StonyLab®

Glass Reactor

Operation Manual

(Please read the instruction carefully before you use the machine)

Contents

1. Overview

1.1 Preface

StonyLab has thoroughly researched and assessed the potential risks that may arise during product use. However, it is extremely difficult to anticipate all possible hazards. As such, the safety precautions outlined in this manual may not cover every conceivable risk.

To ensure maximum safety, it is essential to operate the equipment strictly in accordance with the procedures and requirements described in this manual. Users must remain vigilant at all times to prevent accidents or equipment malfunctions.

1.2 Safety

This manual outlines the safety regulations related to the installation and operation of the HJ Series Glass Reactor. Users must strictly follow the operating procedures and fully understand the relevant warning indicators to ensure both equipment integrity and personal safety.

1.2.1 User Qualifications

The operator of the StonyLab Series Glass Reactor should possess hands-on experience and technical knowledge in accordance with the requirements outlined in this manual. The equipment must be used under the supervision or guidance of personnel with adequate expertise and cognitive competence.

1.2.2 Proper Use

This equipment is suitable for a wide range of laboratory and pilot-scale chemical synthesis processes, including but not limited to:

1) Synthetic reaction processes requiring high or low temperature conditions
2) Reactions under reduced pressure with simultaneous stirring
3) Dispersion, mixing, and liquid separation
4) Distillation (reflux, recovery), and concentration
5) Nitrogen protection

6) Dropwise addition of specific solvents, timed and quantitative feeding

7) Feeding of powders and solids

8) pH online monitoring, ultrasonic dispersion, and homogeneous emulsification

9) Auxiliary synthesis operations as required

10) Integration with other equipment to form a process flow according to specific requirements

1.2.3 Improper Use

Any operation that does not comply with the procedures and regulations outlined in this manual is considered improper use. Therefore, any actions or procedures not explicitly covered must be thoroughly evaluated and assessed prior to implementation.

The user assumes full responsibility for any damage, malfunction, or safety hazard resulting from improper use.

The use of this equipment is strictly prohibited under the following conditions:

1) Locations where the power supply does not meet the specified requirements;

2) Environments with strong magnetic fields or high levels of corrosive substances;

3) Use with hydrofluoric acid solution, hot phosphoric acid, or high-temperature concentrated alkali;

4) Introduction of bulk materials that may damage the glass vessel;

5) Sample volume in the reactor exceeds the specified capacity limit;

6) Rapid heating or cooling of the glass vessel - temperature changes must follow a controlled gradient;

7) For additional prohibited conditions, please refer to Chapter 2 of this manual.

2. Safety Symbols and Warnings

2.1 General Warning Guidelines

	Glass components cannot withstand positive pressure; only atmospheric or negative pressure is allowed.
	Glass must not be subjected to rapid heating or cooling. The temperature difference between the material inside the vessel and the jacket should be less than 40°C.
	During jacket circulation, the pressure must remain below 0.1 MPa. Do not install valves in the circulation loop!
	The glass flange joints on the reactor lid must be handled gently during operation - insert and remove with care.
	When not in use, the bottom discharge valve must remain in the open position.
	When operating the bottom discharge valve, do not apply excessive force. (Excessive force may damage the reactor body.) Simply tighten it securely.
	Outdoor use is strictly prohibited. Exposure to rain, splashing water, or other outdoor conditions may cause the electric controller housing to become energized, resulting in the risk of electric shock. Keep electrical components dry. Avoid contact between liquids and any electrical parts, including the electric heating mantle (if applicable) and electric controller. Prevent solid contamination. If any solid materials fall into or onto the equipment, they must be promptly and thoroughly cleaned to ensure safe and proper operation.

	The glass vessel and its connected heat transfer fluid pipes are exposed to high or low temperatures during the process. Do not touch these components directly to avoid burns or injuries.
	Wear personal protective equipment when operating this equipment, such as protective eyewear, gloves, and appropriate work clothing.
	Warning signs are posted on specific parts of the equipment. Please read this manual carefully for detailed warnings and instructions.

2.2 Safety Warnings

To ensure safe operation of the equipment and prevent damage or injury, please carefully read and follow the safety warnings below.

