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FLUID CONTROL EXCELLENCE

Valve Solutions for Fuel Cell Systems

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Solenoid valves for fuel cell systems

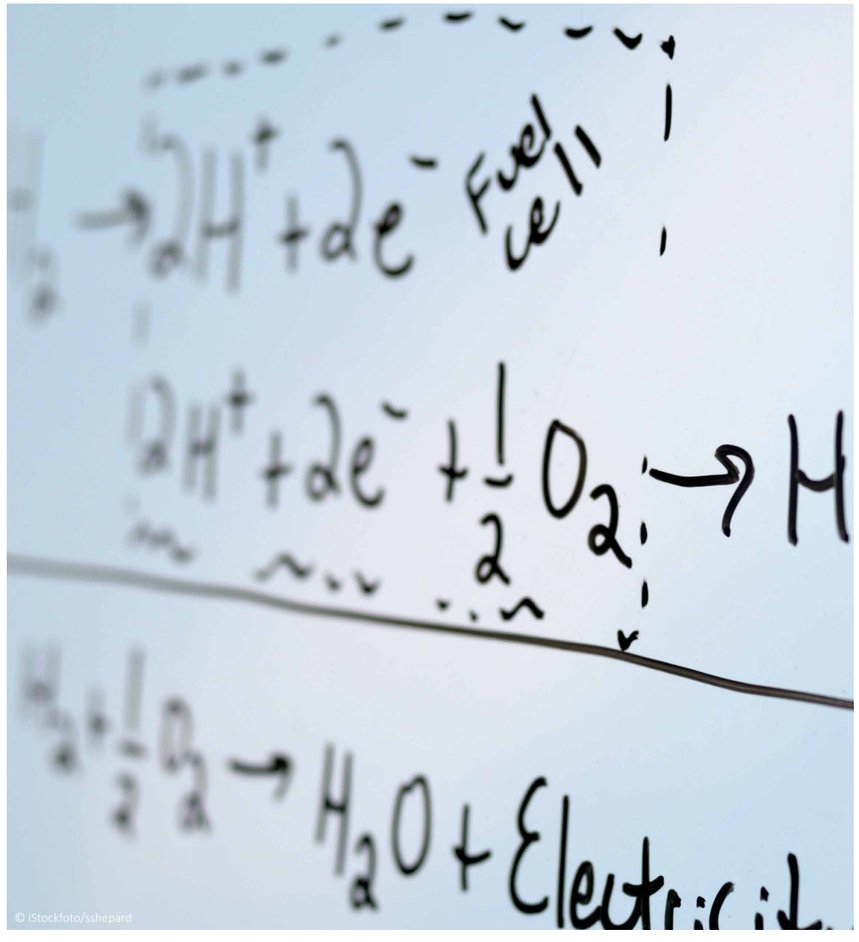
Valves are required in fuel cell systems to supply the gaseous fuel (generally natural gas or hydrogen) at the inlet side and to purge the condensate at the outlet side of the device. According to the initial pressure of the gas, the pressure will be reduced in several cascades.

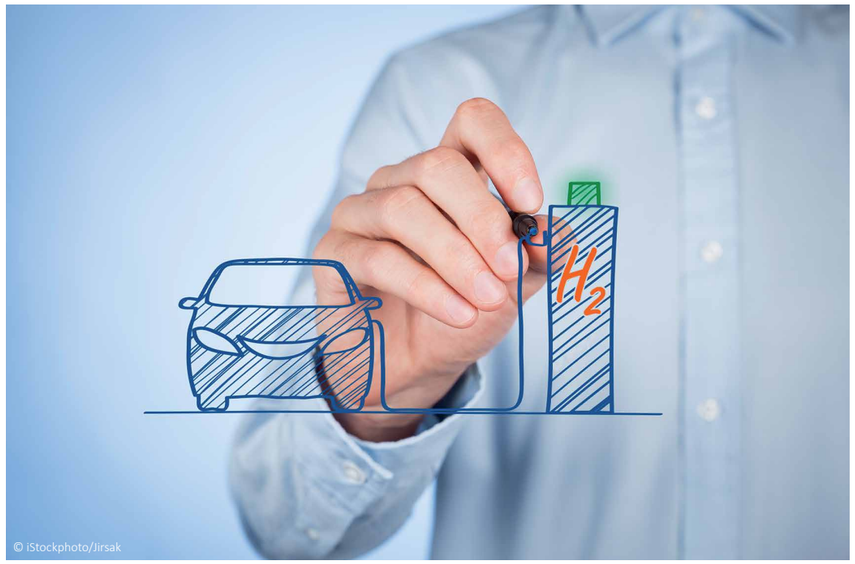
Usually, two types of valves are embedded. On one hand the system needs on/off valves to drain condensate or to shut off the tank or the entire system. On the other hand, one proportional valve is required to dose the flow rate of gaseous fuel to the stack's inlet. Depending on the actual power demand, the gaseous fuel flow will be controlled through a highly dynamical proportional behavior.

