APPLIED ANALYTICS

TDL-506
Oxygen Analyzer

- **rugged solid state construction**
- **VCSEL tunable diode laser detection**
- **intuitive graphical interface**
- **standard industry I/O (4-20mA, relay)**
- **elegant modular design**

At the forefront of a mature market, the TDL-506 outperforms competitors by virtue of its evolved design. Harnessing the vast potential of surface-emitting laser technology, this affordable system delivers fast, reliable oxygen monitoring in even the most volatile process streams. With a sleek modular build and a compact form factor, the TDL-506 excels both as a rugged standalone and as an integrated unit within larger analytical systems.

The ability to emit high-intensity light at an extremely specific wavelength is critical for monitoring the sharp absorbance peaks that are characteristic of diatomic oxygen. Rugged and power-efficient, the tunable diode laser housed in the TDL-506 provides this ability. This system precisely monitors the R-branch of the oxygen A-band near 760nm, minimizing interference and optimizing detection resolution.

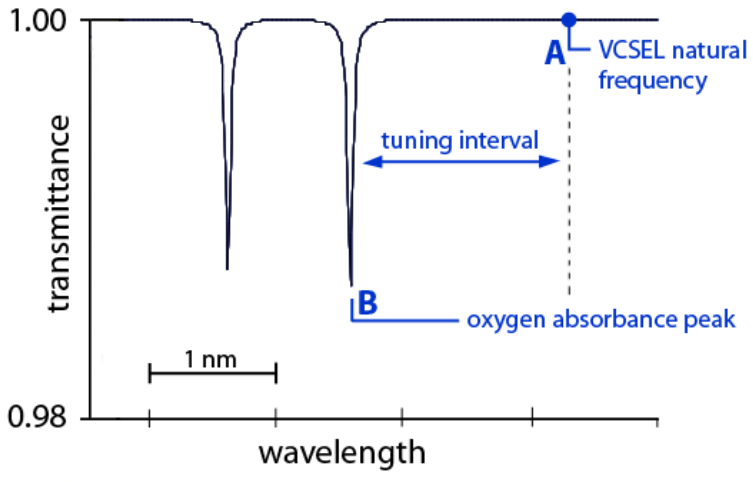
What is VCSEL Technology?

With the advent of the internet in the late 1980's came a vision of groundbreaking network speeds and photon-based optical computing, all driven by lasers. Conventional distributed feedback (DFB) lasers were extremely expensive, difficult to manufacture, and thus commercially impractical; a complete redesign of the laser diode was in order. The efforts were fueled by heavy investments from the research arm of the U.S. Department of Defense, which sought to use the still embryonic networking technology for various military systems.

The vertical-cavity surface-emitting laser (VCSEL) was born. Unlike its predecessors, the VCSEL's manufacturing costs are low and the units can be tested at the mid-production wafer level. Although the technology was developed primarily with projects such as Gigabit Ethernet in mind, AAI engineering has deployed the VCSEL for process monitoring in the form of the elegant TDL-506. This analyzer was built to fulfill the specifications of the most demanding oxygen sensing applications at a price point which is simply unfeasible for any system built around the older, industrially entrenched DFB lasers used by our competitors.

Laser Spectroscopy in the TDL-506

Any laser diode such as the VCSEL is a semiconductor device that converts electrical current into coherent, monochromatic light. The light emitted from the diode is all of one specific wavelength, and all the waves are in phase with one another. The spectroscopic value of using a laser as a light source lies in the coherence and wavelength precision of the signal, which enables the system to monitor sample absorbance at an extremely well-defined spectral region. For a component such as oxygen, the capacity for isolating these high-absorbance lines is critical for measuring concentration.



VCSEL Illustration. Using electrical current, the laser diode is tuned between its natural emission frequency (pt. A) and a sharp peak in oxygen's absorbance spectrum (pt. B). The level of light transmittance at the monitored peak will vary with the concentration of oxygen in the process stream, such that a higher oxygen concentration yields a more prominent dip at point B. The VCSEL also monitors transmittance at its natural frequency (pt. A), where oxygen is known to absorb no light. This spectral baseline provides a constant reference for calculating how much absorbance is due strictly to oxygen in the process.

In the TDL-506, the VCSEL is tuned to the exact wavelength that coincides with the absorption A-band of oxygen (763.43 nm). This sharp wavelength selectivity minimizes interference from other stream components, and the fast scan time contributes to an excellent signal-to-noise ratio.

User Interface

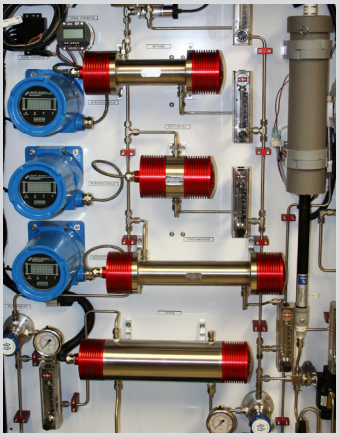
The TDL-506 uses a 192x128 pixel backlit LCD screen as a graphical interface. Real-time oxygen concentration is cleanly displayed to the end user during operation. The interface centers on four buttons with explicit functions specific to each screen.

The setup wizard streamlines the calibration procedure. If the slope and offset of the calibration line are known, the user can input them directly. Otherwise, a short sequence of screens guides the user through a simple zero and span configuration.

Modular Design

Integration is where AAI engineering gets to shine. Our design philosophy accepts nothing less than the completeness and elegance of a properly unified system. Many of our products are modular units, built to serve both as rugged standalones and as workhorse elements within comprehensive solutions. An AAI integrated system consolidates an array of technologies for robust, full-featured monitoring.

Standalone TDL-506.
Dedicated controller; lightweight and compact.

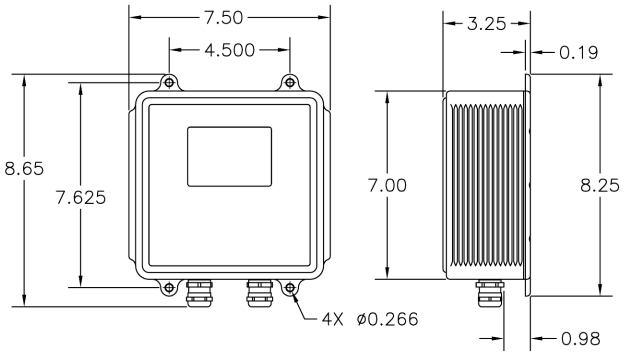


Integrated TDL-506.
Controlled by the central, unified display that governs the entire system; seamless modularity achieved through rigorous engineering.

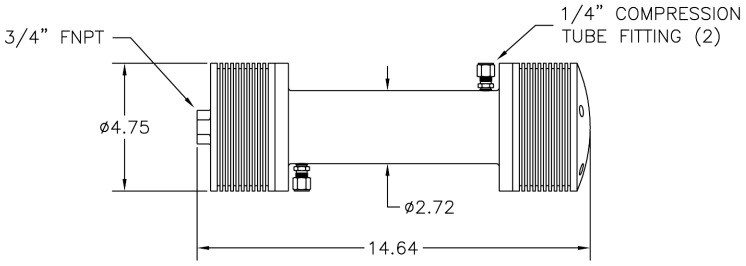
The AAI Brand

Applied Analytics, Inc. (AAI) designs, manufactures, and supports advanced analytical solutions for a higher caliber of process control. Our specialties include solid state, multi-component spectrophotometers and process-tailored sampling systems. Our products primarily serve the chemical, petrochemical, pharmaceutical, power generation, refining, environmental, and semiconductor industries, yet we remain pioneers in process control technology—always eager for new applications and opportunities for innovative engineering.

Specifications



CONTROLLER HOUSING



TDL–506 FLOW CELL

Measurement Technology	Tunable diode laser detection
Light Source	Vertical-cavity surface-emitting laser (VCSEL)
Detection Wavelength	763.43 nm
Sample Introduction	Continuous flow from positive pressure stream
Range	0-25% volume O2
Accuracy	±0.1% volume O2 or 1% of reading (whichever higher)
Sensitivity	±0.1% volume O2
Drift	0.1% volume O2 per week
Warm-up Time	2 minutes
Ambient Temperature	-10 to 50 °C (14 to 122 °F)
Ambient Pressure	11 to 18 psia
Flow Rate	Intrinsic instrument: 0.1 to 4 LPM
Sample Volume	20cm length x 0.8cm diameter = 65cm3
Sample Gas Pressure	0.1 to 1.2 bar
Sample Gas Temperature	-10 to 50 °C (14 to 122 °F)
Sample Gas Humidity	Dewpoint 5 °C below ambient temperature
Power In	Used as standalone: 120 VAC
Display/Flow Cell Interface	RS232 serial interface cable
Area Classification	Class 1, Division 1

North America

Headquarters
Applied Analytics, Inc.
29 Domino Drive
Concord, MA 01742
Tel: (978) 287-4222
Fax: (978) 287-5222
Email: sales@a-a-inc.com

Houston
Applied Analytics, Inc.
10777 Westheimer, Suite 1100
Houston, TX 77042
Tel: (713) 292 -1491
Fax: (713)-260-9602
Email: sales@a-a-inc.com

Baton Rouge
Applied Analytics, Inc.
Tel: (225) 445-8326
Alt: (225) 305-0822
Email: sales@a-a-inc.com

Southeast Asia
Applied Analytics Pte. Ltd.
50 Raffles Place
37th Floor, Singapore Land Tower
Singapore 048623
Republic of Singapore
Tel: +65 6829 7057
Fax: +65 6829 7070
Email: sales@a-a-inc.com

Middle East
Applied Analytics Middle East (FZE)
R2-45, SAIF Zone,
Sharjah, United Arab Emirates
Tel : +971 6 5578525
Fax : +971 6 5578524
Email: sales@appliedanalytics.ae

India
Applied Analytics (India) Pte. Ltd.
Contact: Harsh Mehta
A/203-4 MAHAN TERRACE
ADAJAN ROAD
SURAT-395 009
GUJARAT-INDIA
Tel: +91 261 2782625
Fax: +91 261 2785000
Email: sales@appliedanalytics.in

MADE IN USA

www.a-a-inc.com