Heliocentris

Renewable Energy Technology for Education and Research

For Schools, Vocational Schools, Universities and Research Institutes

ACADEMIA OFFERING

Fuel Cells Energy Management Renewable Energy Efficiency Power to Ga

Heliocentris Academia – Your Partner for Instruction in Renewable Energies, Energy Storage and Energy Management.

Knowledge about renewable energies and their storage have become a permanent fixture in our lives and will play an even greater role in the future. The education of students in this technology is a central element of our mission.

Heliocentris training products help students at schools, universities and research institutions to understand key concepts regarding renewable energy, energy management and energy storage. You will bring students closer to these complex technologies, while achieving the desired learning outcomes in a fun and interesting way. Heliocentris products will pique the interest of students and assist instructors in the key areas of Science, Technology, Engineering and Mathematics. Each product includes well written manuals, instructional material and software that is tailored to the key topics covered by the system. While the curriculum topics vary, they help give students the required knowledge to understand renewable energy systems.

Our products stand for:

» Curricular relevance and didactic quality
» Measurement precision and excellent workmanship
» High quality products and robust construction
» Simple and fast commissioning and operation
» Versatile areas of application in chemistry, physics and electrical engineering
» Target-group-specific documentation and experiments for students

Heliocentris Academia

Training Products for Schools, Universities and Research Institutes

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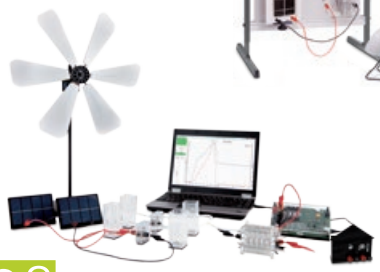

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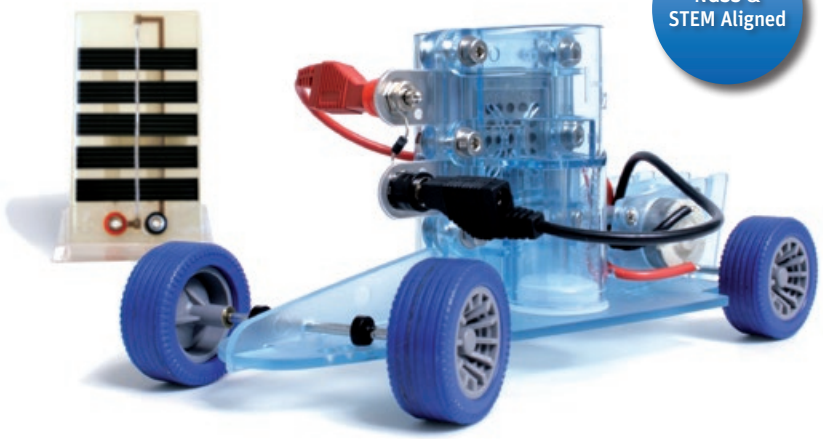
Model Car

A Science & STEM Focussed Solar & Hydrogen-Fuel Cell Car Kit

Powered by water and sunlight, the Model Car is a vivid introduction to the topic of renewable energies. With pre-configured experiments and a curriculum-oriented instruction manual, the contents of solar, hydrogen and fuel cell technology can be easily communicated.

The Model Car is distinguished by its flexible and durable construction and can be used for individual or group work. The numerous experiments can be practically implemented for current topics such as energy storage and alternative drives.

NGSS & STEM Aligned



Key Features

- Design of fuel cells and solar cells
- How to measure the current and the voltage of the fuel cell
- Up to 5 students can work with the Model Car at the same time
- Suitable for communicating subject matter from physics, chemistry and technology curricula
- CO_2-free mobility
- Energy Storage and use of renewable energies
- Chemical reactions of the entire energy conversion chain (e.g. water to hydrogen and oxygen)
- Hydrogen generation by means of electrolysis via solar module or hand generator

COMPONENTS

STORAGE BOX

REVERSIBLE FUEL CELL

SOLAR PANEL

CHASSIS

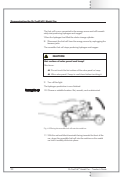
HAND GENERATOR*

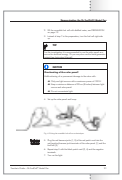
LOAD MEASUREMENT BOX*

INSTRUCTION MATERIAL WITH EXPERIMENT GUIDE & CD

Sample Experiments

- Energy conversion
- How to measure the current and the voltage of the fuel cell and electrolysis
- Hydrogen generation by means of electrolysis via solar module or hand generator
- Load measurement box for measuring current and voltage
- Characteristic curves of current and voltage
- Measurement of electrical charge
- Various load settings possible for measuring the effect on current and voltage
- Design of solar cells and fuel cells
- Influence of illumination intensity and cell shading on the behavior of solar cells
- Generation of electrical energy





Model Car is available as bundle. *Page 7*

Product Options

Model Car Complete	Model Car Demo
The measurement box enables quantitative investigations. Power can be generated with the hand generator as an alternative to the solar module	Numerous simple demonstration experiments for physics, chemistry and technology lessons
» Reversible fuel cell » Solar panel » Chassis » Instruction material with Experiment Guide in ring binder + CD » Bottle with distilled water » Cable set » *Load measurement box** » *Hand generator**	» Reversible fuel cell » Solar panel » Chassis » Instruction material with Experiment Guide in ring binder + CD » Bottle with distilled water » Cable set
Art. no. 354	**Art. no. 352**

Accessories

Lamp	Lamp for operating the solar cell	**Art. no. 314**

Dimensions (W x H x D): 345 x 160 x 280 mm, weight: approx. 2.9 kg.
*Only included with Model Car Complete.

