# Solar Hydrogen Extension

Mobile Unit for Solar Hydrogen Production

**New with Solar tracking system**

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.
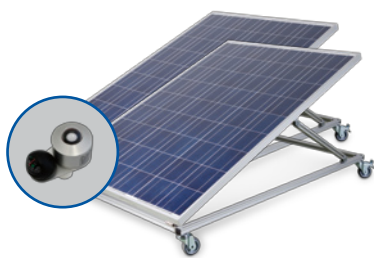


### Solar Module Unit

» 2 x >250 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 net-work connection
» Includes power electronics, measuring technology and batteries
» Optimized for the supply of the electro-lyzer

### Hydrogen Generator

» Production capacity of 72 sl/h » Suitable for continuous operation
» Interface for PC control

# Functional Principle



Solar Module

Load Regulator

Battery

Power Electronics

Hydrogen Generator

H₂ Storages*

*not included in the scope of delivery

The direct current generated by the solar modules charges the system batteries by means of a load regulator. The power elec-tronics, 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 hy-drogen 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



Laptop not included

The solar Hydrogen Extension can be combined with the following products: (FCT) Fuel Cell Trainer; (HEL) Hybrid Energy Lab System; (NIS) NEXA Integration System.

# 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.
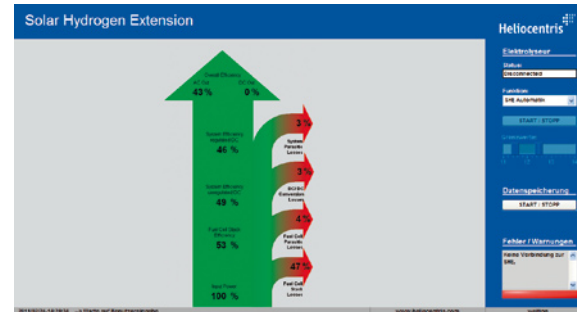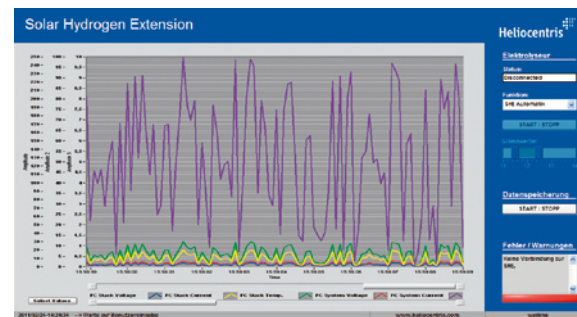


**Efficiency Analysis**
» Overall s ystem output balancing
» System efficiency chain (Sankey diagram)
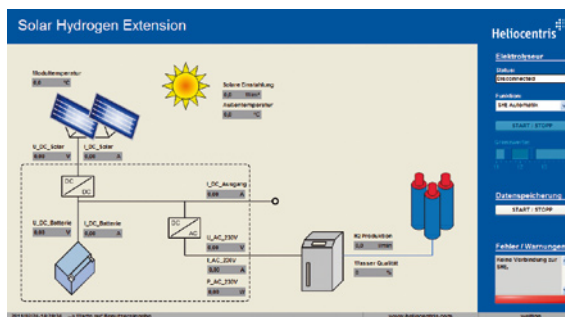


**System Overview**
» Flow chart view
» Voltage and current display for individual components



**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

» Monitoring and control software
» Cable set

With 72 nl/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 Nl
» Quick coupling

Item No. 650

# 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 | > 250 Wp |
| Efficiency | >16 % |
| Short circuit current | >9 A |
| MPP voltage | >30 V |

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

| Hydrogen Generator | |
|---|---|
| Production capacity | 72 nl/h |
| H2 flow rate | 1200cc/min. |
| Hydrogen purity | >  (99.99999 %) |
| Outlet pressure | 16 bars |
| Required water quality | < 1µS/cm, deionized or distilled |
| Power supply voltage | 100-240 Vac 50/60Hz |
| Internal tank capacity | 1,1l |
| External tank capacity | 5 or 10l |
| Dimensions Rack | 19" |
| Weight (unfilled) | 25 kg |

### Heliocentris

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Optional to the Mobile Solar Modul, Solar Tracking System: