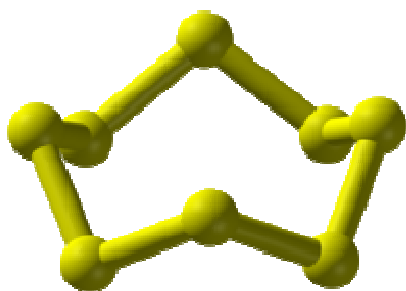


## BASE BA-SLFIC Online Sulfur In Crude Analyzer (UV spectroscopy method)



The BASE BA-SLFIC is part of the **BAGGI BASE®** Instrument Series. They are the result

of combining the latest state-of-the-art-technology with over 50 years of industry experience.

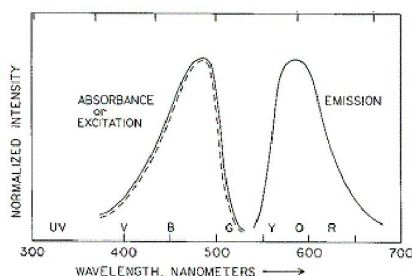
The BA-SLFIC is an online analyzer for continuous, reliable and accurate measurement of the concentration of sulfur in crude oil. It is available for operation in an explosive atmosphere (**ATEX**) environment. The sample flow is fed to a thermal oxidizer that generates a flow of gas. An Ultraviolet spectroscopy analyzer measures the *sulphur dioxide* (SO<sub>2</sub>) level in this flow with great precision. It is suited for ultra-low sulphur concentration monitoring.

Accurate measurement of sulfur is critical during the refining and processing of fuels and oils. For environmental reasons, and for its effect on quality, sulfur content in hydrocarbons is rigorously controlled by both national and international regulations. In addition, maximum levels for sulfur content in fuels continue to be made even stricter, thus analytical instrumentation today plays an even more important role than ever before.

The offered instrument is based upon oxidation of the Sulfur to SO<sub>2</sub> at 1000 °C, followed by Ultraviolet Fluorescence SO<sub>2</sub> measurement. This method is suitable for fluids up to a Final Boiling Point (FBP) of 450 °C. Reference is made to ASTM D5453 method for Total Sulfur in petroleum products.

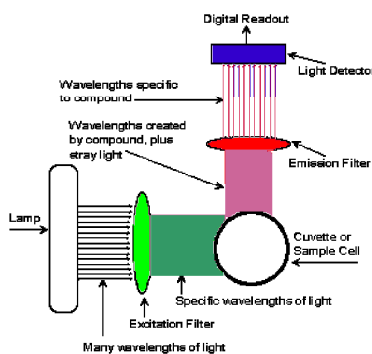
The fuel sample, introduced in the pyrolysis tube, is combusted with an excess of O<sub>2</sub>. As a result, the Sulfur compounds are converted into SO<sub>2</sub>. The combustion products pass into the optical measurement cell. The SO<sub>2</sub> is excited by an Ultraviolet light and consequently it emits a specific wavelength (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 here in the figure.

The wavelength distribution is characteristic of the analyte molecule, while the intensity of the emission (fluorescence) is correlated to the analyte concentration. The measuring sensor



collects the fluorescence light at 90° from the direction of the excitation UV light. In

general, fluorescent measurements are more sensitive than absorbance based photometric measurements. The figure shows the arrangement of the cell for fluorescence measurement.



The BASE® Series embedded computer is the heart of the system.

The computer collects the signals from the sensors and is in charge of:

- Controlling the pyrolysis process
- Calculating the salt concentration from the signals received by the fluorescence sensors
- Transmitting the concentration value over 4...20 analog mA signals
- Actuating the output relays for indicating possible alarms
- Displaying the measurement data in a Graphical User Interface (GUI)
- Archiving the measurement data in Microsoft Office compatible format
- Interfacing the human operator for system configuration and alarm reporting

This figure shows the computer display together with the six functional keys.

As outlined, the BA-SLFIC is a complete solution built to operate in a potentially explosive atmosphere, due to the possible presence of

gas. The ATEX protection is achieved by the pressurized enclosure method.

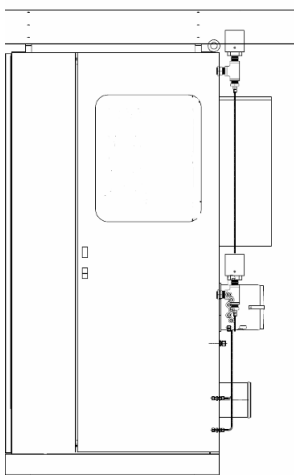
That is, all the devices that could be ignition sources are isolated within a pressurized enclosure filled with a protective gas (air or nitrogen).

The electrical signals and power are interconnected externally by means of appropriate junction boxes.

The related marking is typically the following:

**II 3 G Ex pz IIB T3 IP66**

Due to the physical characteristics of fuel oil, the BA-SLFIC is also in charge of heating the relevant pipes. Typically, the oil temperature is kept constant at 100 °C within the system. Of course, care is taken to maintain the electronic components at their correct working temperature. The cabinet containing the electronics is pressurized by instrument air, while the one containing the pyrolysis furnace is pressurized by nitrogen.



This drawing illustrates a typical cabinet front end configuration.

The window allows to visually check the BASE computer display.

The pipes are the exhaust vents for the nitrogen and the instrument air used to pressurize for ATEX protection.

From top to down, on the right side:

- the air conditioner (optional) to keep the internal temperature at 20 °C
- the protective pressure indicator
- a junction box

The inlets of nitrogen and instrument air, and the inlet/outlet of the process sample are in the back side.



The BA-SLFIC offers the following main advantages:

- No lead waste disposal problems (in comparison with the lead acetate tape method)
- No radioactive license required (in comparison with the X-ray transmission method)
- Very accurate measurements down to 250 ppb (Part Per Billion)
- Low maintenance: the Xenon flash lamp (UV source) features a guaranteed lifetime of 10<sup>9</sup> flashes

- Ease of use: the diagnostics are performed automatically by the BASE® computer and the operation is driven by a menu based graphical interface
- Remote diagnostics and remote operation capabilities
- The sample conditioning system can be designed according to Customer's requirements

Specifications	
<b>Measurement method</b>	Pyrolysis and Ultra Violet Fluorescence
<b>Method compliance</b>	ASTM D5453
<b>Range</b>	0 – thousands ppm
<b>Accuracy - instrument</b>	+/- 1% Full Scale
<b>Accuracy - overall</b>	Function of the sample representativeness and of instrument calibration; optimized by BAGGI either by in-field survey or by sample laboratory analysis
<b>Response time</b>	< 5 minutes
<b>Pyrolysis tube material</b>	Quartz
<b>Optical cell material</b>	316L Stainless Steel
<b>Power</b>	100 – 240 VAC 1500 W
<b>Analog outputs (4...20 mA)</b>	- Total Sulfur concentration
<b>Digital (relay) outputs</b>	- Fault - Enclosure pressure alarm - Enclosure temperature alarm - Pyrolysis temperature alarm
<b>Additional input/output (activated according to the software packages installed)</b>	- Analog input: four inputs filtered with transient protection - Analog output: two isolated outputs, 4 – 20 mA (standard) - Analog output: three additional isolated outputs (optional) - Digital input: six digital inputs (optional) - 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
<b>Services required</b>	- Instrument air (enclosure purging) - Nitrogen (enclosure purging) - Oxygen (pyrolysis combustion)
<b>Environmental conditions</b>	From - 25 °C to +50 °C
<b>Enclosure protection</b>	IP66
<b>Compliances</b>	- EN 61326, EN 61010-1 - ATEX II 3 G Ex pz IIB T3

All the specifications subject to change without notice

For specific requirements, please contact the e-mail address below:  
[baggi@baggi.com](mailto:baggi@baggi.com)

