



# Dual Sensor Carbon Monoxide Hydrogen Sulfide Miniature Size



PATENTED and PATENT PENDING

## Introduction

The world wide use of multigas, portable, personal safety monitors has grown since the 1970s to include an ever increasing number of industries. The one requirement in common to the majority of these instruments is the need to measure both Carbon Monoxide and Hydrogen Sulfide simultaneously.

Alphasense now offers a compact, dual gas sensor which allows designers to reduce significantly instrument size and cost. The D2 sensor provides a unique approach to the dual gas sensor in both its size and working electrode configuration. The use of a high capacity filter over the Carbon Monoxide working electrode eliminates Hydrogen Sulfide cross sensitivity to Carbon Monoxide.

Proven in the field over many years, these sensors perform well even under long term, challenging conditions.

## D2 Specification Carbon Monoxide Channel

<b>PERFORMANCE</b>	Sensitivity	nA/ppm in 400ppm CO	27 to 55
	Response time	t <sub>90</sub> (s) from zero to 400ppm CO	< 25
	Zero current	ppm equivalent in zero air	< ± 6
	Resolution	rms noise (ppm equivalent)	1
	Range	ppm CO limit of performance warranty	1000
	Linearity	ppm error at full scale, linear at zero and 400 ppm CO	< 40
	Overgas limit	maximum CO for stable response to gas pulse	5000
<b>LIFETIME</b>	Zero drift	ppm equivalent change/year in lab air	< 0.5
	Sensitivity drift	% change/year in lab air, monthly test	< 4
	Operating life	months until 80% original signal (24 month warranted)	24
<b>ENVIRONMENTAL</b>	Sensitivity @ -20°C	% (output @ -20°C/output @ 20°C) @ 100ppm CO	45 to 70
	Sensitivity @ 50°C	% (output @ 50°C/output @ 20°C) @ 100ppm CO	105 to 125
	Zero @ -20°C	ppm equivalent change from 20°C	-1 to 1
	Zero @ 50°C	ppm equivalent change from 20°C	-1 to 4
<b>CROSS SENSITIVITY</b>	Filter Capacity	ppm-hours of Hydrogen Sulfide	15,000
	H <sub>2</sub> S sensitivity	% measured gas @ 20ppm	< 8
	NO <sub>2</sub> sensitivity	% measured gas @ 10ppm	< 0.1
	Cl <sub>2</sub> sensitivity	% measured gas @ 10ppm	< 0.1
	NO sensitivity	% measured gas @ 50ppm	< 50
	SO <sub>2</sub> sensitivity	% measured gas @ 20ppm	< 0.1
	H <sub>2</sub> sensitivity	% measured gas @ 400ppm	H <sub>2</sub> @ 20°C < 55
	C <sub>2</sub> H <sub>4</sub> sensitivity	% measured gas @ 400ppm	C <sub>2</sub> H <sub>4</sub> < 200
NH <sub>3</sub> sensitivity	% measured gas @ 20ppm	NH <sub>3</sub> < 0.1	
<b>KEY SPECIFICATIONS</b>	Temperature range	°C	-30 to 50
	Pressure range	kPa	80 to 120
	Humidity range	%rh continuous (see note below)	15 to 90
	Storage period	months @ 3 to 20°C (stored in sealed pot)	6
	Load resistor	Ω (recommended)	10 to 47
	Weight	g	< 2

**Note:** Above 85% rh and 40°C a maximum continuous exposure period of 10 days is warranted. Where such exposure occurs the sensor will recover normal electrolyte volumes, when allowed to rest at lower %rh and temperature levels for several days.

**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.



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.



