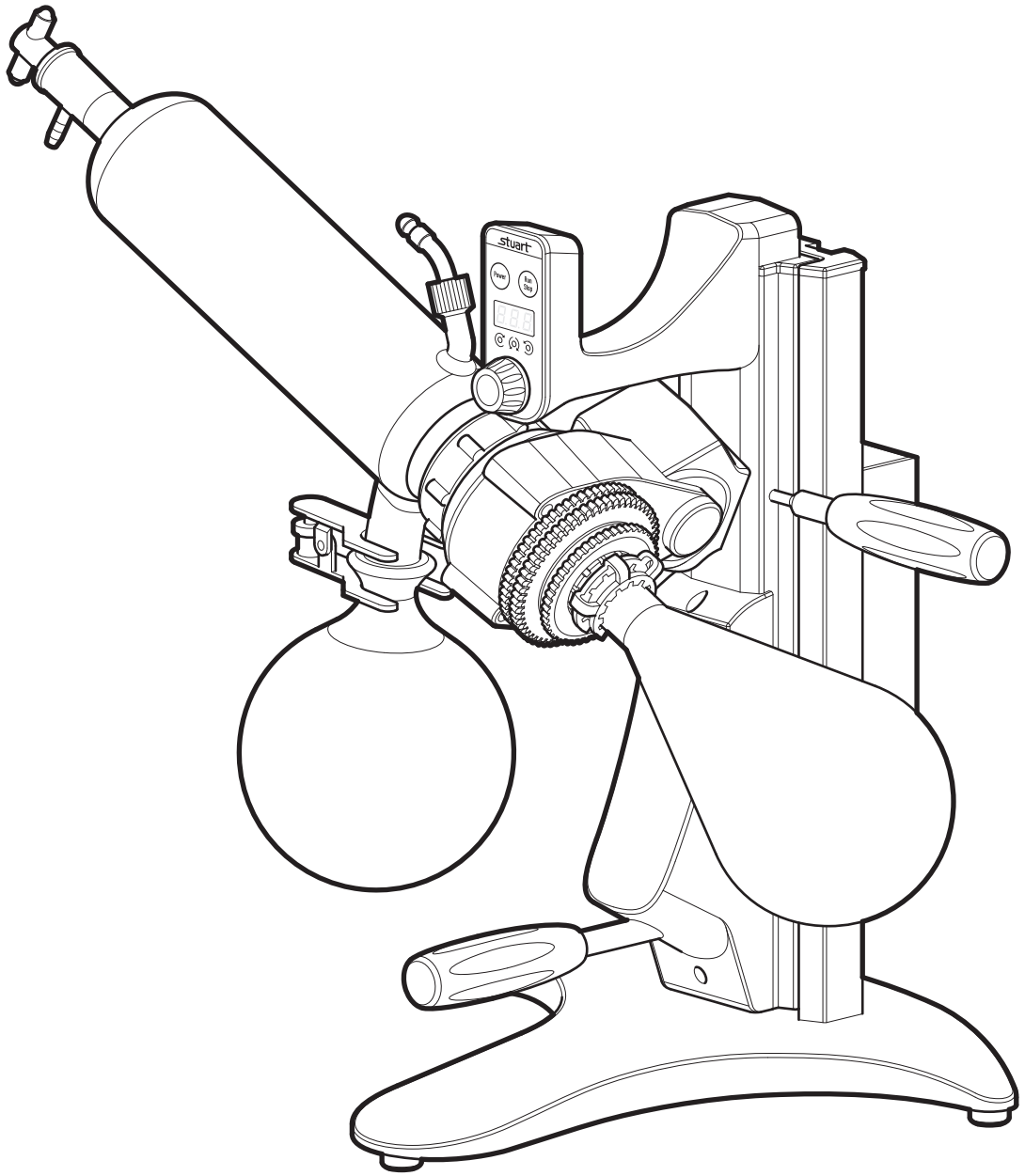
Rotary Evaporators




# Instruction Manual

STU0002 / Version 1.0

Cole-Parmer®

# Rotary Evaporators
# RE400, RE401, RE402, RE400P, RE401P, RE402P

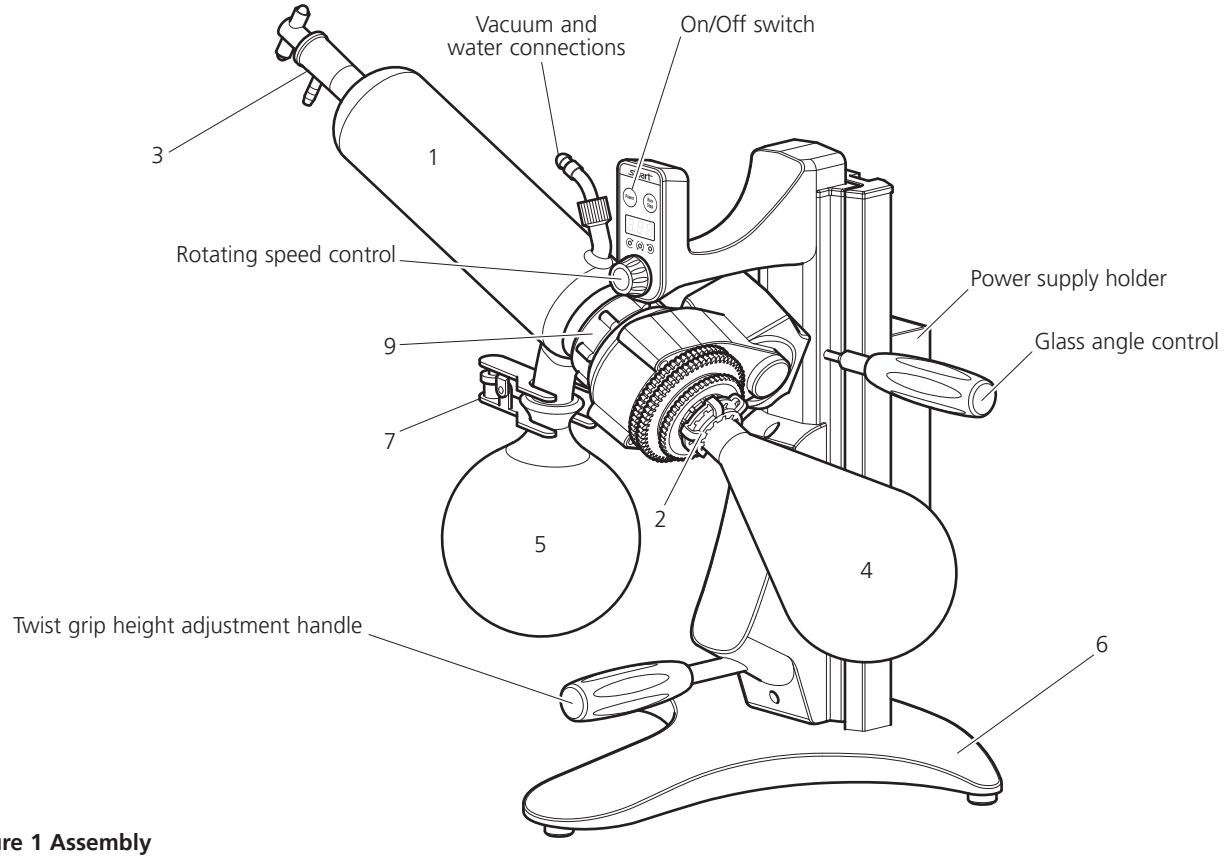



**Figure 1 Assembly**

# Assembly and operating instructions

## Before use

***If the equipment is not used in the manner described in this manual the protection provided by the equipment may be impaired.***

Stuart rotary evaporators are designed to operate under the following conditions:

- For indoor use only
- Use in a well ventilated area
- Ambient temperature range +5°C to +40°C
- Altitude up to 2000m
- Relative humidity not exceeding 80%
- Mains supply voltage fluctuations not greater than ±10% of nominal
- Over voltage category 2 IEC 60364-4-443
- Pollution degree 2 IEC664

## General description

Rotary evaporators are distillation units that incorporate an efficient condenser with a rotary flask system. As the flask containing the solvent is rotated it continually transfers a thin layer of liquid over the entire inner surface. This gives a very large surface area for evaporation that is effected by heating from the accessory waterbath.

## Location & Services

In order to get the optimum performance from your Stuart rotary evaporator careful consideration should be given to the intended location. Please study the following notes before commencing assembly.

Choose a convenient location, which will allow easy access to both rotating and receiving flask.

The location should have access to the following services:

Cold water supply capable of delivering 60l/hr is required for RE400, RE400P, RE401, RE401P.
Electricity supply
Drain
Vacuum line (optional)

# Electrical Supply

**THIS EQUIPMENT MUST BE EARTHED**

Before connection please read and understand this instruction manual and ensure that the line supply corresponds to that shown on the rating plate. Stuart rotary evaporators require a supply rated at 100-240V, 50/60Hz, single phase,~.

Power consumption is:

| Model | Power | Frequency |
|---|---|---|
| RE400/P | 8W | 50/60Hz |
| RE401/P | 8W | 50/60Hz |
| RE402/P | 8W | 50/60Hz |

**IF IN DOUBT CONSULT A QUALIFIED ELECTRICIAN**

The product is provided with a UK 3-pin for 230 V installations.

There are 2 power sockets on the rear of the stand, either of which can be used. The spare socket should must not be used with any other product, this is to avoid accident or malfunction.

The wires in the mains cable are coloured as follows:

BROWN - LIVE
BLUE - NEUTRAL
GREEN/YELLOW - EARTH

The unit is fitted with an IEC socket at the rear of the instrument for connection of the mains lead. The appropriate mains lead should be connected BEFORE connection to the mains supply.

Should the mains lead need replacement a cable of 0.75mm$^2$ of harmonised code H03VVH2-F connected to an IEC 320 plug should be used.

**IT IS IMPORTANT THAT THIS OPERATION SHOULD ONLY BE UNDERTAKEN BY A QUALIFIED ELECTRICIAN**

# Safety Advice before Use

- If the jacking mechanism is to be raised without the glassware fitted great care must be taken. Without the weight of the glass the jack will rise rapidly and can cause damage to the mechanism. Unlock the jack carefully while applying downward pressure to control the movement.
- As the apparatus is likely to be used under vacuum, before operation, examine all glassware carefully for scratches or chemical etching. Use of damaged glassware under vacuum could result in an implosion. In any case it is recommended that the apparatus be operated behind a safety screen.
- DO NOT use the equipment in a hazardous atmosphere or for mixing of hazardous materials.
- Special care should be taken when using the equipment with flammable solvents. The unit is not spark or explosion proof.
- In case of mains interruption, a fault or mechanical failure, the unit will continue to operate on removal of the fault.
- Beware of safety issues associated with rotating glassware and when jacking glassware up and down.
- DO NOT position the product so that it is difficult to access the ON/OFF switch.
- DO NOT position the product so that it is difficult to disconnect it from the mains supply using the mains plug.
- The mains outlet socket used should be located close to the equipment and readily identifiable and accessible to users.

