ORBISPHERE TC SENSOR

Selective gas measurement

Benefits

- Continuous CO_2, N_2, or H_2 measurements in gas phase or dissolved in a liquid.
- Selective measurement, result unaffected by the presence of other gases.
- Fast response time to improve plant productivity.
- No sample preparation needed, gas concentration measured directly in the sample.
- Compact design for easy insertion into a process line or a flow chamber.
- Robust construction to handle harsh plant conditions and high sample pressures.
- High temperature resistance to withstand cleaning in place (CIP).
- Annual maintenance and traceable calibration, quick and easy to carry out for a minimum down time.

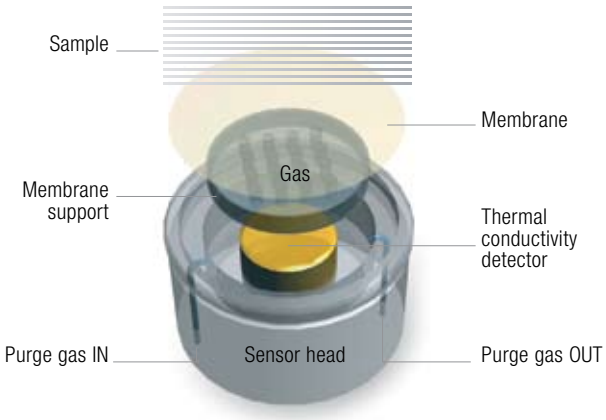
Principle of measurement

The ORBISPHERE patented Thermal Conductivity sensor has been developed to give continuous CO_2, N_2, or H_2 measurements in gas phase or dissolved in a liquid.

The measuring technique is a combination of a gas diffusion membrane and a solid-state gas thermal conductivity detector.

A micro volume enclosed between a semi-permeable membrane and a thermal conductivity detector is periodically flushed with a purge gas. After each purge, the gas to be measured diffuses from the sample through the membrane, changing the thermal conductivity of the gas surrounding the detector.

A change in thermal conductivity modifies the detector resistivity. This is measured, together with temperature, to calculate the gas concentration.



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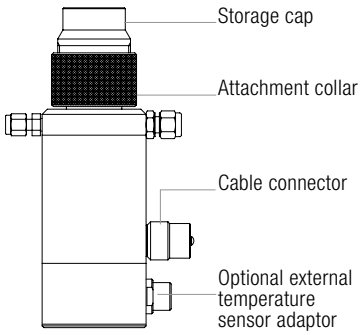
Specifications of in-line ORBISPHERE TC Sensors

Sensor model[1]	314xx for CO_2	315xx for N_2	312xx for H_2	312xx for H_2	312xx for H_2
Applications	In-line beverage	In-line beverage Semiconductor process UPW: immersion lithography, Functional water	Waste gas off gas, and reactor coolant	Trace level	Reactor coolant
Sample					
Temperature range	0 to 50 °C	0 to 50 °C	0 to 50 °C	0 to 50 °C	0 to 50 °C
Pressure[2] range at 25 °C	0 to 20 bar	0 to 20 bar	0 to 20 bar	0 to 20 bar	0 to 20 bar
Flow rate[3]	100 ml/min	300 ml/min	220 ml/min	250 ml/min	200 ml/min
Linear flow rate[4]	50 cm/sec	150 cm/sec	N/A	N/A	N/A
Measurement					
Range at 25 °C	0-10 bar, or 0-15 g/kg, or 0-7 V/V	0-20 bar, or 0-350 ppm, or 0-300 ml/l	0-2 ppm, or 0-25 cc/kg, or 0-1.5 bar	0-1000 ppb, or 0-10 cc/kg, or 0-0.5 bar	0-10 ppm, or 0-120 cc/kg, or 0-6 bar
Accuracy[5], the greater of	± 1% of reading, or ± 8 mbar, or ± 0.012 g/kg, or ± 0.006 V/V	± 2% of reading, or ± 15 mbar, or ± 0.3 ppm, or ± 0.25 ml/l	± 1% of reading, or ± 2 ppb, or ± 0.03 cc/kg, or ± 1.5 mbar	± 1% of reading, or ± 1 ppb, or ± 0.01 cc/kg, or ± 0.6 mbar	± 1% of reading, or ± 8 ppb, or ± 0.1 cc/kg, or ± 6 mbar
Accuracy[6], the greater of	± 2% of reading, or ± 14 mbar, or ± 0.048 g/kg, or ± 0.02 V/V	± 4% of reading, or ± 34 mbar, or ± 1 ppm, or ± 0.8 ml/l	± 3% of reading, or ± 15 ppb, or ± 0.18 cc/kg, or ± 6 mbar	± 3% of reading, or ± 3 ppb, or ± 0.03 cc/kg, or ± 2 mbar	± 3% of reading, or ± 60 ppb, or ± 0.6 cc/kg, or ± 20 mbar
Cycle time	22 sec	22 sec	17 sec	12 sec	17 sec
Recommended purge gas	Pure N_2 or air	Pure CO_2	Pure N_2 or air	Pure N_2 or air	Pure N_2 or air
Recommended calibration gas	Pure CO_2	Pure N_2	Pure H_2	10% H_2, 90% N_2	Pure H_2
Signal drift (per year)	< 1% of reading	< 2% of reading	< 1% of reading	< 1% of reading	< 1% of reading
Membrane					
Model	29561A	29561A	29561A	29562A	2952A
Thickness	25 µm	25 µm	25 µm	25 µm	25 µm
Material	PFA	PFA	PFA	Silicone rubber/ Polycarbonate	ETFE
Radiation dose limit	10^5 rad	10^5 rad	10^5 rad	10^7 rad	10^8 rad

Certifications	EN 61326:1997/A1:1998/A2:2001/A3:2003 following directive 89/336/CE
Weight	0.95 kg
Maximum distance to analyzer	50 m



1 Sensor models
31x50 Standard TC sensor
31x60 TC sensor with external temperature sensor adaptor

2 Sample pressure up to 170 bar for 312xxHP and 315xxHP

3 Recommended, through model 32001 flow chamber

4 Recommended, past model 29501 sensor socket

5 Sample temperature 20-50 °C, within ± 5 °C of calibration temperature

6 Sample temperature 0-50 °C, independent of calibration temperature

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