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SGX-4CO-A Datasheet

Industrial Carbon Monoxide Sensor

for applications where cross sensitivity to Hydrogen either impacts accuracy or produces false alarms.

Performance

Output Signal	70±20nA / ppm
Measurement Range	0 – 2000 ppm
Typical Baseline Range (pure air)	±2 ppm CO equivalent
Filter Capacity	n/a
T90 Response Time	<30 sec
Maximum Overload	5000 ppm
Linearlity	Linear up to 5000ppm
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	1000±200 mbar
Operating Humidity Range	15-90% RH

Lifetime Details

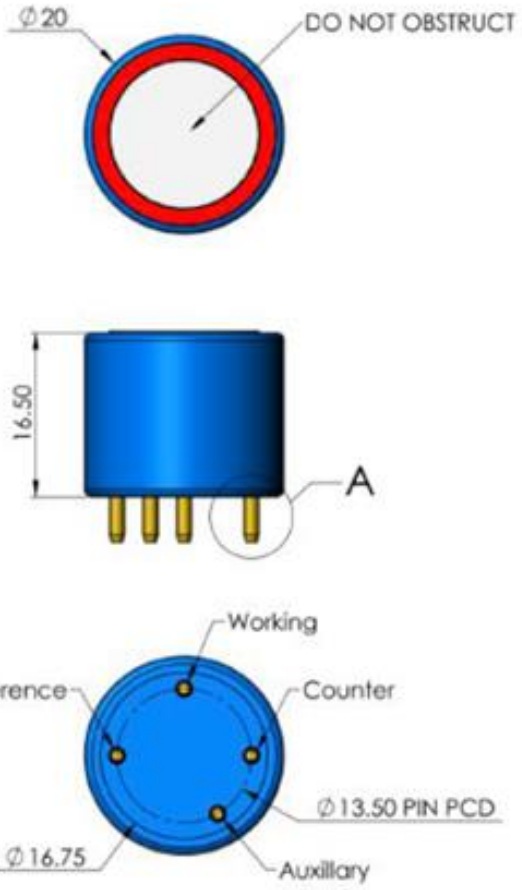
Long Term Output Drift	< 1% / month
Recommended Storage Temp	0 to 20°C
Expected Operating Life time	>24 months in air

Intrinsic Safety Data

Maximum at 2000ppm	0.3 mA
Maximum o/c Voltage	1.3 V
Maximum S/C Current	<1.0 A

OUTLINE

All dimensions are in mm
All tolerances are ±0.15mm
Pin diameter = 1.50 mm



Please note gluing or soldering direct to the pins will void warranty, please use PCB sockets

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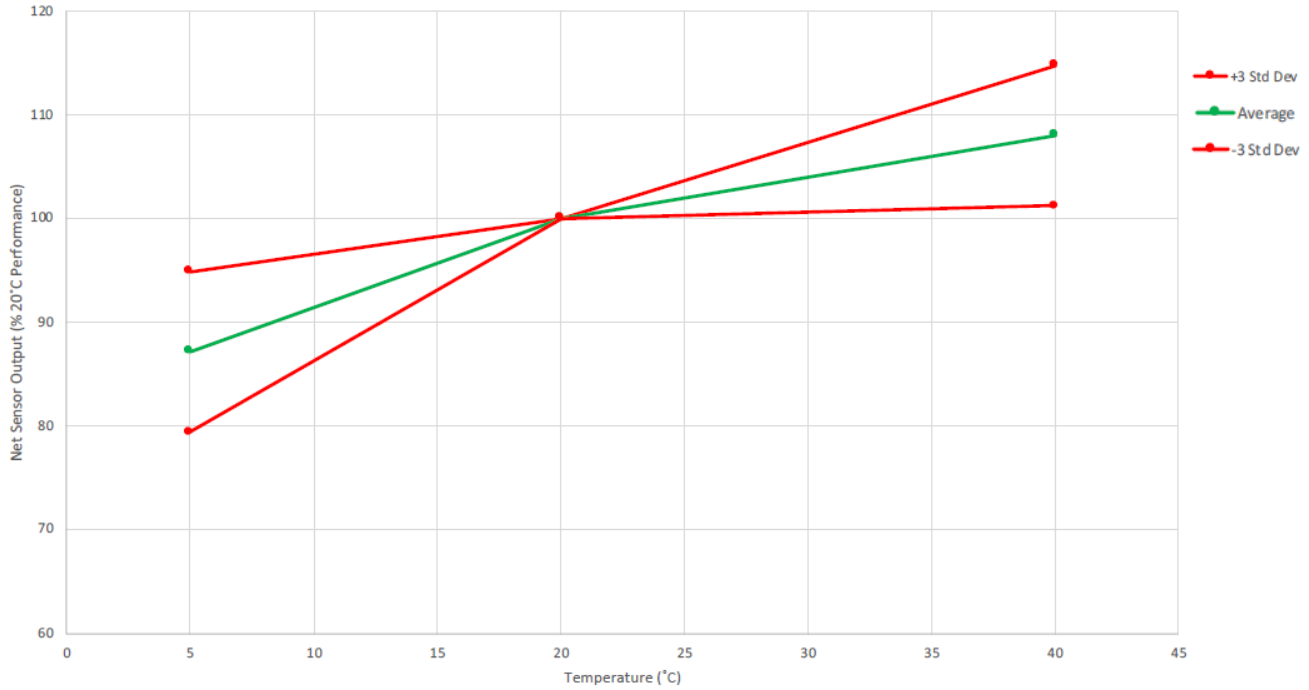
SGX-4CO-A Sensor CO Sensitivity vs Temperature



