



School bus project @ CRI

Basic training and maintenance tips of Rotary evaporator





BUCHI (Thailand) team



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Product specialist



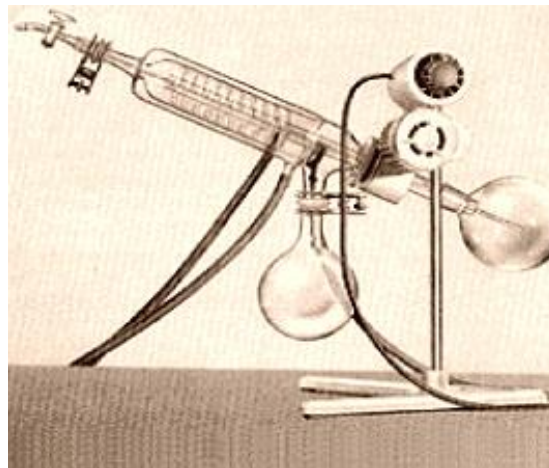
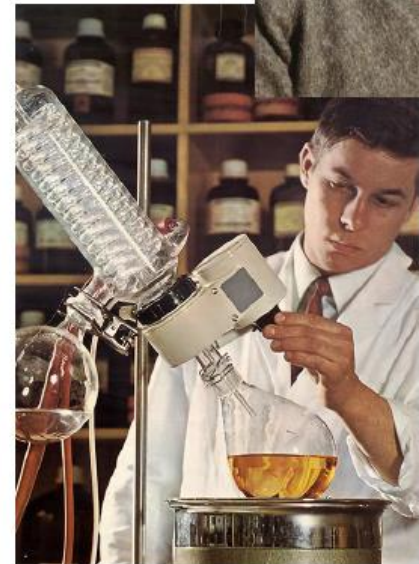
Suraphan Chiamchit
“Po”
Service engineer manager



Keereekhan Phandaeng
“Pom”
Senior service engineer

Milestones of the company history

- 1939 Founded by Mr. Walter Büchi in Heerbrugg (Switzerland)
- Production of level balances and laboratory glass
- 1942 – Enhancement fabric in Flawil
- 1957 – First rotary evaporator
- Continuous extension of the product portfolio



BUCHI LABORTECHNIK AG

TODAY, Buchi Group

- Development and production in Flawil Switzerland
- Affiliates in many countries (Thailand, Japan, Indonesia, Korea, China, India, USA, UK, Italy, France, Germany, Switzerland)
- Distribution partners in over 60 countries



Evaporation



Rotavapor



Parallel Evaporator



Industrial Rotary
20-50L

Purification



Pure chromatography



Supercritical fluid
chromatography

Formulation



Encapsulator & Mini spray dry & Freeze dry

Extraction



Analysis



Kjeldahl



Melting Point



NIR/NIR Online



Promotion campaigns 2023



AutoDest Sensor

R-300 + V-300 + I-300 Pro

Free ! AutoDest sensor

From Today – End of 2023



Rise of Safety

R-300 System

(R-300 + V-300 + I-300/300 Pro)

Free ! 2nd Condenser

Free ! Level sensor

From Today – End of 2023



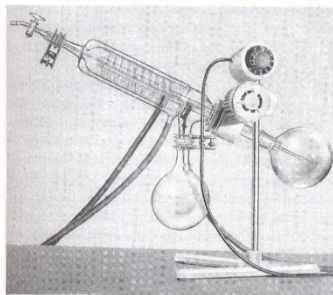
Agenda

1. Product overview & configuration
2. Achieve higher distillation efficiency
3. Solving common issue on the Rotavapor®
4. Features & Accessories
5. Basic maintenance
6. Q&A

1

Product overview & configuration

BUCHI Rotavapor® history



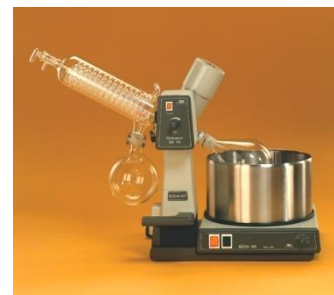
Rotavapor Model
(1957)



Rotavapor-R
(1971)



Rotavapor R-110
(1980)



Rotavapor RE-111
(1983)



Rotavapor R-114
(1992)



Rotavapor
R-200/205 (2000)



Rotavapor R-3
(2010)



Rotavapor R-210/215
(2006)



Rotavapor R-100/300
(2015 - Today)

Historical Development



Rotavapor® R-300 systems

- For convenience in evaporation
- Flexible, extendable concept
- Possibility for automation and remote monitoring



Rotavapor® R-100 systems

- To cover essential needs in evaporation
- For price-sensitive customers

Basic and principle of Rotavapor®

Pressure and boiling point relationship

- The boiling point of a liquid decreases with lower surrounding pressure
- High-boiling substances can be distilled at lower boiling point temperature
- Quick and gentle evaporation process
- Prevent damage to temp-sensitive substances

Configuration

Definition: Rotary Evaporator

Instrument for the separation of two liquids or liquid from solid by vacuum distillation

Condenser

Pump

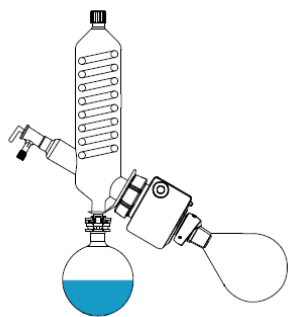
Interface

Heating bath

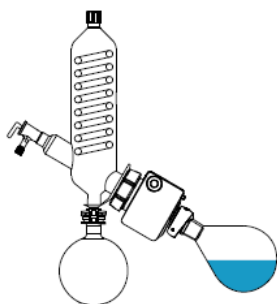
Recirculation
chiller



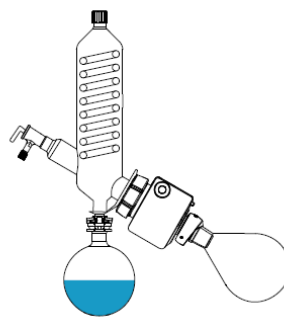
Rotavapor® more than just evaporation!



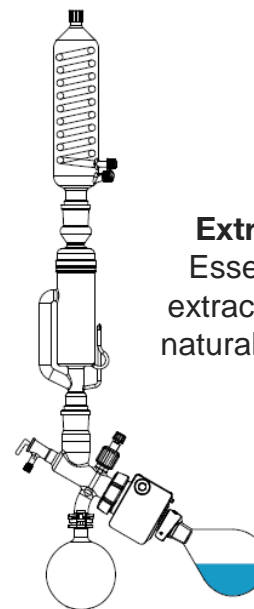
Evaporation
Fast distillation
of mixed solvent



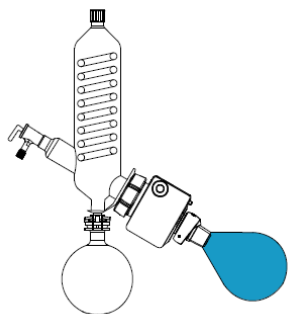
Concentration
Concentration of
solutions to a specific
level



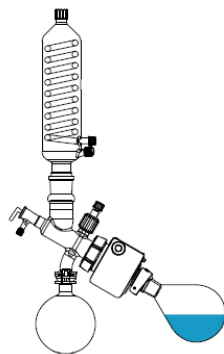
Recycling
Solvent recycle



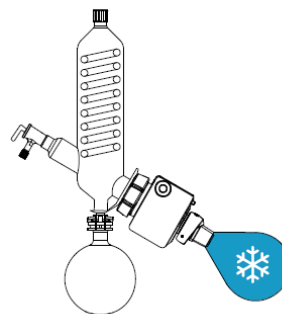
Extraction
Essential oil
extraction from
natural samples



