Product Characterisation Note

1series: SO_2 Sensor

Contents

Document Purpose

The purpose of this document is to provide indicative, technical performance data for the 1SO2 sensor to assist in the integration of the sensor into gas detection instrumentation. The sensor has been subjected to a rigorous testing program as part of the development process. Within this document, detailed information on the results of this program is presented.

This document and the information contained within does not constitute a specification. The data is provided for informational purposes only and is not warranted by the manufacturer. It should be used in conjunction with the 1SO2 Product Datasheet, Operating Principles (OP08) and the Product Safety Datasheet (PSDS 11).

CITY TECHNOLOGY

The Gas Response Curve

The data in Figure 1 shows a typical response curve for the 1SO2.

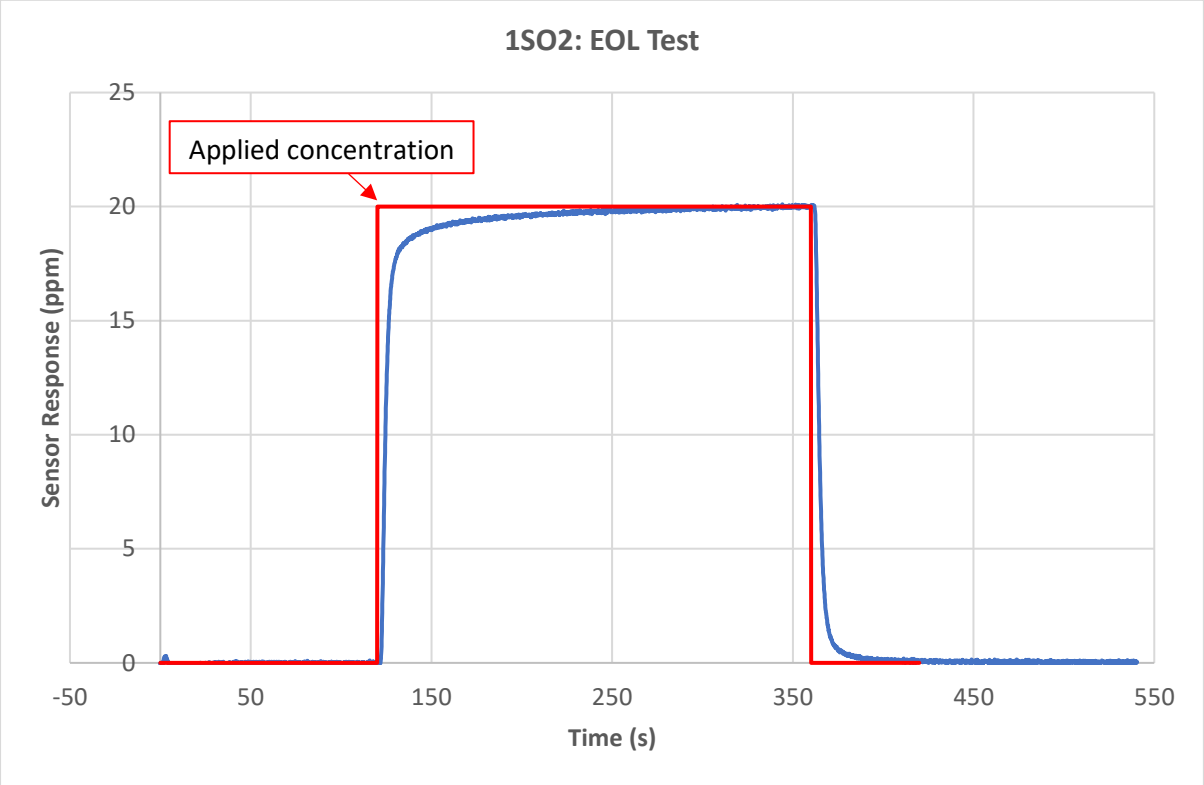
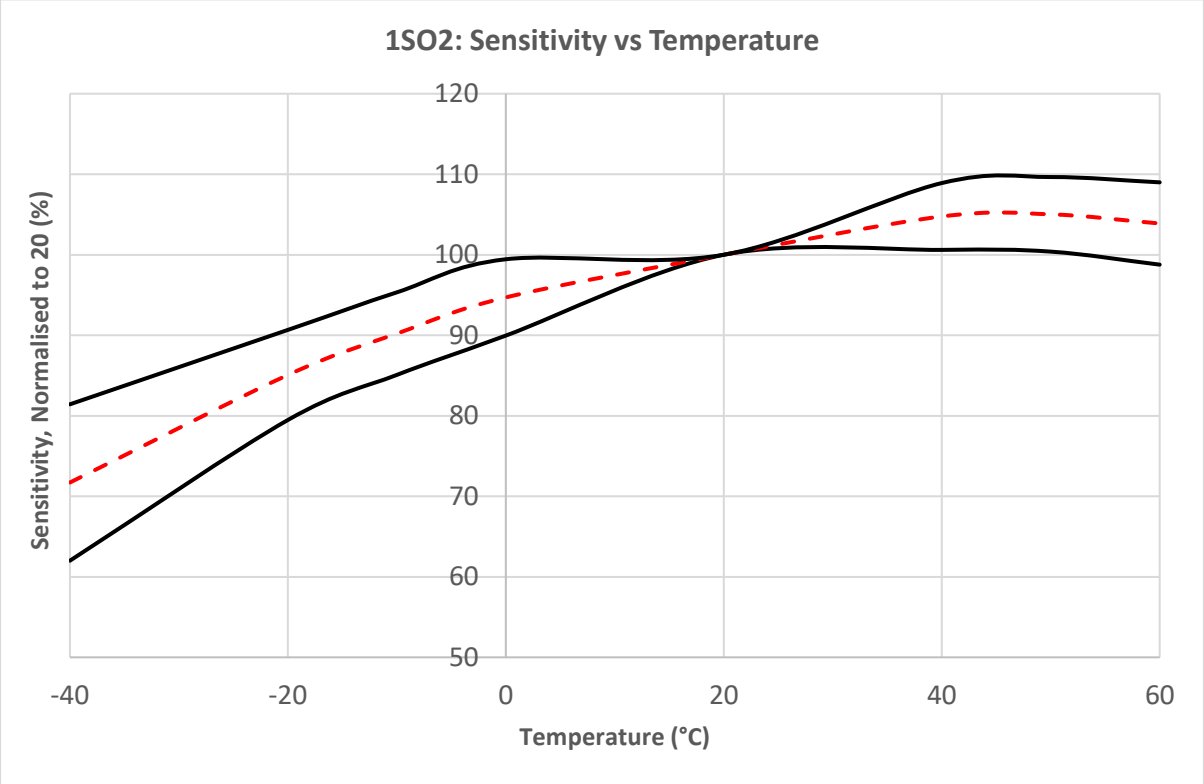


Figure 1. Gas Response Curve

Variation of Sensitivity with Temperature

The output of the 1SO2 will vary as a function of ambient temperature. The data in Figure 2 shows the typical variation in sensitivity across the operating temperature range and is presented normalized to the 20°C value. For instruments that are expected to function across a wide range of ambient temperatures, City Technology recommends that an electronic compensation algorithm is used to ensure maximum accuracy. The presented results reflect the performance of a typical production batch.

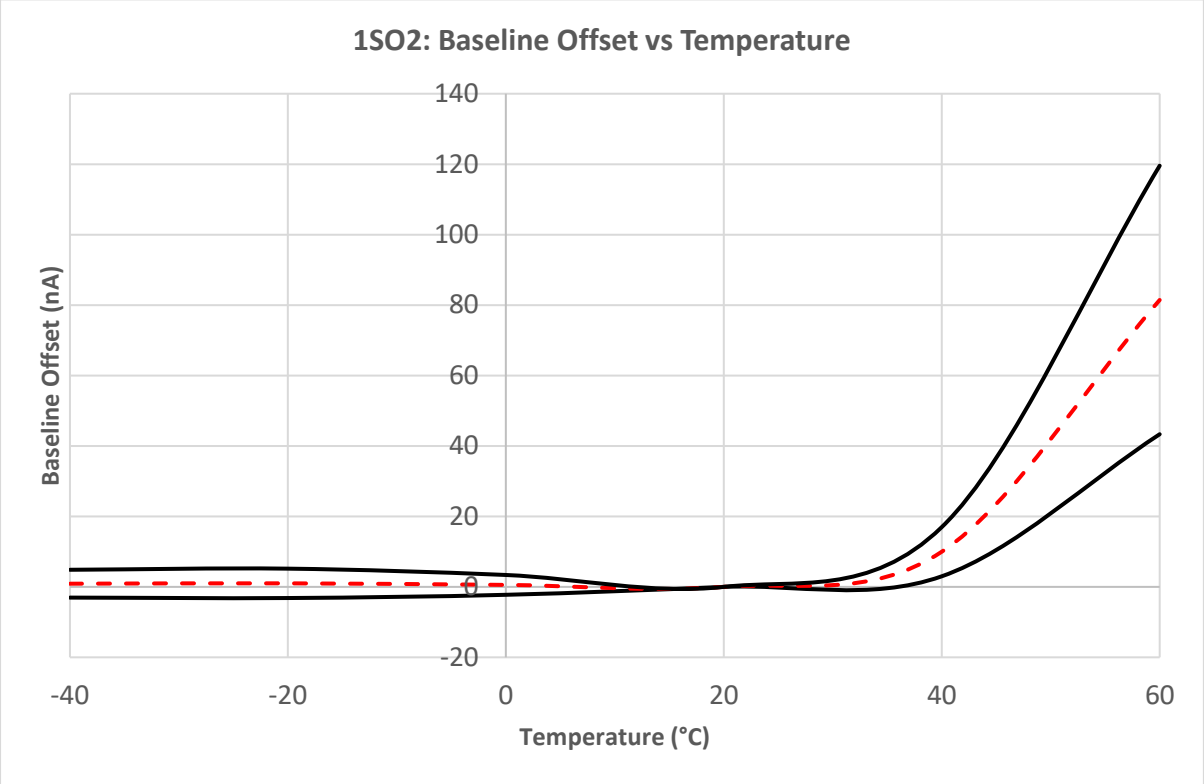


Temperature (°C)	-40	-20	-10	0	20	40	50	60
Average (%)	71.72	85.07	90.21	94.70	100.00	104.75	105.02	103.88
-3SD	81.43	90.67	95.33	99.44	100.00	108.90	109.65	109.00
+3SD	62.01	79.48	85.08	89.96	100.00	100.61	100.39	98.77

Figure 2. Temperature Characteristics Variation of Output with Temperature

Variation of Baseline Offset with Temperature

The electrical output in the absence of target gas (baseline offset) of the 1SO2 will vary as a function of the ambient temperature. The data below shows typical 1SO2 performance across the operating temperature range, for sensors calibrated at 20°C. Although the variation is relatively small, City Technology recommends the use of offset correction factors so as to minimize inaccuracies in the baseline measurement. The presented results reflect the performance of a typical production batch.



Temperature (°C)	-40	-20	0	20	40	60
Average	0.90	1.00	0.56	0.00	9.98	81.45
-3SD	-3.05	-3.16	-2.25	0.00	3.00	43.33
+3SD	4.85	5.17	3.38	0.00	16.95	119.56

Figure 3. Variation of Baseline Offset with Temperature

Variation of T90 Response Time with Temperature

The response time of the 1SO2 will vary as a function of ambient temperature, typically getting faster at higher temperatures and responding more slowly at lower temperatures. The data in Figure 4 shows typical T90 response times of the 1SO2 across the operating temperature range. Data is representative of a typical production batch.

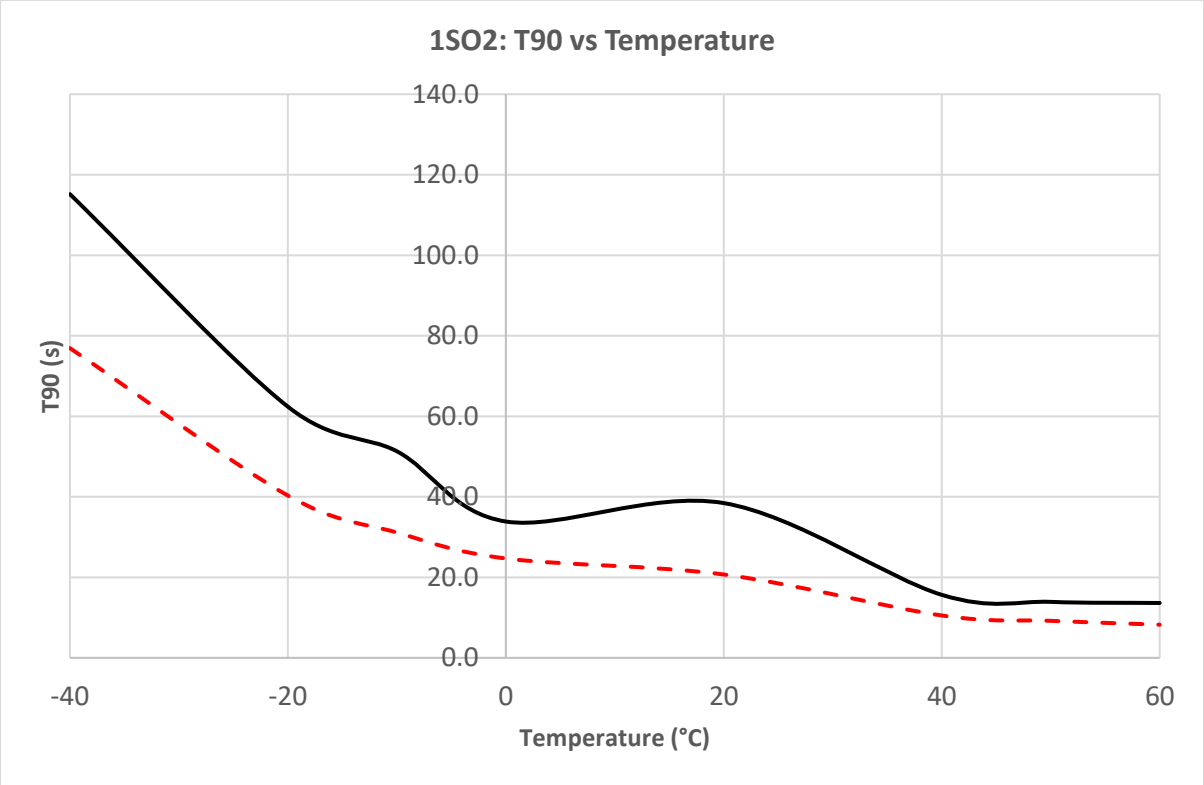


Figure 4. Variation of Response Time with Temperature

Long Term Data:

Sensitivity

The typical long term sensitivity of the 1SO2 is represented in Figure 5, which reflects the performance of a typical production batch.

The sensor batches under test were stored and tested in ambient conditions.

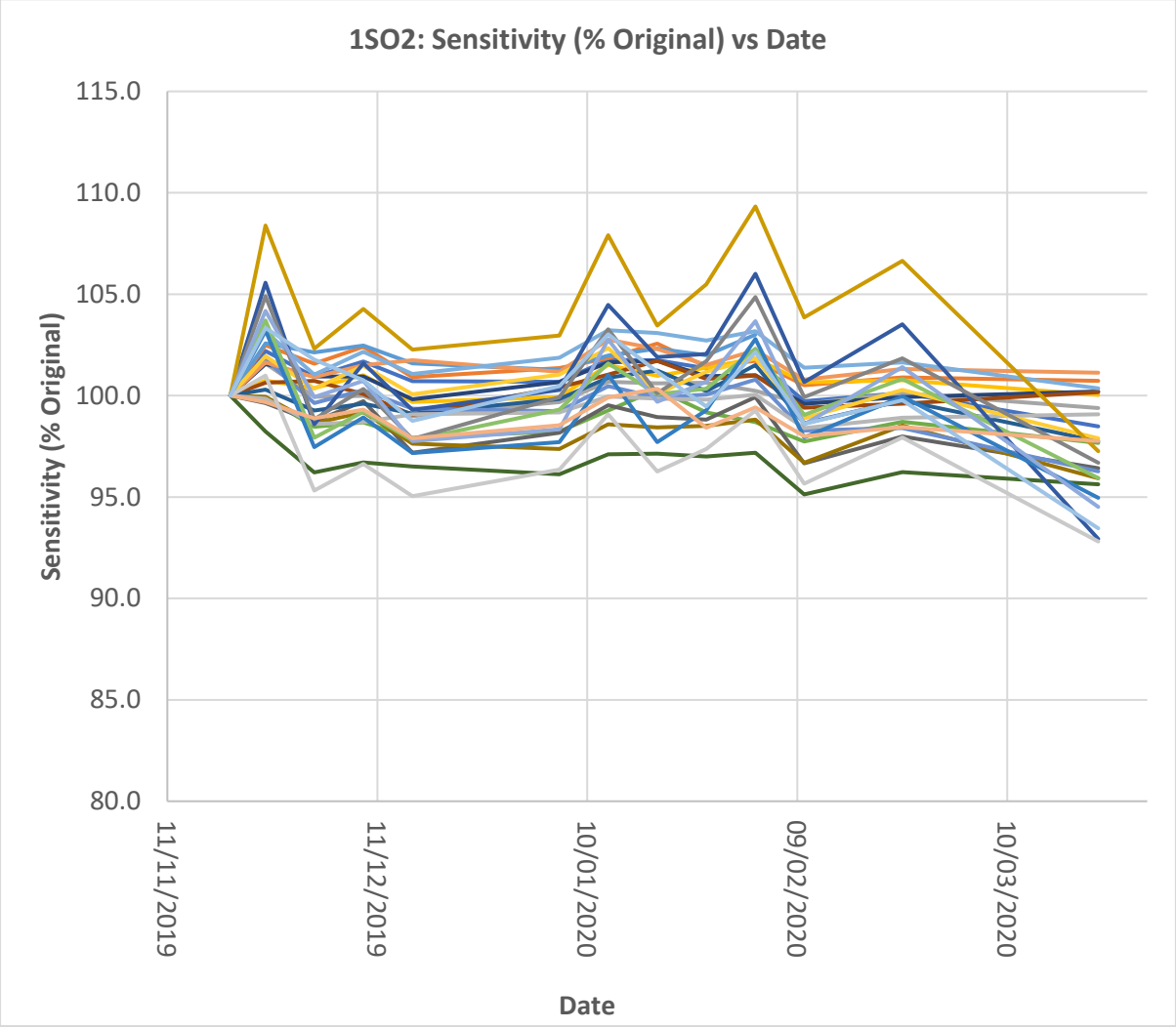


Figure 5. Long Term Sensitivity

Baseline Drift

The typical long term baseline drift of the 1SO2 is represented in Figure 6, which reflects the performance of a typical production batch.

The sensor batches under test were stored and tested in ambient conditions.

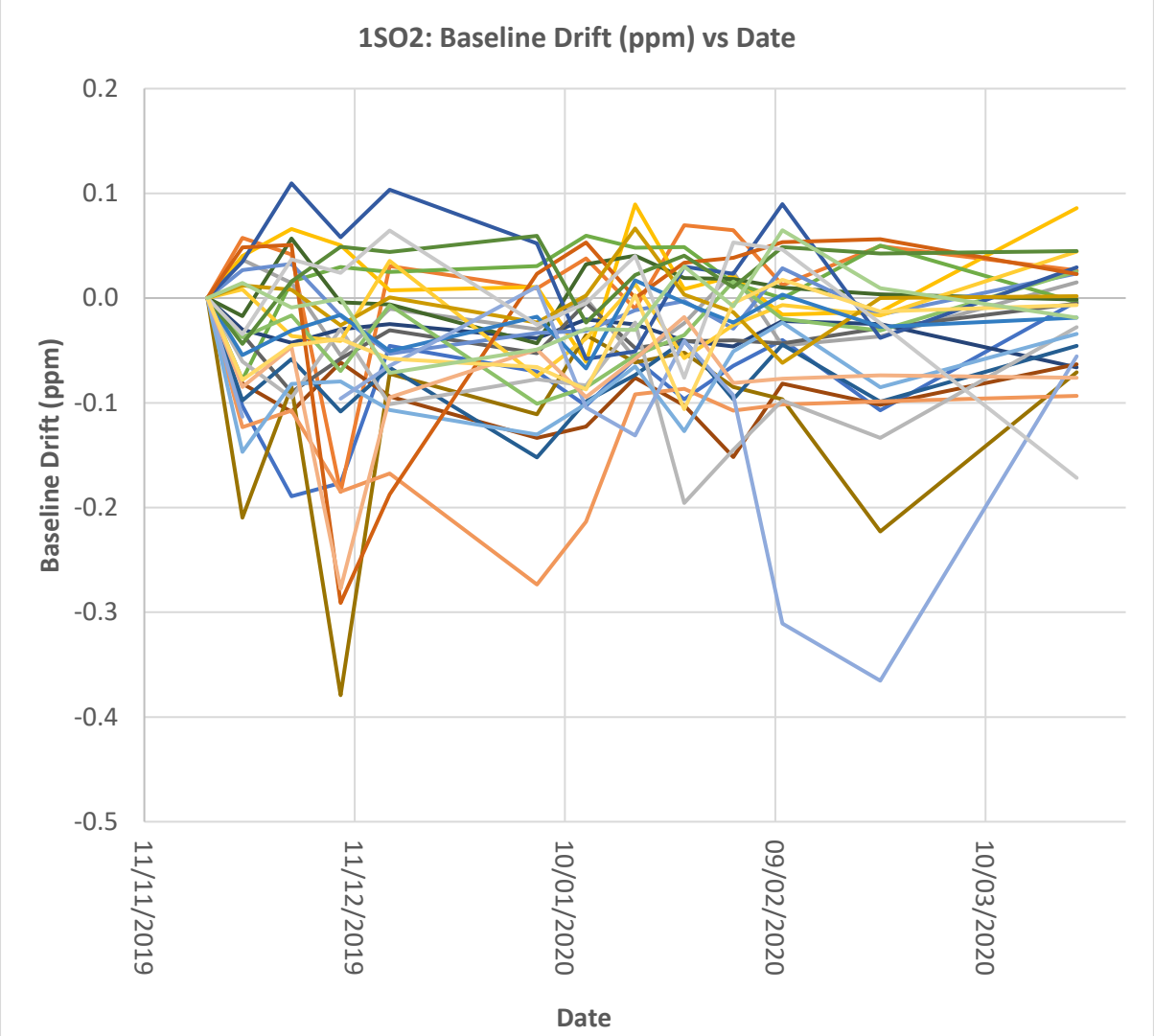


Figure 6. Long Term Baseline Drift

T90 response

The typical long term T90 response of the 1SO2 is represented in Figure 7, which reflects the performance of a typical production batch.

The sensor batches under test were stored and tested in ambient conditions.

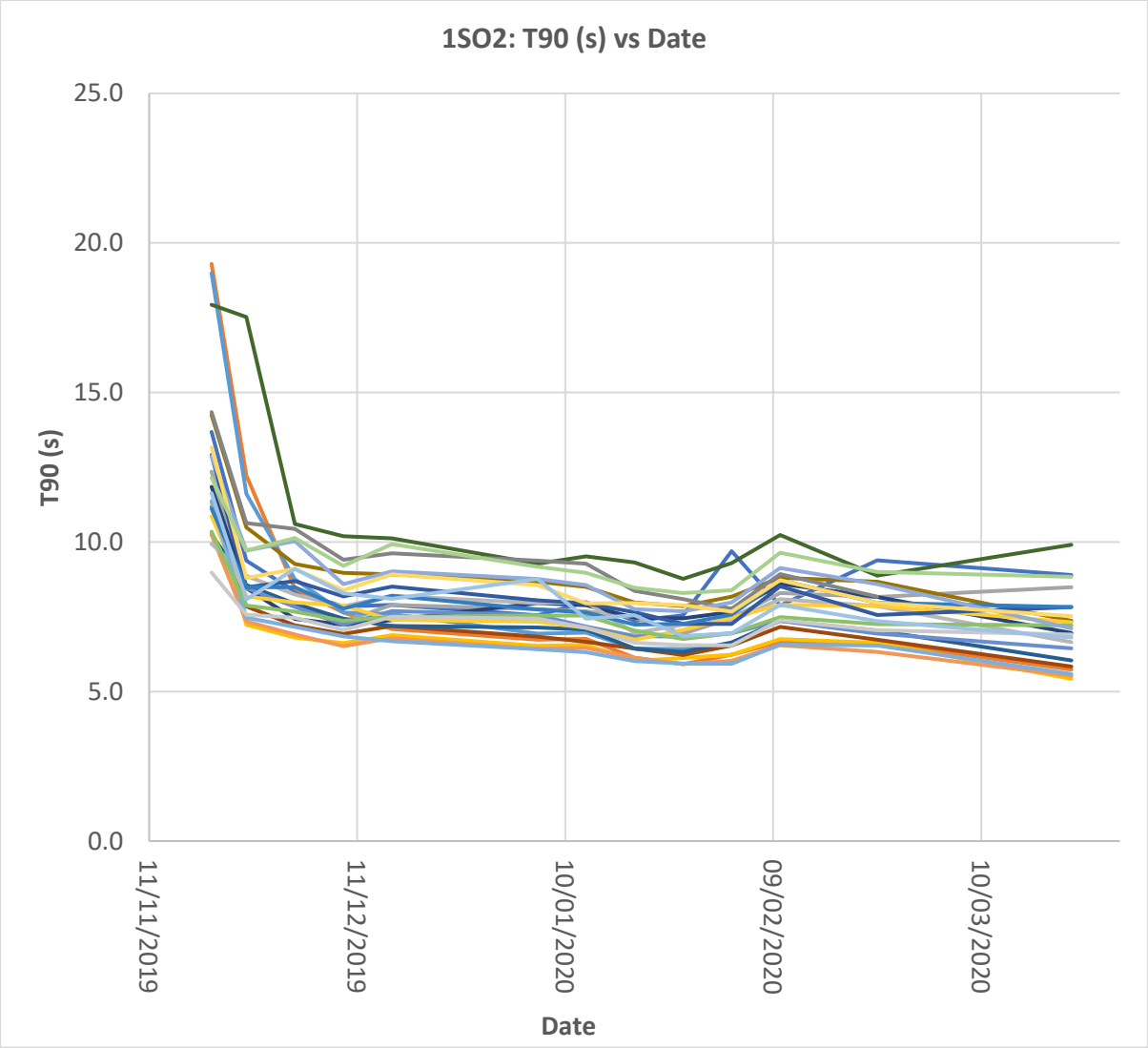


Figure 7. Long Term T90 response

Effect of Prolonged Exposure in Extreme conditions on Performance

If the sensor is subjected to prolonged extremes of relative humidity at high temperatures for extended periods of time, there remains a risk that the performance of the sensor may be compromised, showing a loss in sensitivity, enhanced baseline or slow response times. It is therefore recommended that if the intended use of the 1SO2 may subject it to prolonged exposures to extreme environments, City Technology's Technical Sales team is consulted for further advice as to the likely implications and how to overcome any issues seen.

60 °C and 5% RH

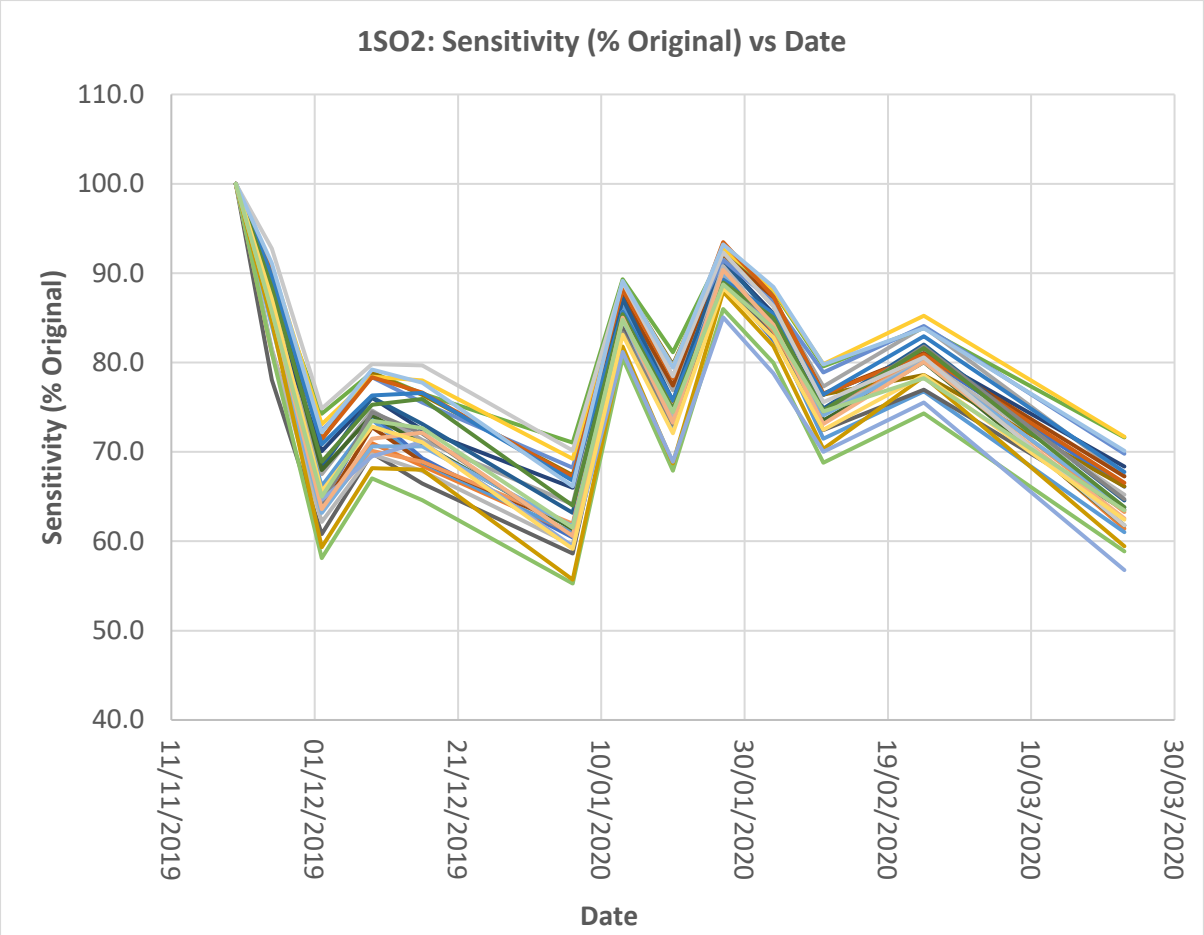


Figure 8. Variation in the sensitivity of 1SO2 sensors stored at 60 °C and 5% RH (tested at ambient).

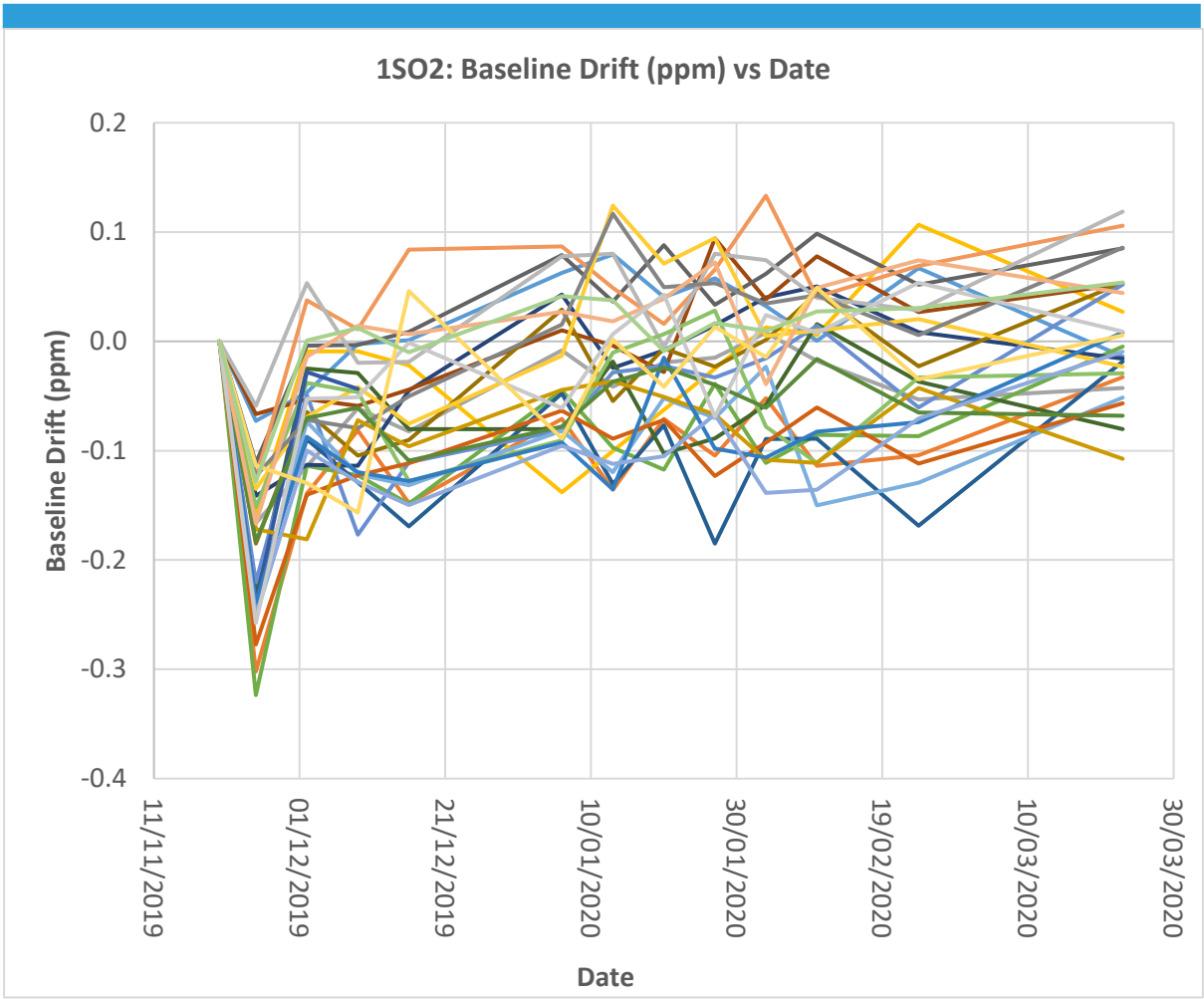


Figure 9. Variation in the baseline drift of 1SO2 sensors stored at 60 °C and 5% RH (tested at ambient).

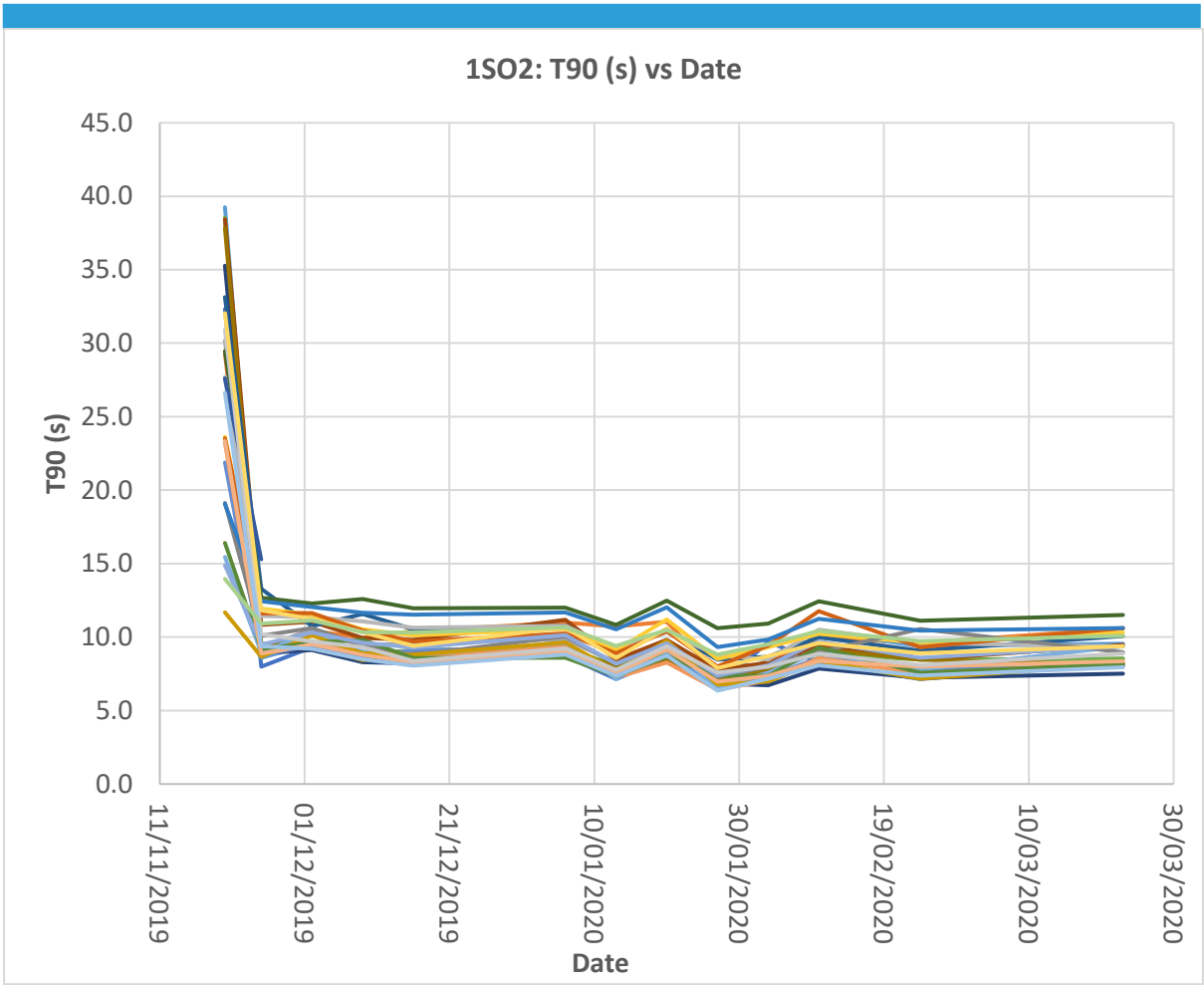


Figure 10. Variation in the T90 response of 1SO2 sensors stored at 60 °C and 5% RH (tested at ambient).

- 20°C:

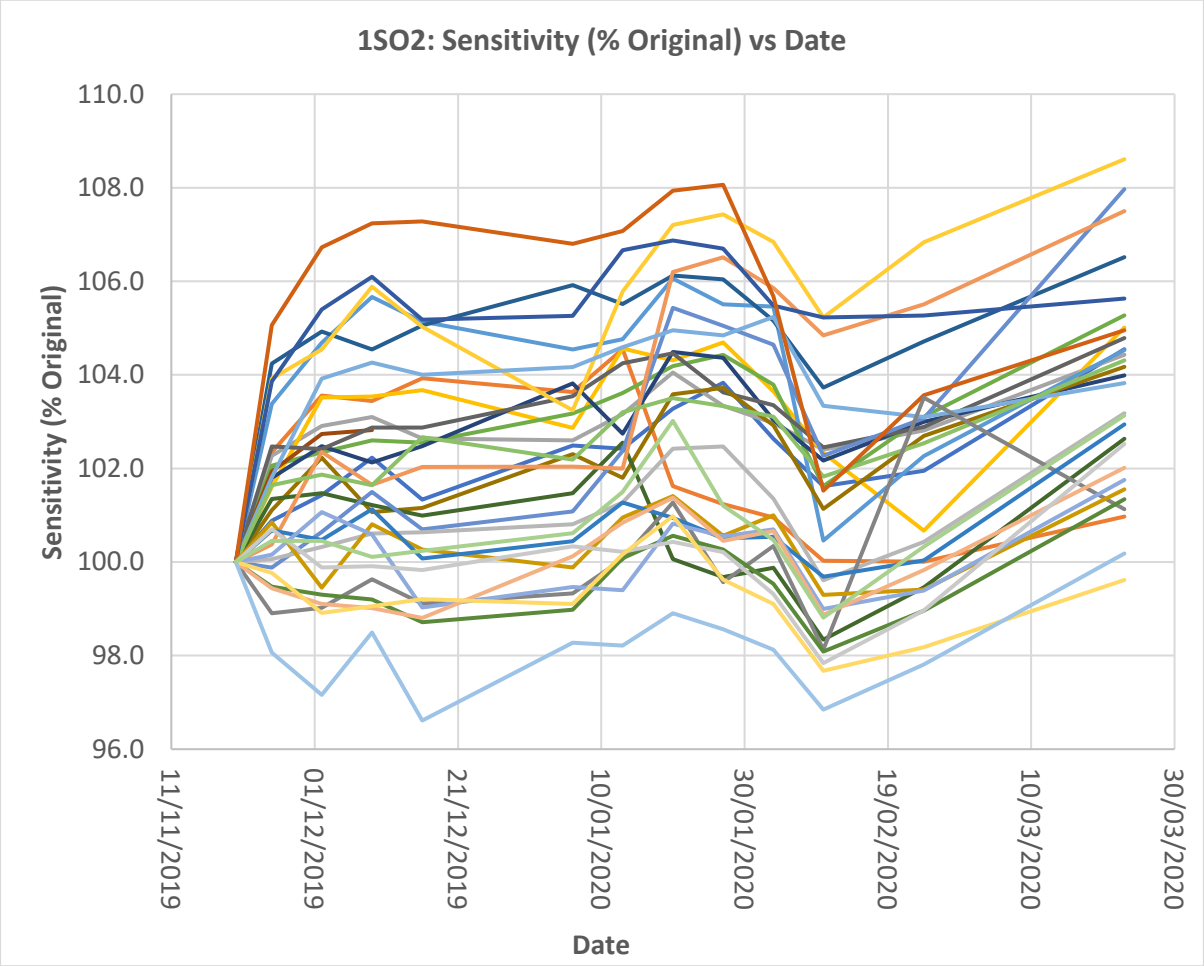


Figure 11. Long Term Sensitivity when sensors are stored continuously at -20°C. Tested in ambient conditions.

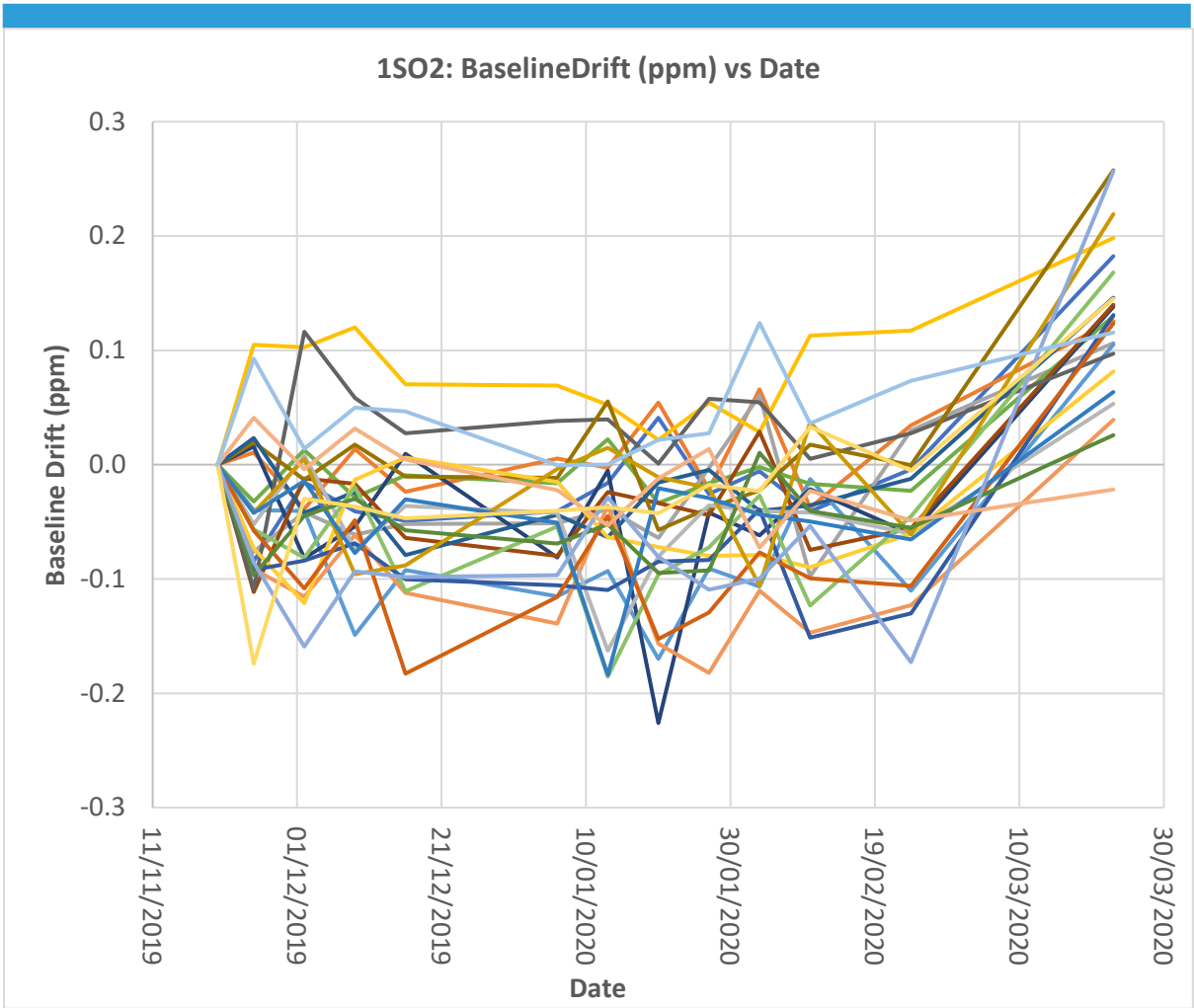


Figure 12. Long Term Baseline Drift when sensors are stored continuously at -20°C. Tested in ambient conditions.

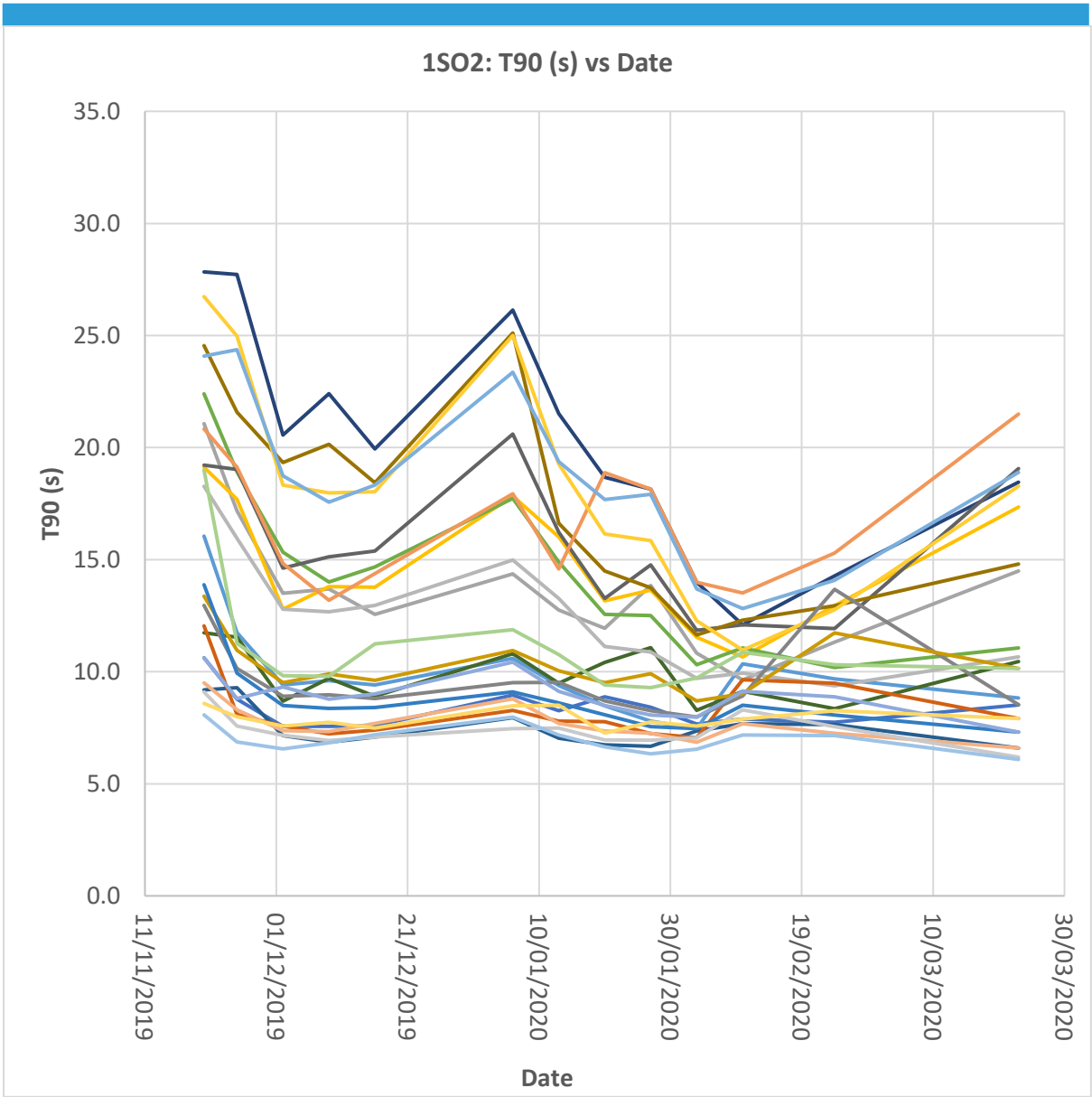


Figure 13. Long Term T90 response when sensors are stored continuously at -20°C. Tested in ambient conditions

Overload

Toxic gas sensors will be linear up to the maximum overload concentration and can operate for ten minutes without drifting by more than ±2% from the five-minute signal. The data in Figure 14 shows a typical overload response curve for the 1SO2.

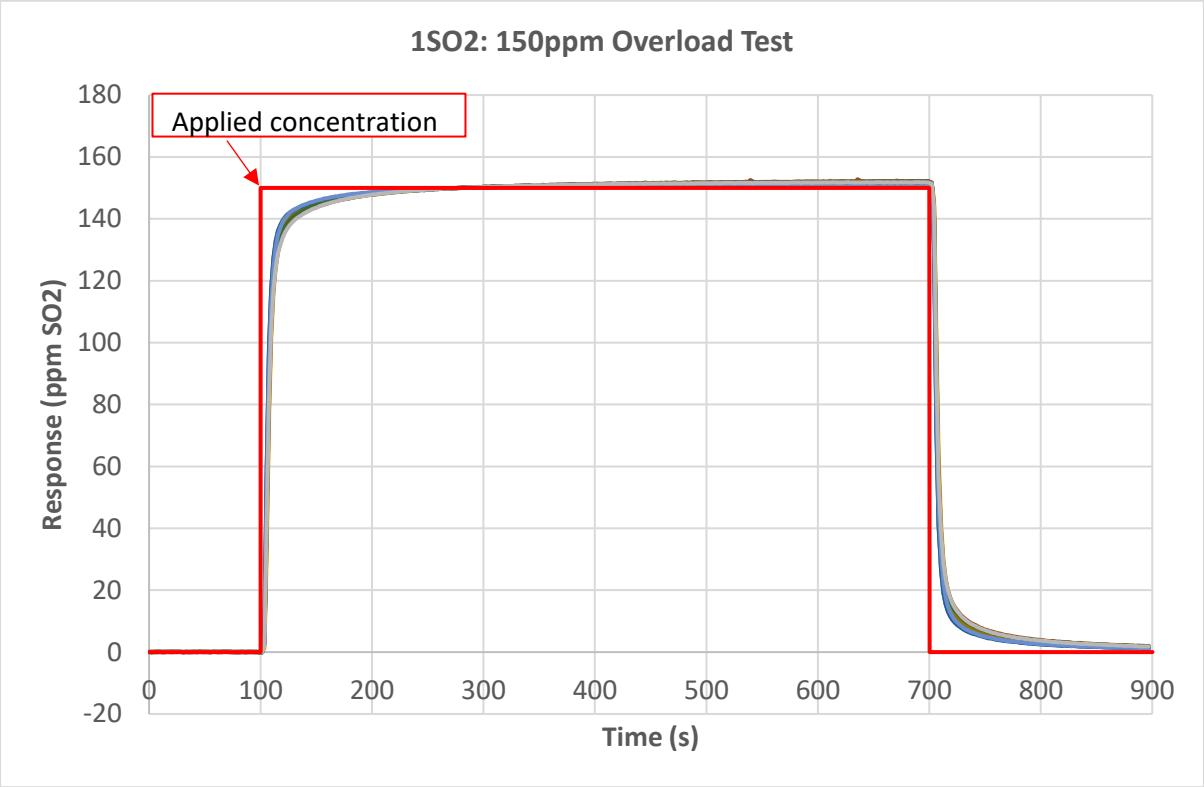


Figure 14. 1SO2 overload

Humidity Transient Behaviour

The data reflect the typical transient responses from a production batch

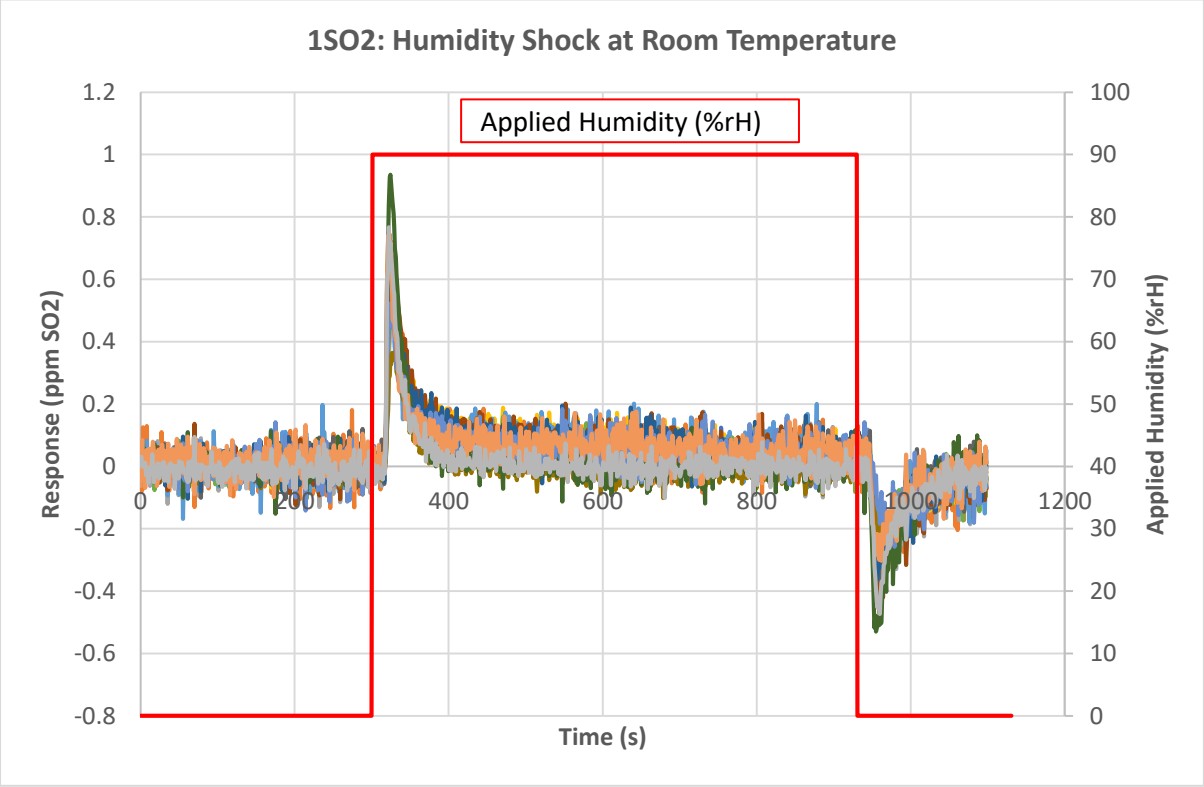
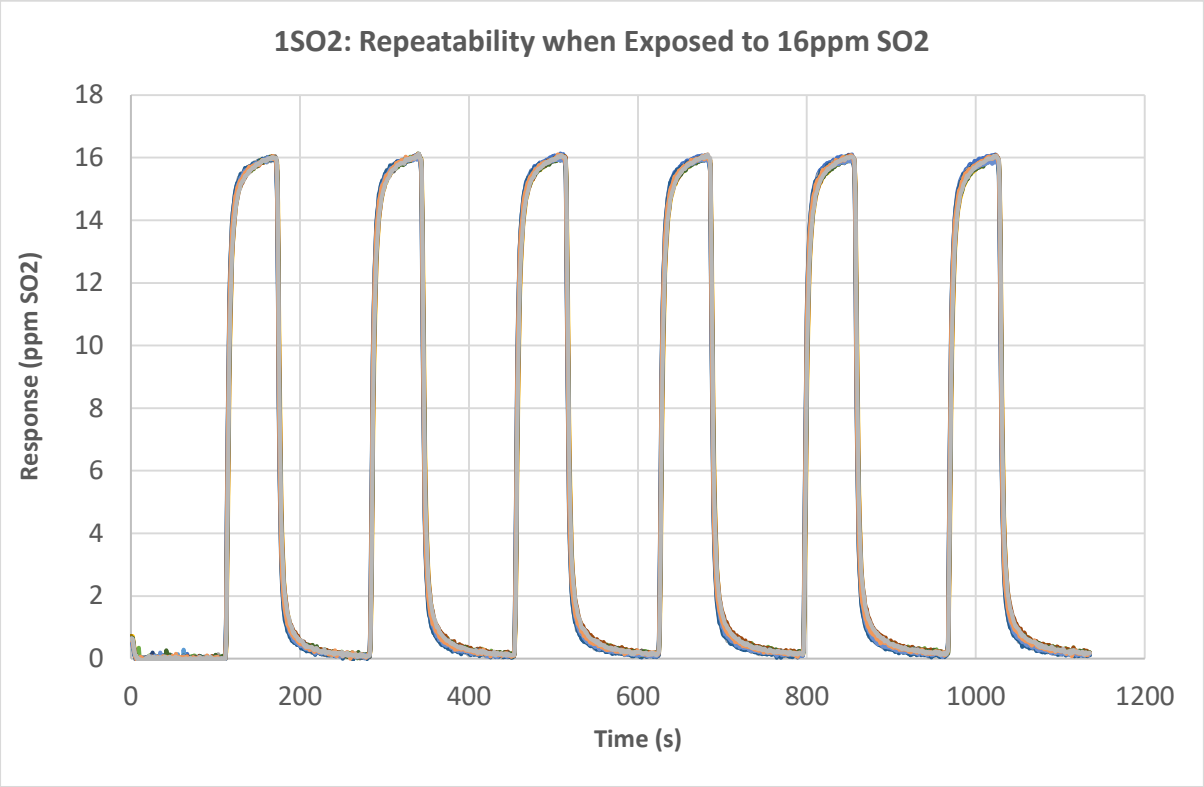


Figure 15. Effect of Humidity shock of 1SO2. (Reading ppm SO2 & humidity vs time (seconds))

Repeatability

The data in Figure 16 shows the performance of the 1SO2 sensor when exposed repeatedly to SO2. The presented results reflect the performance of a typical production batch.