Danger

- The use of hydrofluoric acid and high concentrations of lye is strictly prohibited.
- It is strictly forbidden to introduce steam into the reactor jacket as a heat source.

Warning

- Use only the power supply specified on the equipment nameplate.
- Equipotential bonding has been implemented; do not remove the internal grounding wire.
- Before opening the electrical casing for maintenance or inspection, disconnect the power supply and wait for at least 5 seconds to allow residual voltage to safely discharge and avoid electric shock.
- Do not use broken or cracked glass components.
- The glass vessel and associated heat transfer fluid pipes may become extremely hot or cold during operation. Do not touch them directly to avoid burns.
- When operating the bottom discharge valve, do not apply excessive force. Overtightening may damage the vessel. Tighten only as needed to ensure sealing.

Prohibited

- Outdoor use is prohibited. Exposure to rain, moisture, or splashing water may cause the electrical controller housing to become energized, leading to electric shock.
- Prevent liquid contact with the electric heating mantle (if present), the electric controller, and other electronic components.
- If solid materials fall into the device or onto the mantle, they must be cleaned up promptly.

Notice

- If any abnormal condition occurs during use, immediately disconnect the power supply, investigate the issue, and contact qualified maintenance personnel.
- Regularly inspect for broken or cracked glass components to avoid injury.
- The maximum allowable temperature difference between the inner and outer surfaces of the vessel is 80°C. Exceeding this may cause the glass to break.
- When handling glass components, avoid scratching the surface or impacting the inside or outside.
- The maximum allowable circulating pressure in the jacket is 0.03 MPa.
- Ensure the circulating pipeline is unobstructed to avoid pressure buildup.
- Heating the liquid in the jacket causes it to expand, increasing pressure. Excessive pressure may cause vessel rupture.
- The allowable pressure range inside the vessel is from absolute vacuum to atmospheric pressure.
- If positive pressure is generated during the reaction process, glass breakage may occur.
- The operating temperature range is -80°C to 200°C. Exceeding this may damage sealing components and lead to seal failure or glass breakage.

- After use, clean the discharge valve and its connection with the glass vessel promptly to maintain sealing performance.
- Use of a glass vessel insulation cover is recommended to help prevent personal injury in case of glass breakage.
- When feeding materials through the inlet port, beware of static electricity buildup.
- In the three-layer kettle structure, evacuate the vacuum layer to no more than -0.07 MPa.
- Excessive vacuum may cause glass breakage due to combined stress from vacuum and circulating pressure.
- If temperature control equipment is connected and valves are installed in the circulation loop, ensure all valves are fully open during use.
- The heat transfer fluid expands with temperature changes; blocked fluid may cause cracking of the glass vessel.
- The inlet and outlet ports of the jacket are equipped with stainless steel transfer elbows and buffer tubes.
- Take care during installation to avoid misalignment that could strain the glass joint.
- At ultra-low temperatures, the glass may become brittle - use cable ties or clamps to reduce stress on the ports.
- If a ground glass joint becomes stuck due to hardened vacuum grease, do not force disassembly.
- Gently heat the joint to soften the grease before attempting to remove it.

Additional Notice

- Samples added to the vessel or certain surrounding solvents may form peroxides or include high concentrations of flammable substances.
- Acidic or alkaline vapors near the equipment can degrade insulation, impacting component performance and service life.
- When handling hazardous or unknown substances, be aware of explosion risks.

Tip

- Always wear personal protective equipment (PPE) when operating this equipment.

- This includes protective goggles, chemical-resistant gloves, and lab coats.

3. Product Equipment Introduction

3.1 Product Overview

The StonyLab Series Speed-Regulating Glass Reactor is primarily used for material synthesis, distillation, concentration, and other experimental procedures or process development.

The glass vessel is available in three structural types: single-layer, double-layer, and three-layer.

If needed, the reactor can be evacuated to a negative pressure state or filled with inert gas (Note: When filling with inert gas, ensure there is one inlet and one outlet to prevent excessive internal pressure that could damage the glass).

Material can be added evenly by adjusting the regulating valve on the constant pressure funnel.

Precise, timed, and quantitative addition of specific materials can also be achieved using a metering pump or peristaltic pump.

The condenser's heat exchange function allows for solvent distillation, which can then either be returned to the reactor or collected in a receiving flask.

Glass Vessel Structures:

- **Single-Layer Glass Vessel:**
  This structure consists of a single glass layer and does not include an interlayer.

- **Double-Layer Glass Vessel:**
  Composed of inner and outer glass layers, with an interlayer between them. The interlayer is connected to a heating/refrigeration circulation device through which a high- or low-temperature heat transfer liquid is circulated. This enables temperature control of the material inside the reactor via thermal conduction.

- **Three-Layer Glass Vessel:**
  This structure includes three glass layers: an inner layer, an intermediate jacket, and an outer vacuum layer. The inner jacket is connected to an external heating/refrigeration circulation device, allowing for the introduction of high- or low-temperature liquid to regulate the material temperature via thermal conduction. The outer jacket is connected to a vacuum pump, creating a negative pressure environment that provides thermal

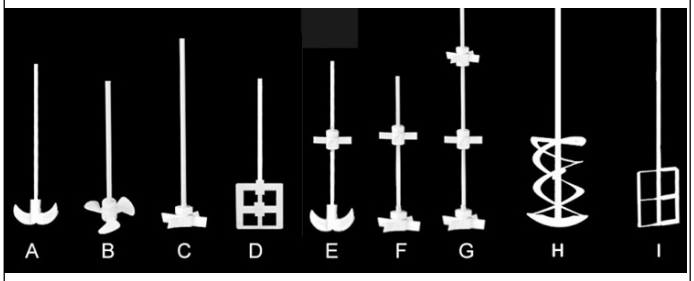
insulation for improved energy efficiency and temperature stability.

3.2 General Product Parameters

Note: Due to the flexible and customizable configuration of the reactor, please refer to the actual product supplied for precise specifications.

