clean heating bath, flush condenser, check hoses for brittleness.
- **As needed:** Replace worn seals, damaged glassware, or cracked tubing.

5.3 Cleaning and inspecting the vapor duct

1. Switch off power and remove the evaporating flask by unscrewing the clip.
2. Carefully pull the duct from the motor housing.
3. Inspect the duct for cracks, wear marks, or chemical deposits.
4. Clean with a lint-free cloth and water or ethanol. For stubborn buildup, use a mild detergent.
5. Dry thoroughly and reinstall with grease, ensuring the oil seal set is properly seated.

5.4 Checking vacuum integrity

To ensure efficient distillation, the system must remain airtight.

1. Connect a vacuum pump with a pressure gauge.
2. Install evaporating and receiving flasks; close the feed valve.

3. Pull vacuum down to approx. 50 mbar.
4. Isolate the pump and monitor pressure for 1 minute:
    - If rise is ≤ 3 mbar → system is leak-tight.
    - If rise is > 3 mbar → inspect seals, tubing, and joints for leaks.

Reseal ground glass joints with vacuum grease and replace brittle hoses as needed.

5.5 Inspecting and maintaining seals

Seals are wear parts and should be checked regularly.

- Remove seals (vacuum, coolant, and feed tube).
- Rinse in water or ethanol; dry with a soft cloth.
- Replace any seals showing cracks, flattening, or discoloration.
- Check glass contact surfaces for scratches or chips before reinstalling seals.

Notice

New PTFE seals may require several hours of operation to “bed in” for optimal sealing.

5.6 Cleaning the condenser

- Flush the condenser by introducing ethanol or a compatible solvent through the vacuum port and draining at the bottom outlet.
- For biological or algae buildup, use an alkaline cleaning agent, then rinse thoroughly with clean water.
- Dry condenser by applying gentle vacuum for several minutes.

5.7 Cleaning the heating bath

Caution

Electrical hazard!

Never immerse the bath housing in water. Only clean the inner stainless-steel bowl.

1. Unplug the heating bath and allow to cool completely.
2. Empty fluid into a suitable container.
3. Wipe inner bowl with a soft sponge and mild cleaner.
4. For limescale deposits: use acetic acid (dilute vinegar) to dissolve, then rinse thoroughly.
5. Dry before refilling.

5.8 Removing solvent residues

Before storing overnight or long-term:

1. Fit clean, dry evaporating and receiving flasks.
2. Close feed valve.
3. Run vacuum pump for 2–3 minutes to remove residual vapors.
4. Vent system and disconnect vacuum.
5. Dispose of solvent residues in accordance with SDS and local regulations.

This page is intentionally left blank

6 Troubleshooting

This section outlines the most common issues encountered during operation of the rotary evaporator. For each fault, possible causes and recommended corrective actions are provided. Always ensure the unit is powered off and cooled down before servicing.

Table 2 - Troubleshooting for the Rotary Evaporators

Issue	Possible Cause	Recommended Action
Vacuum not achieved	Receiving flask full, causing back-evaporation	Empty receiving flask and resume operation
	Coolant too warm or flow too weak	Lower coolant temp (<20 °C) and increase flow to ≥40 L/h
	Pump under-sized	Switch to a properly rated vacuum pump
	Glass joints or seals leaking	Inspect, clean, re-grease, or replace seals
System leaking	Tubing cracked, brittle, or poorly fitted	Replace tubing with vacuum-rated hose
	Glass joints dry or dirty	Re-grease and re-seat glass joints
Distillation performance poor	Bath and condenser temps too close (ΔT < ~20 °C)	Adjust heating bath upward and ensure condenser is cooled adequately
	Insufficient coolant circulation	Increase chiller/tap water flow
	Receiving flask overfilled	Empty flask before restarting run
Heating bath won't heat	Bath not plugged in / power issue	Verify power connection
	Thermal cut-off engaged from overheating	Let bath cool, then reset safety switch
	Blown fuse	Replace fuse (see Service section)
Device will not power on	No mains connection or faulty outlet	Plug into a grounded, active outlet
	Blown fuse	Replace fuse; if issue repeats, contact service support

Issue	Possible Cause	Recommended Action
Excessive pressure in glassware	Stopcock open or seal damaged	Inspect and replace faulty seals
	Evaporating flask overfilled (>50% capacity)	Use properly sized flask and fill ≤ half volume
Heating bath overflows or splashes	Overfilled before immersing flask	Drain liquid as to not overfill the bath

7 Decommissioning, disassembly and disposal

7.1 Decommissioning the unit

When the rotary evaporator is no longer in use or has reached the end of its service life, follow these steps to ensure safe shutdown and preparation for storage or disposal:

- **Drain all fluids:** Empty the heating bath and remove any residual solvents from the evaporating and receiving flasks.
- **Power down:** Switch off the main unit and heating bath.
- **Disconnect power supply:** Unplug all electrical connections before further handling.
- **Disassemble glassware:** Carefully remove all glass components and store or dispose of them as appropriate.
- **Clean the system:** Wipe down the housing and ensure no hazardous residues remain before moving or disposal.

WARNING

Risk of injury!

Only trained personnel should decommission the unit. Handle all glassware and fluids with appropriate PPE to prevent cuts, burns, or chemical exposure.

7.2 Disposal guidelines

Proper disposal of the rotary evaporator is required to meet environmental and safety standards:

- **Fluids:** All solvents and bath liquids must be drained completely and disposed of in accordance with local environmental regulations and the applicable Safety Data Sheets (SDS).
- **Glassware:** Dispose of cracked or damaged glass as laboratory glass waste; intact glassware may be recycled if allowed by local regulations.
- **Electronics and power components:** Recycle circuit boards, LCD displays, and control panels through an approved electronic waste facility.
- **Metal components:** Stainless steel and aluminum parts can typically be recycled.
- **Batteries or electronics (if applicable):** Dispose of through certified e-waste programs.

WARNING

Risk of serious injury or environmental harm!

Improper disposal of solvents, electronic components, or batteries can cause environmental contamination, injury, or legal penalties. Always follow local and national disposal requirements.

8 Technical specifications

Technical specifications of the Rotary Evaporator are mentioned below.

Table 3 - Technical specifications

Model	ULR-200
Voltage / Frequency	120V 60Hz · Single Phase · 15A (12.8A draw)
Total Power	1540 W
Rotary Motor Power	40 W
Heating Power	1500 W
Maximum Vacuum	5 Torr · -29.8 inHg
Evaporation Flask Capacity	2 L
Collection Flask Capacity	1 L
Rotary Speed	35 – 200 rpm
Temperature Control Range	Room Temp to 95 °C (203 °F)
Temperature Control Accuracy	±1 °C
Lifting Mechanism	Automatic
Lifting Distance	180 mm (7 in)
Condenser Dimension	85 × 430 H mm (3.3 × 17 in)
Condenser Connection	35/20 S Joint
Evaporating Capacity	≥ 1 L/h (Alcohol)
Heater Output (BTU)	5,118 BTU
Condensing Area	0.17 m^2
Material Feeding Valve	3/8 in Barb Fitting
Vacuum Nozzle	GL-14 Connection
Condenser Coil Connections (In/Out)	GL-14 Connection
Bath Dimension / Capacity	5 L
Overall Dimension (W × D × H)	650 × 420 × 900 mm (25.6 × 16.5 × 35.4 in)
Net Weight	20 kg (44 lbs)
Packing Weight	23 kg (50 lbs)

8.1 Ambient conditions

Table 4 - Ambient conditions

Parameter	Operating limits
Maximum altitude	2000 m (6,560 ft) above sea level
Ambient temperature	5 °C to 40 °C (41 °F to 104 °F)
Relative humidity	Up to 80% at ≤ 31 °C, decreasing linearly to 50% at 40 °C (non-condensing)
Indoor use only	Designed exclusively for controlled laboratory environments

WARNING

Operating outside these conditions may affect performance, safety, and product lifespan.

8.2 Component materials

Table 5 - Component materials

Component	Material
Main housing	Powder coated anodized aluminum
Heating bath shell	ABS
Heating bath	304 stainless steel
Glassware	Borosilicate glass
Rotary drive unit	Aluminum
Condenser flange	Aluminum
Oil seal	High quality PTFE
Condenser screw	Glass-fiber reinforced nylon
Evaporator flask clip	Glass-fiber reinforced nylon

9 Solvent reference (25 common lab solvents)

The following data provides approximate boiling points, densities, and recommended vacuum levels (for ~40 °C vapor temperature) of commonly used solvents. This table is intended as a practical reference guide to support efficient rotary evaporation, but it is not a substitute for reviewing the Safety Data Sheet (SDS) or verifying with a calibrated vacuum controller. Values may vary with system setup, temperature probe placement, and solvent grade.

