## Technical Specification

### IRC-A1 CARBON DIOXIDE INFRARED SENSOR PYROELECTRIC DETECTOR

**Figure 1 NDIR-A Schematic Diagram**

Pin out details:
1. Lamp return
2. Lamp +5V
3. +5V Pyro supply
4. Detector output
5. Reference output
6. Thermistor output
7. OV Pyro supply and case connection

Notes:
1. Dimensions without tolerances are nominal
2. Recommended PCB socket: Wearnes Cambion Ltd. code: 450-3326-01-06-00
3. Weight: 15g
4. Use antistatic precautions when handling
5. Do not cut pins
6. Do not solder directly to pins

### PERFORMANCE

**Maximum Power Requirements** 5.0 VDC, 60mA max. (50% duty cycle source drive)

**Minimum Operating Voltage** 2.0 VDC, 20mA max. (50% duty cycle source drive)

**Source Drive Frequency** 1.5 to 3 Hz (recommended 2 to 2.25 Hz)

**Active Output in N₂ (peak-to-peak)** 60 - 100mV @ 2.1 Hz, 50% duty cycle

**Reference Output in N₂ (peak-to-peak)** 40 - 80mV @ 2.1 Hz, 50% duty cycle

**Response Time (t₉₀)** < 40s @ 20°C ambient

**Warm-up Time** To final zero ± 100ppm: < 30 s @ 20°C

To specification: < 30 minutes @ 20°C

### LIFETIME

**MTBF** > 5 years

### KEY SPECIFICATIONS

**Temperature Signal** Integral thermistor (NTC, R₂₅ = 3000 Ω B = 3450 K)

**Operating Temperature Range** -20°C to +55°C (linear compensation from -10 to 40°C)

**Storage Temperature Range** -40°C to +75°C

**Humidity Range** 0 to 95% rh non-condensing

### TYPE

<table>
<thead>
<tr>
<th>TYPE</th>
<th>Range (Application)</th>
<th>Accuracy (%FS, using universal linearisation coefficients)</th>
<th>Zero Resolution</th>
<th>Full Scale Resolution</th>
<th>Zero Repeatability</th>
<th>Full Scale Repeatability</th>
</tr>
</thead>
<tbody>
<tr>
<td>IAQ</td>
<td>0 to 5000ppm (IAQ)</td>
<td>1 ppm</td>
<td>15ppm</td>
<td>±10ppm</td>
<td>±50ppm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0 to 5 % vol (Safety)</td>
<td>1.5 ppm</td>
<td>100ppm</td>
<td>±10ppm</td>
<td>±500ppm</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>0 to 20 % vol (Combustion)</td>
<td>2.5 ppm</td>
<td>500ppm</td>
<td>±10ppm</td>
<td>±2500ppm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0 to 100 % vol (Process Control)</td>
<td>4 ppm</td>
<td>0.5 % vol</td>
<td>±10ppm</td>
<td>±5000ppm</td>
<td></td>
</tr>
</tbody>
</table>

*When ordering, select ‘IAQ’ or ‘Other’, depending on your application.*

**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.
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. IRCA1/APR18

IRC-A1 Performance Data

Figure 2 Comparison of Resolution

Comparison of resolution of IRC-A1 (red) and competitor’s 20mm diameter NDIR cell (blue).

Both cells were operated at 2.25 Hz with the same electronic circuit. Both cells use the same light source and dual pyroelectric detector.

The improved resolution of the IRC-A1 is due to the patent pending optical design.

Figure 3 Beer-Lambert Performance

Typical response from 0 to 5000ppm CO₂.

The fit is very close to the theoretical curve, predicted by the Beer-Lambert Law.

Figure 4 Temperature Compensation

Temperature compensation corrects for temperature error in the detector.

Best compensation includes both span and zero correction; span correction can be a universal correction, but zero temperature correction will vary with each cell.

The graph shows error at 5,000 ppm CO₂.

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".
IRC-A1 Performance Data

Figure 5 Linearisation

Custom linearisation is not necessary with the IRC-A1. Using universal linearisation constants, repeatability between cells is very good, allowing easy implementation.

For an IAQ application, a zero and then single calibration at 4,000ppm CO₂ gives the error shown above: less than 2% of reading and typically less than 0.5% of reading for six different IRC-A1 cells.

Figure 6 Resolution

Excellent stability and resolution at 1000ppm CO₂ for the IRC-A1 is achieved by better design, not by using more expensive components.

NOTE:
For applications where fluctuating ambient light will fall on the white dust filter (top of sensor), order with the optional ambient light filter (IRC-AF).

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.

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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