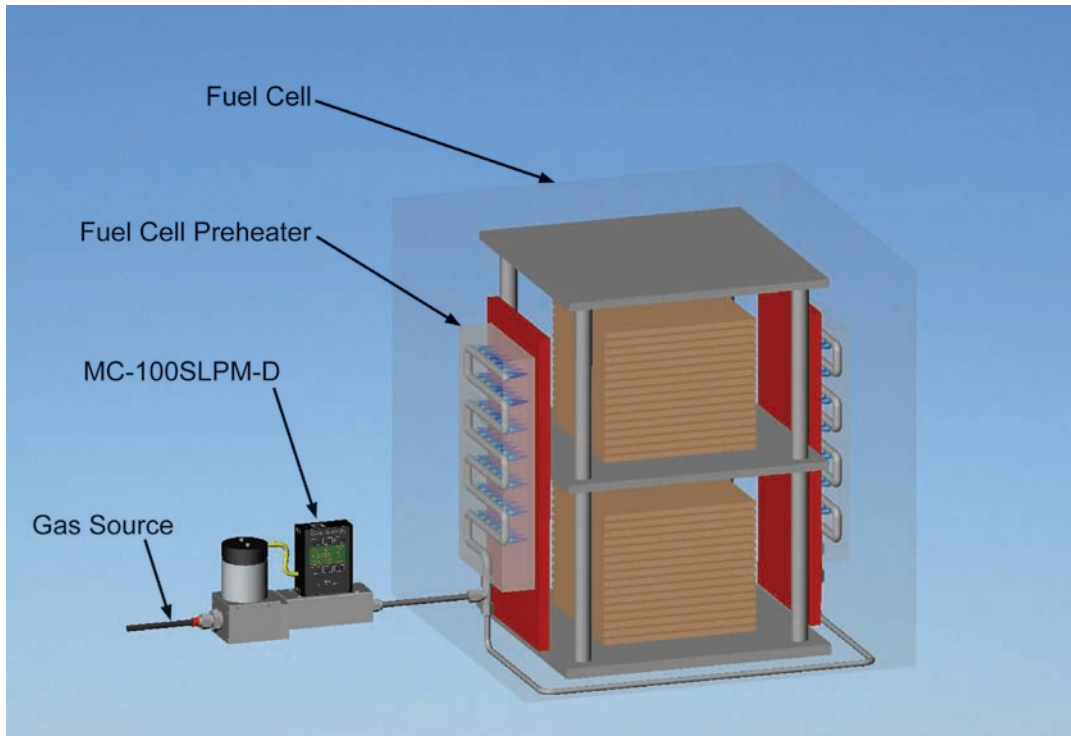


Alicat Controllers in SOFC Applications

Traditional fuel cell stacks are dependent upon mass flow control devices to regulate the flow of fuel gas into the reformer (in the case of hydrocarbon fueled systems) or hydrogen and air or oxygen directly into the stack (in the case of hydrogen fueled systems). SOFC stacks have the additional requirement of preheating prior to the start of power generation. Controlling the rate of temperature rise is a critical factor in preventing damage to the fuel cell stack during the transition from room temperature to operating temperature.



Much of the time, catastrophic damage to fuel cell stacks is caused by malfunctions in the ancillary equipment. SOFC stacks are particularly vulnerable to cracking induced by uneven heating or too high a heating rate during startup. Alicat Scientific mass flow controllers provide the very fast, very precise control needed to protect SOFC stacks from thermal transient damage during the startup cycle.

When driven by RS-232 set-point signals, Alicat controllers can be incremented by as little as 1/64,000 of full scale flow. This allows minute adjustments to be made in the amount of fuel burned per unit time. By monitoring the stack temperature directly, the customer's control computer can keep the temperature vs. time profile smooth and on track.

The very high bandwidth inherent in all Alicat controllers, allows them to quickly respond to transients in fuel gas supply pressure. Alicat mass flow controllers read the flow and correct the drive to the control valve about 1000 times per second. In that manner, fuel pressure transients (such as one might experience when the reformer is being initially charged) are quickly compensated for. Typical response to step changes in flow are faster than 50 milliseconds.