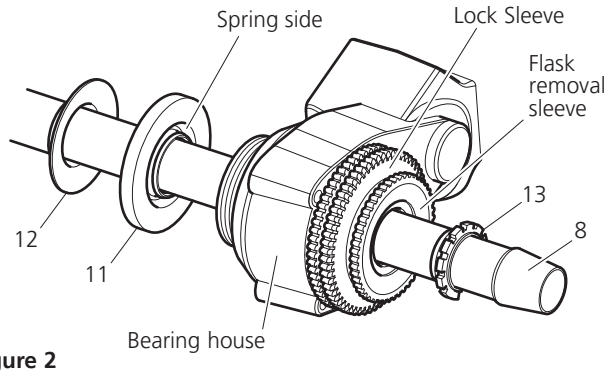



**Figure 2**

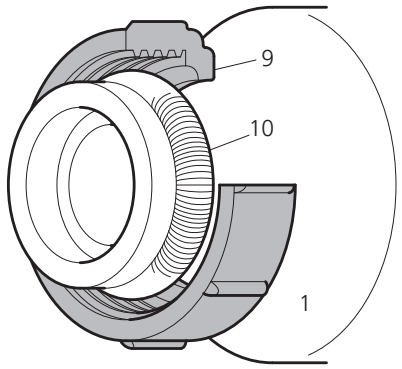



**Figure 3**

# Assembly

**If the jacking mechanism is to be raised without the glassware fitted great care must be taken. Without the weight of the glass the jack will rise rapidly and can cause damage to the mechanism. Unlock the jack carefully while applying downward pressure to control the movement.**

1. Unpack the rotary evaporator and identify the following components:

| Item No | Component | Catalogue Number |
|---|---|---|
| 1 | Condenser | RE100/CO or RE200/VC or RE200/CF and RE200/CFD |
| 2 | Conical joint clip | KCM29 |
| 3 | Feed/vacuum release adapter | RE100/VR |
| 4 | Florentine flask 1L | FD1L/4RE |
| 5 | Receiving flask 1L | RE100/RF/1L |
| 6 | Rotary evaporator motor stand | RE400/MS |
| 7 | Spherical joint clip | JC35 |
| 8 | Vapour tube | RE100/VT or RE100/VT/CF |
| 9 | Grey retaining cap | RE100/CS |
| 10 | Circular metal spring | RE100/RS |

All components below are included with the Rotary evaporator stand RE400/MS

| | | |
|---|---|---|
| 11 | Vacuum seal | RE100/VS |
| 12 | Sub-seal | |
| 13 | Retaining Clip | |
| - | Power supply | |
| - | UK power supply lead | |
| - | Power supply holder | |

2. Place the stand on a level surface. You will require easy access to a water supply, drain, electric power and vacuum line to use your rotary evaporator.

   Use the base adjustment knob at the rear of the stand to adjust the level of the unit. Turning the knob anti-clockwise will lower the stand, turning the knob clockwise will raise the stand.

3. Pass the plain end of the vapour tube (8) through the right side of the motor assembly and push into position until it locates firmly behind the spring clip. The conical joint should be to the right of the motor when viewed from the front.

4. Place the main vacuum seal (11) and sub-seal (12) onto the plain end of the vapour tube (left) and slide them down until they locate in the bearing housing. It is important that these elements are fitted in the correct order and that the spring loaded side of the main vacuum seal (11) faces the bearing housing (figure 2).

5. Place the retaining clip (13) on the jointed side of the vapour tube (right) and slide until it clips in the flask removal sleeve (figure 2).

6. Place the grey retaining cap (9) over the butt joint of the condenser (1) with the screwthread facing outwards and retain in position with the circular spring (10) (figure 3).

7. Place the condenser over the vapour tube so that it butts up to the vacuum seal. Ensure the spherical joint faces downwards. Secure by screwing the retaining cap onto the bearing housing. If using a RE400 diagonal coil condenser, check that the vapour tube is central and will not foul the condenser cooling coil.

8. The condenser may now be set to the required angle:

   **RE400 and RE400P** Diagonal position

   **RE401, RE401P and RE402, RE402P** Vertical position

9. Support the condenser while loosening the glass angle control.

10. Position condenser and tighten the control.

11. Hold the receiving flask (5) in position and secure with the spherical joint clip (7).

12. Place the rotating flask (4) onto the end of the vapour tube and secure using the conical joint clip (2).

13. Remove the grey plastic screwcap from the narrow end of the condenser and assemble it to the feed/vacuum release adapter (3) (figure 4).

14. Pass the PTFE tube through the condenser and vapour tube so that the end is inside the rotating flask. Note that for the RE301 and RE302, the PTFE tube may have to be reduced in length to fit into the Florentine flask (figure 4).

15. Secure by tightening the screw cap.

16. **RE402 and RE402P only:** Assemble the drain stopcock (RE200/CFD) to the condenser using the grey plastic cap located on the lower side arm.

17. To connect the condenser to the water supply, drain and vacuum line, flexible hose of 9mm I.D. is required. Ensure you identify every connection correctly before starting. Note tubing suitable for use under vacuum must be used for the vacuum connection.

    **RE400, RE400P** First remove the plastic connectors from the condenser and fit into the hose. Secure with a suitable clip, e.g. Jubilee. The connectors and hose may now be fitted to the inlet and outlet water connections on the condenser (bottom two connections linked to the coil). Proceed in the same way for the vacuum connection (top connection).

    **RE401, RE401P** First remove the plastic connectors from the condenser and fit into the hose. Secure with a suitable clip, e.g. Jubilee. The connectors and hose may now be fitted to the inlet and outlet water connections on the condenser (bottom two connections linked to the coil). Proceed in the same way for the vacuum connection (top connection).

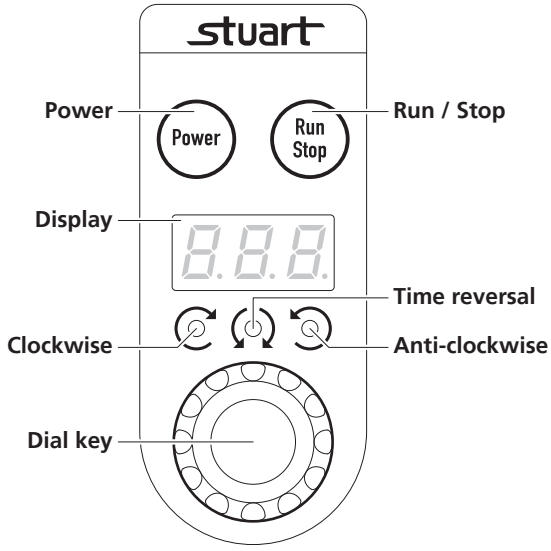
    **RE402, RE402P** First remove the plastic connector at the back of the condenser and fit into the hose. Secure with a suitable clip, e.g. Jubilee. The connector and hose may now be fitted to the vacuum line.

    Note: A plastic cover is provided to reduce evaporation of cooling agent.

Your rotary evaporator is now ready to be used.

# Operation

**RE400, RE400P, RE401, RE401P, RE402 and RE402P Control Panel**




Anti-clockwise rotation mode is selected and the power outage recovery mode is OFF when shipped from the factory.

While the unit is at normal stop status *0* will appear on the display.

### Rotation mode

**Clockwise:** The specimen flask turns clockwise.
**Anti-clockwise:** The specimen flask turns anti-clockwise.
**Time:** The speciman flask can be set to switch between turning clockwise and anti-clockwise at a specified speed and for a specified amount of time.

### Setting the rotation direction and speed

1. Press the **Power** button. The display will come on and show the number of rotations as *0*.
2. Press and hold the **Dial key** for 5 seconds or more. The display indicates *rot* and setting of the rotation mode is enabled.
3. Turn the **Dial key** to select the required rotation direction, the selected rotation direction light will illuminate. Press the **Dial key** once to enter chosen rotation mode.
4. Press the **Dial key** again. The display will flash *20* or the number or the number of rotations from the last session. The factory setting is *20*.
3. Turn the **Dial key** to the required rotation speed and press the **Dial key** once to confirm. Turning the **Dial key** slowly increases the number by one, turning the **Dial key** quickly increase by 10.

   NOTE: You can change the rotation speed during rotation.

**Setting the time reversal mode**

1. Press the **Power** button. The display will come on and show the number of rotations as 0.
2. Press and hold the **Dial key** for 5 seconds or more. The display indicates rot , turn the **Dial key** to select **Time**. The **Time** and **Clockwise** or **Anti-clockwise** lights will illuminate.
2. Press the **Dial key** once. The display will flash 20 or the number or the number of rotations from the last session. The factory setting is 20.
3. Turn the **Dial key** to the required amount of rotations and press the **Dial key** once to confirm. Then the display will alternate between the timer indicator tmr and the time used in the previous session. The factory setting is 5.
4. While the display is flashing, turn the **Dial key** to the required amount time. Press the **Dial key** once to exit Time reversal mode.

   NOTE: The timer range is between 5 and 999 seconds.
   NOTE: You can change the speed and time of rotations during rotation.

**Power outage recovery mode**

**Power outage recovery OFF:** When the power is shut off during rotation, rotation will stop when power is recovered. Display alternates between number of rotations and PoF. Display can be cleared by pressing the dial key.
**Power outage recovery ON:** When the power is shut off during rotation, rotation will resume when power is recovered. Display alternates between number of rotations and Pon. Display can be cleared by pressing the dial key.

**Setting the power outage recovery mode**

1. Whilst rot is displayed in rotation mode, press the **Dial key** for 5 seconds or more. When the display indicates PoF, turn the **Dial key** to select PoF or Pon. Press the **Dial key** once to confrim and exit power outage recovery.

**Batch Operation**

a) Remove the rotating flask (4) from the vapour tube (8) and fill with the liquid to be evaporated. Ensure that the flask is never more than half full. Secure the flask onto the conical joint using the clip (2)

b) Examine the feed/release adapter (3) and ensure that both the stopcock and vacuum release screwcap are closed (figure 4).

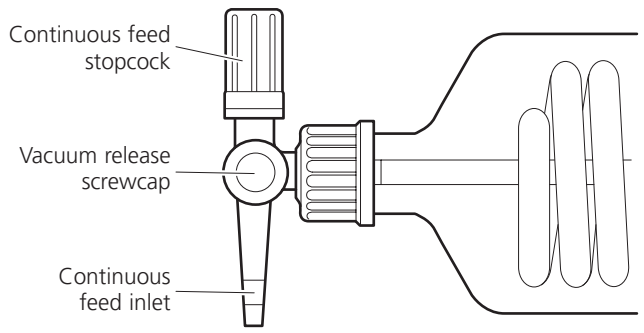



**Figure 4**

c) Ensure that water is flowing through the condenser at approx. 60l/hr (RE400 and RE401) or that the cold trap is filled with ice or dry ice (RE402).

d) Switch on the electricity supply.

e) Raise the glassware assembly to its highest position by turning the handle anticlockwise. Note that the mechanism is spring loaded. Once at the right height, turn the handle clockwise to secure the position.

f) Place a suitable water bath directly under the rotating flask.

**N.B. A water bath designed for use with the RE400 is available from Stuart, code RE400DB or RE400OB. Please contact the sales office for details.**

g) Lower the glassware until the rotating flask is partially immersed in the water.

**N.B. Ensure that the glassware does not touch the bath and that no water overflows as the flask is immersed.**

h) Press the **Power** button. The display will come on and show the number of rotations as 0.

i) Set the rotation speed to the desired speed ensuring that rotation is not so fast that water is splashed out of the bath.

j) If evaporation at reduced pressure is required a vacuum line should be attached to the vacuum side arm on the condenser. Turn on the vacuum and set to required value.

**N.B. A vacuum pump designed for use with the RE400 is available from Stuart, code RE3022C. Please contact the sales office for details.**

k) Set the temperature of the water bath as required.

l) Press the **Run / Stop** button to begin

m) When evaporation is complete release the vacuum by slowly unscrewing the vacuum release screwcap (figure 4). Set the rotation speed to 0, press the **Run / Stop** button to stop and raise the glassware clear of the bath.