# Performance Data Carbon Monoxide Channel

Technical Specification

**Figure 2 CO Channel Sensitivity Temperature Dependence**

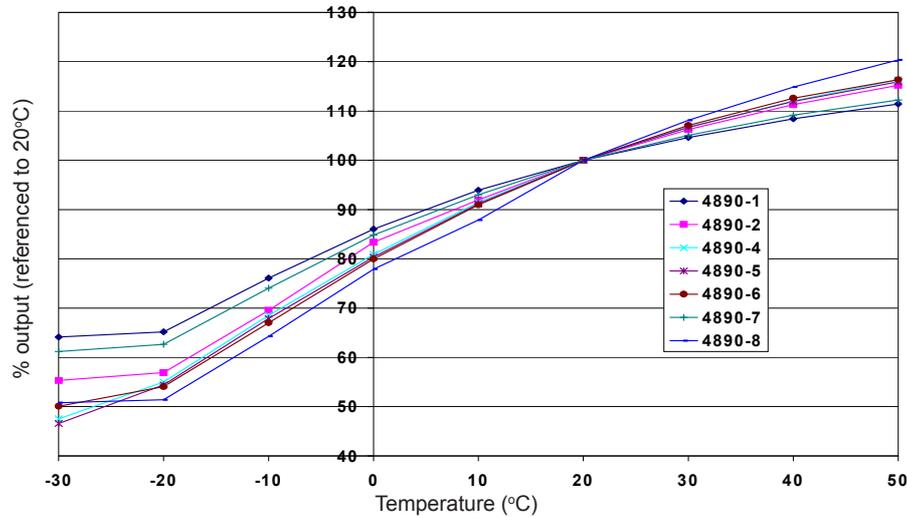


Figure 2 shows the variation in sensitivity caused by changes in temperature.

The data is taken from a typical batch of sensors.

**Figure 3 CO Channel Zero Temperature Dependence**

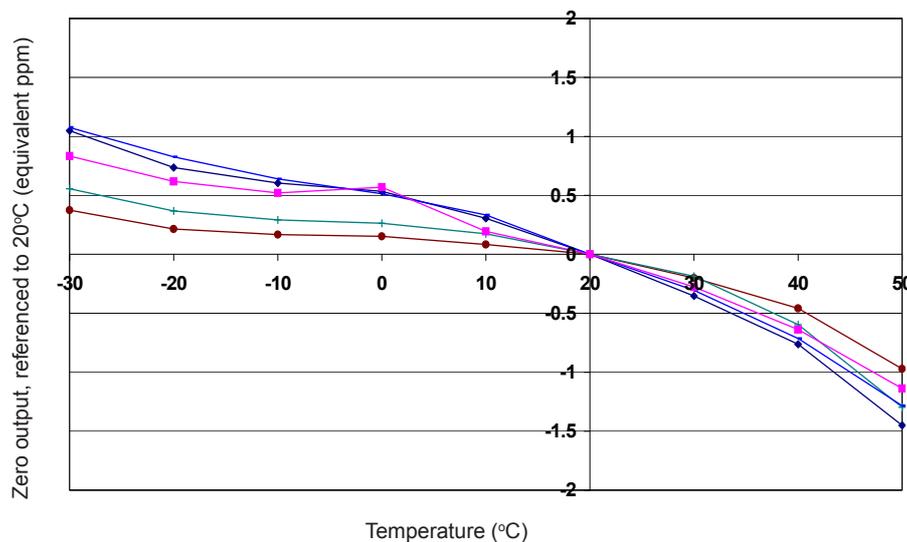


Figure 3 shows the variation in zero output caused by changes in temperature, expressed as ppm gas equivalent referenced to the zero at 20°C.

This data is taken from a typical batch of sensors.

**Figure 4 CO Channel Response to High CO Concentration**

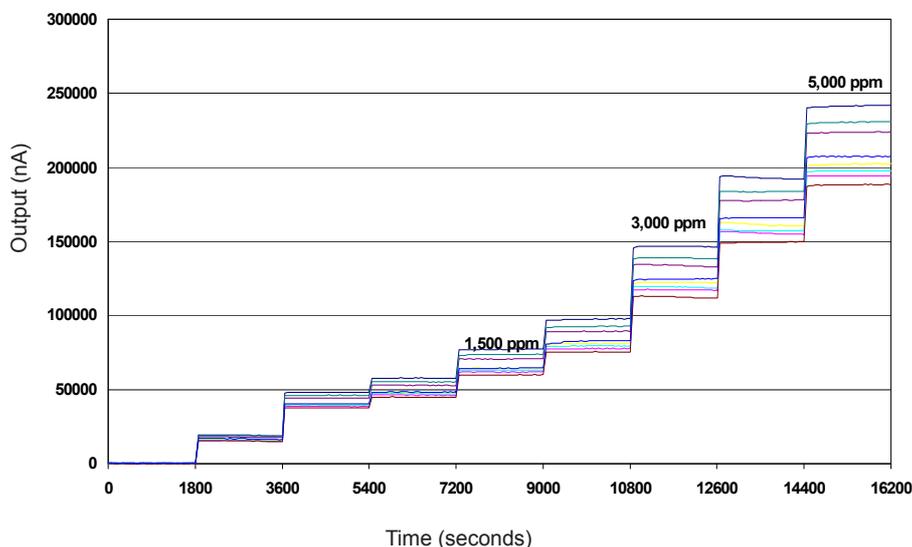


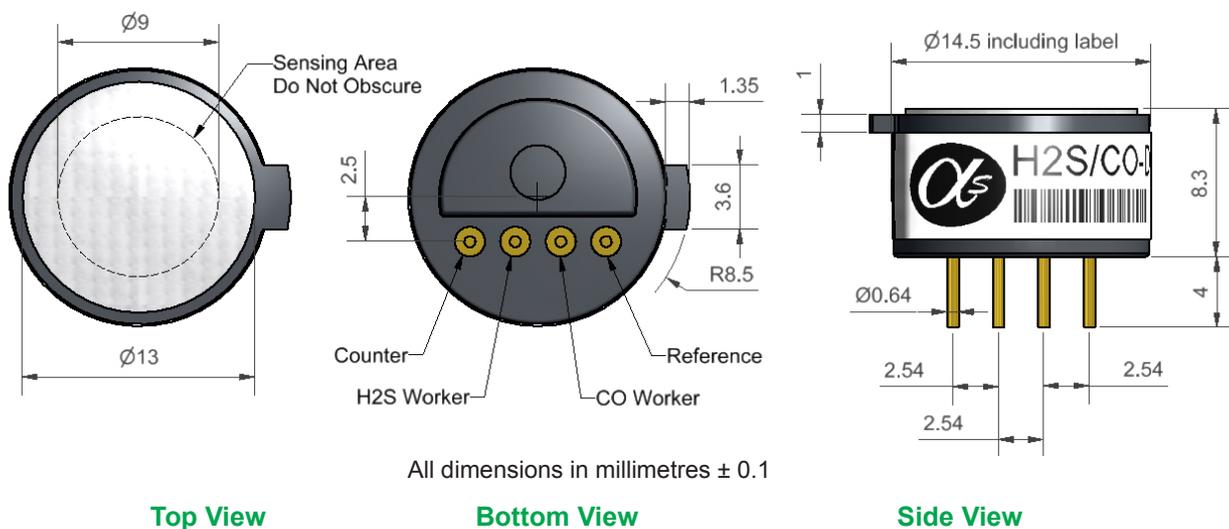
Figure 4 shows the response for a batch of D2 sensors tested with CO gas up to 5000ppm. The fast, stable response shows a robust sensor that operates well above its specification.



# Performance Specification continued



**Figure 1 D2 Schematic Diagram**



## D2 Specification Hydrogen Sulfide Channel

<b>PERFORMANCE</b>	Sensitivity	nA/ppm in 20ppm H <sub>2</sub> S	90 to 160
	Response time	t <sub>90</sub> (s) from zero to 20ppm H <sub>2</sub> S @ 20°C	< 30
	Zero current	ppm equivalent in zero air	< $\pm 1$
	Resolution	rms noise (ppm equivalent)	< 0.25
	Range	ppm H <sub>2</sub> S limit of performance warranty	100
	Linearity	ppm error at full scale, linear at zero and 20ppm H <sub>2</sub> S	0 to -9
	Overgas limit	maximum ppm H <sub>2</sub> S for stable response to gas pulse	400
	<b>LIFETIME</b>	Zero drift	ppm equivalent change/year in lab air
Sensitivity drift		% change/year in lab air, monthly test	< 2
Operating life		months until 80% original signal (24 month warranted)	24
<b>ENVIRONMENTAL</b>	Sensitivity @ -20°C	% (output @ -20°C/output @ 20°C) @ 20ppm H <sub>2</sub> S	75 to 90
	Sensitivity @ 50°C	% (output @ 50°C/output @ 20°C) @ 20ppm H <sub>2</sub> S	103 to 112
	Zero @ -20°C	ppm equivalent change from 20°C	-0.3 to 0.2
	Zero @ 50°C	ppm equivalent change from 20°C	< $\pm 1$
<b>CROSS SENSITIVITY</b>	NO <sub>2</sub>	sensitivity % measured gas @ 10ppm NO <sub>2</sub>	< -10
	Cl <sub>2</sub>	sensitivity % measured gas @ 10ppm Cl <sub>2</sub>	< -10
	NO	sensitivity % measured gas @ 50ppm NO	< 10
	SO <sub>2</sub>	sensitivity % measured gas @ 20ppm SO <sub>2</sub>	< 10
	CO	sensitivity % measured gas @ 400ppm CO	< 2
	H <sub>2</sub>	sensitivity % measured gas @ 400ppm H <sub>2</sub>	< 1
	C <sub>2</sub> H <sub>4</sub>	sensitivity % measured gas @ 400ppm C <sub>2</sub> H <sub>4</sub>	< 1
	NH <sub>3</sub>	sensitivity % measured gas @ 20ppm NH <sub>3</sub>	0

**\*Note:** Above 85% rh and 40°C a maximum continuous exposure period of 10 days is warranted. Where such exposure occurs, the sensor will recover normal electrolyte volumes when allowed to rest at lower %rh and temperature levels for several days.



# Performance Data Hydrogen Sulfide Channel

Technical Specification

**Figure 5 H<sub>2</sub>S Channel Sensitivity Temperature Dependence**

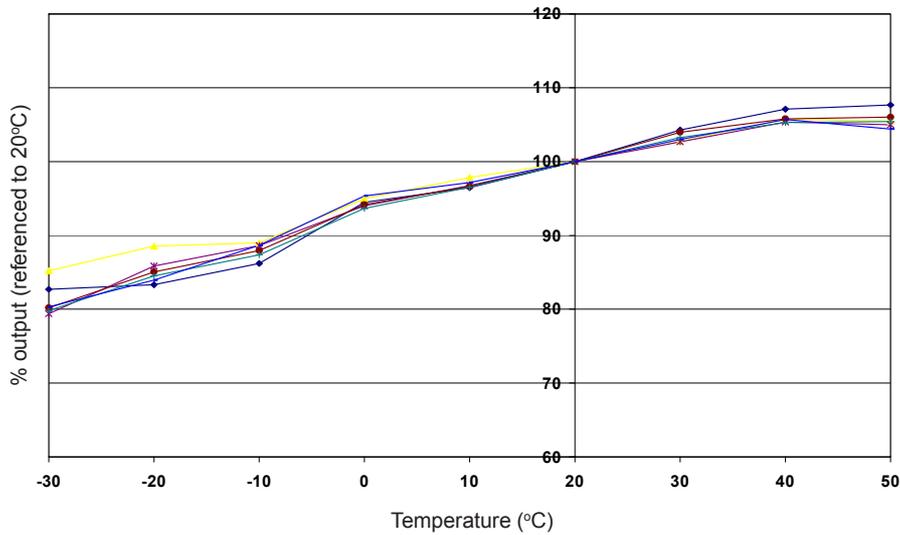


Figure 5 shows the variation in sensitivity caused by changes in temperature. The data is taken from a typical batch of sensors.

**Figure 6 H<sub>2</sub>S Channel Zero Temperature Dependence**

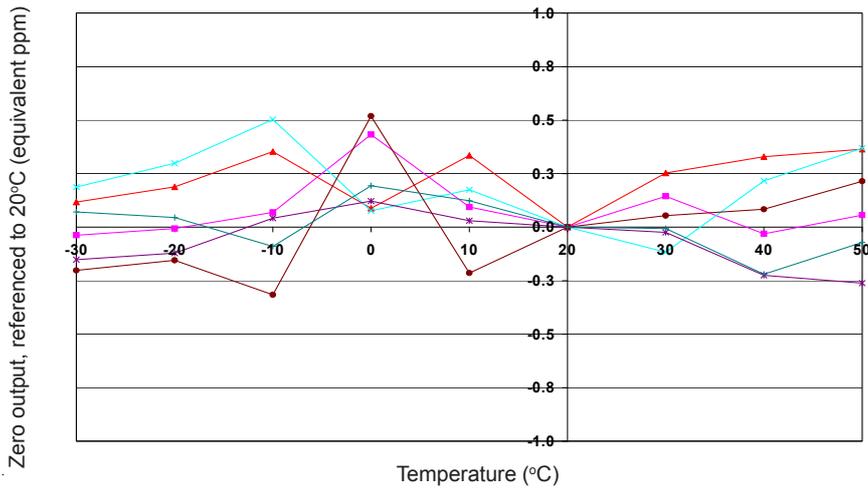


Figure 6 shows the variation in zero output caused by changes in temperature, expressed as ppm gas equivalent referenced to 20°C. This data is taken from a typical batch of sensors.

**Figure 7 Ambient Long Term Test Results**

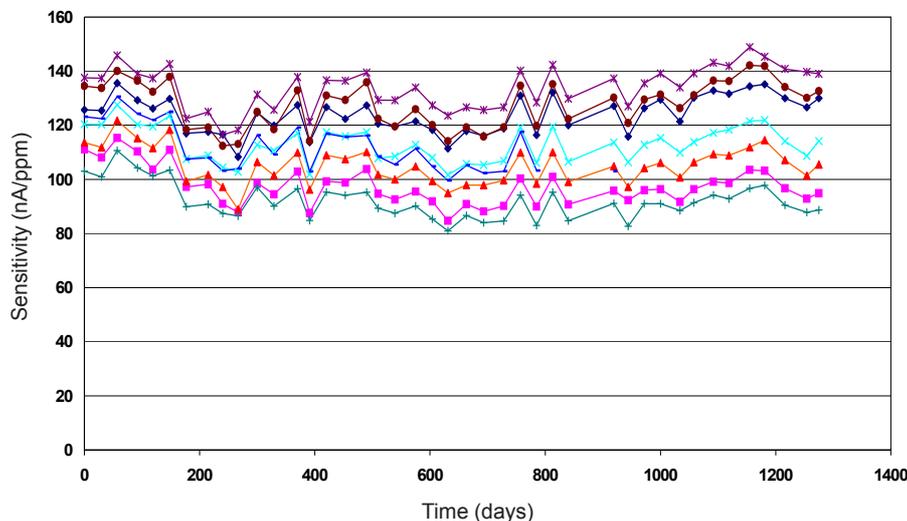


Figure 7 shows good long term stability to H<sub>2</sub>S for the D2 sensor.

Sensors were tested monthly and stored at ambient laboratory conditions.

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](http://www.alphasense.com)".

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