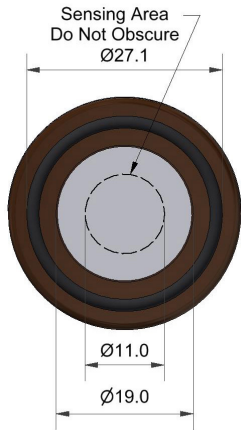


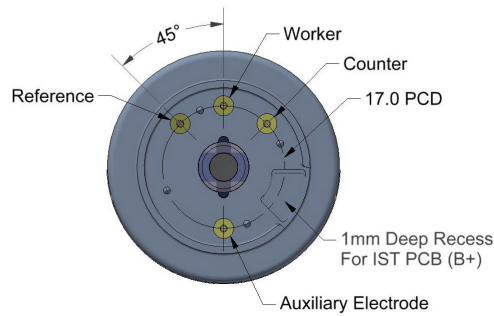
VOC-B4/VOC-B4+ Volatile Organic Compound Sensor

The VOC-B4 sensor is a PPB sensor that is designed for environmental air quality applications with best-in-class baseline stability. This product is available in our standard format (VOC-B4) and with our patented Integrated Smart Technology (VOC-B4+) that has an IST board with a memory chip and temperature sensor integrated in the sensor. The + sensors store specific calibration, specification, and identification data on every sensor allowing plug and play operation. The on-board temperature sensor improves the accuracy and simplicity of temperature compensation algorithms.

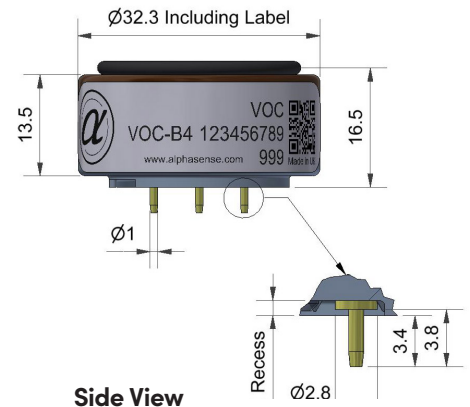
VOC-B4 Volatile Organic Compound Sensor – 4-Electrode



Top View

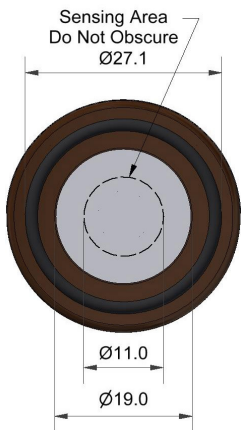


Bottom View

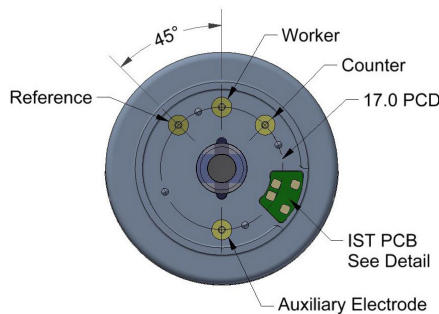


Side View

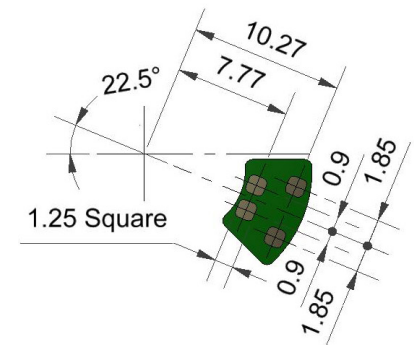
VOC-B4+ Volatile Organic Compound Sensor – 4-Electrode (with Integrated Smart Technology)



