PROTON MOTOR FUEL CELL GMBH

Reliable fuel-cell operation

bürkert
FLUID CONTROL SYSTEMS

Functionally integrated system solutions for hydrogen supply and water separation

COLLABORATION WITH PROTON MOTOR FUEL CELL GMBH

Bürkert's fluidics components have consistently demonstrated their reliability in many hydrogen applications to date. Turnkey system solutions for anode supply and water separation have been developed for the fuel cells produced by Proton Motor Fuel Cell GmbH.

One effective way to address the climate crisis and reduce the carbon footprint is the use of green hydrogen. Fuel cell systems are both an environmentally-friendly and sustainable energy-supply solution in stationary and mobile applications alike. Fluidics components play an important part in ensuring that they can function reliably and safely. Bürkert's functionally integrated system solutions, which feature advanced valves and sensors, guarantee precise hydrogen dosing, secure hydrogen shut-off, and accurate water separation within the anode circuit of the fuel cells. These compact solutions are designed for seamless integration with fuel cell stacks.

About Proton Motor Fuel Cell GmbH

Since 1998, Proton Motor Fuel Cell GmbH has been Europe's leading expert in climate-neutral energy generation through CleanTech innovations, specializing in the development and manufacturing of emission-free hydrogen fuel cells. Production is focused on stationary applications such as off-grid, decentralized energy supply solutions for residential projects and critical infrastructure. The carbon-neutral custom, standard, and hybrid systems for B2B markets are also used in eco-friendly propulsion concepts in the automotive, maritime, and rail sectors.

Precise and safe hydrogen dosing

With the HyStack® 400, Proton Motor Fuel Cell GmbH has developed compact fuel cell modules that deliver power ranging from 21.3 to 49.7 kW, making them suitable for a wide range of applications. In the HyShelter®, the scalable fuel cell modules are arranged into a hybrid, turnkey container solution.

The scalable HyStack® 400 fuel cell covers power ranges from 21.3 to 49.7 kW, making it suitable for a wide range of applications. © Proton Motor

“We were looking for a tried-and-tested, turnkey system solution for our module hydrogen supply and water separation that would meet our fluidic requirements and provide a tailored interface to the fuel cell stack module.” Such systems are critical for the operation of the fuel cell, as they regulate the supply of hydrogen at the anode inlet as well as being responsible for safety shut-off. At the anode outlet, they must also ensure proper gas purging as well as water separation.

Robert Baustädter, Fuel Cell Engineering at Proton Motor Fuel Cell GmbH

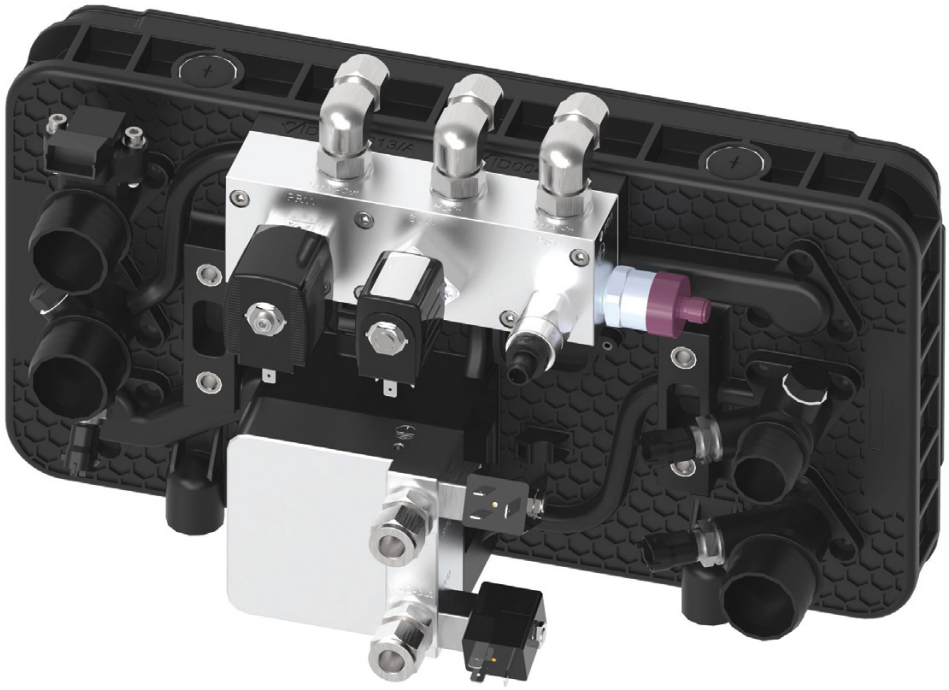
Thanks to its extensive experience across all areas of hydrogen, ranging from generation to distribution and utilization, Bürkert has proven to be a competent partner for the development of the desired fluidic solution. Indeed, in earlier projects, other fuel cell manufacturers also had positive experiences with Bürkert valve technology. The Bürkert product portfolio includes a wide range of fluidic components, with materials tailored to the specific requirements of these applications, thus providing the basis for diverse system solutions. For the application in question, compact blocks were developed for anode supply and water separation. These blocks were designed to be mounted directly on the media adapter plate of the stacks using fluidic fittings, keeping installation space requirements to a minimum.

“The media adapter plates, produced by an external supplier using 3D printing, serve as more than just a mechanical interface. They are in fact multifunctional components that monitors both the pressure and temperature of each line, and in conjunction with the overarching system, ensures proper temperature regulation,” explains Robert Baustädter. This means that the fuel cells become operational quickly even at sub-zero temperatures.

Proportional valves in the anode block

In the anode block, a proportional valve handles the hydrogen supply, while a shut-off valve is responsible for the safety shut-off of the hydrogen. An integrated pressure sensor monitors the set-point pressure. A pressure switch has been installed additionally as a redundant safety component. This safety shut-off valve (Type 6440) – a servo-controlled piston valve – has already proven its reliability in numerous hydrogen applications. The stopper and core guide tube are welded together to increase pressure resistance and provide safety against leaks. The particular shape and surface quality of the housing allow maximal flow values. The coils are encased with an epoxy that is highly resistant to chemicals.

The second valve (Type 6020) – a direct-acting proportional valve – handles pressure control for the hydrogen. With its integrated shut-off function, it also provides a tight seal. It is already being deployed in many hydrogen and gas applications. Suitable cartridge and flange connections, as well as solenoids with automotive plugs with IP6K9K protection rating, are available for use in fuel-cell systems.



For anode supply and water separation, compact system blocks were developed that are designed to be mounted directly on the media adapter plate of the stacks using fluidic fittings.
© Proton Motor

Water and hydrogen separation

In fuel cell systems, the hydrogen fed into the anode is never fully consumed. Through the so-called recirculation loop, unused hydrogen is not wasted but is instead fed back into the fuel cell stack. At the anode outlet, the water separator with its two integrated valves, performs two key functions: it facilitates the flushing process of the fuel cell system and removes the water produced by the chemical reaction within the fuel cell stack. In the two direct-acting Type 7011 plunger valves, the stopper and core guide tube are welded together to increase pressure resistance and provide safety against leaks. The sealing materials are tailored to the specific application, as they must not only work precisely and reliably, but must also be suitable for the specific operating condition. For hydrogen, it must be ensured that the materials used do not become brittle, and where deionised water is concerned, that the materials do not corrode.

The advantages

Enduring safety:
The enhanced pressure and leak safety, along with reliable sealing of the hydrogen valves, ensure long-term and failure-free operation. IP6K9K protection rating.

Space-saving solution:
Compact block solutions incorporating valves and sensors require minimal space and can be installed with a high level of flexibility to meet your requirements.

Flexible components:
Depending on the application, valves are available with cartridge and flange housings, as well as solenoids with automotive connectors.

Quick installation:
Turnkey system solutions consisting of valves and sensors enable compact and quick assembly in fuel cell stacks.

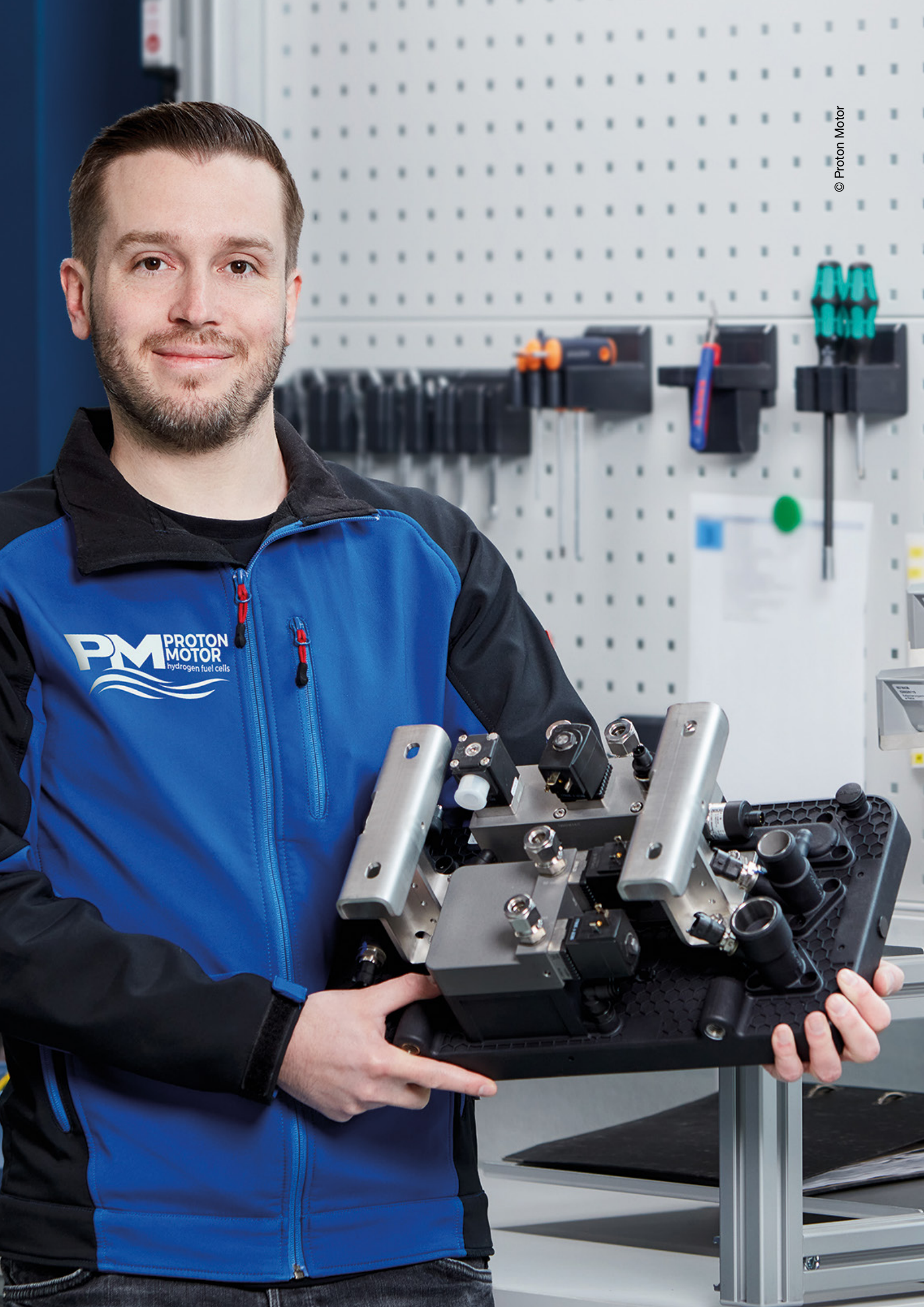
Specific materials:
Fluidic components made from materials that do not become brittle or corrode in applications using deionised water.

Bürkert know how:
Our fluidics components have demonstrated their reliability many times over in situations where hydrogen is produced, distributed, and utilised.

PROTON MOTOR
hydrogen fuel cells

“Since the fluid system solution for anode supply and water separation has proven itself admirably in the HyStack® 400, we will continue to work closely with Bürkert in the future. With the HyStack® 200, which is currently in development with outputs ranging from 4 to 11 kW, the same fluid systems will basically be used, but with smaller valve nominal diameters. Here, too, we will benefit greatly from the know-how of the fluidics experts.”

Robert Baustädter, Fuel Cell Engineering at
Proton Motor Fuel Cell GmbH



07/2024

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