



OMA Process Analyzers

Continuously measure the chemicals in a liquid or gas process stream using the future of industrial process analytics: the OMA.

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What is the OMA?

The OMA is an industrial device which measures a high-resolution absorbance spectrum in a continuously drawn sample from a liquid or gas process stream. Harvesting this rich data, the OMA provides real-time analytics for the process stream, including chemical concentrations, purity, and color.

» What is Absorbance Spectroscopy?

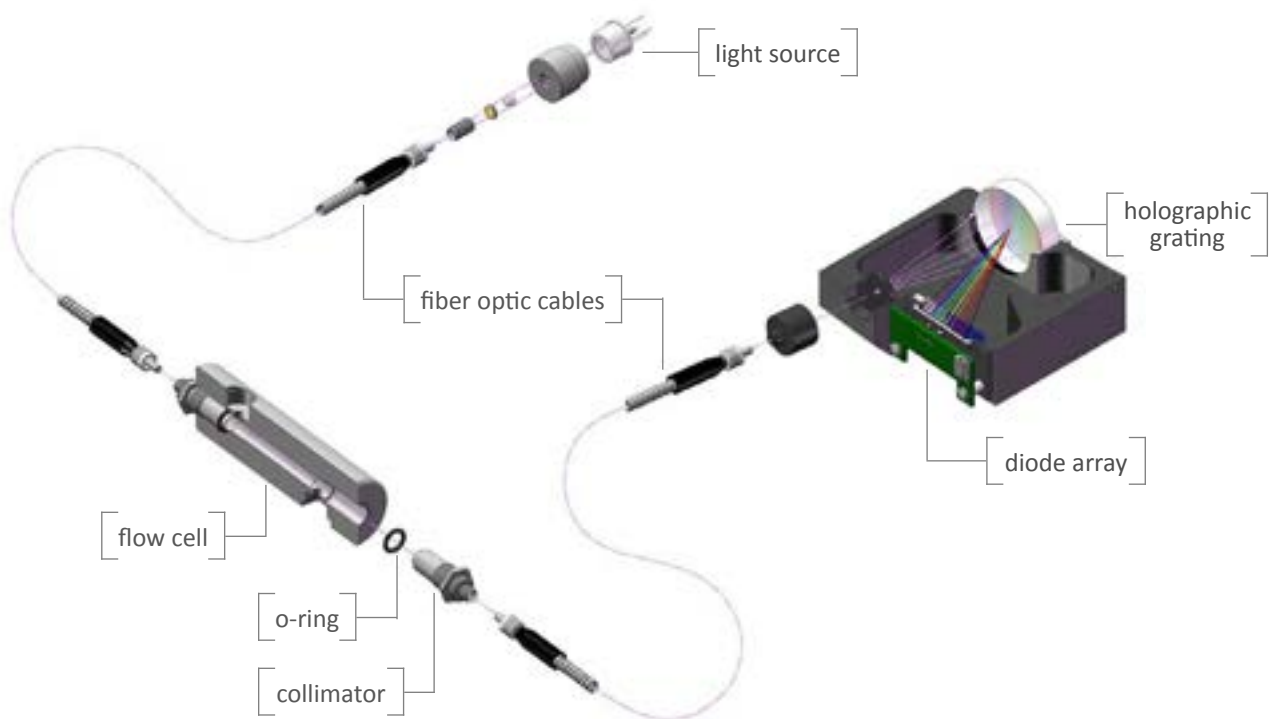
One of the ways in which light interacts with matter is *absorption*: a molecule absorbs specific wavelengths of radiation as a function of its unique electronic and molecular structures. The energies (wavelengths) of radiation that are absorbed match the energy quanta that are required to move that molecule between two quantum mechanical states. This is why each molecule absorbs radiation in a unique, recognizable way.

Absorption is quantified as *absorbance*, or the difference between intensity of the radiation entering the substance and the intensity of the radiation exiting the substance. Plotting the absorbance against wavelength creates an *absorbance spectrum*, which allows us to observe the shape (curve) of the absorbance. Each chemical species has a natural identifier in its absorbance curve that can be detected like a fingerprint.

According to Beer-Lambert law, the absorbance of a chemical in a mixture is directly proportional to its concentration. By measuring the height of a chemical's absorbance curve, an instrument can determine that chemical's concentration.

» OMA Principle of Operation

The optical assembly of the OMA is depicted below, illustrating the complete path of the signal.



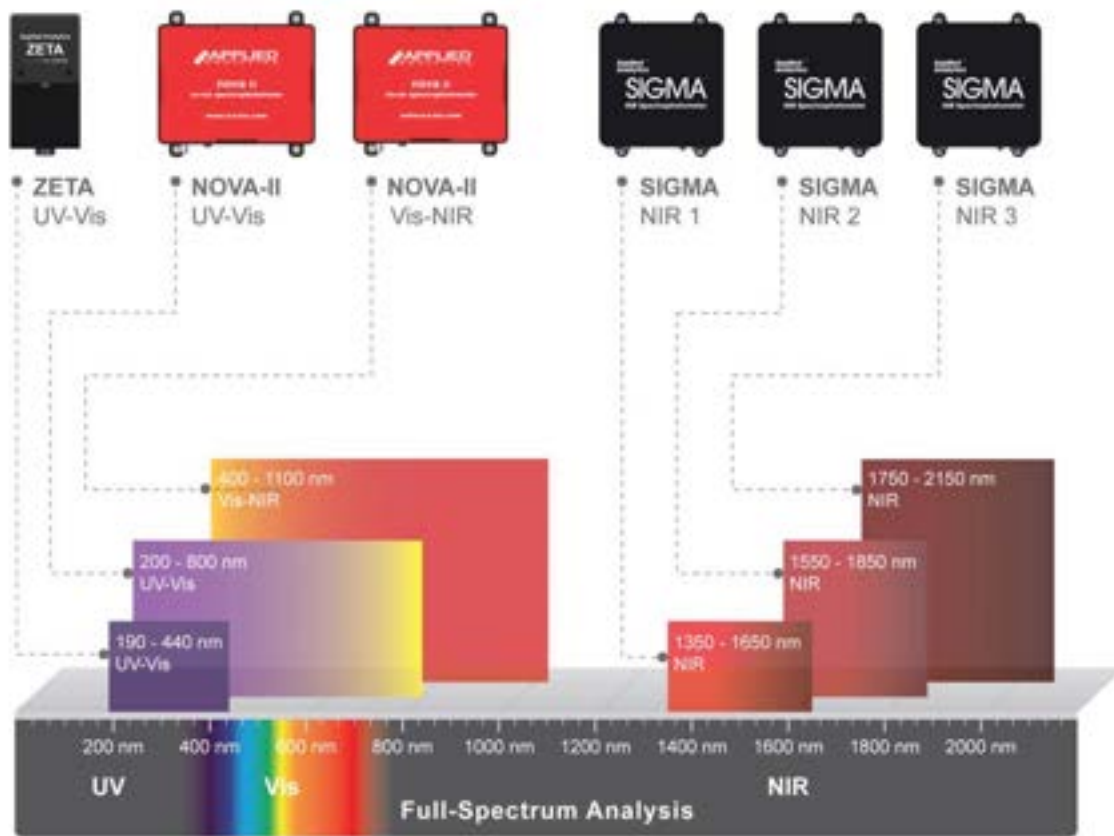
The signal originates in the light source and travels via fiber optic cable to the sample flow cell. Passing through the length of the flow cell, the signal picks up the absorbance imprint of the continuously drawn sample fluid.

Exiting the flow cell on the opposite end, the signal travels by fiber optic cable to the spectrophotometer, where a holographic grating separates the signal into its constituent wavelengths, focusing each wavelength onto a corresponding photodiode on a 1024-diode array. This is known as *dispersive* spectrophotometry.

» Spectral Range of the OMA

The OMA Series offer a variety of spectrophotometers to meet different measurement needs, including ZETA UV-Vis, NOVA-II UV-Vis, NOVA-II Vis-NIR and SIGMA NIR with three wavelength range options.

