

# Solar Hydrogen Extension

Mobile Unit for Solar Hydrogen Production

The Solar Hydrogen Extension generates hydrogen from solar power. A software program helps users to learn about energy flux and system efficiency, making it possible to implement interesting projects dealing with autarkic energy supply.



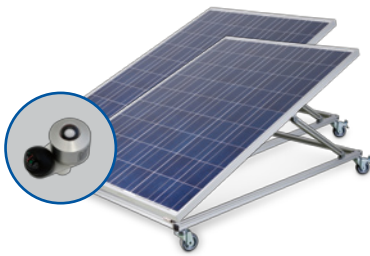
## Product Features

- » PV systems for AC loads up to 700 W
- » Electrolyzer and PV system can be used separately
- » PC software for system control and data acquisition is included
- » Extensive instruction and experimentation material
- » Mobile system components with rollers
- » Remote monitoring via LAN network is possible

# System Design

## Solar Hydrogen Extension

The Solar Hydrogen Extension is a modular system. Connecting cables and quick-release couplings allow easy set-up and take-down.



### Solar Module Unit

- » 2 x 200 Wp polycrystalline solar module
- » Adjustable angle of inclination

#### Optional: PV Sensor Kit

- » Temperature sensors
- » Irradiation sensors
- » Compass for module alignment



### System Technology Unit

- » Suitable for loads up to 700 W
- » Ethernet port for PC control and network connection
- » Includes power electronics, measuring technology and batteries
- » Optimized for the supply of the electrolyzer



### Hydrogen Generator

- » Production capacity of 30 or 60 sl/h
- » Suitable for continuous operation
- » Interface for PC control

# Functional Principle



Solar Module



Load Regulator



Battery



Power Electronics



Hydrogen Generator



H<sub>2</sub> Storages\*

The direct current generated by the solar modules charges the system batteries by means of a load regulator. The power electronics, including an inverter and a DC converter, provide the user with 12 V DC and 230 V AC.

The system control provides for optimal operation of the hydrogen generator. It does not start operating until the battery has reached a minimum charge. This ensures uninterrupted operation of the system in case of inconsistent sunshine.

The hydrogen is stored in metal hydride canisters, which are also used in training and fuel cell systems from Heliocentris.

### Possible Combinations



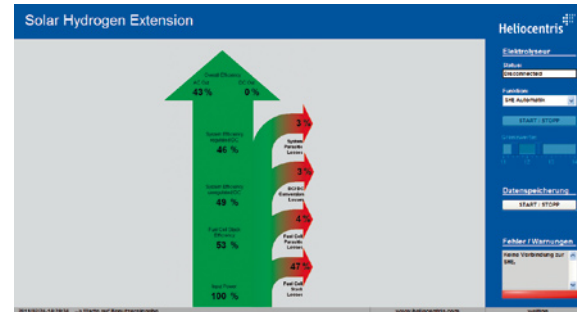
The Solar Hydrogen Extension can be combined with the following products: Instructor Training and Integration System, Nexa® Training and Integration System and FC-42 Evaluation Kit.

\*not included in the scope of delivery

# Software

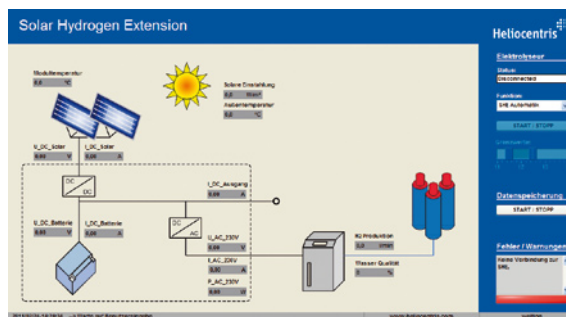
## Solar Hydrogen Extension

The software is used to visualize data and control the system. Measurements at the system and component level are displayed and can easily be retrieved and exported for further processing. Also, the limit values for the battery regulation can be defined.



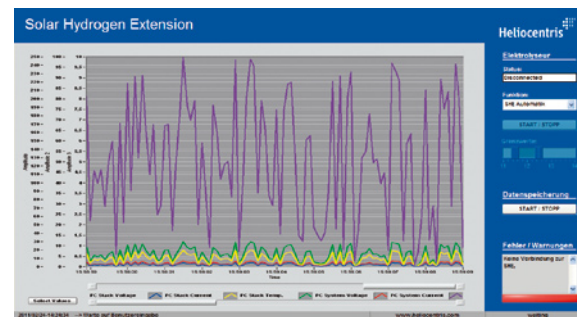
### Efficiency Analysis

- » Overall system output balancing
- » System efficiency chain (Sankey diagram)



### System Overview

- » Flow chart view
- » Voltage and current display for individual components



### Time Curve

- » Graphic visualization of the measurements
- » Freely configurable measurements

# Supplementary Material

The supplementary material facilitates use of the system.

- » Detailed operating manual
- » Science book on hydrogen
- » Experiment Guide with:
  - Graphic display of experiment set-ups
  - Worksheets with questions and tasks
  - Solutions
- » CD-ROM with printable experiment sheets (PDF files)

### Sample Experiments

- » Optimal alignment of solar modules
- » Determining the efficiency of the electrolyzer
- » Behavior of solar modules



# Product Overview

## Solar Hydrogen Extension



### Solar Hydrogen Extension

- » System technology unit
- » 2 mobile solar module units
- » Hydrogen generator with interface (30 or 60 sl/h)

- » Monitoring and control software
- » Cable set

With 30 sl/h hydrogen generator

Item No. 811

With 60 sl/h hydrogen generator

Item No. 812

### Accessories



### PV Sensor Kit

- » Irradiation sensor
- » Temperature sensors
- » Compass

Item No. 821



### Hydrogen Storage Canister

- » Low-pressure metal hydride canister
- » Capacity 760 NI
- » Quick coupling

Item No. 647

# Technical Data

System Technology Unit	
Max. input current, photovoltaics	30 A
System voltage, photovoltaics	24 V DC
Max. output current 12 V DC	2 A
Max. continuous output 230 V AC	700 W
Momentary peak load	1050 W (for 10 sec)
Output voltage frequency	230 V, 50/60 Hz, True Sinus

Solar Module	
Type	Polycrystalline
System voltage	24 V DC
MPP output	200 Wp
Efficiency	>13 %
Short circuit current	8.5 A
MPP voltage	24.95 V

Battery	
Type	2 solar lead-acid batteries (12 V), maintenance-free
System voltage	24 V DC
Capacity	55 Ah

Hydrogen Generator	
Production capacity	30   60 sl/h
Hydrogen purity	> 6.0 (99.9999 %)
Outlet pressure	1.4 - 10.7 bar (selectable)
Required water quality	max. 2 µS/cm, deionized or distilled
Operating temperature	15 °C to 40 °C
Input voltage	120 or 240 V AC / 50-60 Hz
Max consumption (selectable)	300   480 VA
Dimensions (W x D x H)	230 x 35 mm
Weight (unfilled)	20 kg



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