Product Characterisation Note
1LEL75 CiTipeL Sensor

Contents

Document Purpose

The purpose of this document is to provide additional technical performance data for the 1LEL75 range of pellisters to assist and accelerate the integration of the sensor into gas detection instrumentation. The sensor has been subjected to a rigorous characterisation regime as part of the development process. Within this document, detailed information on the results of this regime is presented.

This document and the information contained within does not constitute a specification and the data is provided for informational purposes only. It should be used in conjunction with the Product Datasheet and the appropriate Operating Principles. All data provided was current at the time of release of this document.

All data are based on EN50054 LEL values unless otherwise stated.

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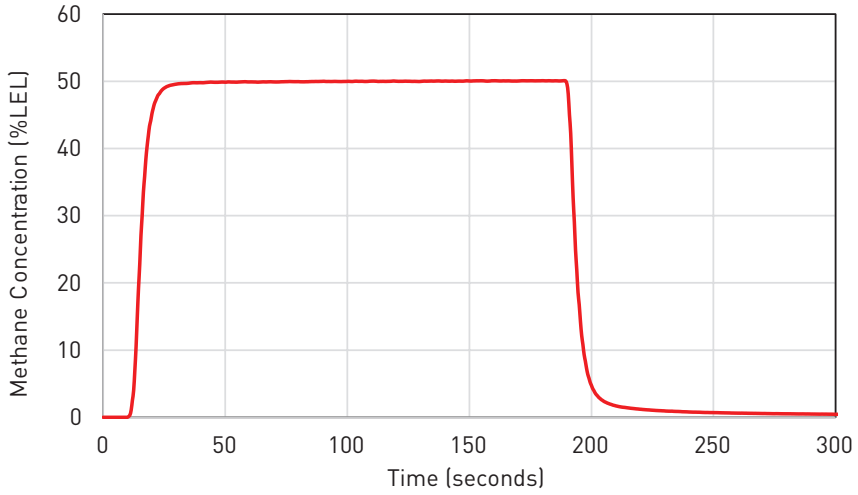
The Gas Response Curve

The data in Figure 1 shows a typical response curve for the 1LEL75, when using 2.5%vol. methane at a flow rate of 1000 ml/min. Response curves will differ when tested with alternate gases.

Test data was taken from current production at the time of release of this document, and reflects the typical performance of a production batch at this time.

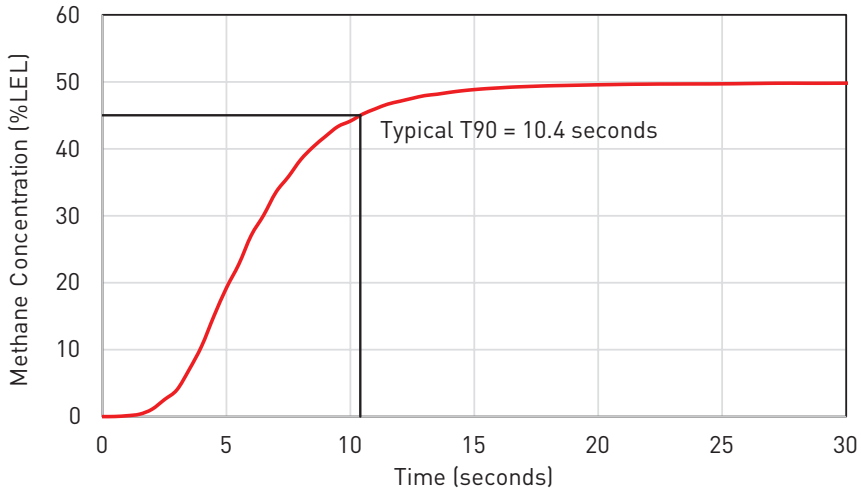
The response times of the 1LEL75C and 1LEL75M will be very similar to the 1LEL75 curve shown in Figure 1.

Figure 1. Typical Gas Response Curve of the 1LEL75 to 2.5%vol Methane



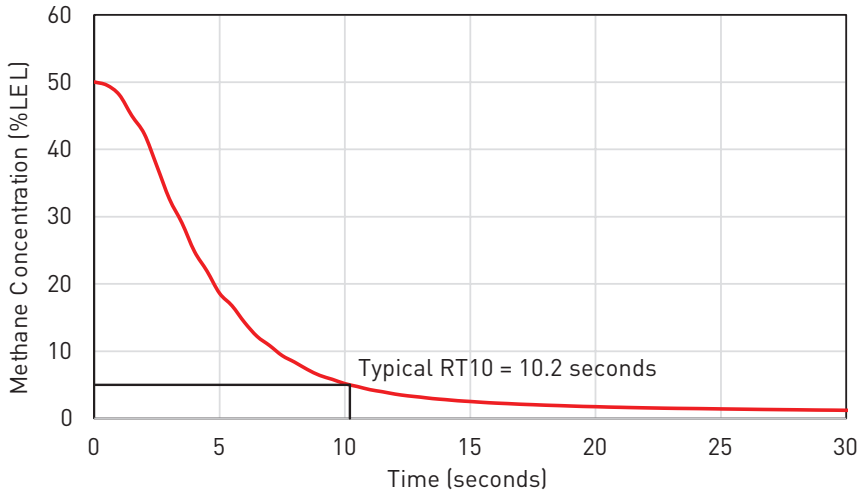
Typical T90 Response to Methane

Figure 2. Typical 1LEL75 Gas Response Curve (Clean Air to 2.5%vol. Methane)



Typical Recovery Performance After Exposure to Methane

Figure 3. Typical 1LEL 75 Gas Recovery Curve (2.5%vol. Methane to Clean Air)



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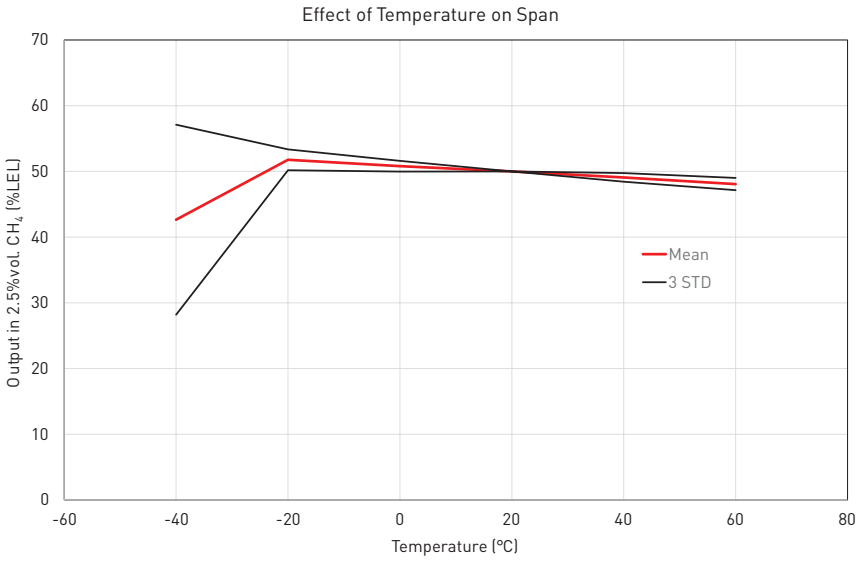
Output Variation with Temperature

The output of the 1LEL75 range of pellisters will vary as a function of ambient temperature. The data in Figure 4 shows the output performance across the operating temperature range and is presented normalised 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.

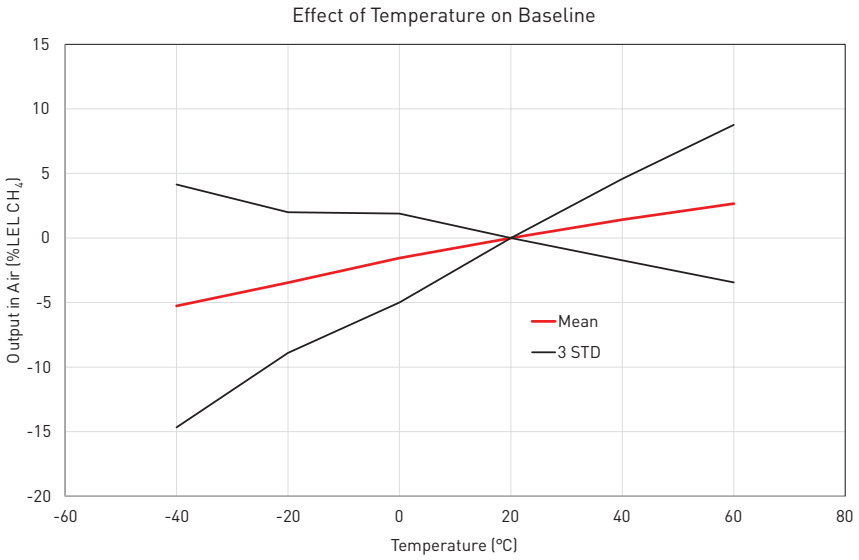
Figure 4. Output Variation with Temperature



Baseline Offset Variation with Temperature

The electrical output in the absence of target gas (baseline offset) of the 1LEL75 range of pellisters will vary as a function of the ambient temperature. The data in Figure 5 shows the baseline offset performance across the operating temperature range. Although the variation is relatively small, City Technology recommends the use of offset correction factors, particularly at higher temperatures, to minimise inaccuracies in the span measurement. The presented results reflect the typical performance of a production batch.

Figure 5. Baseline Offset Variation with Temperature



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Response and Recovery Time Variation with Temperature

The response time of the 1LEL75 range of pellisters will vary as a function of ambient temperature, becoming faster at higher temperatures and responding more slowly at lower temperatures. The data in Figures 6 to 8 show typical T90 response times and RT90 recovery times across the operating temperature range. The presented results reflect the performance of a typical production batch.

Figure 6. Effect of Temperature on T90 Response Time

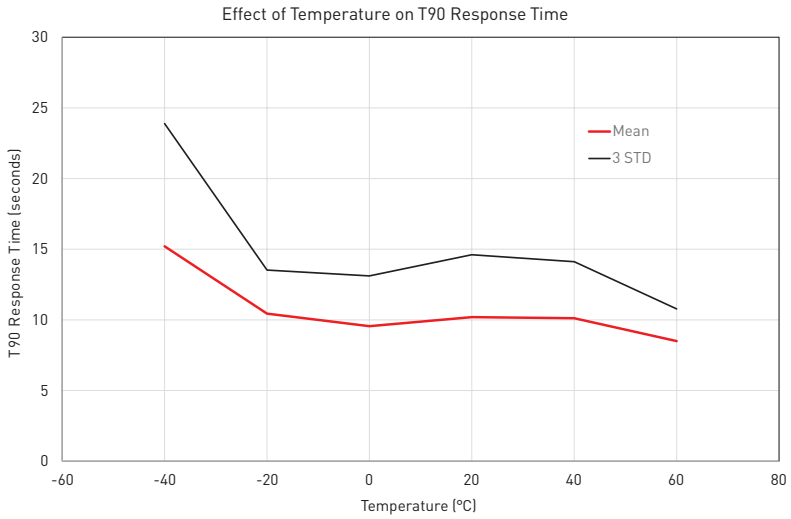


Figure 7. Effect of Temperature on T50 Response Time

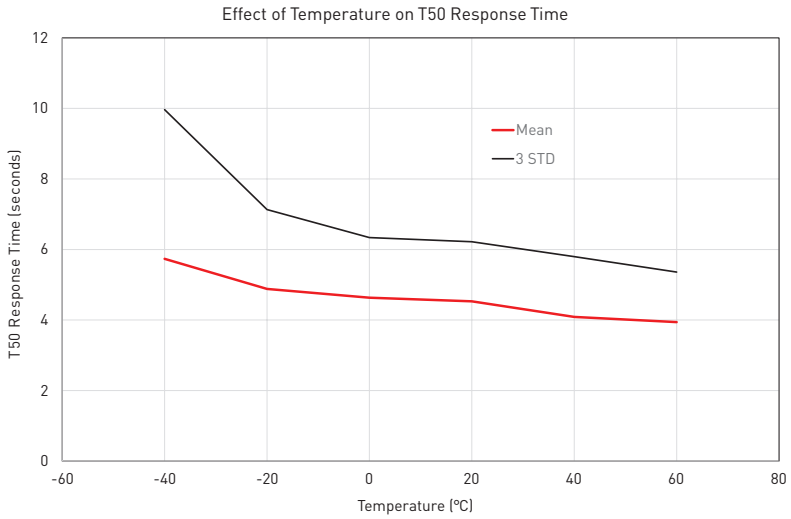
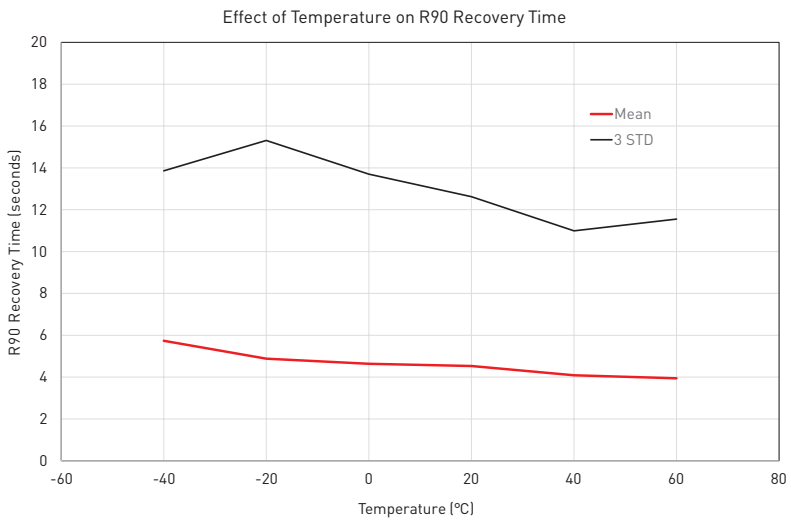


Figure 8. Effect of Temperature on R90 Recovery Time



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Long Term Performance Stability

The data in Figure 9 describes the stability of 1LEL75 range of pellisors over time. The presented results reflect the performance of a typical production batch.

Figure 9. Sensitivity Drift - 2.5%vol Methane

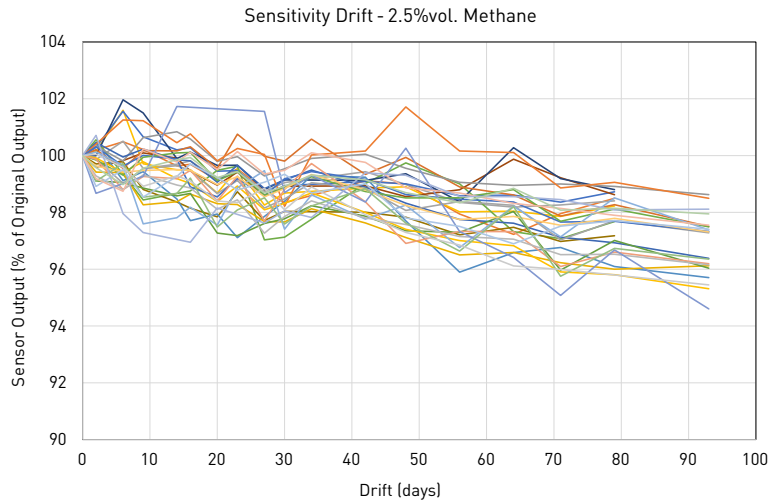


Figure 10. Sensitivity Drift - 0.7%vol Pentane

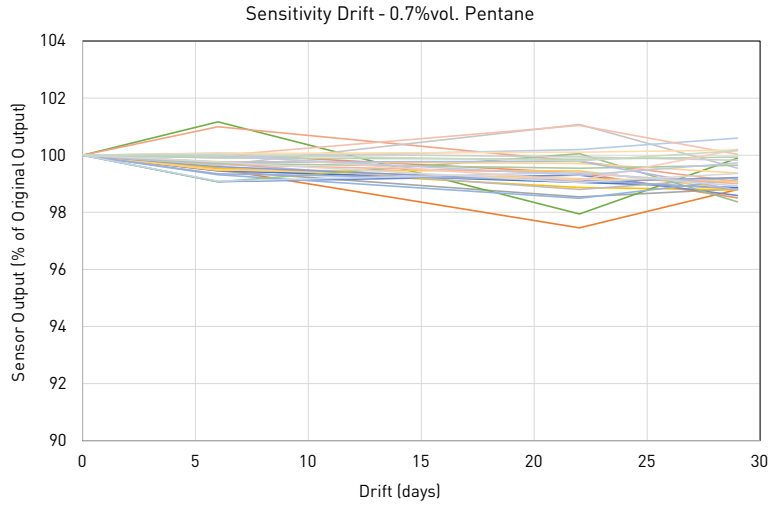
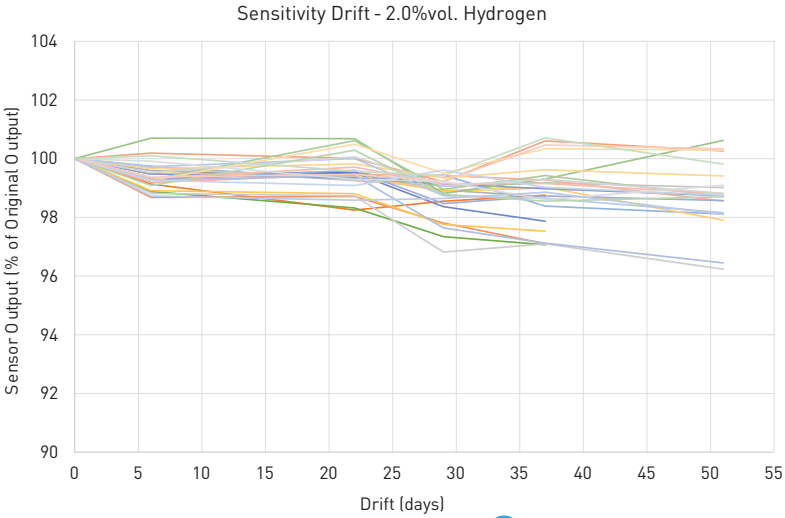


Figure 11. Sensitivity Drift - 2.0%vol Hydrogen



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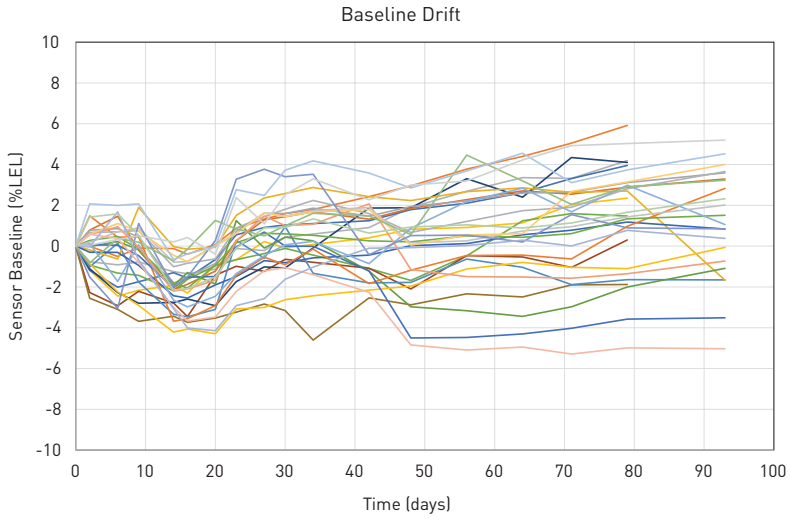
Baseline Drift in Clean Air

Figure 12. Baseline Drift

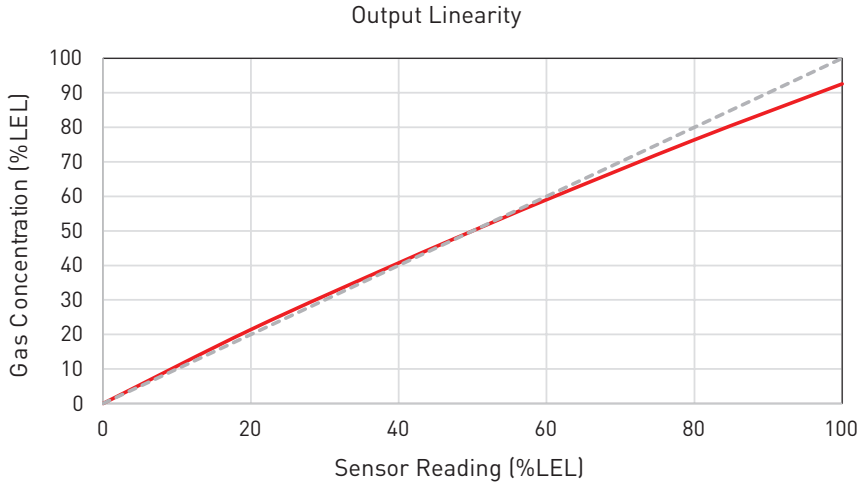


Linearity Characterisation

The 1 Series range of pellistors have almost linear responses to flammable gases at levels up to 60% of the lower explosive limit (LEL). This linearity deviation at gas levels over 60%LEL.

Instruments designed to measure combustible gases at levels higher than 60%LEL may experience problems while undergoing tests due to this non-linearity at higher gas levels. Compensation can be applied to linearise the response over the full range if required.

Figure 13. Output Linearity



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Relative Sensitivities

IMPORTANT NOTE

The relative response data shown below does not form part of the product specification and is supplied for guidance only. For the most accurate measurements, an instrument should be calibrated using the gas under investigation.

The table shows the variation in response of the CiTipeL on exposure to a range of gases and vapours at the same %LEL concentration. The figures are experimentally derived and expressed relative to the methane signal (=100). Testing was performed using 2.5%vol. CH4 (50%LEL CH4 based on LEL values from the now obsolete EN50054).

Relative response data are shown in the table below, based on the LEL values stated in EN 50054 (now obsolete) and EN60079-20-1:2010.

Figure 14. Relative Sensitivities

1LEL75

Gas/Vapor	Relative Sensitivity	
	EN 50054 (obsolete)	EN 60079-20-1:2010
Methane (CH_4)	100	100
Propane (C_3H_8)	61	56
n-Butane (C_4H_{10})	66	70
n-Pentane (C_5H_{12})	58	66
Hexane (C_6H_{14})	48	46
Heptane (C_7H_{16})	55	62
Octane (C_8H_{18})	48	43
Nonane (C_9H_{20})	29	34
Hydrogen (H_2)	111	126
Methanol (CHOH)	90	102

1LEL75C

Gas/Vapor	Relative Sensitivity	
	EN 50054 (obsolete)	EN 60079-20-1:2010
Methane (CH_4)	100	100
Propane (C_3H_8)	61	56
n-Butane (C_4H_{10})	67	71
n-Pentane (C_5H_{12})	58	66
Hexane (C_6H_{14})	50	48
Hydrogen (H_2)	111	126

1LEL75M

Gas/Vapor	Relative Sensitivity	
	EN 50054 (obsolete)	EN 60079-20-1:2010
Methane (CH_4)	100	100
Hydrogen (H_2)	111	126

1LEL75 CiTipeL Sensor Characterisation Note | Issue 2 | 06/18

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