Wavelength Ranges of the OMA Series Spectrophotometers



Choose Your Measurements

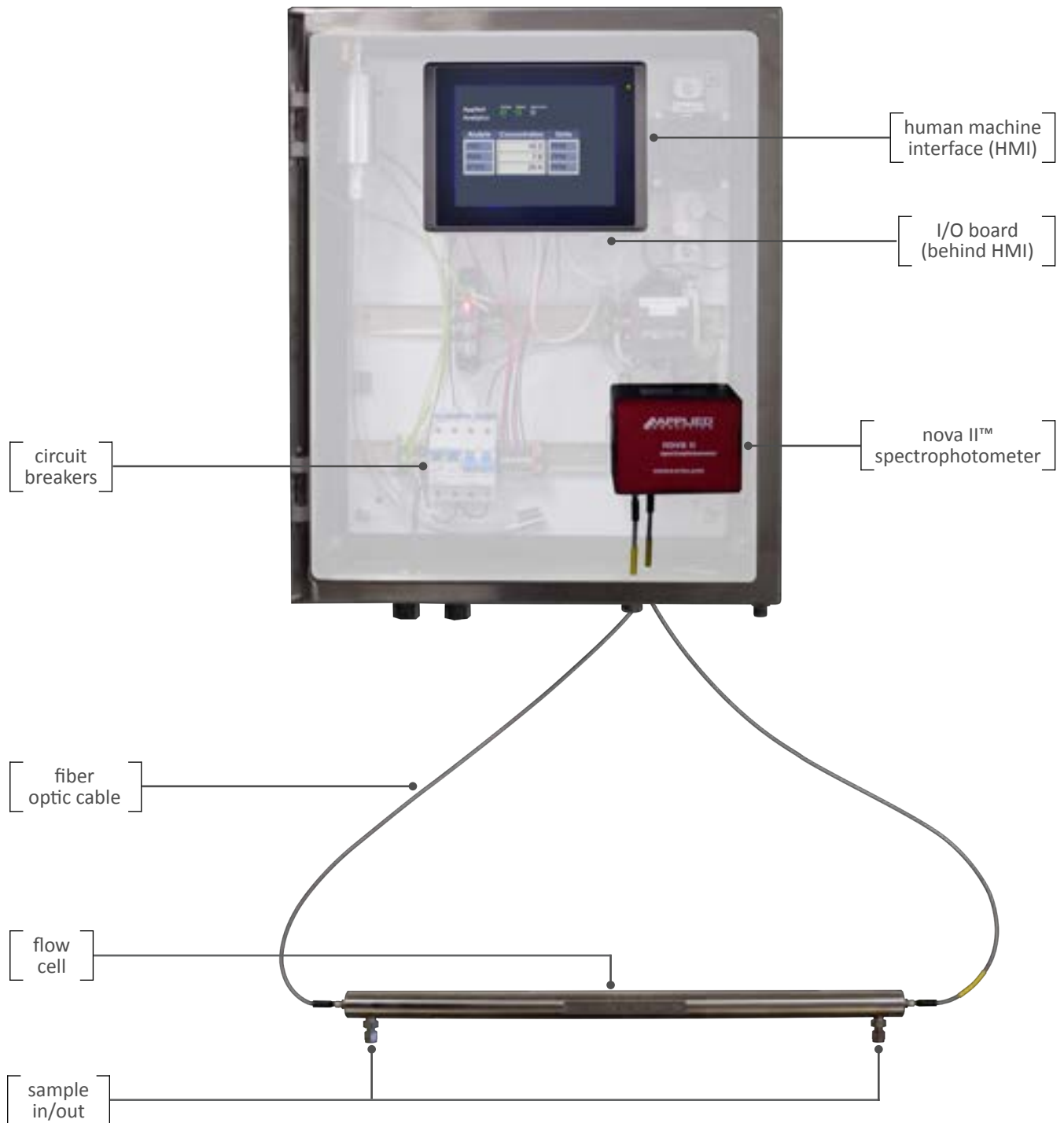
This system measures the concentration of any chemical that has an appreciable absorbance curve within the UV-Vis / SW-NIR spectral range, or any physical property that correlates to the measured absorbance spectrum.

» Common OMA Measurements

acrylonitrile	chromium ions	iron ions	styrene
ammonia	cobalt ions	hydroquinone monomethyl ether	sulfur
ammonium	color	mercury	sulfur dioxide
aromatic hydrocarbons	copper ions	metallocenes	4-tert-Butylcatechol (TBC)
arsenic	diesel	methanol	titanium tetrachloride
benzene	dimethyl sulfide	methyl mercaptan (MeSH)	transmittance
bisphenol A	ethanol	nitric oxide	toluene
bromine	ethylene glycol (MEG)	nitrogen dioxide	vanadium
BTX	ethyl mercaptan (EtSH)	nitrogen trichloride	vanadium oxytrichloride
1,3-butadiene	ferric chloride	NOx	xylene
caffeine	ferrous sulfate	odorants	
carbon disulfide	fluorine	olefins	
carbonyl sulfide	hydrogen peroxide	ozone	
chlorine	hydrogen sulfide	phenol	
chlorine dioxide	hypochlorite	pitch	

System Overview

Each version of the OMA uses the same basic components. These components are indicated below inside the model OMA-300 (door removed):



» Spectrophotometer

The heart of the OMA is the spectrophotometer. This device contains the light source as well as the detector which measures the absorbance spectrum.



ZETA
UV-Vis



NOVA-II
UV-Vis/Vis-NIR



SIGMA
NIR

» Human Machine Interface

The HMI controlling the spectrophotometer and communication provides a simple, touch-screen visual interface. Running our proprietary ECLIPSE software, the HMI offers the user several display choices (e.g. standard numeric display, trendgraph, bar graph).

From this interface, the user can quickly adjust settings like how frequently the Auto Zero is performed, the unit of concentration for each measurement, the analog output range, and much more.

» Flow Cell

The sample (gas or liquid) from the process stream continuously cycles through the flow cell via 1/4" Swagelok tube fittings. The standard flow cell is rated up to 3,000 psi / 150 °C and made from stainless steel 316L for corrosion-proof durability.

The path length of the flow cell is specified by our engineers to optimize the measurement for the expected concentration ranges of your analytes.



2 mm path



600 mm path

» Fiber Optic Cables

Our fibers are all manufactured in-house to ensure spectroscopic-grade quality. The stainless steel cladding provides proven durability in the field. Before shipment, each fiber is tested to ensure it meets transmission benchmarks, Exceptional UV light transmission is achieved through our presolarization technique.

The fibers connect to the flow cell through rugged steel collimators, and are thus not wetted to the sample fluid. Optional cooling extensions provide further protection from hot samples.

Choose Your Form Factor

The OMA Process Analyzer is available in three different models:



MODEL OMA-300 WALL-MOUNTED ANALYZER

Available in a variety of enclosure materials.



MODEL OMA-206P PORTABLE ANALYZER

A rugged copolymer suitcase enclosure.



MODEL OMA-406R RACKMOUNT ANALYZER

Designed for a standard 19" rack.

Customize Your OMA

» Explosion-Proof Your OMA

The OMA-300 is available in two explosion-proof formats:



Ex p Purged Enclosure (X/Z Purge)



Ex d Cast-Aluminum NEMA 4X Enclosure

» Integration Options

The OMA can be also be provided within a cabinet or freestanding structure for turnkey implementation:



