»TO IDENTIFY THE POTENTIAL FOR OPTIMISING YOUR PERIPHERAL COMPONENTS USING SCIENTIFICALLY RELIABLE METHODS AND TO APPLY OUR INDEPENDENT TESTING RESULTS FOR CONVINCING YOUR CUSTOMERS.«

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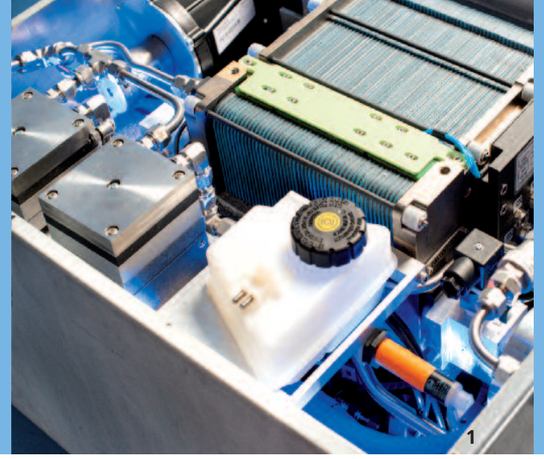
SYSTEM TECHNOLOGY FOR FUEL CELLS. CHARACTERIZATION. TESTING. VERIFICATION.



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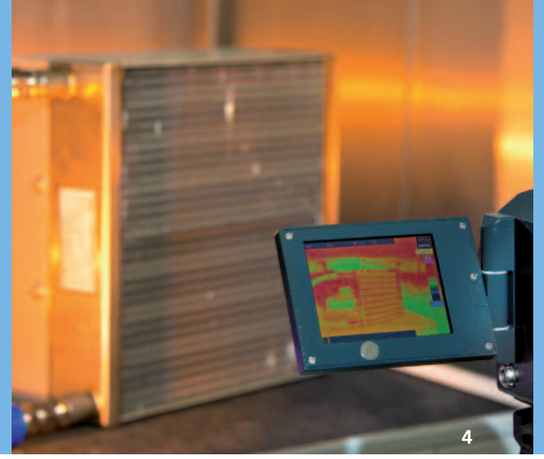

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THE SYSTEM PERIPHERY IS DECISIVE

In fuel cell systems, the demands on pheripheral devices are high. Both external components (humidifiers, compressors, condensers, pumps, valves, heat exchangers) and the primary fuel cell components (bipolar plates, gas diffusion layers, membrane electrode units) must operate reliably and efficiently under extreme conditions with high electrochemical stability. At the Fraunhofer Institute for Solar Energy Systems ISE, we support our clients in their product development by offering our expert scientific analysis, application-oriented tests and independent test results.

OUR SERVICES

- Investigating the start-up and operating behavior of pheripheral components under defined climate conditions
- Long-term tests
- High altitude tests in our low pressure chamber
- Analysis of the chemical and electrochemical stability of components and materials
- Support in drawing up the functional specifications and defining the requirements

TESTS UNDER EXTREME CLIMATE CONDITIONS

Would you like to test the reliability of a peripheral device under defined climate conditions? We measure the start-up and operating behavior of the individual components as well as its efficiency.

- Temperature tests from -40 °C up to +95 °C. Climate tests from +5 °C, relative humidity from 10 up to 95 percent
- Power consumption measurements under different operating modes or during cyclical operation
- Applying pressurized hydrogen up to 12 bar
- On request, we test the performance of the peripheral devices in conjunction with a fuel cell stack or system

Title photo *Long-term test of valves at low temperatures in the climate test chamber.*
1 *Fraunhofer ISE fuel cell system for an autonomous energy supply with a power of 1.5 kW_{el} including peripheral components.*
2 *Testing laboratory to investigate fuel cell components.*
3 *Test drive with one of two fuel cell cars of Fraunhofer ISE.*
4 *Test of a cooling device at high ambient temperatures.*
(photos Rammelberg)

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LONG-TERM TEST

Do you need proof of the long-term stability of your peripheral components? We perform tests to investigate the lifetime of system technology.

- Cyclic load tests
- Leakage tests, also under pressurization
- On request, also in combination with a temperature test from -40 °C up to +95 °C, climate test from +5 °C and relative humidity from 10 up to 95 percent
- On request, peripherals tested in conjunction with a fuel cell stack or system

HIGH ALTITUDE TESTS

Will your components be used at high altitudes and low air pressures? We can analyze their operational reliability in our low pressure chamber.

- Simulation of the operation at low air pressures
- Measurement of the power consumption for different operating modes or in cyclic operation
- Applying pressurized hydrogen up to 12 bar

ELECTROCHEMICAL RELIABILITY

Are your components exposed to corrosive media? We can test the corrosion resistance of your components and offer you a reliable analysis.

- Laboratory tests by exposure to DI water or acid solution also under high temperatures
- Corrosion measurement by applying potential using 3 electrode setup also under high temperatures
- Element analysis of the product water or for determining the chemical resistance of components (ICP-MS)
- Scanning electron microscopy to investigate surfaces, e.g. for the detection of micro cracks
- Energy dispersive x-ray analysis (EDX) for determination of the elements in the material surface, e.g. by catalyst migration
- Electrical conductivity measurements and contact resistance analysis of gas diffusion layer and bipolar plates