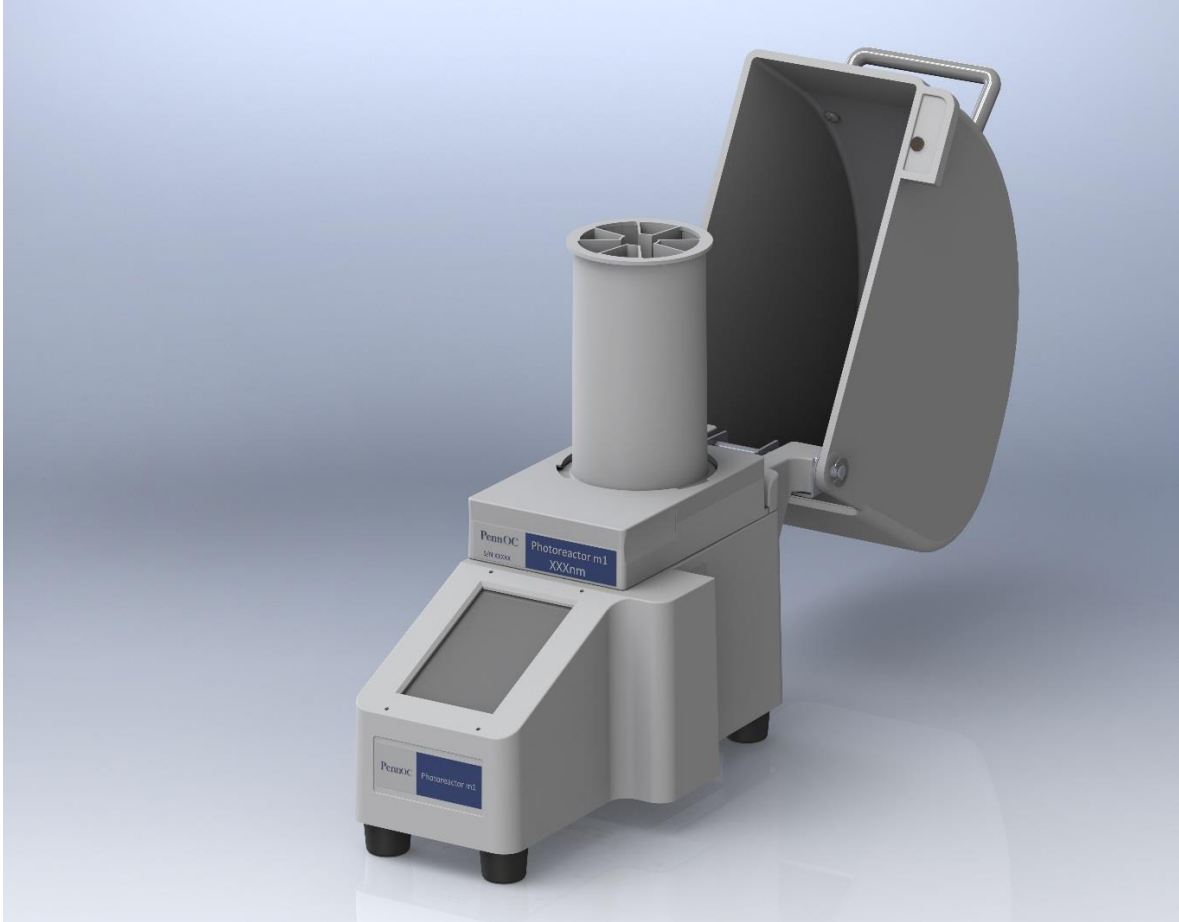


PennOC

Photoreactor m1



User Manual

Rev B

Penn
Optical Coatings



Penn Optical Coatings, LLC
1055 Mensch Dam Road
Pennsburg, PA 18073, USA
Tel: (011) 267-923-8798

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1 Introduction

The Photoreactor m1 combines illumination, mechanical stirring and cooling for optimized photoredox reactions. The product includes an integrated touch screen for user control over reaction parameters such as illumination intensity, stir bar speed, and airflow. A modular design allows for use with a variety of wavelengths and vial sizes.

2 Safety

The Photoreactor m1 contains a powerful LED with modules that can produce wavelengths at 365nm, 420nm, and 450nm. Unit produces extremely bright light. Proper care must be taken during setup and operation to prevent injury to operators and other personnel, or damage to the unit.

The Photoreactor m1 is intended to deliver light energy and mechanical stirring to catalyze chemical reactions. Use of this device should only be carried out after thorough reading of this manual. Using this device without reading and understanding the instructions for use may result in injury to the operator, damage to the device, or damage to the vial.

Only use the Photoreactor m1 with approved accessories. Before each use check that the vial is secured in the vial holder and that the vial holder is securely attached to the LED module.

The unit is equipped with multiple safety features including an interlock device that will not permit LED emission when the light shield is not in place. Keep magnets away from the device to prevent accidental interlock activation. Do not look into the back end of the Photoreactor when the LED is activated as this may result in eye damage.



No modification of this equipment is allowed.



Never open or remove the bottom cover. Qualified personnel must perform all maintenance.



The Illuminator unit requires adequate airflow to maintain proper cooling. Ensure the ventilation holes and bottom of the unit are unobstructed and a minimum of 4" clearance is provided in rear of unit.



If the Illuminator is used in a manner not specified within this manual, the protection provided by the equipment might be impaired. It is the responsibility of the user to follow all applicable safety guidelines in prevention of injury or damage to the unit.

