Oxygen Deficiency Monitor and Oxygen Analyzers

Oxygen Sensors for 0-25% and 0-1000ppm
ABOUT PUREAIRE MONITORING SYSTEMS

- **PureAire** is an experienced safety gas detection manufacturer providing long lasting reliable products. We are capable of handling any size project including proving custom projects for OEM’s.

- **PureAire’s** most popular product, an Oxygen Deficiency Monitor, is paired with advanced electronics and software alerting employees of unsafe environments in seconds.

- Beginning in 1996, our growth has been a result of our commitment to supporting our customers. Our goal is to provide the best service and support in the industry. Available 24 hours a day, 7 days a week, **PureAire** takes the extra step to ensure your complete satisfaction.
PureAire $O_2$ Monitoring System and typical installations

Installed in any confined space where cryogenic gases (nitrogen, argon, helium, and $CO_2$) are located.

- Cryogenic gas storage areas
- Nitrogen freezers
- Confined spaces
- Nitrogen generators
- Air separation plants
- Cleanrooms, semiconductor
- Laboratories, hospitals, and universities
- 3D printers
- MRI, NMR
- Any other locations where low oxygen levels may pose an asphyxiation hazard
Benefits and Features

- 10+ year sensor life
- Zero maintenance
- No calibration required
- Unaffected by environmental temperature, humidity and barometric variations
- Operates at -40°F (-40°C) in freezers
- Local display, 4-20mA output
- 2 adjustable or configurable relays
- Computer controlled electronics
- UL / CUL listed and Ce approved
- Furnished with UL-listed 110 VAC/24 VDC regulated power adapter
**O₂ DEFICIENCY MONITOR**

### Specifications

- **Sampling Method and Range:** Diffusion, 0 – 25% O₂
- **Accuracy:** ±0.5% of full scale
- **Operating Temperature:** -40°F to 131°F (-40°C to 55°C)
- **Humidity:** 0 – 95%
- **Display:** 3/4” backlit LCD digital
- **Audible Alarm (Sound Output):** 90 db
- **Response Time:** Within 1 second of any change in O₂
- **Repeatability:** ±1%
- **Required Calibration:** None (no zero or span pots supplied)
- **Minimum Detection:** 1000 ppm or .1% (other ranges available)
- **Signal Outputs:** DC 4-20mA analog output; dual-level user-selectable alarm relays and one fault relay (2 amps @ 30 VDC/240 VAC)
**O₂ DEFICIENCY MONITOR**

**Specifications continued**

- **Power Requirements:**
  24 VDC 100mA without relays
  500 mA with relays
  (unit supplied with 110 VAC power adapter with 6 ft. power cord)

- **Dimensions:**
  5.5" (W) x 3.5" (H) x 3.25" (D)
  (140 mm x 89 mm x 83 mm)

- **Enclosure:** ABS plastic, NEMA 4X rated general purpose
  (optional EX available for hazardous areas)

- **Weight:** 1.6 lbs. (0.8 kg)
**O₂ DEFICIENCY MONITOR**

**PureAire Current Limiting Zirconium Oxide O₂ cell**

- Does not require a reference gas. Operates in 100% N₂ environments
- Non-consuming sensor cell
  - Cell Life is 10 + years
- Maintenance Free
  - No cell replacement required
- No Calibration
  - Non depleting and does not rely on partial pressure
- Operates at high and low temperatures
  - Can operate down to –40°C

**Partial Pressure Electrochemical Disposable Lead based sensor cell**

- Continuously Consuming sensor
  - Lead anode is used up in detecting O₂
- Drifts to changes in barometric pressure
  - Operates on partial pressure of O₂ to drive molecules through the barrier into the sensor
- One to Two year cell life
  - Warmer temperatures consumes the anode faster
- Requires frequent dynamic calibration
  - Continuous exposure to ambient O₂ depletes the lead anode
- Cannot operate at low temperatures
  - Cell electrolyte freezes and output drops to zero
- Lead contents presents disposal hazard
**O₂ Deficiency Monitor**

**Principle of PureAire Oxygen Sensor**

Schematic diagram of the sensor is shown in Fig. 1.

Zirconia electrolyte disc having electrodes on both sides has the ability to pass oxygen ions at high temperature. By attaching a cap with an aperture on one side (cathode) of the disc, the gas diffusion is limited and the saturated current is observed (fig. 2).

It is termed "limiting current". The limiting current is proportional to the ambient oxygen concentration as shown in Fig. 3.

Fig. 4 shows the structure of the sensor.

