H3 Dynamics

Hydrogen Air Mobility
Solutions and Accessories

2023

www.h3dynamics.com

H³ Dynamics

Advanced Energy & Propulsion Solutions

Fuel Cell Systems

H_2 Gas Cylinders

H_2 Regulator

H_2 Compressor

H_2 Refueling Trailer

H_2 Drones

H_2 Propulsion Nacelles

Hydrogen Air Mobility

Power Solutions and Accessories

2023

www.h3dynamics.com

HYCOPTER HYDROGEN MULTI-ROTOR DRONE

UP TO 3.5 HOURS FLIGHT ENDURANCE

H3 Dynamics

The H3 Dynamics HYCOPTER is a hydrogen electric hexacopter drone capable of long endurance flight, making large-scale inspections easier and faster, compared to conventional battery UAVs.

The HYCOPTER integrates a lightweight airframe that houses an open cargo bay allowing multiple payload options. Featuring a modular design and an adjustable centre of gravity (CG), the HYCOPTER can be perfectly balanced regardless of the payload and cylinder configuration.

The HYCOPTER is powered by H3 Dynamics AEROSTAK 1500 fuel cell, carries one hydrogen gas cylinder and has an emergency battery backup on board as a failsafe.

AIRCRAFT

MTOW	16.5 kg
Dimensions [1]	D : 1 450 mm | H : 500 mm
Flight Time [2]	Up to 3.5 h
FC Nominal Power[3]	1 500 W
LiPo Peak Power	4 000 W (< 10 s)
Oper. Temperature	-5 °C to 45 °C
Flight Controller	Pixhawk 2.0
Max. Speed [4]	48 km/h
Max. Ascendent Speed [4]	3.2 m/s
Max. Descendent Speed [4]	2.2 m/s
Max. Tilt Angle	32 °
Pitch	150 °°/s
Yaw	80 °°/s
Wind Survivability	32 km/h

[1] Excluding propellers
[2] Depending on H_2 cylinder and payload
[3] Using the Aerostak A-1500
[4] Payload dependent
[5] Optional

PAYLOAD

Volume	L : 260 mm | W : 330 mm | H :200 mm
Max. Weight	2.5 kg
Voltage	5 - 32 V
Max. Power [5]	180 W

REMOTE CONTROLLER

Model	HereLink
Operational Frequency	2.4 Ghz
Battery	4 950 mAh LiPo
Max. Transmitting Distance	FCC : 20 km | CE , SRRC : 12 km

H2FIELD-1 HYDROGEN REFUELING STATION

H3 Dynamics

Access to hydrogen is a requirement for remote field operations. H3 Dynamics provides a unique mobile automatic refilling trailer to directly produce hydrogen from water. This trailer has the capability of refilling a 9L - 350 bar cylinder in under 2.5 hours continuously or in a couple of minutes depending on configuration

The Mobile Refilling Station is an automated turnkey system, easy to operate with little to no user intervention once started. The system fully controls the production of hydrogen gas and safely monitors the high-pressure filling of the hydrogen cylinder. It is designed to minimize maintenance and consumable requirements.

WATER → WATER PURIFICATION → ELECTROLYZER → DRYER → ACCUMULATOR → PRESSURE BOOSTER → HYDROGEN CYLINDER

WATER PURIFICATION SYSTEM

Input Water Maximum Salinity	> 99.999 %
Input Water Temperature Range	10 - 25 °C
Output Water Production Rate [1]	1.3 L / min

WATER STORAGE

Capacity	35 L
Max. Outlet Water Flow Rate	3.8 L / min

DRYER

H_2 Flow Rate	Up to 1 Nm^3/h
H_2 Output Purity	> 99.999 %
Average Dew Point [2]	< - 70°C

ELECTROLYZER

H_2 Production Rate	1000 NL/h or 2.157 kg / 24h
H_2 Output Purity	> 99.999 %
Water Consumption	0.8 L / h
Weight	110 kg

TRAILER

Box Dimensions	L: 2140 mm | W: 1550 mm | H: 1090 mm
Full Trailer Dimensions	L: 3355 mm | W: 1950 mm | H: 2040 mm
Total Weight	1.600 kg
Mounting Points	4 x ½-UNC13

POWER

Power Supply	200 - 240 VAC | 50 / 60 Hz
Average Power (no booster)	5.7kW
Peak Power (no electrolyzer)	4.6kW
Peak Power	9.3kW

[1] Edith 500 mg/L TDS and 20 °C input water
[2] Compliant with ISO 14687

AEROPAK HYDROGEN PROPULSION NACELLE

H3 Dynamics

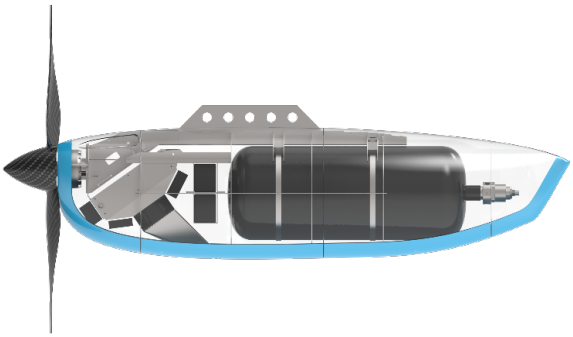
The AEROPAK is a nacelle with a fully integrated hydrogen-electric powertrain to power fixed wing or VTOL drones.