Drying
Efficient drying
of samples



Reflux
Chemical synthesis
under reflux



Freeze drying sample preparation
Quicker freeze-drying sample
preparation

2

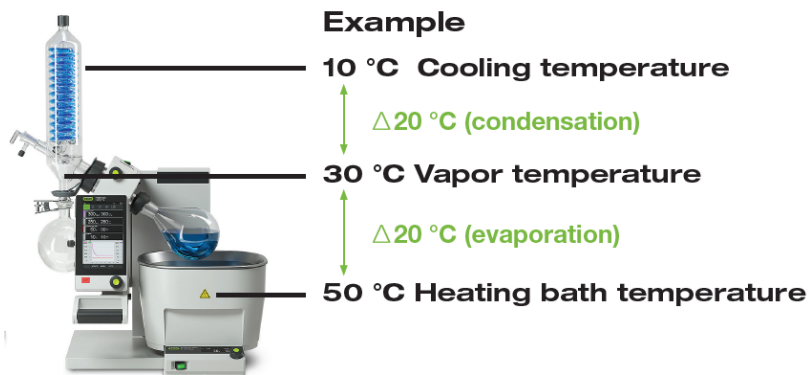
Achieve higher distillation efficiency

Achieve higher distillation efficiency

- Respect the $\Delta 20$ rule
- Optimize the pressure
- Load 75% or $\frac{3}{4}$ of condenser
- Increase rotation speed
- Use larger flask
- Immersion angle

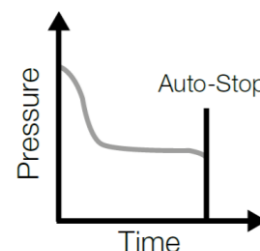
Achieve higher distillation efficiency

1. Respect the $\Delta 20$ rule



2. Optimize the pressure

- Gently reduce the pressure
- Use a Solvent library
- Use AutoDest sensor



3. Load 75% or $\frac{3}{4}$ of condenser

To optimal condenser loading

Too low condensate level \rightarrow Too high pressure

No evaporation

Slow process

Too high condensate level \rightarrow Too low pressure

Emission of solvent vapor

Short lifetime of vacuum pump

Sample loss

Contamination

Achieve higher distillation efficiency

4. Increase rotation speed

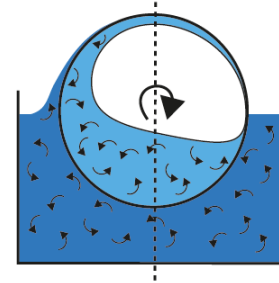
High rotation speed

Higher distillation rate

Reduce bumping / foaming

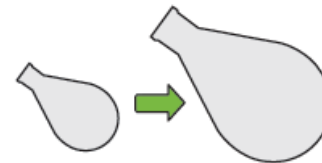
Low rotation speed

High viscosity sample / Drying of powder

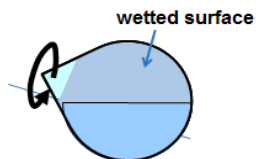


5. Use larger flask

More heat transfer through larger surface area



6. Immersion angle



Flatter angle 😊

→ more wetted surface inside the flask



3

Solving common issue on the Rotavapor®

Solving common issue on the Rotavapor®

Three common issues faced by Rotavapor® customers are:

1. Poor vacuum
2. Solvent loss / Smelly evaporation
3. Bumping and foaming samples

1. Poor vacuum



Finding the leak

1. Poor vacuum



If the leak is at the vacuum

- Disconnect the pump.
- Wash the pump with acetone or ethanol
- Dry the pump by running it for 5 min



If the leak is at the Rotavapor

- Check all glass connections, apply grease when needed
- Replace the vacuum gasket

2. Solvent loss / Smelly evaporation



1. **A leaky Rotavapor is the usually main cause of solvent loss and solvent smell.**

Solution: Fixing the leak (Change gasket)

2. **Wrong setting on the vacuum**

Solution: Setting proper pressure

3. **Too fast distillation**

Solution: Slow down distillation or use HP condenser for improved performance

3. Bumping and foaming samples

1. Wrong setting on the vacuum pump

Solution: Use the correctly recommended pressure. Use pressure gradients

2. Too slow rotation

Solution: Rotate samples faster

3. Sample with surfactants

Solution: Press aeration / Foam sensor (for R-300)



4

Features and Accessories

Foam sensor



Prevents sample from foaming into the condenser by temporarily aerating the system



Rotavapor® R-300
Discover the Foam Sensor

AutoDest sensor



Distill automatically without supervision. It is suited for work with **unknown samples**



AutoDest
How to use it

AutoDry valve

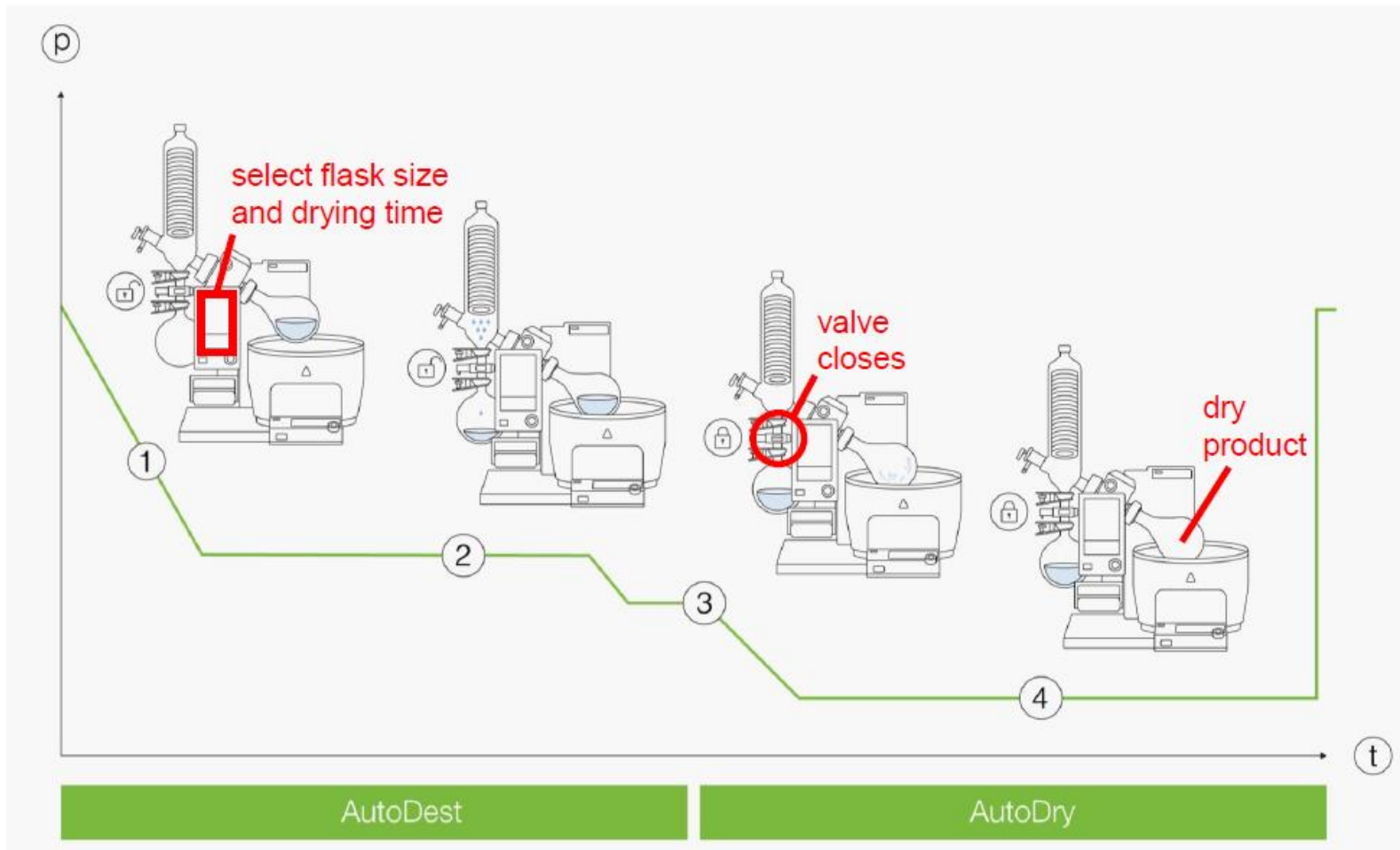
NEW!



- Ability to set a drying time (ensures complete dryness)
- Automatically switches after the AutoDest ends
- User can remove the collected solvent without disrupting the drying method



AutoDest + AutoDry



Accessories



Secondary condenser

Condenses remaining vapors after the vacuum pump outlet



Woulff bottle

For trapping particles and droplets and for pressure equalization



Level sensor

Alert when certain level in primary/secondary condenser receiving flask are reached

Glassware



Beaker flask

Beaker flasks with large screw-cap opening for easy retrieval of substances



Amber flask

For light sensitive samples / products



Analytic stopcock

For application where grease should be avoided

Glassware



Vapor duct with frit

For powder drying. To prevent powder from getting into the condenser



Vapor duct (high temperature)

For high temperature applications (oil as heating medium) to avoid vapor duct being stuck in the rotation drive)

5

Basic maintenance

Basic maintenance

PART 1

Rotary evaporator
& glassware



Cleaning system – Rotary evaporator part

- **Housing:** Clean it regularly with a moist cloth



- **Tube connections and joint:** Replace with new on when tubes become cracked and brittle

- **Sealing system:**

- No need to apply grease to the seal
- Cleaning the seal regularly, especially after bumping
- Replace with new one when it wears out and tear

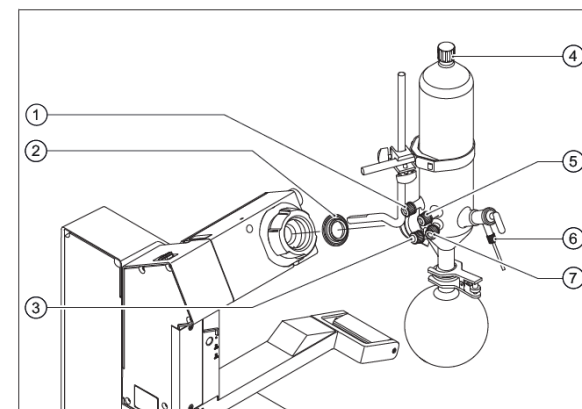
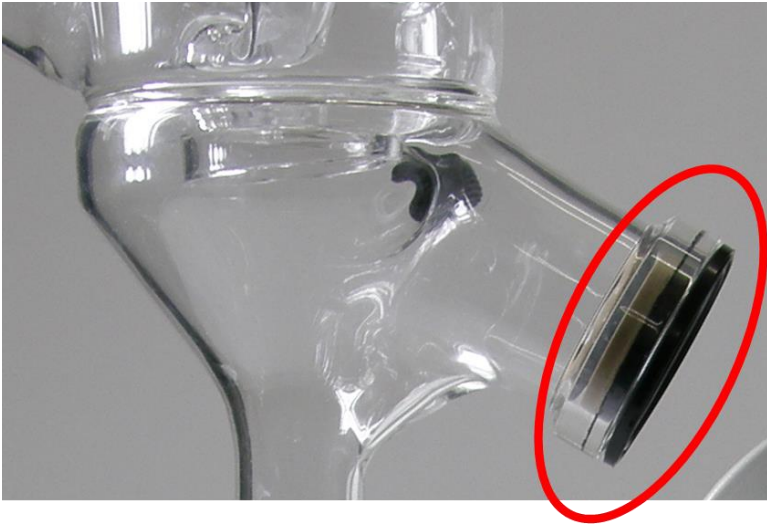


Fig. 45: Seals on Rotavapor and cooling condenser

- | | |
|----------------|--------------------------|
| 1 Coolant seal | 4 Cleaning hole seal |
| 2 Vacuum seal | 5 Coolant seal |
| 3 Sensor seal | 6 Feed tubing seal |
| | 7 Vacuum connection seal |

