PENTAIR
ENGINEERED FILTRATION

Hydrogen

HUMIDIPOWER FUEL CELL HUMIDIFIER

Hollow Fiber Heat and Moisture Exchanger

SUPERIOR PERFORMANCE FOR YOUR FUEL CELL SYSTEM

A fuel cell is a clean and efficient power plant that makes electricity through a chemical reaction between hydrogen and oxygen.

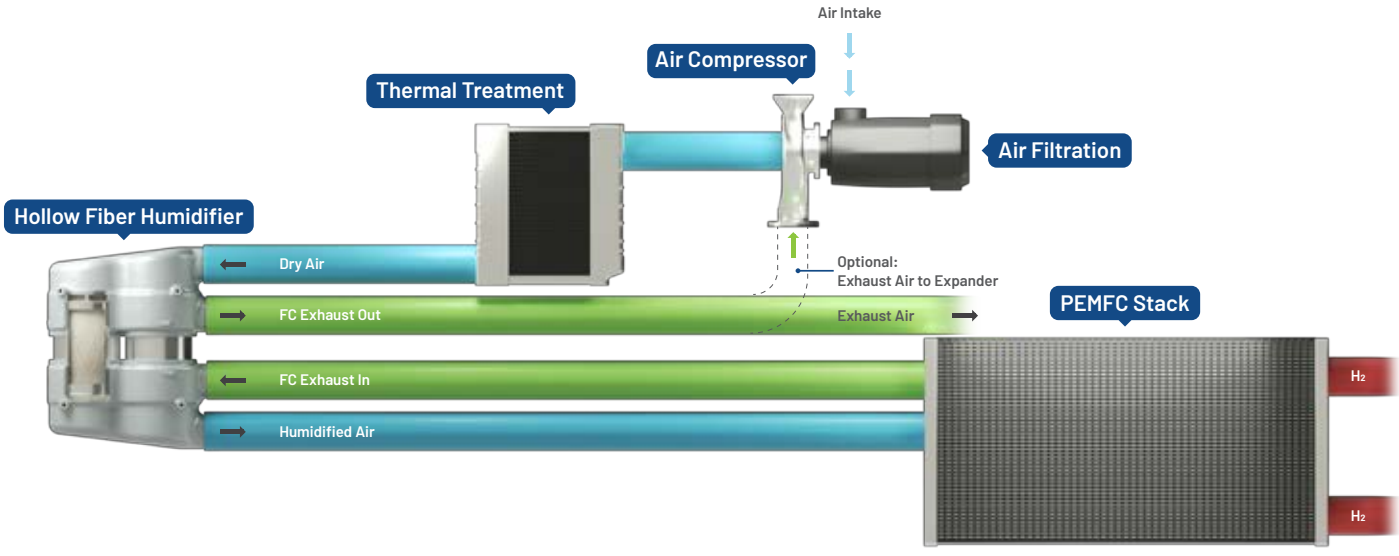
Humidifiers keep the fuel cell stack (PEM) hydrated to lower the resistance of electron flow, improve overall system performance and help prevent the fuel cell stack from permanent damage.