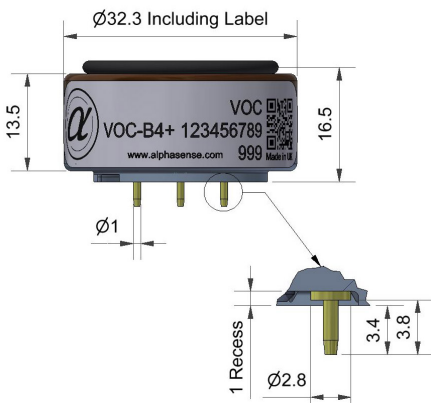
Top View



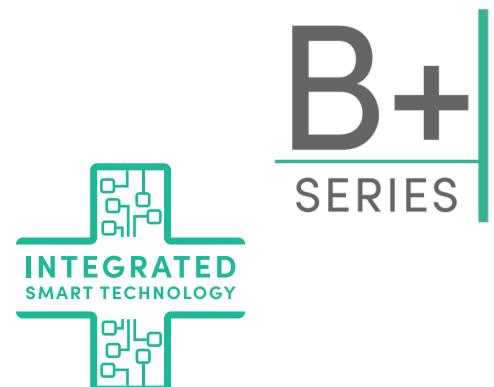
Bottom View



IST Board



Side View



Dimensions are in millimetres (± 0.15 mm).

Sensor Data

Specification CO sensing

Performance	Sensitivity	nA/ppm in 2ppm CO	400 to 700
	Response time	t_{90} (s) from zero to 2ppm CO	< 30
	Zero current	nA in zero air at 20°C	±200
	Noise*	±2 standard deviations (ppb equivalent)	20
	Range	ppm limit of performance warranty	100
	Linearity	ppm CO error at full scale, linear at zero, 10ppm CO	±1
	Overgas limit	maximum ppm for stable response to gas pulse	1000
	*Tested with Alphasense IBS low noise circuit		
Lifetime	Zero drift	ppm equivalent change/year in lab air	±500
	Sensitivity drift	% change/year in lab air, monthly test	< 15
	Operating life	months until 50% original signal (24 month warranted)	> 36
Environmental	Sensitivity @ -20°C	% (output @ -20°C/output @ 20°C) @ 2ppm CO	60 to 80
	Sensitivity @ 50°C	% (output @ 50°C/output @ 20°C) @ 2ppm CO	90 to 110
	Zero @ -20°C	nA change from 20°C	±20
	Zero @ 50°C	nA change from 20°C	1800 to 2000
Cross sensitivity	C ₂ H ₆ O sensitivity	% measured gas @ <1ppm C ₂ H ₆ O	< 100
	H ₂ S sensitivity	% measured gas @ 5ppm H ₂ S	< 350
	NO ₂ sensitivity	% measured gas @ 5ppm NO ₂	< -80
	Cl ₂ sensitivity	% measured gas @ 5ppm Cl ₂	< -40
	NO sensitivity	% measured gas @ 5ppm NO	< 30
	SO ₂ sensitivity	% measured gas @ 5ppm SO ₂	< 80
	H ₂ sensitivity	% measured gas @ 100ppm H ₂ at 20°C	< 50
	C ₂ H ₄ sensitivity	% measured gas @ 40ppm C ₂ H ₄	< 120
	NH ₃ sensitivity	% measured gas @ 20ppm NH ₃	< -0.1
CO ₂ sensitivity	% measured gas @ 5% vol CO ₂	< 0.1	
Key specifications	Temperature range	°C	-30 to 50
	Pressure range	kPa	80 to 120
	Humidity range	% rh continuous	15 to 90
	Storage period	months @ 3 to 20°C (stored in sealed pot)	6
	Load resistor	Ω (AFE circuit is recommended)	33 to 100
	Weight	g	< 13