Cross Sensitivity Data

GAS	Concentration	SGX-4CO-A
Hydrogen Sulfide	25ppm	xx ppm CO
Sulfur Dioxide	20ppm	0 ppm CO
Nitrogen Dioxide	20ppm	0 ppm CO
Nitric Oxide	1000ppm	~30 ppm CO
Hydrogen	500ppm	xx ppm CO

Poisoning

SGX Sensortech's 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 vapours 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.

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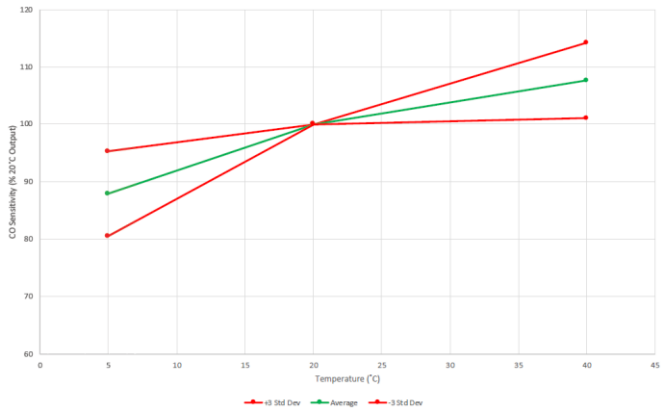
Sensing And Auxiliary Electrode Performance:

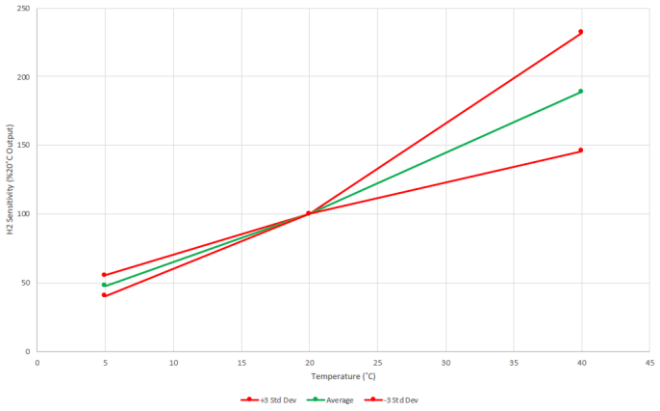
Electrode	Baseline (nA)	CO Sensitivity (nA/ppm)	H2 Sensitivity (nA/ppm)
Sensing Electrode	±300nA	50 to 90 nA/ppm	5 to 25 nA/ppm
Auxilary Electrode	±300nA	0 to 5 nA/ppm	5 to 25 nA/ppm

Sensing Electrode Temperature Performance:

Sensing Electrode CO Sensitivity vs Temperature

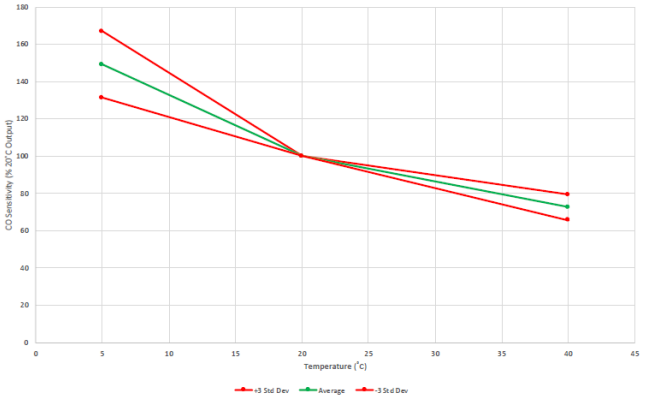


Sensing Electrode H2 Sensitivity vs Temperature

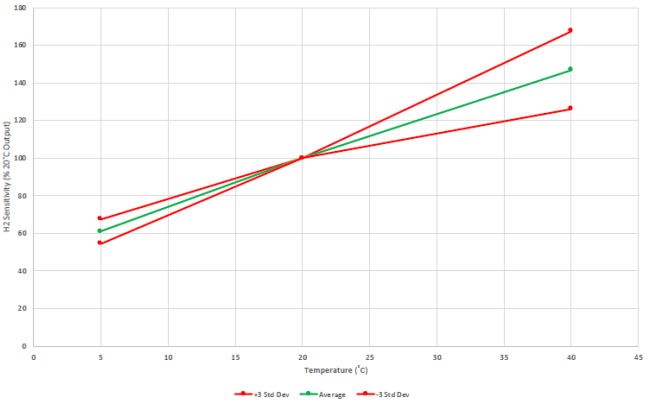


Auxiliary Electrode Temperature Performance:

Auxiliary Electrode CO Sensitivity vs Temperature



Auxiliary Electrode H2 Sensitivity vs Temperature



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SGX-4CO-A 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.