	<i>Use of the equipment with an unapproved power supply may cause damage to the device and/or power supply and may result in injury.</i>
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	<i>It is the responsibility of the user to assess and mitigate any hazards that may result from a mixing interruption.</i>
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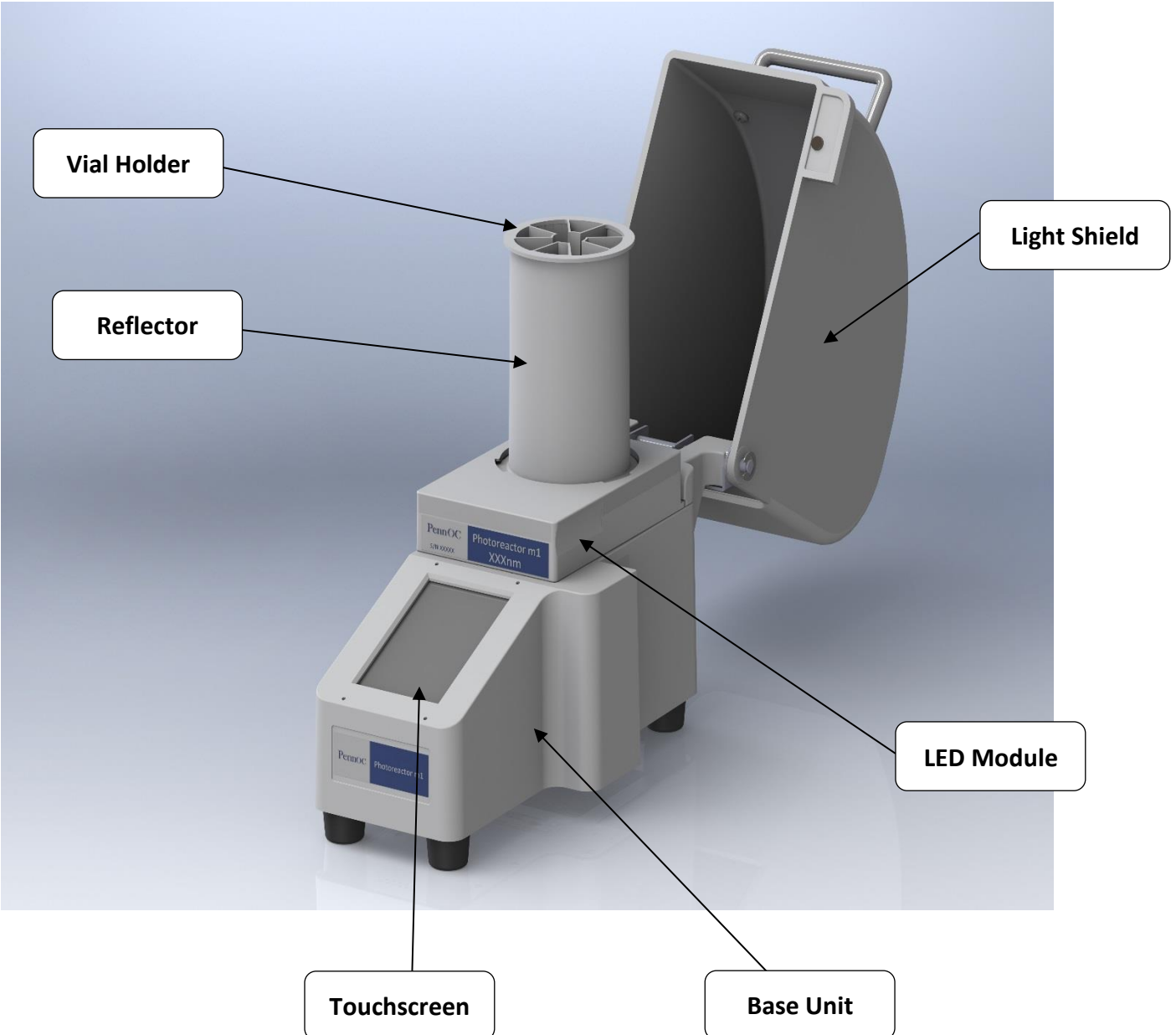
	<i>It is the responsibility of the user to assess and mitigate any hazards that may result from mixing volatile or flammable materials. Users shall comply with all applicable safety and accident-prevention procedures for laboratory work.</i>
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	<i>Device intended for a variety of chemical reactions; Device to be used by trained operator in a laboratory setting.</i>
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2.1 Explanation of labels

	<i>Manufacturer.</i>
	<i>Caution – Read User Manual.</i>

3 System Overview



4 Setup

4.1 System Components

The Photoreactor m1 is comprised of the following components:

- Base Unit
- 450nm LED Module*
- 8ml Reflector
- 40ml Reflector
- gc Vial Holder
- 4ml Vial Holder
- 8ml Vial Holder
- 20ml Vial Holder
- Power Supply
- Power Cable

*Other wavelength LED modules are available for purchase

Carefully unpack all components and immediately notify the manufacturer of any defects.