Solvent	Formula	Boiling point (°C)	Density (g/mL @ ~20 °C)	Approx. pressure for 40 °C boil (mbar)
Acetone	C_3H_6O	56	0.791	~555
Acetonitrile	C_2H_3N	82	0.786	~245
Acetic acid (glacial)	$C_2H_4O_2$	118	1.049	~45
Benzene	C_6H_6	80	0.874–0.879	~235
Cyclohexane	C_6H_{12}	81	0.779	~235
Chloroform	$CHCl_3$	61–62	~1.483	~475
Chlorobenzene	C_6H_5Cl	132	~1.106	~35
Dichloromethane (DCM)	CH_2Cl_2	39–40	~1.33	~850
Diethyl ether	$C_4H_{10}O$	34–35	0.713–0.715	~850
1,4-Dioxane	$C_4H_8O_2$	101	1.03–1.04	~110
DMF (N,N-dimethylformamide)	C_3H_7NO	153	~0.944–0.949	~10–15
DMSO (dimethyl sulfoxide)	C_2H_6OS	189	~1.095	~5
Ethanol	C_2H_6O	78	0.789	~175
Ethyl acetate	$C_4H_8O_2$	77	0.897–0.900	~240
Ethylene glycol	$C_2H_6O_2$	197	~1.113	~3
Heptane (n-)	C_7H_{16}	98–99	~0.684–0.688	~120
Hexane (n-)	C_6H_{14}	68–69	~0.655–0.660	~360
Isopropanol (2-propanol)	C_3H_8O	82–83	~0.786	~135–145
Methanol	CH_3OH	64–65	~0.792	~335

Solvent	Formula	Boiling point (°C)	Density (g/mL @ ~20 °C)	Approx. pressure for 40 °C boil (mbar)
MTBE (tert-butyl methyl ether)	$C_5H_{12}O$	55	~0.74	~310
THF (tetrahydrofuran)	C_4H_8O	66	~0.889	~370–375
Toluene	C_7H_8	110–111	~0.867	~75–80
Water	H_2O	100	1.000	~73
Xylene (mixed isomers)	C_8H_{10}	138–144	~0.861–0.868	~25
Formic acid	CH_2O_2	100–101	~1.22	~100

9.1 How to use the table

- Set your vacuum controller to the listed mbar near 40 °C vapor temperature, then fine-tune so condensate sits between ½ and ¾ of the condenser coil (no flooding at the top).
- Maintain the 20 °C step guideline (bath ≈ vapor +20 °C; coolant ≈ vapor −20 °C).

Important

Note on precision!

Antoine constants differ slightly by source and temperature range. If you need exact values for QA/validation, compute from the NIST constants for your specific solvent and round to your controller’s resolution.

10 Spare parts

For replacement parts or consumables, please contact USA Lab Technical Support at tech@usalab.com or customer service at support@usalab.com

- Only USA Lab–approved spare parts should be used to maintain performance, safety, and warranty coverage.
- Common wear parts include: glassware, seals, heating elements, thermocouples, oil seal sets, switches, and sensors.

This page is intentionally left blank

11 Warranty

All USA Lab products are warranted to be free from defects in workmanship, materials, and mechanical function for a period of one (1) to three (3) years from the date of purchase, depending on the product line.

During the warranty period:

- **USA Customers** – Repairs and replacement parts will be covered in full or in part, including shipping charges.
- **International Customers** – Parts and repairs are covered in full, while the customer is responsible for shipping, labor, and customs duties.

Exclusions – This warranty does not cover:

- Damage caused by misuse, abuse, accidents, or improper operation.
- Unauthorized repairs or modifications.
- Normal wear items (glassware, seals, heating elements, thermocouples, switches, sensors).
- Failures caused by incorrect electrical supply (voltage mismatch).
- Corrosion or damage resulting from use of improper fluids.
    - **Important**: If using a heater or chiller, only distilled or deionized water may be used. Use of tap, filtered, or mineral water voids the warranty.

11.1 Returns policy

USA Lab offers a 30-day return policy from the date of delivery. By purchasing from USA Lab, you agree to the following terms:

Non-Returnable Items

- Customized equipment (built-to-order).
- Consumables and solvents.
- Pre-order cancellations (subject to a 10% non-refundable fee to cover banking and reservation costs).

Restocking Fees

- Standard restocking fee: 15% (applies to unused items in original packaging).
- Items returned without original packaging but in unused condition: 25% restocking fee.
- Used, damaged, or contaminated products (including those with stickers, resins, fluids, or botanical matter) are not eligible for return.

Return Process

- Customers are responsible for return shipping unless the product is deemed defective by USA Lab.
- Once inspected, refunds will be processed as follows:
    - Approved returns: purchase price minus restocking fee.
    - Denied returns: no refund will be issued.

For assistance with returns or warranty service, please contact support@usalab.com at USA Lab

► For more information, see *Contact information* on page 2.

Index

This page is intentionally left blank