## OX-B431 Oxidising Gas Sensor

### Ozone + Nitrogen Dioxide

#### 4-Electrode

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**Figure 1 OX-B431 Schematic Diagram**

Top View  
Bottom View  
Side View

All dimensions in millimetres (± 0.15mm)

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### Specification O₃ Sensing

#### PERFORMANCE

- Sensitivity: nA/ppm at 1ppm O₃  
  -225 to -750
- Response time: t₉₀ (s) from zero to 1ppm O₃  
  < 80
- Zero current: nA in zero air at 20°C  
  -80 to +80
- Noise*: ±2 standard deviations (ppb equivalent)  
  15
- Range: ppm O₃ of performance warranty  
  20
- Linearity: ppm error at full scale, linear at zero and 20ppm O₃  
  < ±0.5
- Overgas limit: maximum ppm for stable response to gas pulse  
  50

* Tested with Alphasense AFE low noise circuit

#### LIFETIME

- Zero drift: ppb equivalent change/year in lab air  
  0 to 20
- Sensitivity drift: % change/year in lab air, monthly test  
  < -20 to -40
- Operating life: months until 50% original signal (24 month warranted)  
  > 24

#### ENVIRONMENTAL

- Sensitivity @ -20°C: (% output @ -20°C/output @ 20°C) @ 2ppm O₃  
  70 to 90
- Sensitivity @ 40°C: (% output @ 40°C/output @ 20°C) @ 2ppm O₃  
  95 to 125
- Zero @ -20°C: nA  
  0 to 25
- Zero @ 40°C: nA  
  5 to 100

#### CROSS SENSITIVITY

- H₂S: sensitivity % measured gas @ 5ppm H₂S  
  < -80
- NO: sensitivity % measured gas @ 5ppm NO  
  < 5
- Cl₂: sensitivity % measured gas @ 5ppm Cl₂  
  < 100
- SO₂: sensitivity % measured gas @ 5ppm SO₂  
  < -3
- CO: sensitivity % measured gas @ 5ppm CO  
  < -3
- C₂H₄: sensitivity % measured gas @ 100ppm C₂H₄  
  < 0.1
- NH₃: sensitivity % measured gas @ 20ppm NH₃  
  < 0.1
- H₂: sensitivity % measured gas @ 100ppm H₂  
  < 0.1
- CO₂: sensitivity % measured gas @ 5% Vol CO₂  
  < 0.1
- Halothane: sensitivity % measured gas @ 100ppm Halothane  
  < 0.1

#### KEY SPECIFICATIONS

- Temperature range: °C  
  -30 to 40
- Pressure range: kPa  
  80 to 120
- Humidity range: % rh continuous  
  15 to 85
- Storage period: months @ 3 to 20°C (stored in sealed pot)  
  6
- Load resistor: Ω (AFE circuit recommended)  
  33 to 100
- Weight: g  
  < 13

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**NOTE:** all sensors are tested at ambient environmental conditions, with 47 ohm load resistor, unless otherwise stated. As applications of use are outside our control, the information provided is given without legal responsibility. Customers should test under their own conditions, to ensure that the sensors are suitable for their own requirements.
In the interest of continued product improvement, we reserve the right to change design features and specifications without prior notification. The data contained in this document is for guidance only. Alphasense Ltd accepts no liability for any consequential losses, injury or damage resulting from the use of this document or the information contained within. (©ALPHASENSE LTD) Doc. Ref. OX-B431/JUL19

**Figure 2** Sensitivity temperature dependence to 1ppm O\textsubscript{3}

This data is taken from a typical batch of sensors.

**Figure 3** Zero temperature dependence

This data is taken from a typical batch of sensors.

**Figure 4** Response from 200 ppb to 0 ppb O\textsubscript{3}

Use of Alphasense AFE circuit reduces noise to 15 ppb, with the opportunity of digital smoothing to reduce noise even further.

Offset voltage is due to intentional ISB circuit electronic offset.
The OX-B431 detects both ozone and nitrogen dioxide (O₃ + NO₂). The NO2-B43F measures only nitrogen dioxide, filtering out ozone. Using these sensors together allows you to calculate the O₃ concentration by subtracting the corrected NO2-B43F concentration from the corrected OX-B431 concentration.

Before subtracting to determine ozone concentration, ensure that the signals from the two sensors have been corrected for electronic zero offset, sensor zero offset and temperature dependence, and sensitivity (nA/ppm) calibration and temperature dependence.