4.2 Choosing a Location

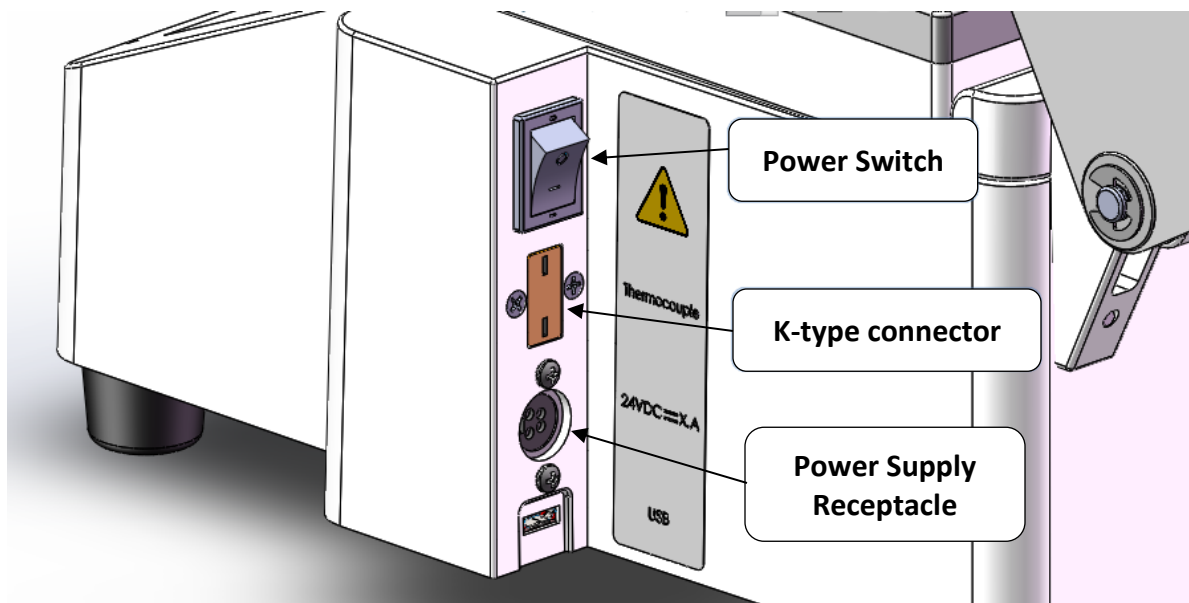
Set the Photoreactor m1 horizontally on its four neoprene feet on a flat surface in a place that allows for adequate air ventilation on the back and bottom. Do not place the Photoreactor on top of paper or loose material that may be drawn into any ventilation port. Do not position the unit so that the back of the unit is obstructed. Position the unit such that the touchscreen and vial holder will be easy to reach. The Photoreactor should only be transported in the horizontal position.

NOTE:	<i>For adequate ventilation, maintain at least 4" of clearance around all sides of the unit in an unenclosed space.</i>
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4.3 Connecting the Power Cord

Insert the power supply receptacle-end into the receptacle on the side of the unit. Insert the power cord plug into a standard AC outlet.

	<i>Warning: To avoid risk of electric shock, this equipment must only be connected to a supply mains with a protective earth.</i>
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The unit must be powered with the supplied power supply (85-264V, 50/60 Hz, Full Range).

