

FEATURES

- Configured for CO₂, 0 – 2% or 0 – 5% vol. concentration
- Can be used for CO₂ monitoring up to 30 bar
- Diffused gas sampling
- Mesh particulate filter
- Low power
- Reference channel for self-compensation
- Special gold plated optical/gas cavity for stable signal levels
- Fast response
- Rugged stainless steel construction
- No moving parts
- Resistance to corrosion
- Immunity from 'poisoning'
- Reliable fail-safe operation
- Low maintenance
- Suitable for fixed or portable respiratory instrumentation

DESCRIPTION

The IR31CE is derived from the IR31BC and IR11BD CO₂ sensors which use the proven non-dispersive infrared (NDIR) principles to detect and monitor the presence of gases. With modified bandpass filtering in the active and reference channels, the IR31CE can reliably track CO₂ levels under conditions where the IR absorption lines change from their normal positions. This can happen where collision broadening occurs for CO₂ gas at high pressure (20 to 30 bar). The sensor is useful for respiratory monitoring in the hyperbaric conditions found in deep diving and other submarine environments.

OPERATION

To operate as NDIR gas sensors, the IR31CE must be interfaced to a suitable transmitter for power supply and for amplifying and processing signals. The end-user may linearise the output signal and include compensation for temperature and pressure changes within the system software. To facilitate this, inputs must be provided from pressure and temperature sensors installed close to the IR31CE inside the instrument housing.

A set of Application Notes (see below) is available from the SGX Sensortech website, to explain more about NDIR gas sensing and provide advice for the end-user on interfacing sensors and processing signals.



(Photograph shows device approximately 3 x actual size)

Infrared Sensor Application Note 1: Background to NDIR Gas Sensing

Infrared Sensor Application Note 2: Signal Processing

Infrared Sensor Application Note 3: Software Design

Infrared Sensor Application Note 4: Electronics Design

Infrared Sensor Application Note 5: Determining Coefficients for Linearisation and Temperature Compensation

Infrared Sensor Application Note 6: Advice for Using Infrared Gas Sensors in Mining Applications

HANDLING PRECAUTIONS

1. Do not allow sensors to fall on the floor. This could cause lamp filament breakage, damage to the pins and the gas entrance aperture.
2. Do not apply mechanical force against the gas entrance aperture.
3. Do not immerse sensors in water or other fluids.
4. Protect the gas entrance aperture against dust ingress and sprayed materials.
5. Anti-static handling precautions must be taken.
6. Under no circumstances should the sensor pins be soldered directly to a pcb or wires. Excessive heat could cause irreparable damage to the pyroelectric detectors.

Gas Mixtures

The IR31CE must not be used for monitoring CO₂ in mixtures including hydrocarbon gases or vapours.

TECHNICAL SPECIFICATION

Mechanical

Dimensions	see outline, page 3
Body material	stainless steel
Weight	27 g

Environmental

Ambient temperature range: for operation for storage	-20 to +55 °C -25 to +85 °C
Operational pressure range	700 to 1300 hPa
Humidity range for operation and storage	0 to 95% non-condensing
Vibration	complies with EN61779-1
Ingress protection	requires extra protection depending on application

Electrical

DC supply to detectors	+3 to +15 V; +5 V recommended
Maximum power supply	180 mW
Lamp supply	3 to 5 V, (60 mA), modulation 4 Hz, 50% duty cycle recommended Note: Applying >5 V will reduce the lamp lifetime
Warm-up time	<20 s to operate, <30 min. to full specification at 20 °C

PERFORMANCE

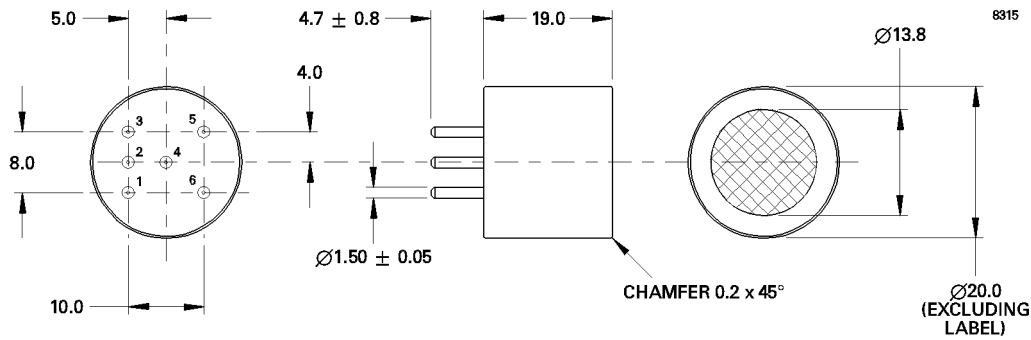
All measurement data taken using:

- SGX Sensortech linearisation and temperature compensation algorithms; see Infrared Sensor Application Notes.
- Lamp modulation 0.4 - 5.0 V, square wave, at 4 Hz and 50% duty cycle.
- Ambient temperature (20 °C) and pressure (1010 hPa).
- All gases diluted in nitrogen.

Note: Any variation from these conditions may affect sensor performance.

Gas	Carbon Dioxide
Gas concentration range	0 – 2% vol.
Maximum response time (T90)	<20 s
Typical detector output voltage in nitrogen (x165 pre-amplifier gain): active channel reference channel	1.3 to 2.5 V 1.6 to 4.2 V
Sensitivity to gas over full concentration range (before linearisation)	See Fractional Absorbance Curve
Maximum deviation from linearity	±0.1% vol.
Typical variation of zero with temperature (-20 to +55 °C)	±10 ppm/°C
Resolution (dependent on electronics)	100 ppm
Maximum non-reproducibility of zero at 20 °C	±100 ppm
Maximum non-reproducibility of sensitivity at 20 °C	±100 ppm
Long-term zero drift/month at 20 °C	±100 ppm
Response to 0 - 90% change in RH at 20 °C in 2% vol. carbon dioxide	0% vol.
MTBF (lamp dependent only)	>10 years for 5 V operation, >20 years for 3 V operation

OUTLINE (All dimensions in millimetres; see note 1)



Pin	Connection
1	+ V detector input
2	Lamp
3	Lamp return
4	Active detector output
5	Reference detector output
6	0 V input (connected internally to sensor body)

Outline Notes

1. Body dimensional tolerances ±0.1 mm. Pin dimensional tolerances as indicated.
2. The IR31CE is designed to press-fit into pcb sockets. The end-user should choose a socket to accommodate the full sensor pin length. This will ensure a stable mechanical location as well as good electrical contact. e2v technologies recommend the Wearn's Cambion type 450-1813-01-03-00 single-pole solder mount socket with through hole, or a suitable equivalent.

FRACTIONAL ABSORBANCE CURVE

Typical Sensitivity to 0 to 2% vol. CO₂

