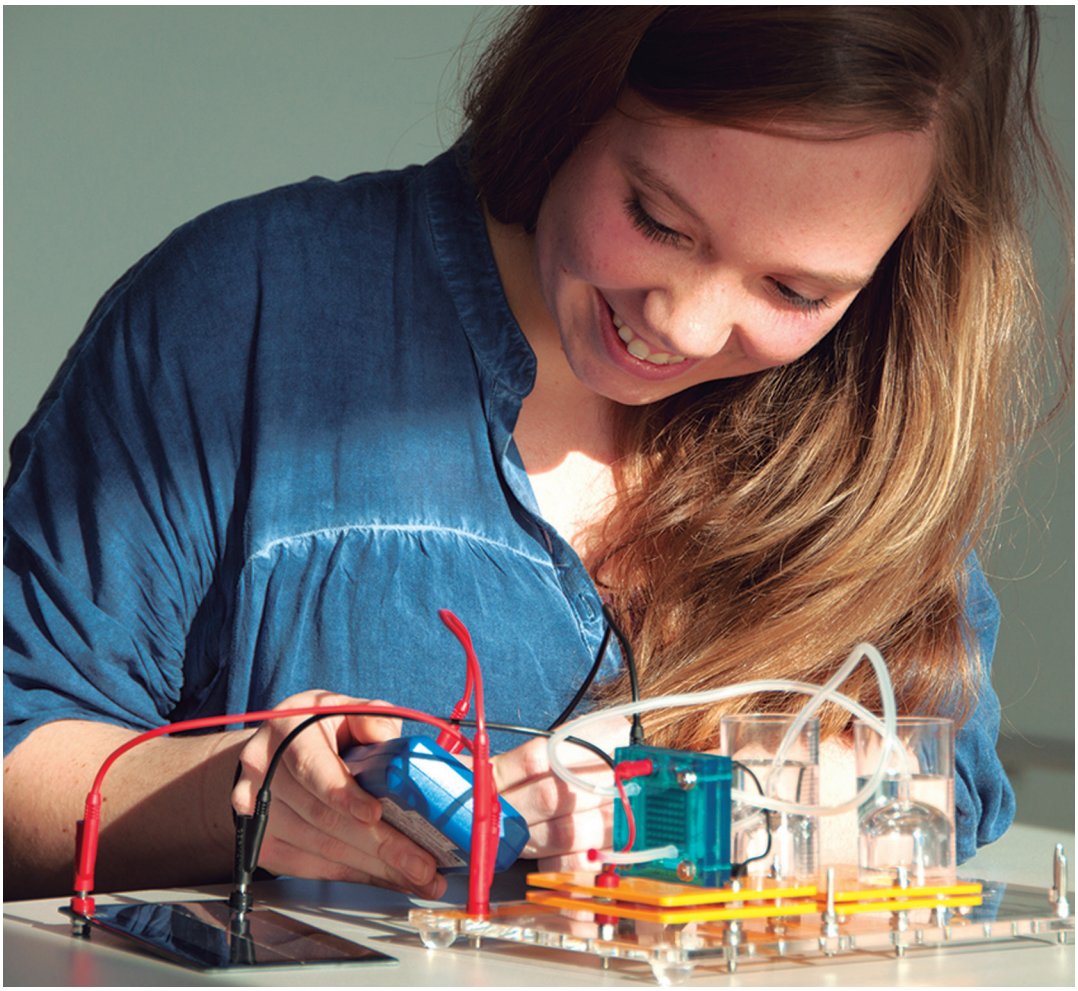
leXsolar-H_2 Professional



Instructions manual

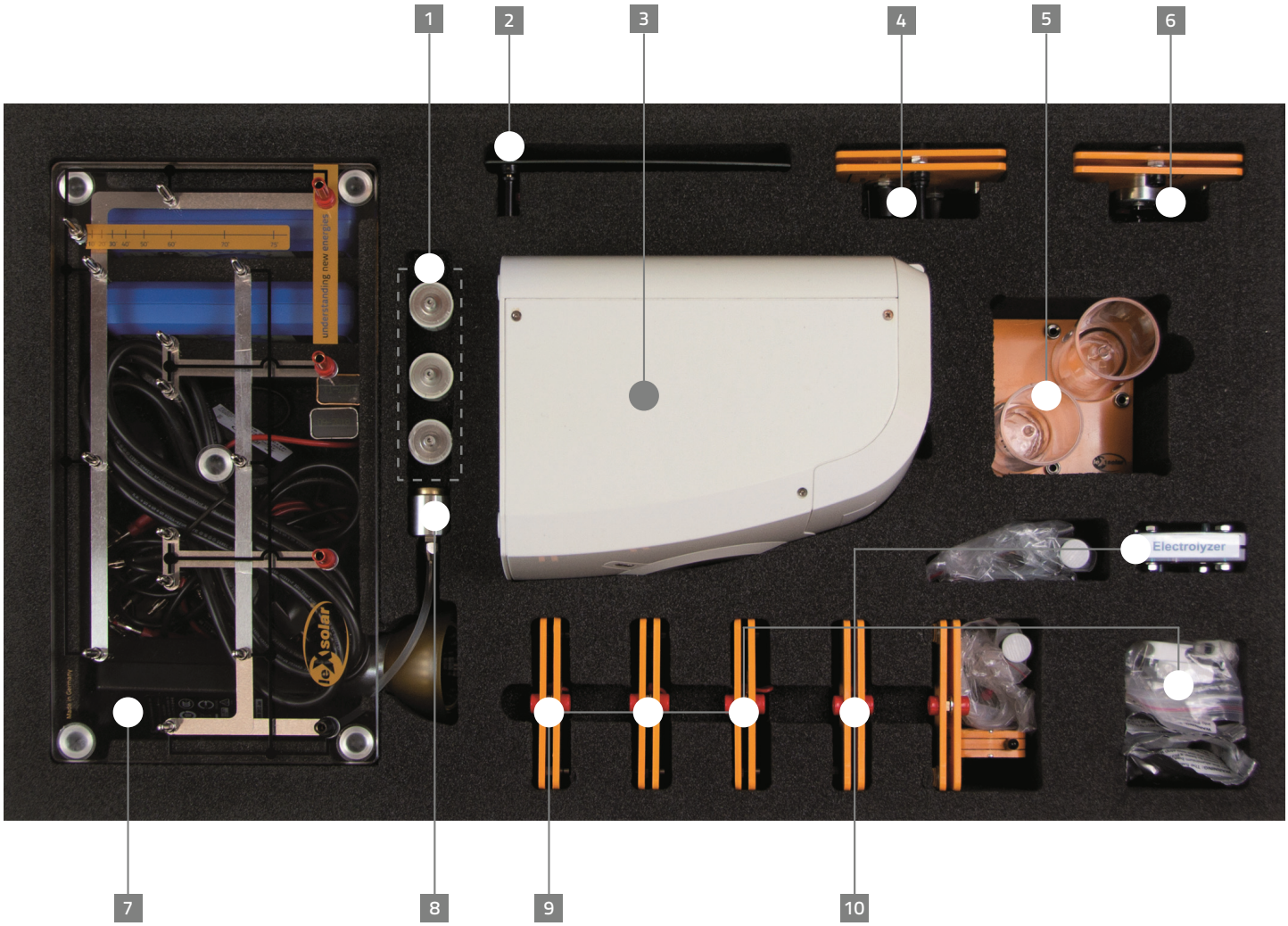
www.lexsolar.de/feedback

Layout diagram leXsolar-H_2 Professional

Item-No.1217

Bestückungsplan leXsolar-H_2 Professional

Art.-Nr.1217



1 1200-18 H2 Storage + 2xoptional expansions
1200-18 H2 Storage + 2xoptionale Erweiterung

2 1100-31 Solar panel 2.5 V, 420 mA
1100-31 Solarmodul 2.5 V, 420 mA

3 1200-17 H2 Charger
1200-17 H2 Charger

4 1100-23 Potentiometer module
1100-23 Potentiometermodul

5 1213-01 Gas storage module
1213-01 Gasspeichermodul

6 1100-27 Motor module with
L2-02-017 Yellow propeller
1100-27 Motormodul ohne Getriebe mit
L2-02-017 Luftschraube (Propeller) gelb

