Electrochemical Gas Analysis Instruments

Michell’s solutions to gas analysis with galvanic sensor technology from Advanced Instruments Inc.

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Gas Analysis Products
Michell’s range of electrochemical sensor-based transmitters and analyzers from Advanced Instruments Inc.

The Advanced Instruments Sensor Technology from Michell focuses on offering optimized sensors to meet the requirements of specific customer applications. The efforts of the AII engineering department produced the only real advancement in the electrochemical sensor technology for decades resulting in the Pico-Ion™ ppb Sensor.

AII Galvanic Sensors offer:

- Superior stability
- Faster recovery time from exposure to air
- Longer service life than traditional sensors
- Wide choice for critical ranges
- Exceptional performance and reliability
- Compatibility with high CO2 concentrations

Typical Applications

- O₂ analysis during vacuum extraction – liquid removal is a major issue
- H₂S analysis: both continuous and spot-checks
- Detect corrosion of transmission lines – O₂ combines to form acids
- O₂ contamination of catalyst, regeneration beds and processed gas
- Protection of personnel, gathering booster equipment, compressors
- O₂ levels in blanketing atmospheres to ensure quality pipe welds
- O₂ in headspace of fermenters, brew and storage tanks
- Personnel safety (O₂ deficiency in CO₂ areas)
- Ppm and % O₂ in inert gases for sealed containers or gloveboxes
- Processing of "cleaned" natural gas and natural gas quality
- Trace oxygen in blanketing gases for welding
- O₂ measurement in pharmaceutical reactors and centrifuges

Customers

Michell's customer base for oxygen analyzers includes leading companies in industries ranging from Natural Gas, Chemical, Power, Compressed Air, Pharmaceutical, Beverage and Petrochemical.

We also work with many smaller enterprises that rely on our market expertise. Due to the high degree of customization available, we are able to meet their specific needs in many applications.
Sensor Technology

Advanced Instruments Sensor Technology

Galvanic Oxygen Sensors for ppb, ppm and % levels

The sensor is the heart of any analyzer, thus sensor technology is the critical factor in analyzer performance. All products are manufactured under an independently certified QA system that complies with ISO 9001:2000 and European CE directives.

The Pico-Ion™ MS sensor, produced with additional sensing surface area of the silver plated cathode generating a higher output that allows for more sensitive and stable O₂ analysis.

Advantages of Pico-Ion™:

<table>
<thead>
<tr>
<th>Advancements</th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal output 100x &gt; traditional sensors</td>
<td>Lower detectable limit &lt;1 ppb Lower accuracy and repeatability &lt;±1%</td>
</tr>
<tr>
<td>Detectable limit &lt;1 ppb</td>
<td>Stability 6 months &lt;5% drift</td>
</tr>
<tr>
<td>High signal to noise ratio</td>
<td>Reovers faster from exposure to O₂</td>
</tr>
<tr>
<td>Maximize the rate oxygen is reacted</td>
<td>No sensor maintenance</td>
</tr>
<tr>
<td>Compact disposable design</td>
<td>Service life 15 months</td>
</tr>
<tr>
<td>Recover faster from exposure to O₂</td>
<td>No sensor maintenance</td>
</tr>
<tr>
<td>Transportable, insensitive to minor shock</td>
<td></td>
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<tr>
<td>Low cost of ownership</td>
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</table>

Galvanic Trace ppm Oxygen Sensors

Exhibit excellent stability at low ppm oxygen levels, faster recovery from excursions to high oxygen concentrations and a longer service life than traditional sensors.

Galvanic % Oxygen Sensors

Offering high performance, reliability, extended life and operating temperature range which are critical to meeting the need for oxygen measurements imposed by today’s industrial processes.

A proprietary electrolyte that demonstrates excellent compatibility with up to 100% concentrations of CO₂ has made the XLT sensors the standard for measuring oxygen contamination in beverage grade CO₂ and natural gas. Required for continuous exposure to carbon dioxide levels above 0.5%, the XLT sensors also feature an extended operating temperature range of -20°C.

![Graph showing recovery from air calibration to <1ppm](image)

Installation of a new sensor

-Sensor in-service @ <1ppm

<table>
<thead>
<tr>
<th>Performance</th>
<th>Pico-Ion™ UHP</th>
<th>Pico-Ion™ MS</th>
<th>Galvanic ppm</th>
<th>Galvanic %</th>
<th>Galvanic Purity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy</td>
<td>±1% FS</td>
<td>±1% FS</td>
<td>±2% FS</td>
<td>±2% FS</td>
<td>±2% FS</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>0.5% FS</td>
<td>0.5% FS</td>
<td>0.5% FS</td>
<td>0.5% FS</td>
<td>0.5% FS</td>
</tr>
<tr>
<td>Low range (ppm)</td>
<td>0-100 ppm</td>
<td>0-1 ppm</td>
<td>0-10 ppm</td>
<td>0-1%</td>
<td>90-100%</td>
</tr>
<tr>
<td>Expected life</td>
<td>15 months</td>
<td>24-36 months</td>
<td>24 months</td>
<td>24-32 months</td>
<td>24 months</td>
</tr>
<tr>
<td>Recovery from exposure to air</td>
<td>&lt;1 hour from 1 minute exposure to 9 ppm back to 1 ppm</td>
<td>&lt;45 minutes</td>
<td>&lt;45 minutes</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

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Michell Instruments have extended their oxygen product portfolio by including the AII range of Galvanic Oxygen Analyzers. Performance, quality, value and world-class customer service have made our partnership a global leader in supplying solutions to demanding applications for process instrumentation, oxygen analysis for natural gas and many others. Our products are manufactured under a single, independently certified quality system that complies with ISO 9001:2008 and major international standards. All the products (except the EXP Analyzers, GPR-15/18/25/28) share a common electronics platform and Human Machine Interface (HMI). All Analyzers and transmitters are supplied with 3-5 ranges and utilize stainless steel wetted parts.

