VIAMED

Nos 3

DATA SHEET

THE C-1 & C-2 MICRO-FUEL CELL

1, General information.

The Teledyne Micro-Fuel Cell is a sealed, disposable electro-chemical transducer that provides Oxygen sensing capability useful in general hospital applications. The cell has no electrolytes to change or electrodes to clean. It is maintenance-free; when the cell reaches the end of its useful life, it is replaced like the battery in a torch. It will operate at relative humidities from 0 to 100%, barring excessive condensation.

Oxygen in the gas space surrounding the cell diffuses through a Teflon membrane and is reduced on the surface of the cathode. A corresponding oxidation occurs at the anode. The electrical current that is generated is proportional to the concentration of Oxygen. Output is limited only by the rate at which Oxygen enters the cell and by the amount of anode material stored within. This linear, current output is sufficient to drive microammeters directly.

The Micro-Fuel Cell is designed to give long-term reliable performance and to respond rapidly to changes in Oxygen concentration. Useful life of the cell depends upon the length of time it is exposed to oxygen and the magnitude of the Oxygen concentration. If left in its environmental gas barrier bag, life expectancy of the Micro-Fuel Cell will deteriorate only a small fraction of its "in air life" per year. A shelf life of 1 year and more is common. The 90% response time of the Micro-Fuel Cell is 30 seconds.

The Micro-Fuel Cell is designed to withstand shock, vibration and movement. However, excessive G-forces may cause erratic readings and/or damage. Since Oxygen sampling is diffusion controlled (through the membrane), the rate at which the sample gas flows over the cell is not critical. Flow rates in the range of 0.1 to 10 litres/minute cause no change in the reading. provided that no significant backpressure is produced.

2,Specification.

Application	Medical*
Analytical Range	0 to 100%
Response Time	90%in 30 secs
Warranty	C-1: 8 months
	C-2: 3 Months
Output at 25 C (in air) - nominal	200 microamp
Accuracy**	+/- 1% of F.S.D

Nominal Oper. Temp. Range 32 F to +131 F (0 C to +50 C) Temperature Dependent upon system utilized (see para.3)

Weight 30 grams (without shorting clip)

*The C-2 Micro-Fuel Cell is specifically designed for anaesthesia applications.

**Statement off accuracy is based upon the capabilities of the Teledyne supplied components, used in temperature compensation.

3,Temperature Compensation,

This is achieved by using a Thermistor & High stability Resistor in parallel with the Fuel Cell. These components are:-

I) Soldered directly onto the Cell.
II) Built into the sockets in the Sensor Holder
III) Potted inside the Sensor Holder

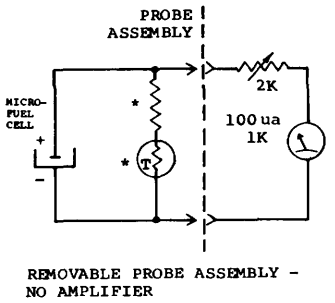

fig.1

4,Removal of Shorting Clip,

The shorting clip provides a current loop, assuring that the cell is ready for immediate use when placed into an analyzer. If the shorting clip has been removed from a cell for some time, placing the cell into service will result in the readout indication being driven off-scale. This is due to Oxygen diffusing into the cell until the electrolyte is saturated. The user can either remove the cell from his instrument and short its output with a shorting clip, or leave the Micro-Fuel Cell installed in the analyzer Sensor Holder. In either case, it will be necessary for the cell to equilibrate to an unsaturated state before placing it into service. For every hour the cell has been unshorted, approximately one hour will be required for stabilization.

To remove the shorting clip, pull it off from the top first, then down and away from the cell body (see Figure 2). If the shorting clip is first pulled off the bottom of the cell, there is a danger that the membrane will be punctured.

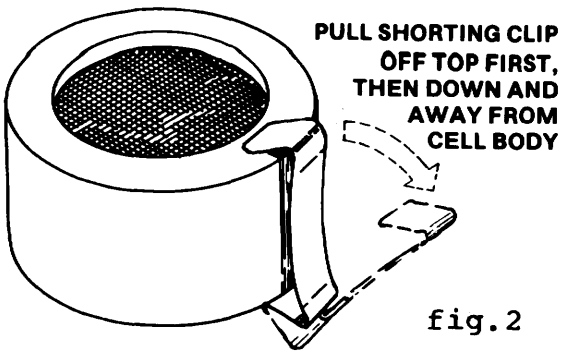

fig.2

5,Cell Leakage,

Cell leakage is covered by warranty if determination is made during the warranted life of the cell. Certain requirements, however, must be met:

1. Cell leakage determination must be made before the transparent barrier bag housing the cell is opened. Under no circumstance will a cell with a perforated membrane be considered for warranty replacement once the original seal on the barrier bag has been violated.

2. If the electrolyte liquid within the cell is visible anywhere on the cell or within the barrier bag, or if crystal growth is visible anywhere on the sensing membrane of the cell, or if the solder points on the printed circuit contact plate appear blackened, the cell is leaking. It will be replaced upon return to Viamed after warranty confirmation.

IMPORTANT: Crystal development around the wire sealing plugs on the circumference of the cell do not in themselves constitute a valid warranty claim for leakage.

6,Storage,

Long-term storage of the Micro-Fuel Cell should be avoided. Warranty protection begins from the date of shipment from Viamed. Careful adherence to a stock rotation system is absolutely essential. Stock rotation should be based upon a "first in, first out" basis.

Never remove the Micro-Fuel Cell from its barrier bag until ready for use. This will ensure maximum longevity of the cell.

7,Application Consideration

High Humidity - The Micro-Fuel Cell is designed to operate in a 100% relative humidity. If reasonable care is taken to keep the sensing surface of the cell out of condensate buildup, high humidity environments pose no special problems. Never install a Micro-Fuel Cell in a breathing circuit so that the sensing surface is immersed in a condensate stream (see Figure 3). However, if the membrane should become immersed in water during test or operation, blot it dry with a cotton swab or soft absorbant tissue.

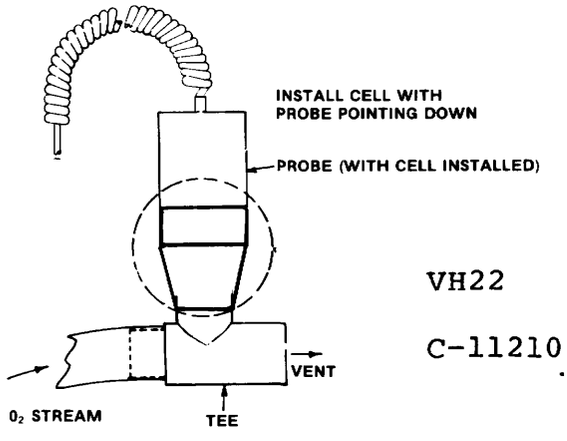

fig.3

Pressure Sensitivity - All electro-chemical Oxygen sensors respond to partial pressure changes of Oxygen (or air) past the sensing surface of the Micro-Fuel Cell. Oxygen must flow past the cell and exit freely (see Figure 3). Make certain that any setup allows for proper venting.

Recommended flow rate is 1 to 2 litres/minute, although rates as high as 10 litres/minute can be tolerated as long as backpressure is not created. Excessive flow rates can create backpressure, especially if the test or operational setup is improperly vented.

Cell-to-Probe Installation - When installing the cell in the probe housing (see Figure 1), make certain that the sensing membrane is facing up (or outward) and the shorting clip is removed. Do not install the Oxygen cell upside down as the cell will be damaged. Also, when installing the cell, observe caution not to scratch or damage the sensing membrane. Always press down on the lip around the membrane, not directly on the membrane.

Position Sensitivity - Some cells will exhibit a sensitivity to position or motion. This is normal. This is due to the momentary change in the sensing membrane spacing relative to the sensing electrode. The excursion is nominally +/- 2 to +/- 5% of reading, and the reading normally returns to the original reading after the movement of the Micro-Fuel Cell ceases.

NOTE
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Always remove C2 Cell & Holders from Anaesthetic circuits after use,particularly if the system is purged with 100% Oxygen.Failure to do this severely shortens the usable life of C2 Cells.

Disinfecting - Teledyne's recommended solutions for disinfecting the Micro- Fuel Cell are either:

(1) Sonacide (potentiated acid glutaraldehyde) - Ayerst Laboratories

(2) Cidex (activated dialdehyde) - Arbrook Inc.

To disinfect the cell, dip it for one (1) minute, minimum, in either of the solutions noted. Then, using a soft absorbant tissue, blot dry the sensing membrane. Place the cell on a paper towel (membrane side up) for 10 - 15 minutes to allow any solution trapped between the contact plate to drain.

Sterilization - For complete sterilization to destroy various tubercle vacilli and resistant spores, use either Sonacide or Cidex, although Cidex is preferred if time is not a factor (see below).

If Sonacide is used, immerse and maintain the cell at 60 C (+122 F) for 60 minutes

CAUTION: Do not autoclave or subject the Micro-Fuel Cell to temperatures above 150 F (65 C). Excessive temperatures will damage the cell

NOTE: After using Sonacide for one (1) hour, a brown ring may be observed under the white hydrophobic sensing membrane. This discoloration will have no effect on performance or cell life.

If Cidex is used as a sterilization agent, immerse the cell for a period of 10 hours (overnight), minimum. Heating is unnecessary when using Cidex.

NOTE: Because heating is unnecessary when using Cidex, this solution is preferred for sterilization. However, the time factor is 10 times greater when using Cidex instead of Sonacide.

Following sterilization of the Micro-Fuel Cell, blot it dry with a cotton swab or soft absorbant tissue. Place the cell on a paper towel (membrane side up) for 10-15 minutes to allow any solution trapped behind the contact to drain.

NOTE: Directions for sterilization are plainly and simply described on each solution container. These printed directions should be followed explicitly.

8,Soldering on Contact Plate,

Excessive heat on the contact plate may damage the cell. Any soldering that is done must be accomplished quickly in order to reduce excessive heat buildup.

9,Fault Finding,

I) Erratic Readings
Check:The Cell is properly installed in the Holder and all contacts Cell,leads,Plugs, & Sockets are clean and soldered joints are good. Check for Physical Damage to Cell. Check cell age.

II) High Output or Low output
Check: Cell has been at the proper temperature for 8 Hrs. Install shorting clip or leave in the Holder for 8 Hrs. Check:Temperature compensation circuit.Impedance of this circuit in ambient temperature should be 200-250 ohms High impedance caused by dry joints will give an apparent high output and High instrument meter reading
If Cell is wet allow to dry out with the shorting clip on or in its Holder for 8 Hrs.

III)Output drifts towards zero
Check age of cell.
Install shorting clip for 8 Hrs.

IV) Monitor Check
Output of the cell is nominally 200 Micro Amps fed directly into the temperature compensation circuit in parallel with a 100 Micro Amp Meter in series with a 2.0Kohm potentiometer.(fig.1)
Feed a voltage of 33mv into the Sensor holder across the Temperature compensation circuit and Calibrate the Monitor to 21% with the Calibration control.
Feed in a voltage of 160 mv the instrument should read 100% .
At 80 mv it should be 50% etc.
If the Sensor Holder does not have the Temperature Compensation circuit it can be replaced by a 250 Ohm resitor during Test.

10, Expected Life Of Cells

Oxygen	C1	C2	
20.9%	16	6	Months
40.0%	8	3	Months
60.0%	5.5	2	Months
80.0%	4.0	1.5	Monthss
100.0%	3.3	1.0	Months