Dual Sensor Carbon Monoxide/Hydrogen Sulfide

Miniature Size

PATENTED and PATENT PENDING

Technical Specification

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 Carbon Monoxide cross sensitivity to Hydrogen Sulfide.

Adoption of the D2 in portable instrument designs enables accurate factory, service and field calibration of instruments using multi-component gases without the fear of incorrect calibration of the Carbon Monoxide channel, providing reduced instrument manufacturing and service costs.

D2 Specification Carbon Monoxide Channel

PERFORMANCE	Sensitivity	nA/ppm in 400ppm CO	34 to 55
	Response time	t_{90} (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
LIFETIME	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
ENVIRONMENTAL	Sensitivity @ -20°C	% (output @ -20°C/output @ 20°C) @ 100ppm CO	61 to 78
	Sensitivity @ 50°C	% (output @ 50°C/output @ 20°C) @ 100ppm CO	103 to 113
	Zero @ -20°C	ppm equivalent change from 20°C	-1 to 1
	Zero @ 50°C	ppm equivalent change from 20°C	-1 to 4
CROSS SENSITIVITY	Filter Capacity	ppm-hoursof Hydrogen Sulfide	15,000
	H_2S sensitivity	% measured gas @ 20ppm H_2S	< 8
	NO_2 sensitivity	% measured gas @ 10ppm NO_2	< 0.1
	Cl_2 sensitivity	% measured gas @10ppm Cl_2	< 0.1
	NO sensitivity	% measured gas @ 50ppm NO	< 50
	SO_2 sensitivity	% measured gas @ 20ppm SO_2	< 0.1
	H_2 sensitivity	% measured gas @ 400ppm H_2 @ 20°C	< 55
	NH_3 sensitivity	% measured gas @ 20ppm NH_3	< 0.1
KEY SPECIFICATIONS	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.

Performance Data
Carbon Monoxide Channel

Technical Specification

Figure 2 CO Channel Sensitivity Temperature Dependence

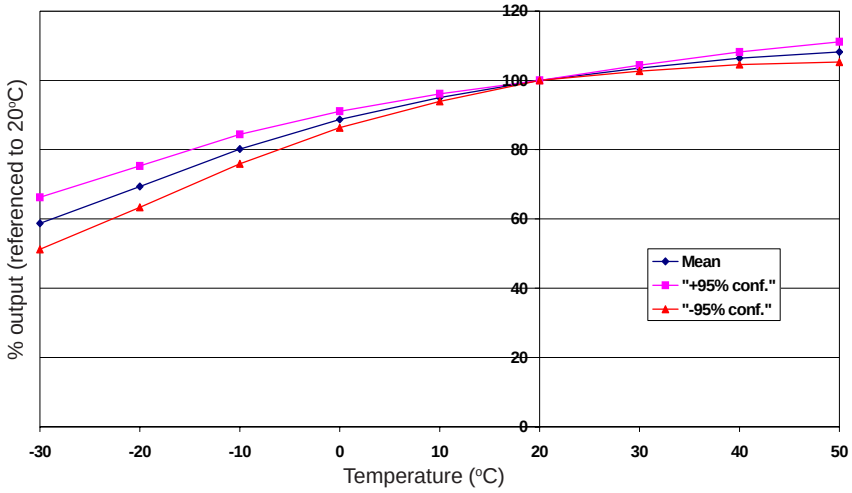


Figure 2 shows the variation in sensitivity caused by changes in temperature. The data is taken from a typical batch of sensors.

