

## Customer Application #4

# Fuel Cell Testing – A Challenge for an Electronic Load

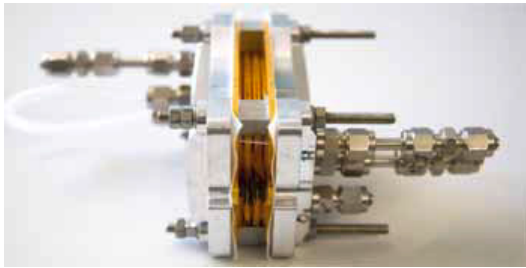
The laboratory for production and usage of hydrogen of the University RheinMain in Wiesbaden owns a power test bench for testing fuel cells. Fuel cells or more correct fuel cell stacks offer the opportunity to produce heat and electrical energy without any emission.



A fuel cell works as follows: The gases hydrogen and oxygen (from the air) are converted in a "cold burning" into water via special platinum coated electrodes and an ionic conductive layer. Simultaneously the conversion creates heat and electrical energy. Different test series for a simple determination of the performance parameters of the fuel cell stacks as well as the electronic impedance spectroscopy for the system were performed between a few Watts and 1.2 Kilowatts.

For testing the different fuel cells an electronic load ZS1606NV from Höcherl & Hackl is used. At this juncture the electronic load is used in its whole range of performance [0...150A & 0...60V] as well as for the creation of electronic impedance spectroscopy.

Whereas the control for the impedance measurement is done by an impedance spectroscope. This can be easily done via the control input (0...10V) of the load's analogue interface. The test bench is controlled with the aid of a cRIO unit from National Instruments with several analogue and digital measurement and control modules. The communication with the electronic load is performed via the analogue Interface. Therefore a special LabVIEW driver was written which was easily done with the aid of the electronic load's manual. For example: The resolution could be changed within one measuring in the remote mode with only one routine of the measurement program. The setpoint setting by the program and the analogue interface is relatively easy as well. Furthermore it is possible to choose one of four operating modes (Current, Resistance, Voltage and Power) whereas Current mode is the most used. In some applications using Voltage mode within one test sequence is useful.



Particularly the stability of the electronic load during the measurements stood the test of time. Apart from that, a handling in manual operation is intuitively possible without reading the manual. Due to performed test series the electronic load was used in endurance tests for several days whereas the load worked reliable and fully met expectations and requirements.

The electronic load from Höcherl & Hackl as part of the test bench for fuel cells is mainly used for training of engineers of physical technique from science department of RheinMain university. For educational purpose measurement equipment has to be robust and easily operable. The electronic load ZS1606NV meets all this requirements and the students are able to work with the load within a short time.



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