7 1100-19 Base unit large
1100-19 Grundeinheit groß

8 L2-06-132 Valve for H2 Storage
L2-06-132 Ventil für H2 Storage

9 3x1218-02 PEM-Fuel cell module
3x1218-02 PEM-Brennstoffzellenmodul

10 1218-03 Electrolyzer module 2.0
1218-03 Elektrolyseurmodul 2.0

Version number
Versionsnummer

II-01.24_L3-03-195_04.05.2017

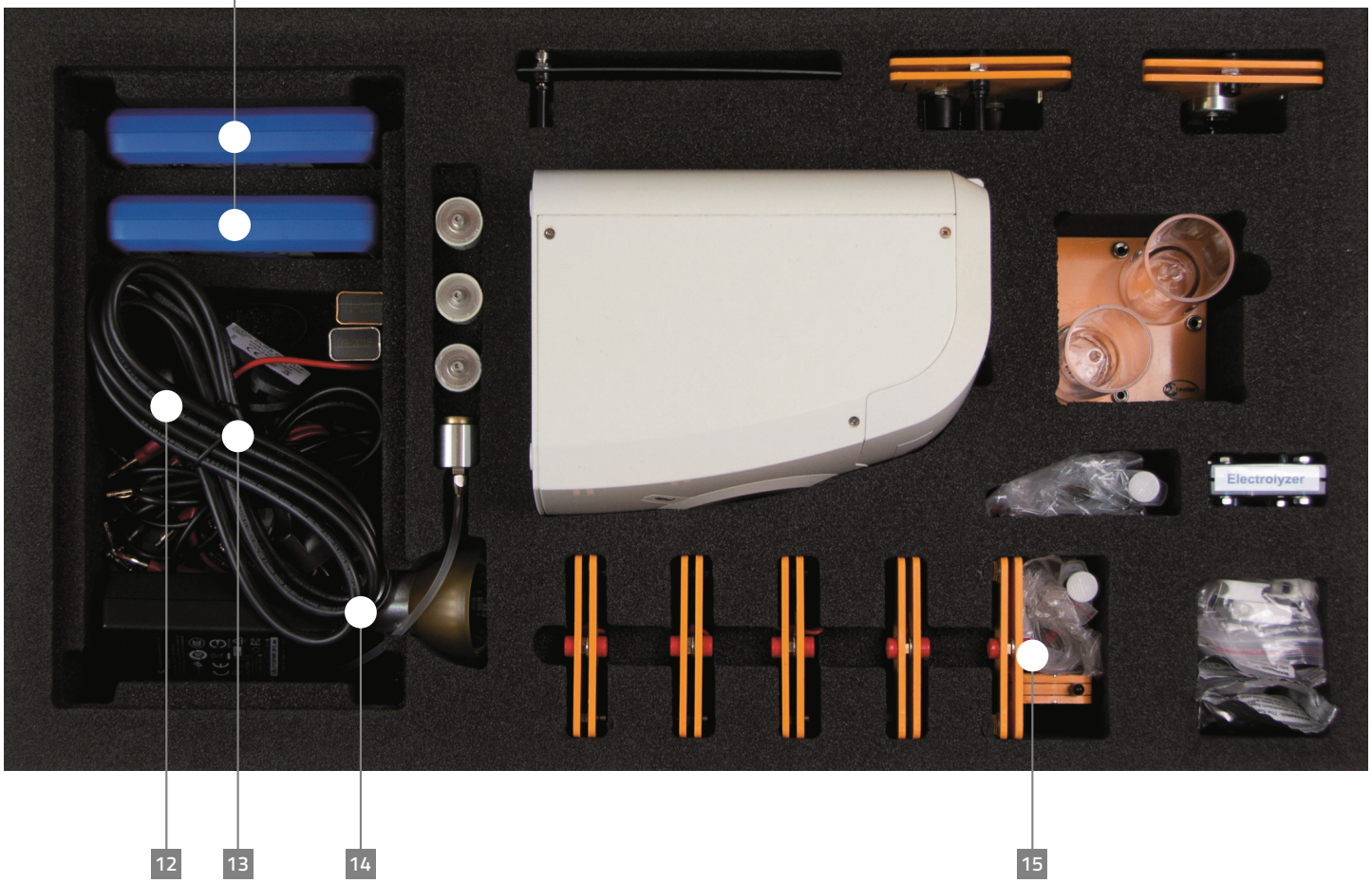
CE RoHS 2

Layout diagram leXsolar-H_2 Professional

Item-No.1217

Bestückungsplan leXsolar-H_2 Professional

Art.-Nr.1217



11 2xL2-06-011 Digital multimeter
2xL2-06-011 Digitalmultimeter

12 2xL2-04-066/067 Test lead black/red 25 cm
2xL2-04-066/067 Messleitung schwarz/rot 25 cm

13 L2-06-059/060 Test lead black/red 50 cm
L2-06-059/060 Messleitung schwarz/rot 50 cm

14 L2-04-022 Lamp with table clamp
L2-04-022 Lampe mit Tischklemme

15 1700-01 Ethanol fuel cell module
1700-01 Ethanol-Brennstoffzellenmodul

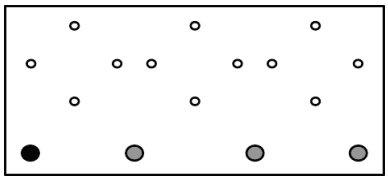
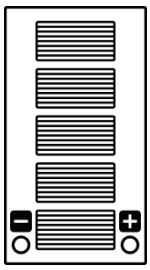
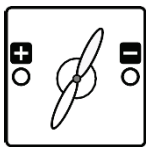
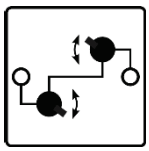
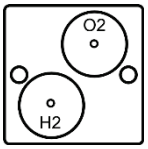
CE RoHS 2

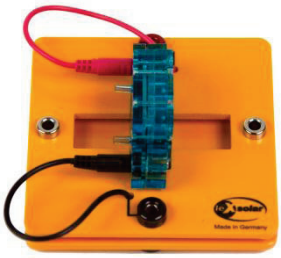
