Portable Gas Detection
Electrochemical Oxygen Sensors and XCell® O_2 Sensors

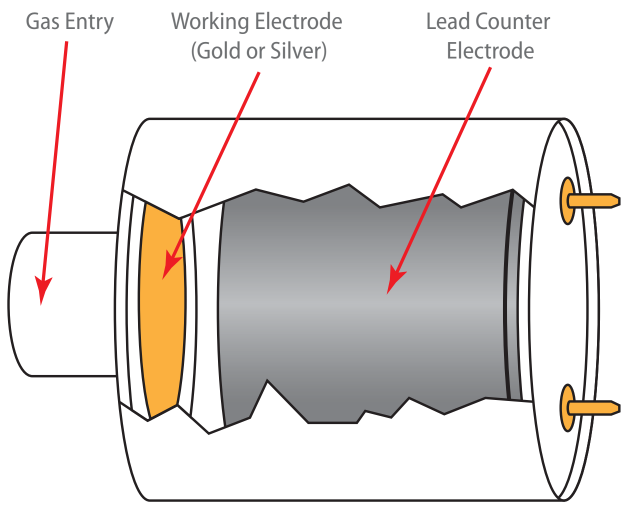
Technical Bulletin

Electrochemical oxygen sensors detect oxygen deficiency or enrichment in the environment.

Standard O_2 Sensor Technology

Oxygen sensors use electrochemical reactions to generate a current proportional to the concentration of oxygen and report the amount of oxygen in percent volume.

Most O_2 sensors on the market use a consumable chemical reaction: oxygen gas reacts with lead to form lead oxide. This chemical reaction is constantly taking place from the time the sensor is manufactured. As lead is converted to lead oxide, the lead is consumed until it is eventually used up. At this point, the sensor's output drops below a point where the sensor will continue to calibrate. When this happens, the sensor reaches end of life. The lifespan of a typical lead based O_2 sensor is about 18-24 months.

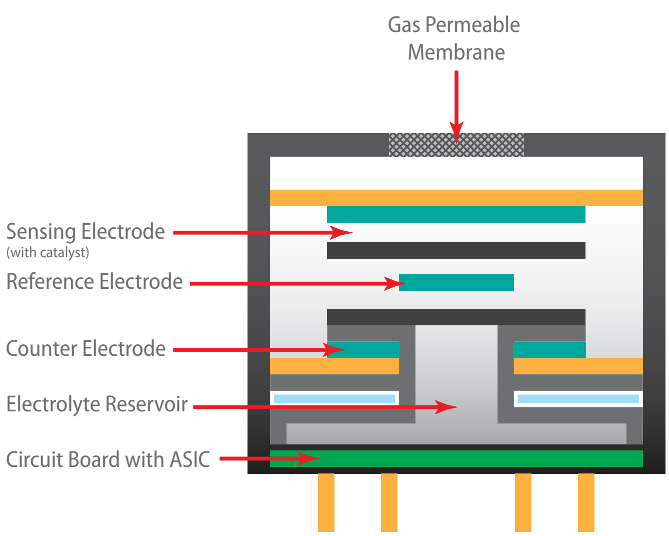


Why MSA XCell O2 Sensors?

Longer Life!

The electrochemical system in the MSA XCell O_2 Sensor uses a *non-consuming* chemical reaction. O_2 molecules entering the sensor react with the working electrode creating electron flow and water as a byproduct. At the counter electrode, water is converted back into O_2 molecules. The chemical reaction requires a low voltage, which is controlled by the application-specific integrated circuit (ASIC) in the XCell Sensor. Because nothing is consumed or "used up" as the sensor is functioning, the sensor has a longer lifespan. XCell O_2 Sensors have a typical life of more than four years.

This non-consuming chemical reaction also means that the sensor can have a much longer shelf-life. The chemical reaction in a traditional lead-based O_2 sensor starts the second the sensor is manufactured. At this time, the chemical process whereby the lead is converted to lead oxide begins and the finite sensor life begins. The MSA XCell O_2 sensor is designed to have a very long shelf-life. While the sensor sits un-powered, no chemical reactions with O_2 are taking place and no life is being depleted from the sensor.



The Safety Company

Performance! Response Time—Pressure Sensitivity

The chemical reaction used by the MSA XCell sensor allows the sensor to respond very quickly to changing O_2 levels with a typical t90 response time of less than 10 seconds.

Most O_2 sensors on the market, including the XCell O_2 sensor, are capillary limited O_2 sensors. This means O_2 is drawn into the sensor by long, thin capillary channel. This capillary keeps the balance between the external ambient pressure and the internal ambient pressure. The ratio of length to diameter of the capillary determines how quickly the sensor equilibrates and how large of a "spike" is cause by quickly changing ambient pressures. The combination of the capillary and the ASIC electronic control gives the XCell O_2 sensor an edge over other sensors by responding to rapid pressure changes. Pressure transients are equalized in seconds and the peak readings from these pressure spikes are minimized to display very small changes for that brief period. This process eliminates unwanted alarms due to pressure changes.

Things to know about Oxygen Sensors!

- Water vapor in the air displaces other gases in the atmosphere including O_2. This is why it is more difficult to breathe in very hot/humid conditions. If you suddenly take an instrument from a relatively dry area where you calibrated it into a very humid area, your O_2 sensor could read several tenths of a percent low. This is not the sensor drifting due to humidity; this is an actually reading that the percent O_2 is slightly lower in that area.
- We calibrate our O_2 sensor in a background of Nitrogen, just like the air we breathe. During this calibration, the flux, or rate that O_2 molecules enter the sensor in nitrogen is part of the calibration. If the background gas significantly changes to another inert gas like Helium or Argon, then this rate at which O_2 molecules enter the sensor will change. The sensor will read high if the background gas molecular size is less than nitrogen, such as helium. It will read low if the background gas molecular size is larger than nitrogen, such as argon.
- Lead-free O_2 sensors do not exhibit cross sensitivities to other gases, just O_2.
- O_2 sensors can be damaged by large amounts of gases that have the ability to damage the platinum working electrode of the sensor. This would typically be percent by volume concentrations of Chlorines or Fluorines (an example would be many refrigerants). If poisoning is suspected, a bump test and/or calibration should be performed.

Never try to calibrate XCell O_2 sensor immediately after installing a replacement sensor. Install the replacement sensor and wait 20-30 minutes for stabilization before calibrating.

ID 0800-82-MC / October 2013

MSA Corporate Center
1000 Cranberry Woods Drive
Cranberry Township, PA 16066 USA
Phone 724-776-8600
www.MSAsafety.com

U.S. Customer Service Center
Phone 1-800-MSA-INST
Fax 1-800-967-0398

MSA Canada
Phone 1-800-672-2222
Fax 1-800-967-0398

MSA Mexico
Phone 01 800 672 7222
Fax 52 - 44 2227 3943

MSA International
Phone 724-776-8626
Toll Free 1-800-672-7777
Fax 724-741-1559
Email msa.international@msasafety.com

Offices and representatives worldwide
For further information: