Amtek Company
1244 Ritchie Highway, Suite 10
Arnold, MD 21012
800-926-8359 (ph)
410-315-9249 (fax)
www.amtekcompany.com

Alternative & Renewable Energy

HYDROGEN FUEL CELL TRAINING SYSTEM

MODEL 8010-80

Hydrogen Fuel Cell Training System, Model 8010-80

GENERAL DESCRIPTION

Lab-Volt now offers a Hydrogen Fuel Cell Training System, designed in a modular format to integrate with our existing EMS systems and further expand our 8010 Series of Renewable Energy Training Systems. This 50 W Hydrogen Fuel Cell Training System realistically represents the basic functions of a hydrogen fuel cell system. The trainer is ideal for teaching foundational engineering principles of fuel cell systems. Realistic, extensive experimenting capabilities and optimized instructional materials make this a comprehensive instruction package. Through practical experiments, students acquire extensive competence in working with fuel cell systems.

The modular design of the Hydrogen Fuel Cell Training System enables flexibility in the complexity of the setup – from simple experiments for teaching basic principles to complex experiments for experienced students. Lab-Volt's Hydrogen Fuel Cell Trainer components and curriculum are offered through a partnership with Heliocentris, the world's leading authority on fuel cells used

in education. The system is suitable for hands-on learning in diverse fields of study and occupations, such as:

- Electrical Engineering
- Energy Engineering
- Process Engineering
- Mechanical Engineering
- Automotive Engineering

This modular training system, which includes numerous prepared experiments, enables students and trainees to examine the design and functions of a real fuel cell system.

The Model 8010-80 system is designed for maximum technical safety. Developed especially for educational purposes, the system is designed for safe and easy operation, even by inexperienced users. With this trainer, students explore the engineering principles of a hydrogen fuel cell system, as well as advanced principles of the overall relationships of the system including:

- Structure and functioning principles
- Thermodynamics
- Characteristic curves and efficiency ratings
- System and power electronics

SAFETY

The Hydrogen Fuel Cell Training System is designed for maximum technical safety. Developed especially for universities and vocational institutions, the system is designed for safe and easy operation by inexperienced and experienced users. In case of overloads or irregularities, the trainer shuts down automatically and locks the hydrogen supply. Therefore, you can take the system to its limits without the risk of safety hazards or damage.

TABLE OF CONTENTS

EXPERIMENTS

Theory

- Introduction to the operation of a fuel cell system
- Characteristic curve and output curve of the fuel cell
- Dependence of output on air supply and temperature
- Hydrogen/current characteristic curve of the fuel cell
- Efficiency analyses of the fuel cell stack

Practice

- Set-up and operation of an autonomous power supply
- Efficiency of the fuel cell system
- Sample application of independent power supply: How long can a fuel cell supply an autonomous consumer?
- Sample application for fuel cell car: Determination of the fuel consumption based on the load profile

EQUIPMENT LIST FOR HYDROGEN FUEL CELL TRAINING SYSTEM, MODEL 8010-80

QTY	DESCRIPTION	ORDERING NUMBER
1	Workstation (Three Modules)	8131
1	Traffic Lights Module	8380
1	Electronic Load Module	8381
1	Hydrogen Fuel Cell Module	8803
1	Metal Hydride Storage Canister	87948
1	Hydrogen Generator (Optional)	8894
1	User Manual	TBE

MODULE DESCRIPTION

Model 8131 – Three-Module Workstation

The Three-Module Workstation, Model 8131 is intended for use on a bench and is fitted with wooden feet to protect the bench top (not supplied). The Three-Module Workstation consists of a single row of three full-height compartments that can accommodate up to three full-size EMS modules or six half-size EMS modules.

The Three-Module Workstation features a front mounted release lever and a safety locking device for each compartment and holes in the rear panel of the workstation with removable cover plates. The Three- Module Workstation requires assembly. A diagram is provided with the workstation to facilitate assembly.

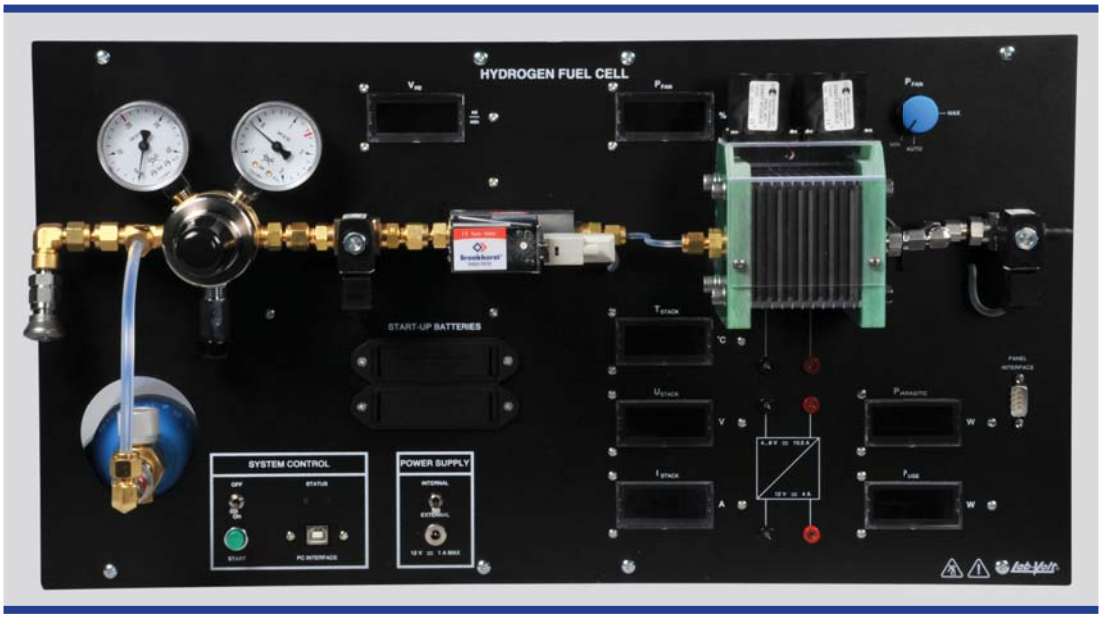
Model 8380 – Traffic Light Module

To simulate a real-world application of fuel cell electricity production, this model traffic light can be attached as a 12 V load.

Model 8381 – Electronic Load Module

The Electronic Load Module provides manual or computer-assisted adjustment of constant rated currents for the fuel cell for recording characteristic curves. Using manual procedures or a PC program, users can investigate the effect of different parameters on the characteristic curves of a fuel cell.

Model 8803 – Hydrogen Fuel Cell



A 50 W fuel cell stack with a fuel cell controller, hydrogen flow meter, a DC-DC converter (to obtain a regulated DC output from the stack), and air supply, as well as seven LED displays for visualization of all essential system parameters (current, voltage, temperature, fuel, and air supply). The system also includes a 200 bar pressure reducer with connecting tubes to refill the hydrogen canister or to connect a standard compressed gas cylinder.

A USB port on the front panel enables use of the included data acquisition software to perform further analysis on the fuel cell stack. This software provides support for the experiments (visualization, data logging, fully automated experiments), in the manual.

Model 87948 – Metal Hydride Storage Canister

The Metal Hydride Storage Canister stores the hydrogen required for multiple experiments without having to recharge from a compressed hydrogen cylinder. The canister is delivered empty and must be refilled from compressed hydrogen gas canisters or a hydrogen generator.

SPECIFICATIONS

Model 8131-10 – Three-Module Workstation		
Physical Characteristics	Dimensions (H x W x D)	375 x 930 x 530 mm (14.8 x 36.6 x 20.9 in)
	Weight	22.7 kg (50 lb)
Model 8380 – Traffic Light		
Input Voltage		12 V DC
Power Consumption Max.		10 W
Physical Characteristics	Dimensions (H x W x D) Net Weight	154 x 287 x 440 mm (6.1 x 11.3 x 17.3 in) TBE
Model 8381 – Electronic Load		
Maximum continuous power output		200 W
Load voltage		1.2 – 20 V DC
Load current		0 – 10 A
Mains connection		120 – 240 V (50 – 60 Hz)
Physical Characteristics	Dimensions (H x W x D) Net Weight	154 x 287 x 440 mm (6.1 x 11.3 x 17.3 in) TBE
Model 8803 – Hydrogen Fuel Cell		
Rated Output		40 W
Maximum Output		50 W
No-Load Voltage		9 V
Current at Rated Output		8 A
Hydrogen Consumption at Rated Output		580 Nml/min
Hydrogen Purity for Operation		4.0 minimum (99.99%)
Permissible Hydrogen Pressure		0.4 – 0.8 bar
Permissible Ambient Temperature during Operation		+5 – 35° Celsius
Communication Port		USB
Pressure Regulator		2-Stage, Hydrogen
	Inlet Pressure Outlet Pressure	max. 19 bar 0.6 ± 0.1 bar
H_2 Cylinder Connection Kit		1-Stage Hydrogen Pressure Regulator
	Max. Inlet Pressure Max. Outlet Pressure Connection	200 bar 17 bar CGA
Accessories		Leak Detection Kit Safety Connection Leads Software
Physical Characteristics	Dimensions (H x W x D) Net Weight	307 x 579 x 533 mm (12.1 x 22.8 x 21 in) TBE

Model 87948 – Metal Hydride Storage Canisters		
Storage Capacity (at charge pressure of 17 bar)		250 Nl
Output		1.7 sl/min
Charge Pressure		10 ... 17 bar
Charge Time		1 hr. at normal ambient temperature and active cooling
Model 8894 - Hydrogen Generator		
Hydrogen Production		30 sl/h
Power Consumption		300 VA
Hydrogen Purity		6.0 (99.9999%)
Hydrogen Pressure		0.1 ... 10.7 bar
Power Input		115/230 V – 50/60 Hz
Physical Characteristics	Dimensions (H x W x D) Net Weight	410 x 230 x 355 mm (16.1 x 9.1 x 14 in) 19 kg (41.88 lb)

Reflecting Lab-Volt's commitment to high quality standards in product, design, development, production, installation, and service, our manufacturing and distribution facility has received the ISO 9001 certification.