AEROPAK offers a complete and easy solution for drone manufacturers and enables the integration of hydrogen-electric power sources by reducing design and integration restrictions.

The interchangeable cylinders can be replaced withing minutes and provide continuous operation with minimal downtime.

AEROPAK is offered with three possible power outputs which can be multiplied using a distributed propulsion design with several nacelles.

AEROPAK can be distributed along the wing to increase overall propulsive power and to add redundancy.



AEROPAK-350	
Weight	5.7 kg
Dimensions	L: 800 mm D: 180 mm
Nominal Propulsive Power[1]	226 W
Propulsive Peak Power	1100 W
Autonomy at max power	3 h
Control	ESC servo

AEROPAK-500	
Weight	7.8 kg
Dimensions	L: 1110 mm D: 220 mm
Nominal Propulsive Power[1]	325 W
Propulsive Peak Power	1151W
Autonomy at max power	5 h
Control	ESC servo

AEROPAK-1000	
Weight	11.5 kg
Dimensions	L: 1100 mm D: 270 mm
Nominal Propulsive Power[1]	650 W
Propulsive Peak Power[1]	1800 W
Autonomy at max power	3h
Control	ESC servo

[1] 90 % motor and esc efficiency and 80 % propeller efficiency

AEROSTAK HYDROGEN FUEL CELL SYSTEMS FOR UAS

FULL LINE UP OF ULTRA-LIGHT PEM FUEL CELL SYSTEMS

H3 Dynamics

The H3 Dynamics AEROSTAKs are family of advanced ultra-light hydrogen fuel cells, ranging from 250W to 1.5kW nominal rated power. All AEROSTAKs feature a special grade PEM fuel cell stack, full balance of plant, control electronics, LiPo-compatible hybrid electronics, lightweight casing and are plug and play. Pair the AEROSTAK with our hydrogen storage, pressure regulation, and refilling technology for a complete turnkey power solution.

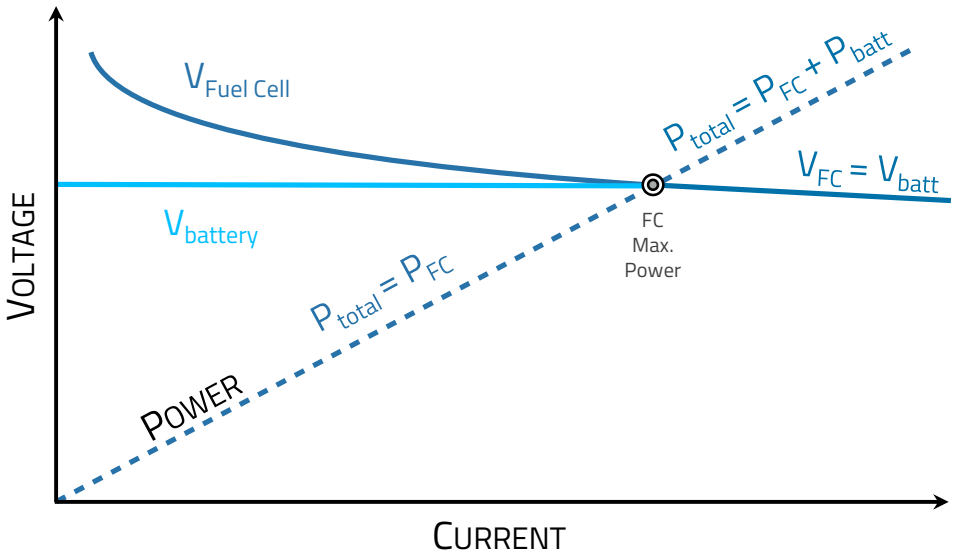
System operational data such as voltages, currents, power, and temperatures are provided through an RS232 data connection. Wireless data transmission is available as an option. The LiPo battery provides power for startup and additional electric power when the load required exceeds the capacity of the fuel cell stack. The electronics also provide up to 1.5 A to recharge the battery when excess power is available.

Standard system features:

- Remote ON/OFF button
- RS232 Data monitoring
- Maintenance cycle signal
- Waterproof hard case for transport
- H2 supply tube and quick-connect

Add-ons:

- DC/DC converter
- Wireless telemetry
- Custom firmware
- Higher power systems by stacking several systems



AEROSTAK A-1500 (1500W)

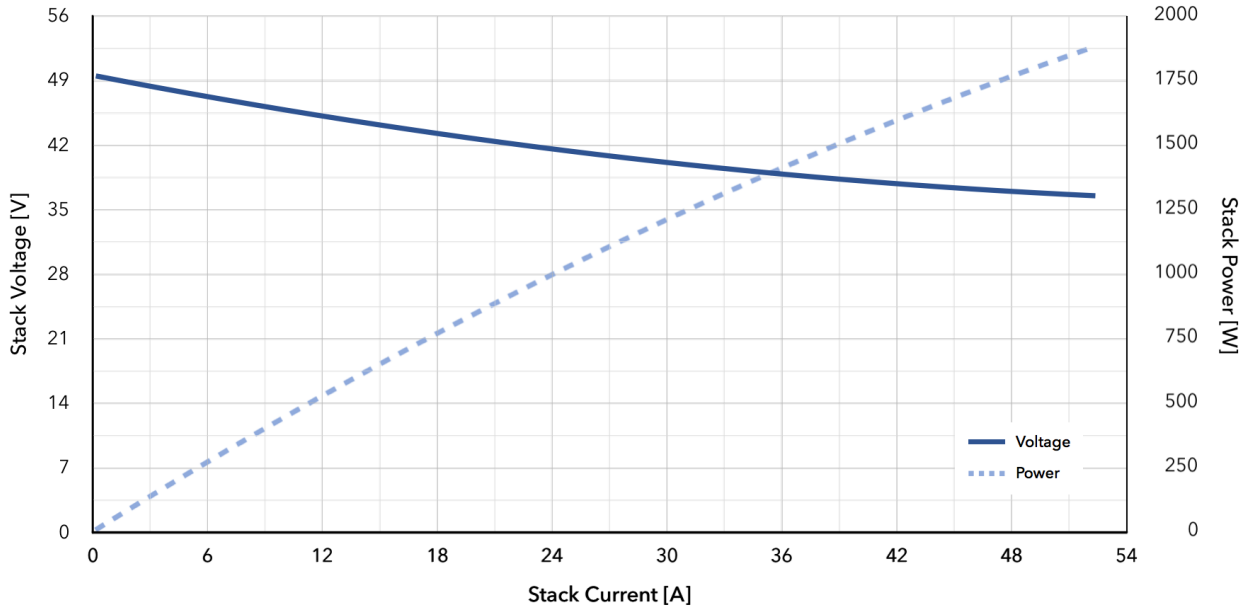
ADVANCED LIGHTWEIGHT FUEL CELL SYSTEM

H³Dynamics

The AEROSTAK 1500 is suitable for larger payload multi rotor UAV's as well as for fixed wing, VTOL and other higher power mobile applications.

Stack Design	55 cells
Rated Power (FC)	1500 W
Peak Power (FC + battery)	4000 W
Voltage	32.0 - 51.3 V
Current	0 - 50 A
Weight	3 000 g
Specific Power	500 W/kg
Power Density	180 W/L

Dimensions	339 x 143 x 172 mm
Cooling	Air
Air Input Temperature	0 - 35°C
Hydrogen Input Pressure	0.6 - 0.8 bar
Hydrogen Purity Required	99,998%
Max. Consumption	< 16.8 L/min
Start Up Time	< 20 s
Suggested Hybrid LiPo	9S (>100C)



AEROSTAK A-1000 HV (1000W)