Figure 3 CO Channel Zero Temperature Dependence

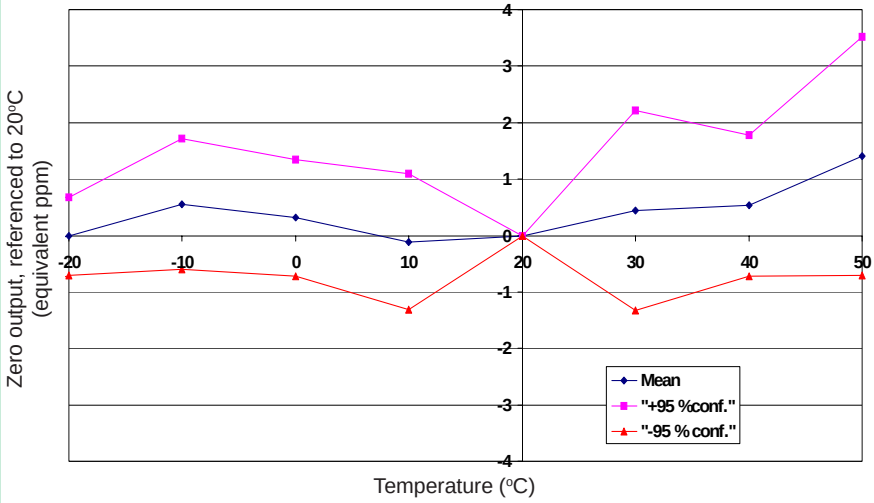


Figure 3 shows the variation in zero output caused by changes in temperature, expressed as ppm gas equivalent.

This data is taken from a typical batch of sensors and shows the ± 95% confidence intervals, referenced to 20°C.

Figure 4 CO Channel Response to High CO Concentration

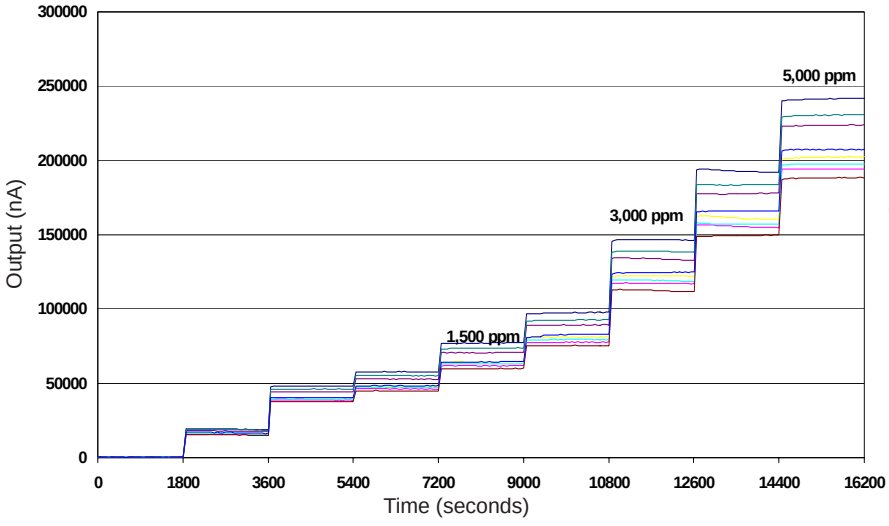
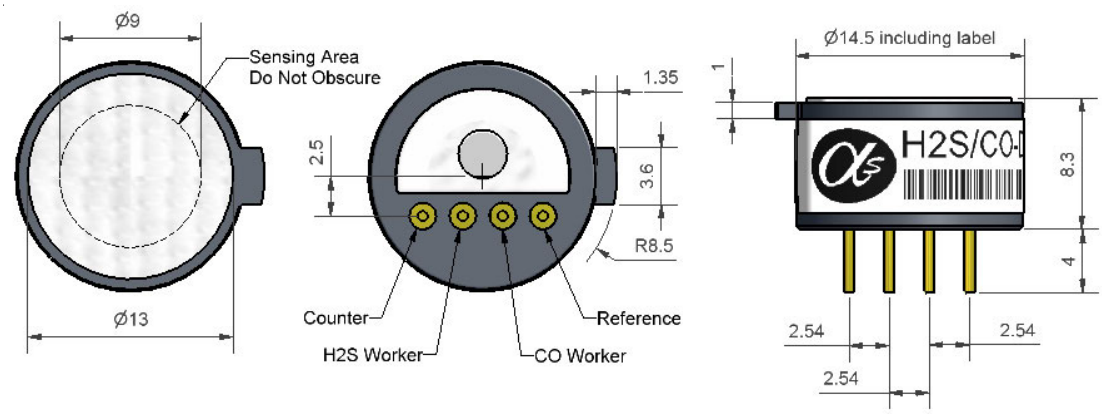


