



IE-SOAR™

QUICK START GUIDE

2.4kW FCPM



Please read all sections of this guide, as well as the user manual before powering your system on.

Not following guidance risks voiding warranty and causing irreparable damage to your FCPM/s.

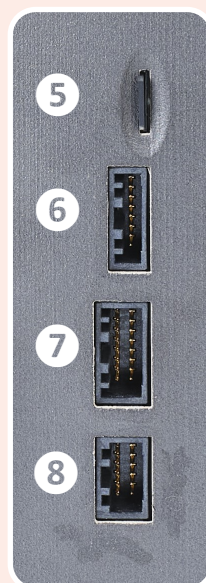
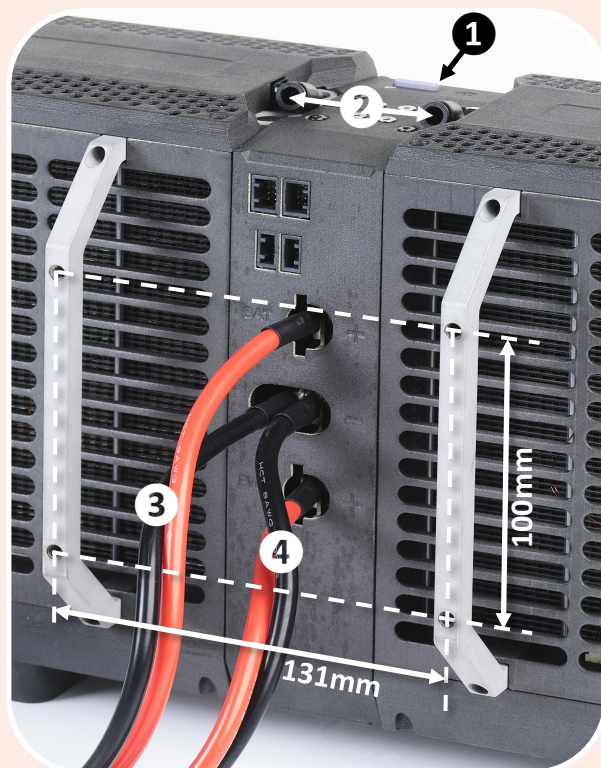
WHAT'S IN THE BOX?

- 1 x 2.4kW FCPM (Fuel Cell Power Module) - S2.4
- 2 x 3.3Ah LiPo hybrid batteries—these should be connected in series before plugging them into the S2.4
- 2 x HMI cables—one for CAN/UART, the other for remote start and analogue signals
- 1 x Reconditioning SD card—for use during maintenance **only**
- 2 x Inlet restrictors—for cold operations
- 1 x LPI (Low Pressure Indicator) and cable assembly- this monitors hydrogen supply pressure, and will be connected to port #6
- 1 x HFLW regulator (if ordered)
- 1 x Quick-connect extension and H₂ tubing—allows for connection to an Intelligent Energy regulator

QUICK START—STEPS:

- 1- If integrating the system with Ardupilot, follow the QR code on page 6 of this leaflet to the Ardupilot landing page for “generator” setup documentation.
- 2- Connect signal wires from the provided cable assemblies to your avionics, notably Tx/Rx if using Ardupilot, be sure to make a **common ground** connection between the avionics and FCPM through the HMI.
- 3- Mount the system to your UAV using the provided brackets. Connect the necessary cabling (**regulator harness** and **UART HMI** or **Analog/digital HMI**).
- 4- Prepare your Hydrogen cylinder/s by first **purging** then **filling** them to full pressure, follow the QR code on page 6. Secure cylinder to UAV, connect regulator interface cable to LPI. Connect Hydrogen tube quick connector to the regulator.
- 5- For more information on setup, read the full user manual for this product—QR code on the back of this leaflet.
- 6- Power up the system by connecting your provided hybrid batteries in series (default is 2x 6S LiPo's in series). Take care **not** to connect the battery to the power out port. **Note:** Once the **hybrid battery is connected**, the FCPM **output will be live**, powering your UAV/load. Press the button on the FCPM for 4s to switch fuel cell power on/off.
- 7- Verify that data is being correctly read into the Flight controller from your FCPM, most importantly tank percentage.

- ① On / off button (4s hold)
- ② H₂ inlets
- ③ Battery input
- ④ Power output to load
- ⑤ SD card slot *
- ⑥ Regulator / LPI interface *
- ⑦ Digital / analog HMI *
- ⑧ UART / CAN HMI *



The 2x HMI cables come with unterminated wires fitted with cable markers to indicate pin numbers, see section 12 of the user manual for pinouts.

* The regulator interface, SD card **and** either one of the two HMI connectors must be in place for the system to power on.

LIGHTWEIGHT REGULATOR

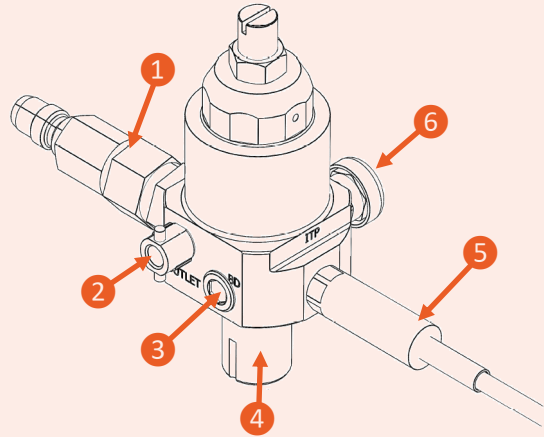
The Intelligent Energy High Flow Lightweight regulator (HFLW) is designed specifically for use with the S2.4.

Its static output pressure is ~1000mbar.g, this is monitored by the LPI.

The HFLW regulator can deliver a minimum of 50SLPM of hydrogen.

Key:

- 1 Swagelok quick connector fill port
- 2 H₂ outlet
- 3 High pressure burst disc
- 4 M18 cylinder thread
- 5 High pressure transducer
- 6 Low pressure relief (2bar)



LOW PRESSURE INDICATOR (LPI)

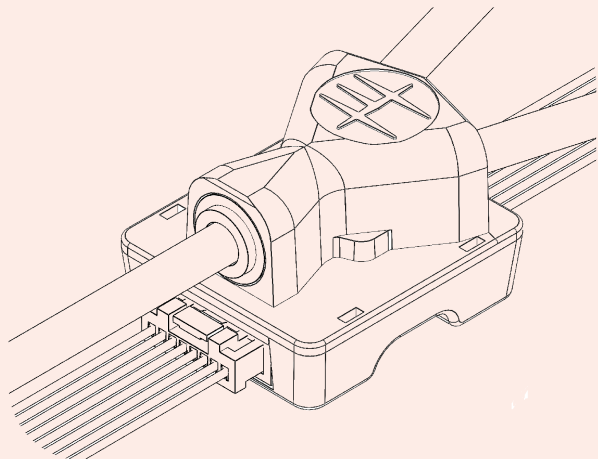


4.7

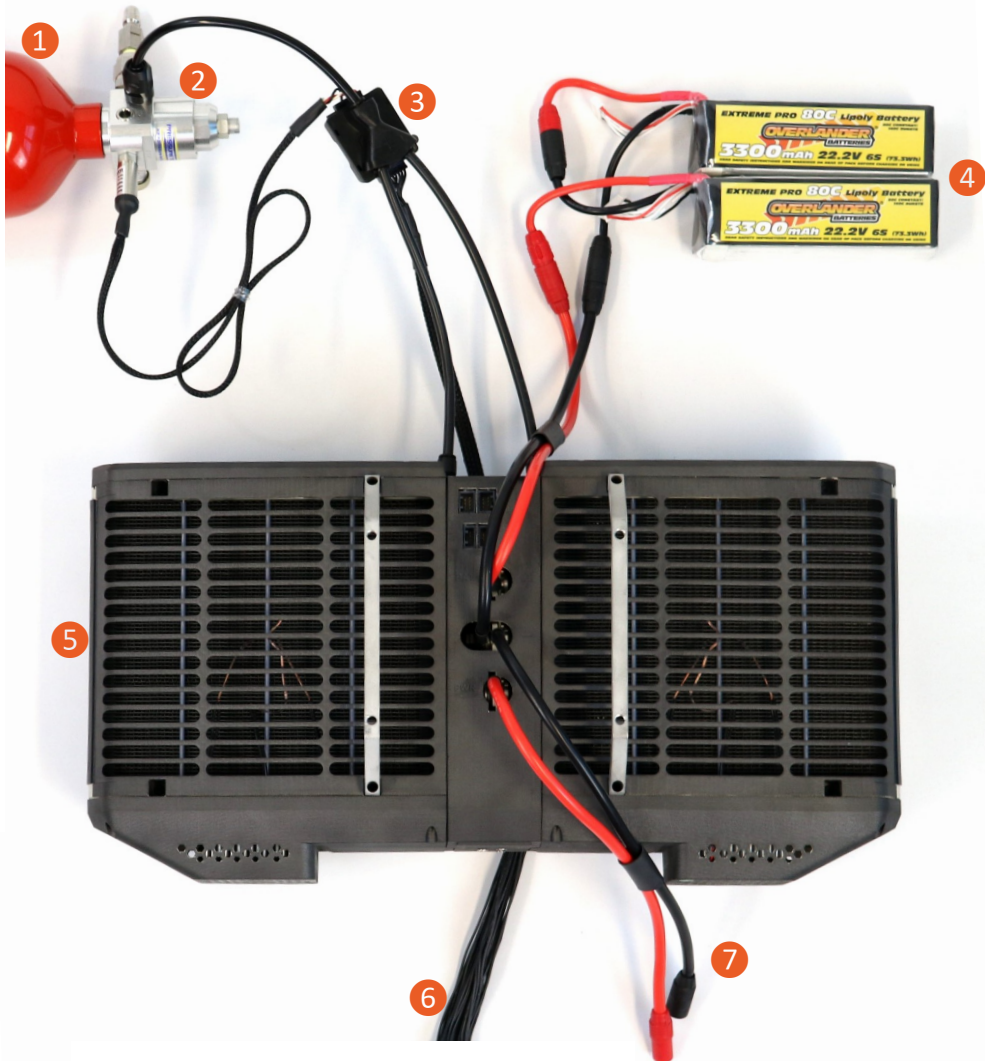
The LPI is situated in series with the hydrogen supply to the fuel cell stacks, its purpose is to monitor hydrogen inlet pressure.

The FCPM will not start without the LPI in place.

Pressure readings from the LPI allow the FCPM to de-rate its power output to avert damage when inlet pressure is low.



ELECTRICAL & H₂ CONNECTIONS



1 Hydrogen cylinder

2 HFLW regulator

3 Low pressure indicator (LPI)

4 Hybrid batteries (2x 6S in series)

5 S2.4

6 HMI cables (ports 7&8)

7 Output power connectors (AS150)

SAFETY WARNINGS



- Before starting any electrical or hydrogen / pressure related work, please ensure that all parties involved are suitably qualified and experienced, high pressure flammable gases require training to work with safely. If unsure about any safety aspects, please contact the servicing team.
- Do not make any connections when wires are live, doing so would cause excessive out-rush current that could damage the S2.4. Use anti-sparking connectors where possible.
- If any part of the S2.4 is damaged, or has been flooded with water, do not use the system and contact product support.
- Always check Hydrogen supply tubing before pressurisation, especially where it interfaces with push-fit connectors. Do not use the system if there is any damage to hydrogen tubing.

REFERENCE LINKS

Full user manual for
the S2.4:

tinyurl.com/mvd7esys



Ardupilot generator
landing page:

tinyurl.com/yc47jpnk



CONTACT US

Technical / integration assistance
servicing@intelligent-energy.com

HYDROGEN SUPPLY



4.2, 4.3

The Intelligent Energy High Flow Lightweight (HFLW) regulator is used to regulate Hydrogen pressure from the supply cylinder. It's crucial specification is the ability to deliver 50SLPM of H₂ at 900mbar.g \pm 100mbar.g.

Hydrogen purity in the cylinder should be >99.9%. Follow the link on page 6 for details on how to prepare a cylinder for use by purging it of air. Inadequate cylinder purging will permanently damage fuel cells.

Insufficient Hydrogen supply pressure, flowrate, or quality will permanently damage the chemistry of your fuel cell system.

MOUNTING TO A UAV



3.2

The most important consideration when mounting the FCPM to a UAV / Multirotor is that there is **sufficient space for airflow** around the **stack inlet** and **outlet vents**, as well as around the electronics cooling fans on the unit's underside. A minimum of **40mm** clearance is required on the inlet side.

Where possible, mount the FCPM such that the fans face up or down. Not doing so could lead to a **ram air effect** and **overcooling** of the stack, especially in windy conditions or at high speeds.

The **mounting holes** are **M6**, spacing can be found on the previous page.

All **cables** running to/from the S2.4 system should be **secured** to the UAV frame to limit the possibility of contact with fans / rotor blades.

Particular care should be taken when routing the **H₂ supply tubing** that it is **not kinked**, and can't flex into the path of a rotor blade.

ALTERNATIVE CONFIGURATIONS

The S2.4 can be configured in a number of ways, for example, the output voltage can be changed to support differing hybrid battery cell counts, and the cylinder pressure trips may be disabled to allow for LPI-only operation.

Contact the product support team for more information and options.

COLD OPERATIONS



6.8

Contained within the S2.4 system pack are a set of inlet restrictors. These **must** be fitted any time the ambient temperature drops below **5°C** (minimum operating temperature -5°C).

Fitting the inlet restrictors will **improve the performance** of the S2.4 system in **cold conditions** and **protect it from damage**. Fitting instructions—6.8.

In cold operating conditions, the fans may “blast” periodically to clear any condensed water from the cell channels.

RECONDITIONING / MAINTENANCE



9.3

When not used for prolonged periods, the fuel cell’s performance may drop off as it dries out, and contaminants from the air accumulate in the stack. To restore performance, **reconditioning** should be carried out on the system (using the provided reconditioning SD card).

See section 9.3 of the full user manual for more information on how to conduct reconditioning cycles with the S2.4.

To reduce the likelihood of a need for reconditioning, follow the recommended storage conditions below.

RECOMMENDED STORAGE

Avoid exposure to volatile organics (**VOCs**), poisonous/corrosive gasses and anything with a prominent scent. This includes but is not limited to cleaning products, air-fresheners, glues/adhesives/epoxies, chemical solvents and ammonia. Particular care should be taken to **avoid storing the fuel cell in an enclosed space** (e.g. drawer, bag or box) **with potential contaminants** as this may accelerate the contamination process.