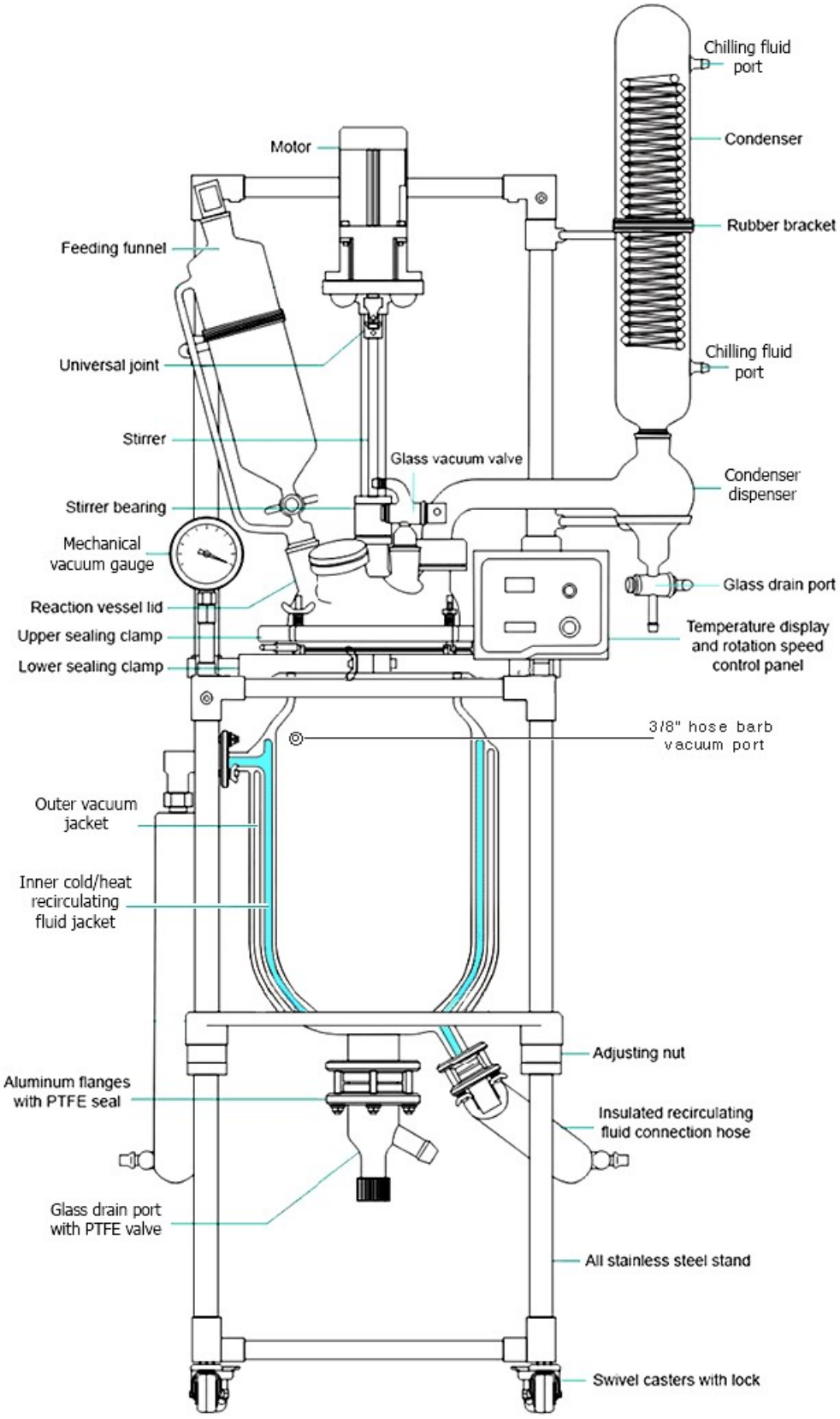
Items	Configuration
Glass Vessel Capacity	5L, 10L, 20L, 30L, 50L, 80L, 100L, 150L, 200L Option 1: Heat-Preservation Insulated Jacket Option 2: Heating Jacket Option 3: Internal Baffles for improved mixing and dispersion Option 4: Ring Baffles within thermal layer for precise temperature control
Glass Vessel Layers	Single layer / Double layer / Triple layer
Condenser Heat Exchange	a. Cooling area: 0.2 ~ 1.5 m^2 b. Receiving flask: None required or 2L ~ 50L (continuous discharge without affecting vacuum) c. Can be equipped with multiple receiving flasks d. Style: Vertical or horizontal coil condenser with GL adapter e. Condensate reflux: Can be fully refluxed into the glass vessel
Constant Pressure Dropping Funnel	Style 1: 1/2L constant pressure funnel (with high vacuum PTFE hand valve) Style 2: 5L, 10L, 20L high-level bottle or drip can Style 3: Double-layer 2L, 5L, 10L, 20L feeding flask (with stirring) Style 4: Peristaltic pump or metering pump for timed, quantitative feeding
Glass Lid Openings	Flange sizes: 265#, 340#, 400# Total 7 openings: a. Stirring port - 60# flange b. Temperature sensor port - DN25 c. Condenser connection port - S50/20 (ball mill port) d. Constant pressure funnel port - 40# (grinding mouth)

	e. Solid feeding port - 80# flange (with PTFE cover) f. Evacuation valve / vacuum port / nitrogen port - 34# (grinding port) g. Liquid feed / spray cleaning port - DN25 Opening diameters and quantities can be customized; please inquire.
Glass Materials	High borosilicate glass 3.3 (material certificate provided) Style 1: Transparent Style 2: Brown
Main Frame	Style 1: Stainless steel frame Style 2: H-shaped (lifting and rotating; glass vessel can rotate 180°) Optional: Frame sprayed with PTFE
Mobility	Lockable universal swivel wheels
Operating Parameters	a. Operating temperature: -80 °C to +200 °C b. Vessel pressure: -0.1 MPa to 0.0 MPa (negative and atmospheric pressure) c. Jacket pressure: ≤ +0.03 MPa d. Vacuum system boost rate: ≤ 2 kPa/h
Stirring Motor	Power options: 120W, 180W, 250W, 370W, 550W, 750W, 1500W Motor types: a. DC brushless motor b. AC low-speed booster motor (with reducer) c. Explosion-proof motor, ExDIIBT4 (certificate available) d. Air motor Speed control: Variable frequency drive controller (prevents temperature rise, noise, and other electronic speed regulation issues) Speed range: 20–600 RPM (also available 1200 RPM, 2000 RPM)
Temperature Sensor	PT 100 with PTFE coating
Stirring Sealing (Optional)	Option 1: PTFE components plus mechanical double seals with ceramic bearings Option 2: Imported stirring seal

