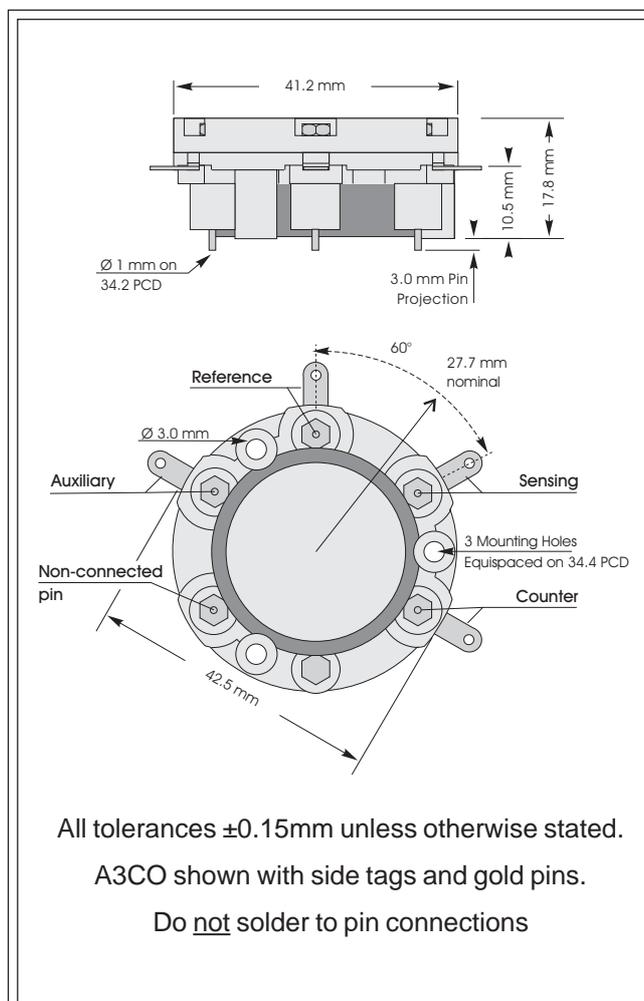# Carbon Monoxide CiTiceL® Specification

A3CO EnviroceL®

This sensor is for monitoring gases at levels found in the environment. It is designed to give accurate readings of CO in ambient air.

Performance Characteristics

Nominal Range	0-500ppm
Maximum Overload	1000ppm
Expected Operating Life	Two years
Output Signal	0.2 ± 0.04 µA/ppm
Resolution	100ppb
Temperature Range	-20°C to +50°C
Pressure Range	Atmospheric ± 10%
Pressure Coefficient	No data
T_{90} Response Time	<40 seconds
Relative Humidity Range	15 to 90% non-condensing
Typical Baseline Range (pure air)	0 to 1ppm equivalent
Maximum Zero Shift (+20°C to +40°C)	2ppm equivalent
Long Term Output Drift	<10% signal loss/year in air
Recommended Load Resistor	10Ω (see over)
Bias Voltage	Not required
Repeatability	1% of signal
Output Linearity	Linear

All tolerances ±0.15mm unless otherwise stated.

A3CO shown with side tags and gold pins.

Do not solder to pin connections

N.B.   All performance data is based on conditions at 20°C, 50%RH, and 1013mBar

Physical Characteristics

Material	Polycarbonate
Weight	22g
Position Sensitivity	None
Storage Life	Six months in CTL container
Recommended Storage Temperature	0-20°C
	12 months from date of despatch

Cross-Sensitivity Data

Sulphur Dioxide	None
Hydrogen Sulphide	None
Nitrogen Dioxide	None
Nitric Oxide	None

Circuitry required

The A3CO EnviroceL differs from standard three electrode sensors by the introduction of a second working electrode, known as the **Auxiliary**. A suitable operating circuit is shown below.

Figure 1.
A3CO Operating Circuit

IC1 - This amplifier should have either a low offset or have its offset nulled out. The PMI OP-77, OP-90, Intersil or Teledyne 7650, and Linear Technology LT1078 are all suitable.

IC2, IC3 - This amplifier acts as a current to voltage converter and its offset performance is less critical. The OP-77 or similar is a suitable choice

Recommended value of **R$_{load}$** is given in the specification overleaf.
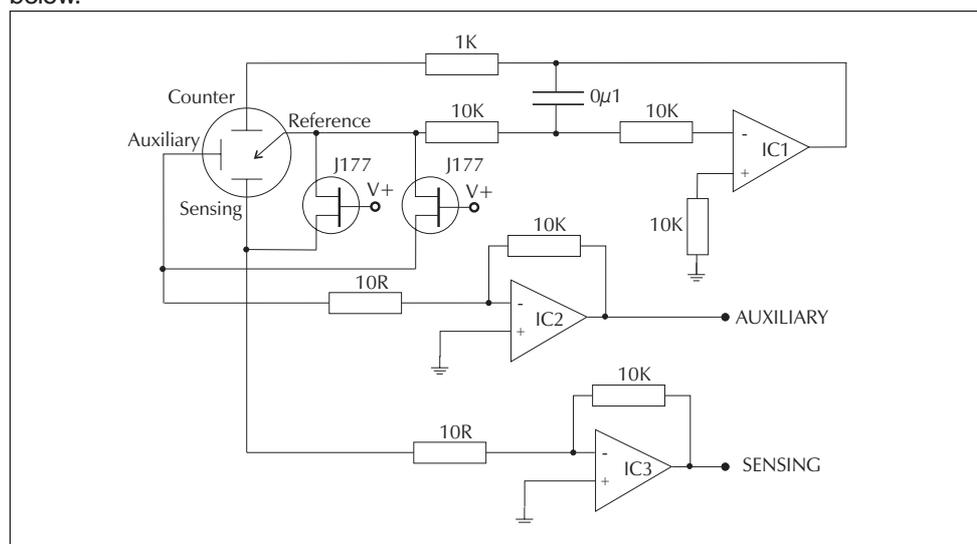
When no gas is present, there is a small zero gas (baseline) signal from each electrode. Upon exposure to carbon monoxide, the *sensing* electrode produces a signal proportional to the concentration of gas. Virtually all the gas is reacted on contact with this electrode, so the *auxiliary* electrode remains largely unaffected and hence the signal remains at its baseline level. It can therefore be assumed the *auxiliary* signal is wholly attributed to the baseline.

The baseline signal of both electrodes is slightly affected by changes in atmospheric conditions (e.g. temperature). However as both are subject to the same conditions, any shift in baseline on the *sensing* electrode will be followed by a similar shift in the *auxiliary*. Hence by comparing the two signals any baseline changes may be compensated.

Evaluating the carbon monoxide concentration of a sample from the two signals is a straightforward subtraction:-.

Let:

I_S = *Sensing* electrode signal;
I_A = *Auxiliary* electrode signal;
I_{CO} = Baseline compensated carbon monoxide signal.

Then

$$I_{CO} = I_S - I_A$$

City Technology Ltd, City Technology Centre, Walton Rd, Portsmouth PO6 1SZ, UK
Tel:+44 23 9232 5511, Fax:+44 23 9238 6611, sensors@citytech.co.uk, www.citytech.com