OMA-300
CEM System

Each decade, emissions regulations become more stringent. The enforced limits continue spreading to new pollutants, new jurisdictions, and—as recently as 2010—to new industrial sectors.

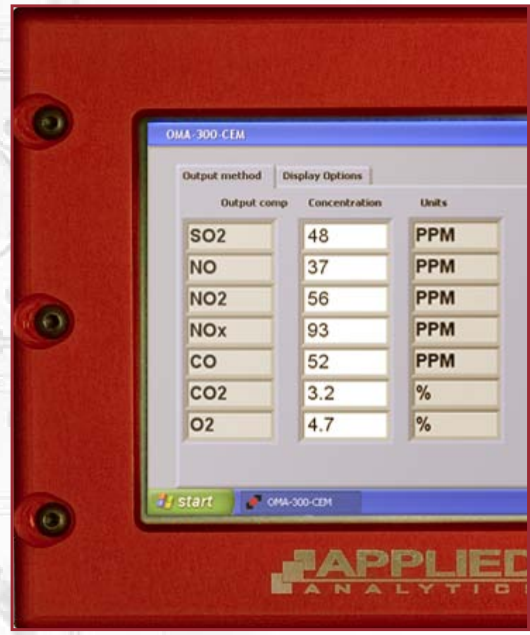
AAI technology is where the momentum of global industry and the safety of our environment get reconciled. The balance lies in effective emissions monitoring that matches the best available spectroscopic technology to each target species. The elegance of a reliable, well-integrated CEM solution simplifies every aspect of environmental compliance, from sustainable accuracy to automated data logging.

In a single coherent system, the powerhouse OMA-300 CEM unifies UV-VIS diode array (measuring SO_2, NO and NO_2), non-dispersive IR detection (measuring CO and CO_2), and tunable diode laser (measuring O_2). A centralized graphical interface governs the entire build, zeroing the instruments in unison and displaying the real-time concentrations of all monitored stream components. With uncompromising dynamic range, the OMA-300 CEM tracks analyte concentrations seamlessly from low ppm up to high percent values.

AAI continues to pave the road ahead of regulations. Our solid state systems provide the detection limits today that will carry your process beyond the pollution legislation of tomorrow.

UV-VIS Absorbance via Diode Array

(Monitors SO_2, NO, NO_2, total NO_X)*



The nova-II ultraviolet-visible spectrometer is the heart of the OMA series. Each of its 1,024 photodiodes continuously measures light intensity at a unique wavelength; together they produce flue gas absorbance spectra at ultra-fine wavelength resolution and in real time. The payload of diode array lies in unrivaled accuracy when monitoring multiple components with a single instrument.

The measurement technique treats sample absorbance like a composite image. Each individual species (SO_2, NO, and NO_2) contributes an unknown amount of its own distinctive absorbance structure based on its concentration in the stream. Solving for these unknowns is a matter of systemic over-determined regression, the classical set-of-equations taken to its logical limits. To achieve the best possible detection limits with the most robust background correction, these algorithms require broad-range, high-res spectral data; that's what the nova-II spectrometer delivers.

*Optional expansion to monitor H_2S, Cl_2, COS, and/or CS_2.

IR Absorbance via Non-Dispersive Sensor

(Monitors CO and CO_2)*

Due to their weak absorption in other regions, carbon monoxide and carbon dioxide are traditional infrared applications. In the OMA-300 CEM, two solid state IR photodetectors--one for CO, one for CO_2—measure absorbance in their respective flow cells using tungsten light passed through component-specific optical filters. These integrated units are modular versions of the standalone MCP-200.

*Optional expansion to monitor CH_4 and/or N_2O.

Oxygen Peak via Tunable Diode Laser

Diatomic oxygen has sharp, isolated absorbance peaks. With the inherent ability to emit high-intensity light at extremely precise wavelengths, laser technology is the obvious choice for monitoring oxygen concentrations in flue gas.

The VCSEL tunable diode laser built into the OMA-300 CEM is tuned to the exact wavelength coinciding with the R-branch of the absorption A-band of oxygen (763.43 nm). This sharp selectivity minimizes interference from other stream components, and automated tuning to and from the reference baseline keeps measurement free of drift. This integrated unit is a modular version of the standalone TDL-506.

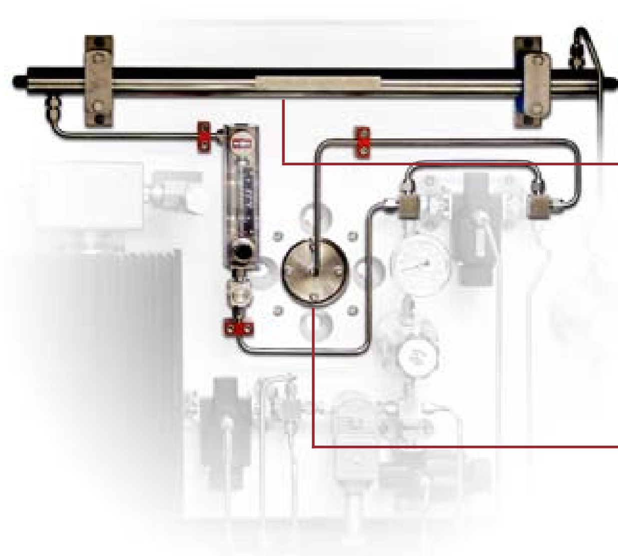
The Close-Coupled Sampling System

When it comes to sampling from flue gas streams, traditional cross-stack (in situ) and extractive methods each have their unique strengths and pitfalls. While in situ sampling bests extractive methods in response time and sample integrity, it falls far short of extraction in terms of measurement verification and ease of installation.

As a conceptual hybrid of these two methods, close-coupled sampling elegantly retains the advantages of both. The sample conditioning system (containing all flow cells and optics) is mounted directly on the stack. The sampling probe enters the stack through the weld neck, drawing a continuous sample by means of an enclosed aspirator.

	Cross-Stack	Extractive	Close-Coupled (OMA-300 CEM)
Response Time	Fast. In situ sampling inherently reduces measurement time.	Slow. Long sample lines = sample lag.	Fast. No sample lines; the measurement cells are housed in an enclosure mounted directly on stack.
Sample Integrity	High. No sample conditioning.	Relatively Low. Drying and dilution introduce significant measurement error.	High. Direct analysis of hot, wet sample inside mounted enclosure.
Span Checks and Zero Using Calibration Gases	Difficult or Impossible. The stack itself cannot be filled with calibration or zero gas, and all workarounds ultimately calibrate using non-representative path lengths.	Simple but Slow. Performed externally, but long sample lines increase procedure duration (and thus downtime).	Simple and Fast. Following a user-configured schedule, the system automatically introduces calibration or zero gas to the flow cells and runs a synchronous span check or zero across all instrumentation. The procedure is brief due to minimal sample transport.
Maintenance Regimen	Intensive. Aside from the difficulty of cleaning coated optics inside a stack, the instrumentation is also subject to heat and corrosion from the flue gas. Repairs often require total removal and thus downtime.	Intensive. Long sample lines suffer from cold spot plugging.	Mild. No sample lines to maintain; the optics are easily accessible in the mounted enclosure for monthly cleaning--a 60-second task. A shut-off valve allows for hot-tapping.

This example shows a typical close-coupled configuration, demonstrating the minimal sample route. Note: only the UV-VIS flow cell is shown here, but a complete CEM system also includes IR and TDL flow cells.



UV-VIS Absorbance Flow Cell. Here, the sample molecules interact with the light signal.

Stack Interface. The sample enters here directly from the sintered metal probe.

The OMA Advantage

Comprehensive CEM solution

Continuously monitors SO_2, NO_x, CO, CO_2, and O_2

Expandable Modular Design

Easily modified to monitor H_2S, Cl_2, COS, CS_2, and/or greenhouse gases such as CH_4 and N_2O

Integrates Complementary Spectroscopic Technologies

UV-VIS diode array, non-dispersive IR sensing, and tunable diode laser all working in tandem for the best possible detection limits

Excellent Dynamic Range

Seamless accuracy from low ppm up to high percent

Solid State Technology

More automation and less maintenance

No Sample Lines

Fast measurement response and no heat-tracing required

True NO_x Value

Combines separate measurements for NO and NO_2

Centralized Interface

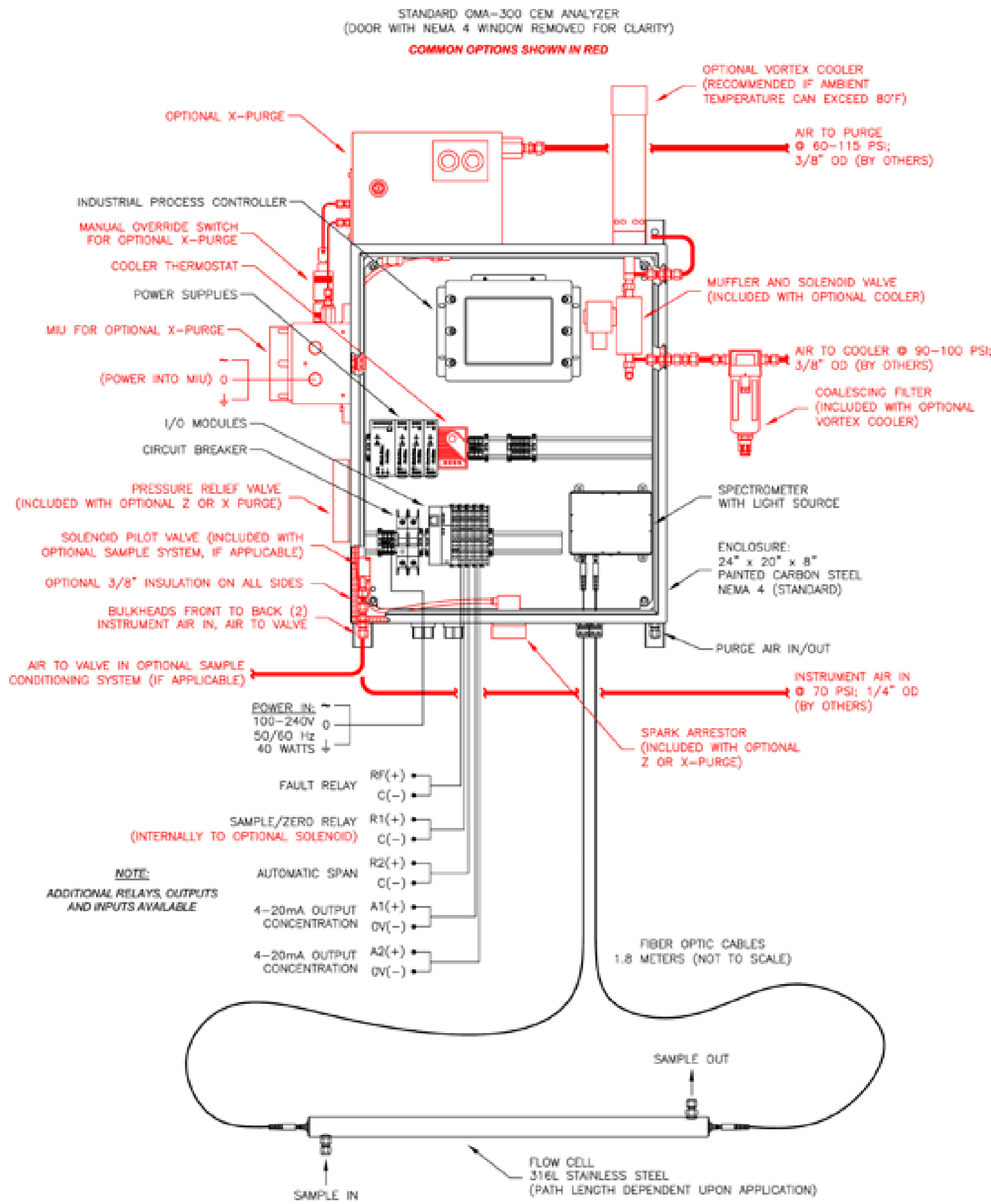
A touch-screen graphical display controls the complete system; optional ethernet connection allows for remote diagnostics

No Shelter Necessary

Rugged stainless steel enclosures

Automated Data Logging

Intuitive data saving allows back-up and easy recovery of missing emissions information



Note: this drawing depicts a basic CEM system for SO_2, NO, and NO_2. A complete CEM solution will incorporate additional modular technologies (see MCP-200 IR Analyzer and TDL-506 Oxygen Analyzer).

Requirements Met or Exceeded by OMA-300 CEM:

- ISO 10849, ISO 12039, and ISO 7935
- EPA requirements: Part 60, 63, 75, 266, 267, and 503
- European Large Combustion Plant Directive 2001/80/EC
- European Waste Incineration Directive 2000/76/EC
- European EN 14181 QAL1
- UK MCERTS
- And various other international standards

Specifications

Measurement Technology	Integrated sytem including: UV-VIS diode array spectrometer; non-dispersive IR detector; and tunable diode laser
Sample Introduction	Close-coupled sample conditioning system and probe

Components	Measurement Range	Accuracy	Repeatability
SO_2	20-1,000 ppm	±1% of measurement	±1.0%
NO_X	0-1,000 ppm	±1% of measurement	±1.0%
CO	0-500 ppm	±1% of measurement	±1.0%
CO_2	0-20 %	±1% of measurement	±1.0%
O_2	0-25 %	±1% of measurement	±1.0%

*Common measurement ranges are shown. Ranges will vary by application.

Response Time (T10 - T90)	10s
Zero Drift	±0.1 % after 1hr warm-up, measured over 24hrs at constant ambient temperature
Sensitivity	±0.1 % full scale
Calibration	Factory calibrated with certified calibration gases
Validation	Easy verification/validation with standard certified gas samples
Noise	0.004AU at 220 nm
Ambient Temperature	-20 to 50 °C (0 - 120 °F)
Instrument Air	70 psi (-40 °C dew point)
Environment	Indoor/Outdoor (no shelter required)
Wetted Materials	Stainless steel 316/316L
Outputs	One 4-20mA output per component (SO_2, NO_X, CO, CO_2, and O_2); modbus TCP/IP (op- tional); RS232 (optional); four digital outputs for fault and sampling system control (user programmable)
Electrical Requirements	100 to 240 VAC 47 to 63 Hz
Power Consumption	60 watts (minimum)
Area Classification	Class I, Div. 2 (optional) / Class I, Div. 1 (optional) / ATEX Exp II 2(2) GD (optional)

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