H-TEC EDUCATION

Operating Instructions

F105 - Quattro Fuel Cell

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General Safety Precautions

- The units may only be set up and operated by a responsible supervisor.
- WARNING! Not suitable for children under 12 years old!
- Read the Operating Instructions before setting up the fuel cell. Follow them during use and keep them readily available for reference.
- Wear protective goggles.
- Equipment and gases must be used and stored out of the reach of small children.
- Plug-in power supplies can be dangerous - they are not toys!
- Disconnect the unit from the plug-in power supply and the solar module before cleaning with liquids.
- Unless instructed to the contrary by the manual, do not reverse or short-circuit the connecting terminals.
- The units must not be operated when empty. Always ensure that they contain sufficient water. Pay attention to the water level marks.
- Remove flammable gases, vapours or liquids from the area surrounding fuel cells and electrolysers. The catalytic materials involved may cause spontaneous ignition.
- Hydrogen and oxygen may escape from the units. Operate the units in well-ventilated rooms to ensure that the gases do not accumulate and form explosive mixtures.
- Do not smoke in the vacinity of this equipment.
- The units may only be operated in display cases if adequate ventilation is guaranteed under all circumstances. The operator is responsible for ensuring this.
- Remove from the vicinity of the units anything that could ignite the hydrogen (e.g. open flame, materials that can become charged with static electricity, substances with a catalytic action).
- Remove from the vicinity of the units all substances that could spontaneously ignite in increased oxygen concentration.
- Hoses, plugs and gas tanks are used for pressure compensation. They must not be fixed or secured with clamps, adhesive, etc.
- Only use the gas storage tanks associated with or supplied with the units. Never connect alternative gas storage tanks.
- Minimum separation distances must be observed when using solar modules and artificial lights. These are: 30 cm between H-TEC Education solar modules, and 50 cm in the case of the H-TEC Education Spotlight. When using lights from other manufacturers, observe the minimum distance specified by the manufacturer.
- WARNING! The surface of solar modules can get very hot during extended operation.
- Tell your students about any potential dangers and carefully supervise experimentation.
- H-TEC Education accepts no responsibility for injuries or damage sustained in the event these General Safety Precautions are not followed.

Setting Up:

Introduction

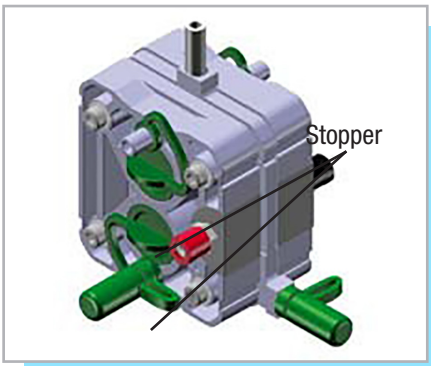
This PEM fuel cell (PEM = Proton Exchange Membrane) produces electricity by using hydrogen and oxygen gas (or atmospheric oxygen). Its only by-products are water and heat.

H_2/O_2 Set Up

Read the Operating Instructions and the General Safety Precautions before using any of the equipment.

1. Fit caps to the bottom outlets of the fuel cell.

Note:
Make sure the stoppers are fitted snugly into the air inlets.



2. Connect the hydrogen gas supply to the top hydrogen gas connector, and the oxygen gas supply to the top oxygen connectors of the fuel cell (e.g. H-TEC Education Electrolyser 10, Item E102).

3. Connect an electrical load (e.g. H-TED Education Fan Tutorial Item No. A105).
When doing so, make sure that the polarity is correct (red = “+”, black = “-”).

4. The equipment is now ready for operation and can be used for demonstrations or experiments.

Setting Up:

H_2/Air Set Up

When you use a Type F105 fuel cell, you also have the option of operating the cell in air-breathing mode simply by removing the stoppers. When operating with atmospheric oxygen, the power of the cell is somewhat lower than when operating with pure oxygen.

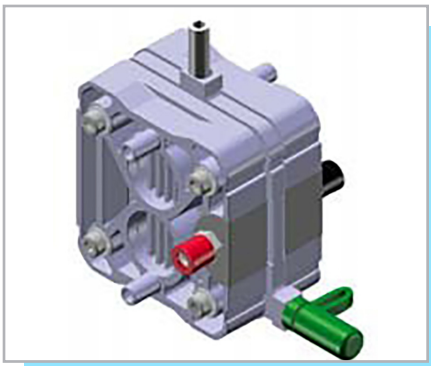
1. Fit a cap to the bottom hydrogen output of the fuel cell.

2. Remove the stoppers on the oxygen sides of the fuel cell.

3. Connect the hydrogen supply to the top hydrogen connector of the fuel cell (e.g. H-TEC Education Electrolyser 10, Item E102).

4. Connect an electrical load (e.g. H-TED Education Fan Tutorial Item No. A105). When doing so, make sure that the polarity is correct (red = “+”, black = “-”).

5. The equipment is now ready for operation and can be used for demonstrations or experiments.



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Technical data

H_2/O_2 Production:	2.4 - 2.6 W @ 1.5 A
H_2 / Air Production:	0.72 - 0.80 W @ 0.375A
Electrode Area:	3.6 cm^2 X 4 Cells
Permitted operating pressure:	0 - 20 mbar
H x W x D:	62 x 60 x 62 mm
Weight:	78 g

Troubleshooting

The fuel cell has very little power.

Possible Cause:

- The fuel cell was stored too dry or for too long. A fuel cell with a dry membrane loses power.

Solution:

- Continue operation. The fuel cell moistens itself during operation which slowly allows it to reach its full capacity again.

Possible Cause:

- Water forms in the cell during operation. This can lead to the gas supply to the cell becoming blocked.

Solution:

- Open the bottom caps so that moisture can escape.

Despite being set up correctly, the cell does not work.

Possible Cause:

- You have connected an external voltage to the fuel cell. This leads to the immediate destruction of the catalyst. The cell is permanently damaged.

Maintenance

The fuel cells we provide in our sets are maintenance-free. However, always remember before putting the cell away:

- Continue operating the cell until the electric load stops by itself. This will ensure that a little water remains in the cell to keep the membrane moist.
- Close the caps and the stoppers to the water in the cell does not evaporate too quickly.

Disposal

Do not dispose of fuel cells and electrolysers as general household waste.

⚠ WARNING

Fire hazard from catalytic substances
The catalysts for the electrodes of fuel cells promote burning when they come into contact with flammable substances. Avoid contact with hydrogen, alcohol fumes or other organic fumes. Ensure correct disposal.

According to European regulations, used electric and electronic devices may no longer be disposed of as unsorted household waste. The symbol of the crossed-out wheelie bin indicates the requirement for separate disposal.

Your local waste management company can provide you with additional information about disposal options.

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