Fast Response BTU Analyzer

COSA 9610

cosa+xentaur

APPLICATIONS

- Turbine Control
- Flare Stack Control
- Fuel Optimization
- Gas Blending
- Custody Transfer

FEATURES

- High accuracy
- Fast Response
- Large Measurement Range
- Measures Low BTU Gases
- Low Maintenance
- Flameless/No Flameouts
- Measures Wobbe and CARI
- Hazardous Area Approved
- No Special Enclosure Required for Outdoor Use

The COSA 9610 Provides a Fast and Accurate Measurement of Wobbe Index,

Heating Value and Combustion Air Requirement Index (CARI)

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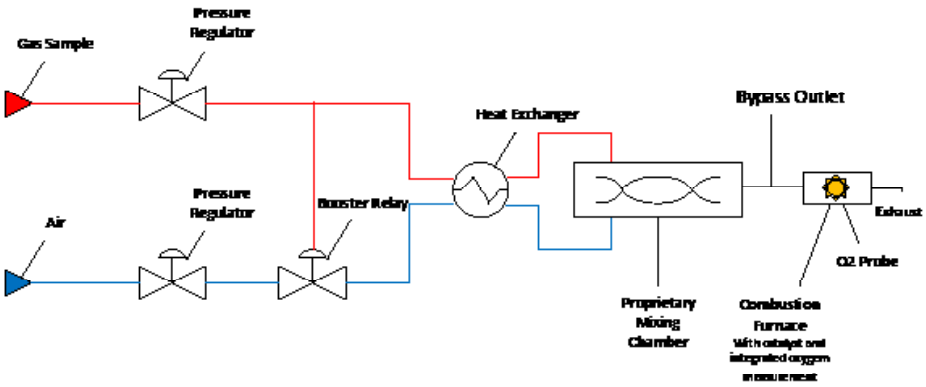
MEASUREMENT PRINCIPLE (RESIDUAL OXYGEN MEASUREMENT)

The COSA 9610 BTU Analyzer's measuring principle is based on the analysis of the oxygen content in the exhaust gas after controlled catalytic combustion of the sample. A continuous gas sample is mixed with dry air at a precisely maintained constant ratio, which depends on the BTU range of the gas to be measured. The fuel air mixture is oxidized in a combustion furnace in the presence of a catalyst at high temperature°C, and the oxygen concentration of the combusted sample is measured by a zirconia oxide cell. The residual oxygen provides an accurate measurement for the Combustion Air Requirement Index of the sample gas, which can be directly correlated accurately to the Wobbe Index of the gas.



Pressure and temperature of gas sample and instrument air are equalized by means of pre-regulators, a dual chamber pressure exchange membrane regulator (booster relays) and a heat exchanger. The two streams then pass through precision orifices operating at super-critical stage through a proprietary low volume area mixing chamber. Orifice sizes are selected based on desired BTU range, precisely maintain a constant fuel-air ratio. The air-gas mixture then enters a combustion chamber where the fuel is oxidized at high temperatures in the presence of a catalyst. A zirconia oxide cell measures the residual oxygen concentration.

ADVANTAGES

Key advantages of this method are its insensitivity to changes in ambient temperature, a very fast response with the ability to measure gases with BTU values down to zero and the measurement of the Combustion Air Requirement Index besides Wobbe Index and Heating Value.

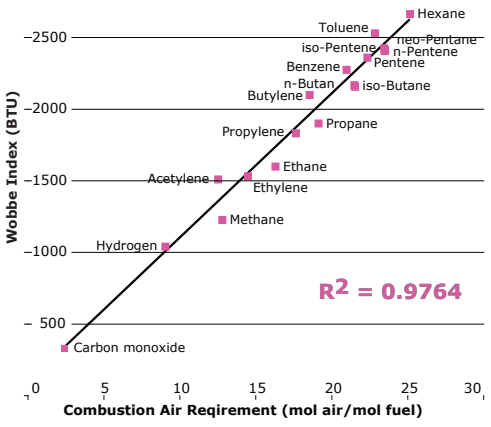
WOBBE INDEX VS. COMBUSTION AIR REQUIREMENT INDEX

The COSA 9610 provides a direct measurement of the Combustion Air Requirement Index (CARI) of a fuel, which is ideally suited for the precise control of the fuel-air ratio of a combustion process.

In applications where the amount of energy introduced to the burner is to be controlled, the Wobbe Index can be precisely correlated to the CARI and differences between the two measurements can be cancelled out by the use of suitable calibration gases. In natural gas applications the instrument accuracy of the COSA 9610 in terms of Wobbe Index is better than ±0.4% of reading.

Correlation Between Wobbe Index and Combustion Air Requirement

	Combustion Air Requirement (mol/mol)	Wobbe Index (BTU)
CARBON MONOXIDE (CO)	2.427	326.9
HYDROGEN (H_2)	9.048	1041
ACETYLENE (C_2H_2)	12.52	1509.1
METHANE (CH_4)	12.787	1226.1
ETHYLENE (C_2H_4)	14.475	1532
ETHANE (C_2H_6)	16.292	1599.1
PROPYLENE (C_3H_6)	17.638	1830.7
BUTYLENE (C_4H_4)	18.541	2098.8
PROPANE (C_3H_8)	19.126	1899.5
BENZENE (C_6H_6)	20.966	2275.2
N-BUTANE (n-C_4H_{10})	21.487	2167.7
ISO-BUTANE (i-C_4H_{10})	21.527	2156.9
PENTENE (C_5H_{10})	22.34	2360
TOLUENE (C_7H_8)	22.839	2528.6
N-PENTANE (n-C_5H_{10})	23.45	2425.2
NEO-PENTANE (neo-C_5H_{10})	23.48	2406.4
ISO-PENTANE (i-C_5H_{10})	23.509	2413.2
HEXANE (C_6H_{14})	25.161	2663.6



The table and graph above show the relationship of Wobbe Index and the Stochiometric Dry Air Requirement for some typical gas constituents. The correlation is close to linear (R^2=0.9767) with an intercept close to zero. The residual oxygen method takes advantage of this correlation by linear extrapolation between measurements of known calibration gases. R^2 for typical natural gas constituents plus hydrogen and CO is 0.9888.

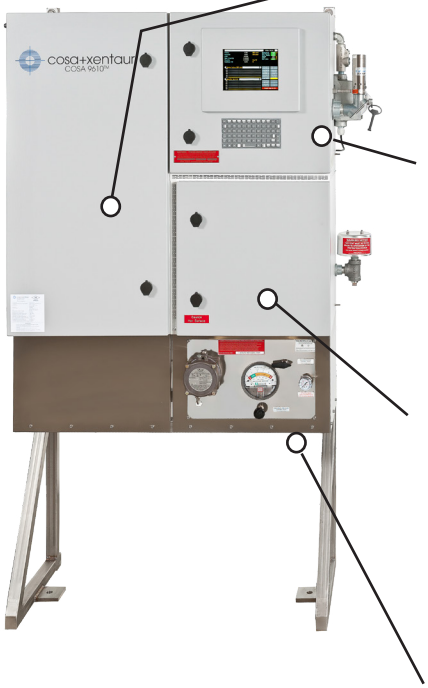
The stability, accuracy speed of response and reliability of the residual oxygen measurement represent significant advantages over traditional flame calorimeters and more than compensate for the small theoretical error in calculating Wobbe. It should be noted, that other calorimeters including flame type are not primary standards either, and they also depend on the use of suitable calibration gases.

HEATING VALUE

For applications requiring the measurement of the Heating Value, a precision specific gravity cell with an accuracy of ±0.1% of reading is integrated into the COSA 9610, and the processor computes the heating value. In applications, where the fuel-air ratio is to be optimized based on the CARI, the measurement of specific gravity is not required.

ANALYZER CONSTRUCTION

The COSA 9610 is housed in a painted stainless steel NEMA4x (IP66) cabinet with the dimensions 41" x 41" x 16" suitable for outdoor installations without additional temperature controlled shelter. For extreme climate conditions, the standard operating temperature range of the COSA 9610 can be extended with the addition of a cabinet heater and/or vortex cooler. The cabinet is suitable for wall mounting or rack mounting. A rack is optionally available.
The analyzer cabinet has three compartments: the gas mixing compartment, the combustion furnace compartment and the electronics compartments.



The gas mixing compartment contains sample conditioning and the gas mixing system. The gas mixing compartment is heated to avoid condensation of heavier gas constituents. All electrical components in the sample compartments are hazardous area rated.

The electronics compartment contains the industrial PC based controller, which performs all instrument control functions and calculations. Measurement output is available visually on the LCD display as well as through various analog & digital protocols. The display interface allows the user to define the parameter display as well as the engineering units in both numerical & graphical formats. CV, Wobbe , ..., O2 content as well as othe variables can be displayed.

The combustion furnace compartment contains the combustion furnace with the zirconia oxide sensor. The exhaust gas is vented and drained.

The electronics compartment and combustion furnace compartment can optionally be purged for any hazardous area certification.

The purge panel is mounted at the underside of the enclosure.

MAINTENANCE

The COSA 9610 has no moving parts and consequently, maintenance requirements are low. With the use of proper sample conditioning, the COSA 9610 can operate unattended for several months. All compartments are easily accessible through separate doors on the front side of the enclosure.

CERTIFICATIONS

•FM + FMC, IECEX, CCOE, GOSTR & ATEX Certifications Available

SPECIFICATIONS

Analyzer Performance

Model:	COSA 9610
Sample gas:	Natural gas, fuel gas, refinery gases, biogas etc.
Ranges	Wobbe Index: 0-2730 BTU/SCF, span 1150 BTU/SCF (selectable) CARI Index: 0-20, span 0-10)
Accuracy (Wobbe):	±0.4% of reading for natural gas ±2.0% of reading for refinery gases with large variations of constituents and BTU values
Repeatability	±0.7 BTU/SCF
Drift	0.4 BTU/SCF/24 hours
Response time	T90 < 5 sec Wobbe only T90 ≥ 10sec with *Density cell

**Streaming option for<5 seconds*

Ambient temperature	:Standard: 10-40º C Extended range: -40°C to +50°C
Outputs	2 x isolated 4-20mA, with programmable span Backlit LCD screen Malfunction relay
Specific Gravity (optional) Range:	0 -3
Accuracy:	±0.0001g/cc

Utilities:

Power supply	110 VAC, 50/60 Hz or 220 VAC/50 Hz
Power consumption	430 VA maximum
Instrument air	20 SCFH (analyzer) at 42 PSIG 40 SCFH (z-purge) at 80 PSIG
Sample	2 SCFH at 28 PSIG

Installation:

Mounting	Rack Mounted
Dimensions	40.82" x 40.82" x 16.33" (1000 x 1000 x 400 mm)
Weight	110 lbs (50 kg)
Certifications	COSA 9610 A Ex ib px II T3 Gb Ta=+5°C to 45°C, IP66 Ex II 2G FM11ATEX0006X IECEX , GOSTR, FM+FMC, ATEX

DIMENSIONS

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