Product Characterisation Note

1series: H_2S Sensor

Contents

Document Purpose

The purpose of this document is to provide indicative, technical performance data for the 1H2S 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 are 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 1H2S Product Datasheet, Operating Principles (OP08) and the Product Safety Datasheet (PSDS 5).

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The Gas Response Curve

The data in Figure 1 shows a typical response curve for the 1H2S.

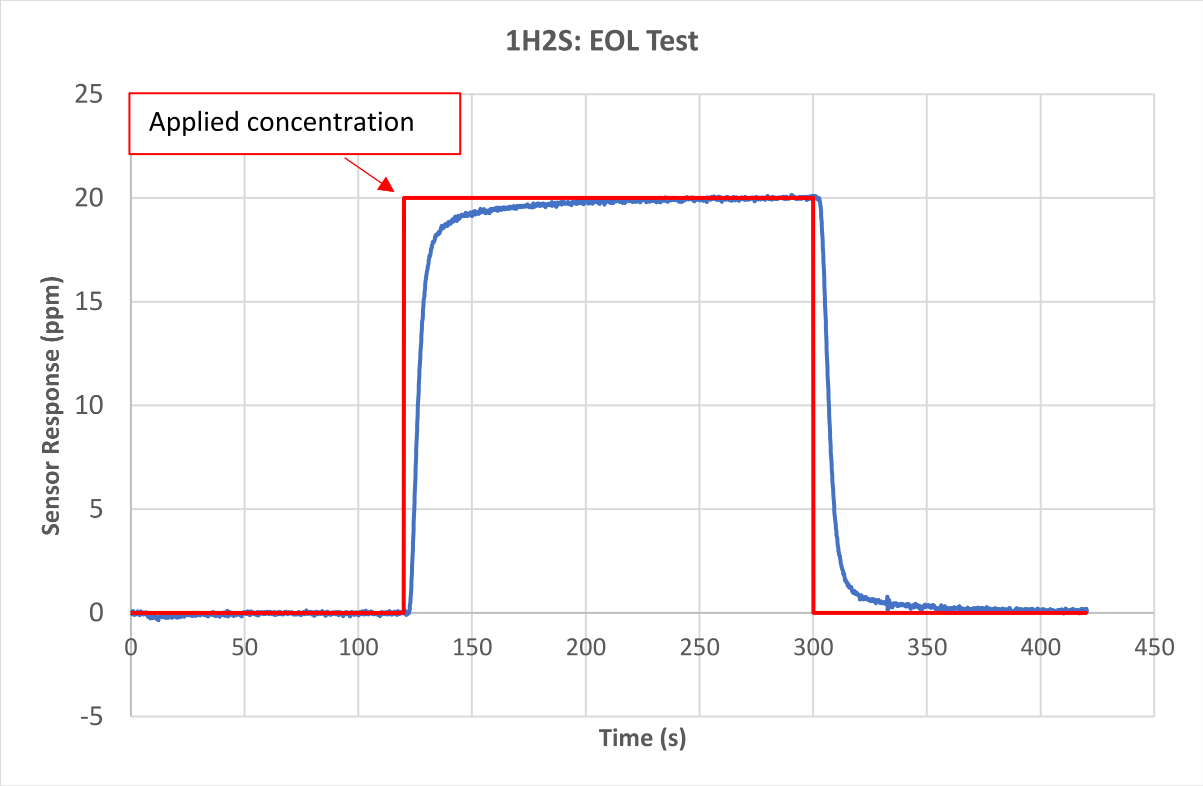
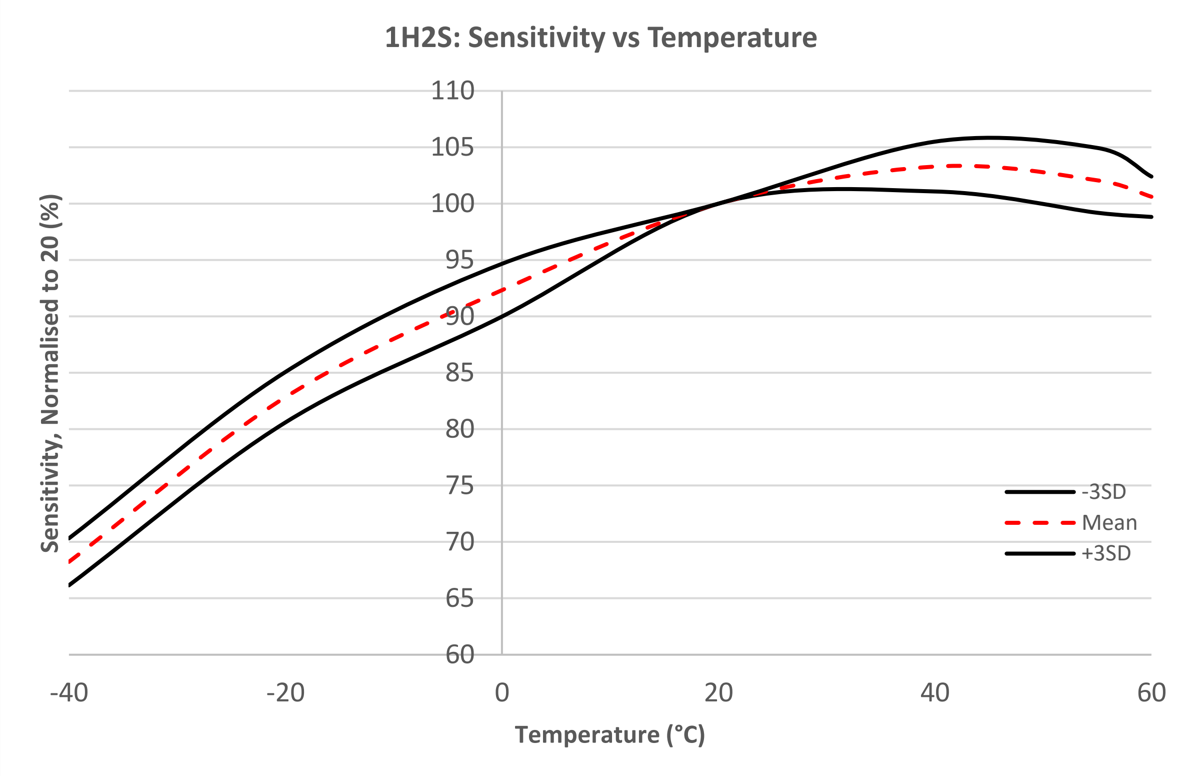


Figure 1. Gas Response Curve

Variation of Sensitivity with Temperature

The output of the 1H2S 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.

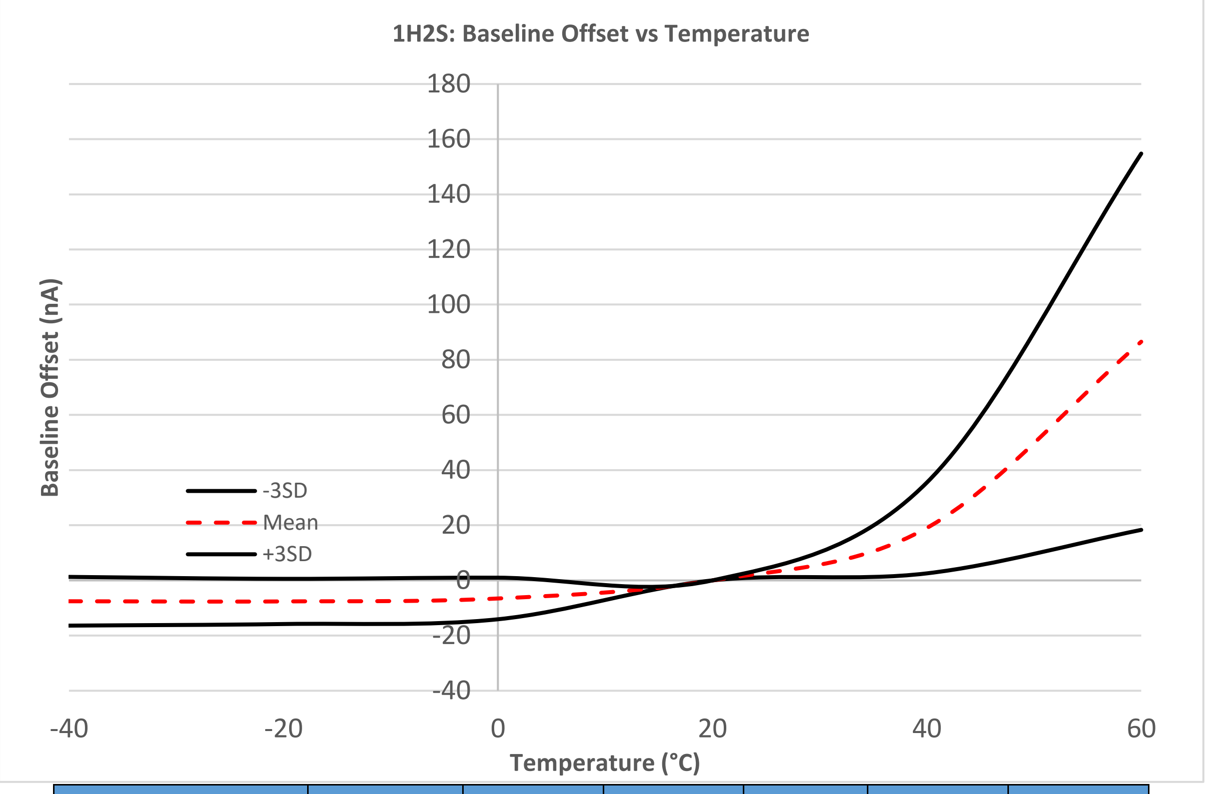


Temperature (°C)	-40	-20	0	20	40	55	60
Average (%)	68.23	82.83	92.32	100	103.28	102.06	100.61
-3SD	70.32	85.07	94.66	100	105.49	104.94	102.40
+3SD	66.15	80.60	89.98	100	101.08	99.19	98.82

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 1H2S will vary as a function of the ambient temperature. The data below shows typical 1H2S 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	-7.55	-7.61	-6.55	0	19.01	86.55
-3SD	1.27	0.57	0.98	0	35.46	154.78
+3SD	-16.39	-15.80	-14.09	0	2.56	18.33

Figure 3. Variation of Baseline Offset with Temperature

Variation of T90 Response Time with Temperature

The response time of the 1H2S 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 1H2S across the operating temperature range. Data is representative of a typical production batch.

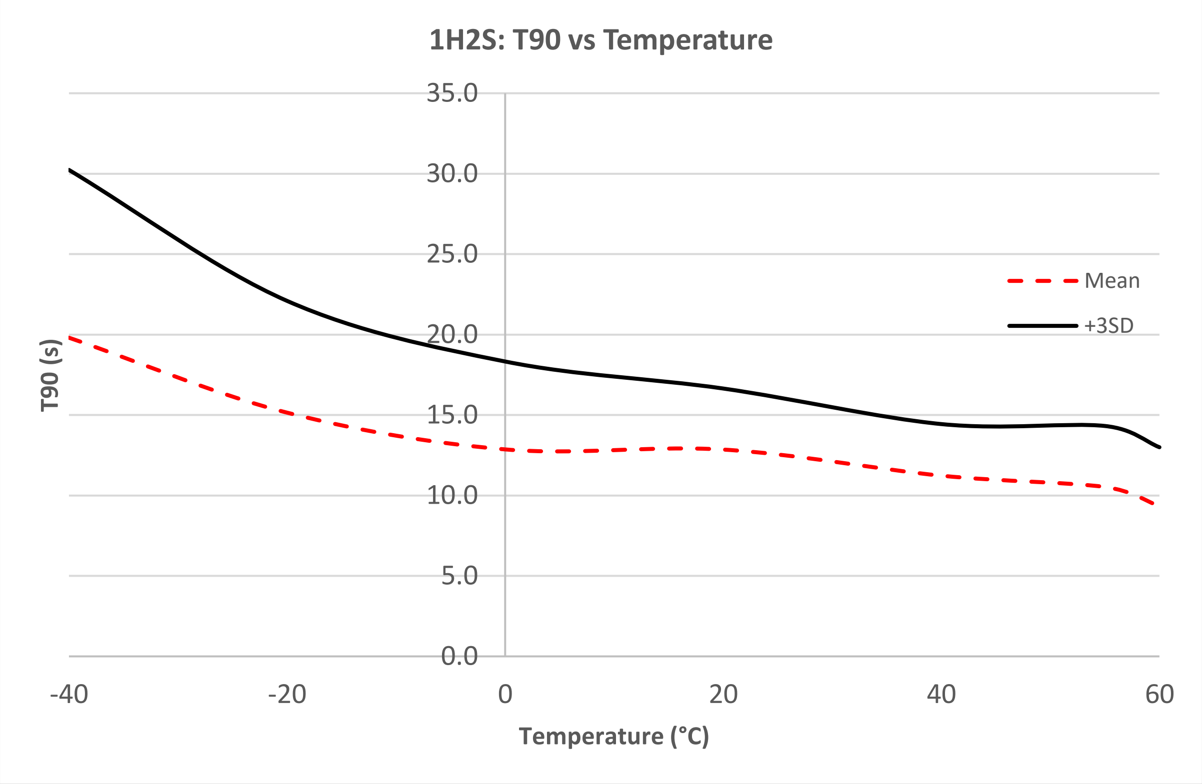


Figure 4. Variation of Response Time with Temperature

Long Term data:

Sensitivity

The typical long term sensitivity of the 1H2S 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.

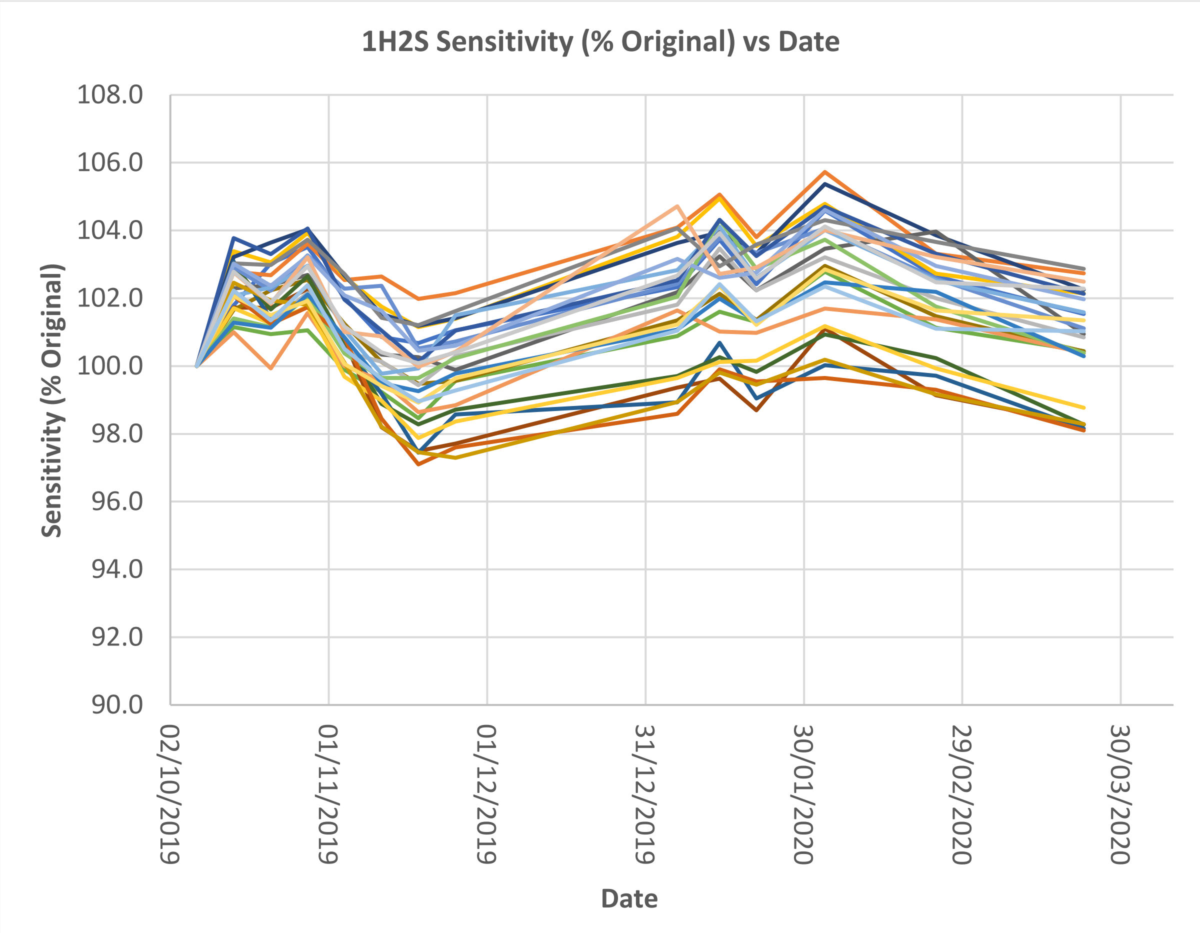


Figure 5. Long Term Sensitivity

Baseline Drift

The typical long term output drift of the 1H2S 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.

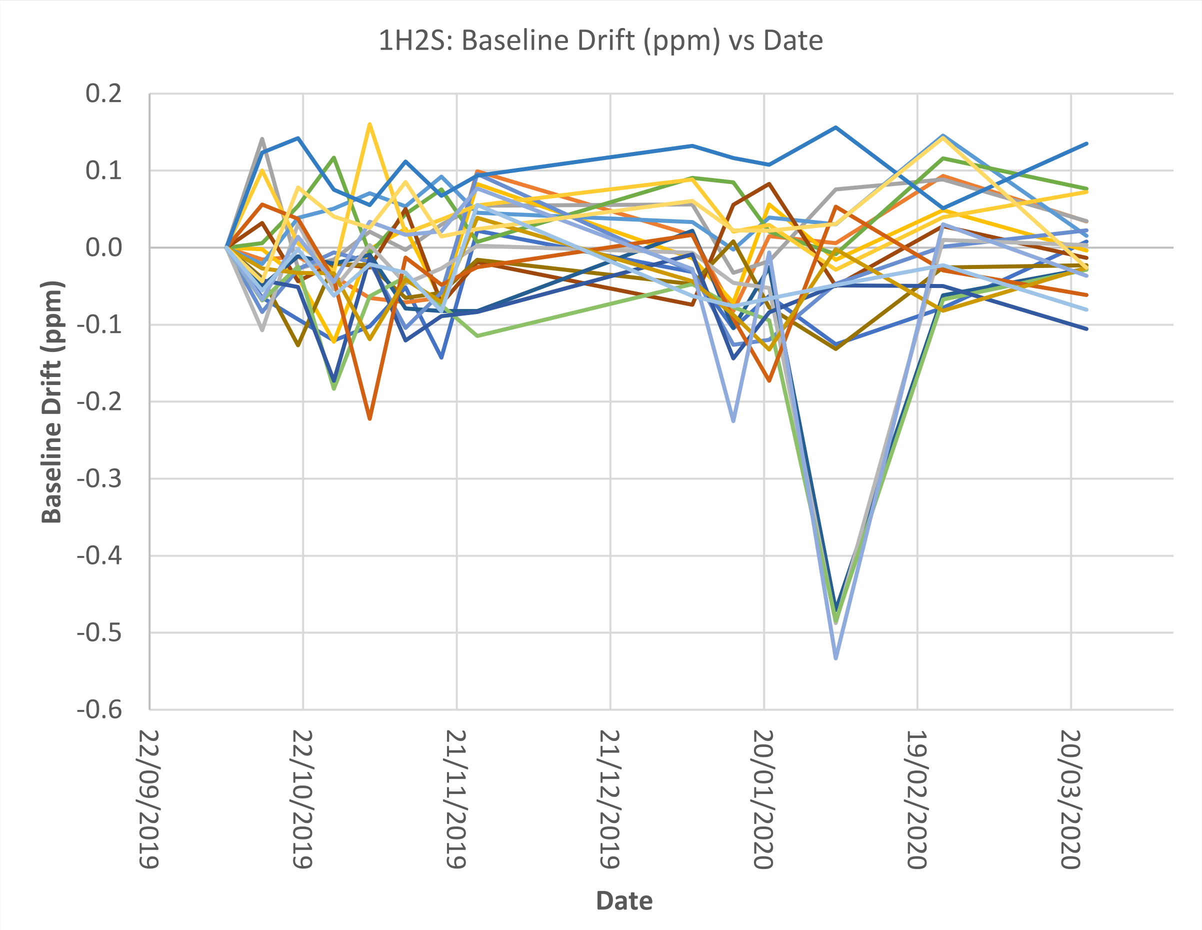


Figure 6. Long Term Baseline Drift

T90 response

The typical long term T90 response of the 1H2S 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.

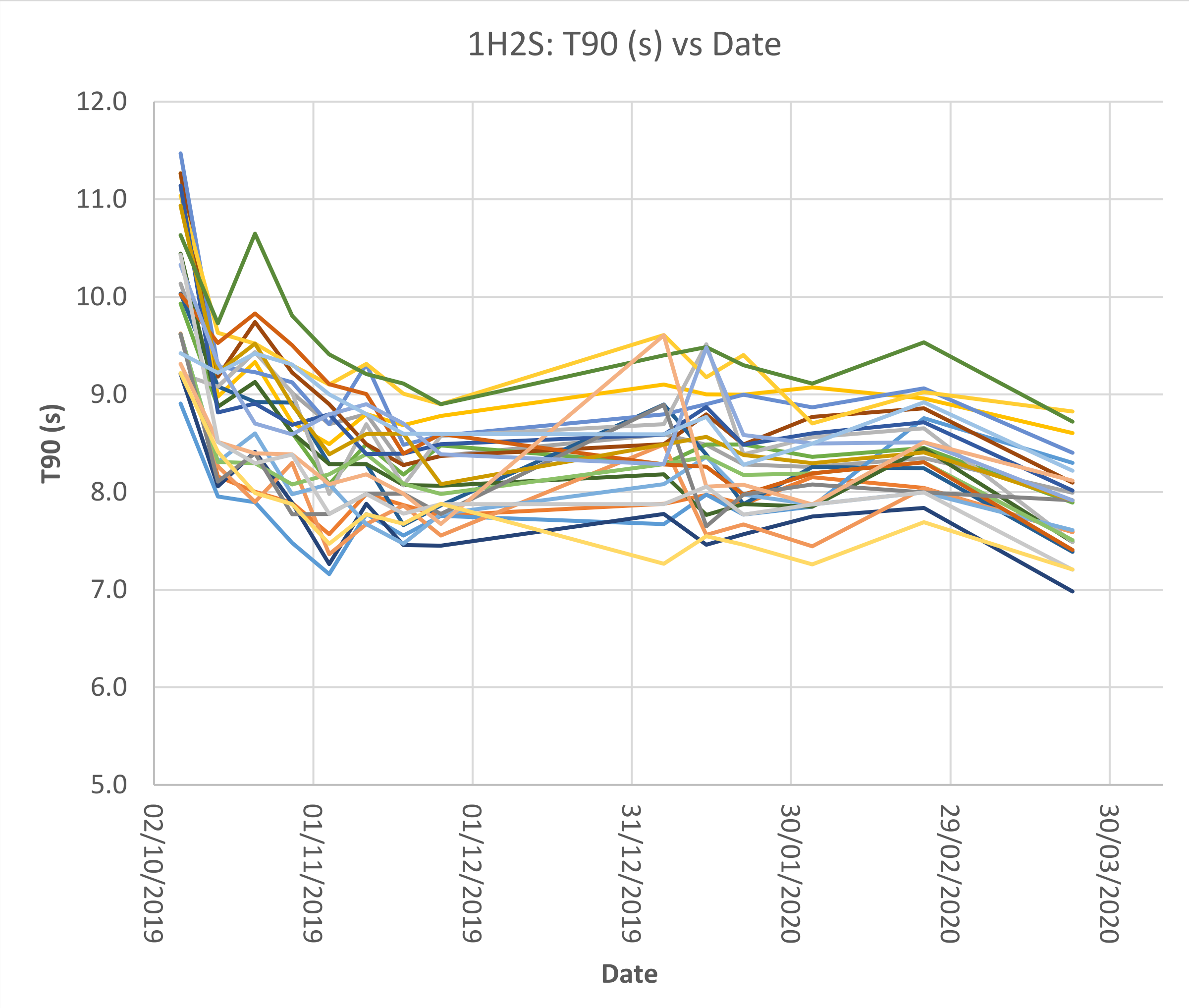


Figure 7. Long Term T90 response

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 1H2S 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:

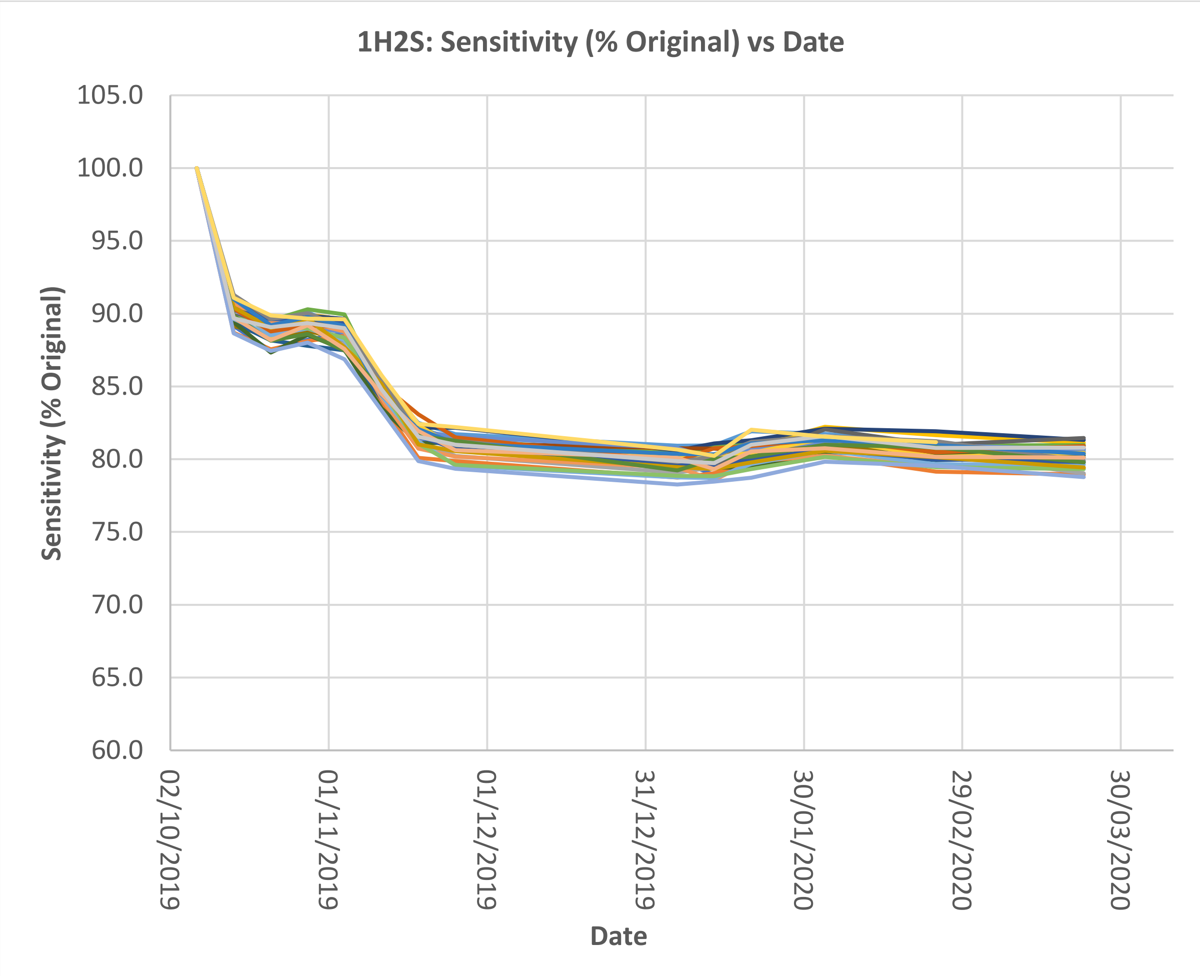


Figure 8. Variation in the sensitivity of 1H2S sensors stored at 60 °C and 5% RH (tested at room temperature)

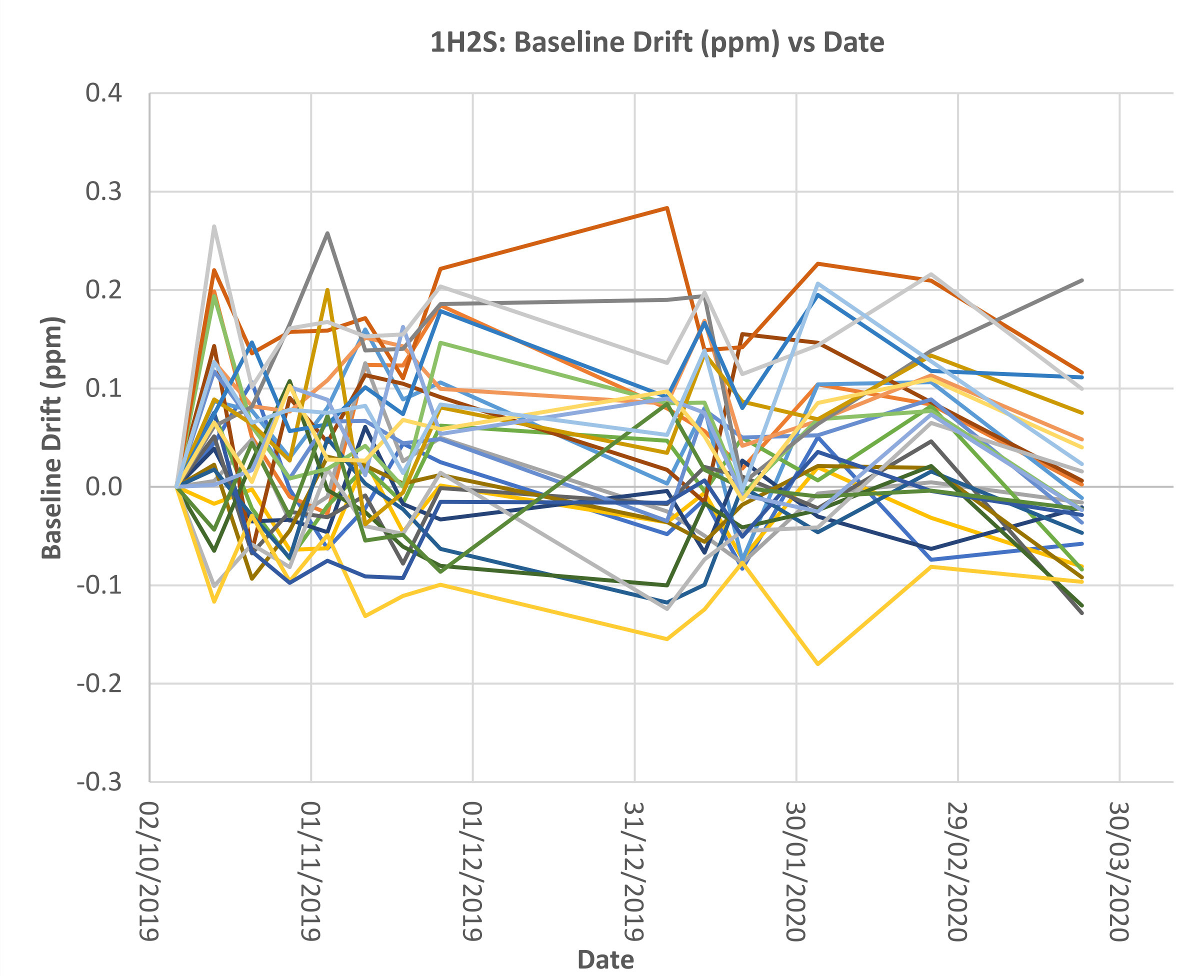


Figure 9. Variation in the baseline drift of 1H2S sensors stored at 60 °C and 5% RH (tested at room temperature)

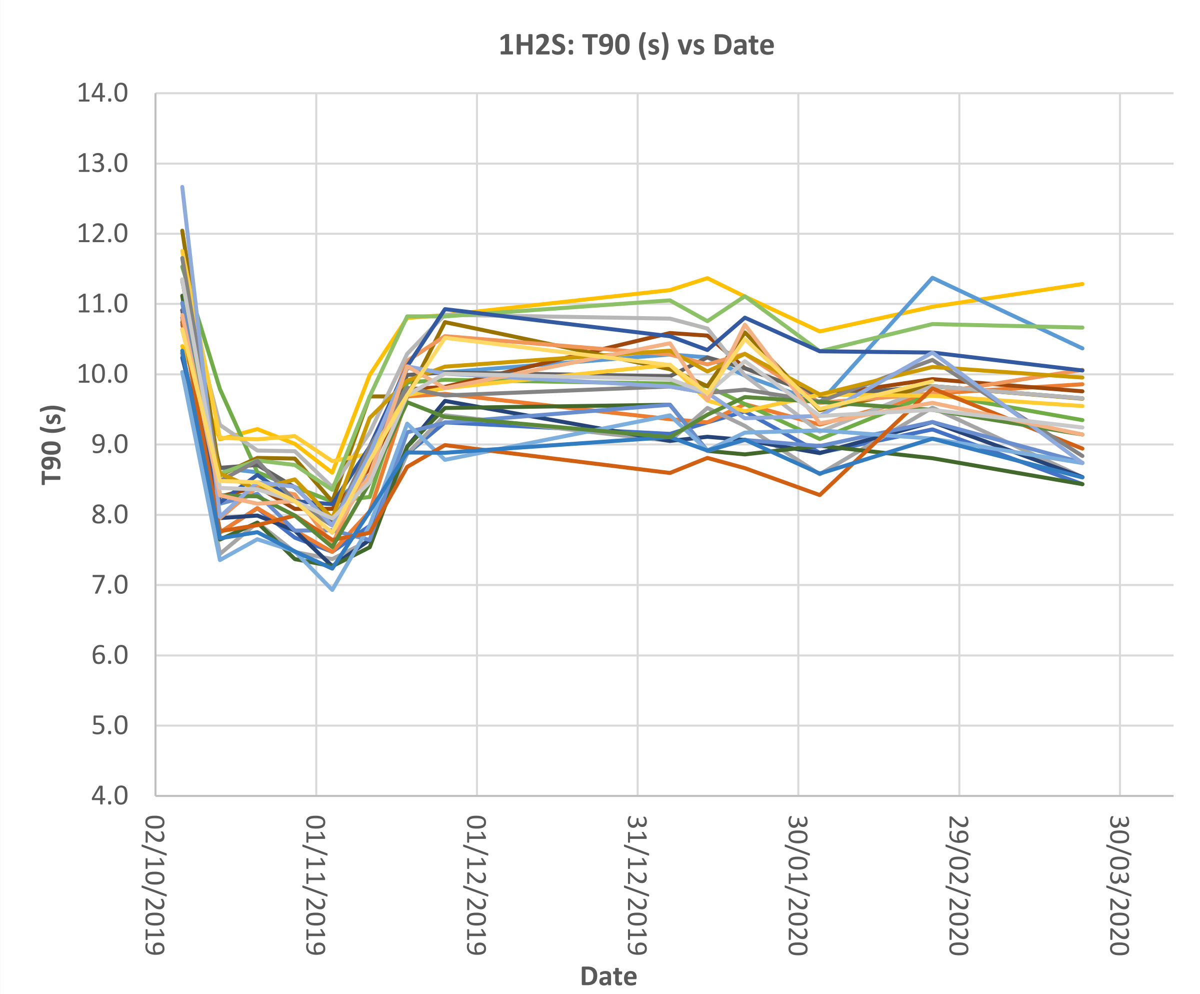


Figure 10. Variation in the T90 response of 1H2S sensors stored at 60 °C and 5% RH (tested at room temperature)

60 °C and 90 %RH:

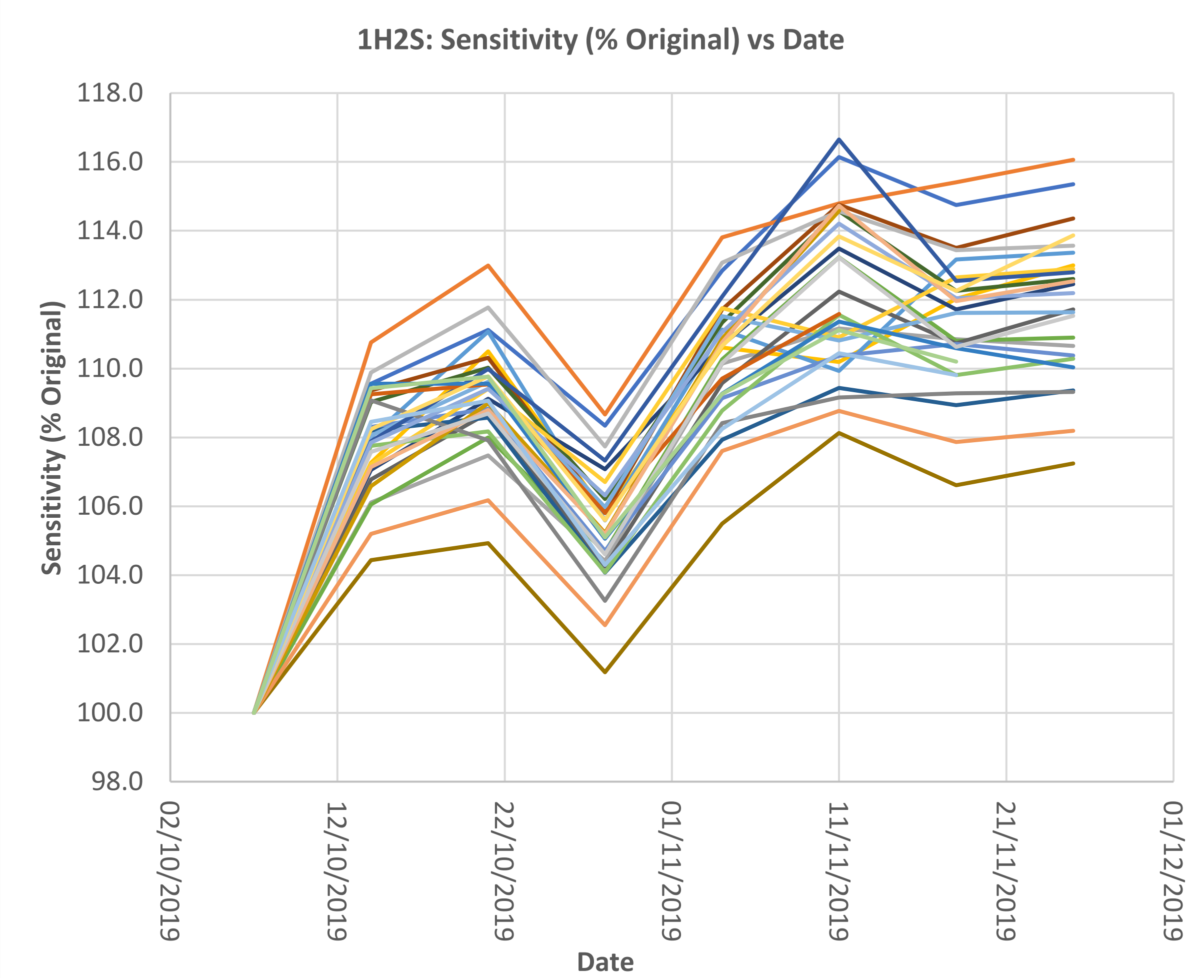


Figure 11. Variation in the sensitivity of 1H2S sensors at 60 °C and 90 %RH (tested at room temperature)

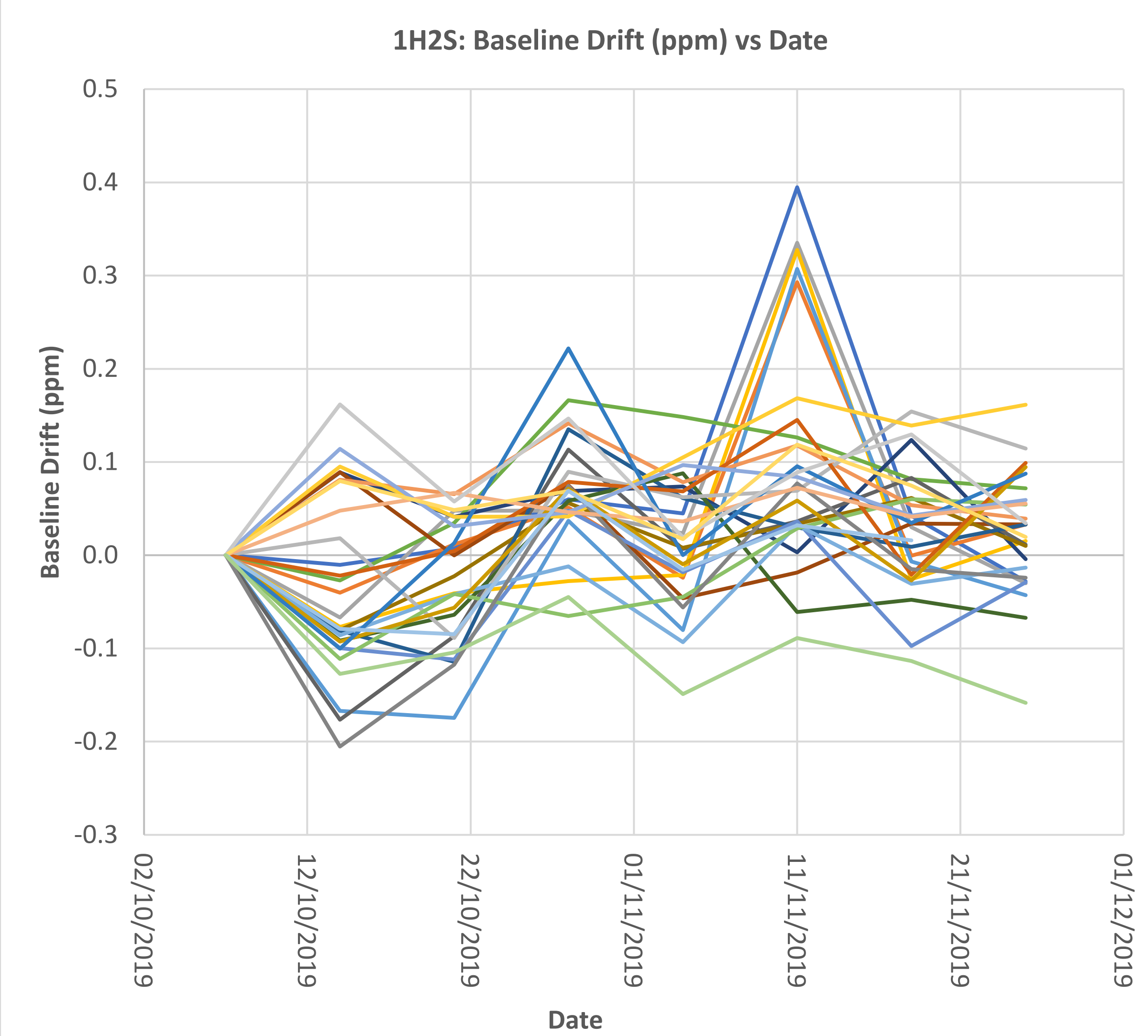


Figure 12. Variation in the baseline drift of 1H2S sensors at 60 °C and 90 %RH (tested at room temperature)

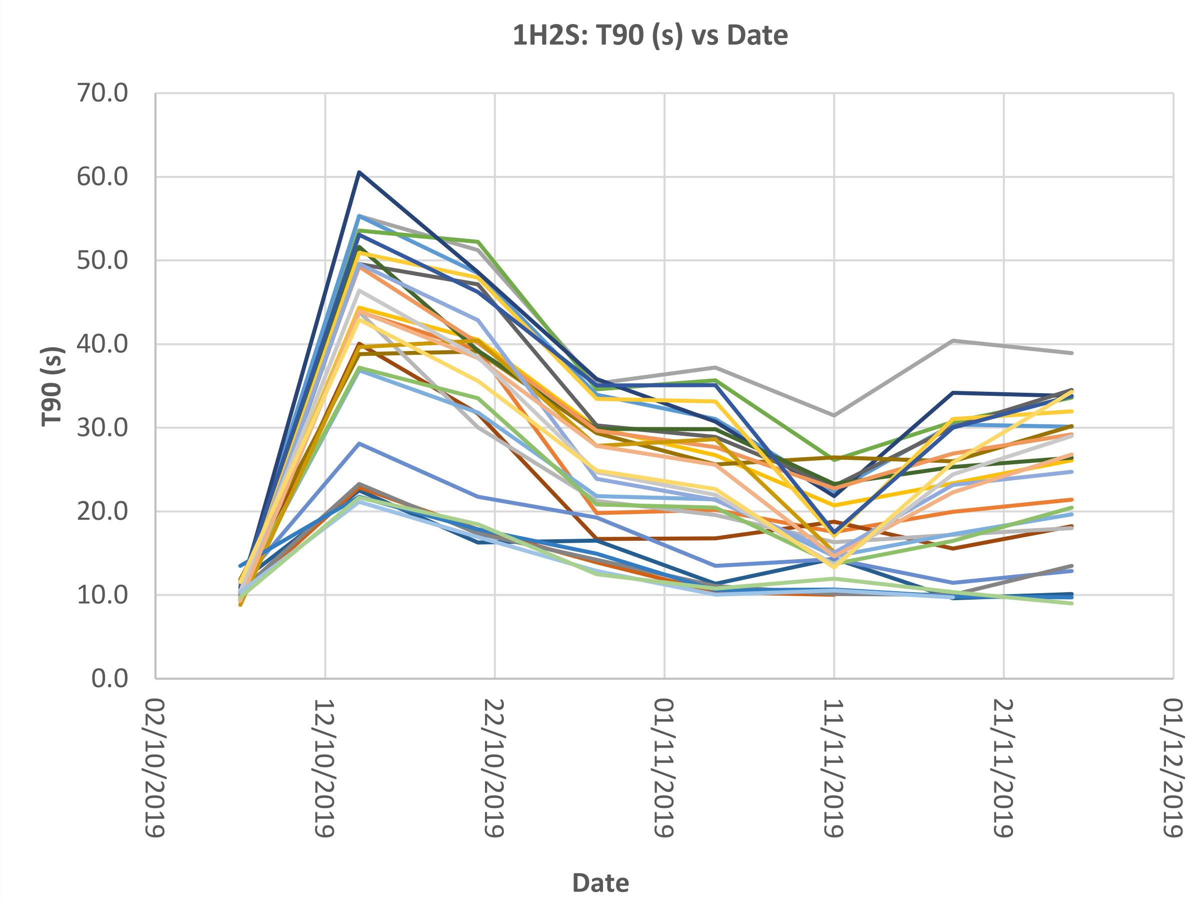


Figure 13. Variation in the T90 response of 1H2S sensors at 60 °C and 90 %RH (tested at room temperature)

-20 °C:

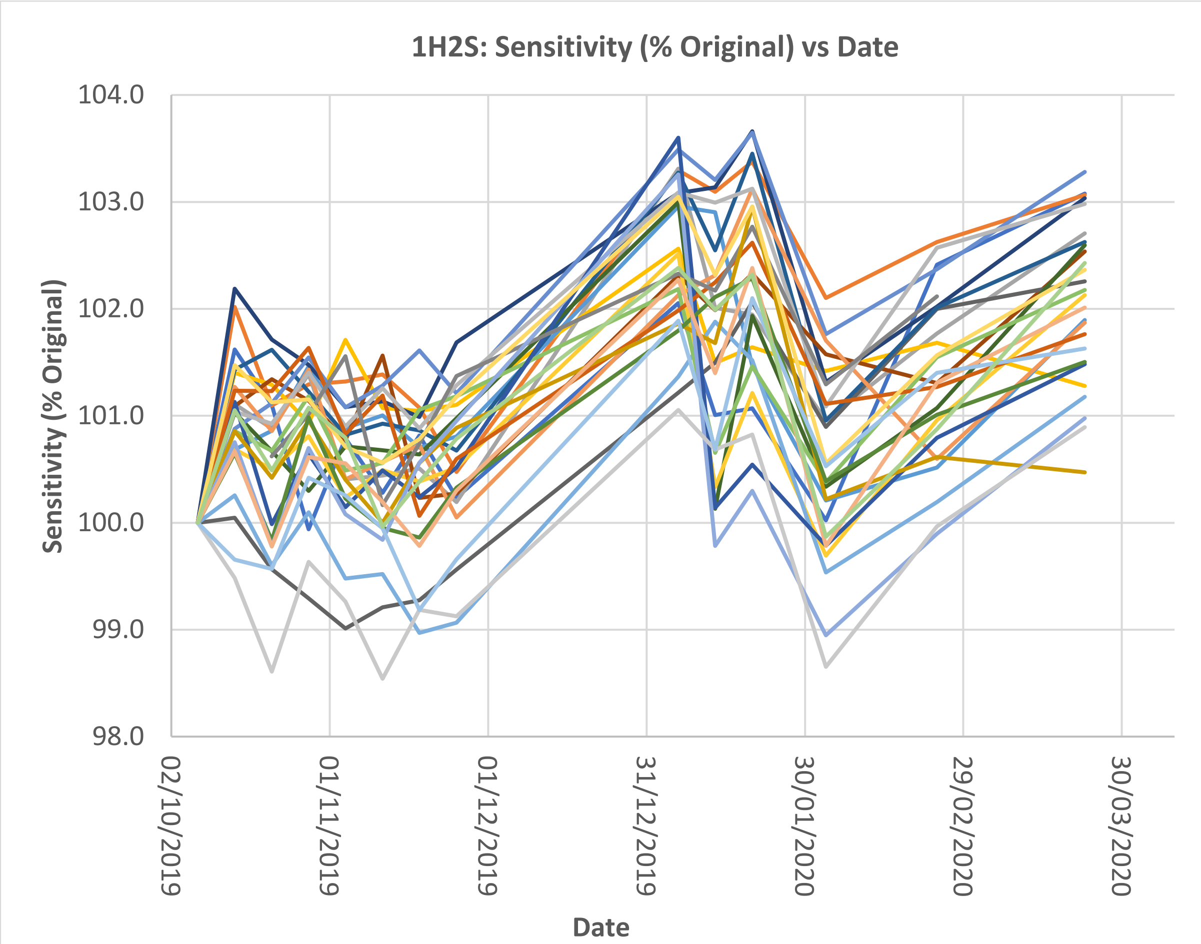


Figure 14. Sensitivity over time when sensors are stored continuously at -20°C. Tested in ambient conditions.

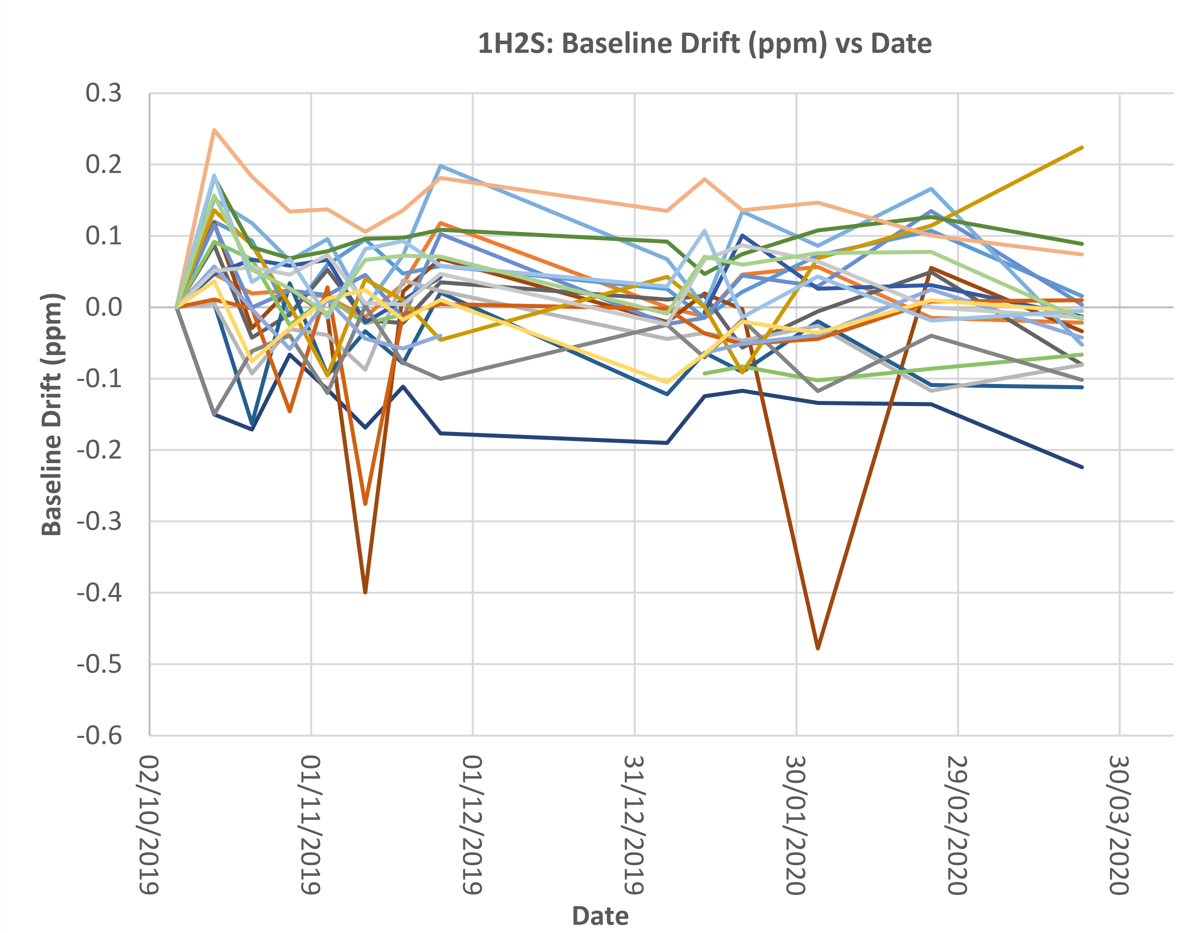


Figure 15. Long Term Baseline Drift when sensors are stored continuously at -20 °C. Tested in ambient conditions.

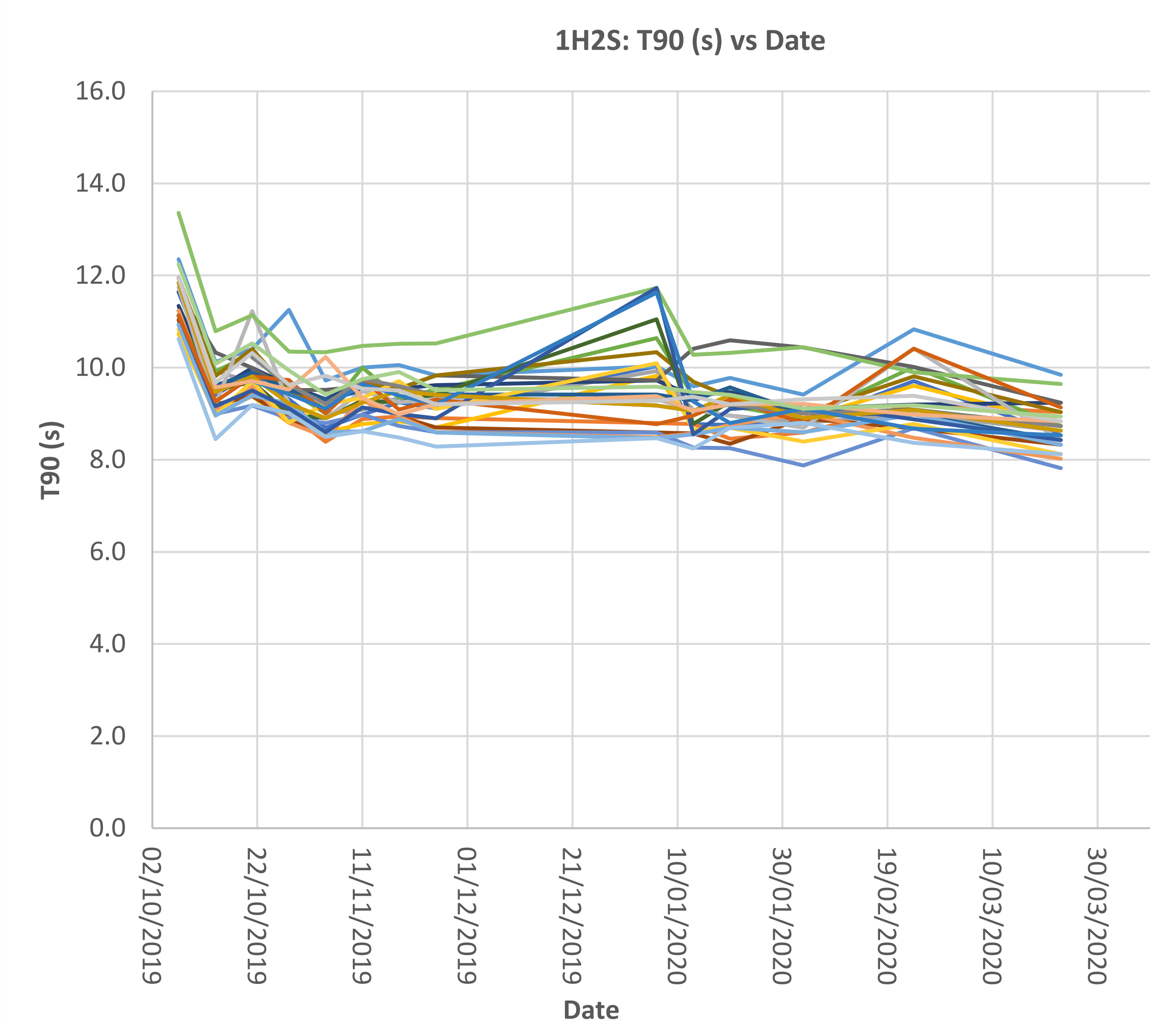


Figure 16. T90 response over time when sensors are stored continuously -20°C. Tested in ambient conditions.

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 17 shows a typical overload response curve for the 1H2S.

Figure 17. 1H2s overload

Humidity Transient Behaviour

The data reflect the typical transient responses from a production batch.

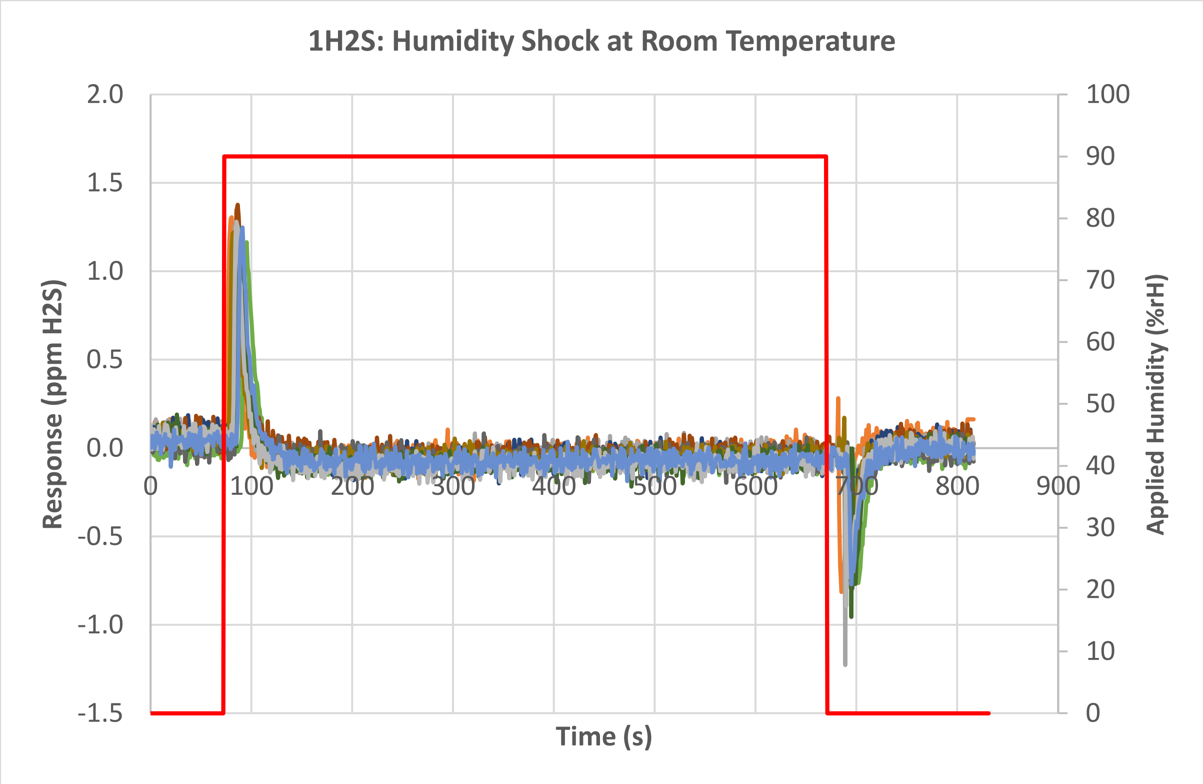
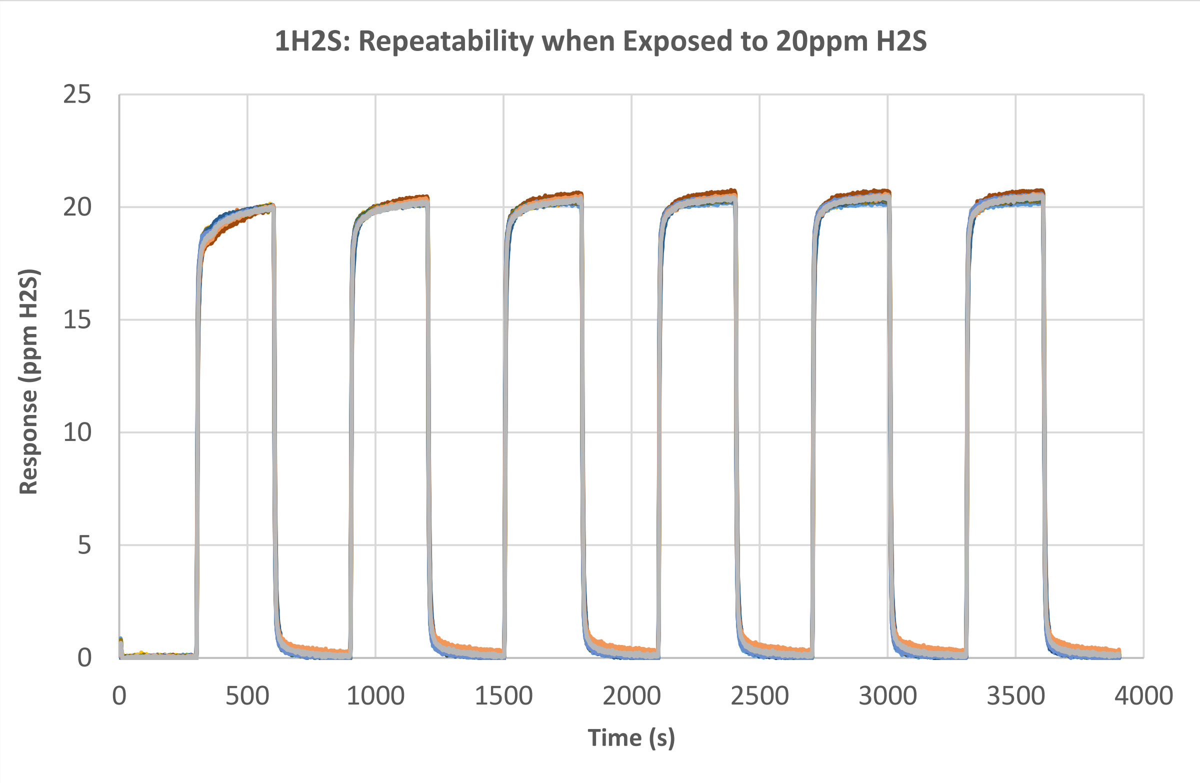


Figure 18. Effect of Humidity shock of 1H2S. (Reading ppm H2S & humidity vs time (seconds))

Repeatability.

The data in Figure 19 and 20 show the performance of the 1H2S sensor when exposed repeatedly to H_2S. The presented results reflect the performance of a typical production batch.



	1st application	2nd	3rd	4th	5th	6th
Mean response (ppm)	20.02	20.27	20.33	20.41	20.44	20.47
St Dev (ppm)	0.04	0.09	0.09	0.12	0.13	0.13

Figure 19. Repeatability of 1H2S Sensor response to 20 ppm H_2S.

