A Hamilton optical oxygen sensor probe is shown diagonally, partially submerged in water. The probe is a sleek, cylindrical device with a metallic finish. The background is a vibrant blue, filled with numerous small, white bubbles that create a dynamic, effervescent effect. The lighting is bright, highlighting the texture of the water and the smooth surface of the probe.

Optical Oxygen Sensors

VisiFerm, VisiPro & VisiTrace

HAMILTON 

The Real Cost of Dissolved Oxygen Measurement

80% of sensor costs come after the initial purchase

CALIBRATING OPTICAL SENSORS

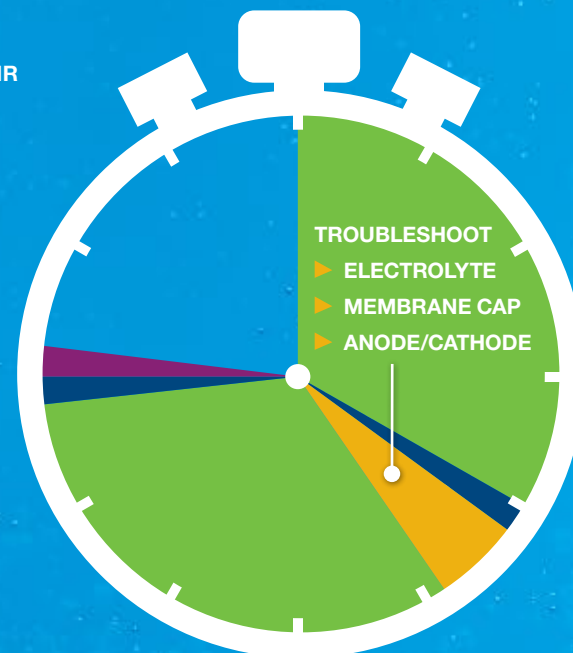
One point, two point, and product calibrations can all be performed using existing polarographic procedures.

Polarographic Sensors

Traditional polarographic membrane sensors use a chemical reaction to generate a small electrical current that is correlated to oxygen concentration in the sample. Keeping the sensor in top condition requires skilled troubleshooting, expensive replacement parts, and considerable time waiting for the sensor to polarize.

TROUBLESHOOT IN 3-8 HOURS

- ▶ POLARIZE
- ▶ TEST IN 100% AIR
- ▶ SERVICE
- ▶ CALIBRATE

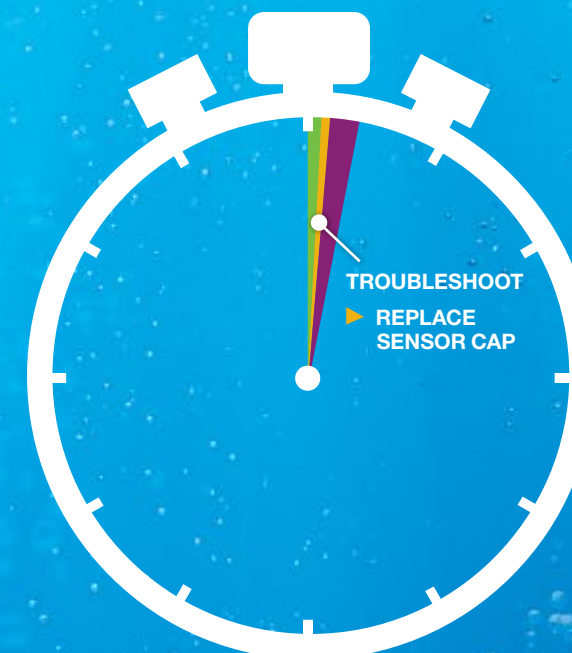


Optical Sensors

Optical sensors measure using an oxygen-sensitive fluorescent dye. The dye requires no equilibration time so it is instantly ready for use. A quality indicator displays the health of the sensor cap, and maintenance is as simple as removing and reinstalling the cap.

