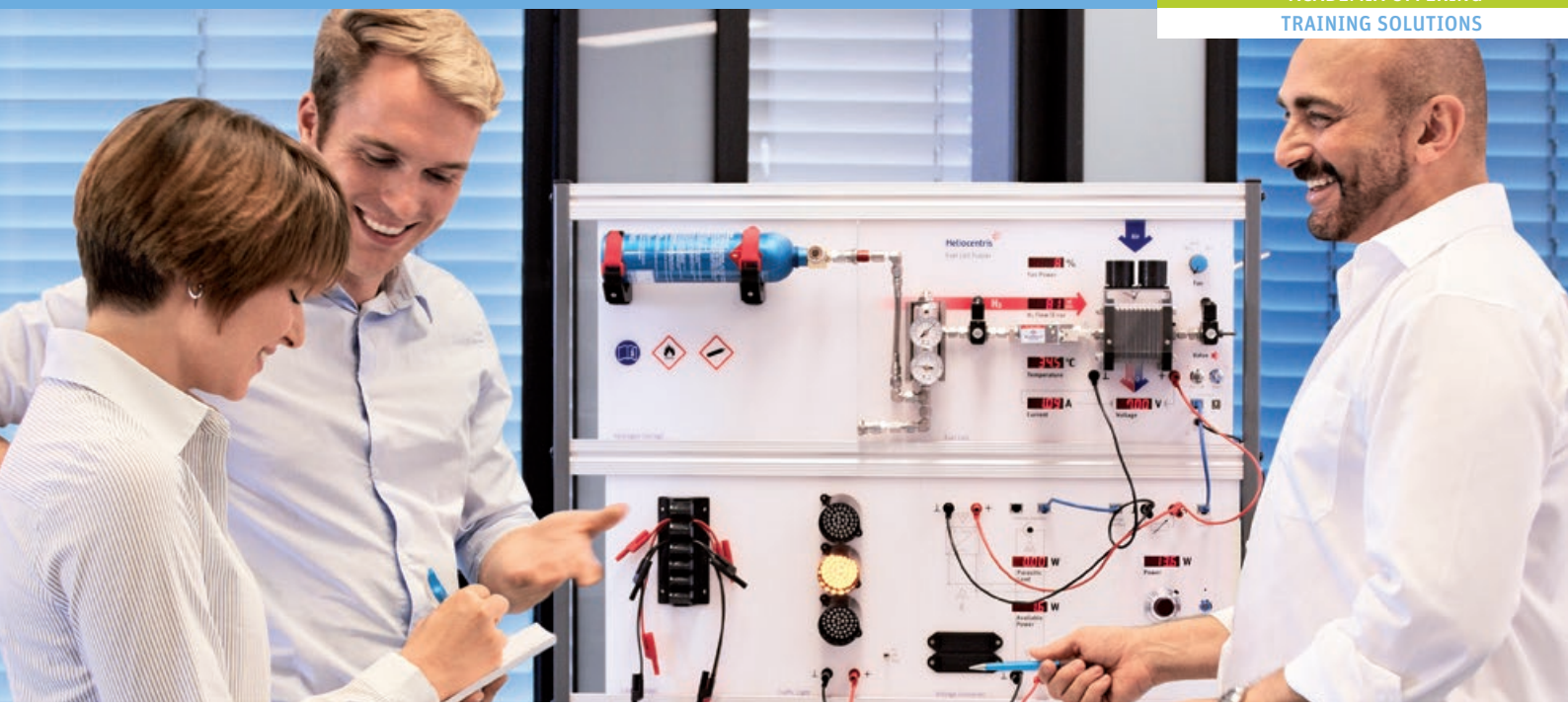
Heliocentris

NEW AND IMPROVED Software and Teaching Material

Fuel Cell Trainer

50 W Fuel Cell Training System

ACADEMIA OFFERING
TRAINING SOLUTIONS



The Heliocentris Fuel Cell Trainer is ideal for teaching fundamental engineering principles of fuel cell systems. Its extensive hands-on experimental capabilities and optimized experiment guide make it a comprehensive training system for both teachers and students.

- » Durable 50 W PEM fuel cell stack (air-cooled, open cathode)
- » USB interface for presenter mode
- » Large displays for monitoring system parameters
- » Intuitive educational user software
- » Automatic teacher mode for instant graph plotting to convey fundamental principles
- » Manual student mode for extensive data generation and empirical analysis
- » Comprehensive teaching material including detailed experiment instructions

- √ **Quick and easy system set-up**
- √ **Robust components**
- √ **Safe and reliable system operation**
- √ **Guaranteed reproducible results**

Fuel Cell Trainer

Fuel Cell Training System for teaching fundamental engineering principles

The Fuel Cell Trainer has been specifically designed to cover the teaching requirements of universities and vocational schools. The fully validated system supports the implementation of practical courses, cutting down preparation time and cost. It helps teachers convey fundamental theoretical knowledge by means of a series of hands-on experiments.

The modular character of the Fuel Cell Trainer allows users to examine each component individually and for a gradual increase in the level of difficulty in order to understand complete fuel cell systems.

Learning objectives of the Fuel Cell Trainer include:

- Fundamental physical and chemical principles: e.g. thermodynamics, Faraday's law, Ohmic resistance etc.
- Structure and functionality of a fuel cell system: e.g. design and dimensioning as well as grid-independent self-sufficient power supply
- Learning to evaluate stack and system efficiencies, losses and parasitic loads
- Parameters influencing the characteristic curve of a fuel cell: e.g. air supply, temperature and load

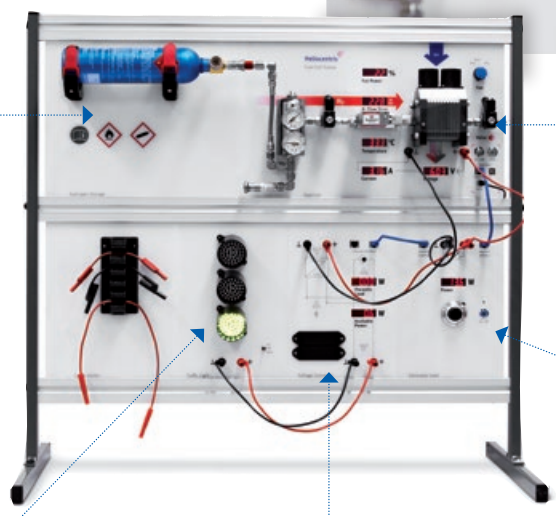
The system is suitable for use in labs, lectures and demonstrations in diverse fields of study:

- Mechanical Engineering
- Chemistry and Physics
- Electrical Engineering
- Mechatronics
- Automotive Engineering
- Renewable Energy and Environmental Technology

Hardware

H_2 Storage Module

The metal hydride canister with a two-stage pressure regulator provides safe hydrogen supply to the 50 W fuel cell.



Fuel Cell Module

Includes a 50 W PEM fuel cell stack, controller, hydrogen flow sensor, purge valve and an adjustable fan. Five LED displays are included for monitoring the temperature, current, voltage, H_2-flow& air supply.

Accessory: Hydrogen Generator HG30

Easy production of high-purity hydrogen (99.9999 % vol), in order to refill the metal hydride canisters.

Electronic Load Module

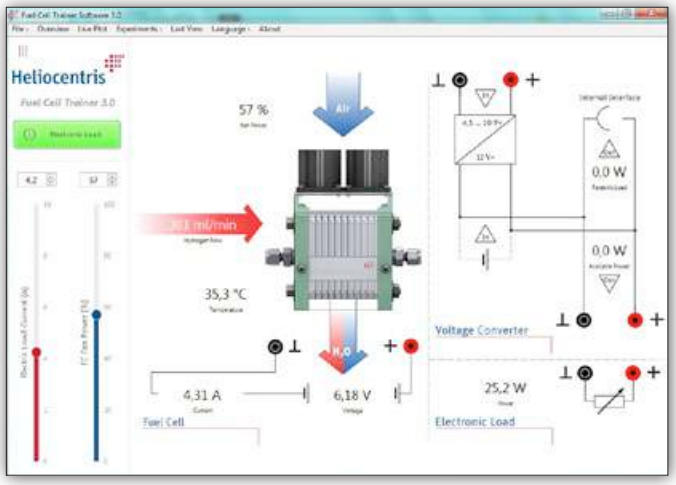
The electronic load allows the user to vary the current and examine its effects on the system. It can be controlled manually or via the software.

Traffic Light Module

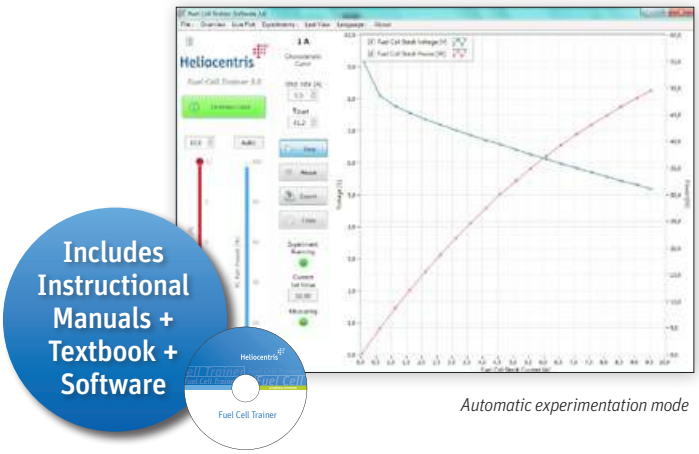
The Traffic Light Module is a 12 V load with three settings.

DC/DC Converter Module

The module converts the output voltage of the fuel cell to regulated 12 V enabling the autonomous power supply of a 12 V load. It includes LCD displays for measuring: load, parasitic losses and available power.



System overview



Automatic experimentation mode

Teaching Material

The teaching material includes a comprehensive instruction manual, experiment guide divided into a teacher and student section as well as the textbook "Fuel Cell Systems Explained" that provides additional background information. The quick-start guide makes system set-up a breeze.

The experiment guide covers:

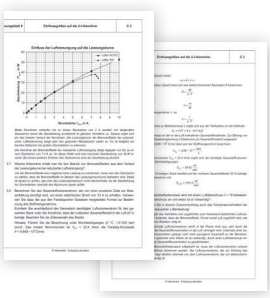
» Basic functions of a fuel cell system

» Characteristic curve of a fuel cell and its influencing factors

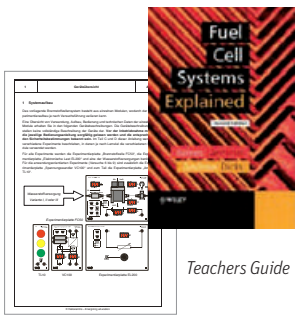
» Determination of the hydrogen current curve

» Efficiency of the fuel cell stack

» Comparing load profiles and the New European Driving Cycle



Experiments



Teachers Guide

Software

The educational user software is designed to facilitate system control, data acquisition and graphical representation of the collected data.

Key features include:

» Visualization of the physical system that is ideal for presentations and group work on experiments

» Real-time monitoring and plotting of system parameters: e.g. hydrogen flow, fuel cell stack temperature, current and voltage

» Automatic experimentation mode for instant graph plotting and evaluation

» Manual experimentation mode for data generation and in-depth analysis of load profiles and various influencing factors such as temperature or oxygen supply

"The Fuel Cell Trainer is the best educational system for teaching fuel cell technology that I have seen on the market. I can recommend this product to any school."

Denis Cote, *Head of Fuel Cell Department*
NAIT Institute of Technology, Canada

Fuel Cell Trainer

- Fuel cell module
- Electronic load module
- DC/DC converter modul
- Traffic light module
- H_2 storage module
- Instruction manual with experiment guide in ring binder
- Software + CD
- Textbook "Fuel Cell Systems Explained"

Art. no. 693*

Accessories: Hydrogen supply – 15 bar H_2 connection kit for supply from 200 bar cylinders

Pressure reducer for filling the hydrogen storage canister in the H_2 storage module

Art. no. 631

* Only available in combination with a hydrogen connection kit from Heliocentris.

Technical Data

Fuel Cell Trainer	
Dimensions (WxHxD)	910 x 840 x 460 mm
Weight	19 kg
Permissible ambient temperature during operation	+5 … +35°C
Language versions	German, English (other languages on request)
Anschlussstandards	DIN, CGA or BS
Netzanschlussweg	230 V (50 Hz), 115 V (60Hz)

Fuel Cell Module	
Rated output	40 W
Maximum output	approx. 50 W
No-load voltage	9 V
Current at rated output	8 A
Hydrogen consumption at rated output	approx. 580 sml/min
Hydrogen purity for operation	min. 4.0 (99.99%)
Permissible hydrogen pressure	0.4 … 0.8 bar

Electronic Load Module	
Maximum continuous power output	100 W
Load voltage	1.2 … 20 V DC
Load current	0 … 10 A
Mains connection	230 V (50 Hz), 115 V (60 Hz)
Dimensions (WxHxD)	400 x 297 x 135 mm

DC/DC Converter Module	
Input voltage	4.5 … 10 V DC
Output voltage	12 V DC
Max. input current	10 A
Dimensions (WxHxD)	200 x 297 x 95 mm

Traffic Light Module	
Input voltage	12 V DC
Power consumption	max. 10 W
Dimensions (WxHxD)	200 x 297 x 140 mm

H_2 Storage Module	
Storage capacity (at charge pressure of 17 bar)	250 sl
Output	1.7 sl/min
Charge pressure	10 … 17 bar
Charge time	ca. 1 h at 20°C and active cooling

Combine the Fuel Cell Trainer with the Solar Hydrogen Trainer to build your own autarkic Power-to-Gas Lab:

Investigate the entire energy conversion chain – energy harvesting, conversion and storage in the form of hydrogen and consumption by a load. We provide extensive consultation for equipping your laboratory.

Solar Hydrogen Trainer	**Art. no. 812**

Further Accessories:

Hydrogen Generator HG30

Produce high-purity hydrogen for the direct operation of the Fuel Cell Trainer or for refilling the metal hydride canisters.

HG30	**Art. no. 651**
Accessories	
HG series input/ output board	**Art. no. 1801**

H_2 Connection Kit

Pressure reducer for 200 bar standard compressed gas cylinders for the refilling of the metal hydride canister.

15 bar H_2 connection kit	**Art. no. 631**

Heliocentris

VENTUS Ciencia Experimental

C/ Argentina, 2 – Nave A6 – P. Ind. Casarrubios
28806 ALCALÁ DE HENARES - MADRID
Tel.: 91 802 35 62 - Fax.: 91 878 16 90
ventus@ventusciencia.com - www.ventusciencia.com