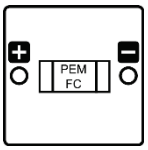
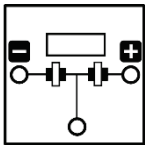
leXsolar-H_2 Professional

Instructions manual

L3-03-198_21.04.2017

1 Designation of components

Standard equipment of leXsolar-H_2 Professional		
Designation	**Component**	**Symbol in the Experimental Setup**
	leXsolar main board	
	Solar module (2.5V, 420mA)	
 	Motor module without gear	
	Potentiometer module	
	Gas storage module	

	Electrolyzer module	
	PEM fuel cell module	
	Ethanol fuel cell module	
	H_2-Charger	
	H_2-Storage	
	Voltmeters / ammeters and cables	

Handling suggestion

Specifications H_2-Storage:

- Capacity: 10 l hydrogen
- Storage material: AB5 metal hydride
- Load pressure: 3 MPa
- Working temperature: 0-55°C

Important handling guidelines:

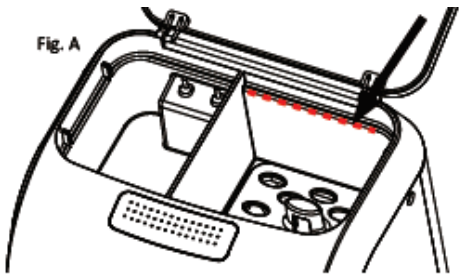
- The H_2-Charger must not be disassembled.
- Both the H_2-Charger and the H_2-Storage must be kept away from heat or flames.
- The H_2-Charger should be operated in an upright position.
- Operations should be done in a well-vented room.
- All electric connections should be kept away from water.

Status light:

green	red	System status
on		H_2-Storage full
1 second on, 1 second off		Filling of H_2-Storage is halted
	on	H_2-Storage is being filled
	1 second on, 1 second off	Add water or empty the waste water container

Usage instructions:

1. Firstly, fill distilled or deionized water up to the mark (see red line and arrow in the figure).



2. Connect the power adaptor to the H_2-Charger. The status light should flash green.

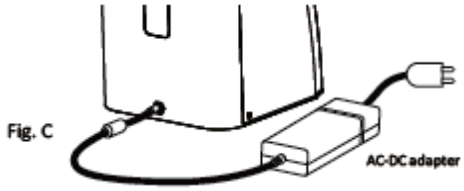


Fig. C

3. Insert the H_2-Storage into the opening on the front side of the H_2-Charger. For this, the stick should be turned clockwise until it locks in place. Don't apply too much force!

Fig. D

4. While the status light is flashing red, the H_2-Storage is being filled. Only when the status light flashes green, the cartridge is completely filled. The stick may now be removed by turning it counter clockwise.

5. Now remove the power adaptor and empty the water tank, in case the H_2-Charger will not be used within the following week. If further cartridges must be filled, revisit this procedure, starting at point 3.

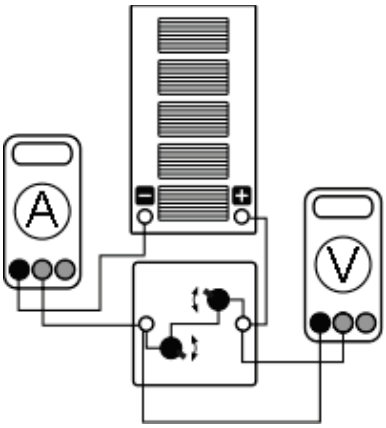
NOTE: Distinct noises (gargling and whistling) are normal during the charging process and are being produced by the self-cleaning of the device.

1. I-V curve of a solar module

Goals

Take the I-V curve of a solar module and interpret ist behavior.

Setup



Equipment needed

- Solar module
- Lamp
- Cables
- Ammeter
- Voltmeter
- Potentiometer module

Procedure

1. Set up the experiment in accordance with the drawing.
2. Place the lamp in front of the solar module (distance ca. 30 cm) and switch on the lamp.
3. Set sensible values for the voltage and measure the resulting current. For this, first adjust the 1kΩ resistor and then the 100Ω resistor for better control.
4. Enter your measurements into the table.

Measurements

V in V	I in mA	P in mW

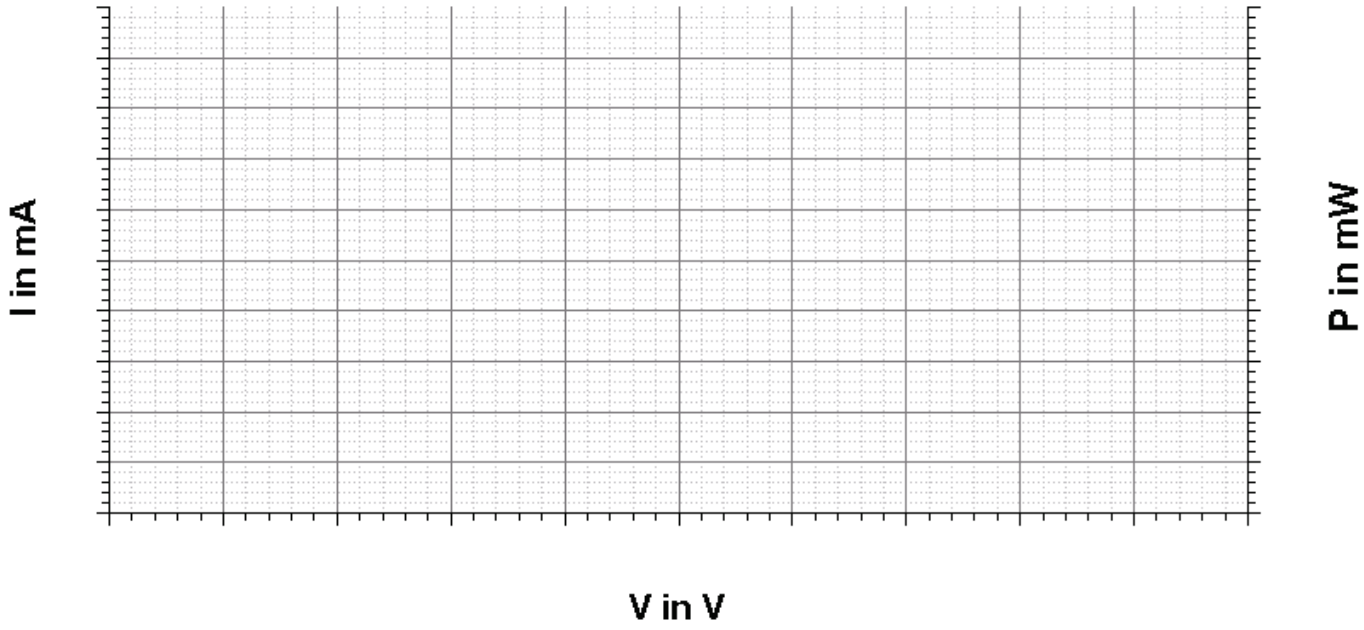
1. I-V curve of a solar module

Evaluation

1. Calculate the power for every pair of voltage and current values and enter your results into the table.
2. Plot the respective value in the given diagram.
3. Describe the behavior of the current and the power in dependence of the voltage.

Diagrams

2.



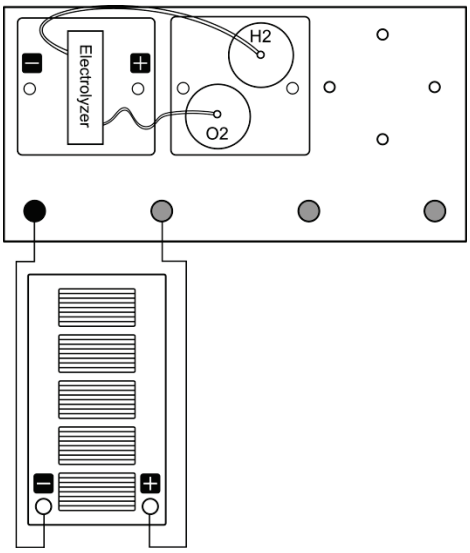
3.

2.1 Properties of an electrolyzer

Goals

Investigate the ability of the electrolyzer to split water.

Setup



Equipment needed

- leXsolar main board
- Electrolyzer module
- Gas storage module
- Tubes
- Solar module
- Lamp
- Cables
- Distilled water

Procedure

1. Assemble the electrolyzer module and the gas storage module in accordance with the drawing. Place the lamp in front of the solar module (distance ca. 30 cm).
   You can find notes on how to set up and use the electrolyzer in chapter “Operation of the electrolyzer” on page 8.
2. Switch on the lamp.
3. Watch what happens inside the gas storage tanks.
4. Note the filling level after 15 minutes.

Observation

Produced amount of H_2:

Produced amount of O_2:

Evaluation

1. What is the composition of water? Use the measured amounts of gas in for your explanation.

Evaluation

1.

2.

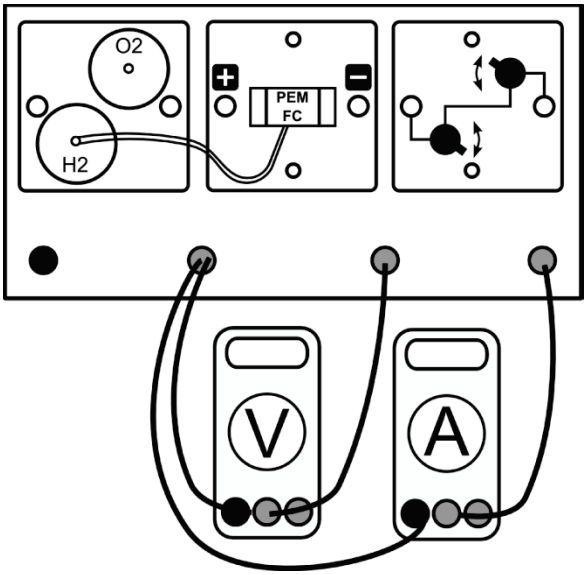
3.

3.2 I-V-curve of a PEM fuel cell

Goals

Take the I-V-curve of a PEM fuel cell.

Setup



Equipment needed

- leXsolar main board
- PEM fuel cell module
- Potentiometer module
- Voltmeter
- Ammeter
- Cables
- Tubes
- Distilled water
- Gas storage (full), alternatively H_2-Storage

Procedure

1. Set up the experiment in accordance with the drawing. The gas storage has to be filled prior to the experiment. You can find notes on how to set up and use the electrolyzer in chapter “Operation of the electrolyzer” on page 8. Alternatively, you can use an H_2-Storage container.
2. Set the potentiometer to the highest resistance by tuning both knobs to their respective maximum.
3. Quickly flush the fuel cell with hydrogen. You can find hints on how to do this on page 10.
4. Determine and set sensible voltage values and measure the resulting current. For this, first adjust the 1kΩ resistor and then the 100Ω resistor for better control.
5. Enter your measurements into the table.

Measurements

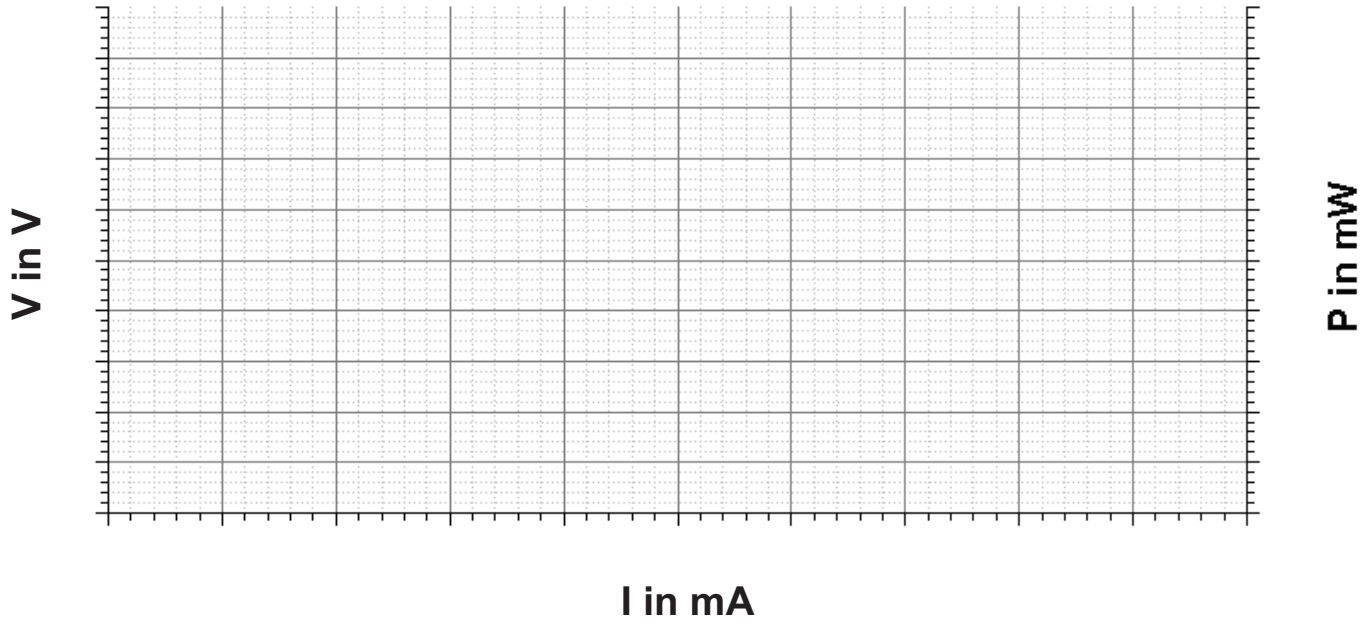
V in V	I in mA	P in mW

3.2 I-V-curve of a PEM fuel cell

Evaluation

1. Calculate the resulting power for every voltage and current value pair and plot your results as well as the value pair in the provided diagram.
2. Describe the behavior of the I-V curve and of the P-I-diagram.
3. Which part of the curve should be used to power a consumer? Justify your answer.
4. Explain the behavior of the I-V curve.

Diagrams



Evaluation

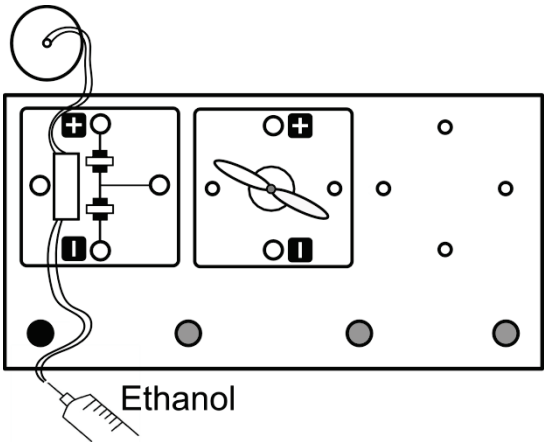
3.

4.1 Working principles of an ethanol fuel cell

Goals

Investigate the working principles of an ethanol fuel cell.

Setup



Equipment needed

- leXsolar main board
- Ethanol fuel cell
- Motor module
- Tubes
- Beaker
- Syringe
- Ethanol

Procedure

1. Set up the experiment in accordance with the drawing.
2. Use the tubes and the syringe to fill the fuel cell with ethanol. Write down your observations.
3. When the motor has started to turn, clutch the syringe tightly in your hand in order to warm up the ethanol. Press the remaining ethanol into the fuel cell. Write down your observations.

Evaluation

1. What can you smell at the fuel cell?
2. Which reactions do occur? Explain the working principle of this reaction

Observations

Evaluation

1.

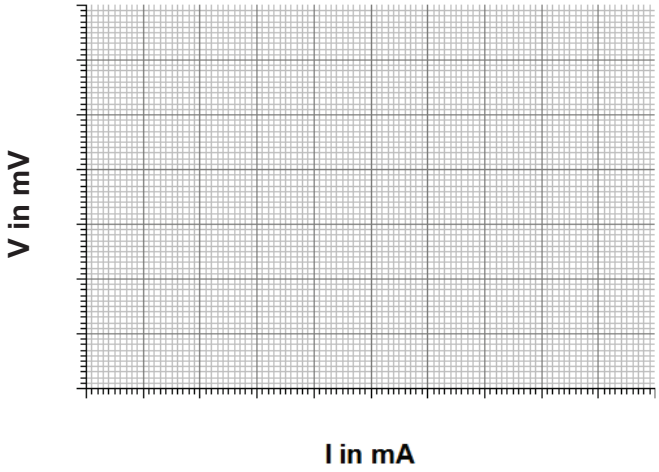
2.

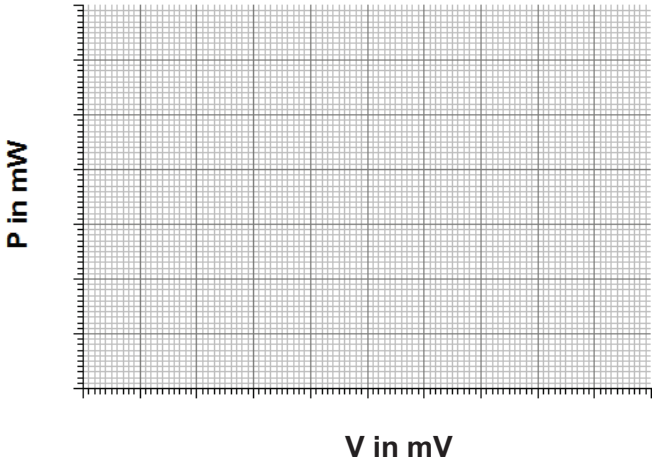
4.4 Concentration dependence of an ethanol fuel cell

Evaluation

1. Calculate the cell's power output for each value and enter your results into the table.
2. Plot your measurements as well as the results of your calculations in the diagrams.
3. How can the curves be interpreted?

Diagrams





Evaluation

3.

leXsolar GmbH
Strehlener Straße 12-14
01069 Dresden / Germany

Telefon: +49 (0) 351 - 47 96 56 0
Fax: +49 (0) 351 - 47 96 56 - 111
E-Mail: info@lexsolar.de
Web: www.lexsolar.de