ET 280
Modular electrolyser for H2 (AEM)

Learning objectives/experiments

- conversion of electrical energy into chemical energy
- function and design of an electrolysis system for the generation of H_2
- relationships between the operating parameters of the electrolyser
- factors that affect the performance of electrolysers
- recording and visualisation of all relevant characteristics
- calculation of relevant parameters
- calculation of the energy balance

Description

- **AEM electrolysis for hydrogen production**
- **raw water purification by reverse osmosis**
- **combination with the ET 255 energy system for solar and wind power**

The generation of hydrogen using energy from renewable sources is considered a key process for a sustainable economy. The ET 280 trainer can be operated in conjunction with the ET 255 energy system for solar and wind power and its components.

The ET 280 device contains an electrolyser that uses anion exchange membrane technology (AEM) to break down water (H_2O) into hydrogen (H_2) and oxygen (O_2). The core component is a stack consisting of several cells connected in series in a bipolar design.

The anodic half-cell is filled with diluted KOH (alkaline) electrolyte solution; the cathodic half-cell does not contain any liquid. An anion exchange membrane is located between the half-cells. The water from the electrolyte solution penetrates the membrane. Hydrogen is produced at the cathode. The hydrogen generated is safely flared off in a well-protected burner. Oxygen is produced on the anodic side and removed from the stack. The energy management system supplied is used to monitor and control the electrolyser.

In order to ensure the required water quality, the trainer includes a reverse osmosis system for raw water purification. This means that standard laboratory tap water can be used to operate the electrolyser.

A combination with ET 255 and its components enables investigations into the overall efficiency of the system and serves as a foundation for the design of needs-based grid coverage.

Measured values for hydrogen flow rate and pressure, as well as current and voltage at the electrolyser, are monitored and transmitted to the GUNT software. The GUNT software is network-compatible and enables experiments to be monitored, recorded and analysed at any number of workstations via the customer's own network.

The GUNT Media Center provides extensive didactic multimedia teaching materials.

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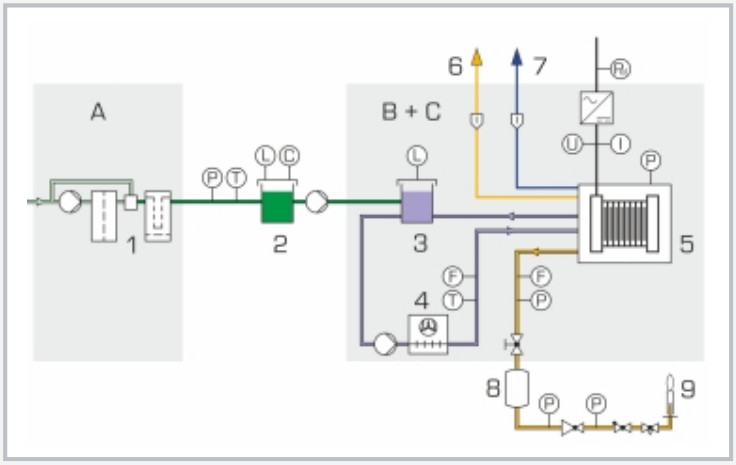
1 gas burner, 2 raw water purification, 3 tank for purified water, 4 AEM electrolyser with tank for potassium hydroxide, 5 manometers for hydrogen pressure



Process stages of the H_2 production
A raw water purification
B H_2 generation
C H_2 purification
1 reverse osmosis, 2 tank with purified water, 3 AEM electrolyser with tank for potassium hydroxide, 4 heat exchanger, 5 AEM electrolyser, 6 excess H_2, 7 generated O_2, 8 buffer tank for H_2, 9 gas burner; P pressure, F flow, T temperature, L level, C conductivity, U voltage, I current, P_{el} electrical power, orange: H_2, blue: O_2, green: H_2O

Trainer ET 280 with two exhausts for oxygen and hydrogen

Specification

[1] AEM electrolysis for hydrogen production
[2] raw water purification by reverse osmosis
[3] H_2 generation in an air-cooled electrolyser with potassium hydroxide tank
[4] stack with several series-connected cells in bipolar design
[5] integrated control unit for automated operation
[6] exhausts for oxygen and hydrogen
[7] conventional gas burner for flaring the hydrogen generated
[8] combination with ET 255 energy system for solar and wind power and the photovoltaic components ET 255.01 and ET 250.02 and the ET 255.04 wind turbine
[9] data acquisition and display of measurement data via GUNT software; data transmission via LAN /WiFi connection
[10] multimedia instructional materials online in GUNT Media Center

Technical data

Electrolyser
- production output: max. 500NL/h
- initial pressure: max. 35bar
- power consumption during operation: 2,4kW
- heat output: 0,6kW
- water consumption: 420mL/h at 25°C

Raw water purification
- output conductivity: min. 5µS
- power consumption: 200W
- flow rate: 2L/min
- operating pressure: max. 4bar
- water temperature: +5°C...+30°C
- ambient temperature: +5°C...+40°C

Measuring ranges
- current: 0...16A
- power: 0...4000W
- flow rate: hydrogen 0...800L/h
- pressure: hydrogen 0...60bar

230V, 50Hz, 1 phase; 230V, 60Hz, 1 phase
Electrolyser
LxWxH: 1260x790x1764mm; Weight: approx. 180kg
Exhaust
LxWxH: 800x800x2784mm; Weight: approx. 10kg

Required for operation

water connection, PC with Windows

Scope of delivery

1 electrolyser
1 raw water purification
1 gas burner
2 exhausts
1 online access to the GUNT Media Center

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Optional accessories

ET 255	Energy system for solar and wind power