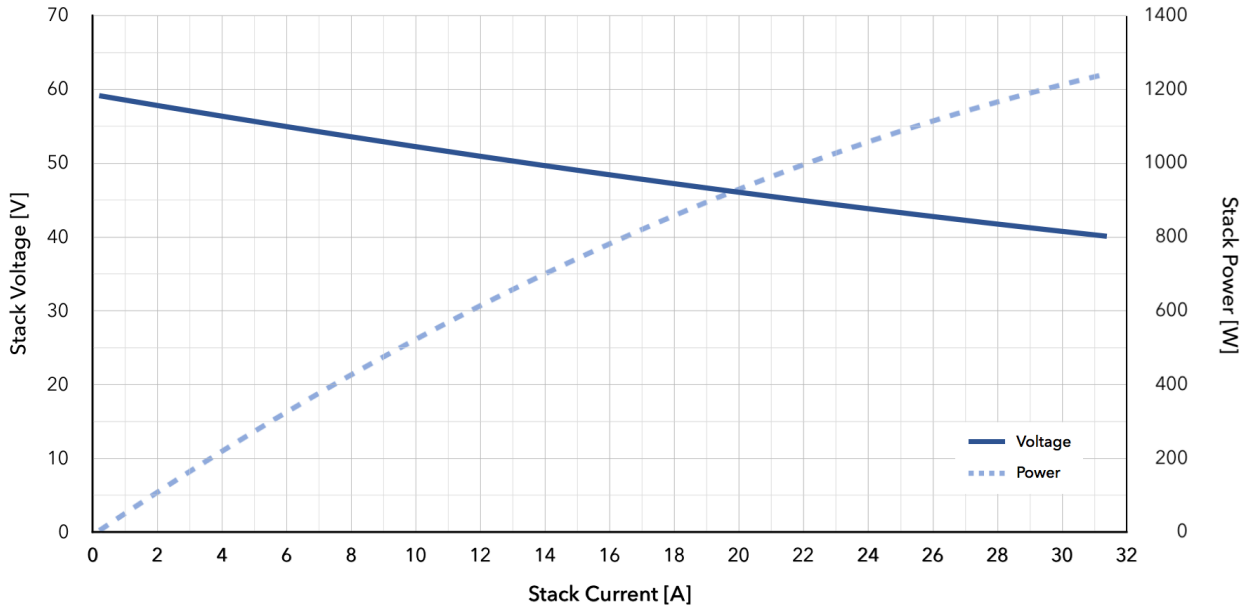
ADVANCED LIGHTWEIGHT FUEL CELL SYSTEM

H³Dynamics

The AEROSTAK 1000-HV has been designed to power large fixed wing drones and mid-sized multi rotor UAV's (<10 kg MTOW), as well as other portable applications.

Stack Design	65 cells
Rated Power (FC)	1000 W
Peak Power (FC + battery)	3800 W
Voltage	35.0 - 61.8 V
Current	0 - 30 A
Weight	2 100 g
Specific Power	476 W/kg
Power Density	210 W/L

Dimensions	194 x 127 x 193 mm
Cooling	Air
Air Input Temperature	0 - 35°C
Hydrogen Input Pressure	0.6 - 0.8 bar
Hydrogen Purity Required	99,998%
Max. Consumption	< 11.2 L/min
Start Up Time	< 20 s
Suggested Hybrid LiPo	10 S (>100C)



AEROSTAK A-1000 LV (1000W)

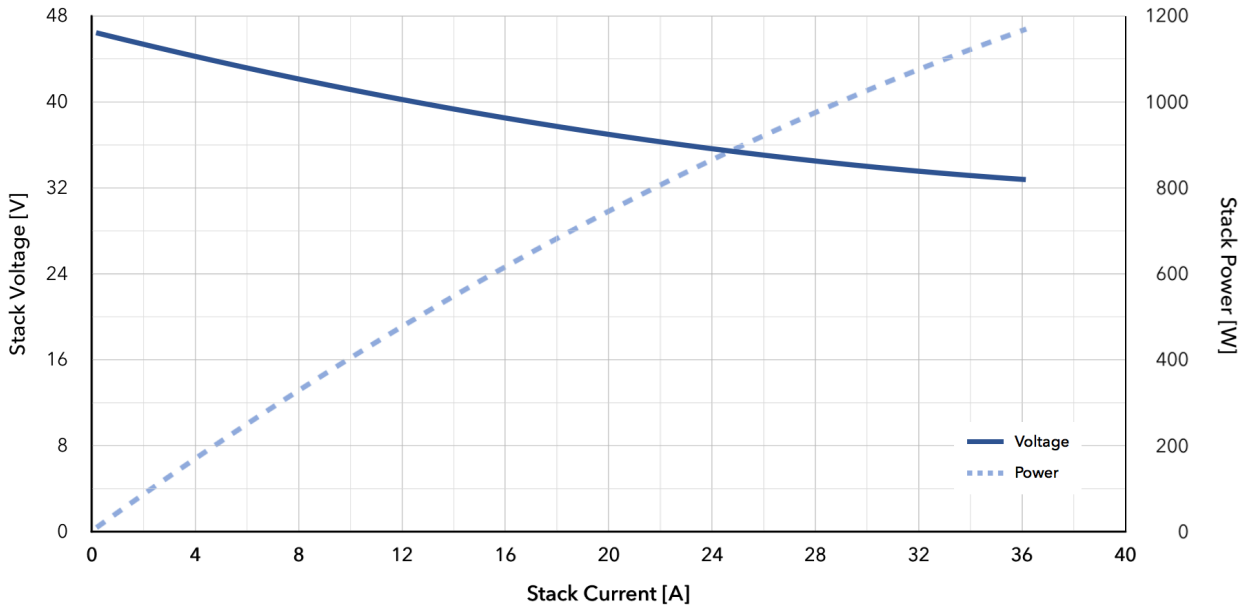
ADVANCED LIGHTWEIGHT FUEL CELL SYSTEM

H³Dynamics

The AEROSTAK 1000-LV has been designed to power large fixed wing drones and mid-sized multi rotor UAV's (<10 kg MTOW), as well as other portable applications.

