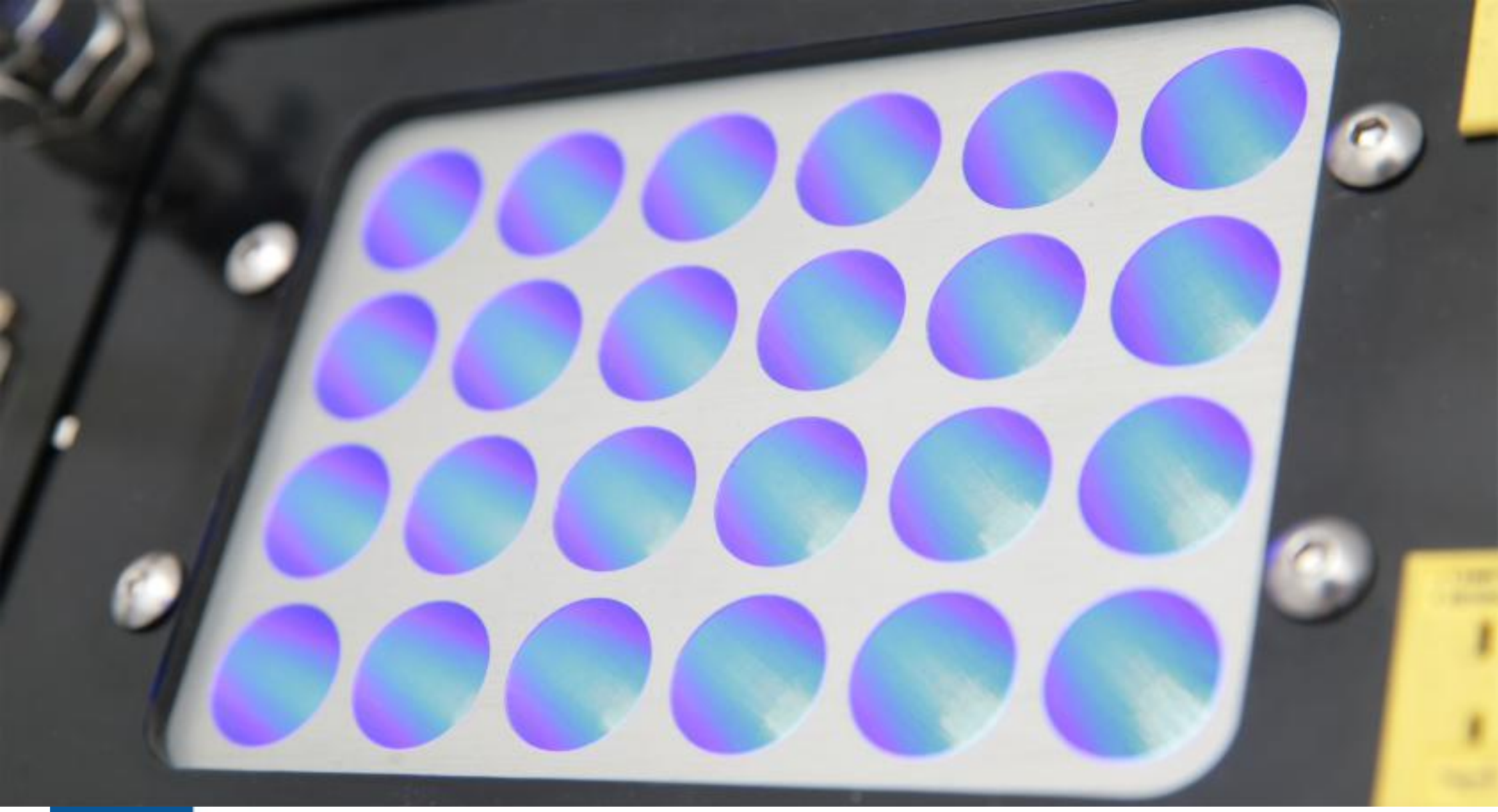

uoslab

LAB-SCALE PHOTOREACTOR

OVERVIEW

A complete reactor consists of three modules: a power supply, an LED block and a reactor block. Liquid cooling is required, either with tap water or with a circulating chiller.

POWER SUPPLY AND CONTROLLER

- Provides up to 600W of power to the LED module
- LCD touch-screen with individual LED chain control
- Constant power mode or constant reactor temperature mode

24-POSITION LED BLOCK

- 7 high power LEDs per position, wavelengths available: 365, 385, 405, 450, 525 nm
- Safety interlocks prevent accidental exposure to LED light
- Built-in magnetic stirrer controlled from the power supply block

LIQUID-COOLED REACTOR BLOCKS

- 24 x 8 ml vials
- 6 x 25 ml bottles
- 2 x 100 ml bottles
- 8 ml FEP tubing flow module
- custom modules

POWER SUPPLY

Power supply houses 4 LED current sources and their controller and requires 100-240V AC mains power. All user interaction is via a 3 inch colour touch-screen.

MODES OF OPERATION

There are two modes of operation – constant power, when a user-set LED output is maintained, or temperature control mode, when a temperature limit for reaction vessels is set and controller automatically picks the highest power level possible. Temperature control mode requires that at least one of the two possible thermocouples is used.

User can also control magnetic stirrer rotation and set an automatic timer countdown.

SAFETY FEATURES

Controller cuts power to LEDs permanently in case of PCB overtemperature, if a thermocouple is disconnected in temperature control mode, or if there is no connection between the power supply block and the LED block.

As LED temperature approaches dangerous levels, the controller will attempt to throttle power to LEDs, so that inadequate cooling does not necessarily mean that LEDs will be turned off outright.

LEDs are also temporarily turned off if either the reactor block lid or the reactor block itself is lifted up, so as to prevent accidental exposure to bright light.

LED BLOCK

A 450nm LED block is shown here with 24-vial reaction block installed. Any LED block is compatible with any reaction block and the reaction block can be swapped out in a matter of seconds without any tools.

LIGHT SOURCE

There are 24 clusters of 7 high power LEDs inside the LED block, grouped in 4 chains of 6 clusters. Every chain can be turned on individually and LEDs can be dimmed from 10% to 100% power.

Liquid cooling is required and a chiller capable of at least 300W of cooling at 10°C is recommended, however it is perfectly possible to cool the reactor with 20°C tap water with restricted power.

STIRRING

LED block also houses a built-in magnetic stirrer. For best results we recommend using rare earth magnetic stirring bars.

REACTOR BLOCK

There are 4 standard reactor blocks, as shown from top to bottom: 24 x 8 ml vial block, 6 x 25 ml bottle block, 2 x 100 ml bottle block and an 8 ml FEP tubing flow module.

It is possible to make reaction blocks that would accommodate other vessels, so long as they fit inside a 85x125mm window.

COOLING

The reaction vessels are housed in an anodised aluminium dry block cooled either with the same liquid that runs through the LED block or from a separate stream (as may be necessary for reactions in DMSO, for example) .

Liquid cooling of the reaction vessels is necessary for stable reaction vessel temperature. Larger bottles will need more cooling due to thicker walls and unfavourable wall area to volume ratio.

FLOW REACTOR

We offer a flow module with flat FEP tubing spiral (2 mm ID, transparent for all LED wavelengths used) housed inside an aluminium cooling fixture. The reagent stream first enters a 5 ml dark spiral where it has a chance to cool down to reactor block temperature and is then fed into an 8 ml irradiated spiral, where it is illuminated by the entire surface of the LED PCB. For gas/liquid reactions a slight backpressure is possible (up to 3 bar).

ADVANTAGES

You could just get a colour LED strip and put a vial in front of it, so why bother with our photoreactor and liquid cooling?

LED POWER

Our LED block is much more powerful. A high density 5050 LED strip has one 0.25W LED every cm or so (and at that density may also need active cooling), our blocks have seven 3W LEDs just a few mm away from the vial bottom.

STABLE TEMPERATURE

Liquid cooling means reactor temperature will stay stable despite changes in ambient temperature. If reaction mixture temperature is critical, you can set a limit and let the reactor regulate power as needed.

PARALLEL SYNTHESIS

You can run up to 24 reactions at the same time.

ADDITIONAL SERVICES

We can test your process, or a similar one in our reactor before you buy it. If you need to scale up, we have larger reactors, both batch and flow, and again, we can test your process before you make a decision to buy.