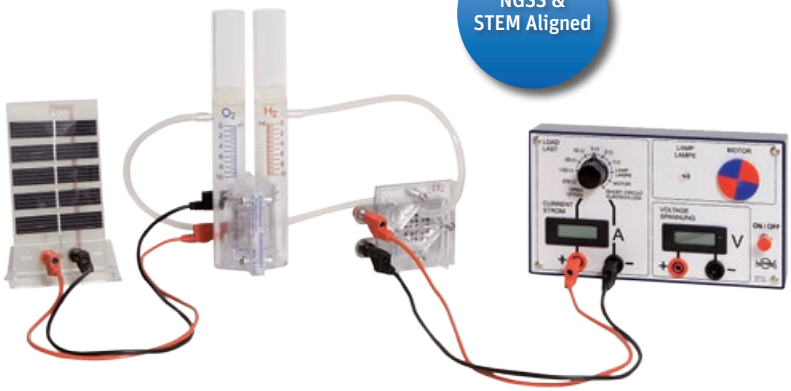
Science Kit

A Science & STEM Focussed Solar & Hydrogen-Fuel Cell Kit

The Science Kit is an extensive experiment set for the subject of renewable energies. 20 pre-configured experiments and extensive accompanying materials make it a complete solution for physics and chemistry lessons.

The components form a complete solar-hydrogen energy conversion chain and can be flexibly combines with one another. The topic of renewable energies can be approached in consideration of the entire conversion chain or on the level of the individual technologies, such as photovoltaics or fuel cells. All components can be used and investigated separately.

NGSS & STEM Aligned



Key Features

- Basic design of fuel cells and solar cells
- Up to 5 students can work with the Science Kit at the same time
- Suitable for communicating subject matter from physics, chemistry and technology curricula
- Energy Storage and use of renewable energies
- Chemical reactions of the entire energy conversion chain, e.g. water to hydrogen and oxygen or methanol to carbon dioxide and current
- Hydrogen generation by means of electrolysis via solar module or hand generator
- Conversion of solar energy to electronic energy and hydrogen
- Increase of efficiency of fuel cells
- Use of stored energy
- Separation of water into hydrogen and oxygen

COMPONENTS

STORAGE BOX

FUEL CELL

LOAD MEASUREMENT BOX

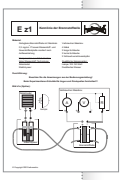
METHANOL FUEL CELL*

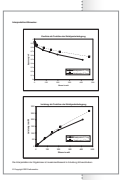
FUEL CELL COMPONENTS*

INSTRUCTION MATERIAL WITH EXPERIMENT GUIDE AND CD

Sample Experiments

- Examination of solar cells and their efficiency
- How to determine the tilt angle of solar cells
- How many solar cells supply a house?
- Investigation of water electrolysis – how is water separated?
- Investigation of the electrolyzer: Does current increase when the voltage is increased?
- Examination of a hydrogen and methanol fuel cell
- How does the green house effect work?
- Examination of efficiency in the system
- Investigating electrolyzers and fuel cells
- Hydrogen as an energy carrier and storage
- How to create a characteristic curve of an electrolyzer and of a hydrogen and methanol fuel cell
- Calculating the Faraday efficiency of an electrolyzer





Science Kit is available as a bundle. *Page 7*

Product Options

Science Kit Complete	Science Kit Demo
Basic experiments and in-depth experiments for various fuel cell types	A variety of basic experiments for physics, chemistry or technology lessons
» Electrolyzer » Fuel cell » Solar panel » Load measurement box » Instruction material with Experiment Guide + CD » Take-apart fuel cell* » *Methanol fuel cell**	» Electrolyzer » Fuel cell » Solar panel » Load measurement box » Instruction material with Experiment Guide + CD
Art. no. 355	**Art. no. 350**

Accessories

Lamp	Lamp for operating the solar cell	**Art. no. 314**
Hand generator	Hand generator for manual production of hydrogen	**Art. no. 345**

Dimensions (W x H x D): 430 x 150 x 310 mm, weight: approx. 5.6 kg.
*Only included with Science Kit Complete.

Professional

Focussed on Science, Engineering (STEM) & Renewable Energy Topics

The Professional Training System forms a complete solar-hydrogen energy circuit. Electric current is generated by a solar cell, stored by means of electrolysis and converted back in a fuel cell which supplies a consumer.

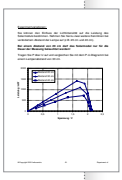
The Professional Training System supports you in presentations to the class. Solar technology and fuel cells can be investigated in detail. Large components and easy-to-read displays are ideal for group presentations.
Pre-configured experiments and comprehensive documentation simplify lesson preparation.

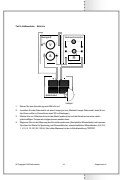
Key Features

- Demonstration unit for classroom-style teaching
- Suitable for communicating subject matter from physics, chemistry and technology curricula
- Basic design of fuel cells and solar cells
- How to measure the current and the voltage of the fuel cell and electrolyzer
- Energy storage and use of renewable energies
- Chemical reactions of the entire energy conversion chain
- Water to hydrogen and oxygen
- Hydrogen generation by means of electrolysis via solar module or hand generator
- Quick guide for fast commissioning
- Complete energy conversion chain from solar energy to hydrogen and into electrical energy again
- Observing increased efficiency of fuel cells

Sample Experiments

- Examination of solar cells and their efficiency
- How to determine the tilt angle of solar cells
- How many solar cells supply a house?
- Investigation of water electrolysis: How is water separated?
- Investigation of the electrolyzer – does current increase when the voltage is increased?
- Examination of a hydrogen and a methanol fuel cell
- How does the green house effect work?
- Examination of efficiency in the system
- Investigating electrolyzers and fuel cells
- Hydrogen as an energy carrier and storage
- Characteristic curve of an electrolyzer and a hydrogen fuel cell
- Calculating the Faraday efficiency of an electrolyzer





COMPONENTS

INSTRUCTION MATERIAL WITH EXPERIMENT GUIDE + CD

SOLAR PANEL

DOUBLE FUEL CELL

ELECTROLYZER

MEASURING UNIT[1]

LOAD

Product Options

Professional Complete	Professional Demo
Visualization of measurement data by the measuring unit	Numerous descriptive demonstration experiments for physics, chemistry and technology lessons
» Solar panel » Electrolyzer » Double fuel cell » Load » Instruction material with Experiment Guide + CD » *Measuring unit*[1]	» Solar panel » Electrolyzer » Double fuel cell » Load » Instruction material with Experiment Guide + CD
Art. no. 392	**Art. no. 391**

Accessories

Lamp	Lamp for operating the solar cell	**Art. no. 314**

Dimensions (W x H x D): 600 x 840 x 460 mm, weight: approx. 10.1 kg.
[1] Measuring unit only included with Professional Complete.

Classroom Sets and Instruction Material

The affordable offer for the entire class.

The classroom sets are designed for use by six groups of four students each.[1]

Professional Complete Bundle

1 x Professional Complete

6 x Science Kit Basic*

1 x Science Kit instructional materials

1 x CD

Includes the Professional Complete for presentations to the class. It is based on the same didactic concept as the included Science Kits.

Art. no. 927

Professional Demo Bundle

1 x Professional Demo

6 x Science Kit Basic*

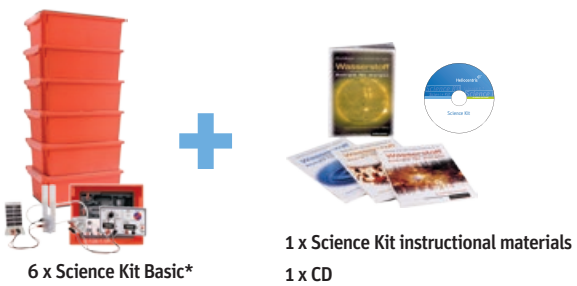
1 x Science Kit instructional materials

1 x CD-ROM

Includes the Professional Demo (without measuring module) for presentations to the class. It is based on the same didactic concept as the included Science Kits.

Art. no. 915

Science Kit Basic Bundle



6 x Science Kit Basic*

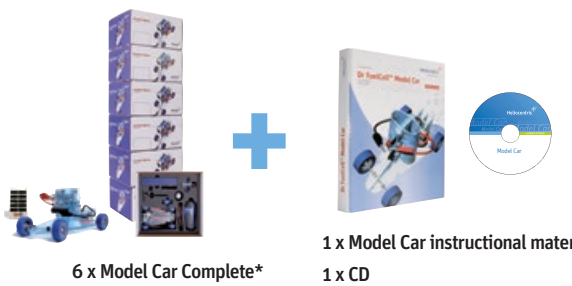
1 x Science Kit instructional materials

1 x CD

Includes the Science Kit Basic for experiments together with the class.

Art. no. 916

Model Car Complete Bundle



6 x Model Car Complete*

1 x Model Car instructional materials

1 x CD

Includes the Model Car Complete for experiments together with the class.