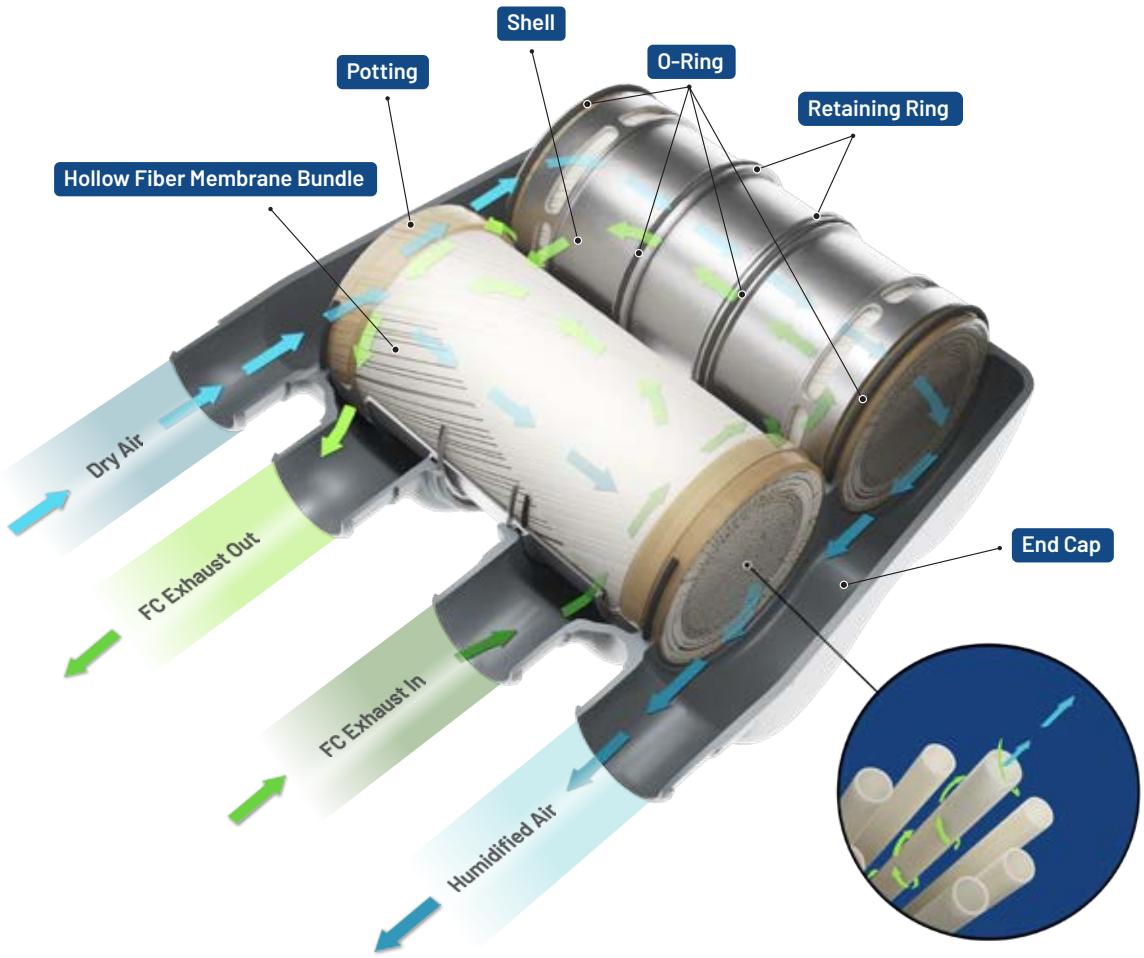
Pentair developed a new line of humidifiers for hydrogen fuel cells. With over a decade of expertise in manufacturing and selling humidifiers to fuel cell OEMs, Pentair has become a trusted name in the industry with a global footprint – due to over 40,000 moisture transfer modules produced annually.

Pentair's HumidiPower Fuel Cell Humidifier is engineered to thrive in extreme environmental conditions, that help ensure optimal humidification with minimal energy demand. The innovation lies in the selectable fluid interface and orientation, providing a tailored fit for your specific system requirements.

What sets Pentair apart is our modular, scalable design with standardized replaceable membrane modules for your entire line of humidifiers. They lead up to 30% less total cost of ownership. The unique housing design seamlessly integrates into your fuel cell system.

