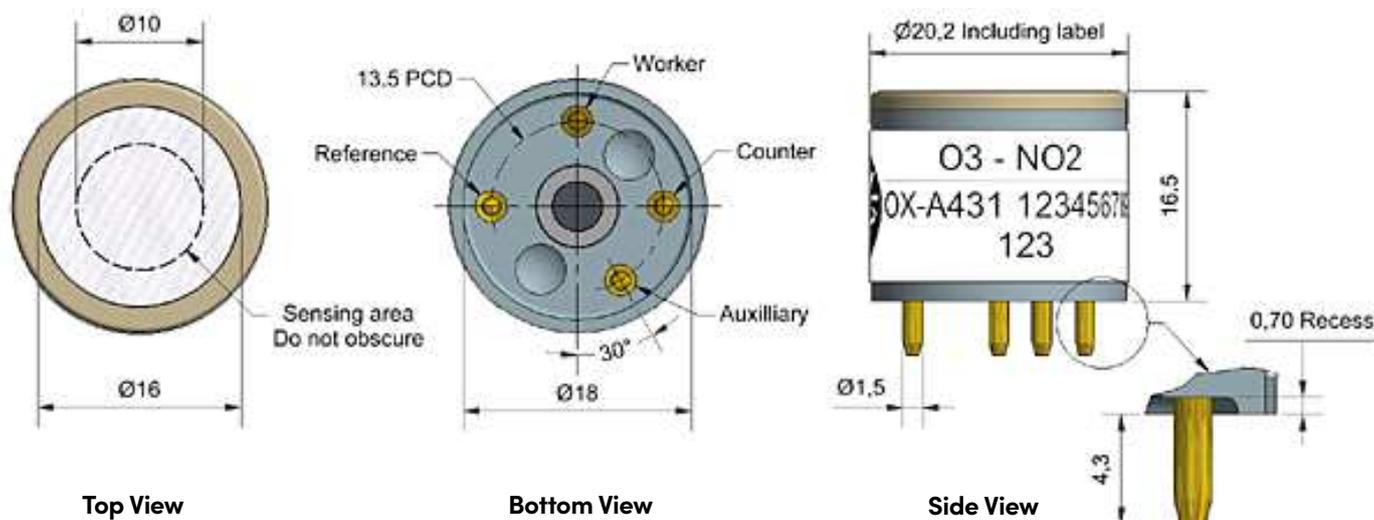




Technical specifications Version 1.0

## OX-A431 Oxidising Gas Sensor – Ozone + Nitrogen Dioxide – 4-Electrode


 Dimensions are in millimetres ( $\pm 0.15$  mm).

### Specification O<sub>3</sub> Sensing

#### Performance

|               |  |              |
|---------------|--|--------------|
| Sensitivity   | nA/ppm at 1ppm O <sub>3</sub>                                    | -200 to -650 |
| Response time | t90 (s) from zero to 1ppm O <sub>3</sub>                         | < 80         |
| Zero current  | nA in zero air at 20°C   | -70 to +70   |
| Noise*        | $\pm 2$ standard deviations (ppb equivalent)                     | 15           |
| Range         | ppm O <sub>3</sub> limit of performance warranty                 | 20           |
| Linearity     | ppm error at full scale, linear at zero and 20ppm O <sub>3</sub> | < $\pm 0.5$  |
| 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 O <sub>3</sub> | 60 to 80  |
| Sensitivity @ 40°C  | % (output @ 40°C/output @ 20°C) @ 2ppm O <sub>3</sub>  | 80 to 105 |
| Zero @ -20°C        | nA   | 0 to 25   |
| Zero @ 40°C         | nA   | 20 to 90  |