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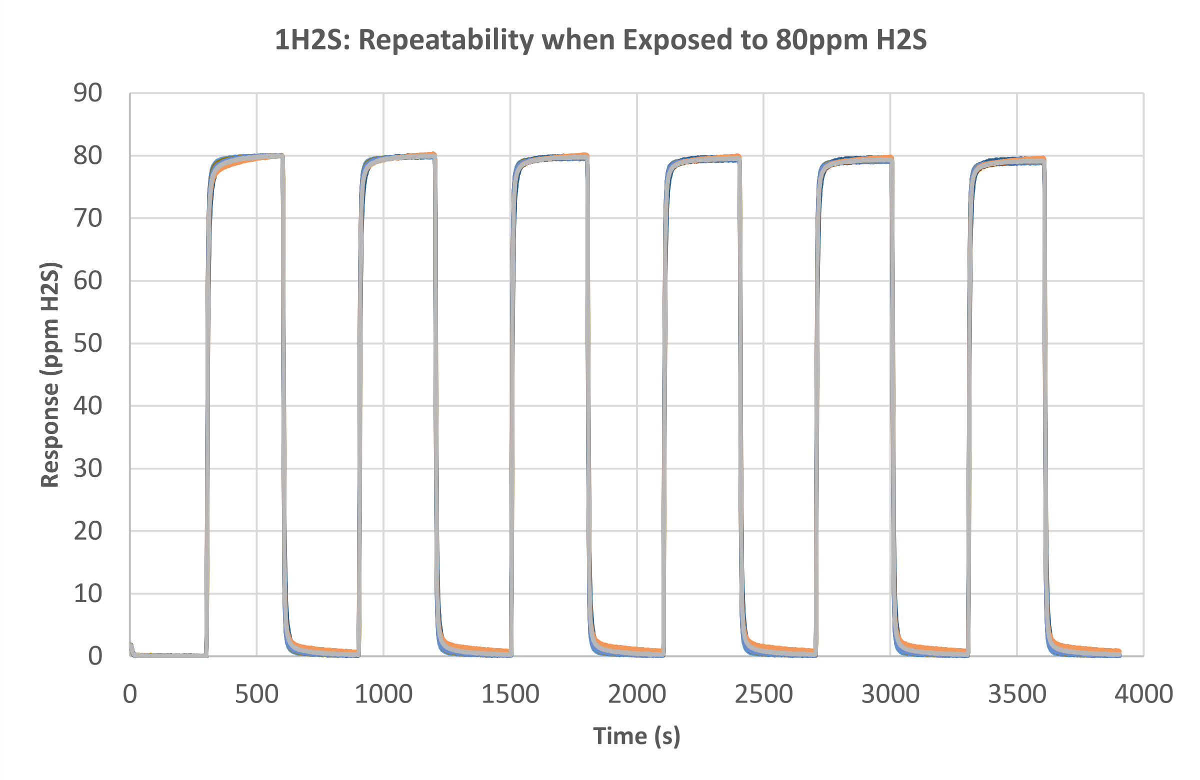

	1st application	2nd	3rd	4th	5th	6th
Mean response (ppm)	79.98	79.89	79.73	79.50	79.31	79.10
St Dev (ppm)	0.03	0.10	0.12	0.17	0.20	0.20

Figure 20. Repeatability of 1H2S Sensor response to 80 ppm H_2S.

Linearity

The data in Figure 21 shows the linearity performance of the 1H2S when subjected to differing H_2S 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 and no additional compensation should be required.

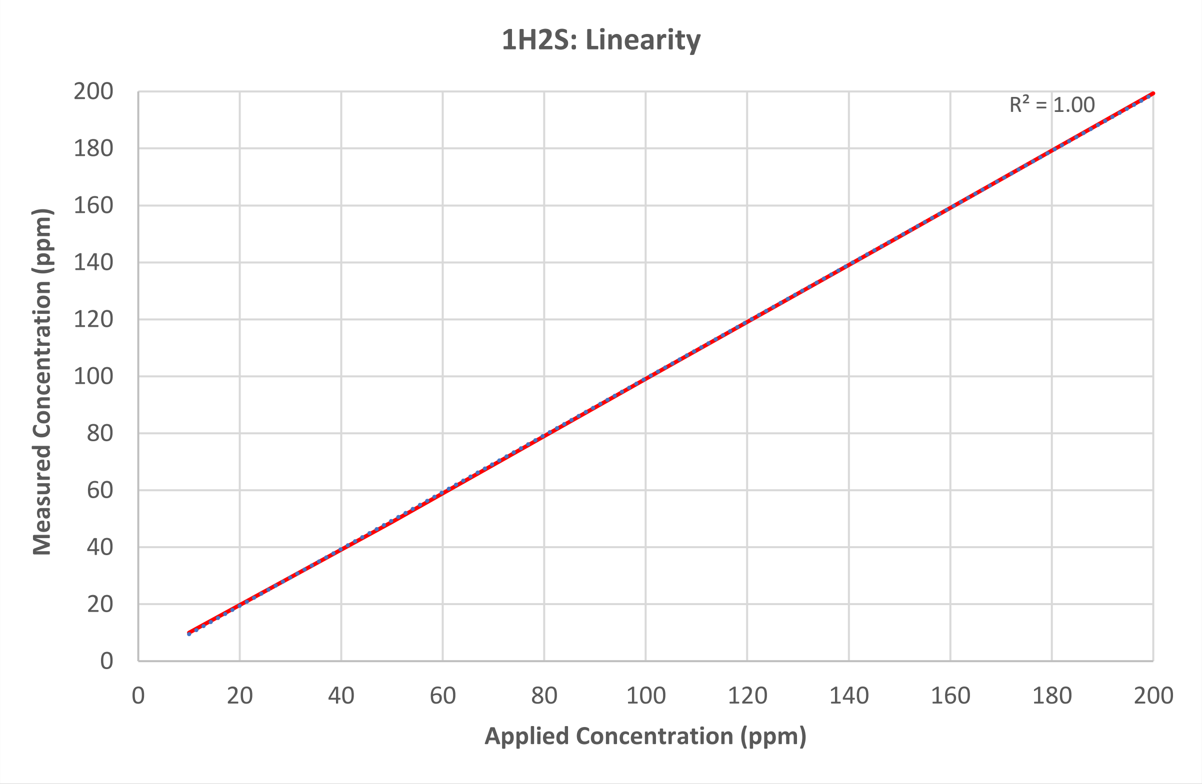

Figure 21. Linearity

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	-0.1	0
Carbon Monoxide	1000ppm	2.5	0.3
Hydrogen	100ppm	0.15	0.1
Methane	5%V/V	0	0
Nitrogen Dioxide	10ppm	-2	-20
Nitric Oxide	25ppm	1.6	6.4

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Counter polarisation

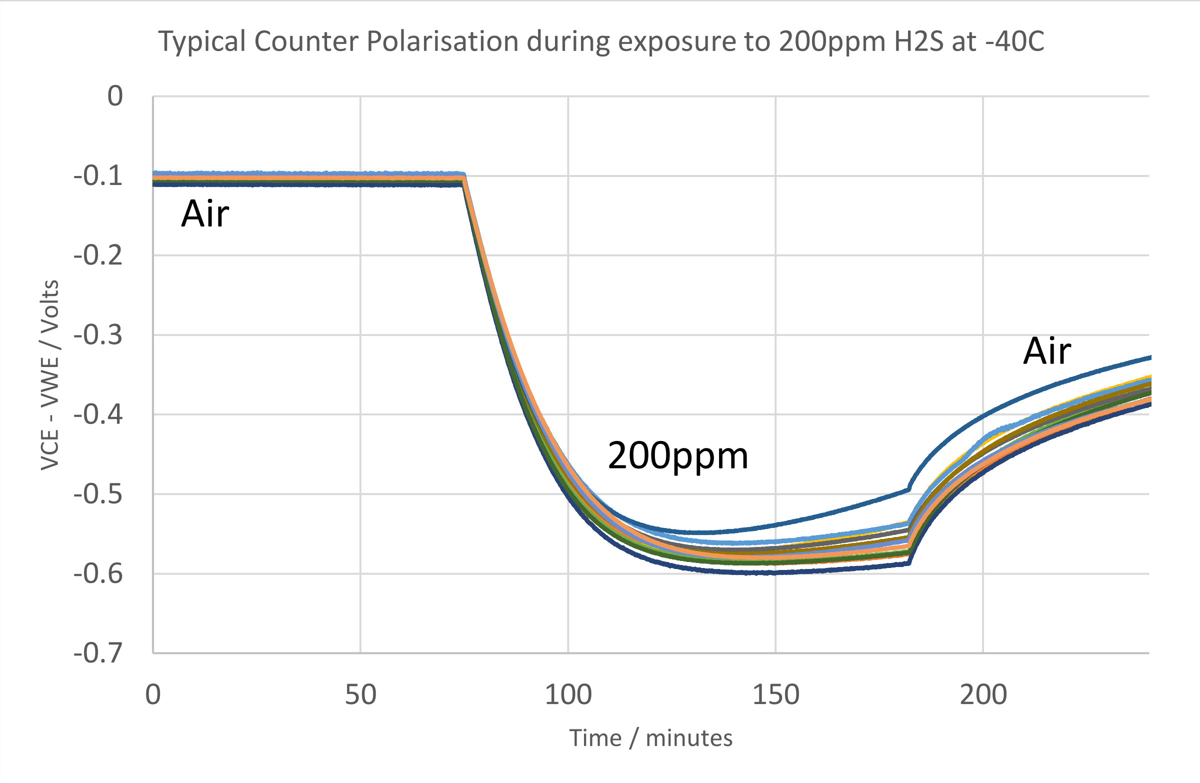

Figure 22. 1H2S Counter polarisation

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