Stack Design	50 cells
Rated Power (FC)	1000 W
Peak Power (FC + battery)	3250 W
Voltage	28.0 - 47.5 V
Current	0 - 35 A
Weight	2 150 g
Specific Power	465 W/kg
Power Density	197 W/L

Dimensions	279 x 127 x 143 mm
Cooling	Air
Air Input Temperature	0 - 35°C
Hydrogen Input Pressure	0.6 - 0.8 bar
Hydrogen Purity Required	99,998%
Max. Consumption	< 11.2 L/min
Start Up Time	< 20 s
Suggested Hybrid LiPo	8 S (>100C)



AEROSTAK A-500 (500W)

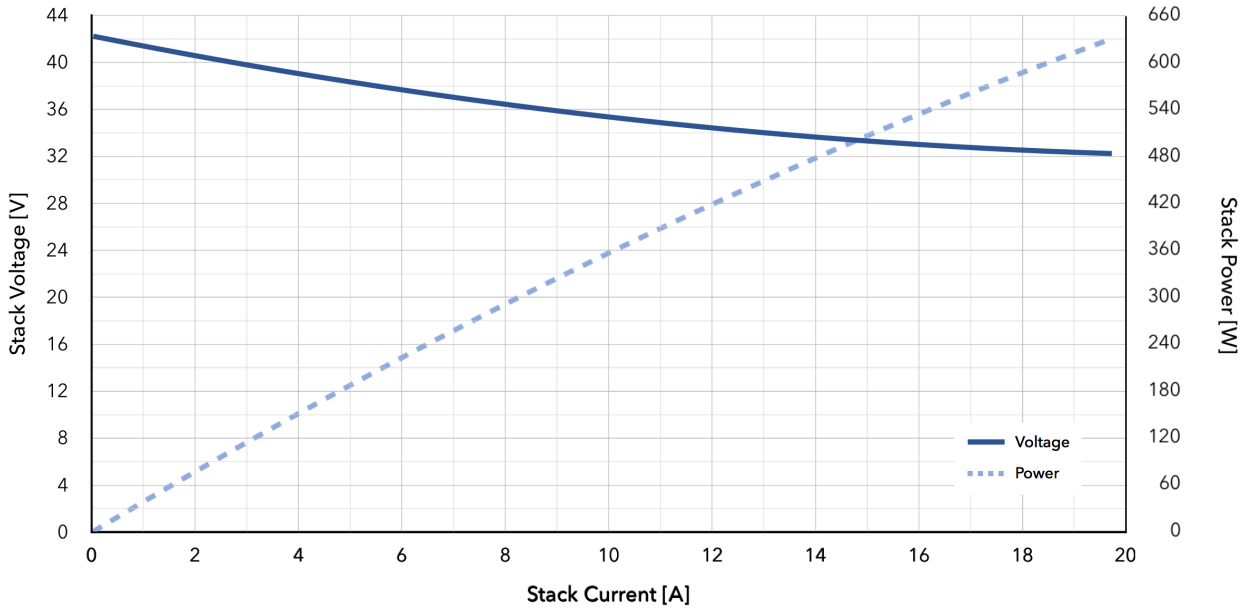
ADVANCED LIGHTWEIGHT FUEL CELL SYSTEM

H³Dynamics

The AEROSTAK 500 has the perfect power and form factor for fixed wing and VTOL drones.

Stack Design	45 cells
Rated Power (FC)	500 W
Peak Power (FC + battery)	2750 W
Voltage	28.0 - 42.8 V
Current	0 - 20 A
Weight	1 580 g
Specific Power	316 W/kg
Power Density	146 W/L

Dimensions	214 x 123 x 130 mm
Cooling	Air
Air Input Temperature	0 - 35°C
Hydrogen Input Pressure	0.6 - 0.8 bar
Hydrogen Purity Required	99,998%
Max. Consumption	< 5.6 L/min
Start Up Time	< 20 s
Suggested Hybrid LiPo	8 S (>100C)



AEROSTAK A-250 (250W)

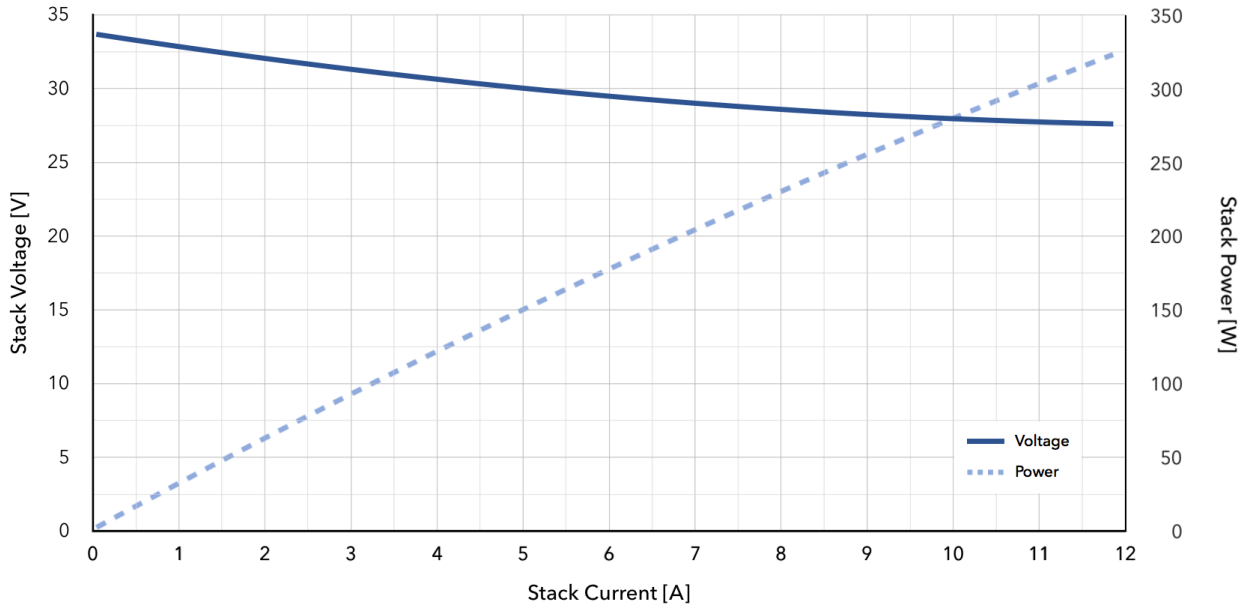
ADVANCED LIGHTWEIGHT FUEL CELL SYSTEM

H3Dynamics

The AEROSTAK 250 is ideal for powering smaller fixed wing drones, scaled demonstrators, research, and other low-powered hydrogen applications.

Stack Design	37 cells
Rated Power (FC)	250 W
Peak Power (FC + battery)	800W – up to 2210W
Voltage	24.5 - 35.2 V
Current	0 - 13 A
Weight	720 g
Specific Power	347 W/kg
Power Density	149 W/L

Dimensions	122 x 123 x 112 mm
Cooling	Air
Air Input Temperature	0 - 35°C
Hydrogen Input Pressure	0.6 - 0.8 bar
Hydrogen Purity Required	99,998%
Max. Consumption	< 2.8 L/min
Start Up Time	< 20 s
Suggested Hybrid LiPo	7 S (>100C)



Compatible With
AEROSTAK PEM Fuel Cells Systems
H_2 Pressure Regulator

A-Series Pressurized H_2 Gas Cylinders 350 bar

Pressure Regulator sold separately

H³Dynamics

A-Series cylinders are designed and manufactured following the best practices in the industry, in order to guarantee safety and security. The Series A have a working pressure up to 350 bar and a M18x1.5 thread compatible with our ultra-light pressure regulator.

	Weight [1]	Water Capacity	Hydrogen Mass	Dimensions	Specific Energy	Energy Density	Electrical Energy [2]
A5	1.65 kg	5 L	120 g	⌀ : 152 mm L : 395 mm	8 725 kJ/kg	2 879 kJ/L	2 000 Wh
A9	2.65 kg	9 L	216 g	⌀ : 173 mm L : 528 mm	9 779 kJ/kg	2 879 kJ/L	3 600 Wh
A12	3.30 kg	12 L	288 g	⌀ : 196 mm L : 532 mm	10 471 kJ/kg	2 879 kJ/L	4 800 Wh
A20	7.05 kg	20 L	480 g	⌀ : 230 mm L : 655 mm	8 169 kJ/kg	2 879 kJ/L	8 000 Wh

[1] Excluding Pressure Regulator
[2] Estimated at 50 % efficiency

Compatible With
AEROSTAK PEM Fuel Cells Systems
H_2 Pressure Regulator

EN 12245 CERTIFICATION

F-Series Pressurized H_2 Gas Cylinders 300 bar

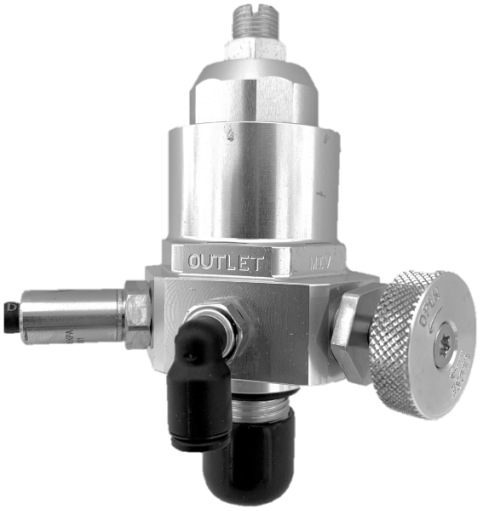
Pressure Regulator sold separately

H³Dynamics

F-Series cylinders are designed and manufactured in conformity with EN 12245. The Series F have a working pressure up to 300 bar and a M18x1.5 thread compatible with our ultra-light pressure regulator.

