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Orbisphere Hydrogen Sensors

Applications
- Power

Accurately monitor hydrogen in your power production process

Thermal Conductivity Sensor



Hydrogen measurement in hydrogen cooled generators

- Allows stability of high hydrogen purity to keep the generator at its highest efficiency
- Reduces risks of hydrogen leaks and unplanned outages
- Minimizes downtime during generator maintenance
- Improves operator and plant safety
- Reliable hydrogen sensing technology reducing risks of false alarms

Analysis of waste or off gas hydrogen in nuclear power plants

- Reliable gas analysis reduces possibility of unscheduled outages
- Self-contained, pre-tested sampling systems for simplified installation
- System detects and corrects potential explosive conditions

Dissolved hydrogen analysis in reactor coolant systems (RSC in PWR or HWC in BWR)

- In-process measurement minimizes personnel radiation exposure
- Continuous on-line analysis of RCS dissolved gas levels provides real-time process control
- Unique hydrogen measurement method yields high accuracy, requires virtually no service

Electrochemical Sensor



Measurement of dissolved hydrogen as a determination of corrosion rate in power plants

- Accurate dissolved hydrogen measurement down to 0.03 ppb assures the ability to detect corrosion
- Fast response enables data to be gathered quickly and easily
- Process or portable configurations available for any application

HACH®
Be Right™

Technical Data*

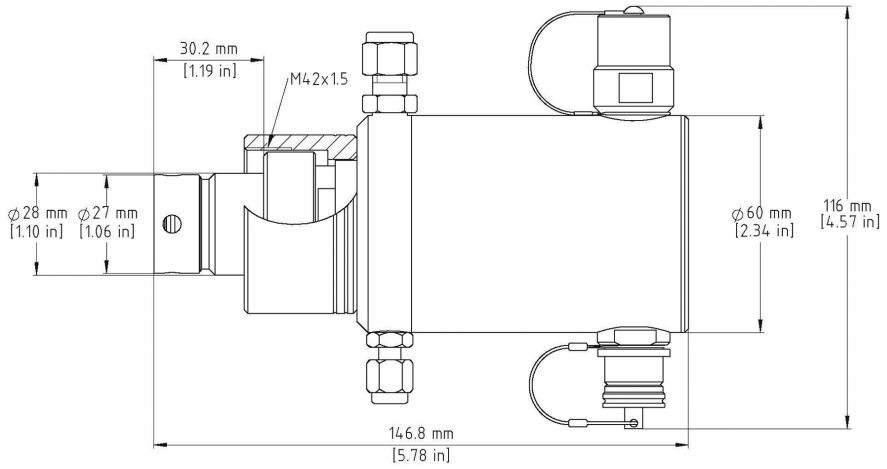
Thermal Conductivity Sensor			
Sensor Model	**Orbisphere 31290 Sensors (or previous generation 31250 and 31260 sensors)**		
Applications	**Waste gas (PWR), off gas (BWR), and reactor water (HWC)**	**Reactor coolant (PWR)**	**High H_2 level**
Membrane			
Model	29561A	2952A	2935A
Thickness Membrane	25 µm	25 µm	25 µm
Material	PFA	ETFE	ECTFE (Halar)
Radiation Dose Limits	10^5 rad	10^8 rad	10^8 rad
Sample			
Temperature Range	0 to 50 °C		
Pressure Range at 25 °C	0 to 20 bar / up to 170 bar for 312xxHP		
Flow Rate[1]	220 mL/min	200 mL/min	100 mL/min
Measurement			
Range at 25 °C	0 to 2 ppm, or 0 to 25 cc/kg, or 0 to 1.5 bar	0 to 10 ppm, or 0 to 120 cc/kg, or 0 to 6 bar	0 to 20 ppm, or 0 to 220 cc/kg, or 0 to 12 bar
Accuracy, the greater of (Sample temperature 20 to 50 °C, within ±5 °C of calibration temperature)	±1% of reading, or ±2 ppb, or ±0.03 cc/kg, or ±1.5 bar	±1% of reading, or ±8 ppb, or ±0.1 cc/kg, or ±6 mbar	±1% of reading, or ±25 ppb, or ±0.4 cc/kg, or ±20 mbar
Accuracy, the greater of (Sample temperature 0 to 50 °C, independent of calibration temperature)	±3% of reading, or ±15 ppb, or ±0.18 cc/kg, or ±6 mbar	±3% of reading, or ±60 ppb, or ±0.6 cc/kg, or ±20 mbar	±3% of reading, or ±150 ppb, or ±2.5 cc/kg, or ±50 mbar
Cycle Time	17 s		
Recommended Purge Gas	Pure N_2 or air		
Recommended Calibration Gas	Pure H_2		
Signal Drift (per year)	<1% of reading		
Certifications	2004/108/EC - EN 61326-1		
Weight	2.09 lbs. (0.95 kg)		
Maximum Distance to Analyzer	50 m		

[1]Recommeded, through model 32001 flow chamber

**Subject to change without notice.*

Dimensions

In millimeters (inches).



Technical Data*

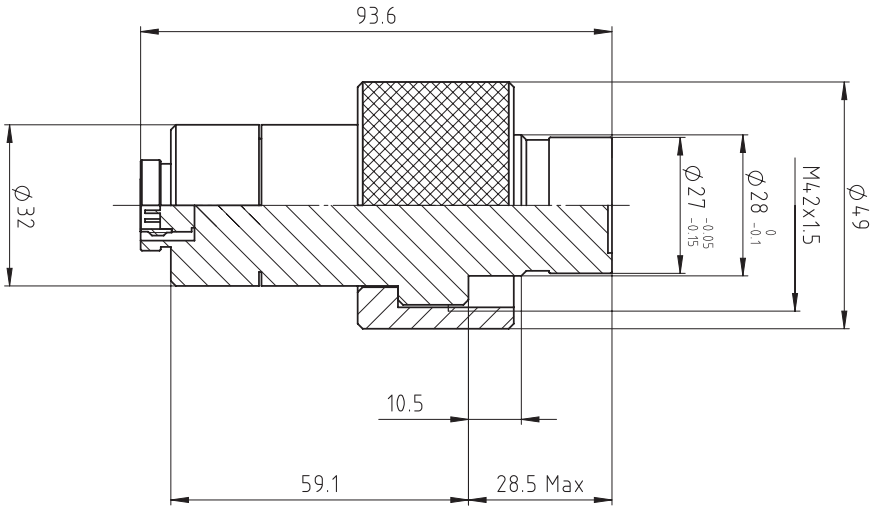
Electrochemical Sensor				
Sensor Model	**Orbisphere 31210.12 / 31230.01 / 31240.01**			
Applications	**Corrosion rate**			
Membrane				
Model	2956A	2952A	2995A	29015A
Thickness Membrane	25 µm	25 µm	12.5 µm	23 µm
Material	PFA	ETFE	Tedlar®	Saran
Radiation Dose Limits	2 x 10^4 rad	10^8 rad	10^8 rad	N/A rad
Sample				
Temperature Range	-5 to 100 °C			
Temperature Compensation Range	0 to 50 °C	0 to 50 °C	10 to 45 °C	10 to 45 °C
Response Time[1]	2 s	5 s	6 s	50 s
Pressure Range at 25 °C	0 to 50 bar / up to 200 bar for 31240.01			
Recommended Liquid Flow Rate[2]	50 to 220 mL/min	40 to 200 mL/min	20 to 70 mL/min	20 to 40 mL/min
Recommended Min. Linear Flow Rate[2]	200 cm/s	150 cm/s	50 cm/s	30 cm/s
Recommended Gaseous Flow Rate[2]	0.005 to 3 L/min			
Measurement	**Trace measurement**	**Low concentration**	**Average concentration**	**High concentration**
Dissolved Measuring Range	0 to 75 ppb	0 to 300 ppb	0 to 3200 ppb	0 ppb to 32 ppm
Gaseous Measuring Range	0 Pa to 5 kPa	0 Pa to 20 kPa	0 Pa to 200 kPa	0 to 2000 kPa
Accuracy, the greater of	±1% of reading, or ±0.03 ppb, or ±1 Pa	±1% of reading, or ±0.09 ppb, or ±6 Pa	±1% of reading, or ±1 ppb, or ±50 Pa	±1% of reading, or ±10 ppb, or ±1 kPa
Expected Current in Pure Gas	150 µA	50 µA	5 µA	0.5 µA
Calibration Gas	1% pure H_2	10% pure H_2	100% pure H_2	100% pure H_2
Certifications	IP68 / NEMA4			
Weight	140 to 700 grams, depending on the construction material			
Maximum Distance to Analyzer	Up to 1000 m, 50 m if model 28117 pressure sensor is used			

[1]Response time at 25 °C for a 90% signal change; [2]Liquid flow through an Orbisphere 32001 flow chamber, with protection cap and no grid

**Subject to change without notice.*

Dimensions

In millimeters (inches).



Order Information

Hydrogen Thermal Conductivity Sensor (max. pressure rating)

31290TC Standard hydrogen TC sensor with external temperature sensor adapter, with nitrogen purge and protection cap (20 bar)

31290HP High pressure hydrogen TC sensor with external temperature sensor adapter, with nitrogen purge and protection cap 29108 (170 bar)

Hydrogen Thermal Conductivity Accessories

32739 Maintenance Kit for high pressure hydrogen TC sensor. Includes membranes 29561A, membrane holding ring 29228.01, kit 29082, and tools for sensor maintenance.

32741 Maintenance Kit for hydrogen TC sensors with 29108 protection cap. Includes membranes 2952A, membrane holding ring 29228.01, kit 29082, and tools for sensor maintenance.

32605 Safety purge backup unit for Orbisphere TC sensors

32559.0 External temperature sensor for off-line use, supplied with 4 pin LEMO connector for TC sensors equipped with sensor adapter 32558. T piece for connection to 6 mm tubing included.

32559.1 External temperature sensor for off-line use, supplied with 4 pin LEMO connector for TC sensors equipped with sensor adapter 32558. T piece for connection to ¼" tubing included.

32505.XX Cable to connect 31xxx sensors to Orbisphere 410/510 controllers. XX = 01, 03, 05, 10, 15, 20, or 25 m length

Hydrogen Electrochemical Sensor (max. pressure rating)

31210.12 Hydrogen EC sensor, PEEK, guard ring: platinum, o-ring: FKM/FPM (20 bar)

31230.01 Hydrogen EC sensor, stainless steel, guard ring: platinum, o-ring: EPDM (100 bar)

31240.01 High pressure hydrogen EC sensor, stainless steel, guard ring: platinum, o-ring: EPDM (200 bar)

Hydrogen Electrochemical Accessories

29010 Electrolyte for H_2 sensor (50 mL)

29011 Chloridizing solution for H_2 sensor (50 mL)

29781 Polishing kit for O_3 and H_2 sensors, incl. 3 µm powder (29331) and cloth

3272X Recharge kit for hydrogen electrochemical sensors (with X=0 for menbrane 2952A, X=1 for membrane 29015A, X=2 for membrane 2956A, X=3 for membrane 2995A)

32301.A Electrochemical sensor cleaning and regeneration unit, 115 VAC

32301.B Electrochemical sensor cleaning and regeneration unit, 230 VAC

Common Hydrogen Sensors Accessories

28117GP Pressure sensor, 0 to 5 bar absolute (for gas phase applications)

28117.C Pressure sensor, 0 to 1 bar absolute (for gas phase applications)

29006.0 EPDM O-rings for flow chamber/sensor socket 28x2 and 32x2 mm

Flow chambers

32001.010 Flow chamber in stainless steel (316) with 6 mm fittings. Supplied with EPDM O-rings.

32001.011 Flow chamber in stainless steel (316) with ¼" fittings. Supplied with EPDM O-rings.

32002.010 Multi parameter flow chamber in stainless steel with 6 mm fittings. Supplied with EPDM O-rings.

32002.011 Multi-parameter flow chamber in stainless steel with ¼" fittings. Supplied with EPDM O-rings.

32006 Flow chamber in stainless steel (316) for use with for model 28117 and 28117.C pressure sensors

DOC053.53.35026.Jan22

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