Figure 1 Linearity from 0 to 10ppm CO

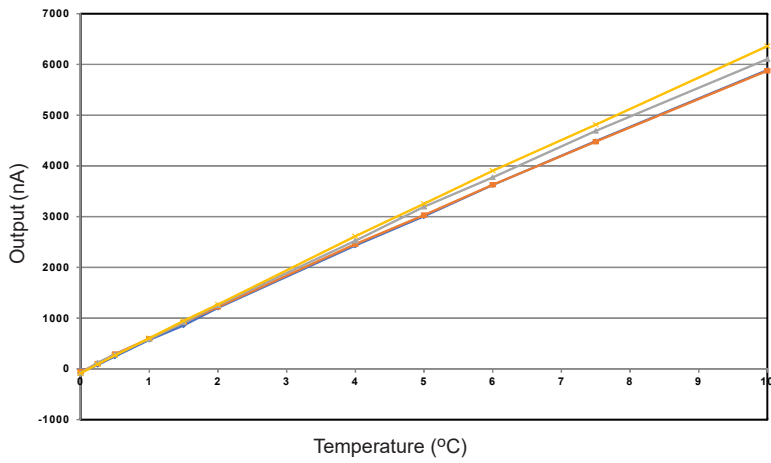


Figure 1 shows example sensor response at concentrations of up to 10ppm CO.

Figure 2 Zero Temperature Dependence

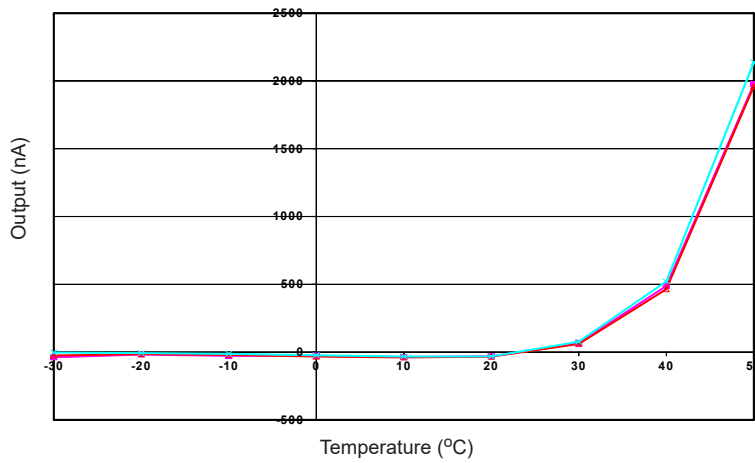


Figure 2 shows example variation in zero output of the working electrode caused by changes in temperature, expressed as nA.

The VOC-B4 detects both VOCs and CO gases. Using both a VOC-B4 and a CO-B4 sensor in combination allows the estimation of VOC concentration at 0V bias.

The data given in this TDS refers to the use of the VOC-B4 sensor at 0V bias. Other voltages within the range 0 to 0.3V can also be applied (see application note AAN-805).

In order to calculate the VOC concentration, it is necessary to ensure 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 Ethanol (C₂H₆O) sensing

