TECHINSTRO®
Vision Beyond Technology

PHOTOCHEMICAL REACTOR SETUP (CLASSIC MODEL)

User Manual

Call Us: +91-8007799090 | +91-9765849656
Website: www.techinstro.com | E-Mail: info@techinstro.com

Address: 463, 2nd Floor, Yadav Nagar, Nagpur, Maharashtra, India. Pin Code : 440026

WorKing

The photochemical reactor is used to carry out a photochemical reaction, water splitting, and photochlorination reaction. The reaction takes place in the presence of a photon and catalyst. Hence it is called a photocatalysis reaction or photochemical reaction. The reactor is also known as the photocatalytic reactor. The photochemical reactor's Classic Model setup includes triple jacketed immersion well, a Xenon lamp or medium and high-pressure mercury lamp (as per requirement), lamp power supply, safety cabinet, and a magnetic stirrer.

Triple Jacked reactor with Immersion Well

Double-Jacketed immersion well in Quartz material permits water cooling of lamps and filtering or excitation radiation. It is specially manufactured by GE Quartz, where maximum radiation transmission is possible. Their outermost jacket is made of a Borosilicate glass, where the required solution has been stirred.

Specifications

Description	*Specifications*
Glass type	UV borosilicate glass is highly durable and tested at 650 °C
Quartz Type	GE Quartz tested at 1100 °C
Outside Glass Reactor Ports	1. Teflon-Glass B7R Threaded Port to take-out Liquid Sample 2. Teflon-Glass B7R Threaded Port for Thermocouple 3. Teflon-Glass B7R Threaded Port to take-out Gas Sample
Reactor Design	Threaded Outer Borosilicate reactor with Teflon
Reactor bottom	C flat suitable for magnetic bar N 12 type
Immersion Well (Dimensions)	OD – 75mm, ID – 49mm, Height – 350mm
Outer Glass Jacket (Dimensions)	• 150 ml Capacity: OD - 90mm, Height - 290mm • 250 ml Capacity: OD - 100mm, Height - 260mm • 500 ml Capacity: OD - 100mm, Height - 290mm • 1000 ml Capacity: OD - 120mm, Height - 290mm

Important Note:

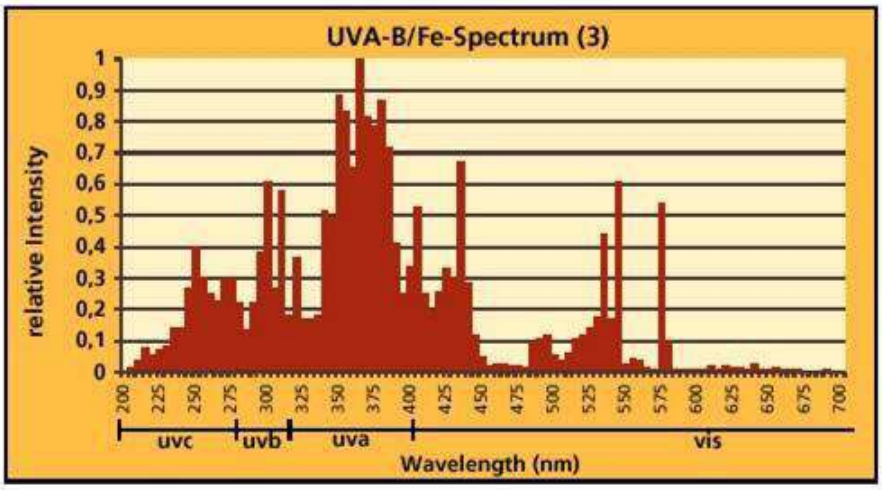
Customisation can be provided as per capacity, number of ports, and immersion well. The reactor capacity above 1 liter will be provided under the customizations. We also offer agitator-type reactors.

