



PHOTOCHEMICAL REACTOR SETUP (SIMPLE MODEL)

Model Number : PCR Setup (Simple Model-250W)

User Manual

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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 Simple Model setup includes triple jacketed immersion well, a Xenon lamp or medium and high-pressure mercury lamp (as per requirement), a lamp power supply, and a simple cabinet.

Triple Jacketed 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

Descriptions	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:

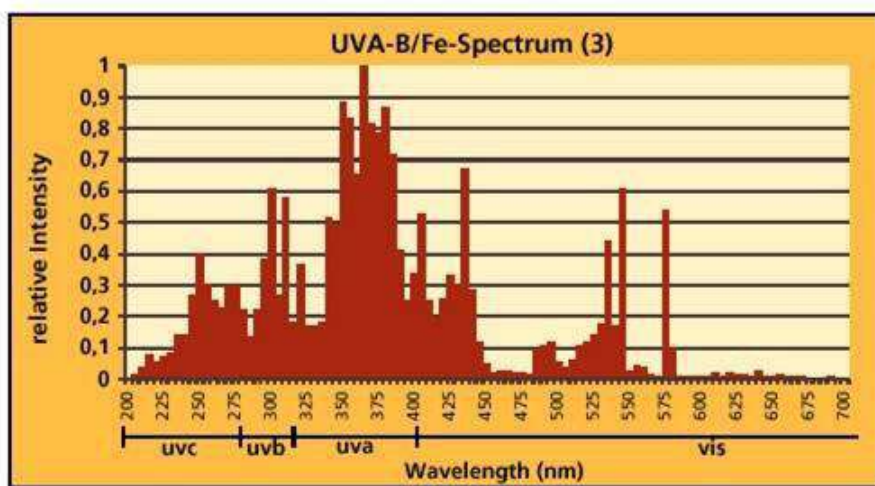
Customisation can be provided as per capacity, number of ports, and immersion well. The reactor capacity above 1 liter will be provided under the customizations. We also offer agitator-type reactors.

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.

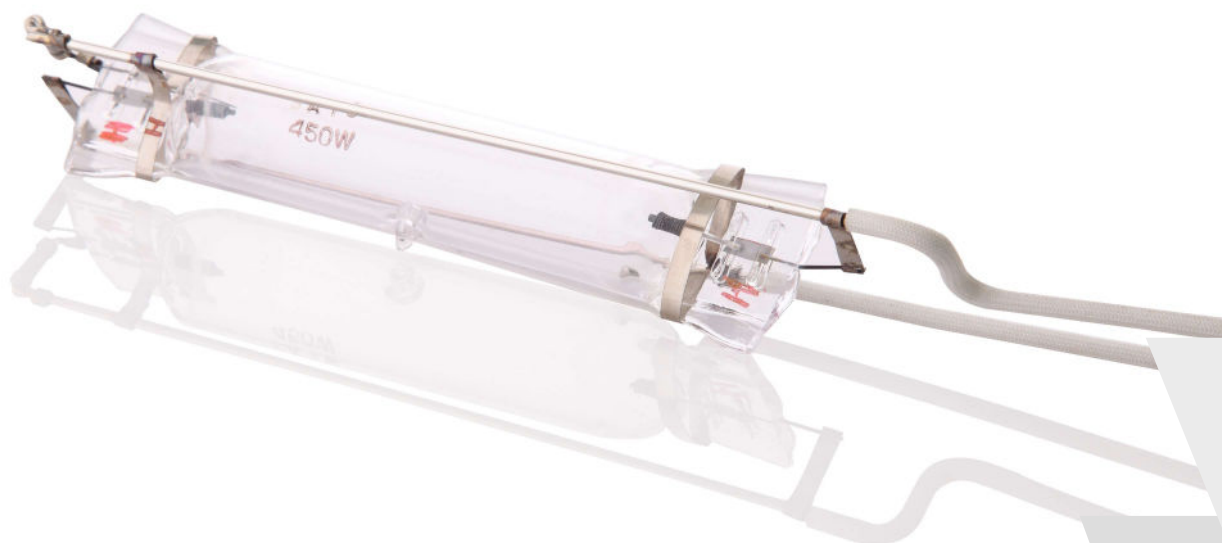
Medium Pressure Mercury lamp (UV lamp)

<i>Specifications</i>	<i>125W</i>	<i>250W</i>	<i>450W</i>	<i>1000W</i>
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



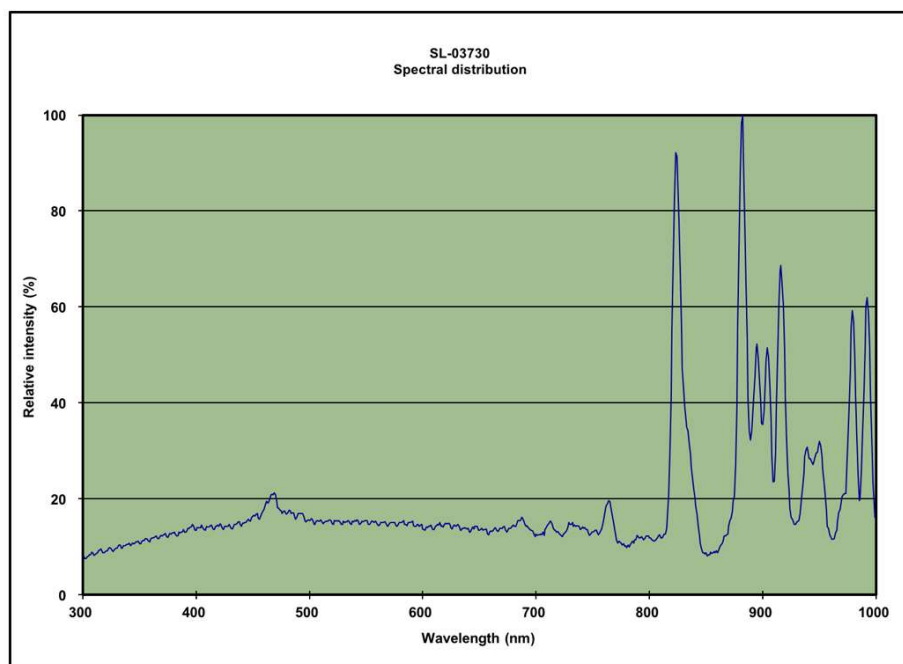
High-Pressure Mercury lamp (Visible Lamp)

<i>Specifications</i>	<i>125W</i>	<i>250W</i>	<i>450W</i>
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

<i>Specifications</i>	<i>75W</i>	<i>150W</i>	<i>350W</i>	<i>500W</i>
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	Specification
Safety cabinet	• Safety switch for UV lamp electronic ballast control along with the step-down transformer • Electrical plug socket (1 nos.) • Silicon tubing (ID 10mm, OD 14mm) • Clamp based in-build reactor Holding Stand
System Control	Manual UV Lamp Operation
Temperature Display	No
Digital Magnetic Stirrer	No
Digital Volt meter	(Yes on Power Supply)
Exhaust system	Yes
Locking system	Dual Locking System
Lamp Power Supply	A suitable power supply as per Lamp
Safety	UV light protected Goggles

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. Make sure that all the connections fit correctly.
3. Start the main switch of the cabinet, and start the water circulation system for the colling of the lamp. (Not in the case of the Xenon lamp, since air cooling is required for the Xenon)
4. Place the magnetic stirrer inside the cabinet.
5. Ensure that the electrical connection inside the cabinet chamber are working, and then connect the magnetic stirrer to the given connections.
6. Placed triple-walled jacketed reactor over a magnetic stirrer.
7. 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.
8. Fill the reactor with suitable photosensitive chemicals through one port provided at the side of the reactor.
9. Now place the lamp of the required power inside the double-walled quartz reactor.
10. Then connect the lamp connections, which are hanging at the top.
11. Now close the door and lock it with the provided key.
12. Once again, ensure that all the above points have done.
13. Start the water circulation system before the start of the lamp.
14. The lamp starts by pressing the direct button given the Power supply.
15. The Digital Voltage meter on the power supply is the operating voltage of the complete setup.

Safety Tips

1. Please note that the Lamp switches ON only after chilled water start circulating in the Quartz jacketed tube.
2. Once started, the lamp would work continuously for up to 5 hours if proper procedure is followed.
3. 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.
4. The standard life of High & medium-pressure UV lamps is 700 hours if used as per the instructions provided
5. Always use safety goggles when switching UV light.
6. A sufficient space of a minimum of 15mm needs to maintain between the Quartz jacketed tube and the reactor between which the magnetic bar would rotate.
7. In the case of Xenon Lamp, the connection is separately given with proper colour identifications.
8. Connect the wire with a Red indication to the Red side and the wire with Black indications to the Black side.
9. For Xenon Lamp, use only Air cooling through immersion well.

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