# CVA-100 Wobbe Index Analyzer

Applied Analytics DS-005A — Revised 18 June 2013



## Online monitoring of calorific value in fuel gases.

The Wobbe Index (WI) expresses the heating value (known as calorific value) of gases used as fuels, taking into account the proportionality of calorific value to the specific gravity, or the density ratio between the given fuel gas and air. More precisely, the specific gravity is proportional to flow velocity through a constant orifice size at a constant pressure, and thus proportional to gas calorific value. The CVA-100 puts continuous Wobbe Index monitoring and control in the hands of fuel gas producers, distributors, or anyone requiring WI readings for process optimization.

### Features

- Continuously measures Wobbe Index through residual oxygen analysis
- VCSEL tunable diode laser sensing technology
- User-configurable alarms for threshold values

**CVA-100 Sample Conditioner**

The primary purpose of the CVA-100 sample conditioning panel is to pyrolyze the sample (i.e. controlled combustion). Upon entering the CVA-100, the sample flow encounters a tee and is split between the fast loop and the sample loop. The fast loop takes most of the sample, passing it through a flow meter and then returning it to the process line. The flow meter can be adjusted, allowing the user to control the sample lag time as well as sample fuel consumption. A small portion of the sample enters the sample loop for preparation and analysis.

The sample for analysis is filtered with a 15 µm particulate filter. After the filter, the sample reaches an air-actuated 3-way ball valve which allows for introduction of cal gas for calibration and validation. A second air actuated 3-way ball valve allows flexible calibration with separate cal gas sources for calibrating on low range or high range. The sample then passes through an optional density transmitter to measure gas density. Mass flow rate controllers are then used to carefully mix the sample with air; the flow rates of the sample gas and air are application-specific because they are based on air/fuel ratio and fuel chemistry.

The sample/air mixture passes through a spark arrestor and into the pyrolyzer tube. The pyrolyzer itself is heated to 1000 °C; this heat is sufficient for complete combustion of the sample. The combustion products are primarily carbon dioxide and water.

The water is removed using a coalescing filter before oxygen measurement occurs. The sample then reaches the oxygen sensor, where residual oxygen absorbance is measured (via fiber optic cables). Finally, the sample flow passes through a backpressure regulator, which maintains a constant pressure inside the system. After the backpressure regulator, the sample exits the system as waste gas.

- 36”x36”x12” NEMA 4X carbon steel enclosure
- Industrial pyrolyzing furnace
- Two mass flow controllers for sample gas and air supply
- Optional density transmitter
- Oxygen sensor
- Backpressure regulator to control the pressure of the gas flow
- Two air-actuated 3-way valves
- Includes 15 µm particulate filter and coalescing filter
- Fast loop flow meter

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All performance specifications are subject to the assumption that the sample conditioning system and unit installation are approved by Applied Analytics. For any other arrangement, please inquire directly with Sales.



| Technical Data | |
|---|---|
| **General** | |
| Measurement Principle | Tunable diode laser detection |
| Light Source | Vertical-cavity surface-emitting laser (VCSEL) |
| Sample Conditioning | The SCS utilizes mass flow controllers to continuously mix the sample gas with oxygen at a precise fuel:air ratio. The system passes the resultant mixture through a furnace tube heated to 1100 °C. Post-combustion, the residual oxygen is measured. |
| Analyzer Calibration | Factory calibrated with certified calibration gases. |
| Reading Verification | Simple verification with samples or neutral density filters |
| Human Machine Interface | Applied Analytics standard HMI: industrial controller with touch-screen LCD display<br>Data sheet: http://www.a-a-inc.com/documents/AA_DS202A_HMI.pdf |
| User Interface | ECLIPSE™ Runtime Software<br>Data sheet: http://www.a-a-inc.com/documents/AA_DS203A_Eclipse.pdf |
| Data Storage | 32GB Solid State Drive<br>Data sheet: http://www.a-a-inc.com/documents/AA_DS204A_SSD.pdf |
| Enclosure | Standard: wall-mounted, carbon steel NEMA 4 enclosure<br>Options in data sheet: http://www.a-a-inc.com/documents/AA_DS401X_Enclosures.pdf |
| Available Certifications | CSA Class I, Division 1<br>CSA Class I, Division 2<br>ATEX Exp II 2(2) GD<br>*Please inquire for other certifications.* |
| **Measuring Parameters** | |
| Accuracy | Wobbe Index<br>45-50 range: ±0.2%<br>CARI Index<br>(13-16 range): ±0.2% |
| Resolution | <0.02% |
| Linearity | Better than 1% |
| Span Drift | <2% of measurement range |
| Zero Drift | <1% per year |
| **Sample Conditions** | |
| Sample Temperature | 1300 °C |
| Sample Pressure (max) | 10 bar abs. |
| **Ambient Conditions** | |
| Analyzer Environment | Indoor/Outdoor (no shelter required) |
| Ambient Temperature | -20 to 60 °C<br>*To avoid radiational heating, use of a sunshade is recommended for systems installed in direct sunlight.* |
| **Physical Specifications** | |
| Dimensions | Analyzer: 24”” H x 20”” W x 8”” D (610mm H x 508mm W x 203mm D)<br>SCS: 24”” H x 30”” W x 8”” D (610mm H x 760mm W x 200mm D) |

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|---|---|
| Weight | Analyzer: 32 lbs. (15 kg)<br>SCS: variable |
| Wetted Materials | Standard: K7 glass, Viton, stainless steel 316L<br>*Various custom materials available — please inquire.* |
| **Utility Requirements** | |
| Electrical Requirements | 85 to 264 VAC 47 to 63 Hz |
| Power Consumption | 45 watts |
| **Outputs/Communication** | |
| Outputs | 1x galvanically isolated 4-20mA analog output per measured analyte<br>2x digital outputs for fault and SCS control<br>Optional: Modbus TCP/IP; RS-232; RS-485; Fieldbus; Profibus; HART; more |
| I/O Electronics | Voltage/Current Interface Module (i.e. I/O Board)<br>Data sheet: http://www.a-a-inc.com/documents/AA_DS205A_VCIM.pdf |




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