HIDEN ANALYTICAL



DEMS System

Differential Electrochemical Mass Spectrometry



Real Time Gas Analysis for Advanced Energy and Electrocatalytic Research – DEMS system

Differential Electrochemical Mass Spectrometry is a technique that allows unique online analysis of gaseous and volatile products from electrochemical reactions. The Hiden DEMS systems combines advanced electrochemical half cells with excellent performance in mass spectrometry to achieve outstanding analytical capabilities.

Designed for applications such as fuel cell diagnostics, CO_2 reduction, catalyst evaluation, corrosion studies and battery research. It provides scientists with accurate, immediate data on reaction pathways and product selectivity.



Key Features

- Versatile Mass Spectrometer system compatible with multiple cells and inlet types
- Near-instantaneous time response – direct electrode-to-MS connection delivers rapid, quantitative product detection
- Mass scanning and time/intensity trend monitoring of multiple species
- Deposition compatible working electrodes
- Data synchronisation within a single intuitive software package
- A turnkey solution – everything you need to start your experiments immediately

System Configuration & Options

ITEM	DESCRIPTION	PARTCODE
SYSTEM	HPR-40 DEMS bench-top gas analysis system for electrochemistry, including ECL-Static and ECL-Insight cells and Hiden HAL 201 RC mass spectrometer with Faraday/Electron Multiplier detector. Mass range 200 amu.	**305250**
OPTIONS & ACCESSORIES	Extended mass range. 300 amu mass range (in place of standard 200 amu mass range).	**305021**
	ECL-Probe – Extendable probe, allowing dissolved gas to be measured in custom cells.	**303443**
	Potentiostat Integration – Cables available for connection to most Potentiostats, allowing trigger start and real time integration of Potential and Current into Hiden software.	**270220/270221**
GAS INLET OPTIONS	**QIC inlet -** heated capillary inlet for sampling gases and vapours at atmospheric pressure.	**303562**
	Microflow inlet, flow rate from 12 µl/min, unheated.	**303452**
SPARES KIT	**Recommended spares kit** ▸ Twin filament, oxide coated iridium ▸ Filament kit ▸ ECL-Static ▸ ECL-Insight	 **201200** **201600** **3035515** **3035517**

ECL-Series

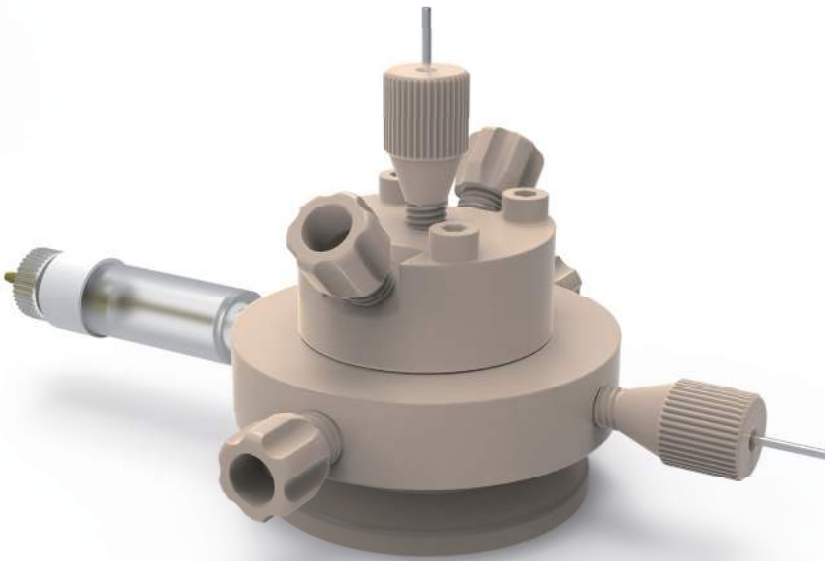


ECL-Static

ECL-Static cell is optimised for ease of use and flexible experimentation setup. Its four ports accommodate counter and reference electrodes as well as allowing for electrolyte flow, should a flow configuration be required. Depending on the application, the vitreous carbon working electrode can be used as an inert electrode or an electrocatalyst can be applied to the active surface using various deposition techniques. The cell is supplied 'Research Ready' while still offering flexibility to customise electrodes and configurations.

ECL-Insight

ECL-Insight cell is designed for high-performance, real-time electrochemical mass spectrometry, offering direct electrode-to-MS connection for rapid, quantitative detection. With a gold sputter-coated membrane, dual-chamber non-metallic design, and bubble-free operation at currents up to 100 mA/cm², it combines exceptional collection efficiency, ultra-fast voltage scans up to 100 mV/s, and high sensitivity down to ~50 µA/cm². This makes it the ideal choice for studies in CO_2 reduction, hydrogen evolution, and isotope labelling.





ECL-Probe

The ECL-Probe enables direct dissolved gas analysis in both standard and custom electrochemical cells. Its non-metallic, immersion-ready construction ensures compatibility without electrochemical interference, while a specialised hydrophobic support delivers an enriched gas signal. Ready-to-connect with the HPR-40 DEMS, the ECL-Probe offers seamless integration and reliable performance.

Example data

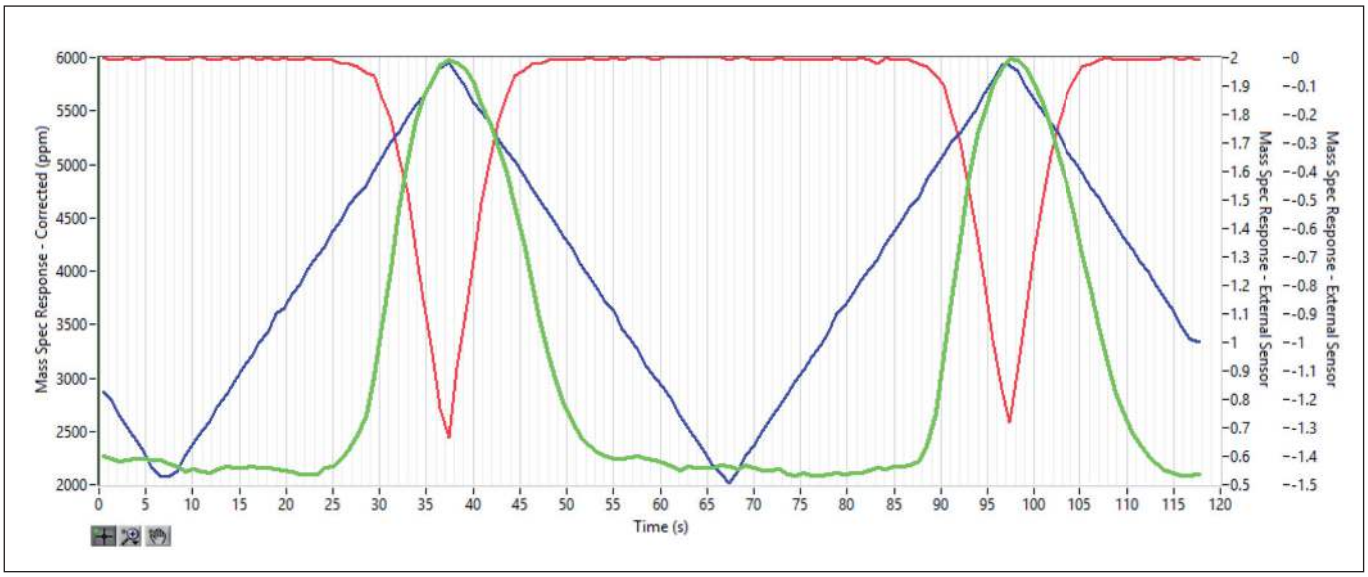


Figure 1: Real-time hydrogen generation during water electrolysis using ECL-Insight, showing the clear synchronisation of the hydrogen signal with applied potential and current in QGA software.

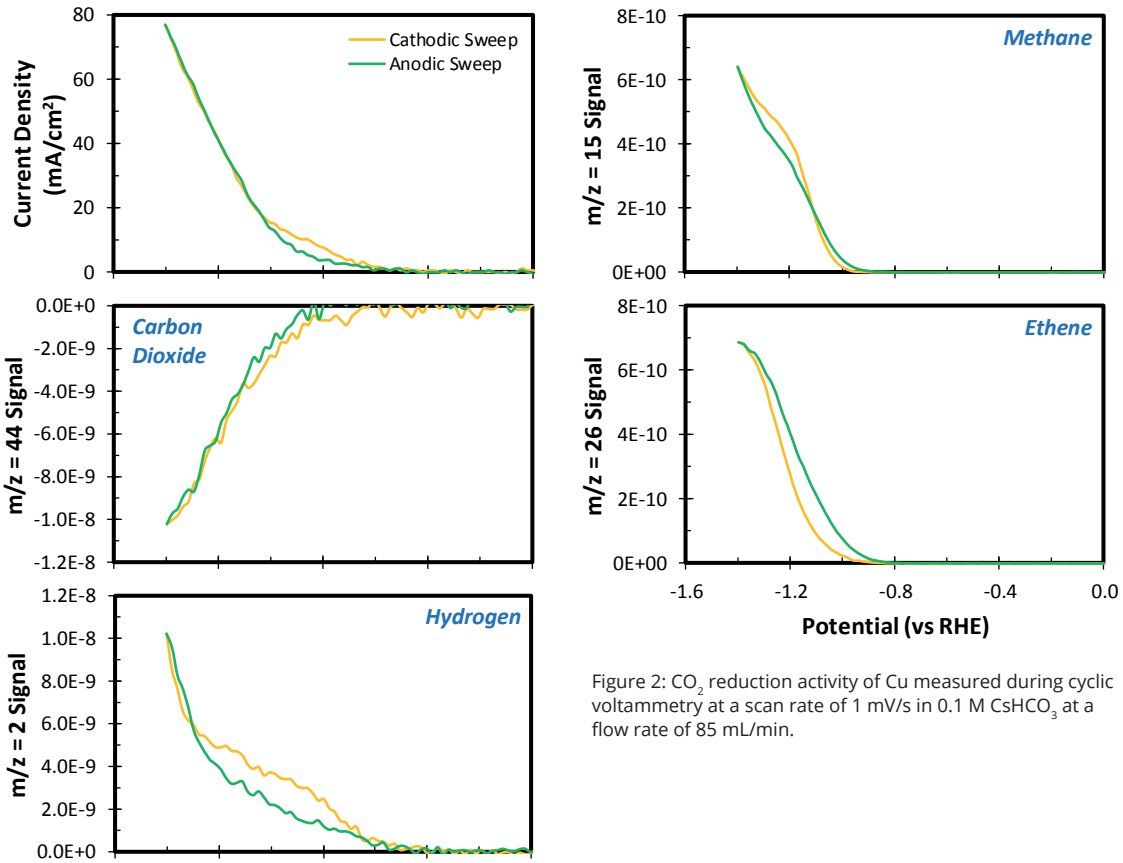
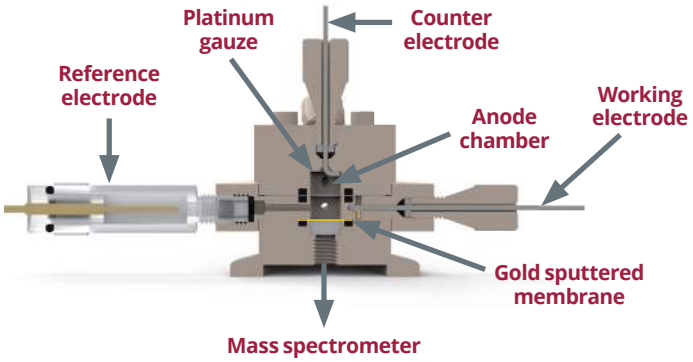


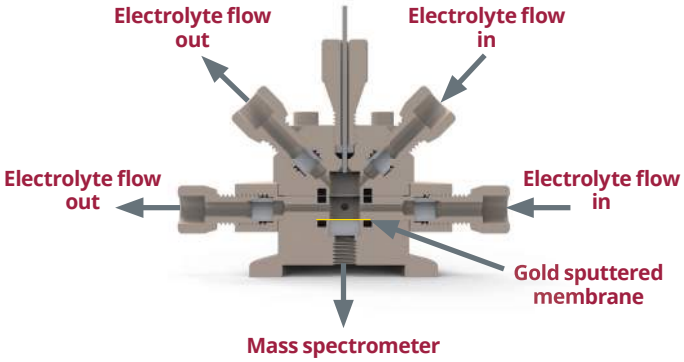
Figure 2: CO_2 reduction activity of Cu measured during cyclic voltammetry at a scan rate of 1 mV/s in 0.1 M $CsHCO_3$ at a flow rate of 85 mL/min.

Technical data

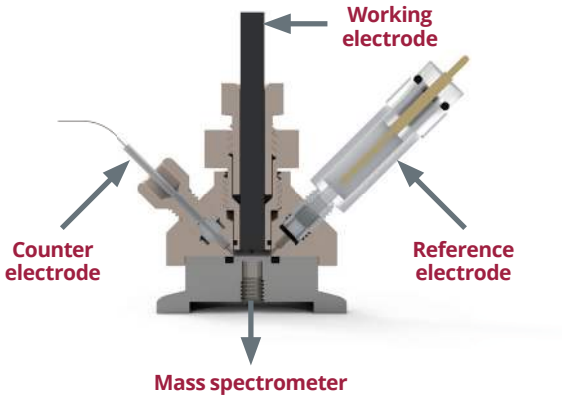
ECL-Insight electrode view



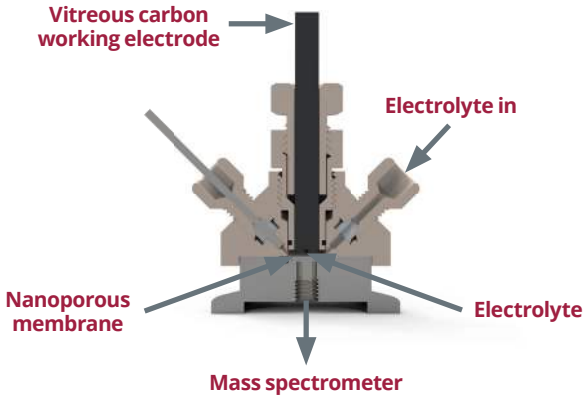
ECL-Insight electrolyte view



ECL-Static electrode view



ECL-Static electrolyte view



Mass ranges, amu:	1-200 / 1-300 amu
Sensitivity:	100% to 100 ppb subject to spectral interference
Speed:	Up to 650 measurements/second
Response time:	<100 ms
Software:	MASsoft Professional
	Windows compatible
	QGAsoft
Interface:	Ethernet/USB/Serial (RS-232) connections
Detector:	Dual Faraday/Channeltron Electron Multiplier
Analogue input:	8x (optional)/16 bit
Analogue output:	8x (optional)/14 bit
Digital input:	8x
Digital output:	8x, 24 V
Dimensions (L x W x H), mm:	495 x 538 x 382 mm
Weight, kg:	Typically 31 kg and external scroll pump 26 kg
Power requirement:	110/220/240 V AC, 50/60 Hz, 1.2 kVA

Hiden**APPLICATIONS**

Hiden's quadrupole mass spectrometer systems address a broad application range in:

GAS ANALYSIS

- Dynamic measurement of reaction gas streams
- Catalysis and thermal analysis
- Molecular beam studies
- Dissolved species probes
- Fermentation, environmental and ecological studies





SURFACE ANALYSIS

- UHV TPD/TDS
- ToF qSIMS and SIMS analysers
- End point detection in ion beam etch
- Elemental imaging – 3D mapping
- SIMS system with simultaneous dual polarity analysis

PLASMA DIAGNOSTICS

- Plasma source characterisation
- Etch and deposition process reaction kinetic studies
- Analysis of neutral and radical species





VACUUM ANALYSIS

- Partial pressure measurement and control of process gases
- Reactive sputter process control
- Vacuum diagnostics
- Vacuum coating process monitoring

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