	Weight [1]	Water Capacity	Hydrogen Mass	Dimensions	Specific Energy	Energy Density	Electrical Energy [2]
F2	1.46 kg	2 L	42 g	⌀ : 114 mm L : 371 mm	3 477 kJ/kg	2 538 kJ/L	705 Wh
F3	1.75 kg	3 L	63 g	⌀ : 120 mm L : 445 mm	4 351 kJ/kg	2 538 kJ/L	1 060 Wh
F6	2.89 kg	6 L	127 g	⌀ : 161 mm L : 481 mm	6 269 kJ/kg	2 538 kJ/L	2 115 Wh
F6.8	3.09 kg	6.8 L	144 g	⌀ : 161 mm L : 520 mm	5 585 kJ/kg	2 538 kJ/L	2 400 Wh
F7.2	3.29 kg	7.2 L	152 g	⌀ : 166 mm L : 550 mm	5 554 kJ/kg	2 538 kJ/L	2 540 Wh
F9	4.06 kg	9 L	190 g	⌀ : 186 mm L : 545 mm	5 626 kJ/kg	2 538 kJ/L	3 175 Wh
F13[3]	6.25 kg	13 L	275 g	⌀ : 225 mm L : 542 mm	5 076 kJ/kg	2 538 kJ/L	4 583 Wh

[1] Excluding Pressure Regulator, in Light Version
[2] Estimated at 50 % efficiency
[3] Goes up to 310 bar



Compatible With
AEROSTAK PEM Fuel Cells Systems
A-Series and F-Series Cylinders

Ultralight H_2 Gas Pressure Regulator

Pressure Regulator sold separately

H3 Dynamics

The pressure regulator provides safety and performance in an ultralight package of only 300 grams. The single-stage regulator reduces pressure up to 350 bar storage to less than 1 bar with accurate reliable control. It includes a fill port, an outlet port, a transducer to monitor pressure inside the cylinder, a pressure gauge, a safety burst disk and a manual shut off valve. H3 Dynamics can also provide a refilling kit along with the regulator, to refuel the cylinder with hydrogen from a bottle.

Gas	Hydrogen
Material	Aluminum
Weight	305 g
Type	Single Stage
Max Input Pressure	350 bar
Adjustable Output Pressure [1]	0-1 bar
Cylinder Thread	M18 x 1.5
Outlet Port	1/8" NPT
Fill Port	1/8" NPT
Length	107 mm
Max Flow	< 45 slpm at 0.5 bar

[1] Higher output pressures available

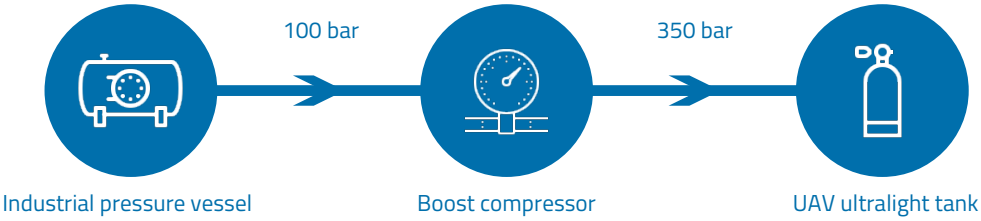
Compatible With
A Series & F Series Cylinders
H_2 Pressure Regulator

ELECTRIC BOOST COMPRESOR

Boosts pressure filling up to 300 or 350 bar

H3 Dynamics

The H3 Dynamics electric gas booster pump system increases a low-pressure hydrogen supply to allow filling of high pressure (300-350 bar) composite cylinders. The pump is self-contained with gauges, valves, an hour meter and a power switch. The pump includes a high and low pressure safety switch as well as a high pressure safety relief valve.



Dimensions	L: 940 mm | H: 292 mm | D: 559 mm
Weight	65.9 kg
Voltage [1]	120 or 240 VAC single phase
Motor Frequency	60/50 Hz
Operational Speed [2]	70 cycles/min
Cooling	Air cooled
Noise	< 63 dB
Maximum Inlet Pressure	372 bar
Minimum Inlet Pressure	34 bar
Maximum Outlet Pressure	386 bar
Maximum Flow Rate [3]	617 slpm

[1] Other voltages available as well as 3 phases
[2] Variable Speed Option
[3] Dependent on input pressure

LIQUID HYDROGEN TANK

H³Dynamics

Designed for UAV applications

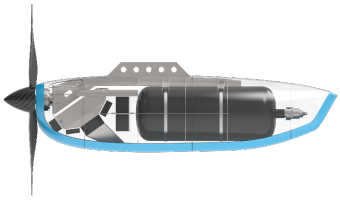
Volume	12L
Empty Weight	2.6 kg
Length	700 mm
Outside Diameter	205 mm
Volumetric Capacity	30 – 40 g/L
Gravimetric capacity	0-25 %wt
MAWP	3 barg
Material	Titanium

Includes

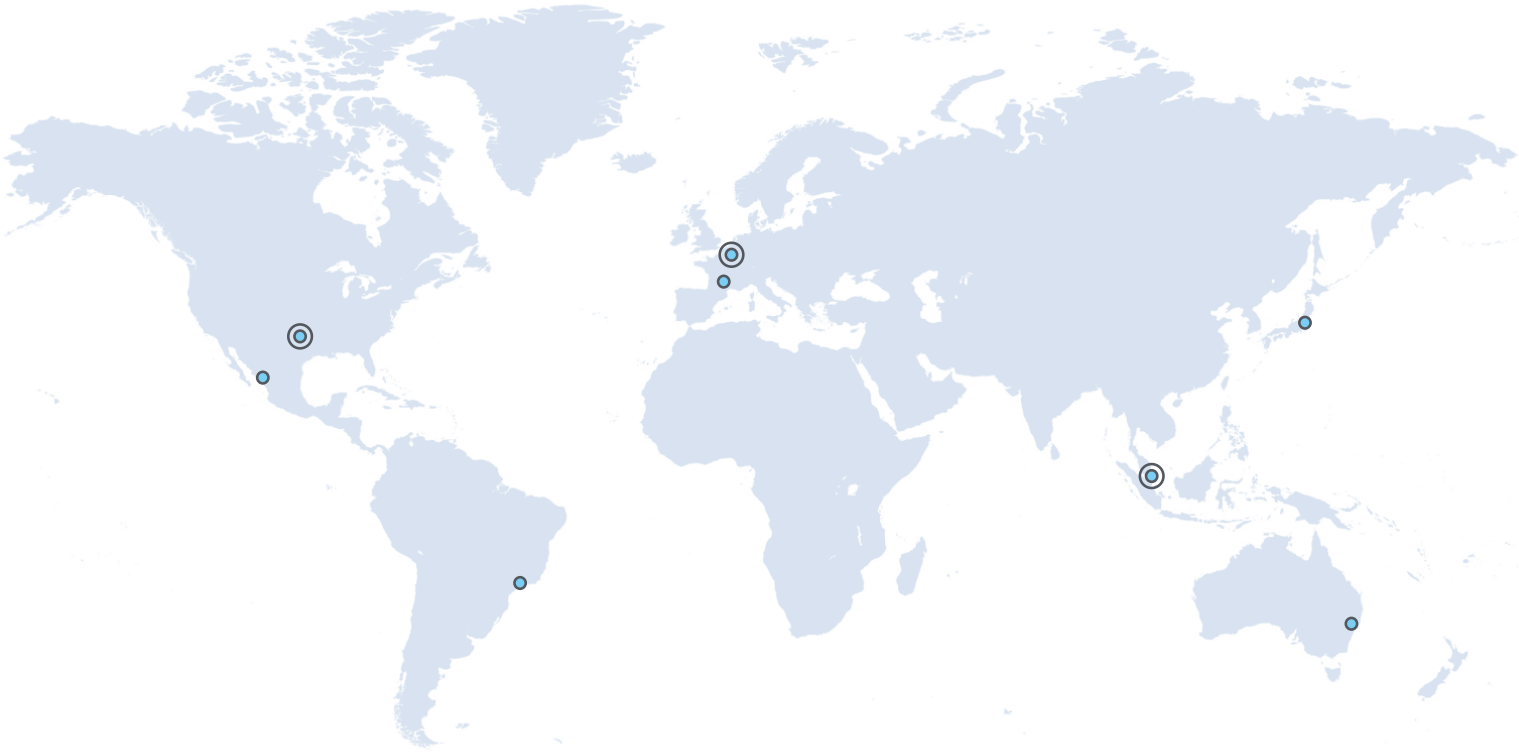
Digital Pressure Gauge
Relief Valve
Heater (24V)
Pressure regulator

Fuelling long-endurance LH2-electric drones

110L version under development



H³ Dynamics



AUSTIN · **TOULOUSE** · **SINGAPORE**

Americas HQ | EMEA HQ | Global HQ

MEXICO · BRAZIL · JAPAN · AUSTRALIA

Contact: sales@h3dynamics.com

www.h3dynamics.com