IRC-A1 Carbon Dioxide infrared sensor – pyroelectric detector

**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
7. We suggest this sensor is best used in a fixed site instrument where calibration and measurement can be carried out in-situ, and the sensor is not subject to acute mechanical stress or changes of temperature.

**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 N\(_2\) (peak-to-peak):** 60 - 100mV @ 2.1 Hz, 50% duty cycle
- **Reference output in N\(_2\) (peak-to-peak):** 40 - 80mV @ 2.1 Hz, 50% duty cycle
- **Response time (190):** < 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, \(R_\infty = 3000 \pm B = 3450 K\))
- **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

**Table: Technical Specifications**

<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</td>
<td>1ppm</td>
<td>15ppm</td>
<td>±10ppm</td>
<td>±50ppm</td>
</tr>
<tr>
<td>Other</td>
<td>0 to 5% vol (Safety)</td>
<td>1.5</td>
<td>1ppm</td>
<td>100ppm</td>
<td>±10ppm</td>
<td>±500ppm</td>
</tr>
<tr>
<td>Other</td>
<td>0 to 20% vol (Combustion)</td>
<td>2.5</td>
<td>1ppm</td>
<td>500ppm</td>
<td>±10ppm</td>
<td>±2500ppm</td>
</tr>
<tr>
<td>Other</td>
<td>0 to 100% vol (Process Control)</td>
<td>4</td>
<td>1ppm</td>
<td>0.5 % vol</td>
<td>±10ppm</td>
<td>±5000ppm</td>
</tr>
</tbody>
</table>

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

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For further information on the performance of this sensor, on other sensors in the range or any other subject, please contact Alphasense Ltd. or visit our website at "www.alphasense.com".
For further information on the performance of this sensor, on other sensors in the range or any other technical specification, provided is given without legal responsibility. Customers should test under their own conditions, to ensure that the sensors are suitable for their own requirements.

Figure 1 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 2 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 3 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.
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.

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