» Integrated Measurements

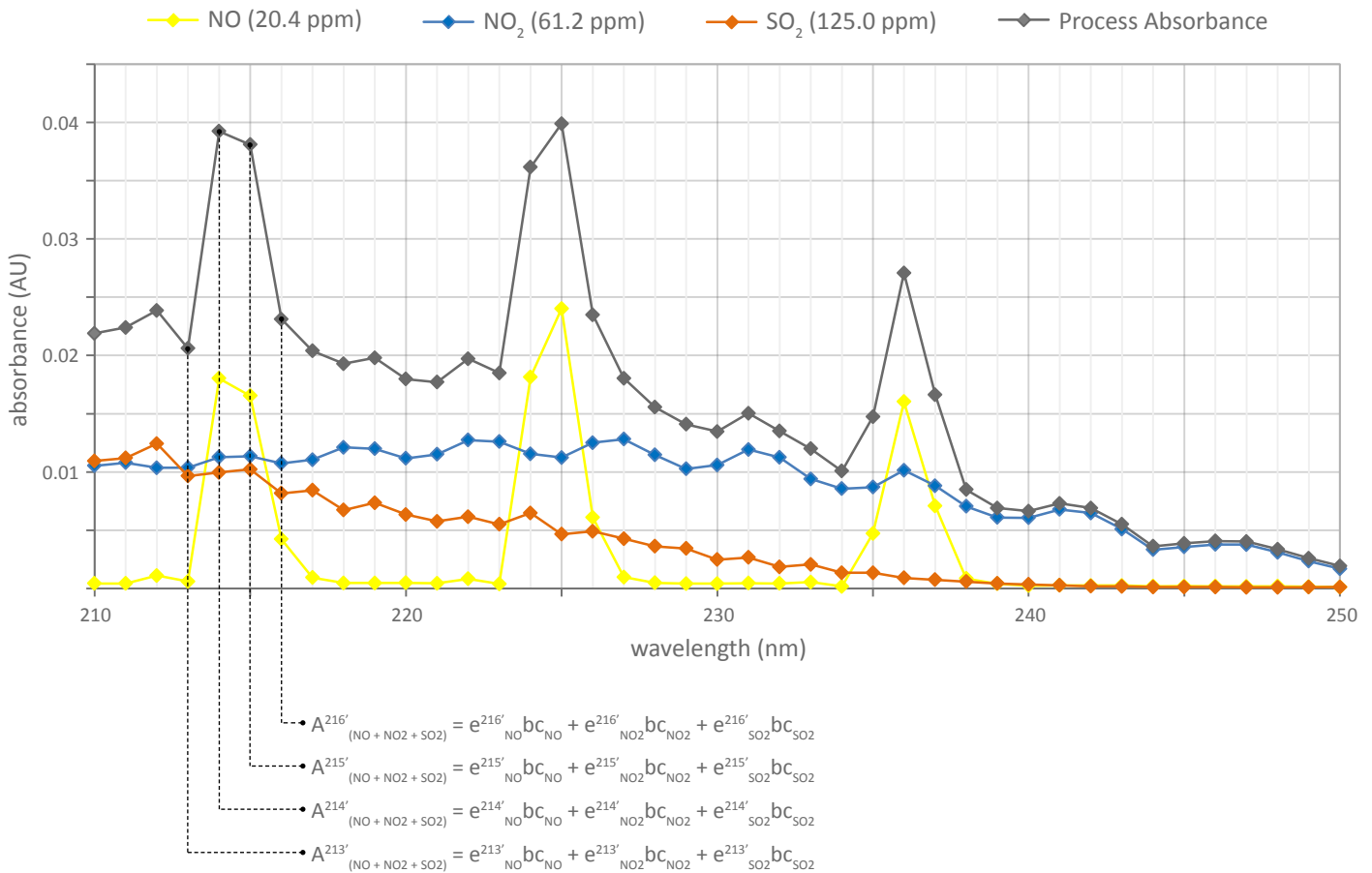
Some chemicals cannot be measured in the OMA's spectral range. However, these measurements can easily be implemented using MicroSpec modules, which integrate seamlessly into the OMA.



- carbon dioxide
- carbon monoxide
- ethylene
- methane
- water

Multi-Component Analysis

The ECLIPSE software is capable of measuring up to 5 chemical species simultaneously by de-convoluting the absorbance curve of each analyte from the total sample absorbance structure.



As illustrated above, each measurement wavelength contributes an equation to a matrix which is continuously solved by the ECLIPSE multi-component algorithm. Due to the resolution of the spectrophotometer, this procedure isolates the absorbance curves of the analytes with very high accuracy and is not susceptible to cross-interference.

Photometers that offer multi-component analysis will often use crude techniques like rotating “chopper” filter wheels or a group of line source lamps. These solutions implement moving parts that are prone to malfunction and multiple light sources that all require replacement, while delivering inferior accuracy.

Through the power of rich data, the OMA provides robust multi-species measurement using a solid state design and a single light source.

» Benefit Summary

- Measure up to 5 chemical species simultaneously with a single OMA
- Add or remove analytes at any time
- Full subtraction of background absorbance (for avoidance of false positives)

Sample Conditioning & Integration

OMA systems use flow cells rated for extreme temperature and pressure, while moisture is transparent to the UV signal. This allows us to build far simpler, more elegant sample conditioning systems that retain high sample integrity and optimal response time.

In our experience, applications can be similar but rarely identical. That is why we always work from the process realities to the drawing board, building custom sample conditioning for each project.

Our core competencies in sampling design include headspace sampling for opaque process streams, close-coupled systems for stack gas analysis, corrosion-proof systems, in situ probes, and stream multiplexing.



Headspace SCS
0-100 ppm H₂S in crude oil



Multiplexed SCS
0-20 ppm H₂S in 7 streams



Ultra-Corrosive Sample SCS
0-50% Cl₂ and 0-30% NCl₃



User Experience

The OMA only requires a one-time calibration during installation. Designed for long-term unattended operation, the system depends on Auto Zero to maintain measurement stability. Spanning is not required to meet performance specifications, but Auto Span is offered as an optional feature.

» Auto Zero

The OMA is self-maintained by periodically normalizing the spectrophotometer on a zero-absorbance fluid (e.g. nitrogen, air) in order to “zero” (i.e. blank) the analyzer. The ECLIPSE Auto Zero function automates this task by operating the SCS valves via relays to purge the flow cell with zero fluid and save a new zero spectrum. Auto Zero can be run on-demand or at a scheduled frequency.

In a typical usage profile, Auto Zero is set to run every 8 hours. The task requires approximately 120 seconds during which the measurement output is frozen. Under these settings, the OMA can provide *greater than 99.5% analyzer uptime*.



runtime display

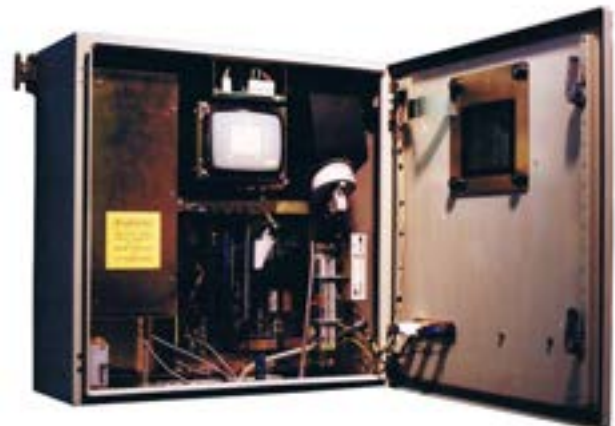


Auto Zero

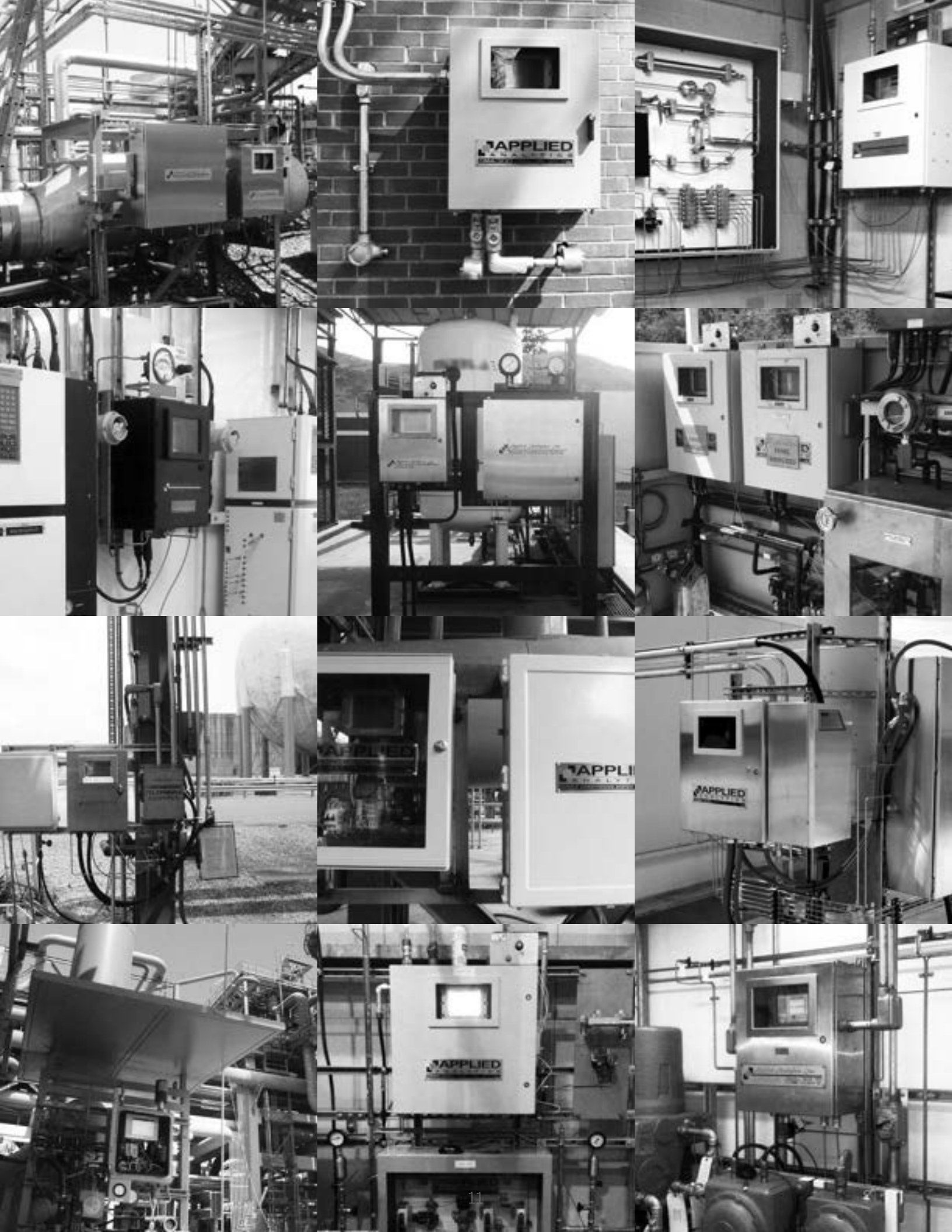
Evolution of OMA

The OMA process analyzer design was developed and first manufactured in 1993 with the conviction that dispersive UV-Vis spectroscopy was an ideal technology for online analysis of liquid/gas process streams.

Since then, the OMA series has been deployed for a vast array of applications across various industries. Due to the benefits of accurate multi-component analysis, wide dynamic range, and solid state reliability, this technology has steadily replaced the simple photometers of the past.



original OMA-300 design in 1993



Technical Specifications

Note: 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.

Subject to modifications. Specified product characteristics and technical data do not serve as guarantee declarations.

