City Technology Limited

March 1999

TECHNICAL BULLETIN

product news

NX1 - hugely successful automotive nitric oxide sensor

City Technology has enjoyed continued success with the NX1 gas sensor. Developed in conjunction with the Bureau of Automotive Repair in the US, it is now incorporated into testing equipment used in over 9000 testing stations involved in California's Smog Check II Program. The NX1 is able to track nitric oxide concentration in emissions as it varies over the duration of an emissions test.

The NX1 is accurate, reliable and cost effective. As a result of its innovative design incorporating a screen electrode, it is the only electrochemical automotive sensor capable of making at least ten accurate measurements each hour for eight hours a day over a lifetime of two years. If you require any further information on this or any of our other automotive products, please contact the Technical Support group.

7 Series Update - new snap-fit housing

The 7 Series range of toxic CiTiceLs which traditionally have been supplied in a metal crimped enclosure, are to be converted to a snap-fit plastic housing.

Some of the sensors are already in production with the remainder to follow over the next six months. The table below summarises the status of each of the products.

Sensor	Gas	Colour	Status
7E	Carbon Monoxide	Red	In production
A7E/F			
7HH	Hydrogen Sulphide	Blue	
7H			
7SH	Sulphur Dioxide	Green	
7ST/F			
7NT	Nitric Oxide	Orange	
7E/F	Carbon Monoxide	Red	Sensors built and on test.
7ETO	Ethylene Oxide	Aqua	Approval and subsequent introduction
7HYT	Hydrogen	Yellow	should be within 6 months.
7HCN	Hydrogen Cyanide	Light Blue	These sensors are known as HYBRID
7HL	Hydrogen Chloride	Pink	design sensors, identified by the
A7AM	Ammonia	Purple	cartwheel on the sensing face.
7AM	Ammonia	Purple	Implementation within 6 months.
7OZ	Ozone	Beige	
7NDH	Nitrogen Dioxide	Black	
7CLH	Chlorine	Brown	

Erratum

In last month's Technical Bulletin, we included a table comparing electrochemical toxic gas sensors with a range of other gas detection technologies. The power requirements of infra-red sensors were incorrectly stated. These units can also be supplied as battery powered instruments. We apologise for any confusion this may have caused.

new appointment

Welcome to David Baines – Sales & Marketing Director

On 15 February, David Baines joined the City Technology Board as Sales & Marketing Director to strengthen the commercial focus of the company and ensure the continued growth of our products into existing and new markets.

David brings with him a wealth of experience from managing at board level the international sales and marketing of technical products for subsidiaries of Graseby plc and Thermo Corporation USA. ➤

Technical Enquiry of the Month

Flow Rate & Calibration

Flow rate plays an important part in any calibration procedure. During calibration, the sensor consumes gas at a rate which is dependent on the sensitivity of the sensor. A high output sensor will consume more gas and conversely, a low output/small capillary will consume less gas. The flow rate needs to be sufficient to counter the effects of consumption and to ensure that dead spaces in the flow are non-existent. If the flow rate is too low, sensors will typically produce a lower than expected signal.

Above the minimum flow rate, sensors are theoretically flow independent. However, if the flow continues to rise above a certain level (which is different for each sensor type and sampling system), the supply becomes turbulent and this results in signal enhancement or instability.

In addition, some gases (known as 'sticky' gases) require an even higher flow rate for successful calibration. This is due to their propensity for adsorbing to surfaces of the tubing and equipment (as a result of unpaired valency electrons) and usually occurs with gases such as chlorine, ammonia and phosphine. With a suitable gas feed and purge system, these issues are easily overcome.

It is important that customers adhere to the recommended minimum flow rates quoted in our Product Data Handbooks and calibrate with the recommended gas concentrations.

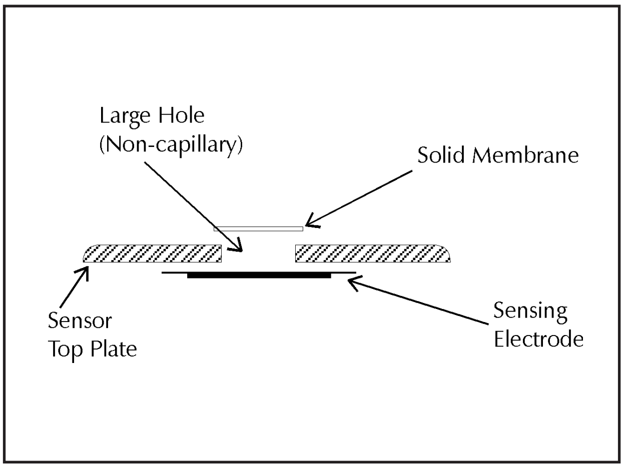
April '99 issue:
Toxic sensors –
The myths explained.

Key telephone numbers:
Karen Wright,
Senior Sales Support Officer
+ 44 1705 288133
Rob White,
Technical Support Officer
+ 44 1705 288115

Oxygen Sensors 3

Partial Pressure Oxygen CiTiceLs

The previous two articles have discussed the performance and characteristics of capillary controlled oxygen sensors, i.e. those which rely on a small hole to control the ingress of oxygen into the cell. This is not the only method of limiting the rate of oxygen entry. It is also possible to use a very thin, plastic membrane over the top of the sensor – the membrane operates as a solid barrier in which the oxygen molecules must dissolve in order to reach the sensing electrode.



The concentration of oxygen at the working electrode is dependent on the pressure gradient of oxygen across the barrier. This means that the output signal from the cell is proportional to the partial pressure of oxygen in the gas mixture. Any changes in atmospheric pressure will therefore result in an equivalent change in the output current of the cell. It is important that this characteristic is considered when designing instruments to ensure that back pressure is not applied to the cell when using pumped gas feeds.

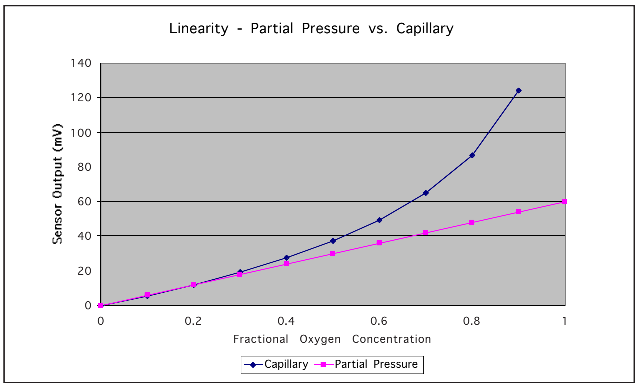
City Technology manufactures two types of partial pressure oxygen sensors for automotive (A02/A03) and medical (MOX) applications where the linear response and 0-100% range achieved with solid membrane cells is beneficial. Details of these sensors are available either from our website (www.citytech.com) or from the Technical Support team.

Linearity

The signal from a capillary control oxygen sensor is non-linear and follows the following relationship with the fractional oxygen concentration (C);

$$\text{Signal} = \text{constant} * \ln [\ 1/(1-C)\ ]$$

In practice, the output from the cells are effectively linear up to 30% oxygen and only oxygen concentrations higher than this cause measurement difficulties. In contrast, partial pressure sensors offer a linear output up to 100% oxygen (or 1.0 fractional oxygen concentration). This is depicted in the graph below.



City Technology Limited
City Technology Centre, Walton Road, Portsmouth, England PO6 1SZ
Telephone: +44 1705 325511 Facsimile: +44 1705 386611
E-mail: sensors@citytech.co.uk Website: http://www.citytech.com