Fuel cell technology –
special requirements for valves

One of the most important requirements for the valves are low internal and external leakage in order to ensure high level of process stability and repeatability of the system. It is hereby also important to reduce the hydrogen consumption, also while in stand-by mode.

The embedded valves have to work precisely and reliably, especially under extreme conditions such as high or low temperatures, or under extreme vibration. At the same time, the valves must comply to safety requirement during the entire expected life time.





Automotive and transport

Fuel Cell Systems allow electrically driven vehicles to have an extended range with zero emissions.

Through the application on vehicles, valves within such fuel cell systems are exposed to extreme environmental conditions where these valves have to work absolutely reliably; last but not least because of the fact that hydrogen is typically used as propellant.

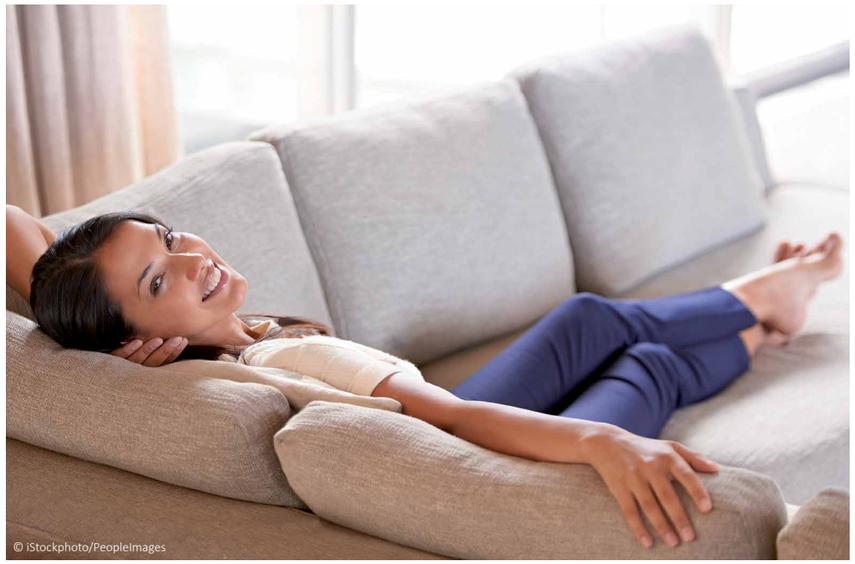
Switching and controlling reliably

There are the following typical valve-requirements on vehicle fuel cell systems:

A **(safety-)shut-off-valve** must close safely in any situation (mechanical shock, power loss, ...) and be leakage-free thereafter. During permanent operation it has to operate energy efficient and consume lowest energy possible. Depending on the specific application, further parameters have to be adapted such as port size, switching time, etc.

A **pressure control valve** is ideally a proportional valve or alternatively a pulse-width-driven switching valve. The pressure control valve must react quickly in order to ensure a precise control mode within a closed loop control circuit.

A **purge/drain valve** controls the release of the condensate, most likely water. The valve has to be frost approved which means, that the expanding liquid must not permanently damage the valve structure and the valve should have a de-frost function.



Stationary fuel cells

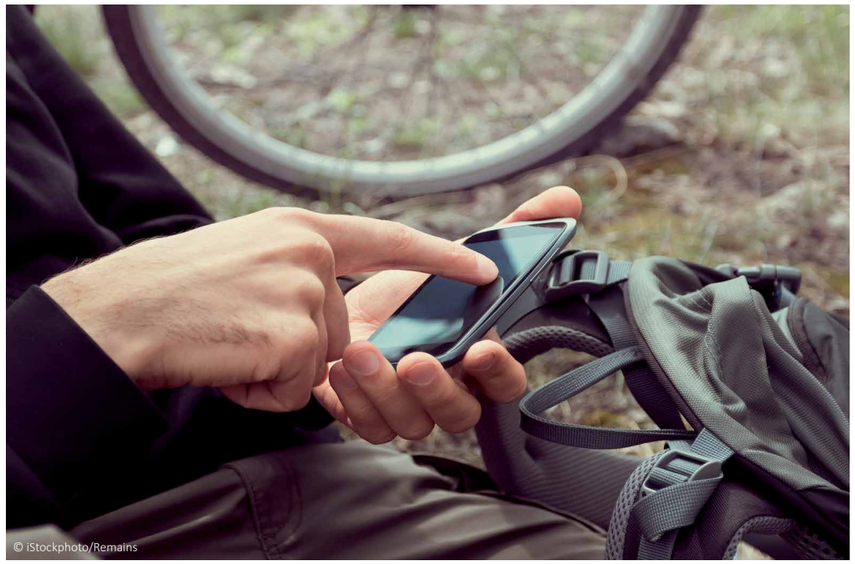
Generate electrical power and heat with low emissions

The process waste heat of stationary fuel cell systems in buildings is fed into the heating circuit of the building. So, besides electrical energy, also heat is „produced“ out of natural gas through the fuel cell. This increases the effectiveness of the system while reducing emissions.

Valves, engineered for long endurance

Stationary fuel cells are generally powered by natural gas, that is fed through pressure regulator valves precisely into the reformer unit of the system. Since such systems are typically installed within closed rooms, the valves must be absolutely gas tight, both internally and externally, which is also subject to the DVGW-approval. As part of a building equipment, the valve has to have a high level of life expectancy.

Also in such stationary system, one additional switching valve is integrated in order to periodically drain the condensate without releasing unconsumed gaseous fuel at the same time.



Portable devices/ battery replacement

More and more electrical devices are used in our every-day life, such as consumer electronics, safety devices or medical technology. The operation time of these devices is always limited to the capacity of the integrated batteries.

Using micro fuel cell systems, such devices can operate much longer independently from the power grid and have a reduced system weight at the same time.

Microvalves, highly integrable

Portable fuel cell systems are typically run with a gas-cartridge which can be exchanged when necessary. Such systems need to be small and light weight, and are normally trimmed to low energy consumption. These requirements are directly assigned to the micro valves that dose the gaseous fuel into the micro stack.

Our 7 mm-Spider®-Valves are specially designed for micro dosing purposes.

You can expect more

We create a value added valve solution out of our wide valve portfolio for you. Because our valves are based on our construction kit, we can react very flexibly on any demand in order to offer an economic solution to you.

You receive a fulfillment – from design and construction up to the serial product. Through our deep vertical integration we have full control over quality and cost.

Value added valves

As a matter of course, a valve, that has been customized for you, is exclusive for you. Only by means of exclusivity of the core components of your products, you can keep and improve your competitive advantage.

Your product is very special! It requires special components therefore. Staiger valve technology.

>> Staiger Valve Technology

For more than 40 years Staiger is coining the evolution of valve technology and valve electronics essentially. More than 200 patents and utility patents result from innovativeness and technical creativity.

Of course we know all the function principles of our standard-products by heart. However, we focus the development of customized products:

Valve solutions including the necessary electronic control – custom fit according to the demands at competitive prices.

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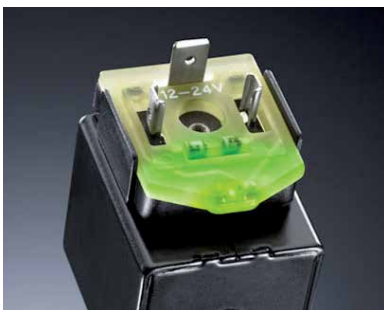



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APPLICATIONS

Automotive

High level of quality at competitive series prices is the classical challenge in this industry sector. We master this by adapting our products perfectly to technical and normative requirements and thereby make a valuable contribution to reliability and consequently to the increasing satisfaction of your customers.

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Auxiliary heating

Type VA 206-001

2-way solenoid valve, direct actuated, NC

Orifice (DN): 0.6 mm

Pressure: -0.5...1.8 bar

Medium: Gasoline, diesel

Valve body: Stainless steel

Emission control

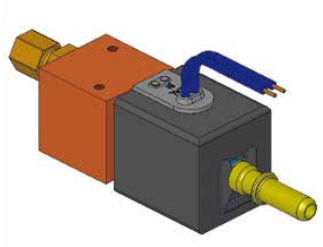
2-way solenoid valve, direct actuated, NO, axial flow

Orifice (DN): 2.5 mm

Pressure: 1...10 bar

Medium: AdBlue®

Valve body: Stainless steel



Gas injection

Type VA 204-507

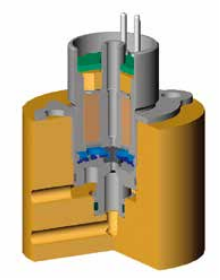
Assembly with 3-way Spider®-Valve, size 15 mm, direct actuated, NC

Orifice (DN): 1.5 mm

Pressure: 0...6 bar

Medium: Liquid gas

Valve body: Brass



Heating system

Type MA 202-007

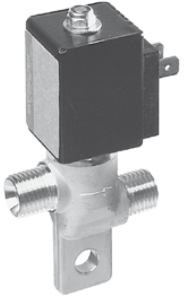
2-way solenoid valve, direct actuated, NC

Orifice (DN): 3.5 mm

Pressure: 0...1 bar

Medium: Gasoline, diesel

Valve body: Aluminium



Heating system

Type PA 200-006

2-way cartridge valve, direct actuated, NC, adjustable stroke

Orifice (DN): 1.6 mm
Pressure: 0...3 bar
Medium: Gasoline, diesel
Valve body: POM

A/C control

Type MA 203-009

2-way solenoid valve, direct actuated, NC

Orifice (DN): 26 mm
Pressure: 0...0.1 bar
Medium: Air
Valve body: Aluminium

APPLICATIONS
AUTOMOTIVE

Fuel cells

Type VP 40

2-way Spider µProp®, proportional valve, direct actuated, NC

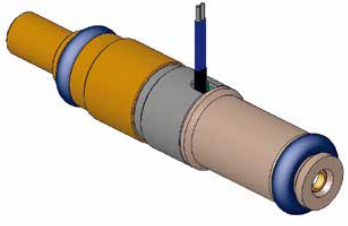
Orifice (DN): 4 mm
Pressure: to 14 bar
Medium: Hydrogen
Valve body: Stainless steel

Emission control

Type VA 204-519

2-way Spider®-Valve, size 15 mm, direct actuated, NC

Orifice (DN): 0.6 mm
Pressure: 1...6 mbar
Medium: AdBlue®
Valve body: Stainless steel



Pneumatic suspension

Type MA 701-005

2-fold manifold with 2-way valves, direct actuated, NC

Orifice (DN): 1.6 mm

Pressure: 0...10 bar

Medium: Compressed air

Valve body: Brass

Seat adjustment

Type PA 201-023

2-way solenoid valve, direct actuated, NC, with pressure switch

Orifice (DN): 1.3 mm

Pressure: -275...600 mbar

Medium: Water-glycol mixture

Valve body: POM

APPLICATIONS
AUTOMOTIVE

Seat adjustment

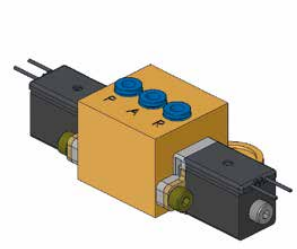
3-way manifold valve block, direct actuated, NC

Orifice (DN): 1.0 mm

Pressure: 6...12 bar

Medium: Compressed air

Valve body: Plastic



Seat adjustment

Type PH 808-001

5-fold manifold, 3-way lever actuated valves

Orifice (DN): 0.6 mm

Pressure: 2...10 bar

Medium: Compressed air

Valve body: POM