#### Cross Sensitivity

|                               |             |                            |                               |       |
|-------------------------------|-------------|----------------------------|-------------------------------|-------|
| H <sub>2</sub> S              | sensitivity | % measured gas @ 5ppm      | H <sub>2</sub> S              | < -80 |
| NO                            | sensitivity | % measured gas @ 5ppm      | NO                            | < 5   |
| Cl <sub>2</sub>               | sensitivity | % measured gas @ 5ppm      | Cl <sub>2</sub>               | < 100 |
| SO <sub>2</sub>               | sensitivity | % measured gas @ 5ppm      | SO <sub>2</sub>               | < -3  |
| CO                            | sensitivity | % measured gas @ 5ppm      | CO                            | < -3  |
| C <sub>2</sub> H <sub>4</sub> | sensitivity | % measured gas @ 100ppm    | C <sub>2</sub> H <sub>4</sub> | < 0.1 |
| NH <sub>3</sub>               | sensitivity | % measured gas @ 20ppm     | NH <sub>3</sub>               | < 0.1 |
| H <sub>2</sub>                | sensitivity | % measured gas @ 100ppm    | H <sub>2</sub>                | < 0.1 |
| CO <sub>2</sub>               | sensitivity | % measured gas @ 5% volume | CO <sub>2</sub>               | < 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     | $\Omega$ (AFE circuit is recommended)     | 33 to 100 |
| Weight            | g   | < 6       |

**Figure 1 Sensitivity Temperature Dependence To 1ppm O<sub>3</sub>**

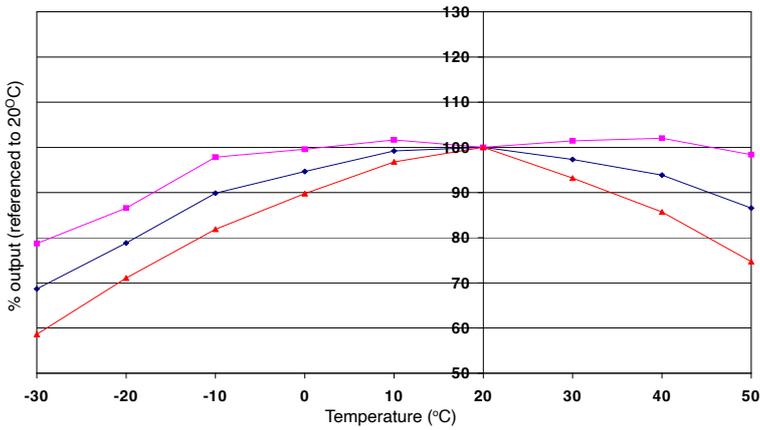


Figure 1 shows the mean and 95% confidence levels for the temperature dependence of sensitivity at 1ppm O<sub>3</sub>.

Measuring Ozone at higher temperatures requires good casing design to ensure the Ozone reaches the sensor before reacting.

This data is taken from a typical batch of sensors.

**Figure 2 Zero Temperature Dependence**

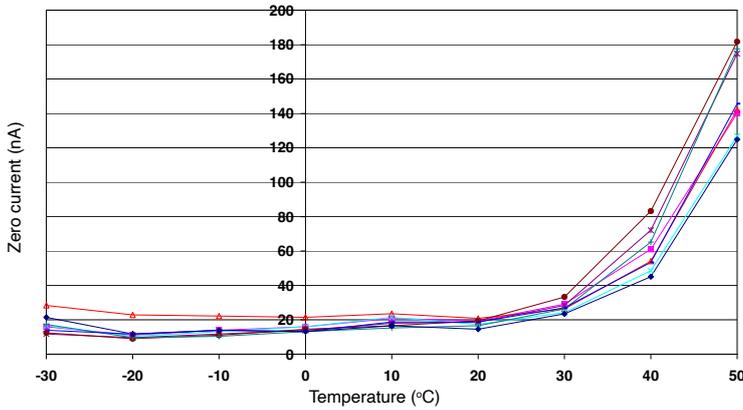


Figure 2 shows the variation in zero output of the working electrode caused by changes in temperature, expressed as nA.

This data is taken from a typical batch of sensors.

Contact Alphasense for further information on zero current correction.

**Figure 3 Response from 200ppb to 0ppb O<sub>3</sub>**

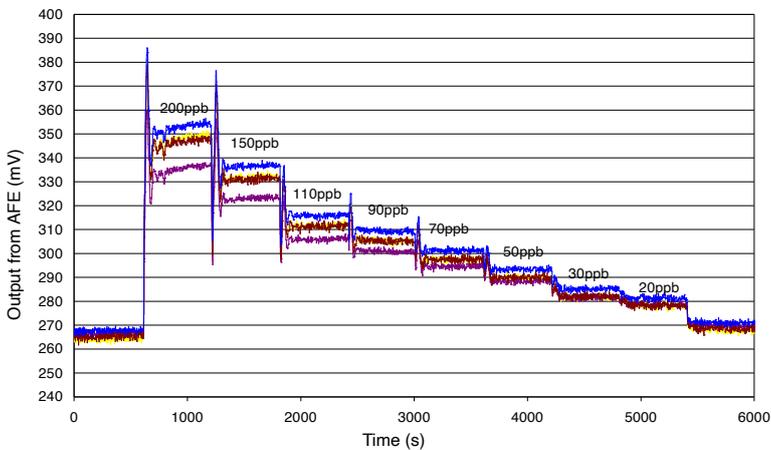


Figure 3 shows response from 200ppb O<sub>3</sub> to 0ppb O<sub>3</sub>.

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

Offset voltage is due to intentional AFE circuit electronic offset.

The OX-A431 detects both ozone and nitrogen dioxide (O<sub>3</sub> +NO<sub>2</sub>). The NO2-A43F measures only nitrogen dioxide, filtering out ozone. Using these sensors together allows you to calculate the O<sub>3</sub> concentration by subtracting the corrected NO2-A43F concentration from the corrected OX-A431 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 NO<sub>2</sub> Sensing

|                           |  |   |                            |                               |        |
|---------------------------|--|---|----------------------------|-------------------------------|--------|
| <b>Performance</b>        | Sensitivity to NO <sub>2</sub>                       | nA/ppm at 2ppm NO <sub>2</sub>                                    | -200 to -550               |                               |        |
|                           | Response time  | t90 (s) from zero to 1ppm NO <sub>2</sub>                         | < 80                       |                               |        |
|                           | Zero current   | nA in zero air at 20°C  | -70 to +70                 |                               |        |
|                           | Noise*   | ±2 standard deviations (ppb equivalent)                           | 15                         |                               |        |
|                           | Range  | ppm NO <sub>2</sub> limit of performance warranty                 | 20                         |                               |        |
|                           | Linearity  | ppm error at full scale, linear at zero and 20ppm NO <sub>2</sub> | < ± 0.5                    |                               |        |
|                           | Overgas limit  | maximum ppm for stable response to gas pulse                      | 50                         |                               |        |
|                           | <b>*Tested with Alphasense AFE low noise circuit</b> |   |                            |                               |        |
| <b>Lifetime</b>           | 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                       |                               |        |
| <b>Environmental</b>      | Sensitivity @ -20°C                                  | % (output @ -20°C/output @ 20°C) @ 2ppm NO <sub>2</sub>           | 50 to 80                   |                               |        |
|                           | Sensitivity @ 40°C                                   | % (output @ 50°C/output @ 20°C) @ 2ppm NO <sub>2</sub>            | 115 to 130                 |                               |        |
|                           | Zero @ -20°C   | nA  | 0 to 25                    |                               |        |
|                           | Zero @ 40°C  | nA  | 20 to 50                   |                               |        |
| <b>Cross Sensitivity</b>  | H <sub>2</sub> S                                     | sensitivity   | % measured gas @ 5ppm      | H <sub>2</sub> S              | < -100 |
|                           | NO   | sensitivity   | % measured gas @ 5ppm      | NO                            | < 5    |
|                           | Cl <sub>2</sub>                                      | sensitivity   | % measured gas @ 5ppm      | Cl <sub>2</sub>               | < 100  |
|                           | SO <sub>2</sub>                                      | sensitivity   | % measured gas @ 5ppm      | SO <sub>2</sub>               | < -3   |
|                           | CO   | sensitivity   | % measured gas @ 5ppm      | CO                            | < -3   |
|                           | C <sub>2</sub> H <sub>4</sub>                        | sensitivity   | % measured gas @ 100ppm    | C <sub>2</sub> H <sub>4</sub> | < 0.1  |
|                           | NH <sub>3</sub>                                      | sensitivity   | % measured gas @ 20ppm     | NH <sub>3</sub>               | < 0.1  |
|                           | H <sub>2</sub>                                       | sensitivity   | % measured gas @ 100ppm    | H <sub>2</sub>                | < 0.1  |
|                           | CO <sub>2</sub>                                      | sensitivity   | % measured gas @ 5% volume | CO <sub>2</sub>               | 0.1    |
| Halothane                 | sensitivity  | % measured gas @ 100ppm   | Halothane                  | < 0.1                         |        |
| <b>Key Specifications</b> | Temperature range                                    | °C  | -30 to 40                  |                               |        |
|                           | Pressure range                                       | kPa   | 80 to 120                  |                               |        |
|                           | Humidity range                                       | % rh continuous   | 15 to 85                   |                               |        |