TROUBLESHOOT IN ≤ 20 MINUTES

- ▶ WARM UP
- ▶ SERVICE
- ▶ CALIBRATE



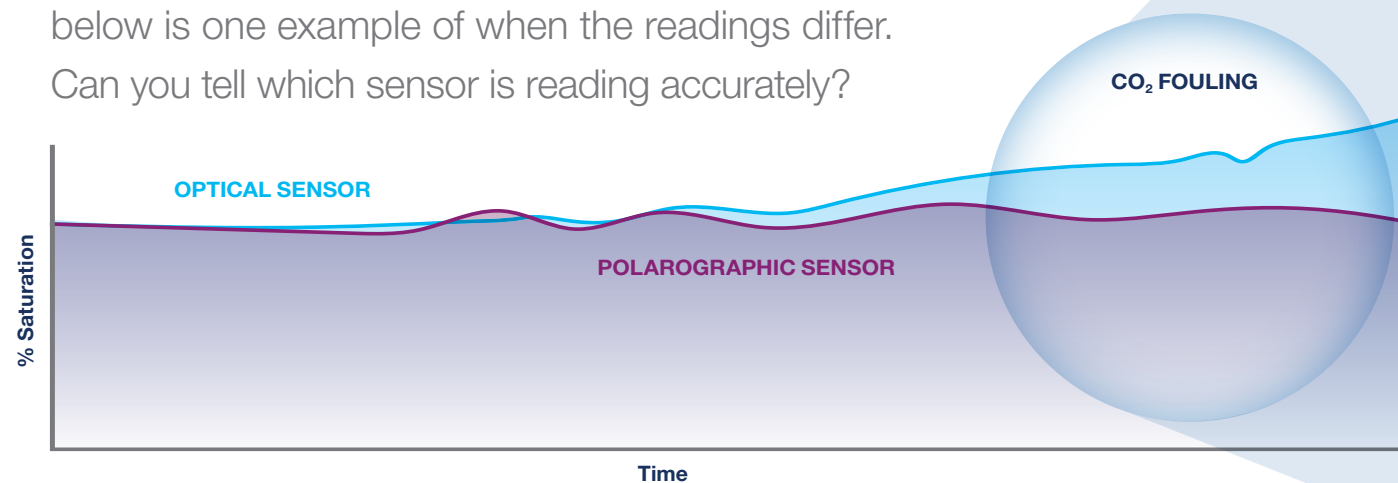
No Polarization Required

Can You Trust Your Oxygen Measurement?

Are polarographic and optical measurements comparable?

Yes, when run in parallel, the data gathered from optical and polarographic sensors is often identical. However, below is one example of when the readings differ.

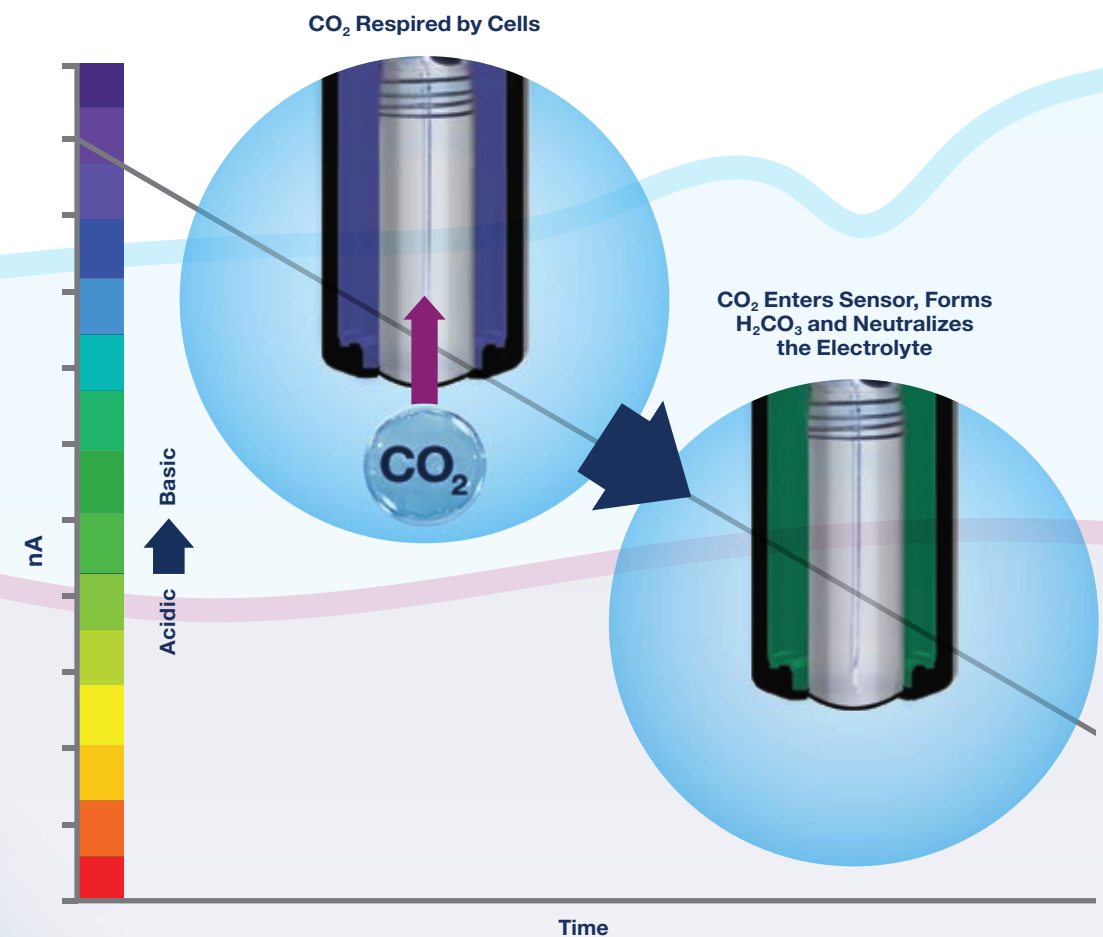
Can you tell which sensor is reading accurately?