**Specification NO₂ Sensing**

**PERFORMANCE**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity to NO₂</td>
<td>nA/ppm at 2ppm NO₂</td>
</tr>
<tr>
<td>Response time</td>
<td>t₉₀ (s) from zero to 2ppm NO₂</td>
</tr>
<tr>
<td>Zero current</td>
<td>nA in zero air at 20°C</td>
</tr>
<tr>
<td>Noise*</td>
<td>±2 standard deviations (ppb equivalent)</td>
</tr>
<tr>
<td>Range</td>
<td>ppm NO₂ limit of performance warranty</td>
</tr>
<tr>
<td>Linearity</td>
<td>ppm error at full scale, linear at zero and 20ppm NO₂</td>
</tr>
<tr>
<td>Overgas limit</td>
<td>maximum ppm for stable response to gas pulse</td>
</tr>
</tbody>
</table>

* Tested with Alphasense AFE low noise circuit

**LIFETIME**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero drift</td>
<td>ppb equivalent change/year in lab air</td>
</tr>
<tr>
<td>Sensitivity drift</td>
<td>% change/year in lab air, monthly test</td>
</tr>
<tr>
<td>Operating life</td>
<td>months until 50% original signal (24 month warranted)</td>
</tr>
</tbody>
</table>

**ENVIRONMENTAL**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity @ -20°C (%)</td>
<td>output @ -20°C/output @ 20°C @ 2ppm NO₂</td>
</tr>
<tr>
<td>Sensitivity @ 40°C (%)</td>
<td>output @ 50°C/output @ 20°C @ 2ppm NO₂</td>
</tr>
<tr>
<td>Zero @ -20°C nA</td>
<td>0 to 25</td>
</tr>
<tr>
<td>Zero @ 40°C nA</td>
<td>5 to 50</td>
</tr>
</tbody>
</table>

**CROSS SENSITIVITY**

<table>
<thead>
<tr>
<th>Gas</th>
<th>Sensitivity % measured gas</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>H₂S</td>
<td>5ppm H₂S</td>
<td>&lt; -80</td>
</tr>
<tr>
<td>NO</td>
<td>5ppm NO</td>
<td>&lt; 5</td>
</tr>
<tr>
<td>Cl</td>
<td>5ppm Cl</td>
<td>&lt; 100</td>
</tr>
<tr>
<td>SO₂</td>
<td>5ppm SO₂</td>
<td>&lt; -3</td>
</tr>
<tr>
<td>CO</td>
<td>5ppm CO</td>
<td>&lt; 3</td>
</tr>
<tr>
<td>CH₄</td>
<td>100ppm CH₄</td>
<td>&lt; 0.1</td>
</tr>
<tr>
<td>NH₃</td>
<td>20ppm NH₃</td>
<td>&lt; 0.1</td>
</tr>
<tr>
<td>H₂</td>
<td>100ppm H₂</td>
<td>&lt; 0.1</td>
</tr>
<tr>
<td>CO₂</td>
<td>5% Vol CO₂</td>
<td>&lt; 0.1</td>
</tr>
<tr>
<td>Halothane</td>
<td>sensitivity % measured gas</td>
<td>&lt; 0.1</td>
</tr>
</tbody>
</table>

**KEY SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature range °C</td>
<td>-30 to 40</td>
</tr>
<tr>
<td>Pressure range kPa</td>
<td>80 to 120</td>
</tr>
<tr>
<td>Humidity range % rh continuous</td>
<td>15 to 85</td>
</tr>
</tbody>
</table>

At the end of the product’s life, do not dispose of any electronic sensor, component or instrument in the domestic waste, but contact the instrument manufacturer, Alphasense or its distributor for disposal instructions.

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OX-B431 Performance Data

Figure 5  Sensitivity temperature dependence to 2ppm NO₂

This data is taken from a typical batch of sensors.

Figure 6  Response to 50ppb NO₂

Figure 7  Response from 200 ppb to 0 ppb NO₂

Use of Alphasense AFE circuit reduces noise to 15ppb, with the opportunity of digital smoothing to reduce noise to less than ±5ppb.

Offset voltage is due to intentional ISB circuit electronic offset.

For further information on the performance of this sensor, on other sensors in the range or any other subject, please contact Alphasense Ltd. For Application Notes visit "www.alphasense.com".

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