FCT SERIES

PEM FUEL CELL TESTERS

BioLogic
Science Instruments

New compact Fuel Cell Testers for PEM...
... imagined by users, made by professionals

Bio-Logic and Paxitech have combined their expertise to design new compact fuel cell test stations.
The **FCT-150S** and **FCT-50S** are complete instruments for PEMFC testing. Based on feedback from our customers, they are designed to be the most flexible test stations on the market.

The FCT series instruments are directly interfaced to a PC by an Ethernet connection. This type of connection also allows the unit to be placed on a Local Area Network for remote access.
The compact chassis integrates a programmable electronic load (250 W), gas and water control circuitry (flow, pressure and temperature) and data acquisition.
The electronic load uses state-of-the-art technology and is capable of reaching very low voltage levels (virtually 0 V) at 150 A (for FCT-150S) and 50 A (for FCT-50S).

A number of safety features have been incorporated in the hardware and also in the software. In the event of an unanticipated overload or loss of control, the **FCT-150S** and **FCT-50S** will automatically perform a safe shutdown procedure and turn into purge mode.

FC-Lab is the operating software used to control and analyze data from the instrument. With an ease-to-use interface, it offers all controls and functions for fuel cell testing with individual tabbed menus. The graphic functions offer a **real-time display** of performances with respect to each of the measured or controlled variables.

To conduct long-term experiments such as fuel cell ageing, **Bio-Logic** has developed automation of humidifier water filling and the condenser water purge.

Three automation levels are proposed. Based on our standard FCT systems, a variety of options can be selected. A fully automatic option offers both humidifier filling and condenser purge. This option can be proposed with a new system but can also be adapted to existing units. This second option must be carried out at the factory. **FC-Lab** software manages automation.

Another semi automatic water filling solution is proposed, totally adaptable to existing FCTs. This solution is managed manually.

GENERAL SPECIFICATIONS

- Electronic Load: 250 W
- Max current: 150 A/50 A for FCT-150S and FCT-50S respectively
- 5 V reference voltage
- Resolution: 76 µV
- Electrochemical Impedance Spectroscopy (EIS) measurement (10 kHz to 10 µHz).

OPTIONS

- Fully automated FCT-50S or FCT-150S
- Upgrade of the existing FCT-50S or FCT-150S units
- Semi automatic water filling kit for existing FCTs

FC-LAB MONITORING SOFTWARE

With an easy-to-use interface, this software enables control of the fuel gas supply and of the electronic load on separate tabs.

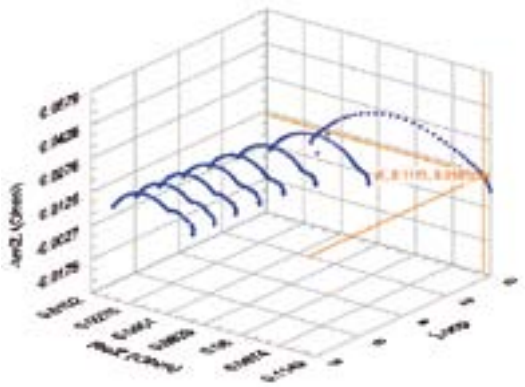
The temperature, pressure and flow rates of gases and water level are monitored and controlled in the software on a specific "Cell & Gas" window while electrochemical techniques are set in separate "Load" tab. With automated systems, a specific "Water" button was added on the main **FC-Lab** window to manage water. In the gas tab, the humidifier automatic filling option is available by ticking a box.

This **FC-Lab** software function ensures water regulation at a constant level. **FC-Lab** software has evolved into an easy-to-use package with unique features and advanced functions. On the load tab, linked technique experiments with 100 sequences can be created quickly. Using the selector on the left side of the screen, the user can switch quickly from one technique to the other. For each technique the user access settings and graph by a simple mouse click in the selector.

When the experiment is launched, the instrument is also a complete autonomous station thanks to its operating system.

Parameters can be modified on the fly. Data are continuously downloaded from the instrument to the computer. If the computer suffers a disconnection with the instrument, data continues to be collected to the on-board buffers (they can hold 50,000 data points). Data is then forwarded when the connection is re-established.

FC-Lab file format is compatible with **EC-Lab®** software offering the possibility to analyze data with the powerful tools of **EC-Lab®** software (linear fit, integral, EIS data fitting...).



Safety features

Both hardware security in the FCT testers and software security in **FC-Lab** software are implemented for safe experiments. In the instrument an automatic shutdown with switch to N_2 purge is done in case of under voltage, over current, over temperature, loss of pressure supplied. An external alarm can be connected and an emergency stop button is available on the front panel. Software securities can be configured for each controlled variable (flow, temperature, pressure, water and load) both on the anodic and cathodic sides.

DESCRIPTION

Gas control and display

- Temperatures, Pressures, Flows
- Water level control
- Independent for each cell and each gas

Facilities

- Current Density Display
- On the fly Parameter change
- Multi Variable Graphic Display

Load control

- Galvanostatic/ Galvanodynamic
- Potentiostatic/ Potentiodynamic
- Power/Resistance

Techniques

- Open Circuit Voltage
- Voltage Pulse
- Current Pulse
- Voltage Scan
- Current Scan
- Potentio EIS
- Galvano EIS
- Constant Load Discharge
- Constant Power Discharge
- Loop

AUTOMATIC WATER FILLING/PURGE

Each gas line is equipped with a water pump and level sensors, on the humidifier and condenser alike, ensuring that each gas line is completely independent. The software can manage filling and purge; securities are also available.

These new automatic instruments enlarge the FCT range. Nevertheless existing FCTs can still be upgraded in the factory.

SEMI AUTOMATIC WATER FILLING KIT

An external kit (Semi Automatic Water Filling Kit) can be added to an existing FCT. This kit consists of two separate pumps that can be easily added to the front panel of a FCT. Using this external tool, researchers can manually fill the humidifier (anodic and cathodic side separately) without switching off the instrument or disrupting the experiment in progress.

SPECIFICATIONS

Electronic load	FCT-150S	FCT-50S
Maximum load current	150 A	50 A
Maximum load power	250 W	250 W
Minimum load resistance	0.7 mΩ (0.1 V at 150 A)	0.7 mΩ (0.035 V at 50 A)
Current measurement accuracy	0.5% FSR*	0.5% FSR*
Current resolution	11 mA	4 mA

Potential measurement		
Maximum voltage	5 V	
Potential measurement accuracy	< 0.1% FSR*	
Potential resolution	76 µV	

Impedance		FCT-150S	FCT-50S
Frequency range		10 µHz to 10 kHz (accuracy 1%, 1°)	10 µHz to 10 kHz (accuracy 1%, 1°)
Amplitude (programmable)	Potentio:	1 mV to 1 V	1 mV to 1 V
	Galvano:	150 mA to 75 A	150 mA to 25 A

Data acquisition
10,000 samples/s

Communication
Ethernet 10/100 baseT

Temperature controllers	
5 Heater PID controllers	1 for the cell 2 for humidifiers 2 for heaters
Probe	PT100 (software limit: 120°C)

Reactant gas control system	FCT-150S	FCT-50S
Humidifiers	PaxiTech design with bypass Temperature: ambient to 120°C	
	100% saturation at 87°C from ambient to 4 bars for Input Gas Flow of:	
	5 L/min	1.7 L/min
	1.8 L water bottles/max. fill capacity 0.6 L	
Heated reactant delivery line	870 W	
Mass flow control (automatic)	H_2: 0-120 L/h O_2: 0-300 L/h Double calibration for O_2 and Air	0-40 L/h O_2: 0-100 L/h Double calibration for O_2 and Air
Back pressure control	0-5 bars manual	
Transfer gas line heaters	Max temperature 120°C	
Internal alarms on temperatures and pressures		
External alarm input		

General	
Dimensions	495 x 430 x 470 mm
Weight	50 kg
Power	85-264 V, 47-440 Hz
PC configuration	Windows 32 bits

* FSR: Full Scale Range

Specifications subject to change

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