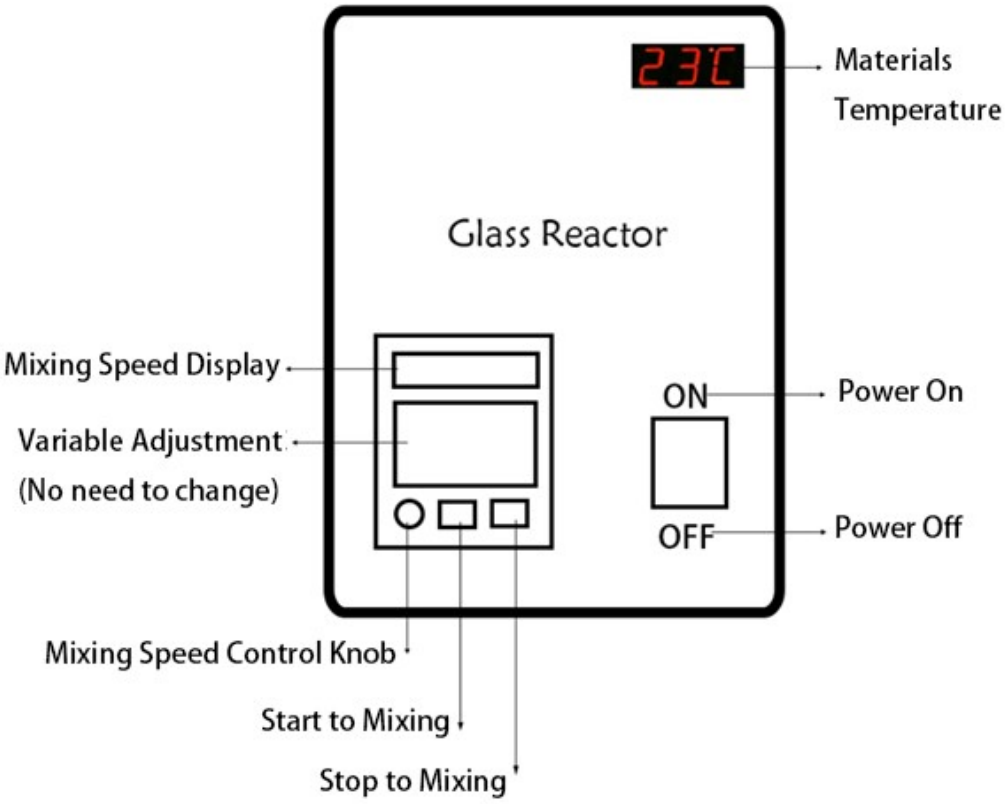
Heat-Transfer Fluid Circulation Manifold Kits	Stainless steel bellows with high-temperature resistant silicone insulation cotton (protects the glass vessel and facilitates discharge of circulating heat transfer liquid in the interlayer)
Discharge Valve	PTFE zero dead space discharge valve Height from ground: 320 mm to 1000 mm (customizable)
Stirring Paddle	Stainless steel coated with PTFE, one-piece molded to prevent leakage Diameter options: 17 mm, 20 mm, 25 mm 
Power Supply	AC/DC 110V 60Hz or 220V 50/60Hz
Ancillary Equipment (Optional)	a. Heating & Cooling Circulator (controls material temperature based on dynamic outlet oil temperature; ramp and program temperature control with ±0.5 °C accuracy) b. Recirculating Chiller (-120 °C, -100 °C, -80 °C, -60 °C, -40 °C, -20 °C) c. Heating Circulator (up to 200 °C, 300 °C) d. Water Jet Aspirator Vacuum Pump / Diaphragm Vacuum Pump

3.3 Glass Reactor Structure

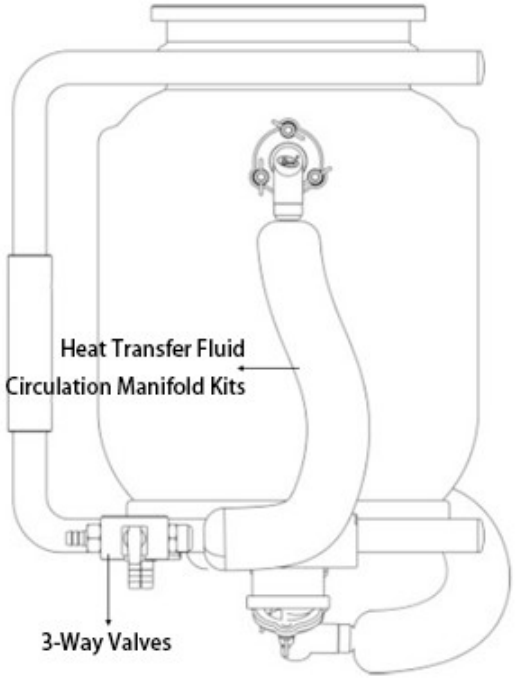
(Note: Actual supplied structure may vary depending on availability.)



3.4 Controller Panel Overview and Operation



3.5 Interlayer Buffer Tube and Three-Way Valve (Optional)



Heat-Transfer-Fluid Circulation Manifold Kits and Three-Way Valves Benefits:

- Protect the glass vessel
- Facilitate easy drainage of the heat transfer fluid from the interlayer

Three-Way Valve Functions:

- One port connects to the outlet and inlet of the glass interlayer
- The second port connects to the temperature control device
- The third port is used for convenient discharge of the heat transfer fluid or for venting

Operation Instructions:

- When discharging the heat transfer fluid, open the oil drain valve on the three-way valve located at the inlet of the glass interlayer to allow fluid to drain. If the fluid does not discharge smoothly, open the exhaust valve on the three-way valve at the outlet of the glass interlayer to facilitate smoother drainage.

4. Product Unpacking and Installation

4.1 Unpacking and Preparation Before Installation

- Open the packing box, remove the product instruction manual, read it carefully, and verify the contents according to the technical agreement and configuration sheet.

- Take out the pearl cotton from the box and spread it on a stable, low-traffic area on the floor. If placing on a table, ensure it is secure to prevent slipping or falling.

- Carefully remove all accessories from the box, unpack them, and place them on the prepared pearl cotton to facilitate easy access during assembly.

- Before assembly, carefully clean the glass components (typically using pure water or alcohol) to ensure they meet cleanliness requirements for testing.

4.2 Installation Instructions

4.2.1 This product includes the following parts:

- Stainless steel frame
- Glass assembly
- Fixed clips
- Tetrafluoro components
- Pipe valves

4.2.2 Installation Steps

1) When packaged, the glass vessel is integrated with the stainless steel main frame and is not disassembled.

2) Place the glass vessel and stainless steel main frame on a flat surface, and lock the caster wheels to prevent movement.

3) Check all hexagon socket screws on the stainless steel frame for looseness or missing screws, and tighten them one by one.

4) Position the middle paddle at the appropriate height relative to the stir bar (if applicable).

5) Install the fixed stirring seal onto the glass kettle lid.

6) Pass the stirring rod through the stirring seal from bottom to top, and fix the mechanical seal to limit the stirring rod length below the kettle lid.

7) Place the gasket between the lids at the upper flange of the glass vessel.

8) Place the stirring rod together with the glass kettle lid onto the upper flange of the glass vessel.

9) Insert the upper part of the kettle lid clamp into the kettle lid, clamp it up and down with the clamp at the neck of the glass vessel, and tighten the folding screws diagonally to secure the kettle lid.

10) Fix the motor support bar onto the frame.

11) Install the fixed motor on the main frame. This step requires two people to coordinate: one installs the motor into the pipe fitting hole on the main frame, while the other aligns the holes, secures the top motor, and adjusts its height.

12) Adjust the motor height as needed so that the stirring paddle extends properly into the kettle.

13) Connect the motor and stirring paddle with a universal joint shaft, ensuring it is perfectly vertical.

14) Ensure the fixed mechanical single-end seal contacts the ceramic surface of the PTFE stirring seal without gaps.

15) Install the return elbow, making sure to use a bottle holder ring to support the dispensing bottle attached to the return elbow.

16) Install the condenser, which can be either vertical or inclined horizontal type. Avoid applying stress to the glass ports during installation.

17) Install the PTFE sprinkler head (if applicable).

18) Install the pH meter (if applicable).

19) Install the ultrasonic dispersing rod or homogenizing emulsifier (if applicable).

20) Install fixed constant pressure dropping funnel, liquid negative pressure feeding valve, solid feeding port, glass valve, and other small parts onto the kettle lid.

21) Install the glass PTFE discharge bottom valve.

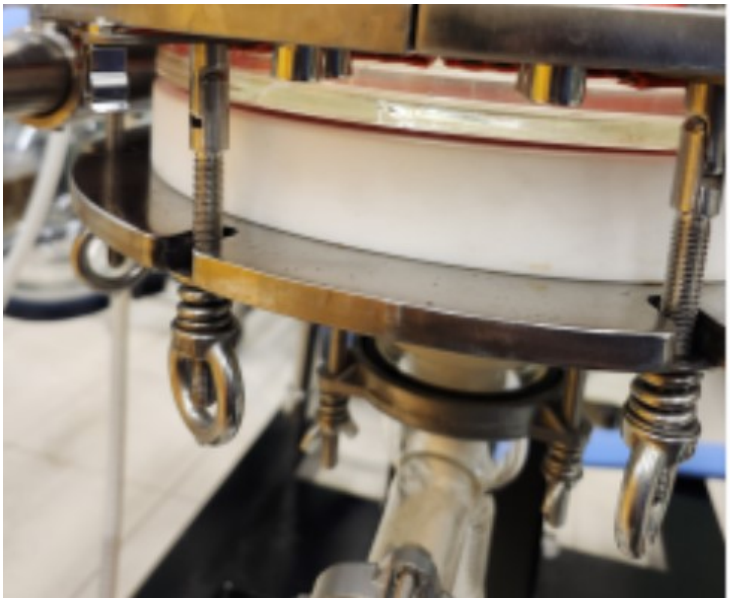
22) Install the fixed controller, and connect the motor’s aviation plug to the controller.

23) Install the thermometer sensor, and connect its air plug to the controller.

24) Secure the power cord, thermometer sensor cables, and other wiring to the frame using cable ties to prevent interference with subsequent operations.

25) Install the stainless steel adapter, buffer tube, and three-way valve at the inlet and outlet of the glass interlayer. Ensure that gaskets and raw material tape at joints are properly placed and tightened with a wrench.

Note: When installing or tightening the eyebolts, be sure to follow a diagonal and gradual tightening sequence. Do not fully tighten any single bolt at once. Uneven force during the installation process can cause stress concentration and result in glass cracking. It is recommended to first lightly tighten all bolts in a diagonal sequence to ensure even sealing, then proceed to gradually tighten them.



5. Operation Instructions

1) Check that the power supply voltage matches the specifications indicated on the machine's nameplate.

2) Plug in the power cord, turn on the power switch on the inverter, and use the speed control knob to select the desired speed.

3) Material flow and motor speed may cause resonance at certain points. Adjust the motor speed accordingly to avoid resonance.

4) After installing the stirring rod, rotate it manually to check for concentricity (vertical alignment). If the alignment is off, loosen the clamp, adjust, then power on the motor and gradually increase speed from slow to fast.

5) Adjust the position of the motor crossbar's fixed pipe fittings; the motor and stirring rod can be moved up or down as needed.

6) If sealing performance in the kettle deteriorates, inspect the PTFE sealing plug between the stirring rod and the reactor lid.

7) The inlet and outlet interlayer of the glass reactor can be heated using hot oil or cooled with a cooling liquid. Steam heating is not recommended.

8) During low-temperature testing, the discharge valve at the bottom may frost over. Thaw it partially before use to avoid glass damage.

9) Particles in the kettle's material may remain on the PTFE piston or valve O-ring during discharge, affecting airtightness. Clean thoroughly after each discharge before reuse.

10) Add reaction materials before heating or cooling; never heat or cool the reactor interlayer when it is empty.

11) Heating or cooling must be performed with circulating heat transfer fluid; never apply direct heating or cooling without circulation.

12) When cooling the kettle from high temperatures, ensure temperature decreases gradually. Do not replace the heat transfer fluid with a different temperature liquid abruptly.

6. Maintenance

To ensure normal operation and prolong the service life of the equipment, please perform regular maintenance and care. Before maintenance, disconnect the equipment's power supply, prepare necessary tools and materials, and follow the instructions in this manual. Failure to do so may result in electric shock or equipment damage.

For proper operation of the reactor and its accessories, please follow these recommendations:

- Regularly monitor and adjust the temperature and humidity of the environment where the reactor is installed to maintain optimal working conditions.

- Avoid violent vibrations when moving the reactor.

- Prevent foreign objects from contacting the reactor to avoid damage to glass components. Frequently inspect the system's connecting pipes; replace any aging or

damaged parts promptly with original specification components.

Maintenance Procedures:

1) Before cleaning, unplug the power cord to prevent electric shock or fire.
2) Frequently wipe the exterior surface of the equipment with a soft cloth to keep it clean.
3) Clean glass components according to the regulations of your laboratory.
4) Avoid any leakage of hazardous substances onto or into the reactor.
5) Do not use brushes, abrasive powders, acids, gasoline, or other solvents on the equipment's surface to prevent damage to the protective coating.
6) The glass vessel and connected parts may be very hot or cold - beware of burns or frostbite! Allow the glass parts to return to near room temperature before cleaning.
7) When cleaning the display and control knobs, avoid applying excessive pressure to prevent damage.

7. Troubleshooting Guide

Fault Phenomenon	Possible Reason	Treatment Measures
Power on but controller has no display signal	Power not connected or poor contact	Check power wiring
	Blown fuse	Turn off power and replace fuse
	Poor communication	Ensure reliable connection of communication lines
Motor does not spin or stalls	Motor failure	Contact service or professional maintenance personnel
	Inverter fault	Contact service or professional maintenance personnel
	Motor power rating too low	Contact service or professional for replacement
Abnormal noise during mixing	Lack of lubricating oil in motor or reducer	Contact service or professional for replacement
	Improper installation of stirring paddle	Re-check stirring paddle installation

	Stirring seal piston loose	Re-check agitator seal installation
	Universal joint shaft not concentric or loose	Recheck and reinstall
	Stirring paddle contacting other parts	Raise or adjust corresponding parts to avoid contact
Vacuum drop	Improper connection between glass interfaces	Clean interface and realign installation
	Worn seals	Replace seals
	Corroded or aged sealing ring	Replace sealing ring
	Improper installation of sealing ring	Recheck and reinstall sealing ring
	Improper connection or aging vacuum hose	Replace vacuum hose
	Vacuum pump issues	Replace or contact vacuum pump supplier
Loose parts	Minor resonance during stirring/mixing	Re-tighten screws of corresponding parts
Motor temperature too high	Speed too low or viscosity mismatch	Motor temperature normal up to room temperature +60捞C; otherwise stop machine and check or contact professional
Controller or motor housing live	Improper grounding or faulty motor/controller	Check grounding; contact professional
Drain valve leaking	Large temperature changes affecting seal	Adjust connecting flange clamp of discharge valve
	Damaged seal	Replace sealing ring

8. Warranty

1) Free Service Period

The product is eligible for free repair service within the warranty period from the date of purchase, provided the malfunction is due to manufacturing quality issues. Damage caused by improper use or handling is not covered under the free service policy.

2) Situations Not Covered by Free Maintenance

The following circumstances fall outside the scope of free warranty service, even if within the warranty period:

a) Failure to present a valid warranty card or proof of purchase;

b) Damage resulting from installation or use not in accordance with the instruction manual or equipment markings;

c) Damage caused by transportation, relocation, dropping, or impact;

d) Damage or malfunction caused by unauthorized modification of the product;

e) Damage caused by force majeure, including but not limited to fire, earthquake, flood, wind disasters, or abnormal power supply;

f) Wear and tear of consumable parts such as glassware, PTFE components, silicone, fluororubber, and other similar materials.

3) Post-Warranty Service

After the warranty period expires, or if the issue falls outside the scope of free service, a repair fee will be charged.

4) Contact for Service

If you experience any issues with the equipment, please contact our after-sales service team promptly.

5) Warranty Effective Date and Additional Information

The warranty takes effect from the date of purchase and is non-transferable.

For complete warranty terms and updates to this manual, please refer to: stonylab.com/pages/warranty

6) Contact Us

Company: StonyLab Inc.
Email: support@stonylab.com
Phone: 631-406-6080
Website: stonylab.com

Note: This instruction manual is subject to change without prior notice.