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**Fig. 1 Schematic diagram of the sensor**

**Fig. 4 Structure of the sensor**
Comparison of annual maintenance for a 50-point $O_2$ system

**PureAire’s $O_2$ Zirconium Oxide sensor does not have consumables.**
**No calibration required**

Average Life is 10 + years

**Replacement cell cost**
@ **average $360 /year per $O_2$ monitor**

Total $0.00 per year

Five year cost $0.00

**Disposable $O_2$ cells**
(Replaced once per year)
(Quarterly calibration required)

Total $18,000 per yr

Five year cost $90,000
Why use?

O₂ monitors are used to protect people in the workplace.

Under normal conditions, we breathe 20.9% oxygen. OSHA states “Anything below 19.5% is deemed hazardous to our health.”

PureAire’s O₂ deficiency monitor is a stand-alone monitor with built-in audible alarm and alarm relay to alert employees when ambient oxygen levels go below 19.5%.
Why use? continued

O₂ monitors are used to protect people in the workplace.

An oxygen monitor is a safety device used in cryogenic areas to alert if there is a low level of oxygen in a room that may be caused by a nitrogen, helium or argon spill.
Why use? continued

**Competitive O₂ monitors use a 6 to 18 month disposable electro-chemical sensor which requires frequent maintenance and calibration.**

PureAire’s O₂ monitor uses a 10+ year zirconium oxide (ZrO₂) non depleting sensor that does not require calibration or replacement.

PureAire is replacing many non performing competitive disposable electrochemical oxygen monitors.
O₂ DEFICIENCY MONITOR

- Standard O₂ monitor with audible alarm:

- Optional Configurations:
  - Sample draw O₂ monitor (built-in pump for remote sampling up to 100 ft.)
  - Explosion-proof O₂ monitor (explosion proof housing suitable for Class 1, Div.1, Group B, C, D locations)
  - Glove box and vacuum O₂ (monitor where low or no oxygen levels need to be measured and controlled)
## O₂ Deficiency Monitor

### Comparison of Annual Maintenance

1-Point O₂ Monitoring System

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<th>PureAire’s O₂ Zirconium Oxide</th>
<th>Disposable O₂ Cells</th>
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<tbody>
<tr>
<td>Replacement sensors</td>
<td>No replacement sensors</td>
<td>Replacement sensor recommended once per year</td>
</tr>
<tr>
<td>Calibration</td>
<td>No calibration required</td>
<td>Quarterly calibration required</td>
</tr>
<tr>
<td>Life</td>
<td>Average life 10+ years</td>
<td>Replacement cells: average $300/year per O₂ sensor cell</td>
</tr>
<tr>
<td>Total (annual)</td>
<td>$0.00</td>
<td>$360</td>
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<tr>
<td>Total (five years)</td>
<td>$0.00</td>
<td>$1,800</td>
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</table>
Monitors require new sensors every 6 to 18 months. Sensors are costly, averaging $200 – 400 per sensor.

Sensors must be calibrated quarterly with a calibration gas, an additional cost to the client.

Sensors drift and false alarm due to infrequent calibration. The biggest customer complaints are customers simply don’t have time to babysit their oxygen monitor.

Sensors false alarm due to thunderstorms, changes in temperature, and changes in barometric pressure.

Additional technicians are needed to maintain and calibrate sensors. Time is money.

“PureAire Monitoring Systems, LLC has sold over 10,000 monitors to a broad range of industries worldwide. Our website lists a few customer testimonials along with reviews on google.”
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<td>(LN₂ – Equipment Cooling)</td>
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<td>Semiconductor</td>
<td>N₂</td>
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<td></td>
<td>and Cryogenics for wafer manufacturing</td>
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<td>Pharmaceutical</td>
<td>Cryogenic Freezers</td>
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<tr>
<td>Misc.</td>
<td>Dewars (N₂, Ar, He)</td>
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<td>Confined Spaces</td>
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O₂ DEFICIENCY MONITOR

Where Are Oxygen Monitors Installed?

- Nitrogen tanks
- MRI Rooms
- Semiconductor
- Additive Manufacturing
- 3D Chamber
- Nitrogen Freezers
- Cryotherapy
O₂ DEFICIENCY MONITOR

Where Are the Monitors Installed? continued

Near N₂, He and Ar Cylinders

Altitude Training with Prince Harry
PureAire Model TX-1100DRA

- Federal Signal Horn & Strobe
- Remote LED Display
- Regulated Power supply 24VDC
  Operates at 110/220VAC
Overview and Bottom Line

- 10+ year zirconium oxide sensor
- Best performing Oxygen monitor on the market
- No maintenance and no calibration required
- No costly replacement sensors
- No false alarms or drifting due to environmental changes
- The only O₂ monitor that operates in -40°C
- Operates in Freezers, confined spaces and gas storage areas
- Reliable and completely linear, full scale 0 – 25% O₂
END OF PRESENTATION

Thank you for your attention