	1st application	2nd	3rd	4th	5th	6th
Mean response (ppm)	15.98	16.05	16.02	16.02	15.99	15.93
St Dev (ppm)	0.02	0.04	0.05	0.05	0.06	0.07

Figure 16. Repeatability of 1SO2 Sensor response to 16 ppm SO_2.

Linearity

The data in Figure 17 shows the typical linearity performance of the 1SO2 when subjected to differing sulphur dioxide concentrations across the detection range. The presented results reflect the performance of a typical production batch. Across typical measurement ranges for industrial safety, the sensor can be considered linear.

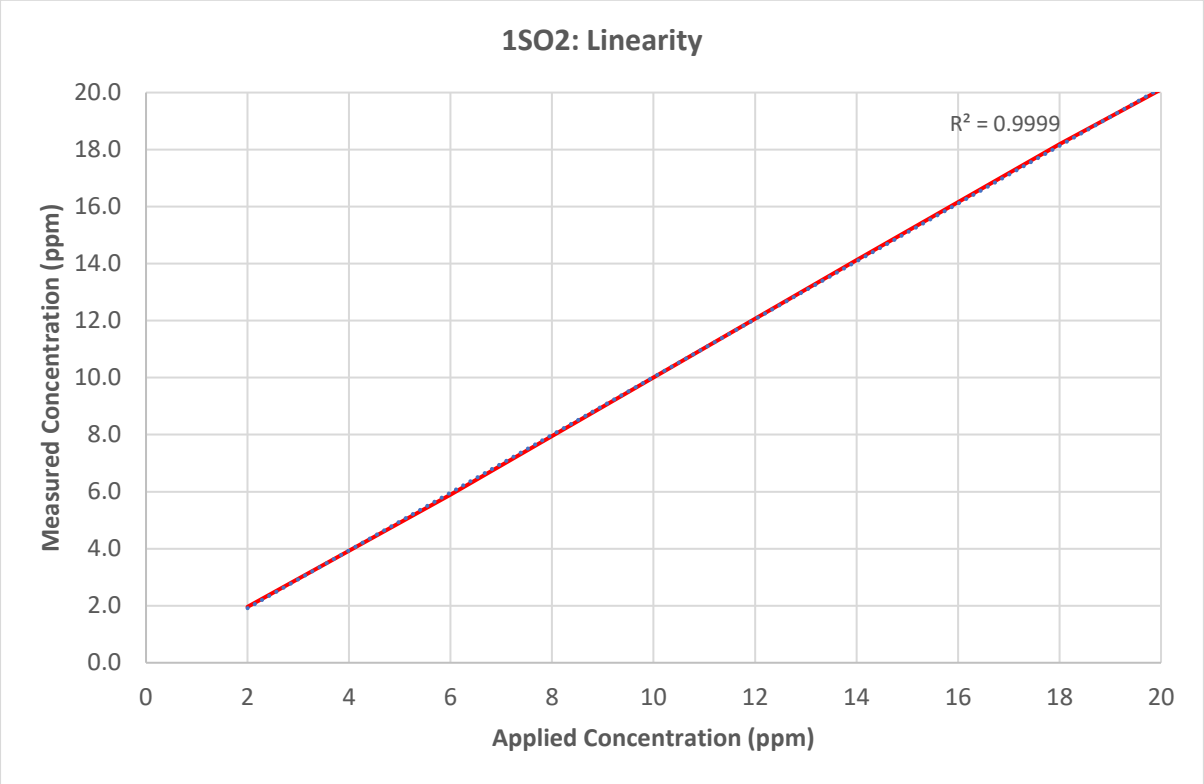


Figure 17. Linearity.

Cross Sensitivity Data

IMPORTANT NOTE The cross-sensitivity data shown below does not form part of the product specification and is supplied for guidance only. Values quoted are based on tests conducted on a small number of sensors and any batch may show significant variation. For the most accurate measurements, an instrument should be calibrated using the gas under investigation.

Whilst 1Series are designed to be specific to the gas they are intended to measure, they will still respond to some degree to various other gases. The table below is not exclusive and other gases not included in the table may still cause a sensor to react.

Gas	Applied	Response (ppm)	Cross-sensitivity (%)
Carbon Dioxide	5%V/V	-0.07	0
Carbon Monoxide	1000ppm	1	0.1
Hydrogen	100ppm	0.15	0.2
Methane	5%V/V	0.1	0
Nitrogen Dioxide	10ppm	-12.6	-126
Nitric Oxide	25ppm	1.5	6

Counter polarisation

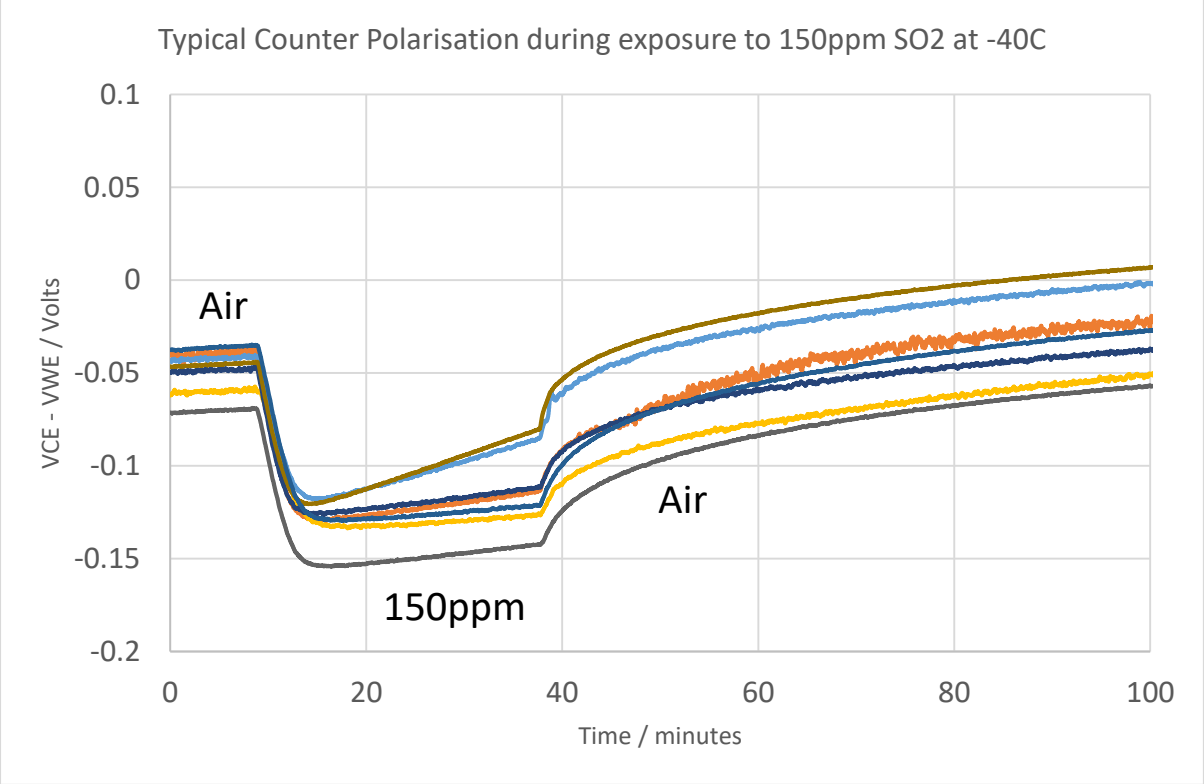


Figure 18. Counter polarisation