City Technology Limited

February 1999

TECHNICAL BULLETIN

Electrochemical gas detection - a better choice

Gas monitoring is becoming evermore commonplace, often as a result of government legislation. There are a number of commercial methods now available to instrument manufacturers and their performance characteristics are featured in the table.

City's electrochemical sensors excel in many ways. They...

- offer a typical resolution of 0.5 ppm (parts per million) as compared with over 50ppm, for example, from a semiconductor sensor
- can be used in conjunction with an instantaneous alarm
- generate a linear signal - unlike any other method - that reduces the amount of signal processing required
- have good long-term stability, typically <5% over lifetime
- are safer than most methods in explosive gases
- are almost immune to false alarms
- are affected only briefly by humidity, whereas other methods suffer more radically
- can be used in battery operated instruments.

Sensing Technology	Electrochemical	Semiconductor	Infra-red	Colorimetric
Measurement Methodology	Molecules of the target gas are directly oxidised or reduced and the current generated is proportional to the concentration of the gas.	Gas molecules cause a change in the conductivity of the semiconductor material that can be measured.	Molecules of the target gas absorb certain wavelengths of infra-red energy. The amount of absorption is related to the concentration of gas.	A chemical changes colour when it comes into contact with the target gas. The amount of colour change depends on gas concentration and exposure time that can be measured via a light source and detector.
Typical resolution	0.5ppm or better	>50ppm	Typically <0.5ppm or better	Unknown
Suitable for instantaneous alarm	Yes	Yes providing alarm point is typically in excess of 50ppm	Yes	No
Linear signal	Yes	No	No	No
Typical long-term stability	Good (<5% over lifetime)	Medium	Good	Poor
Intrinsically safe in explosive gases	Yes	No	No	Yes
Immunity to false alarms	Good	Poor	Good	Very Poor
Effect of changes in humidity on signal	Transient response to step changes only that lasts a few seconds	Causes major signal change	Can cause signal changes	Generally affected
Power requirement	Battery	Mains	Mains	Battery

product news

Customer Returns feed Continuous Quality Improvement

As a valued customer, you will know that we are constantly endeavouring to further improve the high quality of our products. This process is fed by many procedures including that of analysing problems with returned products. David Gale is responsible for our Customer Returns process, logging re-test findings on a custom-designed database. He passes these findings both to Development, when further investigation is necessary, and to Production to ensure that faults do not recur.

7 Series PDH - Now available

Customers requiring technical data sheets for City Technology CiTiceLs in fixed safety applications, can now find this information in our new 7 Series Product Data Handbook. These data sheets are also available in electronic format on our WebSite (www.citytech.com) or you may receive them via e-mail in Adobe Acrobat format. If you require 7 Series data sheets or information on any other CTL product, please contact a member of the Technical Support Team.

2FO - Delayed Deliveries

There have recently been long delays to 2FO oxygen sensor orders. This has been caused by a combination of problems: very low production yields; incorrect component supply, and an accumulating backlog of orders. A dedicated team has been tackling these issues over the last couple of weeks, and since yields have now increased significantly, we are shipping product again and expect to clear overdue orders very shortly.

We apologise to all customers who have been affected.

Sensor '99

City Technology will be exhibiting at Sensor '99 in Nürnberg, Germany this year from 18-20 May. Our stand number will be 4346. If you would like to know how to find us or require further information, please contact Jon Myers, Market Development Co-ordinator. Thank you.

Next month:
Improvements to H_2 CiTiceLs; our new Sales & Marketing Director

Key telephone numbers:
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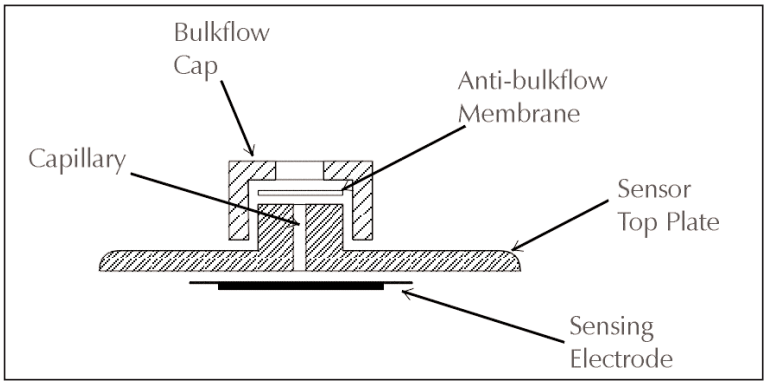
Oxygen Sensors 2 - Under Pressure

The current generated by a capillary controlled oxygen sensor is proportional to the volume fraction (i.e. volume %) of oxygen present and this is independent of the total pressure of gas. If, however the pressure of gas is changed suddenly, then the oxygen sensor will produce a transient current which can cause problems if not correctly controlled. This can also occur where the CiTiceL is subjected to repeated pressure pulses, for example, with a pumped gas supply. This behaviour can be explained as follows:

Pressure Transient

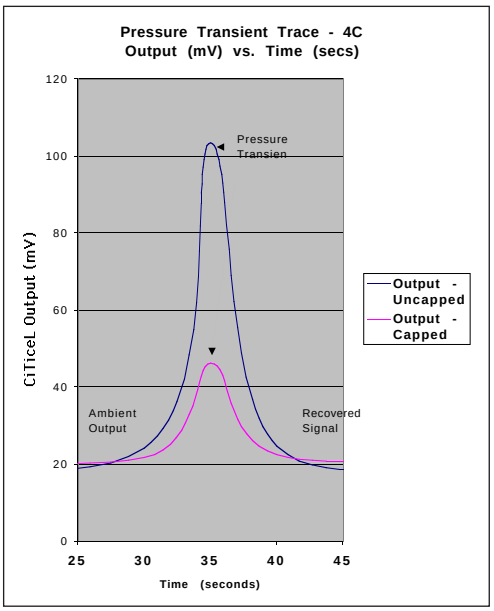
When an oxygen sensor is subjected to a sudden sharp pressure increase or decrease, gas is forced through the capillary barrier (bulkflow). This results in an enhanced (or reduced) internal oxygen concentration and hence a current transient on the measured signal. This transient quickly settles to zero once diffusion conditions are re-established and the pressure pulse is complete. These transients can send an instrument into alarm and so City Technology have actively sought methods to reduce this effect.

All City Technology capillary oxygen sensors are fitted with an anti-bulkflow mechanism which is depicted in the diagram below. Essentially, pressure changes can be 'dampened' by the addition of an additional PTFE anti-bulkflow membrane which reduces the magnitude of the transient effect seen. This membrane is held tightly over the capillary by a metal or moulded plastic cap.



This design modification results in a considerable reduction in the signal transient and can be clearly seen in the typical transient output of a CTL CiTiceL before and after capping.

Some stepwise pressure changes produce transients which are sufficient to overcome this in-built compensation, particularly in instruments using a pumped delivery of gas to the sensor head. Some pumps produce a gas delivery which subject the oxygen CiTiceL to a continual barrage of pressure pulses which can artifically enhance the signal measured. In these cases, it is often preferable to design an external expansion chamber into the gas flow which can minimise the pressure pulses that the sensor is exposed to.



Next month:
Solid Membranes, Linearity and Cross-Sensitivity

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