Product Data Sheet

P/N : GS+A5CO

GS+A5CO

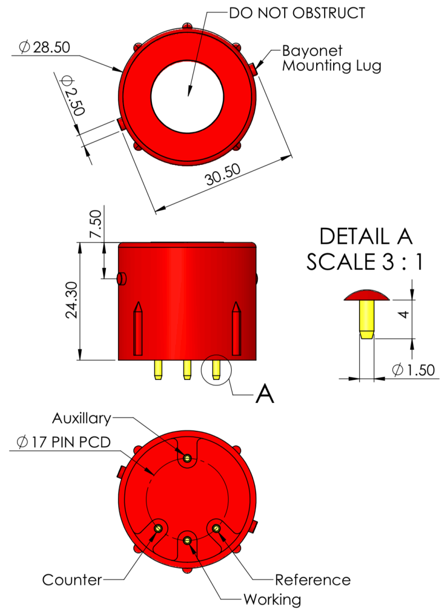
Carbon Monoxide Sensor (CO)

Introduction The GS+A5CO is a premium high quality robust CO sensor, ideal for use in portable emissions gas detectors.

Key Features: High stability, fast response and recovery, robust environmental performance.

Net Sensor Performance Characteristics	
Output signal	75 ± 25 nA / ppm
Typical Baseline Range (pure air)	±5 ppm CO equivalent
Filter Capacity	> 100,000 ppm hours
T90 Response Time	< 40 seconds
Measurement Range	0 - 4,000 ppm
Maximum Overload	10,000 ppm
Linearity	Linear up to 10,000 ppm
Repeatability	< ±2% CO equivalent
Recommended Load Resistor	10 ohms
Resolution (Electronics dependent)	< 1 ppm typical

Environmental Details	
Temperature Range Continuous	-20°C to +50°C
Pressure Range	800 to 1200 mbar
Operating Humidity Range	15% to 90% RH



Product Dimensions
All dimensions in mm
All tolerances ±0.15 mm

Important Note:
All performance data is based on conditions at 20°C, 50%RH and 1 atm, using DD Scientific recommended circuitry.

Sensor performance is temperature dependent, and please contact DD Scientific for temperature performance other than 20°C.

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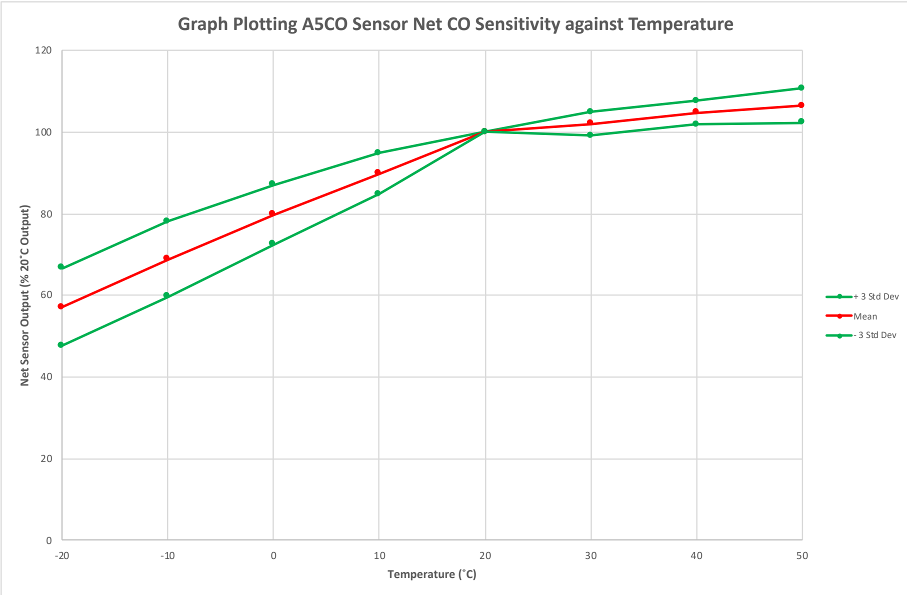
Lifetime Details	
Long Term Output Drift	< 1% per month
Recommended Storage Temp	0°C to 20°C
Expected Operating Life	> 24 months in air
Standard Warranty	12 months from date of dispatch



Cross - Sensitivity Data (Net Sensor Perfromance)		
GAS	CONC.	GS+A5CO
Hydrogen Sulphide	25 ppm	0 ppm
Sulphur dioxide	200 ppm	0 ppm
Nitrogen Dioxide	200 ppm	≈ -1ppm
Nitric Oxide	1,000 ppm	0 ppm
Hydrogen	500 ppm	ppm
	2000 ppm	ppm

Poisoning:
DD Scientific sensors are designed to operate in a wide range of harsh environments and conditions. However, it is important that exposure to high concentrations of solvent vapors is avoided, both during storage, fitting into instrument and operation.
When using sensors on printed circuit boards (PCB's), degreasing agents should be used prior to the sensor being fitted.

Intrinsic Safety Data	
Maximum at 2000 ppm	0.3 mA
Maximum o/c Voltage	1.3 V
Maximum s/c Current	<1.0 A

GS+A5CO meets sensor requirements outlined in:

EN50379

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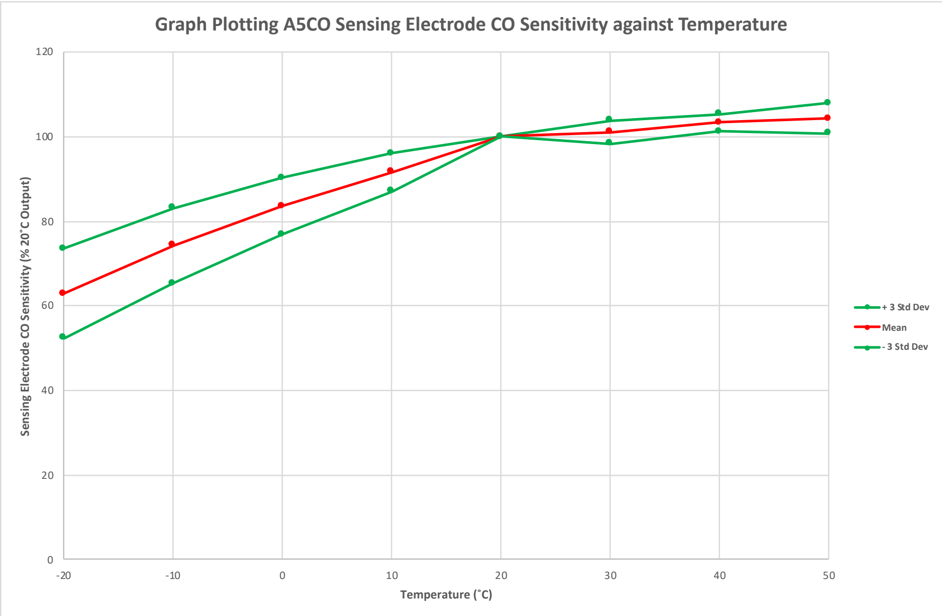
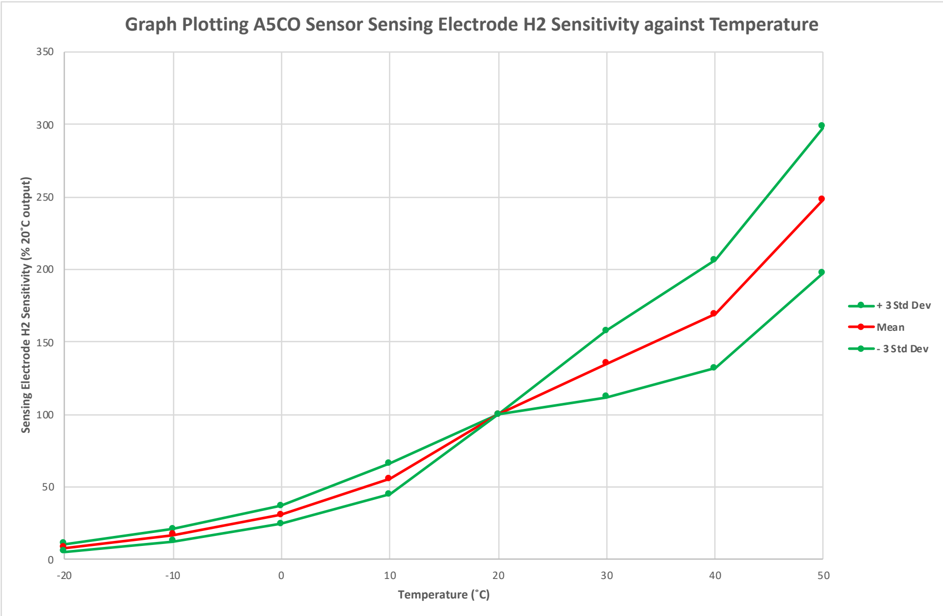
Sensing And Auxiliary Electrode Performance:

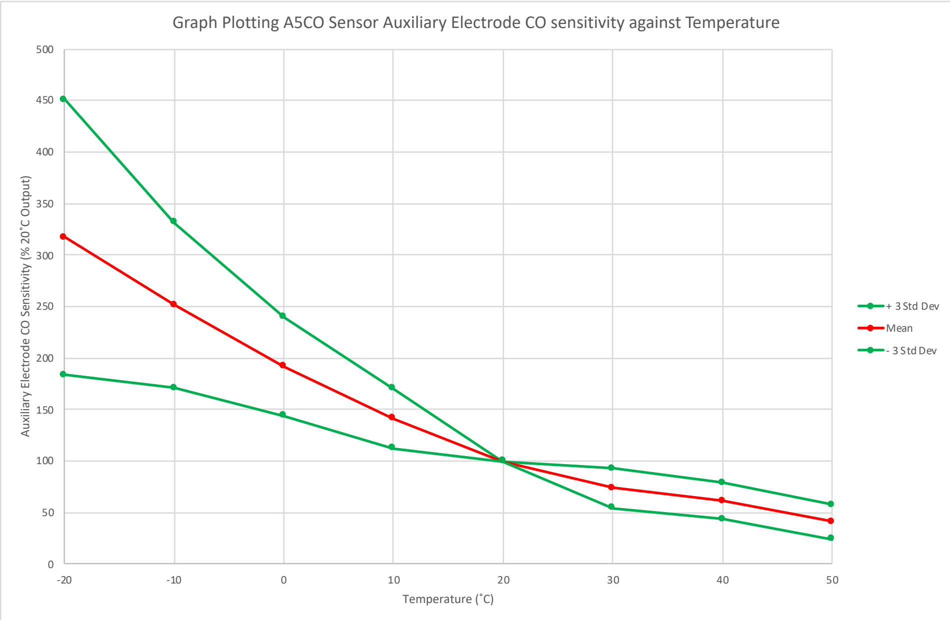
Electrode	Baseline (nA)	CO Sensitivity (nA/ppm)	H2 Sensitivity (nA/ppm)
Sensing Electrode	± 300 nA	50 to 100 nA/ppm	10 to 30 nA/ppm
Auxiliary Electrode	± 300 nA	0 to 5 nA/ppm	10 to 30 nA/ppm

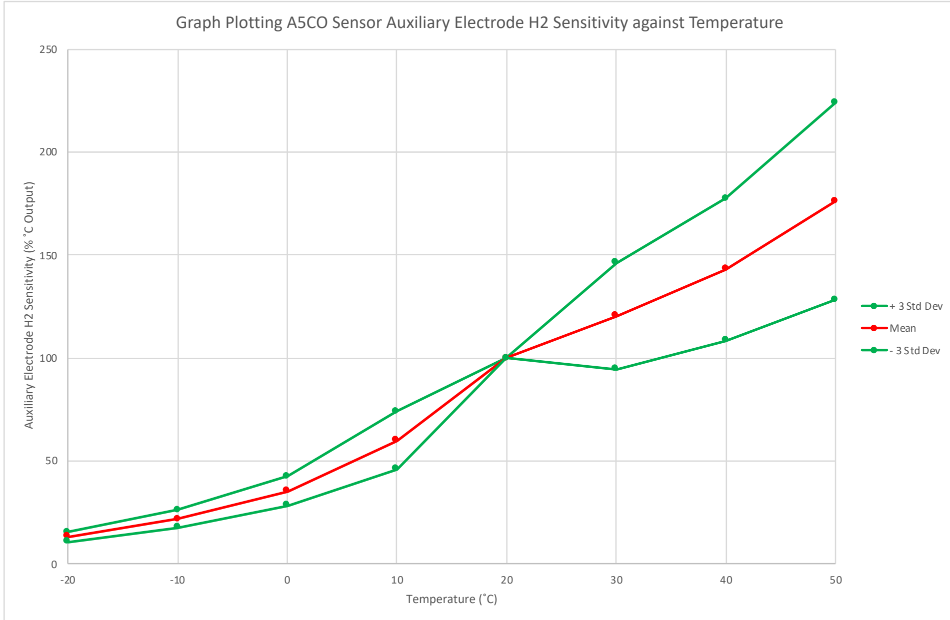
Sensing Electrode Temperature Performance:





Auxiliary Electrode Temperature Performance:





A5CO Sensor Operation:

In order to minimise the effect of hydrogen cross sensitivity on the net sensor performance, thus providing a true value for the CO content of the gas being tested, the output from the Auxiliary electrode should always be subtracted from the output of the Sensing electrode.

The Auxiliary electrode output will always be predominantly due to the hydrogen content of the gas stream, with the sensitivity to CO on this electrode being typically < 5% of that on the sensing electrode.

It cannot be guaranteed that the Sensing / Auxiliary electrode performance is identical when it comes to the relative levels of Hydrogen sensitivity, therefore calibration of both Sensing and Auxiliary electrodes to both CO and H2 (typically in the form of two test gases, CO and a CO / H2 mixture) is required.

From the values generated during this calibration, the level of Auxiliary signal amplification can be determined, commonly referred to as the Gain value, and when applied to the signal before subtraction from the sensing electrode, this amplified signal will ensure that the effect of hydrogen is all but eradicated.

Step by Step this calibration would be as follows:

1: Record the clean air output current for both electrodes ($\mathbf{S}_{zero}$ and $\mathbf{A}_{zero}$)

2: Expose the sensor to a known concentration of Carbon Monoxide [CO], recording the stable output current for both electrodes (typical 3 min exposure), calling these points of data $\mathbf{S}_{CO}$ and $\mathbf{A}_{CO}$

3: The sensor can then be exposed to a CO / H2 gas mixture of known concentrations ([Mix CO] and [Mix H2]), and once a stable signal has been achieved from both electrodes (typical 3 min exposure), record the output current of both electrodes, referring to these data points as $\mathbf{S}_{mix}$ and $\mathbf{A}_{mix}$

4: Using these 6 separate electrode outputs, in conjunction with the known gas concentrations from each stage of the calibration process, it is possible to determine the Gain value required for each individual sensor, such that the Net sensor output (with any potential effect due to the presence of H2 removed) can be calculated, and presented to via the instrument display as a ppm CO value.

5: The calculations that follow outline the various steps that are required:

Step A: Sensing Electrode CO Sensitivity (A): (uA/ppm)

$$A = \frac{S_{CO} - S_{zero}}{[CO]}$$

Step B: Auxiliary Electrode CO Sensitivity (B): (uA/ppm)

$$B = \frac{A_{CO} - A_{zero}}{[CO]}$$

Step C: Sensing Electrode H2 Sensitivity (C): (uA/ppm)

$$C = \frac{(S_{mix} - S_{zero}) - (A \times [Mix\ CO])}{[Mix\ H2]}$$

Step D: Auxiliary Electrode H2 Sensitivity (D): (uA/ppm)

$$D = \frac{(A_{mix} - A_{zero}) - (B \times [Mix\ CO])}{[Mix\ H2]}$$

Step E: Gain Value (no units):

$$Gain = \frac{C}{D}$$

Step F: Net Sensor CO Sensitivity: (uA/ppm)

$$\text{Net CO Sensitivity} = A - (Gain \times B)$$

As mentioned above, the values above can now be used to ensure that the instrument display (ppm CO) will be as accurate as possible, when using the final equation:

$$\text{Displayed CO Concentration (ppm)} = \frac{\text{Sensing Output} - (\text{Gain} \times \text{Auxiliary Output})}{\text{Net CO Sensitivity}}$$

It is important to note that all six of the electrode outputs above can and will be affected by the temperature in which the sensor is held. In particular, as the ambient temperature increases the H2 sensitivity will increase quite dramatically, altering the sensor gain, and with that potentially introducing error to the displayed CO concentration.

It is highly recommended that the effect of temperature on these critical parameters be fully understood, and incorporated within the instrument software to be able to correct for the effect of temperature on the accuracy of the instrument display.

Recommended Operating Circuit: