

本公司經銷英國大廠 Johnson Matthey 的 MEA

Guidance on the use of HiSPEC® membrane electrode assemblies

This document provides guidance for installing, conditioning and operating HiSPEC membrane electrode assemblies (MEAs).

Unpacking

Please do not remove the MEAs from the shrink-wrapped, inner packaging until you are ready to install the MEA in the fuel cell or build the stack. The MEAs have been manufactured and packaged at JMFC in a controlled environment at a temperature of $21^{\circ} \pm 1^{\circ}\text{C}$ ($70^{\circ} \pm 2^{\circ}\text{F}$) and a relative humidity of $55\% \pm 5\%$.

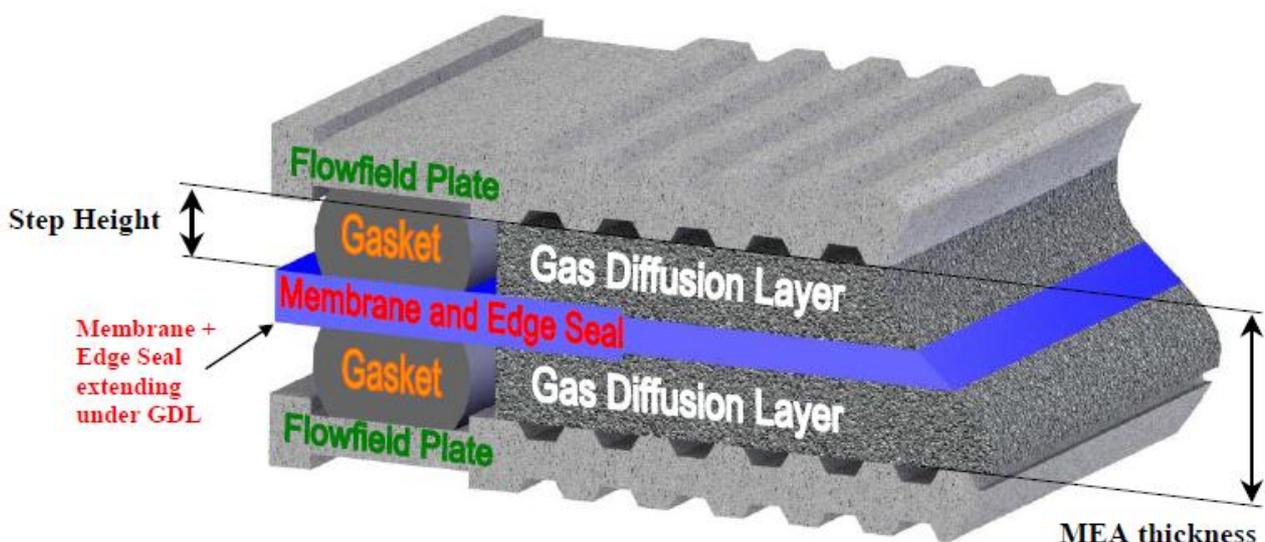
The membrane is sensitive to moisture levels and the dimensions of the MEAs could change if they are allowed to dwell at significantly different ambient conditions. JMFC recommends that you unpack and install the MEA under the same conditions as were used during packaging.

The anode side of the MEA faces upward, unless the sticker on the packaging indicates otherwise.

Cell assembly

Before installing the MEA in the cell for testing, make sure that the cell hardware and flow fields are free of any debris and dry to the touch. The membrane could warp and distort the MEA if the MEA comes into contact with liquid water at this stage.

The MEA should be aligned in the cell and compressed uniformly. The optimal compression depends on your hardware design and gasket material selection. Please refer to the agreed Interface Control Drawing for the MEA dimensions and step-height. The schematic representation below and example calculation illustrates how to estimate the required relative compression.



The relative compression is calculated from the MEA calliper thickness prior to installation (non-compressed MEA thickness) and the MEA thickness after compression (compressed MEA thickness, which is usually equal to the gap between the flow field plates under pressure) using the equation below:

$$\text{Relative MEA Compression (\%)} = \frac{\text{non-compressed MEA thickness} - \text{compressed MEA thickness}}{\text{non-compressed MEA thickness}}$$

For example, a relative compression of $15 \pm 5\%$ is recommended when using Toray TGP-H-060 substrate. JMFC can advise on a relative compression suitable for your customised MEA configuration, provided we have the relevant information on your hardware design.

Conditioning

'Conditioning' describes the period of operation time required for the MEA to achieve its optimal performance. If you do not have a proprietary or in-house protocol for this purpose, it is suggested that you maintain the following operating conditions for a period of 3 to 16 hours until the performance is stable.

- Cell temperature: 80°C (176°F)
- Inlet pressure (Anode and Cathode): 100 kPag (14.5 psi)
- Gas humidification (Anode and Cathode): 100% RH
- Anode Stoichiometry: 1.5
- Cathode Stoichiometry: 2.0
- Constant Current Density: 500 mAcm⁻²

Operation

HiSPEC MEAs are designed to successfully operate under a wide range of operation conditions. It is not possible to give exact operating guidelines, because of the variety of customer operating conditions and hardware design.

The notes below are a general guide to the operation of HiSPEC MEAs:

1. The cell should always be supplied with enough fuel (and oxidant) to produce the electric current being drawn from the cell; in reality excess should be supplied.
2. Prolonged exposure to 'Open Circuit Voltage' (OCV) may lead to MEA degradation.
3. When the fuel cell is not in use, purge the system to remove reactants. Otherwise, maintain fuel cell in stand-by operation by returning to the operating parameter used to 'condition' the MEAs.
4. Any purging of the fuel cell is best done with an inert gas such as nitrogen.
5. Avoid operating the MEAs at very high current densities.
6. Avoid introducing air (oxygen) to the anode electrode where possible, except for the purpose of diagnostic testing. Operation with an 'air bleed' is not recommended as this has significant impact on the lifespan of the MEA.
7. The MEA should not be removed from the cell hardware until all testing has been completed; unnecessary compressing and re-compressing should be avoided.