Figure 4 shows the response for a batch of D2 sensors tested with CO gas up to 5000ppm. The fast, stable response shows a robust sensor that operates well above its specification.

CD2™ Performance Specification continued

Technical Specification

Figure 1 D2 Schematic Diagram



All dimensions in millimetres ± 0.1

Top View **Bottom View** **Side View**

D2 Specification Hydrogen Sulfide Channel

PERFORMANCE	Sensitivity	nA/ppm in 20ppm H_2S	90 to 150
	Response time	t_{90} (s) from zero to 20ppm H_2S @ 20°C	< 30
	Zero current	ppm equivalent in zero air	< ± 0.6
	Resolution	rms noise (ppm equivalent)	<0.25
	Range	ppm H_2S limit of performance warranty	100
	Linearity	ppm error at full scale, linear at zero and 20ppm H_2S	0 to -9
	Overgas limit	maximum ppm H_2S for stable response to gas pulse	400
LIFETIME	Zero drift	ppm equivalent change/year in lab air	<0.1
	Sensitivity drift	% change/year in lab air, monthly test	<2
	Operating life	months until 80% original signal (24 month warranted)	24
ENVIRONMENTAL	Sensitivity @ -20°C	% (output @ -20°C/output @ 20°C) @ 20ppm H_2S	75 to 90
	Sensitivity @ 50°C	% (output @ 50°C/output @ 20°C) @ 20ppm H_2S	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	-1 to 0
CROSS SENSITIVITY	NO_2	sensitivity % measured gas @ 10ppm NO_2	< -10
	Cl_2	sensitivity % measured gas @ 10ppm Cl_2	< -10
	NO	sensitivity % measured gas @ 50ppm NO	< 10
	SO_2	sensitivity % measured gas @ 20ppm SO_2	< 10
	CO	sensitivity % measured gas @ 400ppm CO	< 2
	H_2	sensitivity % measured gas @ 400ppm H_2	<1
	C_2H_4	sensitivity % measured gas @ 400ppm C_2H_4	<1
	NH_3	sensitivity % measured gas @ 20ppm NH_3	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_2S Channel Sensitivity Temperature Dependence

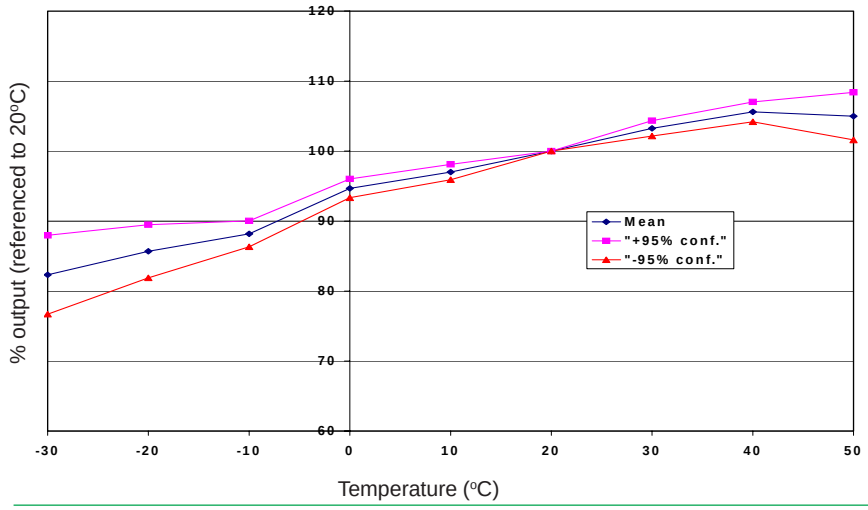


Figure 5 shows the variation in sensitivity caused by changes in temperature. The data is taken from a typical batch of sensors.

Figure 6 H_2S Channel Zero Temperature Dependence

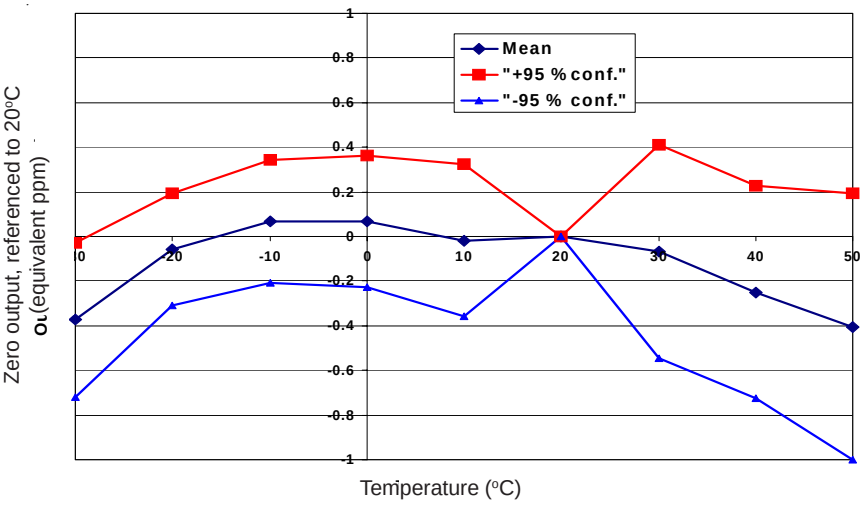


Figure 6 shows the variation in zero output caused by changes in temperature, expressed as ppm gas equivalent.

This data is taken from a typical batch of sensors and shows the ±95% confidence intervals, referenced to 20ºC.

Figure 7 Ambient Long Term Test Results

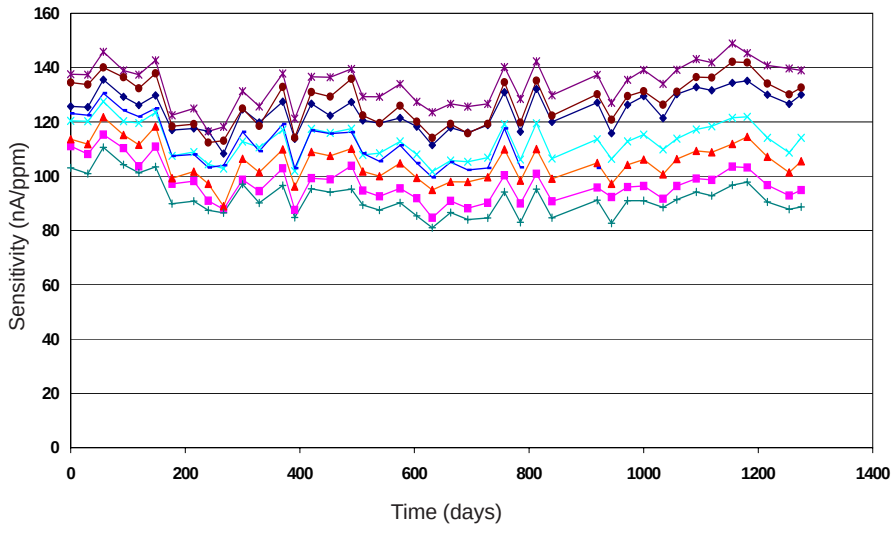


Figure 7 shows good long term stability of the D2.

Sensors were tested monthly and stored in ambient laboratory conditions.