Art. no. 926

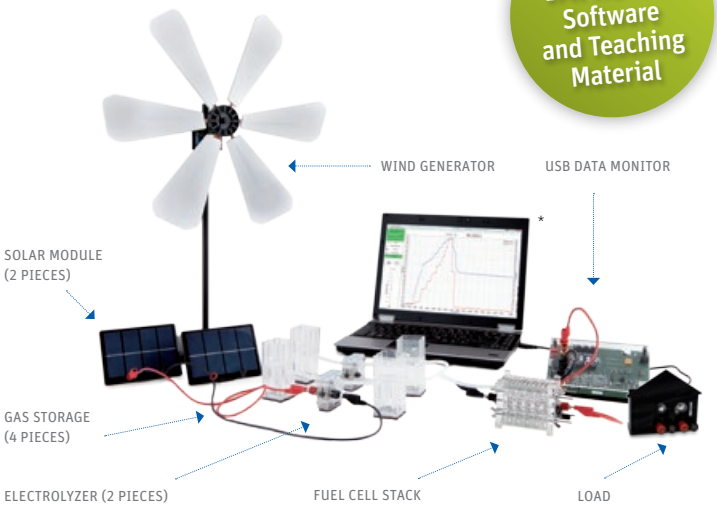
*Without instruction material.

[1] One set of Instruction Material is included in each set.

Clean Energy Trainer

Experiment Set for Energy Production, Energy Storage and Energy Supply

NEW AND IMPROVED Software and Teaching Material



The Clean Energy Trainer demonstrably shows your students the complete chain of renewable energy production (from wind and solar) and hydrogen-based energy storage. Various climate and consumption profiles corresponding to the components in use can be selected in the learning and experimentation software. The supplied documentation is designed for chemistry, physics and electrical engineering lessons.

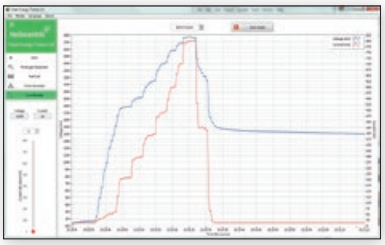
Key Features

- Experimentation set for energy production, storage and supply with solar and wind energy, as well as a fuel cell for up to 4 students at the same time
- Control and generation of electrical energy and the management of these processes
- Comprehensive documentation and experimentation in the fields of chemistry, physics and electrical engineering with 6 experiments and their explanation, as well as the instructor solution set

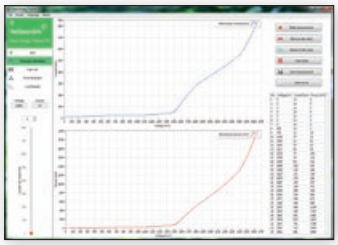
Software

- Guided alignment for optimal positioning of solar and wind components
- Visualization of operating parameters in tables and graphs
- Automatic teacher mode for instant graph plotting to convey fundamental principles
- Manual student mode for extensive data generation and empirical analysis
- Generation of characteristic curves and data export

SOFTWARE



I–V curve

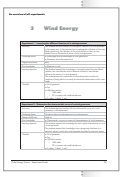


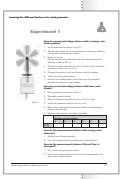
Electrolysis curve

"The Clean Energy Trainer is very good for instruction in renewable energies. [...] We plan to expand its use beyond the regular instruction units in the laboratory."

Dr. Octavian Bass, *2013*
School of Engineering, Edith Cowan University, Australia 2013

Sample Experiments





- Explore properties, efficiency and characteristic curves of the Solar Module, Wind Generator and Fuel Cell
- How to optimally align renewable energy sources: Which energy source generates the most hydrogen?
- Chemical reaction of water during electrolysis: How to generate hydrogen with renewable energy sources
- Which constellation is required at the different locations in order to operate an autarkic single-family home?
- How does a solar / wind / hydrogen system have to be designed in order to supply a residence?
- Applying Faraday's first law to fuel cells

Product Overview

Clean Energy Trainer

- Wind generator
- 2 x solar module
- 2 x 30 ml hydrogen storage canister and 2 x oxygen storage canister
- 2 x electrolyzer
- Take-apart fuel cell stack
- Consumer (house)
- USB data monitor
- PC software
- Anemometer
- Radiation meter
- Instruction Manual and Experiment Guide + CD

	Art. no. 410
Clean Energy Trainer Laboratory Set	**Art. no. 960**

Accessories

Double spot lamp	Lamp with two spots for operation of the solar cells	**Art. no. 421**
Fan	Fan for operation of the wind generator	**Art. no. 422**

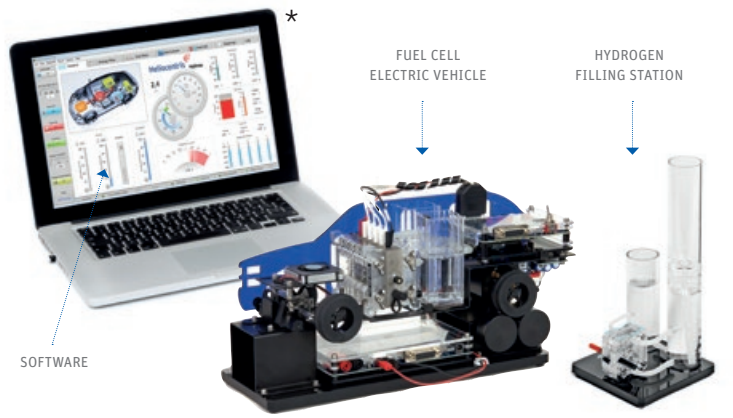
*Notebook not included

NEW
Developed in partnership with key industry players and leading professors

HyDrive – Electric Vehicle Trainer

Experiment Set for Teaching Hydrogen Fuel Cell Technology in Electric Vehicles

The HyDrive provides students with a hands-on experiment set to examine the construction, functionality and benefits of fuel cell and hybrid electric vehicles. The Electric Vehicle Trainer assists teachers in conveying the scientific principles behind this technology. The HyDrive comes with an extensive didactic material and an educational software, facilitating teacher's preparation and execution of classes.



Key Features

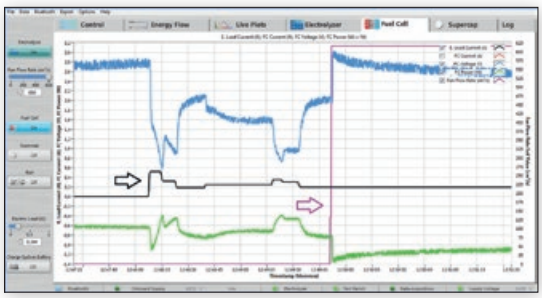
- FCEV vehicle that can be operated independently or in conjunction with a test bench
- H_2 filling station to demonstrate safe vehicle refueling
- The modular set-up allow users to examine separate subcomponents or the complete hybrid system
- Actual components for real qualitative and quantitative analyses - no simulation
- Highly-advanced didactic software
- Extensive experiment guide with >15 experiments that facilitates autodidactical study and problem resolution

Software

The educational software facilitates system control, and monitoring, data acquisition and graphical representation of the collected data. The software visualizes vehicle component interaction, the conversion of one energy type to another, flow direction and state. It displays whether the vehicle is consuming or recuperating energy and allows users to configure a variety of drive cycles and load profiles, e.g. inner city stop & go, highway, uphill or downhill etc..

SOFTWARE

System overview



Characteristic of a fuel cell

Experiments

Basic experiments:

- Charge and discharge characteristics of a supercapacitor
- Characteristic curve of a fuel cell and electrolyzer
- Basic equation of motion
- Conversion of electrical to mechanical power

Application-oriented experiments

- Recuperation of breaking energy
- Constructing and testing a hybrid system

Product Overview

HyDrive

- Model Car
- Take-Apart Fuel Cell Stack
- 2 x Hydrogen Tanks à 30 cm³
- Energy Control Board
- Hydrogen Filling Station
- Supercapacitor
- Test Bench
- Fan
- Software
- Experiment Guide & Teachers Guide
- Bluetooth Dongle
- Accessories e.g. Tubes and Cables

Art. no. 1000

*Notebook not included

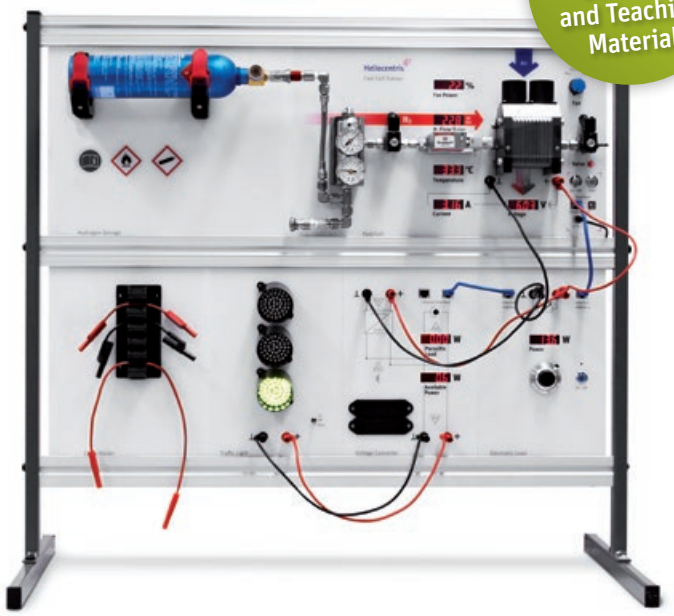
Fuel Cell Trainer

50 W Fuel Cell Training System for Teaching Basic Engineering Principles

The Fuel Cell trainer is ideally suited for teaching the basic engineering principles of PEM fuel cell systems. Extensive experimenting capabilities and comprehensive instruction material with predefined experiments make it a complete instruction package.

All components of the fuel cell system are represented individually and can be examined easily. The supplied software enables your students to conduct experiments and measurements.

NEW AND IMPROVED Software and Teaching Material



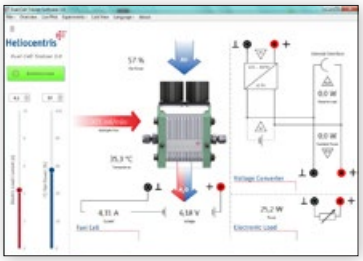
Key Features

- Optimized instruction material for teachers and students
- 50 W PEM fuel cell with modular system design and upgrade options
- Extensive measuring technology and data acquisition via PC interface
- Convenient experimentation software and measurement data acquisition
- Integrated safety monitoring also for inexperienced users

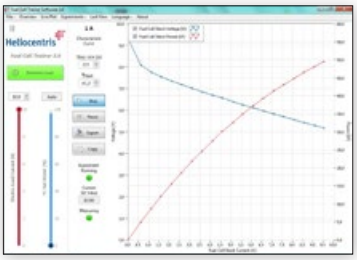
Software

- Visualization of the physical system
- 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

SOFTWARE



System Overview



Automatic experimentation mode

Experiments:

Basic experiments:

- Characteristic curves and efficiency curves
- Dependence of output on temperature and air supply
- Hydrogen / current characteristic curve
- Calculating the efficiency of the fuel cell stack

Application-related experiments:

- System efficiency of a fuel cell system
- Independent power supply and working range of a fuel cell
- Sample application for fuel cell car: fuel consumption and load profile

Product Overview

Fuel Cell Trainer

- Fuel cell module
- Electronic load
- DC voltage converter module
- Traffic light module
- H_2 storage module
- Instruction material with Experiment Guide in ring binder
- Software + CD
- Textbook “Fuel Cell Systems Explained”

Art. no. 693

Accessories: Hydrogen supply – 200 bar H_2 connection kit

Pressure reducer for filling the hydrogen storage canister in the H_2 storage module **Art. no. 631**

Dimensions (W x H x D): 910 x 840 x 460 mm, weight: 20 kg.

Hybrid Energy Lab-System

1.2 kW Fuel Cell and Battery Hybrid System for Laboratory Application

A Fuel Cell – Battery Hybrid System that enables users to understand & research individual components and system behavior under various hybrid set-ups. Designed as a lab to support engineering courses focussed on the application of fuel cells, battery technology, hybrid systems, energy management and energy storage.

Ideal for Courses Focused On:

- Battery Technology (Modeling)
- Battery Systems & Control
- Applied Fuel Cell Technology
- Battery- Fuel Cell Hybrids
- Electrochemical Energy Storage & Conversion
- Renewable Energy Storage
- Electrical & Hybrid Vehicles (HEV/FCEV)
- Backup Power Systems

Includes Instructional Materials

The system provides an experimental platform for advanced training to applied research:

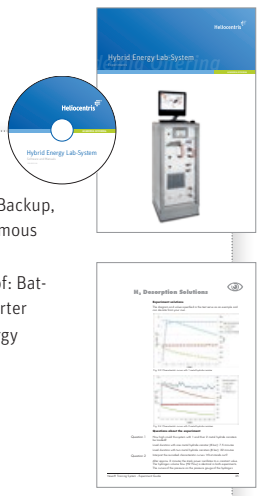
- Fuel Cell – Battery Hybrids
- Battery Charging/Discharging
- Battery & Fuel Cell Model Analysis & Comparison
- Calculation & Evaluation of Electrical Characteristics
- Energy Management
- User Developed Control Algorithms
- Validation of Models Against a Real System
- Hybrid Power System Set-ups: UPS, Autonomous Power Supply, Back-up Power System, HEV/FCEV

Software

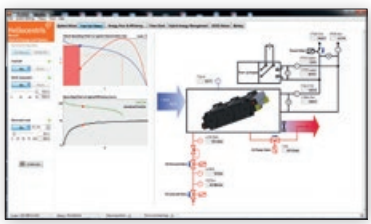
- System Overview
- Efficiency Analysis
- Time Curve
- Freely configurable measurements
- Visualization of characteristic curves
- Selection of manual and automated experiments

Sample Experiments

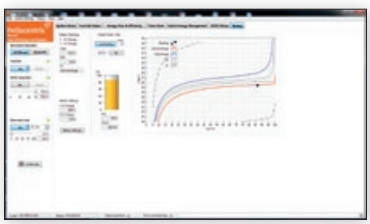
- System design for special applications: Backup, Emergency power supply (UPS), Autonomous power supply, Boost, range extender
- Examination of the operating behavior of: Battery module, Fuel cell module, DC converter
- Determination of the efficiency and energy conversion
- Examination of load step changes of up to 1.5 kW
- Generation of characteristic curves



SOFTWARE



Fuel Cell & H_2 System



Battery charging discharging behavior

Product Overview

Hybrid Energy Lab-System

- Fuel cell module
- Power management module
- Electronic load module
- Battery module
- H2 storage module
- System control module
- Measurement and experimentation software
- All-in-one PC incl. keyboard, mouse
- Instruction and experimentation material

Art. no. 793*

Accessories*: Hydrogen supply – 200 bar H_2 connection kit

Dimensions (W x H x D): 600 x 1,350 x 600 mm, weight: approx. 150 kg.
* Only available in combination with a hydrogen connection kit from Heliocentris.

Solar Hydrogen Trainer

Mobile Laboratory for Hydrogen Generation with Solar Energy

Includes Teaching Materials

The Solar Hydrogen Trainer is a training system for generating hydrogen by means of an electrolyzer, which is powered by two photovoltaic modules. Performance and generation data of the PV modules, power electronics, battery and electrolyzer are captured and displayed in the included LabVIEW based software.

The system is designed to be combined with additional Heliocentris products, such as the Fuel Cell Trainer or Hybrid Energy Lab-System. The components of the system are mobile and can be connected or disconnected quickly. The supplied documentation supports instructors in lesson planning.

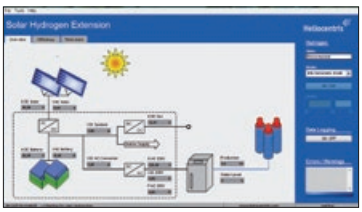
Key Features

- Mobile Laboratory For Solar Hydrogen Generation
- Electrolyzer and PV system can be used separately
- LabVIEW based Software for system control, system monitoring and data acquisition
- Extensive instruction material and Experiment Guide
- User-friendly, easy-to-operate
- Remote monitoring via LAN network is possible
- Can be combined with other systems like Fuel Cell Trainer and Hybrid Energy Lab-System

SOFTWARE

Software

- System overview and control of components
- Overall system efficiency analysis
- Freely configurable measurements
- Overall system output balancing
- System efficiency chain (Sankey diagram) and flow chart
- Voltage and current display for individual components



System Overview

Measurements

Learning Objectives

- Basic principles of photovoltaic power production and storage
- Functional principle of an autonomous solar system
- Determining the efficiency of solar hydrogen generation
- Design of a solar hydrogen system
- Mobile system technology unit
- Hydrogen generator

Product Overview

Solar Hydrogen Trainer

- Mobile unit with solar system components
- 2x mobile photovoltaics module
- Hydrogen generator with interface
- Monitoring and control software
- Cable set

PV version (without hydrogen generator)	**Art. no. 810**
Solar Hydrogen Trainer with 30Nl/h	**Art. no. 811**
Solar Hydrogen Trainer with 60Nl/h	**Art. no. 812**

Accessories

PV sensors: radiation, module and ambient temperature	**Art. no. 821**
H_2 storage canister – metal hydride storage canister 800 Nl	**Art. no. 650**

New Energy Lab

Renewable Energy Smart Grid for Training & Applied Research

The New Energy Lab is a full-fledged energy system for conveying practical knowledge in the field of energy management. The system combines renewable energy generation from solar, wind and fuel cell power with modern energy storage technology.

The New Energy Lab enables the exploration of various energy sources in combination with the battery system or electronic load. The Monitoring and Control Software enable your students to optimally evaluate system data.

Key Features

- Laboratory for solar, wind, hydrogen and fuel cell technology
- Set-up of hybrid system with solar, wind, hydrogen and fuel cell technology, as well as batteries
- High reliability and safety
- Comprehensive system software

Software

- System overview, control and explanation of components
- Efficiency analysis of the overall system and the individual components
- Freely configurable measurements
- Output balancing of the overall system and the individual components
- System efficiency chain and flow chart
- Voltage and current display for individual components
- Monitoring of the hydrogen circuit
- Creating and saving load profiles

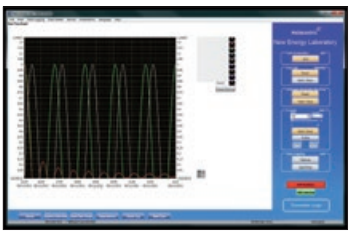
System includes

- Solar system: 1,500 W_p
- Small wind power module: 300 W_p
- Fuel cell module: 1,200 W
- Battery bank: 55 Ah
- Electrolyzer: 60 Nl/h
- Low-pressure metal hydride canisters: approx. 750 Nl
- Electronic load: 2,400 W
- Central energy management unit
- System controller with monitoring and control software
- Measuring technology, such as anemometer, H_2 flow meter

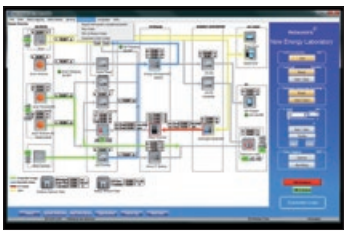
Accessories

- Solar Tracking System
- Extra Sensor Kit
- Solar-PV-Array Simulator 1,500W
- Video Monitoring Unit

SOFTWARE



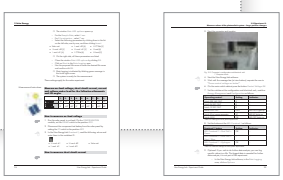
Measurements



System Overview

Learning Objectives

- Introduction to solar, wind, hydrogen and fuel cell technology
- Design of hybrid systems
- Energy management and operation of hybrid systems
- Autonomous operation of real loads
- Scenario analysis: night-time operation, periods of no wind, peak loads



Power-to-Gas Laboratory

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.
Combine the Solar Hydrogen Trainer with the Fuel Cell Trainer or Hybrid Energy Lab-System to build your own autarkic Power-to-Gas Lab.

Solar Hydrogen Trainer

Metal hydride storage canister

Fuel Cell Trainer

Hybrid Energy Lab-System

Hydrogen Supply

For Fuel Cell Modules and Training Systems

HG Series Hydrogen Generators

The HG series hydrogen generators enable the production of the purest hydrogen (99.9999 %) and are suitable for direct operation of fuel cell systems and for filling metal hydride storage canisters.
The maintenance-free generators are available with a production capacity of 30 or 60 Nl/h and are designed for continuous operation. The Input/Output board enables control via PC and an expansion of the product capacity by means of cascading up to 10 generators.

Product Options	
HG30	**Art. no. 651**
HG60	**Art. no. 1302**
Accessories	
HG series Input/Output board	**Art. no. 1801**

Metal Hydride Storage Canisters

Metal hydride storage canisters operate at low pressures from 10 to 17 bar and enable the safe storage of larger quantities of hydrogen.

With various canister capacities (200, 400 and 800 Nl) and the possibility of connecting multiple canisters, the capacity can be increased. The quick coupling connector of the canister assures simple and safe coupling and uncoupling.

Product Options	
MHS200	**Art. no. 648**
MHS400	**Art. no. 649**
MHS800	**Art. no. 650**

H_2 Connection Kit

Pressure reducer for direct operation of fuel cell modules or re-filling metal hydride storage canisters from 200 bar compressed gas cylinders.

Item No. 631

Hydrogen Detector

The portable hydrogen warning device (0 – 100 ppm) for monitoring of the workplace in combination with a leak detection liquid assure safety when working with hydrogen.

Item No. 731

Our products

Product	Art. no.	Article	Page
SCHOOL LEVEL			
Model Car			**Page 04**
	352	Model Car Demo*	
	354	Model Car Complete*	
	926	Model Car Complete Bundle of 6 units	
	Accessories		
	314	Lamp for operating the solar cell	
	345	Hand generator for manual production of hydrogen	
	358	Load measurement box	
	917	Lamps Bundle set of 6 units	
Science Kit			**Page 05**
	350	Science Kit Basic*	
	355	Science Kit Complete *	
	916	Science Kit Basic Bundle of 6 units	
	924	Science Kit Complete Bundle of 6 units	
	Accessories		
	345	Hand generator for manual production of hydrogen	
	314	Lamp for operating the solar cell	
	353	Take-apart fuel cell	
	357	Methanol fuel cell	
	917	Lamps Bundle of 6 units	
Professional			**Page 06**
	391	Professional Demo	
	392	Professional Complete	
	915	Professional Demo Bundle	
	927	Professional Complete Bundle	
	Accessories		
	314	Lamp for operating the solar cell	
	917	Lamps Bundle of 6 units	
HIGHER EDUCATION			
Clean Energy Trainer			**Page 08**
	410	Clean Energy Trainer	
	960	Clean Energy Trainer Laboratory Bundle of 6 units	
	Accessories		
	421	Double spot lamp for operating the solar cell	
	422	Fan for operation of the wind generator	
	962	Double Spot Lamps Bundle	
	963	Fans Laboratory Bundle	
NEW **HyDrive – Electric Vehicle Trainer**			**Page 09**
	1000	HyDrive – Electric Vehicle Trainer	
Fuel Cell Trainer			**Page 10**
	693	Fuel Cell Training System	
	Hydrogen supply		
	631	200 bar H_2 connection kit	
NEW **Hybrid Energy Lab-System**			**Page 11**
	793	Hybrid Energy Lab-System	
	Hydrogen supply		
	736	200 bar H_2 connection kit	
Solar Hydrogen Trainer			**Page 12**
	810	PV version (without hydrogen generator)	
	811	Solar Hydrogen Trainer with 30 Nl/h	
	812	Solar Hydrogen Trainer with 60 Nl/h	
	Accessories		
	821	PV Sensor Kit: Sensors for radiation, module and ambient temperature	
RENEWABLE ENERGY LABORATORY SOLUTIONS			
New Energy Lab			**Page 13**
	880	New Energy Lab	
ACCESSORIES			
Power-to-Gas Laboratory & Hydrogen Supply			**Page 14**
	651	HG30 Hydrogen Generator – 30 Nl/h	
	1302	HG60 Hydrogen Generator – 60 Nl/h	
	Accessories		
	1801	Input/Output board for the HG series	
Metal Hydride Storage Canisters			**Page 14**
	648	MHS200 - Metal hydride storage canisters with 200 Nl	
	649	MHS400 - Metal hydride storage canisters with 400 Nl	
	650	MHs800 - Metal hydride storage canisters with 800 Nl	

Ventus Ciencia Experimental, S.L.
Argentina, 2 - Nave A6 - Pol. Ind. Casarrubios
28806 - Alcal§ de Henares - Madrid
Tel.: 918 023 562
Fax: 918 781 690
ventus@ventusciencia.com
www.ventusciencia.com

Heliocentris Academia GmbH

Rudower Chaussee 29
12489 Berlin, Germany
Tel. + 49 (0) 30 340 601 600
Fax + 49 (0) 30 340 601 599
academia@heliocentris.com
www.heliocentris.com

Heliocentris Energy Systems Inc.

902 – 610 Granville St.
Vancouver, BC
V6C 3T3 Canada
Tel. + 1 604 684 3546
Fax + 1 604 648 9406
academia@heliocentris.com