CENTORR Vacuum Industries
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SERIES O2 – Oxygen Monitors and Inert Gas Purifiers

Description

For many materials processing applications, controlled composition atmospheres are mandatory. In both research and production, undesired impurities at even very low concentrations can cause serious materials processing problems, as typical oxygen levels found in bottled inert gas can be as high as 5 to 10 ppm. Other contaminants include water vapor and Carbon. These Oxygen Monitors and Inert Gas Purifiers help overcome these issues and are designed for both laboratory size and full production use.

Key Features – OXYGEN MONITOR

- Solid State ZrO2 Sensor
- Detects O2 levels from 1x10-15 to 2x105 ppm O2
- Rapid Sensor Response
- Adjustable Alarm Output
- Integrated vacuum pump draws sample from gas stream
- Digital LED Display of O2 levels

Key Features – OXYGEN MONITORS / INERT GAS PURIFIERS

- Purifier with an Integral Oxygen Monitor
- Produces gas purities of better than 1x10-6 at high flow rates
- Applicable with all noble gases (Ar, He, Xe, Ne), and Nitrogen
- Alarm with adjustable setpoint, electrical relay, audible and visible indication when setpoint is exceeded.
- Solid State Control System
- Integrated vacuum pump draws sample from gas stream
- Linear voltage output from sensor can be monitored via 15 pin 'D' connector and used for furnace interlocks or alarms.

Principles of Operation – Oxygen Sensor

A voltaic cell of the concentration type is used to measure the oxygen concentration in the gas stream being monitored. The voltaic cell is a solid electrolyte composed of stabilized Zirconium Dioxide (ZrO2). At elevated temperatures (800°C) the mobility of oxygen in the ZrO2 cell is high. This allows oxygen ions to migrate through the solid electrolyte when driven by differences in the oxygen concentrations. The migration of oxygen results in a voltage difference between the two electrodes. The magnitude of the voltage difference increases as the ratio of the oxygen concentration inside and outside the cell is increased.

The concentration of oxygen in air establishes the potential for the reference electrode. The voltage difference increases as the sample gas decreases in oxygen content. A high impedance electronic circuit continuously monitors the voltage present at the solid electrolyte. The signal is then translated into parts per million (ppm) and displayed on the digital monitor.

The ZrO2 solid electrolyte has proven to be the most reliable oxygen sensor available with much greater useful life and dependability than other less expensive monitors available. The response of the sensor does not change over years of usage therefore recalibration of the sensor is not required.

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Principles of Operation – Inert Gas Purifiers

The purification process of inert gases (ie – Ar and He), takes place by reacting the gaseous impurities present in the gas stream with an active metal. This method of impurity removal is commonly called gettering. The gettering charge consists of high purity titanium or copper contained in a vacuum tight stainless steel canister. When an inert gas, such as argon or helium, is allowed to flow through hot titanium, oxygen, nitrogen, carbon, and water vapor impurities are removed. Tests utilizing an oxygen analyzer have shown that it is possible to purify argon having 2-10 ppm of initial impurities to less than 1x10-10 ppm O2 and Nitrogen gas down to 1x10-6ppm. Although no comparable test method exists for carbon, its equilibrium pressures over titanium is correspondingly low and is removed quantitatively. A gettering charge of 90 grams, such as is used in the Model 2A or 2G will purify between 250 and 300 tanks of argon gas (approx. 2.8 million liters or 100,000 cu ft.) containing a 10 ppm O2 initial impurity level.

Product Specifications

Style	**O_2 Monitor Only**	**O_2 Monitor/Purifier**		**Inert Gas Purifier Only**		
Model	2D	2A-100-SS-120 2A-100-SS-220	2H-200-SS-220	2B-20-Q-120 2B-20-Q-220	2G-100-SS-120 2G-100-SS-220	2F-200-SS-220
Weight	13.75 lbs (6.25 kg)	58 lbs (26.3 kg)	100 lbs (45.4 kg)	15 lbs (6.8kg)	58 lbs (26.3 kg)	100 lbs (45.4 kg)
Dimensions (wxhxd)	11-1/16"x8-3/8"x11" (281x213x279 mm)	21"x13"x22" (530x330x560mm)	20.75"x15.75"x18.5" (527x400x470mm)	8.5"x9.5"x13" (220x240x330mm)	21"x13"x22" (530x330x560mm)	20.75"x15.75"x18.5" (527x400x470mm)
Electrical Utility	120 or 220 ±10% VAC 50 oρ 60 Hz Single Phase		220 ±10% VAC 50 or 60 Hz Single Phase	120 or 220 ±10% VAC 50 or 60 Hz Single Phase		220 ±10% VAC 50 or 60 Hz Single Phase
Power	300 Watts	1.4 KWatt		600 Watts	1.4 KWatt	2.8 KWatt
Gas Inlet Connection	1/4" (6.4 mm) Stainless steel Swagelock™ Compression fitting					
Oxygen Sensor	Zirconium Dioxide	Zirconium Dioxide				
O_2 Monitoring Range†	$1x10^{-15}$ to $2x10^5$ ppm O_2	$1x10^{-15}$ to $2x10^5$ ppm O_2				
O_2 Alarm Range	$1x10^{-15}$ to $2x10^5$ ppm O_2	$1x10^{-15}$ to $2x10^5$ ppm O_2				
Response Time	≤ 50 sec from $1x10^{-15}$ to $2x10^5$ ppm O_2					
Sample Flow Rate *	0.8 - 1.0 slpm (1.8 - 2.4 scfh)	0.9 slpm (2 scfh)	0.9 slpm (2 scfh)			
Inert Gas Purifiers						
Furnace Temperature	800°C (1472°F)	600-800°C (1112-1472°F)		600-800°C (1112-1472°F)		
Gettered Gas Purity		Better than $1x10^{-6}$ ppm		Better than $1x10^{-6}$ ppm		
Gas Flow (Charge) Argon (Titanium) Helium (Titanium) Nitrogen (Copper) Oxygen (Platinum)		 40 slpm (85 scfh) 120 slpm (254 scfh) 30 slpm (64 scfh) 30 slpm (64 scfh)	 70 slpm (158 scfh) 210 slpm (445scfh) 50 slpm (106 scfh) 50 slpm (106 scfh)	 10 slpm (21 scfh) 30 slpm (64 scfh) 7.5 slpm (16 scfh) 7.5 slpm (16 scfh)	 40 slpm (85 scfh) 120 slpm (254 scfh) 30 slpm (64 scfh) 30 slpm (64 scfh)	 70 slpm (158 scfh) 210 slpm (445 scfh) 50 slpm (106 scfh) 50 slpm (106 scfh)
Max. Inlet Pressure ‡		73 psig (500kPa)	73 psig (500kPa)	73 psig (500kPa)	73 psig (500kPa)	73 psig (500kPa)
Purification Charge		0.2 lbs (90g) Titanium or Copper, or Pt coated Alumina	0.4 lbs (180g) Titanium, Copper, or Pt coated Alumina	0.066 lbs (30g) Titanium, Copper, or Pt coated Alumina	0.2 lbs (90g) Titanium, Copper, or Pt coated Alumina	0.4 lbs (180g) Titanium, Copper, or Pt coated Alumina
Charge Container		Stainless Steel	Stainless Steel	Fused Quartz	Stainless Steel	Stainless Steel

* A diaphragm pump module is contained within the Model 2D, 2A, and 2H. This pump extracts the gas to be monitored from the sampling source and draws the sample through the ZrO_2 cell.

† Level of $2x10^5$ is equivalent to air. ‡ High pressure models (up to 500psig) are avail upon request.