

# ECOMATE® Humidifiers

The ECOMATE® membrane humidifier modules are highly permeable to water vapor. The lightweight, compact humidifier provides high humidification efficiency at wide range of flow rates.

Our liquid-to-gas and gas-to-gas humidification-solutions are addressing the main challenges of fuel cell systems: cost, reliability, and zero-electrical-power-consumption.

The modules allow low pressure drop and high heat recovery rate. The assembly, handling and operation are user-friendly.

The ECOMATE® membrane humidifier modules cover a range of fuel cell power from 0.7 kW to 150 kW. They are highly permeable to water vapor. The modules allow low pressure drop and high heat recovery rate, with long operating lifetime and no power consumption. Our humidifiers are specifically designed to achieve effective water transfer through a series of micro-po-

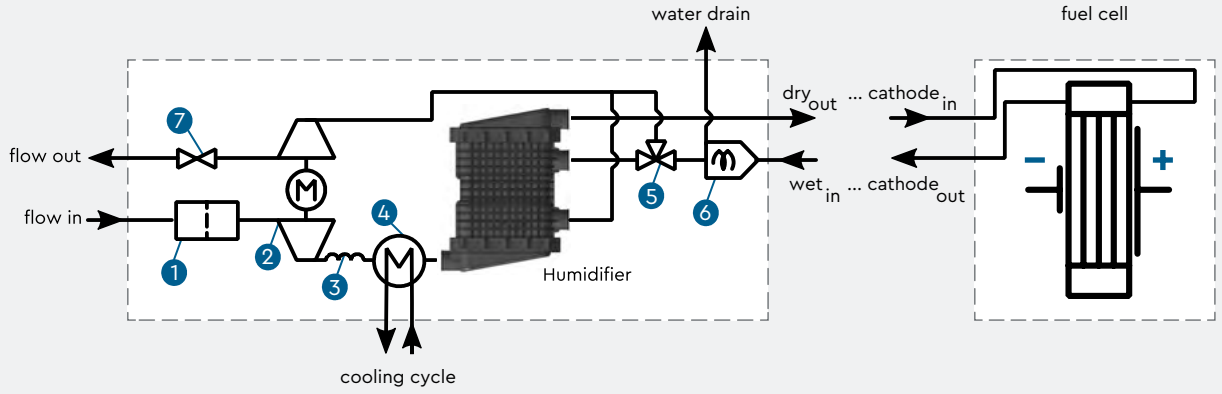
rous hollow fiber membranes at a wide range of flow rates and temperatures. The durability and competitive pricing make it attractive to fuel cell powertrain manufactures that are seeking for improvement of the balance-of-plant. The assembly, handling and operation are user-friendly. The ECOMATE® products are designed as plug-and-play.



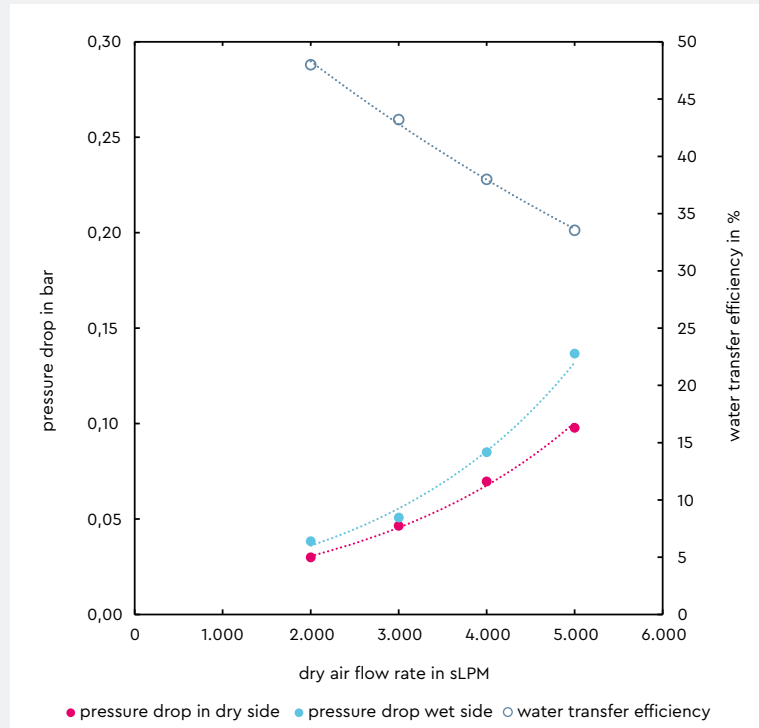
**FIG. 1:** Flow chart sketch of a cathode-sub-system (left system), which includes the humidifier, and its connection to the fuel cell (right) in automotive applications.

