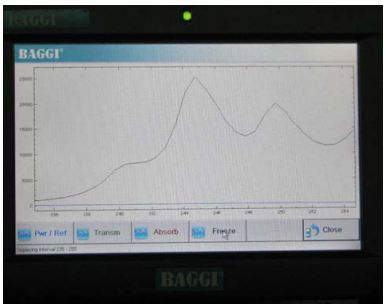
BAGGI®

SENSEVOLUTION®
Industrial measurement & analysis solutions

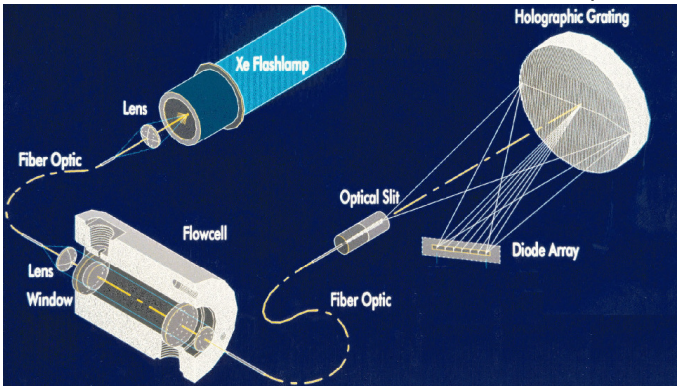
BASE BA-OW
Oil in Water Analyzer
(Spectrometry based)



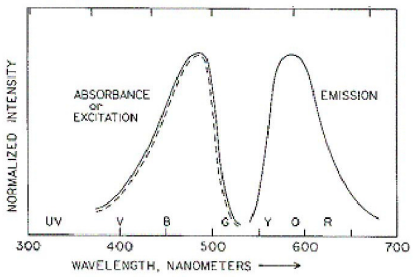
The BASE BA-OW is part of the **BAGGI BASE®** Instruments Series. They are the result of combining the latest state-of-the-art-technology with over 50 years of industry experience.
The BA-OW is a continuous on-line Oil in Water analyzer with the accuracy of PPMs (Part Per Million). It is based on quantitative spectroscopical techniques which allow for fast response, high accuracy and easy configuration. It integrates a high resolution spectroscope operating in the Visible/UltraViolet spectrum. According to the analytes in the sample, one of the following modes of analysis is offered:

- Measurement of the UV energy absorption at selected wavelengths
- Measurement of the fluorescence caused by the UV energy

In the first mode, the measurement technique relies on the Beer-Lambert law. This one is a relationship



that relates the absorption of electromagnetic waves energy to the properties of the material through which the waves are travelling. The material is introduced in a sample cell of specific optical path length. The UV energy is transmitted to the cell via an optical fiber cable, it passes through the cell space and the residual energy is transmitted to the measuring sensor by a second optical fiber. The wavelengths corresponding to the maximum absorption are typical of each analyte. The amount of the absorbed energy is a known function of the analyte(s) concentration. Please refer to the diagram.
The lamp emits broadband energy in the Visible and Ultraviolet spectrum: this energy traverses the measurement cell, where the liquid sample is flowing. The energy that has not been absorbed is split by the holographic grating into narrow band streams, each one of them detected by a dedicated photodiode.



In the second mode, the measurement technique relies on molecular fluorescence. Fluorescence occurs when a molecule absorbs electromagnetic energy, either ultraviolet or visible, and rapidly emits energy, at some longer wavelength. An example is depicted in the figure above. The wavelength distribution is characteristic of the analyte molecule, while the intensity of the emission (fluorescence) is correlated to the analyte concentration. In this case the second optical fiber, connected to the measuring sensor, collects the fluorescence light at 90° from the direction of the excitation light. In general, fluorescence measurements are more sensitive than absorbance based photometric measurements.

To compensate automatically for the presence of suspended particles (Turbidity), the BA-OW analyzer operates also as a Nephelometer. That is, it calculates the particle density by measuring the light reflected from the particles at specific wavelengths, using the same Xenon lamp and detectors described before. In this way, the Oil in Water reading is unaffected by turbidity. The value of turbidity can be displayed by means of the graphical user interface.

The use of measurements at auxiliary reference wavelengths allows also for the automatic compensation of cell window deposits and component aging.

BASE

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The whole system is controlled by an embedded computer running the BASE® application software. This computer is in charge of:

- Applying the appropriate timing to the energy emission
- Calculating the absorption/emission spectrum from the voltages detected by the photodiode array
- Calculating the turbidity value for automatic compensation
- Processing the algorithms to derive the analyte(s) concentration (Oil in Water) from the spectrum
- Archiving the results in CSV format
- Presenting a graphical user interface (GUI) to the Operator
- Performing the calibration procedure
- Generating the alarms and the warning indications (e.g. lamp replacement)

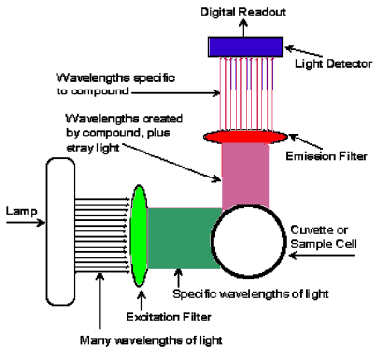
The BASE® Series embedded computer is the heart of the system; together with its circuitry, it acts as a PLC to operate the Oil in Water analyzer during normal operation, start-up, shut-down.
The figure shows an ATEX certified version, contained within a Stainless Steel 316L enclosure provided with a protective air purge system and a Vortex cooler (connected to the plant instrument air). The spectrophotometer is housed in the same enclosure. Magnetic push buttons allow controlling the system without opening the cabinet.
ATEX compliance:

- II 2 G Ex px II T6
- II 3 G Ex pz II T6

The computer is complemented by the sampling system, that typically comprises:

- A measurement cell
- A flow-meter
- An ultrasonic homogenizer (optional)
  it is used to disperse the suspended oil droplets so they can be measured accurately, typically when the oil concentration exceeds 20 ppm
- Piping for connecting the reference water
- The relevant valves and filters
- A pump for the reference water

If the sample water is very dirty, instead of flowing through a cell, the stream is allowed to fall through an open chamber where it is traversed by the UV light. In this way, the optics are not soiled.



When the ATEX certified version is delivered, all the actuators (valves and pump) in the sampling enclosure are operated pneumatically, no electrical components are present.
In this case, the only connections between the BASE® computer and the sampling enclosure are:

- The input and the output optical fibers.
- The instrument air pipes to operate the valves and the pump for switching between the sample and the reference water, under computer control.

When required, the sampling system can be used to monitor multiple streams via stream switching before entering the measurement cell. Accordingly, the test results may be sent to the related operator's location via the appropriate analog and digital external outputs.

In addition, the sampling system can be equipped with more than one measurement cell.
For instance, the cell for fluorescence measurement (refer to the figure at top of page) can coexist with a cell for absorption measurement.
This could be useful for performing extra measurements on the sample, e.g. H2S concentration.

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Maintenance is reduced to a minimum:

- The Xenon flash lamp (within the spectrophotometer) features a guaranteed lifetime of 10^9 flashes. The application software maintains a counter of the number of the flashes. When this counter exceeds 80% of the lifetime, a warning indication is generated by the computer.
- The water, in the measurement cell, is not in direct contact with the lenses, but is enclosed within two protective windows. These windows need to be cleaned once a year. The cell is made by separate sections that can be separated for cleaning the windows.

The computer performs a continuous check of the system.

The interface between the computer and the operator is provided by:

• The LCD touch screen which displays the status of the system, the results of the measurements and the menus for guiding the operator's input. The menus are password protected.
• The six functional keys, whose meaning is shown by the current menu

The interface between the system and the higher level operation center is provided at a minimum by:
• An analog output (4…20 mA) proportional to the measured oil concentration in water
• A digital output indicating the presence of a Fault in the system; if the computer itself fails, this indicator is automatically set up by a hard-wired watch dog timer.
• A digital output indicating a Pressure Loss in the analyzer enclosure (ATEX version)
Additional input/output signals are available, to be configured according to the application.

Specifications	
Range	0 – 100 ppm (higher values by sample dilution)
Accuracy - instrument	+/- 1% FS (due to optics, electronics, algorithms)
Accuracy - overall	Function of the sample representativeness and of instrument calibration; optimized by BAGGI either by in-field survey or by sample laboratory analysis
Response time	90% of final value in 10 sec.
Sample temperature	Up to 90°C / 194°F (according to the model)
Sample pressure	0.1 to 10 Bar
Sample cell	AISI 316, Monel, Inconel, Hastelloy (according to the application)
Power	90-264 VAC, 47-63 Hz; 6A max
External input/output	- Analog input: four inputs filtered with transient protection - Analog output: three isolated outputs, 4 – 20 mA (standard) - Analog output: three additional isolated outputs (optional) - Digital input: six digital inputs (optional) - Digital output: four isolated relay signals (alarm and warning) - Digital output: four additional relay signals (optional) - Serial line: RS-232/RS-422/RS-485 with Modbus/Profibus/FieldbusFoundationProtocol - Ethernet card: two 10/100 mbps with RJ-45 port - One integrated WiFi card 11 Mbit/s
Dimensions/Weight	- Wall Mount: 500mm H x 400mm W x 250mm D (19.68" H x 15.74" W x 9.84" D) - Weight: 15 Kg approx.
Environmental conditions	- 0 °C to 40 °C (32 °F to 104 °F) - 0 °C to 55 °C (32 °F to 131 °F) with vortex cooler
Enclosure protection	IP66
Compliances	- EN 61326, EN 61010-1 - ATEX (optional) II 2 G Ex px II T6 II 3 G Ex pz II T6

All the specifications subject to change without notice

For specific requirements, please contact the e-mail address below:
baggi@baggi.com

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