**Continuous Feed Operation**

When the apparatus is used under reduced pressure it is possible to replenish the liquid in the rotating flask without interrupting the evaporation or removing the flask.

The following procedure should be adopted.

a) Attach a length of flexible tubing to the continuous feed inlet of the feed/release adapter (figure 4).

b) Carry out instructions b-j for batch operation.

c) Immerse the free end of the flexible tubing into the container holding the liquid to be evaporated. Ensure there is no strain on the feed/release adapter.

d) With the apparatus under vacuum slowly open the stopcock on the feed/release adapter. The vacuum will draw liquid into the rotating flask.

e) Close the stopcock when sufficient liquid has entered the flask

Further quantities of liquid may be added during evaporation by reopening the stopcock.

**N.B. Ensure there is sufficient capacity in the flask to cope with the addition. Never fill the flask more than half full.**

**N.B. Ensure there is sufficient capacity in the receiving flask to cope with the condensation.**

**N.B. This evaporator should not be used with rotating flasks bigger than 2 litres or receiving flasks bigger than 1 litre capacity.**

f) Press the **Run / Stop** button to begin

g) If the receiving flask should require emptying during operation the following procedure should be adopted:

   i Release the vacuum and stop rotation
   ii Raise the glassware clear of the water bath
   iii Wait until boiling stops and liquid stops dripping into the receiving flask
   iv The receiving flask may now be removed.

h) When evaporation is complete release the vacuum by slowly unscrewing the vacuum release screwcap (figure 4). Set the rotation speed to 0, press the **Run / Stop** button to stop and raise the glassware clear of the bath.

# Care and Maintenance

**IMPORTANT: Before commencing any maintenance operation or replacement of components parts the unit should be isolated from the electricity supply, water supply and vacuum line.**

**These operations should only be undertaken by suitably qualified personnel.**

***Glassware***

All glassware parts should be cleaned regularly and examined for scratches, cracks and chemical etching. Replace any damaged parts.

***Plastic coated glassware***

The plastic coated glassware should not be exposed to temperature above 80°C and is not dishwasher proof.

***Cleaning***

The main stand and motor should be cleaned using a mild detergent solution.

***Vacuum Seal***

It is recommended that the vacuum seal be regularly washed with distilled or deionised water and allowed to dry naturally.

***Removal of the Vacuum Seal***

a) Remove the rotating and receiving flasks

b) Remove feed/release adapter

c) Remove condenser

d) Withdraw vapour tube from the bearing housing by completely unscrewing the plastic screw bush on the right side of the bearing house.

e) The vacuum seal may now be removed.

f) Reassemble following the assembly instructions in this manual.

# Servicing

It is recommended that any servicing or repair is only undertaken by suitably qualified personnel.

Only spare parts supplied by Cole-Parmer or its agent should be used. Fitting of non-approved parts may affect the performance of the safety features of the instrument.

If in doubt, contact the Technical Service Department of
Cole-Parmer Ltd.
Beacon Road,
Stone, Staffordshire,
ST15 0SA, United Kingdom
Tel: +44 (0)1785 810475
Email: cpservice@coleparmer.com
Web: www.stuart-equipment.com

# Technical Specification

| | RE400/P | RE401/P | RE402/P |
|---|---|---|---|
| Speed, rpm | 10 - 310 | | |
| Vacuum | 3mm Hg | | |
| Lift Distance | 180mm | | |
| Overall dimension (Highest position mm) | 672w x 342d x 504h (684mm) | 479w x 342d x 823h (1003mm) | 514w x 342d x 645h (825mm) |
| Electrical supply | 100 - 240 V, 50/60Hz, 8W | | |

# Warranty

Cole-Parmer Ltd. warrants this mechanical and electrical equipment to be free from defects in material and workmanship, when used under normal laboratory conditions, for a period of three (3) years. In the event of a justified claim Cole-Parmer will replace any defective component free of charge.

This warranty does NOT apply if damage is caused by fire, accident, misuse, neglect, incorrect adjustment or repair, damage by installation adaptation, modification, fitting of non-approved parts or repair by unauthorised personnel.

This warranty does not apply to the glassware or vacuum seal.

# Spares

The following spare parts are available from your laboratory supplier. (For a comprehensive parts list or circuit and wiring diagrams please contact the Technical Service Department of Cole-Parmer quoting model and serial number).

| Cat. No. | Description |
|---|---|
| RE100/CO | Diagonal coil condenser (feed tube not included) |
| RE200/VC | Vertical coil condenser (feed tube not included) |
| RE200/CF | Cold finger condenser (feed tube and drain not included) |
| RE100/COP | Diagonal coil condenser plastic coated (feed tube not included) |
| RE200/VCP | Vertical coil condenser plastic coated (feed tube not included) |
| RE200/CFP | Cold finger condenser plastic coated (feed tube and drain not included) |
| RE200/CFD | Drain for cold finger condenser |
| RE100/VR | Feed tube |
| RE100/VT | Vapour tube for diagonal condenser |
| RE100/VT/CF | Vapour tube for vertical coil and cold finger condensers |
| RE100/VS | Vacuum seal |
| FD1L/4RE | Florentine flask 1000ml |
| FD1L/4REP | Florentine flask 1000ml plastic coated |
| RE100/RF/1L | Receiving flask 1000ml |
| RE100/RF/1LP | Receiving flask 1000ml plastic coated |
| KCM29 | Conical joint clip |
| JC35 | Spherical joint clip |

CE This product meets the applicable EC harmonised standards for radio frequency interference and may be expected not to interfere with, or be affected by, other equipment with similar qualifications. We cannot be sure that other equipment used in its vicinity will meet these standards and so we cannot guarantee that interference will not occur in practice. Where there is a possibility that injury, damage or loss might occur if equipment malfunctions due to radio frequency interference, or for general advice before use, contact the manufacturer.

stuart® Cole-Parmer®

# EU Declaration of Conformity

| | | | |
|---|---|---|---|
| **Product** | Laboratory Equipment | **File Number** | P225 |
| **Manufacturer** | Cole-Parmer Ltd<br>Beacon Road<br>Stone, Staffordshire<br>ST15 0SA<br>United Kingdom | | |

**This declaration of conformity is issued under the sole responsibility of the manufacturer**

| | |
|---|---|
| **Object of Declaration** | Rotary Evaporators - RE Range<br>*(reference the attached list of catalogue numbers)* |

*The object of the declaration described above is in conformity with the relevant Union Harmonisation Legislation:*

| | |
|---|---|
| **Low Voltage Directive** | 2014/35/EU |
| **EMC Directive** | 2014/30/EU |
| **RoHS Directive** | 2011/65/EC |

*References to the relevant harmonised standards used or references to the other technical specifications in relation to which conformity is declared:*

| | |
|---|---|
| IEC/EN 61010-1:2010 | Safety requirements for electrical equipment for measurement, control and laboratory use.<br>Part 1: General requirements. |
| IEC/EN 61010-2-051:2015 | Particular requirements for laboratory equipment for mixing and stirring. |
| IEC/EN 61326-1:2013 | Electrical equipment for measurement, control and laboratory use. EMC requirements.<br>Part 1: General requirements. |

**Signed for and on behalf of the above manufacturer**

| | |
|---|---|
| **Additional Information** | Year of CE Marking: December 2016 |
| **Place of Issue** | Stone, Staffordshire, UK |
| **Date of Issue** | 07 July 2017 |
| **Authorised Representative** | Steve Marriott |
| **Title** | Technical Director |
| **Signature** |  |

Declaration of Conformity is also available to view online at www.stuart-equipment.com

Cole-Parmer®

**Cole-Parmer Ltd.**
Beacon Road,
Stone,
Staffordshire,
ST15 0SA,
United Kingdom
Tel: +44 (0)1785 812121
Email: cpinfo@coleparmer.com
Web: www.stuart-equipment.com