SGX-4CO-A Sensor Calibration

1: Record the clean air output current (µA) for both electrodes (S_{zero} and A_{zero})

2: Expose the sensor to a known concentration of Carbon Monoxide [CO], recording the stable output current (µA) for both electrodes (typical 3 min exposure), calling these points of data S_{CO} and 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 output has been achieved from both electrodes (typical 3 min exposure), record the output current (µA) of both electrodes, referring to these data points as S_{mix} and 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)

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

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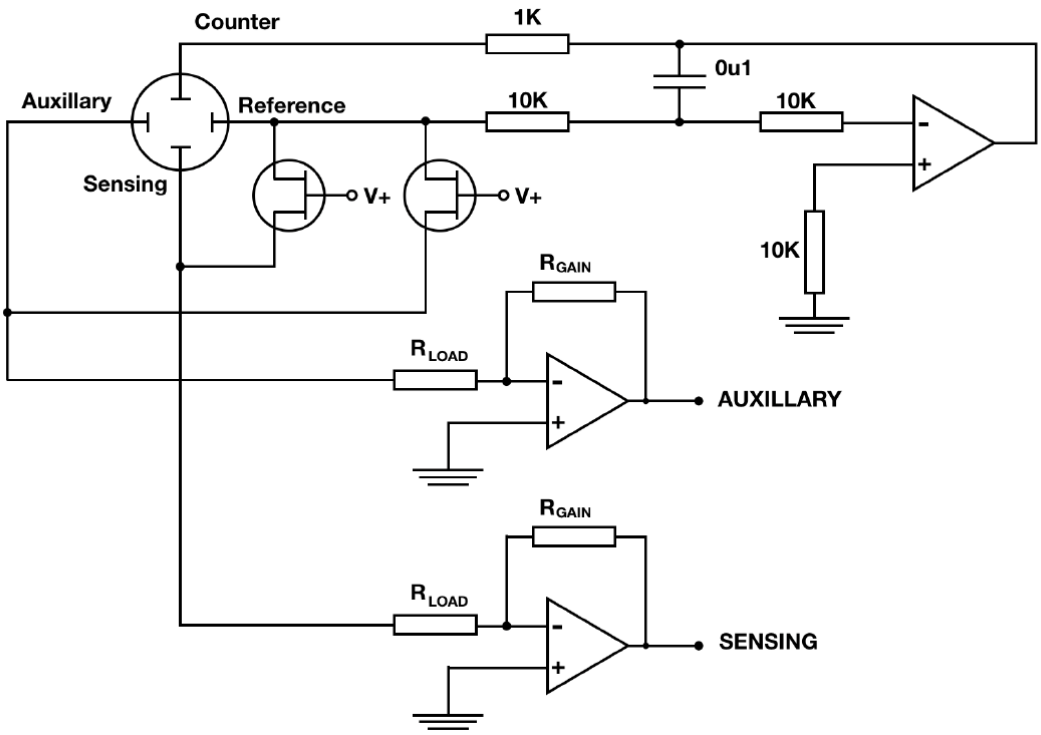
As mentioned above, the values above can now be used to ensure that the instrument display (ppm CO) will be as accurate as possible, when using the final equation:

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

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:



Warning:
By the nature of the technology used, any electrochemical gas sensor offered by SGX Europe Sp. z o.o. can potentially fail to meet specification without warning. SGX Europe Sp. z o.o. makes every effort to ensure the reliability of our products of this type, where life safety is a performance requirement of the product, we recommend that all sensors and instruments using these sensors are checked for response to gas before use. SGX Europe Sp. z o.o reserves the right to make product changes without notice. No liability is accepted for any consequential losses, injury or damage resulting from the use of this document or from any omissions or errors herein. The data is given for guidance only. It does not constitute a specification or an offer for sale. The products are always subject to a program of improvement and testing which may result in some changes in the characteristics quoted. As the products may be used by the client in circumstances beyond the knowledge and control of SGX Europe Sp. z o.o, we cannot give any warranty as to the relevance of these particulars to an application. It is the clients' responsibility to carry out the necessary tests to determine the usefulness of the products and to ensure their safety of operation in a particular application. Performance characteristics on this data sheet outline the performance of newly supplied sensors. Output signal can drift below the lower limit over.