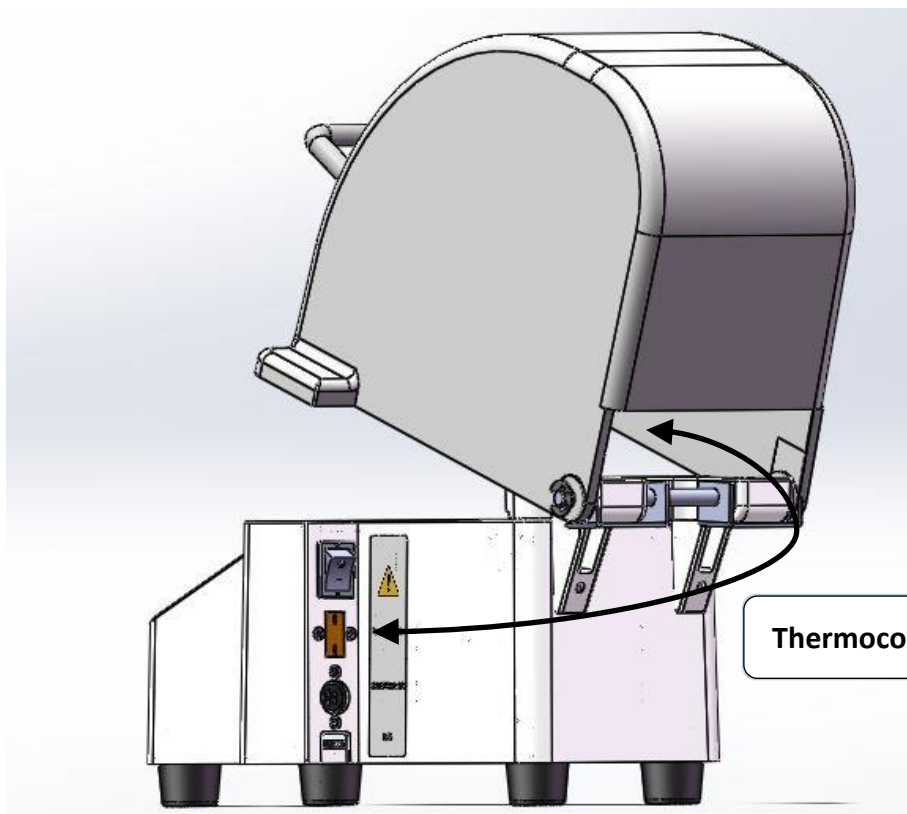
5 Operation

5.1 Setup

1. Once the power cord is connected set the ON/OFF (I/O) switch to the ON (I) position.
2. Add the contents to vial with appropriately sized stir bar (if required) and insert into the vial holder. (Note: select the vial holder that corresponds to the correct vial size and ensure that it is fully seated).
3. Insert the vial holder into the reflector and ensure that the vial is still fully seated and is roughly concentric to the reflector.
4. With the light shield in the open position, select the desired LED module and insert it into the base unit, being careful to properly align the connector pins.
5. Insert the reflector into the LED module by aligning the tabs with the slots and turning the reflector until it stops.
6. If temperature monitoring is desired, connect a K-type thermocouple to the K-type connector. Pass the thermocouple through the opening at the rear of the light shield (see below) and place the distal end within the vial or at the desired location.
7. Lower the light shield and verify that the interlock is engaged by ensuring that the “Interlock” indicator is green on the touch screen.

	<p><i>Warning: Magnetic stirring cannot be achieved with all combinations of stir bars, reflectors, vial holders, and vials. It is recommended that the user select the reflector (8ml or 40ml), which minimizes the distance from the bottom of the vial to the LED module. The user must determine the appropriate combination of stir bar, reflector, vial holder and vial to optimize magnetic stirring.</i></p>
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	<p><i>Warning: To avoid damage to the device, ensure the thermocouple does not come into contact with any moving parts, i.e. stir magnet, motor or fan</i></p>
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5.2 Performing a Photoredox Cycle

8. Using the touch screen set the desired parameters for the photoredox cycle, programmable parameters include:
 - Time (HH:MM:SS)
 - Fan speed (rpm)
 - Stir bar speed (rpm)
 - LED intensity (%)

System Info

Time (HH:MM:SS)

00	00	00
00	00	00

Fan (rpm) Stir (rpm) LED (%)

1500	100	0
0	0	0

T Rktr (C) Interlock

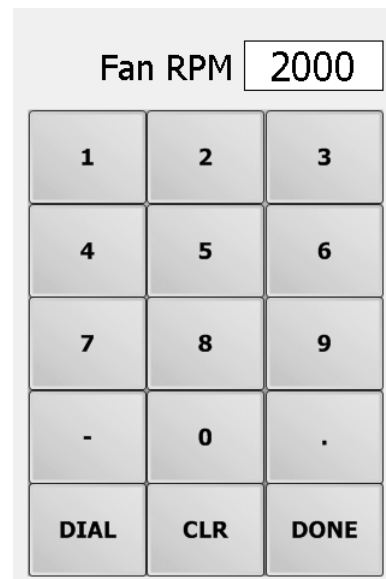
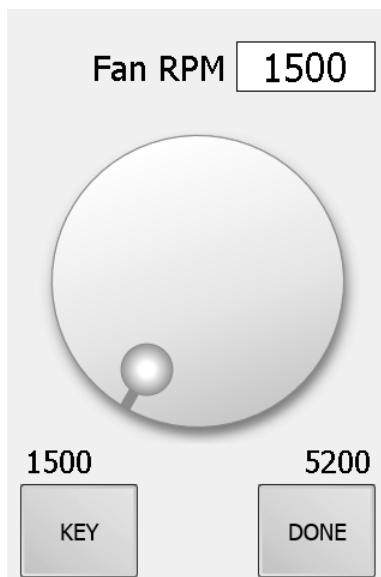
25.0	<input checked="" type="checkbox"/>
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Status

Stopped

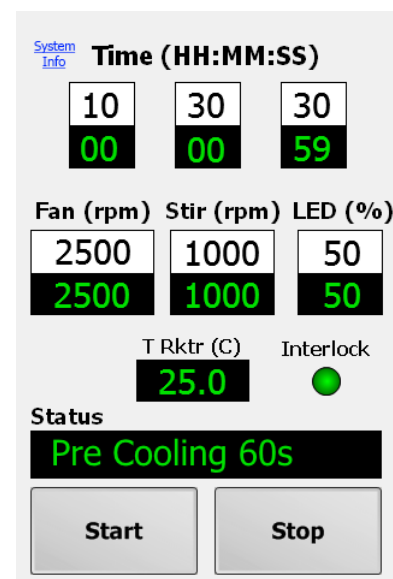
Start Stop

9. To change the set point of a given parameter select it on the touch screen, this will provide a display similar to the one shown on the right. The dial may be rotated to select the desired setting. Alternatively, pressing the “KEY” button will allow the user to enter an exact value using a digital keypad. Pressing the “DONE” button will accept the value.

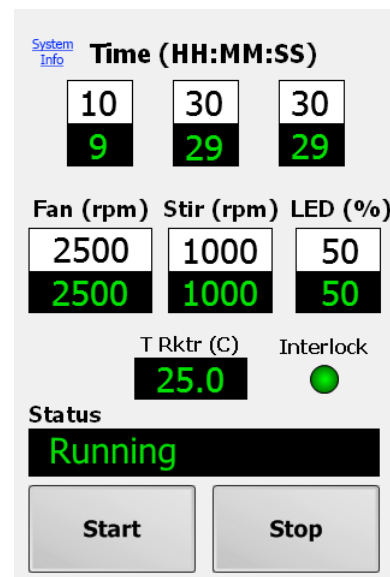


10. Once the parameters have been set for the photoredox cycle, press “Start”. Do not attempt to open the light shield during photoredox cycle operation.

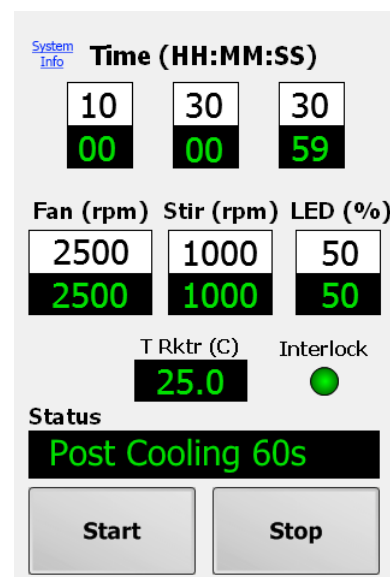
11. The unit will begin a 60 second precooling cycle as indicated by the Status field. The reported time will show the countdown from 60 seconds. The fan and stir motor will start up and the actual RPMs will be shown below the set-points. These values are expected to deviate slightly from the set values. At this point, all values can still be edited, if necessary by changing the parameters as described in #9. Changes in set-points will take effect as soon as the “DONE” button is pressed on the dial or keypad screens, with the exception of the LED as it will not be emitting at this point.



12. Once the precooling countdown reaches 0, the LED will activate at the set intensity. The Status will update to indicate that the photoredox cycle is running. At this time, the count will start from the set value and will no longer be editable. If necessary, the other fields may still be modified by changing the parameters as described in #9. Changes in set-points will take effect as soon as the "DONE" button is pressed on the dial or keypad screens.



