



Sable Systems International

FC-10 OXYGEN ANALYZER

BEST PRECISION TO PRICE RATIO = BEST VALUE: The **Sable Systems FC-10** is reliable, research-grade, and field-portable. The **FC-10** boasts resolution and stability superior to any other single channel fuel cell based oxygen analyzer. It is a *best value* at any price. **Advantages.** Sable Systems' **FC-10** equals or improves upon the noise, drift and resolution performance of heated-zirconia analyzers without their troublesome high power consumption, fragility, systematic errors, and exorbitant cost. The **FC-10** is one of Sable Systems' line of Field-Aware instruments; it is compact and light, powered by uncritical 8 - 20VDC power, requires only a minute of warm-up time, and consumes **less than two watts of power**. Compared with our earlier FC-1b, our **FC-10** oxygen analyzer has less than half the peak-to-peak noise (typically < 3 ppm RMS), a 250% faster sampling rate, four times as many analog outputs, and far greater user control over every aspect of the instrument's operation. Our **FC-10** has the following features:

- **BAROMETRIC PRESSURE COMPENSATION**
 - eliminates drift caused by variations in the pressure of the sampled air stream.
- **DIGITAL SIGNAL PROCESSING** using ultra-high-resolution proprietary circuitry and microcomputer running proprietary algorithms.
- **FOUR ANALOG OUTPUTS** for maximum flexibility with voltage-based data acquisition systems.
- **MULTIPLE AVERAGING RANGES** for tailoring analyzer response time and resolution to your requirements.
- **SERIAL DATA OUTPUT** for data-logging using any laptop or desktop computer and a terminal program.
- **FIELD-READY ADDITIONS:** dust- and water-proof panel switches and prime-quality, driftless controls.
- **PARTIAL PRESSURE OUTPUT** for direct measurement of oxygen partial pressure
- **HIGH RESOLUTION DUAL DISPLAY** shows oxygen concentration to 0.0001% and barometric pressure to 0.0001 kPa



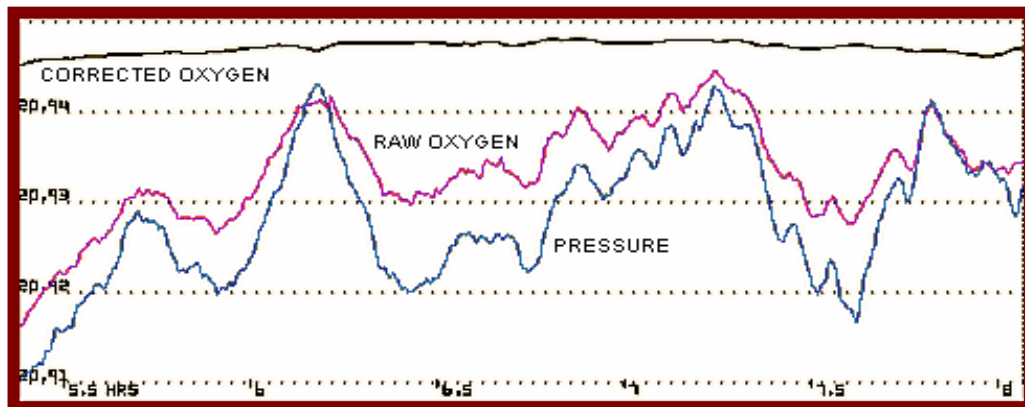
HIGH RESOLUTION, LOW NOISE: The **FC-10's** extraordinary resolution is made possible by advanced, proprietary digital signal processing techniques combined with state-of-the-art electronics. The fuel cell signal is digitized to a resolution of better than one part in four million, as is the barometric pressure. The measured oxygen concentration is continuously corrected for variations in barometric pressure, thus eliminating pressure noise and drift. Pressure correction takes place via proprietary floating-point mathematical algorithms implementing the appropriate corrective equations, rather than via noisy, drift- and error-prone analog computational circuitry. Meanwhile, error-checking and self-calibration routines operate continuously (five times a second!) in the background, guaranteeing the reliability of the **FC-10's** data.

FUEL CELL TECHNOLOGY: Sable Systems' **fuel cell based** oxygen analyzers have proved itself over years of demanding use throughout the world. They operate at ambient temperature, eliminating bulky, power-hungry furnaces. Unlike paramagnetic sensors, the **FC-10** is robust; unlike heated-zirconia sensors, it is immune to moisture and is not affected by volatile by-products of bacterial and animal metabolism. **Uniquely, the FC-10 is completely tolerant to high concentrations of carbon dioxide**, thanks to its novel, patented acidic electrolytes. Sable Systems' successful deployment of fuel cell technology depended on three vital innovations:

- **Ultra-low-voltage-noise amplification** and filtration (because the fuel cell's internal current-converter signal is so tiny, noise and drift levels in the nanovolt range are required for rated resolution).
- **Sophisticated temperature Ouffering** of the fuel cell (including improved insulation and, now, a revolutionary new heat exchanger).
- **Temperature compensation** internal to the fuel cell itself (reducing or eliminating phase-shift errors that compromise compensation accuracy).

VERSATILE DATA ACQUISITION. The **FC-10** is easily interfaced to any data acquisition system or data-logger. Multiple ranges of analog outputs in concentration or partial pressure units, plus cell temperature and barometric pressure, are available from four high quality BNC connectors. This versatile output scheme eliminates offsetting/amplifying by signal conditioners, and guarantees success in interfacing the **FC-10** to any voltage-based data acquisition system. The **FC-10** even includes a fully research-grade *voltage calibrator* for setting up or calibrating analog-based data acquisition systems. The **FC-10** also transmits a stream of serial data. Using any computer and a terminal program, you can *continuously log* pressure-compensated oxygen concentration, oxygen partial pressure, internal temperature, and barometric pressure, simultaneously - and without needing any other data acquisition system.

RESULTS! *The result is an oxygen analyzer that **meets or exceeds our design goal** of superior performance relative to any other research-grade, single-channel oxygen analyzer - but at a quarter of the weight, a quarter of the size, one hundredth of the power consumption, and about half of the price.*



Thanks to its barometric pressure compensation (see above), the **FC-10** shows almost no drift during long-term recordings. Especially under conditions of reasonably constant ambient temperature, residual drift can often be ignored, or can easily be corrected by taking regular baselines. By using Sable Systems' **Baselining Unit (TR-BL1)** or our **Respirometer Multiplexer (TR-RM8)**, baselines can easily be measured under computer control and corrected automatically in software

FC-10 SPECIFICATIONS:

- **Range:** 1% to 100% oxygen, <1 to 105+ kPa oxygen
- **Flow Rates:** 10 - 500 ml/min recommended
- **Panel Display:** Digital 2-line alpha numeric LCD, simultaneous display of oxygen (0.0001 % or 0.0001 kPa resolution) and barometric pressure (0.0001 kPa resolution)
- **Voltage Outputs:** 4, with multiple ranges on each
- **Serial Output:** Percent oxygen, kPa oxygen, both to (0.0001%/kPa), barometric pressure (to 0.0001 kPa) and fuel cell temperature (to 0.001°C) with comma delimiters; **resolution 1 part in 1,000,000 for concentration and pressure.**
- **Power Requirement:** 8 - 20 VDC at approx. 2 W, reverse polarity protected. UL/CSE 120 VAC to 12VDC AC adapter is supplied. (220VAC to 12VDC adapter available upon request)
- **Accuracy and Resolution:** At constant temperature, accuracy better than 0.1%, 2 - 100% oxygen; Resolution 0.0001%; Please note the difference between accuracy and resolution
- **Noise and Drift:** At constant temperature, flow rate and oxygen concentration: Noise < 0.002% pk-pk over 20 minutes; Drift < 0.01% over 24 hours
- **Temperature Compensation:** *Internal* to the fuel cell, optimized over 15 – 45 °C range; *External* optionally uses temperature data (full details supplied on request)
- **Size/Weight:** 13" x 10" x 4" (33 x 25 x 10 cm); less than 10 lbs (4.5 kg)

VALUE ADDED: We offer a **three year warranty** (except for the fuel cell, which is guaranteed for two years in normoxic use) and **free, lifetime technical support.**

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