Performance	Sensitivity	nA/ppm in <1ppm C ₂ H ₆ O	400 to 650
	Response time	t ₉₀ (s) from zero to <1ppm C ₂ H ₆ O	< 30
	Zero current	nA in zero air at 20°C	±200
	Noise*	±2 standard deviations (ppb equivalent)	20
	Range	ppm limit of performance warranty	2
	Linearity	ppm error at full scale, linear at zero, <1ppm C ₂ H ₆ O	< 0.13
	Overgas limit	maximum ppm for stable response to gas pulse	5
	*Tested with Alphasense IBS low noise circuit		
Lifetime	Zero drift	ppb equivalent change/year in lab air	±500
	Sensitivity drift	% change/year in lab air, monthly test	< 15
	Operating life	months until 50% original signal (24 month warranted)	> 36
Environmental	Sensitivity @ -20°C	% (output @ -20°C/output @ 20°C)	ND
	Sensitivity @ 50°C	% (output @ 50°C/output @ 20°C)	ND
	Zero @ -20°C	nA change from 20°C	±20
	Zero @ 50°C	nA change from 20°C	1800 to 2200
Cross sensitivity	CO sensitivity	% measured gas @ 2ppm CO	< 125
	H ₂ S sensitivity	% measured gas @ 5ppm H ₂ S	< 450
	NO ₂ sensitivity	% measured gas @ 5ppm NO ₂	< -90
	Cl ₂ sensitivity	% measured gas @ 5ppm Cl ₂	< -40
	NO sensitivity	% measured gas @ 5ppm NO	< 25
	SO ₂ sensitivity	% measured gas @ 5ppm SO ₂	< 90
	H ₂ sensitivity	% measured gas @ 100ppm H ₂ at 20°C	< 50
	C ₂ H ₄ sensitivity	% measured gas @ 40ppm C ₂ H ₄	< 120
	NH ₃ sensitivity	% measured gas @ 20ppm NH ₃	< -0.1
CO ₂ sensitivity	% measured gas @ 5% vol CO ₂	< 0.1	
Key specifications	Temperature range	°C	-30 to 50
	Pressure range	kPa	80 to 120
	Humidity range	% rh continuous	15 to 90
	Storage period	months @ 3 to 20°C (stored in sealed pot)	6
	Load resistor	Ω (AFE circuit is recommended)	33 to 100
	Weight	g	< 13

Figure 3 Linearity from 0 to 860ppb (approx) Ethanol

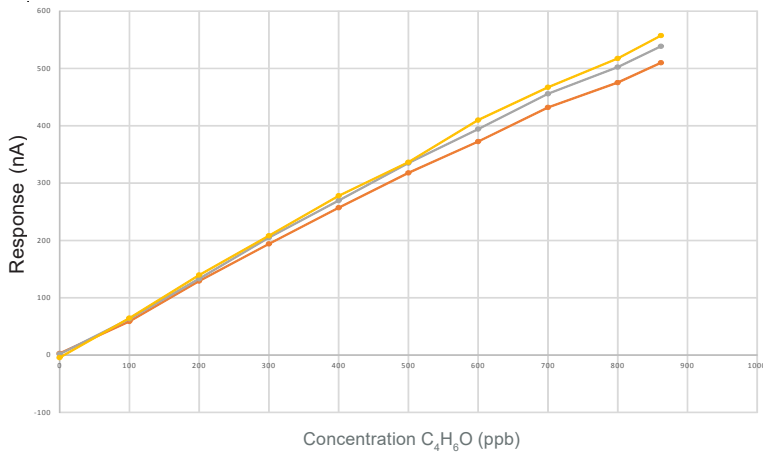


Figure 3 shows example sensor output at concentrations of up to 860ppb Ethanol.

Figure 4 Response to 860ppb (approx) Ethanol

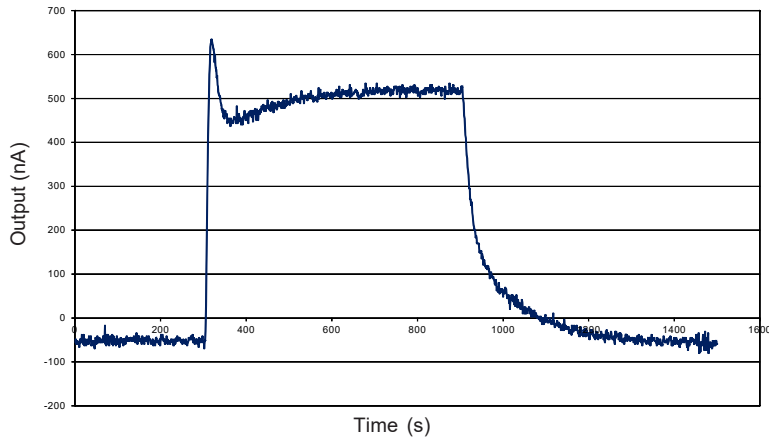


Figure 4 shows example sensor output in response to 860ppb Ethanol.