Types of Lamps for Photoreactions

1. Low-Pressure Mercury Lamps emit over 90% of their energy at 254 nm providing a valuable source of ultraviolet radiation for photoreactions.
2. Medium-pressure mercury lamps have much greater arcs and radiate peaks predominantly at 254nm, 356nm, and 365nm and cover the spectrum range of 200nm – 400nm emits in a UV range. Since it mainly emits UV range, it is also known as UV Lamp.The choice of lamp power and Lamp is determined by the nature of the photoreaction and volume of the reactant solution.
3. The high-pressure mercury lamp has the spectrum range from 360nm to 800nm and predominantly gives peaks at 520nm, which emits visible light range. Since it mainly emits visible light range, it is also known as a Visible Lamp.
4. The Xenon (Xe) arc lamp is designed and developed to emit the high luminescence light in bright white colour. Since it contains a highly pure ionized Xe gas, hence it is called a Xenon lamp. It is also known as a gas discharge lamp. The xenon arc lamp has two significant categories that differentiate with variation in the composition. In one case, the tube was filled with only Xe gas and the other with a small portion of mercury. The other one is known as a xenon-mercury lamp. Currently, our reactor has been equipped with Short Arc Xenon Lamp.

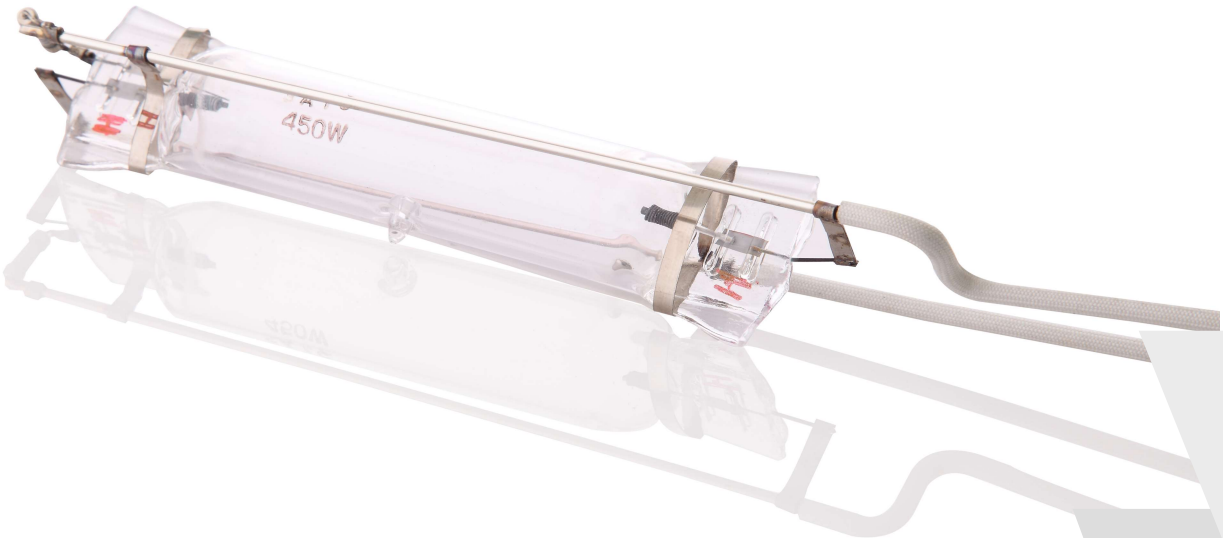
Medium Pressure Mercury lamp (UV lamp)

Specifications	*125W*	*250W*	*450W*	*1000W*
Lamp Length	290mm, Including Mounting	290mm, Including Mounting	290mm, Including Mounting	290mm, Including Mounting
Lamp Teflon Holder	Yes	Yes	Yes	Yes
Lamp Diameter	13mm	18mm	18mm	28mm
Average Lamp Life	800 hr	800 hr	800 hr	600 hr
Input Voltage	220V	220V	220V	220V
Operating Voltage	110-120V, 3.2Amp	110-120V, 3.2Amp	110-120V, 3.2Amp	110-120V, 3.2Amp
Spectral Range of Lamp	200nm-400nm	200nm-400nm	200nm-400nm	200nm-400nm
Peaks @	254nm, 356nm, and 365nm	254nm, 356nm, and 365nm	254nm, 356nm, and 365nm	254nm, 356nm, and 365nm
Arc Length	62mm	80mm	125 mm	164mm



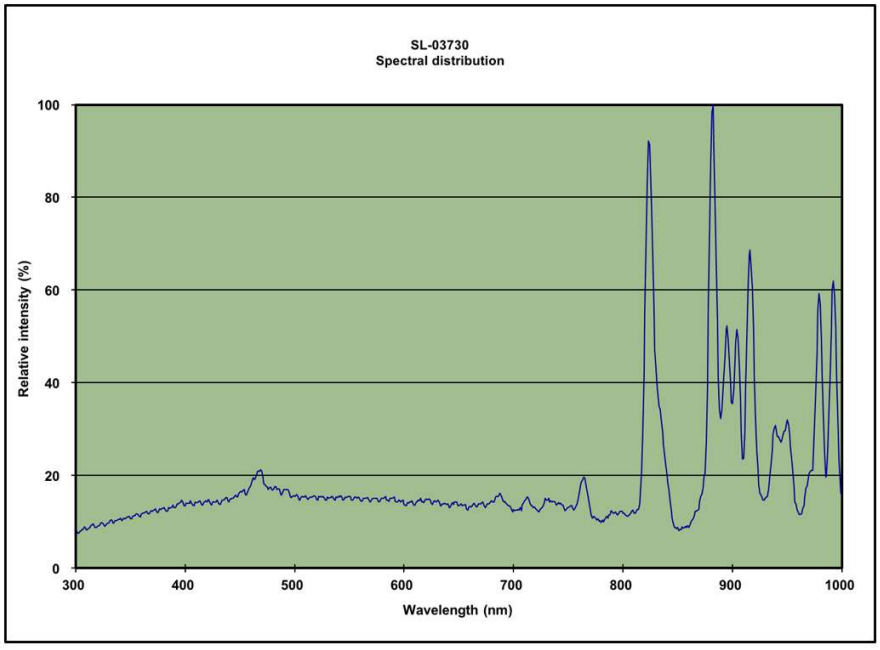
High-Pressure Mercury lamp (Visible Lamp)

Specifications	*125W*	*250W*	*450W*
Lamp Length	290mm, Including Mounting	290mm, Including Mounting	290mm, Including Mounting
Lamp Teflon Holder	Yes	Yes	Yes
Lamp Diameter	13mm	18mm	18mm
Average Lamp life	800 hr	800 hr	800 hr
Input Voltage	220V	220V	220V
Operating Voltage	110-120V, 3.2Amp	110-120V, 3.2Amp	110-120V, 3.2Amp
Spectral Range of Lamp	365nm-800nm	365nm-800nm	365nm-800nm
Peaks @	356nm and 365nm	356nm and 365nm	356nm and 365nm
Arc Length	62 mm	80 mm	125 mm



Short Arc Xenon lamp

Specifications	75W	150W	350W	500W
Arc Length	1.5mm	2.6mm	3mm	4mm
Operating Current	5A	8.5A	16A	25A
Luminous flux	1400Lm	3200Lm	11500Lm	14200Lm
Spectral Range	185 to 2000nm	185 to 2000nm	185 to 2000nm	185 to 2000nm
Average Life	1000 hrs	1000 hrs	1000 hrs	1000 hrs
Cooling Type	Air Cooling	Air Cooling	Air Cooling	Air Cooling
Cooling Speed	5 M/sec	5 M/sec	5 M/sec	5 M/sec
Base	Anode SFc94 & Cathode SFa93	Anode SFc12-4 & Cathode SFc12-4	Anode SFc1-35 & Cathode SFc1-35	Anode SFc1-76 & Cathode SFc1-76
Input Voltage	220V	220V	220V	220V
Operating Voltage	14V	18V	22V	25V



Safety Cabinet for Photochemical Reactor

Description	Specifications
Safety cabinet	Safety switch for UV lamp electronic ballast control along with step down transformer Electrical plug socket (2 nos.) RT inlet-outlet Line Silicon tubing (ID 10mm, OD 14mm) Clamp/Spring based in-build reactor Holding Stand Automatic Switching LED panel Lamp for cabinet
System Control	1. Manual UV Lamp Operation 2. Auto-Timer UV Lamp Operation
Temperature Display	1. Thermocouple Type – PT-100 (range -25 °C to 250 °C) 2. Digital temperature display (Four temperature sensing points) • Water Inlet – CH1 • Water Outlet – CH2
Digital Magnetic Stirrer	✓ Timer Range - 999minutes ✓ Maximum Stirring volume – 2000ml ✓ Power requirement: 220V/50Hz or 110V/60hz ✓ Ambient Temperature – Room temperature to 60 °C ✓ Relative Moisture – 80% ✓ Stirring speed Range: 0-1250 rpm ✓ Weight – 1.9Kg ✓ Large Custom LCD Display ✓ Microprocessor-based functions ✓ Magnet Bar ✓ Large Mixing Capacity ✓ Easy Operation

Digital Volt meter	Yes
Exhaust system	Yes
Locking system	Dual Locking System
Safety Cabinet Dimensions	L 995mm x W 557mm x D 500
Lamp Power Supply	A suitable power supply as per Lamp
Safety	• Automatic UV light or Rays protection system for Eye protect • UV light protected Goggles • Safety LED indicator system

Applications:

- ✓ Photochlorination
- ✓ Water Splitting
- ✓ Water treatment
- ✓ Pharmaceuticals industry
- ✓ Research and development laboratories Educational institutes
- ✓ Alternative Energy
- ✓ Environmental Engineering

How to Install or Use Photochemical Reactor?

1. Make ready all the equipment required during the photochemical reaction.
2. Fill the water in the chiller tank or any water circulating system.
3. Make sure that all the connections fit correctly.
4. Start the main switch of the cabinet, and start the water circulation system for the colling of lamp. (Not in case of Xenon lamp, since the air cooling required for the Xenon)
5. Place the magnetic stirrer inside the cabinet.
6. Ensure that both electrical connections inside the safety cabinet chamber are working, and then connect the magnetic stirrer to one of the given connections.
7. Placed triple-walled jacketed reactor over a magnetic stirrer and connected with the nut and bolt inbuilt stand.
8. Placed a magnetic needle into the reactor and checked with a stirrer whether it was revolving correctly. Maybe some time researcher has to adjust the position of the reactor on the stirrer to fix the proper revolving place.
9. Fill the reactor with suitable photosensitive chemicals through one port provided at the side of the reactor.
10. There is a hole in one port for keeping the thermocouple in the reactor, while another port is for sampling.
11. Now place the UV/Visible lamp of the required capacity inside the double-walled quartz reactor.
12. Then connect the UV lamp connections, which are hanging at the top.
13. Now closed the door and locked it with the provided key.
14. Please note that the Lamp does not start in any condition when the door is open. It is specially made for safety from UV rays effect.
15. Once again, ensure that all the above points have done.
16. Start the water circulation system before the starting of lamp.
17. There are two ways to operate UV lamp action.
    a) Timer
    b) Manual
18. UV lamp starts by pressing the direct button given on the panel. If a researcher wants to run a reaction for a particular time, he can achieve the same with a UV lamp timer.
19. Set the required time in the timer and press the “Start” button. The Lamp automatically off when it completes the set time. The set time is minutes, so the researcher can set it to a max of 9999 minutes.

20 There is a 2-point temperature indicator on the panel, with points like CH1, CH2.
a) CH1 shows the reactor chamber temperature, where the actual reaction is carried out.
b) CH2 shows the safety cabinet chamber temperature

21. The Digital Voltage meter on the panel shows the operating voltage of the complete setup.
22. The set of 4 LEDs placed on the panel has the following indications.
a) Red LED indicates the door is open
b) UV lamp Green LED indicates whether the UV lamp is on or off.
c) Magnetic stirrer Green LED indicates the stirrer is working.

Safety Tips

1. Please note that the UV Lamp switches ON when chilled water starts circulating in the Quartz jacketed tube.
2. Once started, the UV lamp would work continuously for up to 5 hours if proper procedure is followed.
3. The method of the UV lamp works consists of electronic ballast, a step-down transformer, and a high voltage Igniter present in the quartz UV lamp shell, which generates a spark to start the Lamp.
4. Never separate the main reactor from the Quartz Jacketed tube until the entire assembly cools down, as the threaded joint will not detach unless it cools down to room temperature.
5. The standard life of High & medium-pressure UV lamps is 700 hours if used as per the instructions provided
6. Always use safety goggles when switching UV light.
7. A sufficient space of minimum 15mm needs to maintain between the Quartz jacketed tube and the reactor between which the magnetic bar would rotate.
8. An MCB is needed between the systems to ensure there is no power surge and does not damage the delicate circuit inside the controller.
9. In the case of Xenon Lamp, the connection is separately given with proper identifications.
10. Connect the wire with a Red indication to the Red side and the wire with Black indications to the Black side.
11. For Xenon Lamp, use only Air cooling through immersion well.

Feel Free to Reach Us
+91-8007799090 | +91-9765849656
www.techinstro.com | info@techinstro.com