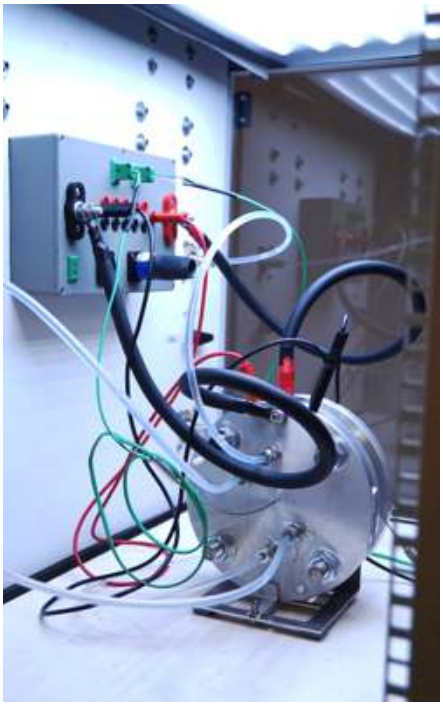
# ETB Series

## PEM Electrolyser Test Benches

### Features

- ✓ Complete gas and water control
- ✓ Anodic and cathodic water circulation
- ✓ High power electrical testing including EIS, up to 2 Kw
- ✓ Employ all primary measuring techniques to characterize single and stacked PEM electrolysers
- ✓ Safe and clean cell mounting area with all electrical and gas/water connections available in convenient locations
- ✓ High safety level with integrated sensors and forced air circulation
- ✓ Outstanding software control and monitoring for all functions



Materials Mates Italia (MMI) offers complete solutions for the study of electrolysers in all their aspects, from high power impedance spectroscopy to multichannel systems for stacks, including standard and customized cells. MMI integrates in their systems a series of additional ancillary equipment such as chillers or gas analyzers. They furthermore supply flexible drivers to manage the equipment from external programs.

Please feel free to contact us for a free evaluation of your system requirements.

The ETB Series was born from our work experience at several laboratories all over the world. It combines, in a single system, everything needed to perform complete hydrolizer tests, both from the phisycal and the electrical standpoint.

The totally symmetrical structure with water and gas management on both circuits allows the operator to perform tests on PEM systems in every possible operational condition.

An ETB Series basic system may be used up to 25 Bar and includes everything needed to test the cell up 150 °C.

We offer, among the different available solutions, operational pressures up to 35 Bar, safety analysis of output gas composition as well as our entire variety of options for impedance spectroscopy, as performed by our line of multi-channel equipment.

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## PEM Electrolyser Test Benches

MaterialsM Instruments

### Technical specifications (example ETB2-30)

Electrolyser test bench with anodic and cathodic water circulation for PEM cells

**Electric**

- Suitable for cells and stacks, up to 2KW of applied DC power
- Cell power supply 0-11 V 0-200A max accuracy +/- 0.5% +/- 0.1 % F.S.
- 5 differential inputs for stack voltages accuracy +/- 0.5% +/- 0.1 % F.S.
- Integral EIS system in the range 1 mHz-10 KHz
- Full software control of the tests

**Thermal**

- Cell water operating temperature 10-150°C
- Temperature readout and controls accuracy +/- 0.5 °C
- Additional Heaters on the cell 1.5 KW overall
- 2 separate PID temperature controls for the cell with thermocouple inputs
- 48V DC heaters operation for maximum safety

**Pressure**

- Max cell operating pressure 30 Bar
- Closed loop backpressure control in the 1-30 bar range or atmospheric
- Pressure readout 0-40 Bar accuracy +/- 0.25% +/- 0.1 % F.S.
- Mechanical, certified 35 Bar exhaust safety valve

**Mass analysis**

- H2 output flow 10 lt/min full scale accuracy +/- 0.5% +/- 0.1 % F.S.
- O2 output flow 6 lt/min full scale accuracy +/- 0.5% +/- 0.1 % F.S.
- Cathodic mass meter (Water+gas) 1 Kg/min accuracy +/- 0.2% +/- 1 g/min

**Water circuit**

- Fully symmetrical design for anodic and cathodic circuits
- Vane metering pump circulation to 1 lt/min reproducibility 1%
- Full flow through deionizing filtering unit with anionic/cationic exchange resins up to 20 Mohm purity
- Continuous in-flow conductivity meter for water quality recording
- Conductivity range 0-200 uS accuracy +/- 1%
- High pressure overall volume 3 liters (for each side)
- High pressure refill pump for continuous operations on long term
- Deionized water refill tank 30 Lt

**Safety circuits**

- O2 in H2 flow analyser 10 % full scale Optical sensor, 0.1% accuracy
- H2 in O2 flow sensor 10% full scale pellistor sensor, 0.5% accuracy
- Explosive gases sensor placed in exhaust duct with 0.1 % LEL threshold
- Nitrogen flushing system with independent actions on the two sides and check valves
- Exhaust fan with 800 $m^3$/h capability, inner construction for depression protection of outer environment
- 6 mm thick protection windows with open alarm
- Interlock safety circuit for connection with internal/external safety circuits in the building

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