

## Product Data Sheet

### Product Datasheet

#### 4P90C Combustible Gas Sensor

#### Document Purpose

The purpose of this document is to present the performance specification of the 4P90C CiTipeL.

This document should be used in conjunction with Operating Principles (OP01), the Product Safety Datasheet (PSDS 22) and the 4P Pellistors Instructions for Safe Use.

The data provided in this document are valid at 20°C, 50% RH and 1013 mBar for 3 months from the date of sensor manufacture. Output signal can drift below the lower limit over time. For guidance on sensor performance outside of these limits, please refer to the Operating Principles.

For guidance on the safe use of the sensor, please refer to the Operating Principles and the 4P Pellistors Instructions for Safe Use.

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### Key Features & Benefits:

- ATEX, UL and CSA Approvals
- Withstands EN/IEC 60079-0 impact test
- Enhanced H<sub>2</sub>S and silicone poison resistance

### Performance Characteristics

#### MEASUREMENT

<b>Operating Principle</b>	Catalytic Oxidation
<b>Gases Detected</b>	Combustible gases
<b>Suitable for</b>	Methane, ethane, propane, butane, pentane, hexane, carbon monoxide & hydrogen
<b>Unsuitable for</b>	Higher hydrocarbons, alcohols, ketones, esters, hydrogen sulfide and other sulfur containing compounds
<b>Range</b>	0-100% LEL
<b>Sensitivity*</b>	28 ± 5 mV/%methane
<b>T90 Response Time*</b>	<20 seconds (methane)
<b>Poison Resistance</b>	Resistance to H <sub>2</sub> S poisoning Superior silicone resistance
<b>H<sub>2</sub>S Filter Lifetime</b>	Typically 1000 ppm hr
<b>Linearity</b>	Linear up to 3% methane

#### ELECTRICAL

<b>Operating Voltage</b>	3.3 ± 0.02 VDC
<b>Detector Operating Current</b>	75 ± 7 mA
<b>Maximum Power Consumption</b>	288 mW
<b>Resolution</b>	1% LEL

#### MECHANICAL

<b>Casing Material</b>	Stainless steel 316
<b>Pin Material</b>	Gold plated brass
<b>Weight</b>	24 g (nominal)
<b>Orientation Sensitivity</b>	None

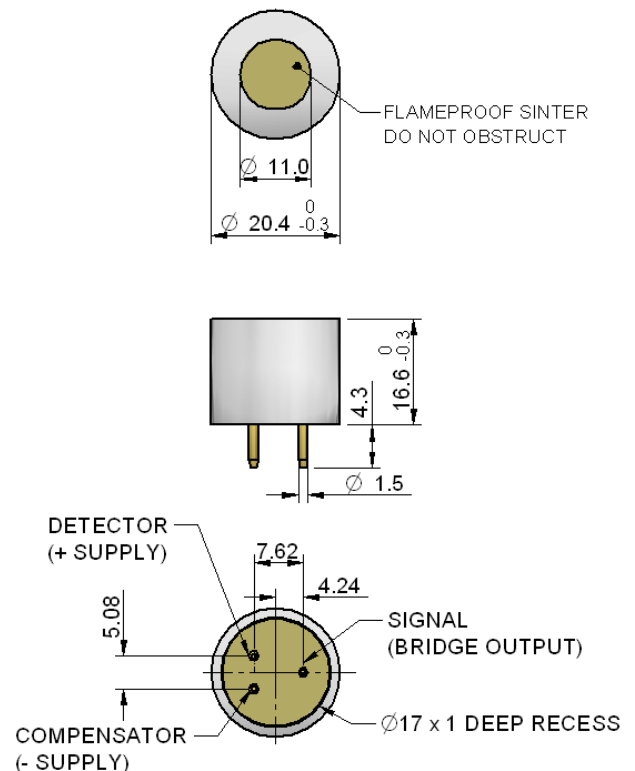
#### ENVIRONMENTAL

<b>Operating Temperature Range</b>	-20°C to +55°C
<b>Operating Pressure Range</b>	1 atm ± 20%
<b>Operating Humidity Range</b>	0-90% RH non-condensing

#### LIFETIME

<b>Long Term Span Drift*</b>	<5% signal/month
<b>Long Term Zero Drift*</b>	<5% LEL <sub>methane</sub> /month
<b>Recommended Storage Temp</b>	0°C to 20°C
<b>Shelf life</b>	6 months in sealed container
<b>Warranty</b>	12 months from date of despatch

### Product Dimensions



All dimensions in mm

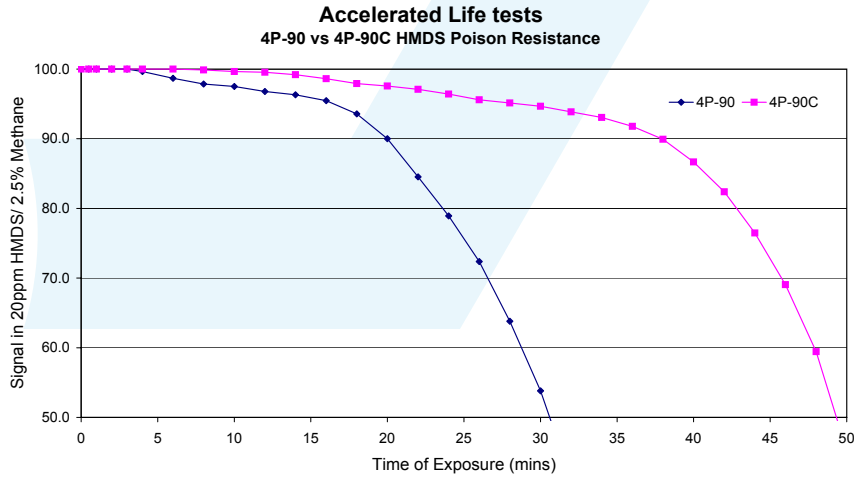
All tolerances ±0.15 mm unless otherwise stated

\* Specifications are valid at 20°C, 50%RH and 1013 mbar at a flow rate of 300 ml/min. Performance characteristics outline the performance of sensors supplied within the first 3 months. Output signal can drift below the lower limit over time.

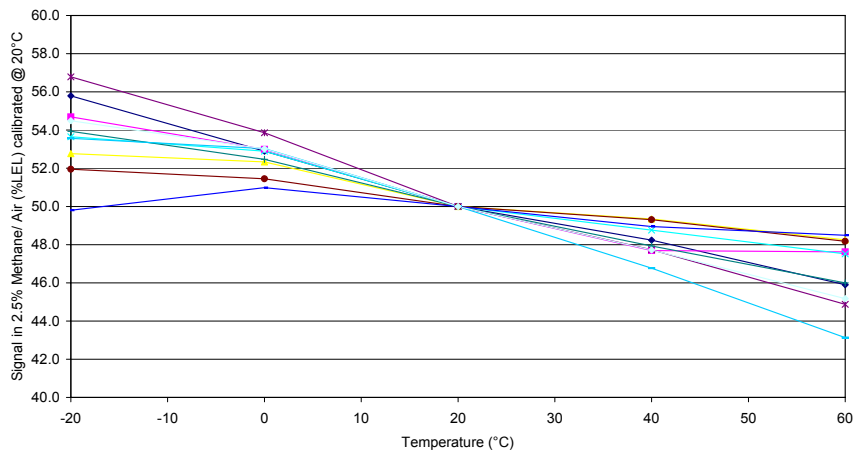
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### IMPORTANT NOTE

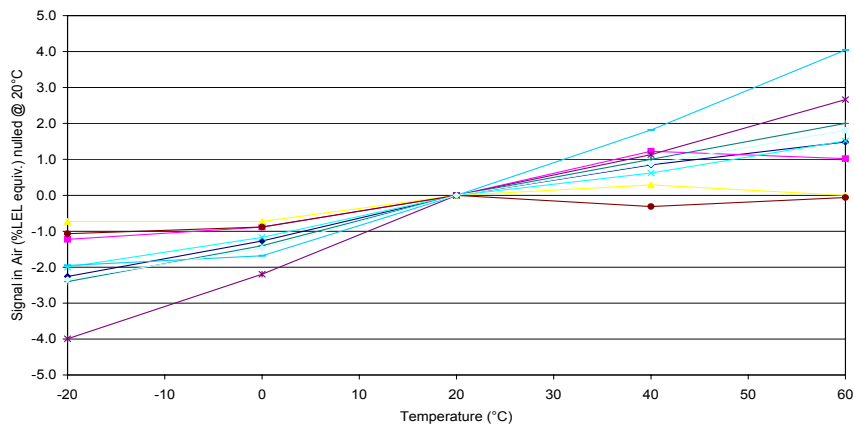
The accelerated life tests, poison resistance and temperature performance data shown below does not form part of the product specification and is supplied for guidance only.



### Effect of Temperature on Methane Signal



### Effect of Temperature on Zero Signal



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### Relative Sensitivity

#### 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 below 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. CH<sub>4</sub> (50%LEL CH<sub>4</sub> 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.

Gas / Vapour	Relative Sensitivity **	
	EN 50054 (obsolete)	EN 60079-20-1:2010
Methane	100	100
Propane	67	61
n-Butane	60	51
n-Pentane	51	58
n-Hexane	42	43
Acetylene	76	80
Carbon monoxide	107	110
Hydrogen	102	116
Ammonia ***	122	139
Cyclohexane	52	55
Ethylene	83	79
<p>** Each sensitivity has been rounded to the nearest 1%            *** T<sub>90</sub> for ammonia has been extended. Contact City Technology for further details.</p>		

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### Product Approval






**Approval Body:** CANADIAN STANDARDS ASSOCIATION  
**Test Standard:** CSA Std C22.2 No 30-M1986  
 Explosion-Proof Enclosures for Use in Class 1 Hazardous Locations  
**Product Categories:** CSA has evaluated the flame propagation characteristics only of the device for Class I, Division 1, Groups A,B, C and D.  
**Certificate Number:** CA 103143



**Approval Body:** UNDERWRITERS LABORATORIES INC.®  
**Test Standard:** UL 913  
**Product Categories:** Class 1, Groups A, B, C, D.  
**Certificate Number:** E 180262



**Approval Body:** SIRA CERTIFICATION SERVICE  
**Test Standard:** EN 60079-0: 2012, General Requirements  
 EN 60079-1: 2014, Flameproof Enclosures 'd'  
**Product Categories:** Ex da IIC T6 Ga Pi=1W,  II1G,  0518  
 Ex da IIC T5 Tamb -20°C to +55°C Ga Pi=0.5W,  II1G,  0518  
 Ex db IIC T4 Tamb -20°C to +55°C Gb Pi=1.5W,  II2G,  0518  
**Certificate Number:** 01 ATEX1205X

### The 4P is also certified under the IECEx Scheme as follows:

**Test Standard:** IEC 60079-0: 5th Edition 2012, General Requirements  
 IEC 60079-1: 6th Edition 2014, Flameproof Enclosures 'd'  
**Product Categories:** Ex da IIC T6 Ga Pi=1W  
 Ex da IIC T5 Tamb -20°C to +55°C Ga Pi=0.5W  
 Ex db IIC T4 Tamb -20°C to +55°C Gb Pi=1.5W  
**Certificate Number:** IECEx SIR 04.0013X

### **Instructions specific to hazardous area installations (reference European ATEX Directive 94 / 9/ EC, Annex II, 1.0.6.)**

The following instructions apply to equipment covered by certificate numbers Sira 01ATEX1205X and SIR 04.0013X;

1. The equipment may be used with flammable gases and vapours with apparatus groups IIA, IIB and IIC and with temperature classifications T1, T2, T3, T4, T5 and T6.
2. The equipment is certified for use in ambient temperatures of -20°C to +40°C.
3. The equipment has not been assessed as a safety related device (as referred to by Directive 94 / 9 / EC Annex II, clause 1.5).
4. Installation of the equipment shall be carried out by suitably trained personnel in accordance with the applicable code of practice (e.g. EN/IEC 60079-14)
5. Inspection and maintenance of this equipment shall be carried out by suitably trained personnel in accordance with the applicable code of practice (e.g. EN/IEC 60079-17).
6. Repair of this equipment shall be carried out by suitably trained personnel in accordance with the applicable code of practice (e.g. EN/IEC 60079-19).

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### 7. Special conditions for safe use

#### 7.1. Matrix of limitations

	DW30	CW2248
0.5W	✓	✓
1W	✓	✓

7.2. The 4P Series Sensing Head is designed to be connected to a gas detector which shall provide an intrinsically safe supply and having a maximum output power ( $P_o$ ) not greater than the wattage detailed in the matrix above.

7.3 This sensor is not a standalone device. It is the responsibility of the detector / instrument manufacturer or designer that uses the sensor to ensure that the sensors are connected to ground with a maximum impedance of  $10^9 \Omega$ .

8. It is recommended that confirmation of adequate sensor performance be conducted on a regular basis by means of a defined, sensor calibration procedure. The calibration frequency will depend upon the environment in which the sensor is operated and on the perceived level of risk from the build up of flammable atmospheres.

9. The certification of this equipment relies upon the following materials used in its construction;

Enclosure material: 316 stainless steel, which contains less than 6% magnesium.

Sinter: 316 stainless steel 316L

Cement:	DW30	CW2248/HY956EN
Manufacturer	Flogates & Hikle	Ciba-Geigy
Type of compound	Ceramic cement	Epoxy resin
Colour	Off white	Beige (natural)
Filler type and %	40% silica	55.2% trihydrated $Al_2O_3$
Other additives	25% MgO 35% $MgSO_4$	8.3%
Surface treatments	None	None
Temperature index	Stable to 475°C	170°C
City Tech reference	RM 462	RM 497

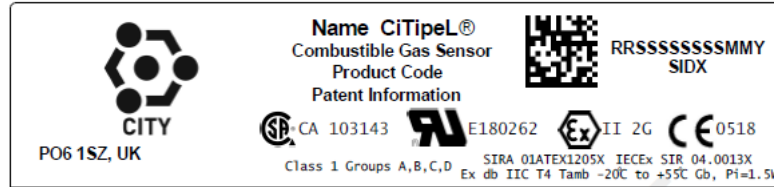
If the equipment is likely to come into contact with aggressive substances, then it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected, thus ensuring that the type of protection is not compromised.

Aggressive substances: e.g. acidic liquids or gases that may attack metals, or solvents that may affect polymeric materials.

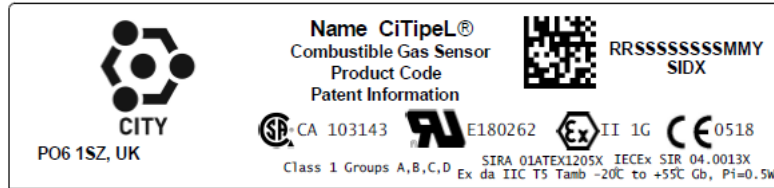
Suitable precautions: regular checks as part of routine inspections or establishing from the material's data sheet that it is resistant to specific chemicals.

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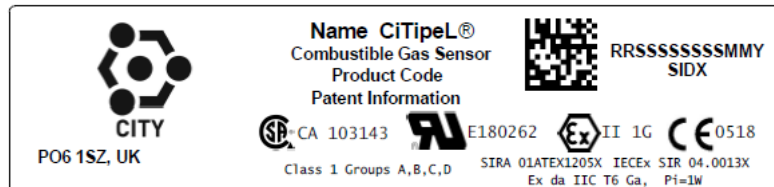
10. 4P Series Gas Sensing Heads are available in T4, T5 and T6 temperature class ratings. The Certification marking is shown below for each case:



T4 Marking



T5 Marking



T6 Marking

11. Certain substances are known to have a detrimental effect on catalytic elements as used in the 4P Series Gas Sensing Head.

**Poisoning:** some compounds will decompose on the catalyst and form a solid barrier over the catalyst surface. This action is cumulative and prolonged exposure will result in an irreversible decrease in sensitivity. The most common of these substances are: lead or sulphur containing compounds; silicones; phosphates.

**Inhibition:** certain other compounds, especially hydrogen sulphide and halogenated hydrocarbons, are absorbed or form compounds that are absorbed by the catalyst. The resultant loss of sensitivity is temporary and in most cases a sensor will recover after a period of operation in clean air.

In applications where it is suspected that poisons or inhibitors may be present, suitable protection for the 4P Series Gas Sensing Head should be provided.

### SAFETY NOTE

This sensor is designed to be used in safety critical applications. To ensure that the sensor and/or instrument in which it is used, are operating properly, it is a requirement that the function of the device is confirmed by exposure to target gas (bump check) before each use of the sensor and/or instrument. Failure to carry out such tests may jeopardize the safety of people and property.

Every effort has been made to ensure the accuracy of this document at the time of printing. In accordance with the company's policy of continued product improvement City Technology Limited reserves the right to make product changes without notice. The products are always subject to a programme 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 City Technology Limited, 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.