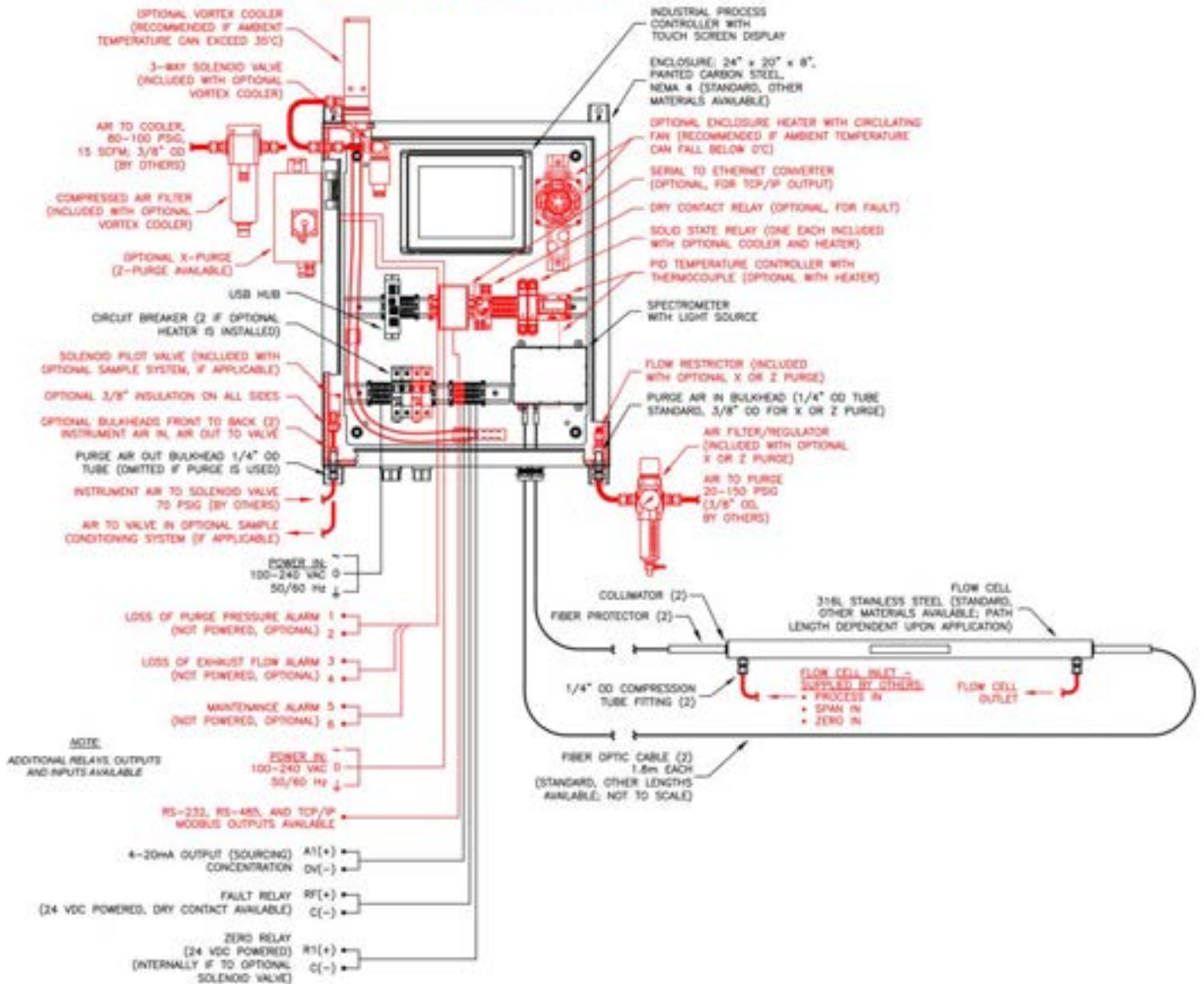
General			
Measurement Principle	Dispersive UV-Vis / SW-NIR absorbance spectrophotometry		
Detector	nova II™ diode array spectrophotometer		
Spectral Range	200-800 nm (UV-Vis model) or 400-1100 nm (SW-NIR model)		
Light Source	Standard: pulsed xenon lamp with average 5 year lifespan (dependent on application)		
Signal Transmission	Standard: 600 µm core 1.8 meter fiber optic cables		
Sample Phase	Gas or liquid		
Sample Introduction	Extractive: stainless steel 316L flow cell with application-dependent path length		
Sample Conditioning	Custom design if necessary		
Analyzer Calibration	If possible, analyzer is factory calibrated with certified calibration fluids; no re-calibration required after initial calibration; measurement normalized by Auto Zero		
Reading Verification	Simple verification with samples and self-check diagnostic		
Human Machine Interface	Industrial controller with touch-screen LCD display running ECLIPSE™ Software		
Data Storage	Solid State Drive		
Available Certifications	Standard: General Purpose Available Options: ATEX, IECEx, EAC, PESO <i>Please inquire with your sales representative for additional certifications (CSA, FM etc.).</i>		
Measuring Parameters			
Photometric Accuracy	±0.004 AU at 220 nm		
Response Time	1-5 seconds		
Sensitivity	±0.1 % full scale		
Sample Conditions			
Sample Temperature	Standard: -20 to 70 °C (-4 to 158 °F) Optional: up to 150 °C (302 °F) with cooling extensions Contact AAI for temperatures above 150 °C (302°F)		
Sample Pressure (max)	Using immersion probe: 100 bar (1470 psig) Using standard flow cell: 206 bar (3000 psi)		
Ambient Conditions			
Analyzer Environment	Indoor/Outdoor (no shelter required)		
Ambient Temperature	Standard: 0 to 35 °C (32 to 95 °F) Optional: -20 to 55 °C (-4 to 131 °F) <i>To avoid radiational heating, use of a sunshade is recommended for systems installed in direct sunlight.</i>		
Utility Requirements			
Electrical	85 to 264 VAC 47 to 63 Hz		
Power Consumption	45 watts		
Outputs/Communication			
1x galvanically isolated 4-20mA analog output per measured analyte (up to 3; additional available by upgrade) 2x digital outputs for fault and SCS control Optional: Modbus TCP/IP; RS-232; RS-485; Fieldbus; Profibus; HART; more			
Physical Specifications			
	Model OMA-300	Model OMA-206P	Model OMA-406R
Analyzer Enclosure	Standard: wall-mounted, carbon steel NEMA 4 enclosure	Ultra High Impact structural copolymer suitcase	Steel rackmount enclosure for standard 19" rack
Analyzer Dimensions	24" H x 20" W x 8" D (610 x 508 x 203 mm)	16.87" H x 20.62" W x 8.12" D (428 x 524 x 206 mm)	8.75" H x 19" W x 11.46" D (222 x 483 x 291 mm)
Analyzer Weight	32 lbs. (15 kg)	25 lbs. (11 kg)	30 lbs. (14 kg)
Wetted Materials	Standard: K7 glass, Viton, stainless steel 316L		

Model OMA-300 Technical Drawing

See data sheets for drawings of OMA-206P and OMA-406R.

STANDARD OMA-300 ANALYZER (DOOR WITH NEMA 4 WINDOW REMOVED FOR CLARITY)

COMMON OPTIONS SHOWN IN RED





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