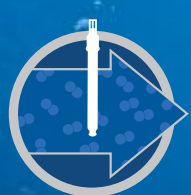
The graph above shows data from a side-by-side comparison of optical (monitoring) and polarographic (controlling) values over a long fermentation run. The divergence at the end of the run is a result of CO₂ fouling of the polarographic control sensor, causing the mass flow control to add too much O₂ during of the run.

WHAT IS CO₂ FOULING?

Over long fermentation runs, sensors are exposed to CO₂ gas used for pH control or resulting from cellular respiration. The gas travels through the membrane of a polarographic sensor and changes the pH of the electrolyte. This change results in a lower nA reading.



ADDITIONAL ADVANTAGES OF OPTICAL MEASUREMENT



Low DO and No Flow

More accurate measurement because optical sensors do not consume oxygen



Inverted Installations

Without electrolyte the sensor reading is not affected by mounting orientation



Response Time

Quicker response time results in less wasted product



Pressure Spikes

Improved mechanical and measurement stability with a glass window instead of a membrane



nA Noise

Signal is not influenced by electrostatics and mechanical stress



H₂S Fouling

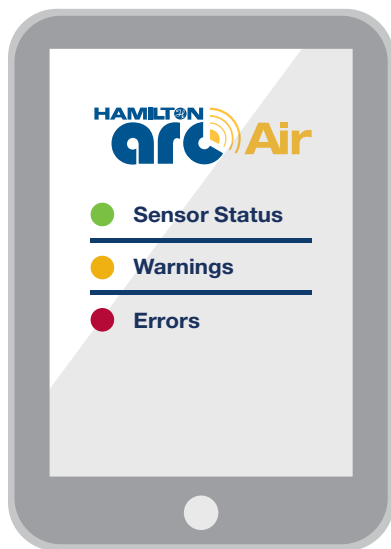
No impact on measurement or sensor life

Intelligent Sensors

Eliminate more than costly transmitters

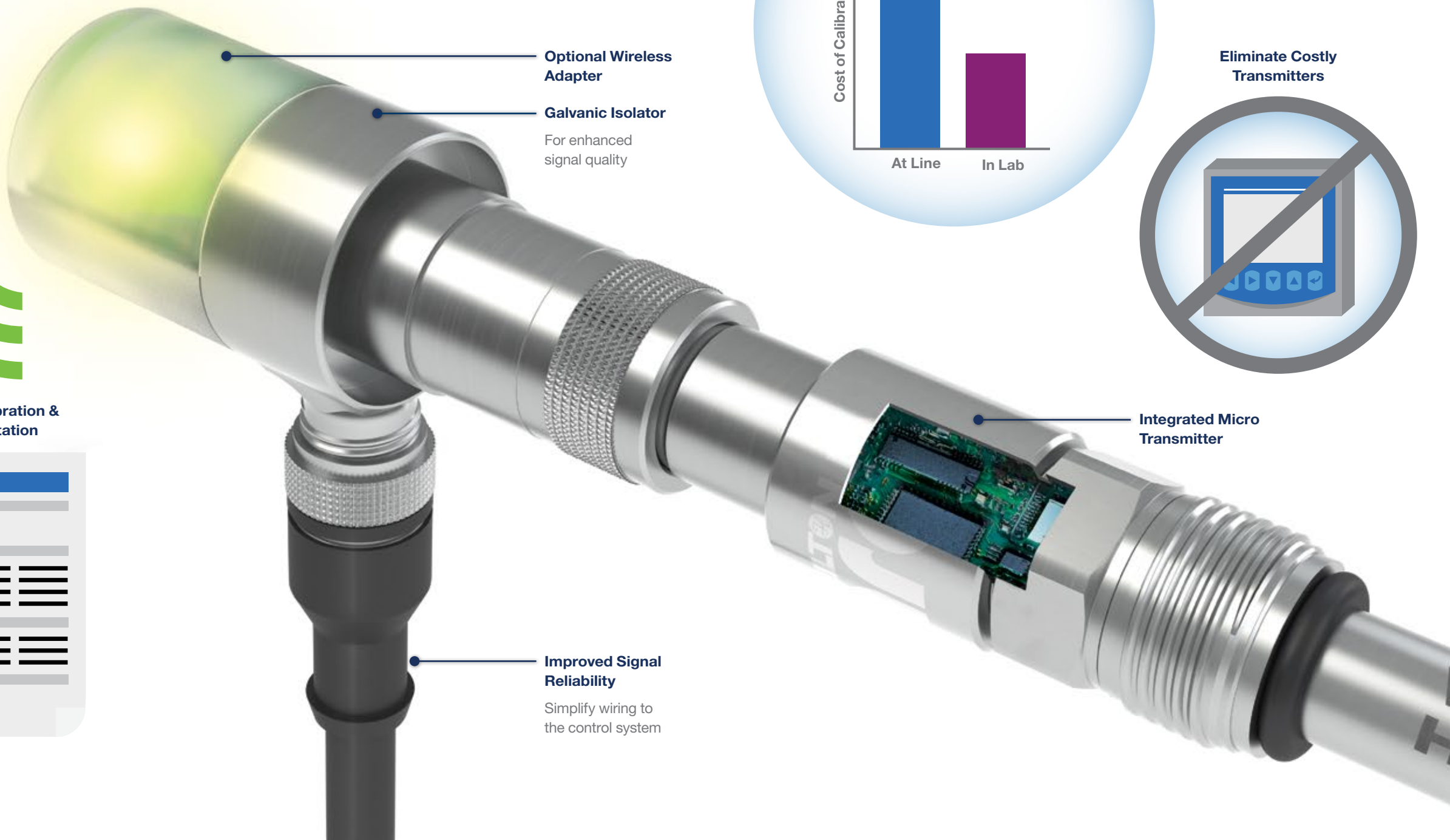
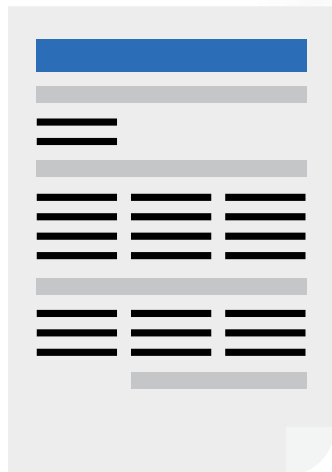
The integrated micro transmitter eliminates signal noise and enables predictive estimates of sensor life, calibration and troubleshooting. These can be conducted in a controlled lab or at line, and documentation is simplified with automatic report generation.

