Tubular membranes/CMR

Membrane or Catalytic Membrane Reactor (CMR) based on standard or CMR-modified ProboStat

Standard ProboStat tubular membrane setup

Use a standard ProboStat to measure permeation through a closed end tubular membrane, by attaching it to the ProboStat pedestal socket.

Standard ProboStat tubular CMR setup

Use the ProboStat as a CMR setup by attaching the tubular membrane to the inner gas tube socket, using a support tube outside of it to hold the catalyst. Collect the product with a top cap.

Custom ProboStat CMR

Special version of the ProboStat base unit:

5 gas connections:
Reactant gas in
Product sweep gas in
Product + sweep gas out
Permeate sweep gas in
Permeate + sweep out

New add-on to the pedestal facilitates:
Membrane as "support tube"
Extra "support tube" for holding catalyst
Allow proper gas tube and flow inside membrane

Top cap extraction of product+sweep
Internal Pt10Rh heaters
Pressures above 1 atm
Heated connector box
Up to 6 thermocouples
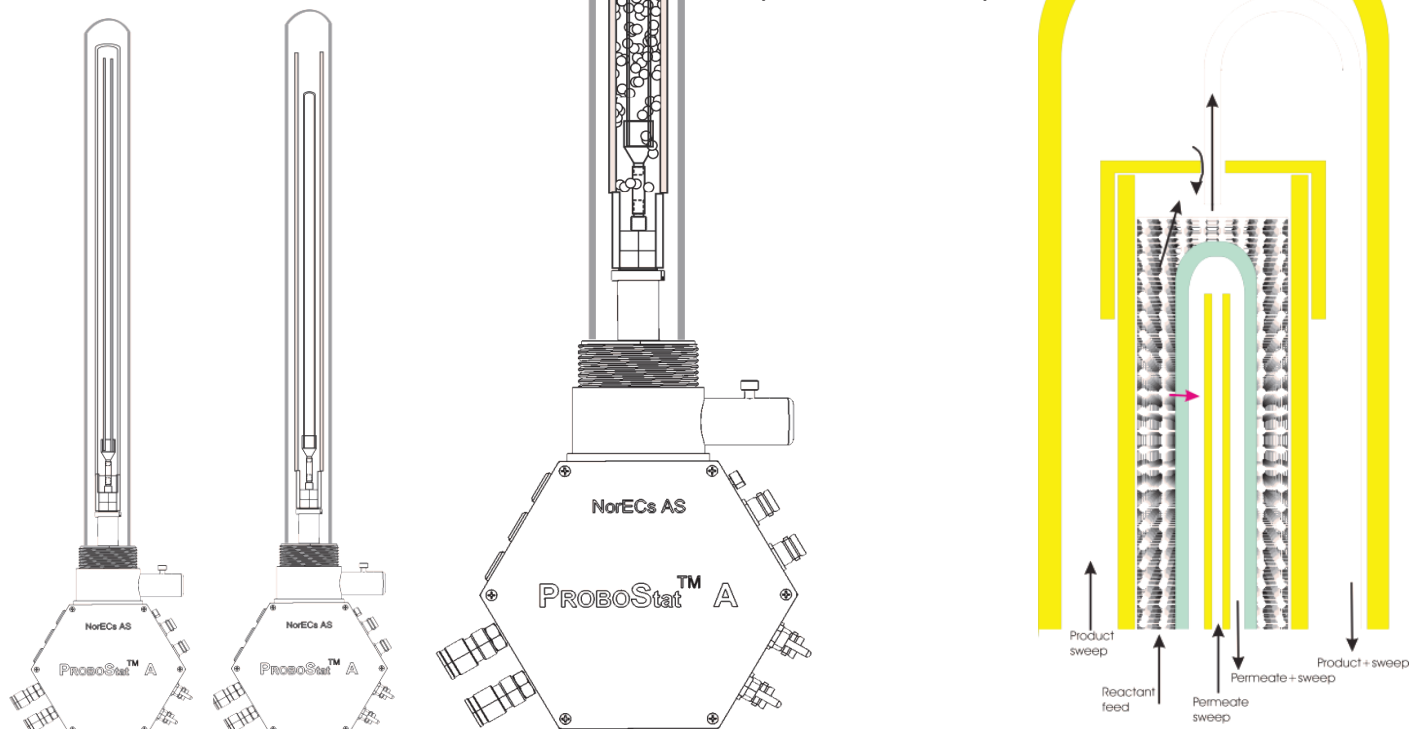
NORECS products

Measurement Systems

ProboStat™	Versatile sample holder system for measurements of electrical properties, transport parameters, kinetics of materials, solid/gas interfaces and electrodes at high temperatures under controlled atmospheres.
SeebSys	System for automated measurements of Seebeck coefficient and electrical resistance at high temperatures and under controlled atmospheres. Measurement software included.
CoulTCell	Coulometric titration setup for measurements of oxygen nonstoichiometry of materials at high temperatures in different partial pressure of oxygen. Measurement software included.
Tubular membranes and electrolytes for ProboStat™	Use standard ProboStat™ for tubular gas separation membranes or electrolyte cells. Catalytic Membrane Reactor (CMR) for tubular membranes with CMR-modified ProboStat™.

Software

Omega	Multipurpose measurement and data analysis software for electrochemical measurements. Omega is designed for maximum flexibility: it accepts data from many different sources such as instruments, furnaces and mass flow controllers. It can plot any measured or calculated data. With no time restrictions nor limit for simultaneous measurements. It was originally developed for ProboStat™ users.
Omega Temp	Software to control and program furnace temperatures and profiles, with unlimited number of segments.

Atmosphere control

ProGasMix FC	Versatile rotameter-based manual gas mixer especially developed for laboratory investigations of the properties of oxides at high temperatures vs T, pO_2, pH_2O etc., or fuel cell tests with humidification of fuel and/or oxidant. Partial pressures are calculated via accompany software. Allows measurements of proton and oxide ion transport numbers separately.
FCMix	Simple and low-cost gas mixer that controls the flows of fuel, oxidant and one inert gas that can be routed to the fuel and oxidant for flushing, soft start, slow SOFC anode reduction, and safe operation, as well as tests of gas diffusion limitations.
Probble	A combined humidification unit and over-pressure controller suitable for small gas flows to SOFC button cell testing (in for example ProboStat™), annealing furnaces, etc. Two units used with FCMix give combined humidification and overpressure control of each ProboStat™ cell chamber as well as fine pressure control in and between two cell chambers.

We supply

Furnaces	Furnaces customized for ProboStat™
TempBox	Simple thermocouple reader with USB port.
Samples and PLD targets	8YSZ, BZY-Ni, BZY, BZCY72, etc.
SOFC button cells	Anode supported cells with 8YSZ electrolyte, porous nickel cermet anode and lanthanum cobaltite cathode.

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