Part number:

- 1 air filter
- 2 turbo compressor
- 3 noise canceler
- 4 heat exchanger
- 5 bypass valve
- 6 water droplets separator
- 7 back pressure valve



**FIG. 2:** Typical operational characteristics of H50N



**Test conditions:** Measurements are counter flow configuration.  
 The pressure at the dry airflow outlet is 1,8 bara.  
 The pressure at the wet side inlet is 1,6 bara  
 The humidity of the wet in air flow is about 95 % relative humidity.  
 The temperature of the air inflows is 80 °C

## TECHNICAL DATA

| General Specifications  |  |
|---|--|
| <b>Fuel Cell Power</b>  | 0.7 ~ 150 kW   |
| <b>Rated Air Flow Rate</b>                                      | 50 ~ 9.000 sLPM  |
| <b>Flow Configuration</b>                                       | Counter & Co-Current                                     |
| <b>Life Time</b>  | Stationary > 7.000 hours                                 |
| <b>Operating Temperature Range</b>                              | -30 °C to 90 °C  |
| <b>Operating Pressure</b>                                       | Moderate to 250 kPa                                      |
| <b>Low Impurities (Cation &amp; Anion Extract in Hot water)</b> | comply with automotive requirements                      |
| <b>Humidification Efficiency (Approach Dew Temp.)</b>           | 4 ~ 15 °C (Gas-to-Gas)<br>2 ~ 5 °C (Liquid-to-Gas)       |
| <b>Total Air Pressure Drop (shell + tube)</b>                   | < 10 kPa @ Rated Flow Rate (dependent on total pressure) |
| <b>Materials of Membrane</b>                                    | Polyimide, Polysulfone                                   |
| <b>Materials of Housing</b>                                     | PA-GF, PPA-GF (Non-flammable, Low Ion Extraction)        |

## PRODUCTS

| Ecomate®                 |   | H7                        | H02                     | H10                           | H20                          | H50                           | H100                          |
|--------------------------|---|---------------------------|-------------------------|-------------------------------|------------------------------|-------------------------------|-------------------------------|
| <b>Design Parameters</b> | Fuel Cell Power (Rated Air Flow)        | ~0.7 kW (~50 sLPM)        | 1~3 kW (50~200 sLPM)    | 3~10 kW (200~600 sLPM)        | 10~45 kW (600~2500 sLPM)     | 45~90 kW (2000~5000 sLPM)     | 90~150 kW (5000~9000 sLPM)    |
|                          | Weight                                  | 0.4 kg                    | 0.6 kg                  | 1.5 kg                        | 3.2 kg                       | 4.8 kg                        | 6.2 kg                        |
|                          | Volume (Dimensions)                     | 0.6 liter (ø 55 × 180 mm) | 1 liter (ø 70 × 230 mm) | 3.8 liter (165 × 80 × 286 mm) | 7 liter (135 × 222 × 230 mm) | 11 liter (178 × 223 × 280 mm) | 16 liter (180 × 315 × 286 mm) |
| <b>Performance</b>       | Approach Dew T. dependent on conditions | 13.7 °C @ 50 sLPM         | 8.3 °C @ 100 sLPM       | 13.8 °C @ 600 sLPM            | 13.6 °C @ 2000 sLPM          | 15.3 °C @ 3000 sLPM           | 15.6 °C @ 5000 sLPM           |