CATHODE AIR HUMIDIFICATION





TARGET SPECIFICATIONS AND FEATURES

Operating range* (kW)	30 to 400 and beyond
Inlet temperature	-30 to 110 °C (-22 to 230 °F)
Connection ports	2" barb (50.8 mm)
Port connection orientation	180 degree increments
Freeze start	Yes
Mounting features	M6 x 1.0 mm screw interface

AVAILABLE OPTIONS

	**Option 1**	Individual hollow fiber membrane modules for customer configurable connections. Replacement membrane modules allow lower cost of ownership.
	**Option 2**	Complete assembly consisting of: • Two hollow fiber membrane modules • End caps/ports for connections
	**Option 3**	Custom design. Contact us for custom design possibilities. Optimize your humidification and pressure loss or efficiency needs by partnering with Pentair for a custom end-cap design. Options include, but not limited to: multiple modules in parallel, variable bundle lengths, water drainage, sensor integration or bypass ports.

BENEFITS

Size, shape and weight	Reduced size and weight
Supply chain and scale	Vertically integrated: Pentair has extruded hollow fiber for over 20 years with in-house moisture transfer design team of engineers and also module manufacturing site producing over 40,000 hollow fiber modules per year with capacity to expand and global Pentair footprint.
Efficiency and performance	• Adequate water transfer from stack exhaust to stack inlet with minimal pressure losses and low overall product weight • Low pressure drop
Ease of use, customizable	• Easy access to mounting • Regulatory compliance • Highest allowable operating temperature • Versatile configurations and connection/interface capability • Versatile housing design for low cost and quick customizations including water management, sensor integration and bypass • Scalable and modular design • Easy and simplified maintenance to reduce the total cost of ownership
Durability	• Freeze start capability • Stable materials of construction with minimal impact on proton exchange membrane (stack)
Partnership	• ISO 9001 quality management system • Access and familiarity with AS9100 and other ISO standards • In-house engineering experts in hollow fiber moisture transfer and humidifier testing capability • Customer care team aimed at exceeding service expectations
Contributes to sustainability	• Pentair's responsibility to provide products and solutions that make life better for people and our planet • Disciplined product stewardship team dedicated to support and contribute to sustainability

PRELIMINARY SPECIFICATIONS

Fuel Cell Humidifier Module

P/N: 11018A

Fuel Cell Humidifier Assembly

P/N: 21018A-UAV

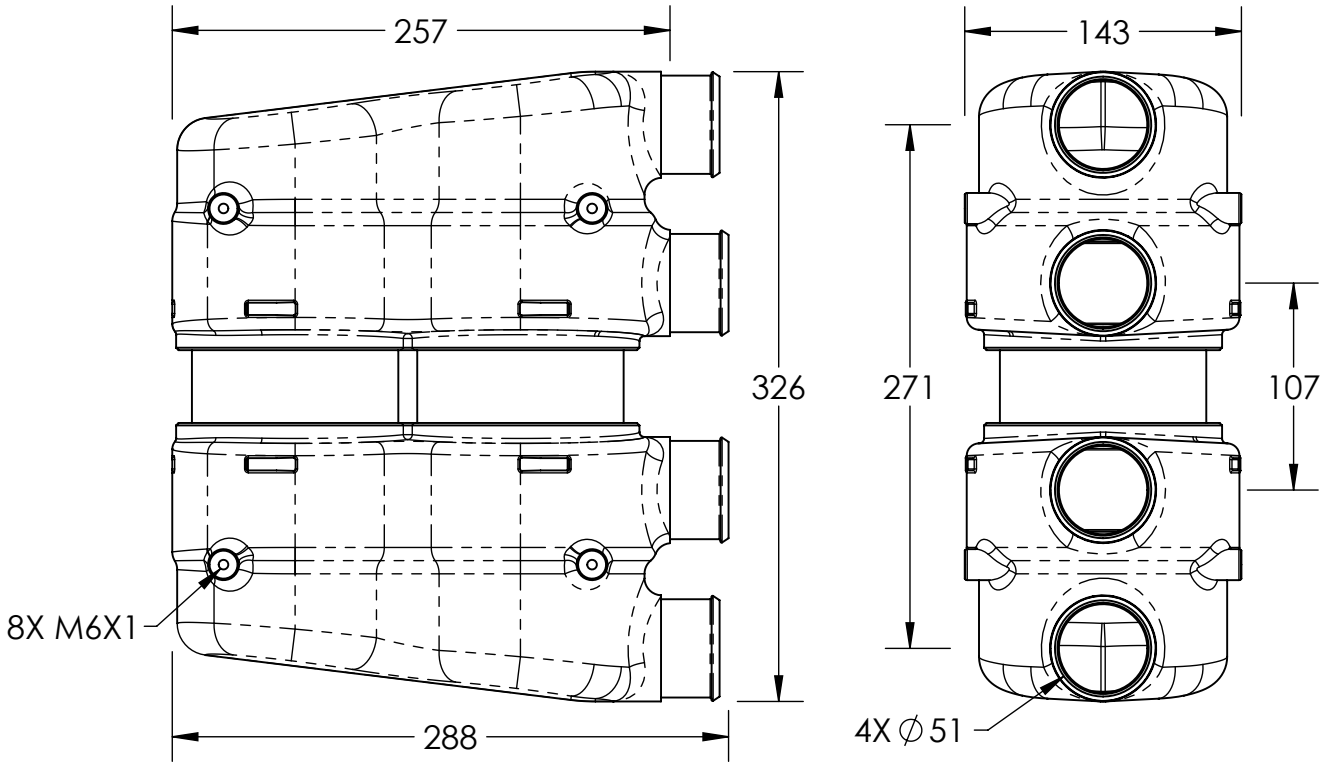
P/N: 21018A-XAV

Feature	HumidiPower Fuel Cell Humidifier Module	HumidiPower Fuel Cell Humidifier Assembly
Size	221 mm x 113 mm	326 mm x 143 mm x 257 mm
Pressure drop	Wet - 16 mbar @ 1000 SLPM Dry - 22 mbar @ 1000 SLPM	Wet - 47 mbar @ 3000 SLPM Dry - 40 mbar @ 3000 SLPM
Humidification performance	55 °C Outlet Dew Point @ 2000 SLPM	55 °C Outlet Dew Point @ 4000 SLPM
Operating temperature range	-30 °C - 110 °C	-30 °C - 110 °C
Operating pressure range	0 - 3.5 bar(a)	0 - 3.5 bar(a)
Weight	1 kg	4.7 kg
Connection	Custom design	2 inch (50.8 mm) Barbed Ports
Mounting	Custom design	M6 x 1.0 mm Screw Interface
Freeze start	1500 cycles	1500 cycles
Lifetime	25000 hours	25000 hours
Housing material	6061 Aluminum treated for corrosion protection	6061 and A356 Aluminum treated for corrosion protection
Internal materials	High performance polymers	High performance polymers

EXPLODED VIEW AND DRAWING

Replaceable, robust and lightweight aluminum housing that reduces waste and enables recyclability.

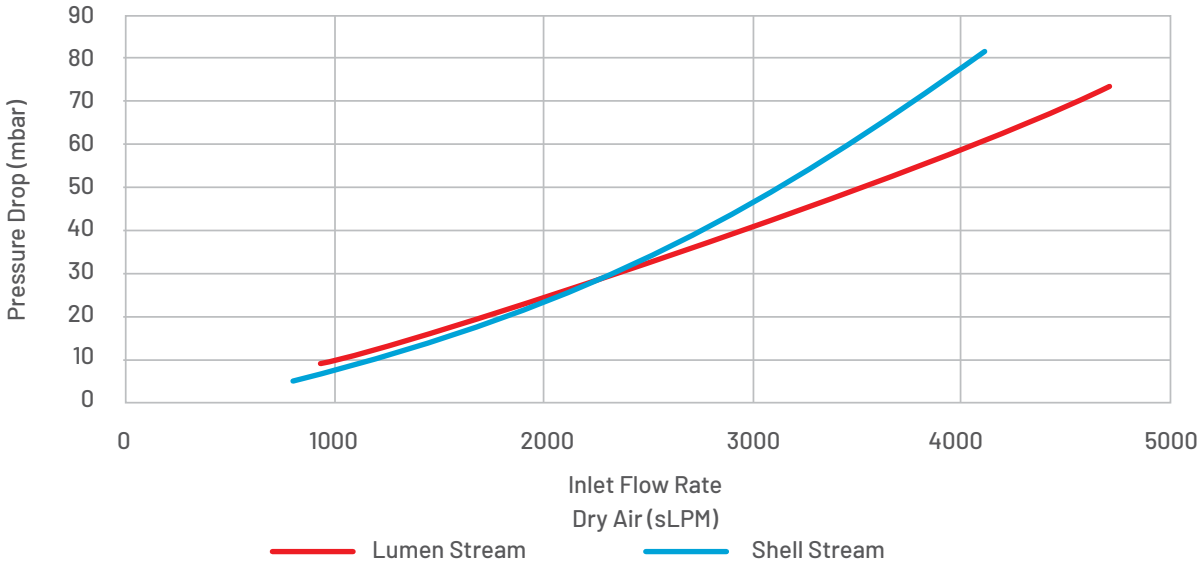
Compliant materials for many regulations



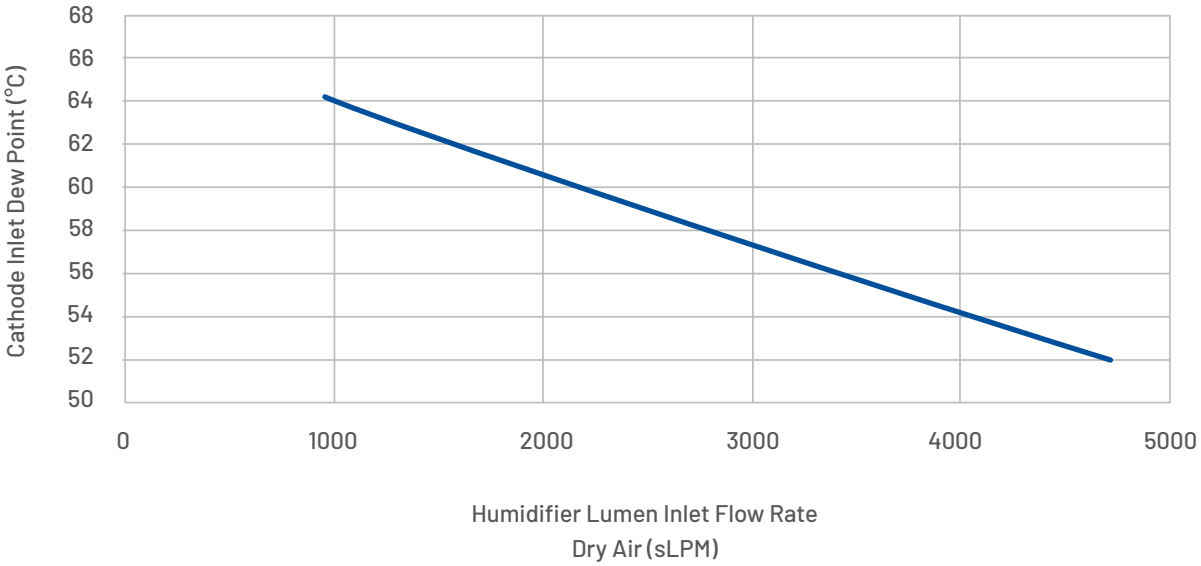
Dimensions in millimeters

PERFORMANCE CURVES

HUMIDIFIER PRESSURE DROP



HUMIDIFIER OUTLET DEW POINT



The results in these graphs are based on the following lumen and shell inlet conditions:

- Dry side (Lumen) inlet conditions: 75 °C, 6.4% RH, 2.0 bar(g)
- Wet side (Shell) inlet conditions: 75 °C, 90% RH, 1.6 bar(g)

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