13. Once the photoredox cycle has completed, the unit will begin a 60 second post cooling cycle as indicated by the Status field. At this point the LED will stop emitting, however the fan and stir bar will continue to rotate until the countdown has reached 0.



14. Upon completion, the unit will return to the stopped conditions. At this point, if necessary parameters may be changed as described in #9 and another reaction may be initiated, if desired.

At any point while the photoredox cycle is being ran, the Stop button will immediately halt all operations and return to the stopped condition.

NOTE:	<i>Please note that the viscosity of the stirred material will affect the ability of the stir bar to remain coupled to the rotating magnet. Materials of high viscosity must be stirred at slower speed settings.</i>
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The screenshot shows a control panel interface with the following elements:

- System Info** (top left)
- Time (HH:MM:SS)** (top center): Three digital displays showing 10, 30, and 30. Below each is a green display showing 10, 30, and 30.
- Fan (rpm)**: Digital display showing 2500, with a green display below showing 0.
- Stir (rpm)**: Digital display showing 1000, with a green display below showing 0.
- LED (%)**: Digital display showing 50, with a green display below showing 50.
- T Rktr (C)**: Digital display showing 25.0.
- Interlock**: A green indicator light.
- Status**: A large green display showing "Stopped".
- Start** and **Stop** buttons (bottom).

5.3 Termination, Turning the Unit “Off”

Unplugging the unit or switching off the unit while it is running will cause no harm to the system, nor will it cause an unsafe condition.

All of the following methods can be used to turn off the unit, safely:

- Side Panel Power Switch.
- Disconnecting Mains Power.

6 Proper Care and Handling

Remove Photoreactor and accessories from packaging and observe all labeling.

6.1 Cleaning, Disinfection, and Disposal

- Clean and disinfect the external housing of the Photoreactor with a mild detergent.
- Wipe with mild detergent, do not spray.
- Never clean any internal electronics with liquid cleaners. If necessary, remove all dust from external surfaces with dry compressed air.
- Photoreactor units shall be disposed of via local and applicable regulations based on the intended use.

7 Maintenance

The Photoreactor m1 is designed to operate for many years without any maintenance required. No user-changeable fuses are included. Consult manufacturer.



All maintenance is to be performed by qualified personnel only. Do not attempt internal maintenance or repair. Consult the manufacturer for further instructions.

Contact Information:

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1055 Mensch Dam Road
Pennsburg, PA 18073, USA
Tel: (011) 267-923-8798

8 Technical Data

Cover closed

- Width: 12.2 cm (4.8 inches)
- Height: 27.2 cm (10.7 inches)
- Depth: 28.2 cm (11.1 inches)

Cover open

- Width: 12.2 cm (4.8 inches)
- Height: 33.8 cm (13.3 inches)
- Depth: 42.67 cm (16.8 inches)

- Weight: Approximately 2 kg (4.4 lbs.)
- Operating mode: Continuous
- Main cable: 10 A/250 V
- Power supply: 85-264V, 50/60 Hz, 120VA
- Expected Service Life: 5 years
- Cleaning: Surface cleaning with mild detergent

Ambient conditions for operation

- Temperature: 5° to 40°C (41° to 104°F)
- Rel. humidity: 0% to 80% non-condensing for temperatures up to 31°C (88°F) decreasing linearly to 50% at 40°C (104°F)
- Air pressure: 700 hPa to 1060 hPa

Ambient conditions for storage (in shipping packaging)

- Temperature: -20° to +50°C (-4° to 122°F)
- Rel. humidity: 0% to 100%, non-condensing

9 Product Ratings



For all CE compliance questions, EU customers may contact;
Necsel IP, Inc., an Ushio Group company
101 Panton Road,
Vergennes, VT 05491, USA
Tel: (011) 802 877 2182