**Transmitters**
- Advanced sensors coupled with basic electronics
- Can be configured for process, ambient and purity analysis
- The most compact and economical ppm and percent analyzers available
- Model numbers: GPR-1500/2500/35/3500

**Portable Oxygen Analyzers**
- Innovative use of bypass valve increases sensor life and speeds up analysis time
- Fully portable with rechargeable batteries
- General Purpose and ATEX variants available
- Multiple sample options including pumps, flow meters and bypass valves
- Model numbers: GPR-1000/1100/1200/2000/3500

**Process Oxygen Analyzers**
- Available ranges in ppb, ppm and % levels
- Auto-ranging or single fixed range
- Capable of measuring in inert gases such as helium, argon, nitrogen, hydrogen or CO$_2$
- Barometric pressure and temperature compensation
- General Purpose (safe area use only) wall or panel mount design options
- Bypass sample system
- Pico-Ion™ sensor option
- Fast recovery from air to trace level analysis
- Model numbers: GPR-1600/1900/2600/2900/3100

**Oxygen Analyzers and Sample Systems for Natural Gas**
- Proprietary CO$_2$ compatible sensor
- Intrinsically Safe design
- Modular sample system to remove H$_2$S, water and regulate inlet pressure
- Suitable for ppm and % range O$_2$
- Analyzers for vacuum extraction and transmission
- Model numbers: GPR-1800/2800

**ATEX Certified Explosion Proof Oxygen Analyzers**
- Available ranges in ppb, ppm and % levels
- EExd enclosures with flame arrestors fitted
- Two adjustable alarms (except GPR-25 XP)
- ATEX certified EX II 2 G Exd IIB or IIB + H2 T6 or T5
- Up to 36 months sensor life
- Model numbers: GPR-18/28/25

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Galvanic Oxygen and H₂S Analyzers

Product Guide

H₂S Analyzers

Using advanced galvanic sensors for measuring trace levels of H₂S in portable or fixed instrument format.

GPR-7100

- Portable with rechargeable batteries
- Coalescing filter, flow meters and integral sample pump
- 0 to 1 V signal output
- Operable during recharging

GPR-7500

- Panel mounted with coalescing filter, flow meters, sample/span valve
- 12 to 28 V loop powered or 110 to 220 V (AIS only)
- Barometric pressure compensation (AIS only)
- Optional Modbus RTU communications

Sampling Systems

Advanced Instruments offer a wide range of sampling options from basic add-ons (flow meters, pumps, alarms etc) to full panel mounted systems. The modular approach means standardization and short lead times.

Glove Box Monitoring

- The GPR-1500 GB is specifically designed for glove box monitoring
- Supplied with transmitter and sensor on flying lead for convenient integration
- Optional sample/calibration module (shown)
- 5 ranges available from 0 to 10 ppm up to 25% O₂

Panel Mounted Sample Systems

- Liquid drain system will protect the sensor from accidental damage even if entire pipework is flooded
- Flow meters, filters, sample valves, scrubbers, enclosures available to match customer requirements
- Modular design ensures repeatable supply and shortened lead times
- Compact design minimizes wall space required

H₂S Scrubber

- For particularly aggressive samples containing hydrogen sulfide Advanced Instruments supply a range of H₂S scrubbers
- These can be a simple catchpot to the large scrubber assembly shown for high concentrations of H₂S
- A scrubber life chart is available to calculate when a scrubber material requires replacement

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Michell Instruments operates in the following markets:

- Compressed Air Dryers
- Pharmaceutical
- Standards Laboratories and Metrology
- Semiconductors
- Natural Gas and Petrochemicals
- Industrial Gas Production (air separation)
- Power Generation

Other Product Ranges

Relative Humidity Instruments
Michell's own RH sensing technology provides excellent resolution, long term stability and speed of response. We offer a wide range of humidity and temperature measuring sensors and instruments, including relative humidity transmitters, humidity and temperature transmitters as well as handheld indicators. The humidity generator range includes the most stable humidity generator on the market.

Dew-Point Transmitters
Michell offers the widest range of dew-point sensors and transmitters on the market. From the industry standard Easidew 2-wire Transmitter to the rugged Easidew PRO IS for hazardous areas; all are supplied with sensors traceable to national standards.

Portable Instruments
Michell's range of easy-to-operate portable instruments provide fast, accurate and stable measurement of dew point, relative humidity and moisture concentration. They are designed to satisfy the most demanding industrial conditions, and are unique in the market for giving repeatedly fast response to low dew points.

Chilled Mirror Instruments
Chilled Mirror is a fundamental measuring technology offering the user exceptionally accurate, reliable and repeatable measurements from trace moisture to high humidity. Michell offers a range of instruments based on a rugged sensor design that is equally suitable for installation in demanding process environments or for use as an accurate reference instrument in a National Standards Laboratory.

Process Analyzers
Michell's range of analyzers are specifically designed to provide reliable online measurement in process applications such as dedicated water and hydrocarbon dew-point determination in natural gas. Three sensing technologies are used: the Ceramic Impedance sensor for measurements in gas and liquid phase; Quartz Crystal Microbalance for trace moisture in process gases and the Dark Spot Chilled Mirror for hydrocarbon dew point.

Calibration Instruments
Michell has a wide offering of calibration equipment for the verification of trace moisture, dew point and relative humidity sensors. A modular concept means that Michell's engineers can build a customized calibration solution that meets your exact needs. Components may include air compressor and dryer; low range or high range humidity generator; simple sensor housing or environmentally controlled test chamber and finally, verification using a traceable Michell Chilled Mirror Hygrometer.