

OXYGEN ANALYSER "CARBON SENSOR" MOD.4153CP



- Direct insertion into the process
- Excellent stability
- No calibration required
- Easy mounting
- Very fast response time
- Low maintenance cost

Operating Principle

Oxygen measuring concentration in the atmosphere of a metal treatment furnace allows through well-known thermodynamic relations, the measuring of carbon potential

$p(C)$ even when traditional analysis systems (Dew point and CO_2) are no longer reliable parameters.

The percentage of the dissolved carbon on the surface (% in weight or mole) is a function of:

$p(C\%) = f(\%C_{SAT}, T(K), p(CO), E(V))$ where:

$\%C_{SAT}$ = Percentage of saturated carbon

$T(K)$ = Operating temperature in Kelvin

$p(CO)$ = C_{CO} partial pressure into an endothermic gas

$E(V)$ = Probe Vdc output

The magnitude of the probe voltage $E(V)$ is dependent on the oxygen concentration in the reference gas (air) and in the atmosphere to analyser according to the following equation:

$$E = \frac{RT}{4F} \ln \frac{pO_2'}{pO_2''}$$

where:

E = Probe Vdc output

R = Perfect gas constant (8,314 joule⁻¹ mole⁻¹)

F = Faraday constant (96487 coulomb g equiv.⁻¹)

pO_2' = Oxygen partial pressure in the gas reference (usually air 20,95% O_2)

pO_2'' = Oxygen partial pressure in the gas to analyser

T = Operating temperature of the electrochemical cell (in Kelvin)

At constant temperature and reference partial pressure of oxygen, the e.m.f. of the electrochemical cell is function of the only oxygen partial pressure of the gas to analyser

F.E.R. probe model 4143 CP is equipped with a zirconia yttria stabilized cell long as the probe itself, without any sealing of different materials thus giving an absolute impervious division of the atmosphere from the reference air.

The cell is equipped with thick electrodes. The external tube made in stainless steel allows a maximum working temperature of 1150 °C.

The probe is equipped, with .Type K or S thermocouple

It is possible to send to the outside electrode a small quantity of air or other gas to permit the burning of the possible carbon deposition.

Technical Specifications

- Accuracy: $\pm 0,05\%$ in weight carbon within operating range.
- Output: 1000 - 1200 mV in the normal operating range.
- Response time: Less than 5 seconds.
- Operating temperature: Probe: 600 -1150 °C. Head of the probe: Less than 150 °C.
- Reference air: Dry and clean air: 50-100cc/minute.
- Scavenging air: 2-3 liters/minute (clean and dry air). To be sent at intervals with variable frequency in function of the deposited carbon quantity.
- Thermocouple: Type K or S
- Dimensions: Length mm. 500 and 650
- Diameter external tube: mm. 27.
- Connection to process: 1" NPT M

The probe should be connected with an instrument (controlling or recording device) having an input impedance of 8 M Ω or higher.

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