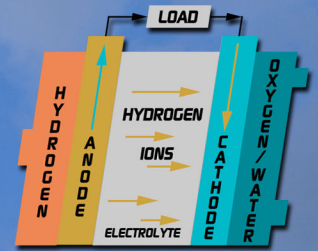




*our pumps start with your specs...*



# Air • Gas • Liquid Diaphragm Pumps for Fuel Cells

proton exchange membrane (pem)

direct methanol

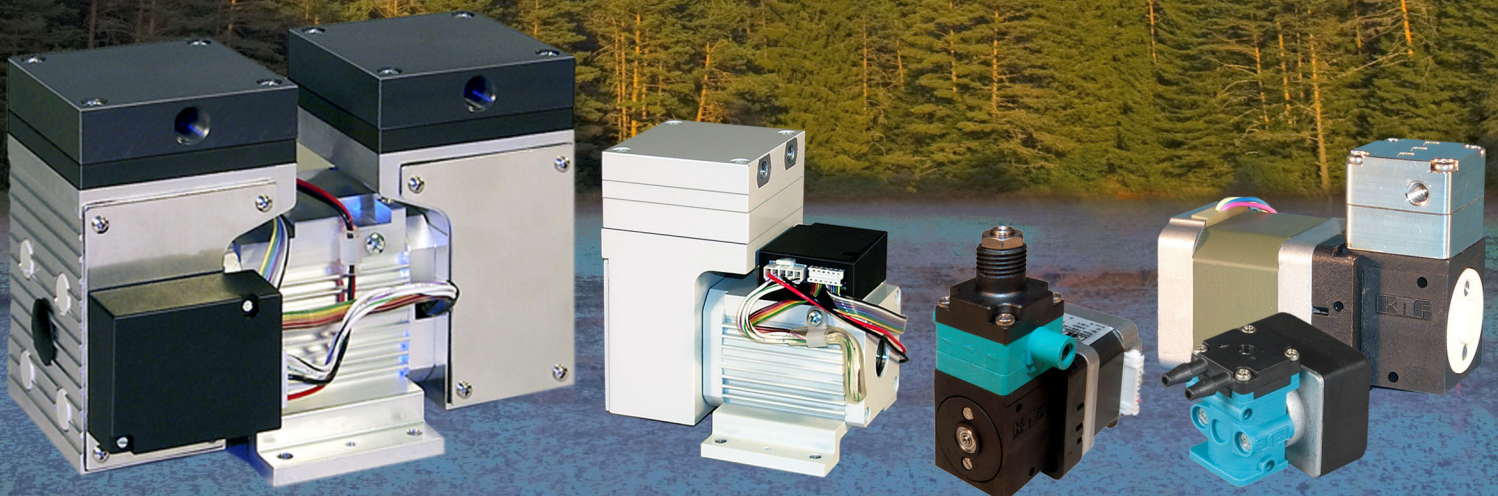
solid oxide

metal hydride

hydrogen generators

reformers

test stands & systems



# Pumps for Fuel Cells

## The clean, oil-free pump for developing technologies

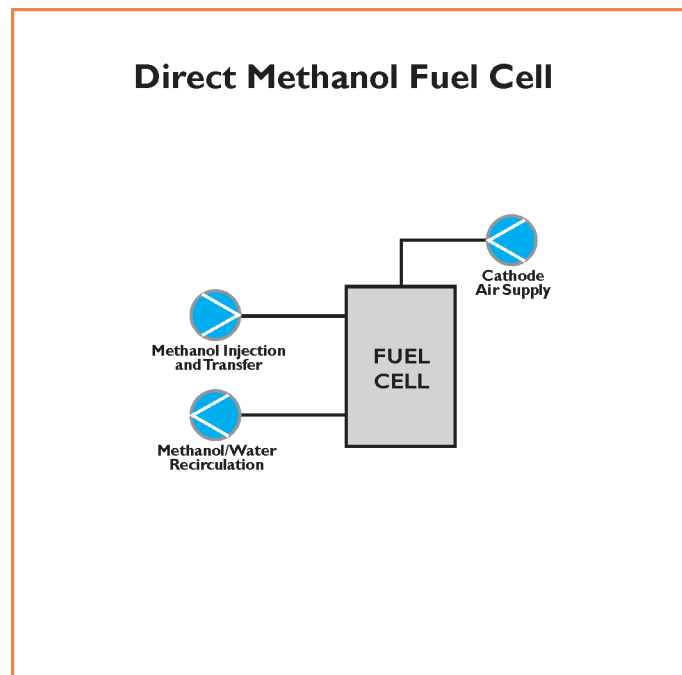
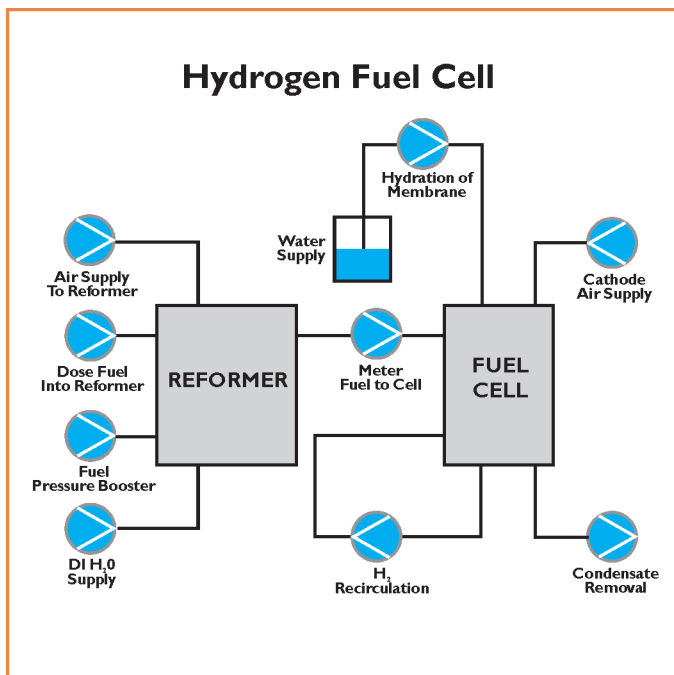
Diaphragm pumps are ideal for fuel cells because they are 100% oil-free. Unlike other pumps, they do not contaminate the media. KNF pumps are specifically designed to pump either liquids or air and gases. We offer a variety of wetted materials, motor types, and performance ranges. Our pumps are ideal for fuel cell systems because of the following qualities:

- **Energy Efficiency** - We understand that pumps are power parasitic to fuel cells. Our designs operate with minimum power requirements, and many feature adjustable speed.
- **Smallest Size** - We make some of the smallest liquid and gas pumps in the world for metering, dosing or for high-speed pumping.
- **Quiet** - Because pumps are typically the most significant generators of noise in a fuel cell system, we focus our efforts to minimize the noise signature.
- **High Reliability** - The lifetime of our pumps was once considerably longer than any fuel cell could last. The newer cells and systems, however, are being designed for much longer service lives. Tell us what lifetime specification you need.
- **Run Wet or Dry** - Our gas-handling pumps handle slugs of liquid, and our liquid pumps operate dry continuously. They do, however, operate most efficiently while pumping their intended media.
- **KNF Experience** - We will meet or exceed your challenges with our 50+ years of designing high-quality, rugged pumps.

- high efficiency, low power consumption
- tolerates wet vapors without damage
- premium, corrosion-resistant wetted parts
- clean, oil-free, compact performance
- reliable, maintenance-free design

- **Motor Selection** - We offer a variety of motors to fit your application. From low-cost carbon-brush types, high quality ironless core versions with precious metal brushes, to the longest life type, a brushless DC motor that features available logic speed controls.
- **We Start with Your Specs** - KNF's modular design concept and corporate philosophy of "optimize...not compromise," has enabled us to efficiently design over 20,000 unique pumping solutions for our customers.
- **CE and DVGW Approved** - All KNF pumps are CE marked. In addition, we have DVGW approval for our secondary safety diaphragm (.12) design, frequently used to boost the pressure of methane, propane, or natural gas going into a reformer, and to recirculate hydrogen through the cell.
- **Worldwide Support** - Fourteen KNF subsidiaries around the globe assures you that we can fully support system manufacturers and your customers.

## Applications for KNF Pumps in Fuel Cell Systems



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