**Figure 4 Sensitivity temperature dependence to 2ppm NO<sub>2</sub>**

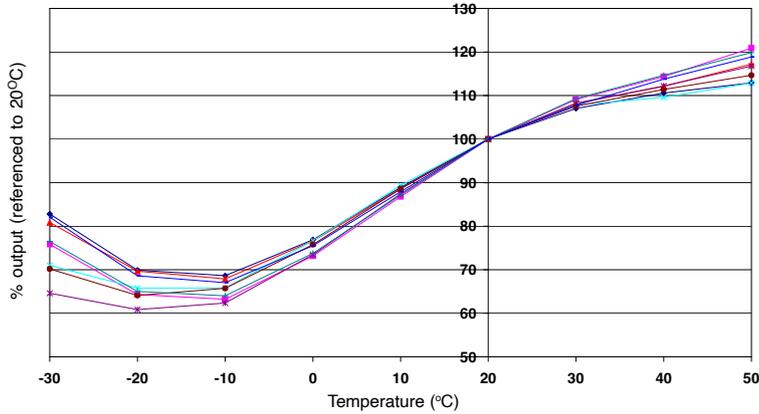
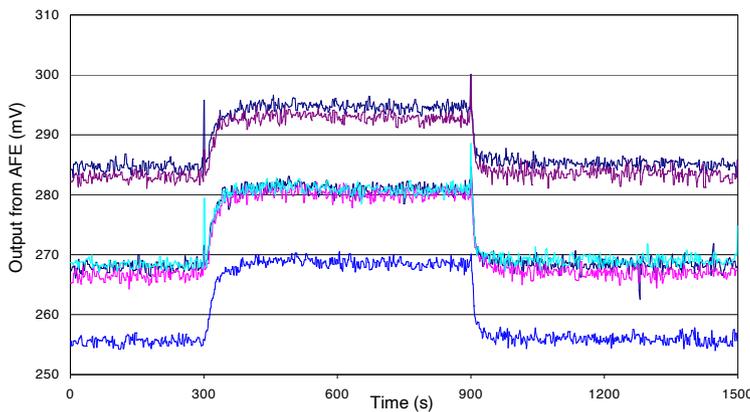


Figure 4 shows the temperature dependence of sensitivity at 2ppm NO<sub>2</sub>.  
This data is taken from a typical batch of sensors.

**Figure 5 Response to 50ppb NO<sub>2</sub>**



The OX-A431 shows fast response and return to baseline, even at low concentrations.

**Figure 6 Response from 200ppb to 0ppb NO<sub>2</sub>**

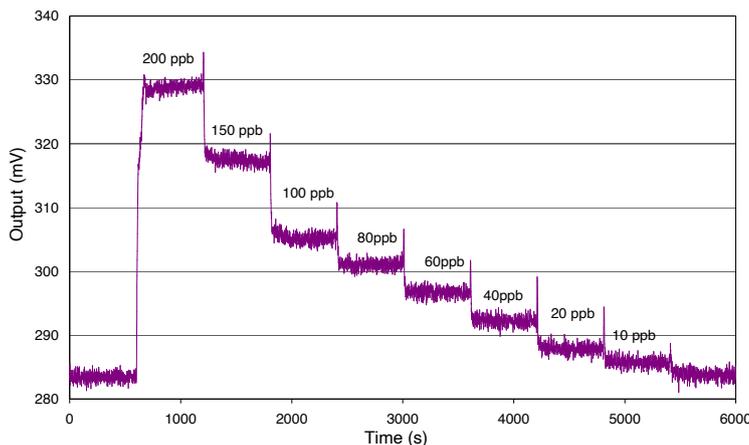


Figure 6 shows response from 200ppb NO<sub>2</sub> to 0ppb NO<sub>2</sub>.  
Use of Alphasense AFE circuit reduces noise to 15ppb, with the opportunity of digital smoothing to reduce noise even further.  
Offset voltage is due to intentional AFE circuit electronic offset.

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.

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. NOTE: all sensors are tested at ambient environmental conditions 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.

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