WIRELESS CALIBRATION & DIAGNOSTICS



Up to 30 Sensors

Automatic Calibration & GMP Documentation

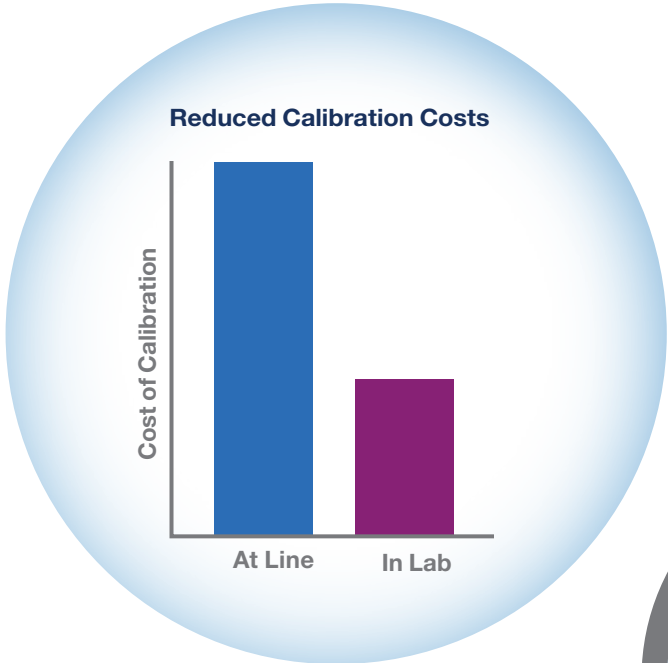


Optional Wireless
Adapter

Galvanic Isolator
For enhanced
signal quality

Improved Signal
Reliability
Simplify wiring to
the control system

Integrated Micro
Transmitter



The Visi Family of Sensors

The right tool for the job

The optical VisiFerm sensors are available in a variety of configurations to meet the needs of your challenging application. The core measurement principal is consistent across all models with various electrical connections, sensor caps, and firmware versions to ensure superior performance and reliability.

SIGNAL PROCESSING & TRANSMISSION

VisiFerm DO

Seamless integration with existing analog bioreactors and transmitters

Output: ECS, 4-20 mA, and Modbus outputs

VisiFerm DO Arc

Improve signal with direct connection to the control system

Output: 4-20 mA and Modbus output

VisiTrace DO

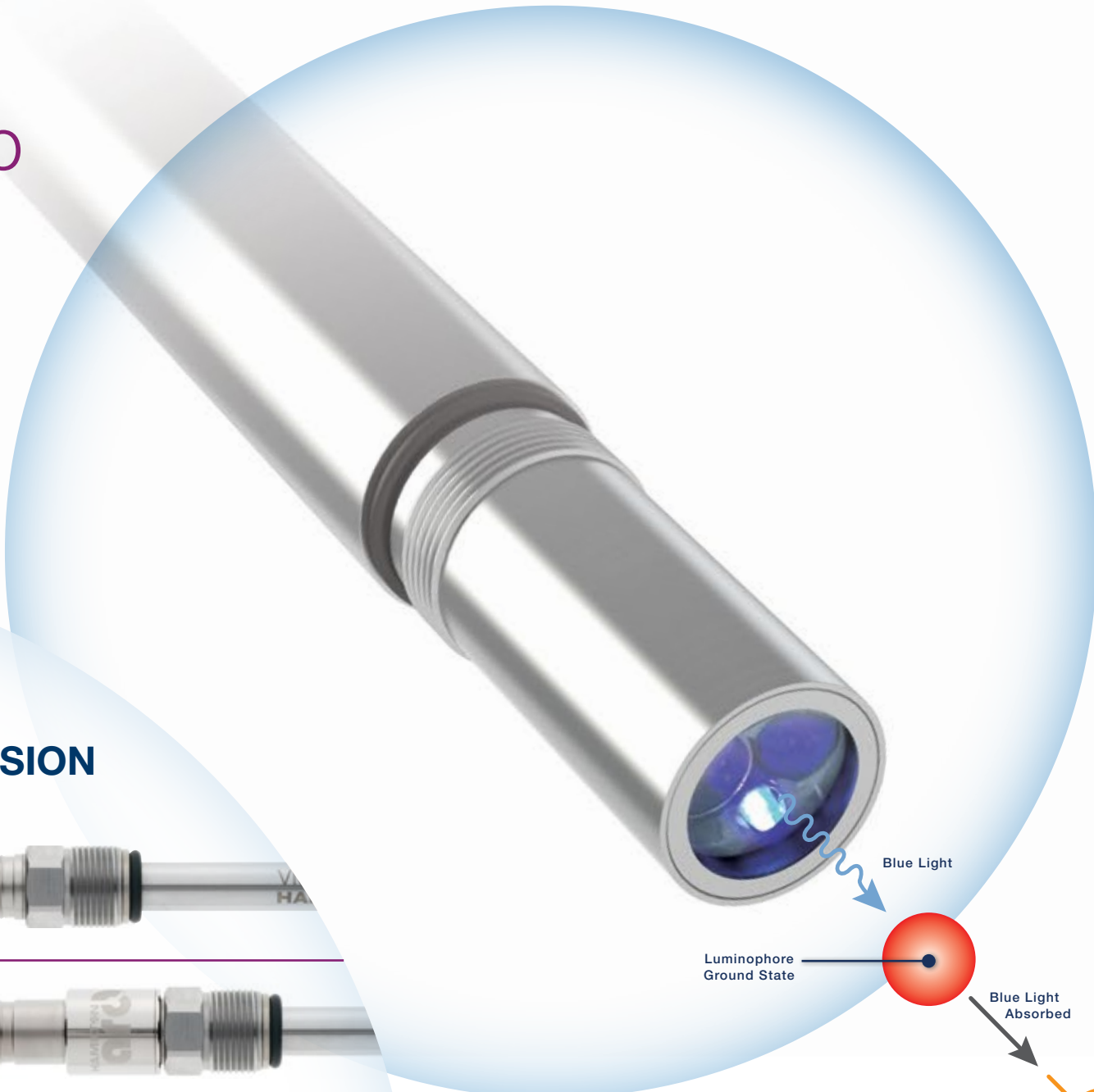
Detect from 0 to 2 ppm with a stability of < 1% week @ 100 ppb and accuracy of ± 0.5 ppb or 2%, whichever is greater (@ 25°C)

Output: 2 wire 4-20 mA and Bluetooth

VisiPro DO (Ex)

Rated for explosive environments and 2 wire loop powered
Available as non-Ex version

Output: 2 wire 4-20 mA, HART, and Bluetooth



SENSOR CAP OPTIONS

H0 Cap

The fastest response time and compatibility with most fermentation and culture media



H2 Cap

Chemically resistant with hygienic design to simplify cleaning and minimize bubble accumulation



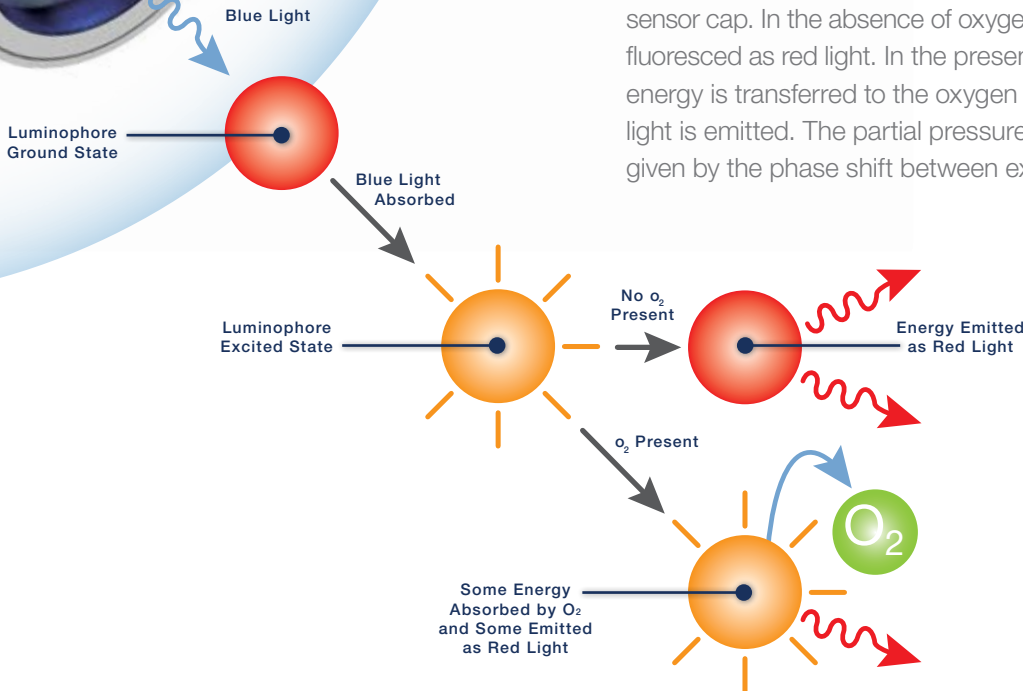
L0 Trace Cap

Optimized for trace measurement from 1 to 2,000 ppb and stable against active chlorine and chlorine dioxide



HOW IT WORKS MEASURING PRINCIPAL

Blue light excites a fluorescent dye (luminophore) in the sensor cap. In the absence of oxygen the energy is fluoresced as red light. In the presence of oxygen some energy is transferred to the oxygen molecule and less red light is emitted. The partial pressure of oxygen is reliably given by the phase shift between excitation and emission.



Unprecedented Connectivity

Eliminate the middle man; talk directly to the sensor

New installations are abandoning dedicated transmitters in favor of computer screens. The Visi family of sensors transitions seamlessly with analog options for existing installations and a variety of digital protocols for future needs.

CALIBRATION & DIAGNOSTICS

Wirelessly communicate with the sensor via Bluetooth. Setup, troubleshoot, and calibrate multiple sensors from a single handheld device or PC.

BLUETOOTH 4.0 



TABLET



SMARTPHONE



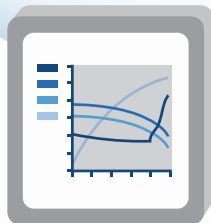
VIEW EX MOBILE



USB WIRELESS CONVERTER

REPLACE TRADITIONAL OXYGEN SENSORS

Enjoy the benefits of optical oxygen measurement with your existing equipment. VisiFerm DO can simulate the output of a traditional polarographic sensor (ECS Mode, ElectroChemical Signal) for integration into any system with minimal effort.



BIO CONTROLLER



nA, ECS

4-20, PROFIBUS DP, MODBUS, HART

FLEXIBILITY AND SIGNAL INTEGRITY

All process data is communicated through a hard wired connection. The Visi family communicates with a variety of open communication protocols enabling connection directly to a PCS or computer. Hamilton provides control software, FDT drivers, and a programmer's guide for custom development.

Validated Cables for Most Bioreactors*

LEMO



Bioreactor Manufacturer:
▶ Sartorius
▶ Bioengineering

BINDER



Bioreactor Manufacturer:
▶ Applikon
▶ DASGIP (Eppendorf)

BNC



Bioreactor Manufacturer:
▶ Applikon

AMP



Bioreactor Manufacturer:
▶ New Brunswick (Eppendorf)

* All Cables have integrated power supplies with selectable country specific plugs

© 2017 Hamilton Company. All rights reserved.
All trademarks are owned and/or registered by Hamilton Company in the U.S. and/or other countries.

REF L30011/01 — 01/2017

HAMILTON®

Web: www.hamiltoncompany.com

USA: 800-648-5950

Europe: +41-58-610-10-10

Hamilton Americas & Pacific Rim

Hamilton Company Inc.
4970 Energy Way
Reno, Nevada 89502 USA
Tel: +1-775-858-3000
Fax: +1-775-856-7259
sales@hamiltoncompany.com

Hamilton Europe, Asia & Africa

Hamilton Bonaduz AG
Via Crusch 8
CH-7402 Bonaduz, Switzerland
Tel: +41-58-610-10-10
Fax: +41-58-610-00-10
contact.pa.ch@hamilton.ch

To find a representative in your area, please visit hamiltoncompany.com/contacts.