Gasket seal



IMPORTANT : DIRTY kills your gasket in a VERY SHORT period → You will not achieve a long life time. **CLEANING IS IMPORTANT !!!!!**

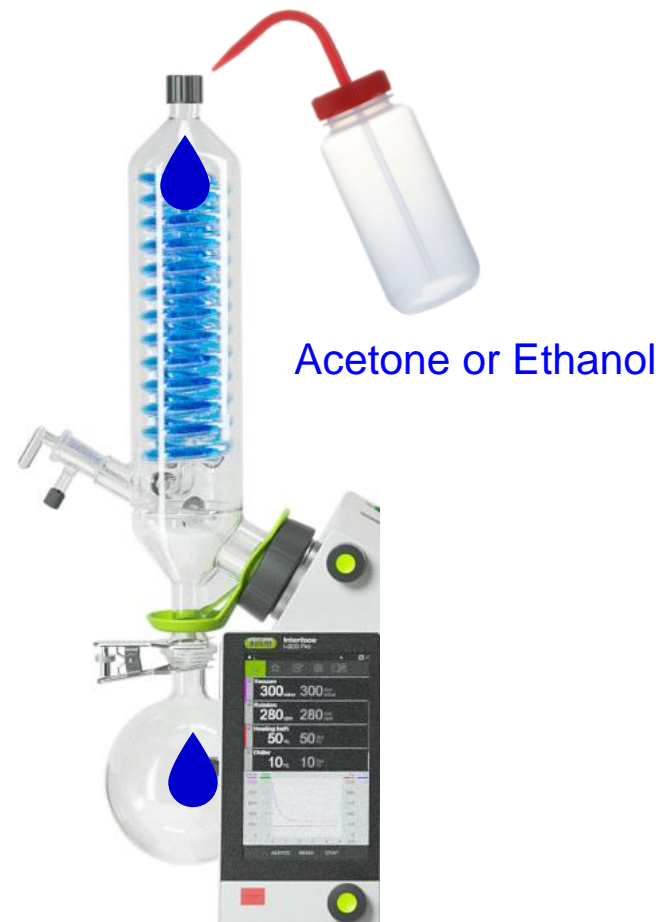
How to change gasket seal



How to exchange a vacuum seal? Vacuum seal VS-26

Cleaning system – Rotary evaporator part

- Keep the system dry at all times
- Once you are finished with the experiment, rinse the system with ethanol and dry it completely



Heating bath



Heating bath fluids

- If use the heating bath with $T < 95^{\circ}\text{C}$ use water
- If use the heating bath with $T > 95^{\circ}\text{C}$ use PAG or PEG



Cleaning

- Use distilled water, deionized water
- Change water once a week
- Persistent calcification: Use 10% acetic acid to clean it



Vapor duct



- Once you are finished with the experiment, especially after bumping, clean with detergent, rinse with DI water or ethanol and dry it completely

Vapor duct



BÜCHI Labortechnik AG

Rungthiwa Phuatphong – Product specialist

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Basic maintenance

PART 2

Vacuum pump



Cleaning system – Vacuum pump V-700



Cleaning system – Vacuum pump V-300 & V-600

Basic maintenance

PART 3

Recirculating chiller



How to select proper coolant?

- DI water / Distilled water
- Mixture of Ethanol and water (40:60)
- Mixture of Ethylene glycol and water (40:60)
- Do not use silicone oil

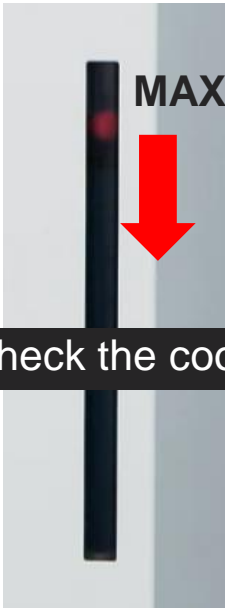
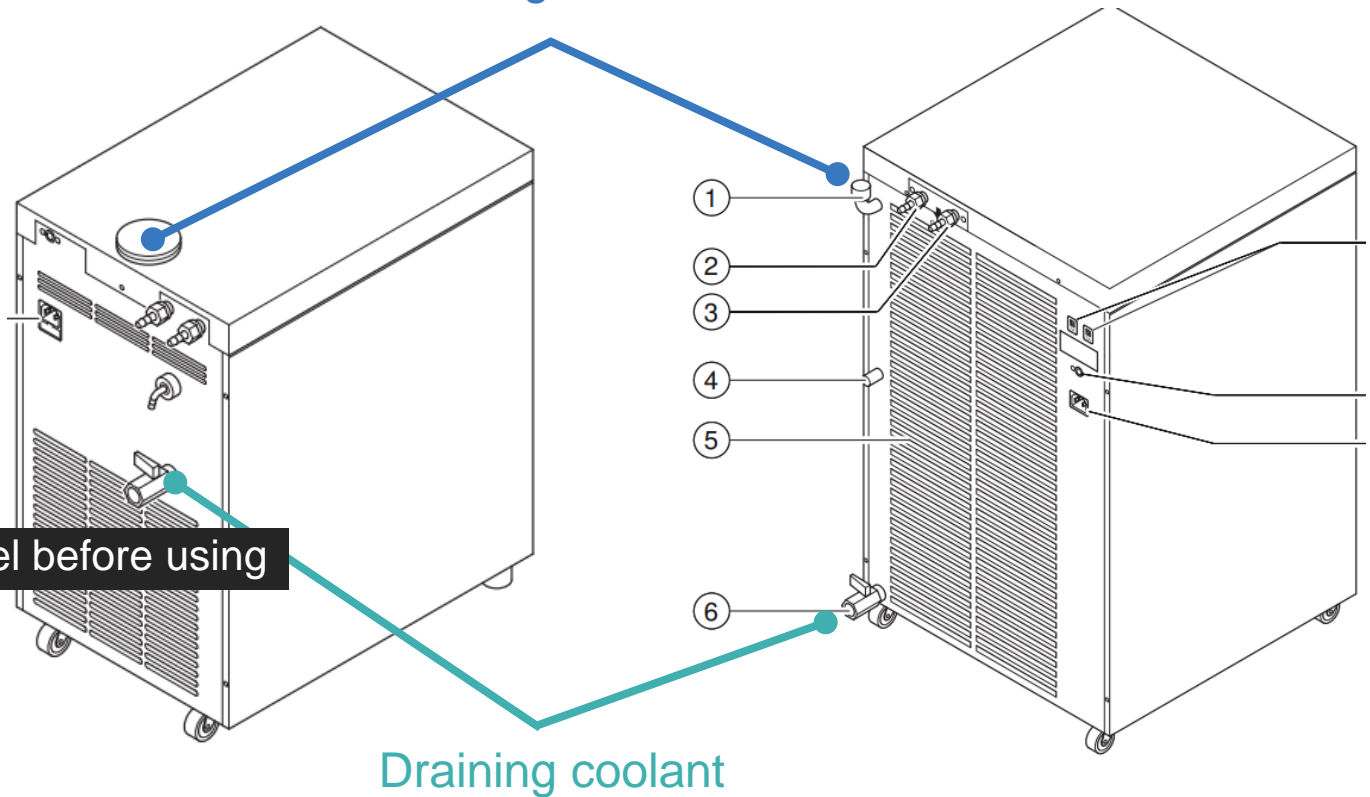


Cleaning & Servicing

Housing: Clean it regularly with a damp cloth



Filling coolant



Check the coolant level before using

Caution & Suggestion

- Always check the system before using
- Clean the system regularly
- To optimized distillation speed, increase rotation speed, use a bigger flask and follow the $\Delta 20$ rule
- Beware evaporating flask collision with edge of heating bath
- Apply vacuum grease to stopcock (don't use vaseline)

Thank you for your kindly attention



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Q&A

