

MIROR CO₂ Laser Analyser for Condensation Boilers

Today the domestic boilers are calibrated by adjusting the combustion air. MIROR provides a fast and reliable tool in boiler testing and calibration. MIROR is the fastest solution to measure the carbon dioxide concentration in exhaust gases, the main parameter to set the correct air-methane ratio.



The System

MIROR's measurement principle is based on Tunable Diode Laser Absorption Spectroscopy (TDLAS) method. The gas concentration is sensed by measuring the attenuation of a laser light from a tunable diode laser source that crosses the sample gas. For CO₂ sensing the laser wavelength is selected to match one of the characteristic absorption lines of CO₂ in the near infrared region (NIR).

Two version of MIROR are suitable, both with same performances, but different dimensions:

- the V.1 version has a horizontal 500 mm length pipe crossed by the laser beam
- the V.2 version is composed by a vertical pipe (100 mm diameter) crossed by the laser beam. The V.2 has reduced dimension compared to the V.1 version and uses a different laser.

Advantages

Direct installation: The MIROR is designed to be mounted directly upon the boiler in the testing line. The MIROR can be easily connected by a bellows to the exhaust pipe of boiler. No sampling or sample conditioning equipments are needed.

Low maintenance: The MIROR contains no moving part or sensitive components that are exposed to the measured gas. A heated system with flushing air provides long term cleanness of the optical windows and prevent condensation.

Long calibration interval: The calibration interval of the MIROR is more than 3 month and can be done with zero/span gases, directly injected through the main pipe with a specific connection.

User interface and embedded PC: The MIROR laser analyser is connected to an embedded PC-RACK that provides all the calculation, the power supply to the analyser, the analog outputs and shows the measurement/diagnostics to an LCD screen. The MIROR PC-RACK can run four MIROR LASER ANALYSERS simultaneously.

Water measurement and compensation: The results of combustion are two main gases: CO₂ and H₂O. In condensation boiler the amount of water can be extremely variable due to the thermal state of the heat exchanger; in this particular case, giving a dry measurement of CO₂ means sensing also the water. The water is measured by an innovative heated humidity sensor that prevents any condensation. MIROR is an in-situ analyser and doesn't need any sample conditioning equipments such as heated lines or refrigerators to remove water; it measures water directly and gives a fast-accurate dry measure. Due to the gas law, MIROR measures also the atmospheric pressure and the gas temperature.

Carbon monoxide measurement upgrade: MIROR CO UPGRADE is a complete carbon monoxide analyser directly integrable to the MIROR LASER ANALYSER. It is a built in extractive system with micro-pump and water removal filter, the analysis is electrochemical cell based.

The new electrochemical cell provides long term stability and two years of lifetime without any changes in the performances.



Benefits

- Fast CO₂ measurement:
 - tunable diode laser absorption spectroscopy method
 - in situ mounting
 - no need for sample conditioning equipment
- Specifically designed for condensation boilers
- Low maintenance
 - heated window with flushing air to ensure windows cleanness
 - easy to clean extractable windows
- Long calibration interval
- Water measurement
- CO measurement upgradeable.

Technical Features

Performances

Measurement Range CO ₂	0 – 20 (%CO ₂)
Accuracy	±0,2 (%CO ₂)
Resolution	0,01 (%CO ₂)
Linearity	<0,05 (%CO ₂) [<lt;0,25% full="" of="" scale="" td="" value]<=""> </lt;0,25%>
Response time	T90 = 2 sec
Temperature dependence over T range	<0,5% of full scale value per 10°C change

Compensations:

Measurement Range of Temperature	0 – 100°C
Accuracy of Temperature	<0,5% of full scale value

Measurement Range of Pressure	800 – 1100 mBar
Accuracy of Pressure	1% of full scale value

Measurement Range of Water	0 -20 (%H ₂ O)
Accuracy of Water	±0,5 (%H ₂ O)

Operating environment

Exhaust gas conditions	
Temperature Range	20 – 80 °C (measured in the boiler sample point)
Water Range	0 – 20 (%H ₂ O)
Ambient Temperature Range	+15 to +45 °C
Storage Temperature Range	-20 to 70°C

Input and output

Power Supply	220V, 50Hz
Power Consumption MIROR – LASER ANALYSER	60 VA
Power Consumption MIROR – PC RACK	60 VA
Analog out	4 – 20 mA (per component: CO ₂ , CO)

Mechanics

Dimension	
MIROR V.1	910 x 210 x170 mm (WxDxH)
MIROR V.2	510 x 210 x130 mm (WxDxH)
Minimum distance from boiler	400 mm
Analyser weight V.1	15 Kg
Analyser weight V.2	9 Kg
Housing classification	IP 54