Figure 5 Response to 2ppm C₄H₈ with voltage bias

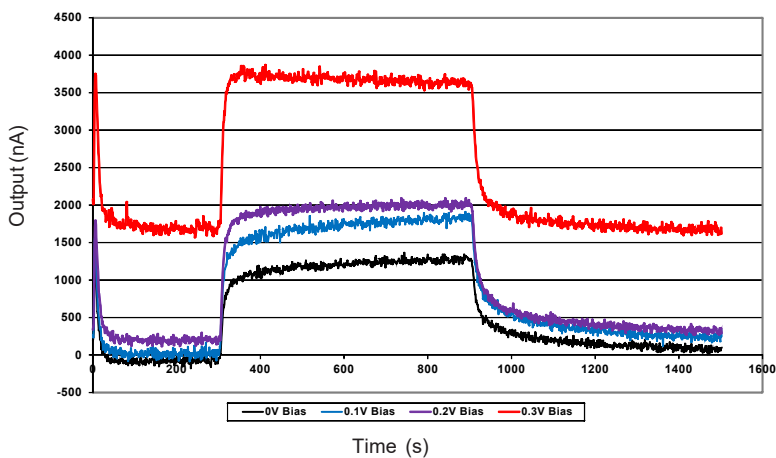


Figure 5 shows example output at different bias voltages in response to 2ppm C₄H₈.

IST Board Data

Interface	Communication Bus	Compatible with the 400 kHz I ² C protocol
	Max. Bus Speed	Up to 1 MHz
	Input Logic Levels	High (Recessive) < 2.3 V Low (Dominant) < 0.2 V
	Absolute Max. Input Signal	3.6 V
Electrical	Supply Voltage Range	1.7 V to 3.6 V
	Supply current – Stand-By	< 5 µA
	Supply current – Operating	< 0.15 mA (temperature reading only) < 2.15 mA (temperature reading + memory reading/writing)
	Power Supply Conditioning	Built-In 100 nF decoupling capacitor
	ESD Protection	4 kV (human body model) - Enhanced ESD / Latch-Up protection
	Bus Pins Input Capacitance	15 pF max.
Performance	Operational Temperature	-40 °C to +85 °C
	Temperature Sensor Accuracy	±1°C (-0°C to +70°C)
	Memory Data Retention	> 200 years
	Memory Write Cycles	> 4,000,000
Data & Communication	Memory IC & I2C Address	M24128X-FCU Device Address: R - 0xA0 / W - 0xA1
	Temperature IC & I2C Address	MAX31875R0TZS+T Device Address: R - 0x90 / W - 0x91
	Product Data Start Address	0x0900
	Calibration Data Start Address	0x0B00
	User Data Area	0x0D00 – 0x18FF (3,072 Bytes)
	CRC Polynomial	0x 01 04C1 1DB7
	Digital Signature Algorithm	SHA-256

Factory-populated data

Product Data
Data Format Version
Customer (OEM) ID
Product ID
Type of Sensor / Target Gas
Sensor Serial Number
End of Storage Period Date
Sensor Replacement Date
Product Data Checksum
Alphasense Digital Signature
Customer Digital Signature

Calibration
Calibration Data Units
Zero (clean dry air) Output
Calibration Span
Calibration Output
Sensitivity
Calibration Date
Calibration Data Checksum
Calibration Data Signature

Sensor Specification
Over-gas limit
Concentration Range
Temperature Range Low
Temperature Range High
Humidity Range Low
Humidity Range High
Pressure Range Low
Pressure Range High
Specification Checksum

15,000+ locations

Customer Specific
Custom Parameters
Re-Calibration Due Date
Operational Limits:
Low High STEL TWA
Next Bump Test Due Date
User Data Area

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, with 10 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. VOCB4/FEB24