

HUMIDITY MEASUREMENT IN FUEL CELLS



In fuel cells, hydrogen and oxygen react in a controlled manner to efficiently produce electricity and heat. The voltage which is achieved depends on the fuel, the quality of the cell, the temperature and the relative humidity of the gases used.

Fig. A shows how the fuel (e.g. natural gas) flows into the converter and is converted into hydrogen. At the anode catalyst, the hydrogen is split into a positive component, the protons (H⁺) and a negative component, the electron (e⁻). The membrane of the fuel cell is permeable to protons but not to electrons. Hence the electrons flow through the external electric circuit - with a current consumer such as a motor - and back to the cathode side of the fuel cell. At the cathode, the oxygen gas (blue spheres) absorbs electrons and

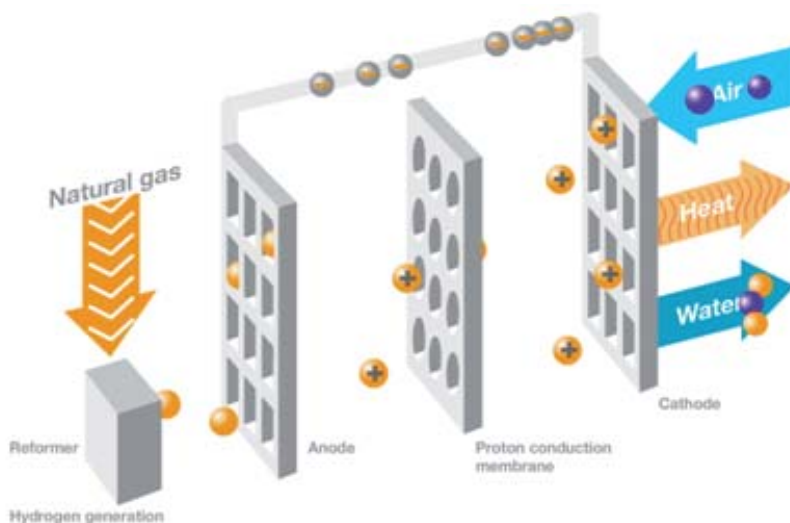


Fig. A - Diagram of a single fuel cell

protons to form water - the primary exhaust of a fuel cell.

In order to obtain a reasonable level of performance from the fuel cell, a large number of separate membrane-electrode components must be combined to form a fuel cell stack



Fig. B - Fuel cell stack

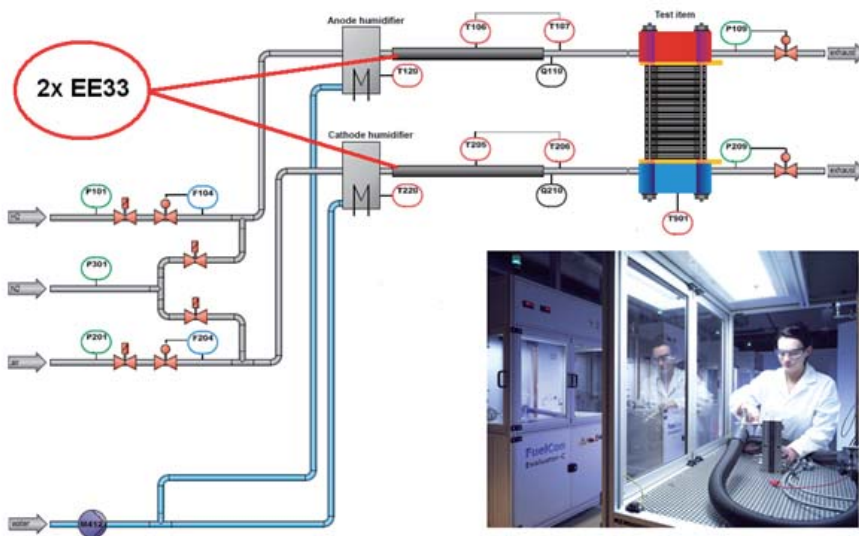
(Fig. B).

The proton permeability of the membrane and therefore the output and the service life of the stack increases in proportion to the water content of the membrane. Because of this, the membrane must be kept damp. This is usually carried out by humidification of the reaction gases hydrogen and oxygen.

In the test system, hydrogen and oxygen are humidified with a very accurate water pump and then heated to the typical operating temperature of the fuel cell (typically 80 °C).

The precise relative humidity of both gases is checked with the EE33 before they are passed to the fuel cell.

The required relative humidity varies according to the individual membrane.



Typical structure of a low temperature fuel cell system

• Application conditions

Measurement range: 85 - 95 % relative humidity
 Output: 4..0000.20 mA
 Operating temperature: 60 - 90 °C (typically 80 °C)
 Operating pressure: ~ 3 bar excess pressure

• E+E Product



EE33-MFTE5022HA03HC01/AB6-T52

Humidity measuring transducers for high-humidity and chemical applications

High accuracy measurement of relative humidity, dewpoint and temperature even with high humidity close to the condensation point or with high levels of chemical contamination.