



Advanced Instruments Inc.

Gas analysis solutions through advanced analyzer and sensor technology

Application Notes

Industry	Service	Measurement	Gas Stream	Analyzer
Air Separation	Ultra high purity N2 (7 nines to 9 nines) produced cryogenically	0-50 ppb O2	N2, Ar, H2, He	GPR-1600UHP
	Low ppm purity N2 (6 nines) generated cryogenically and ceramic membrane process	0-500 ppm O2 Spot checking	N2, Ar, H2, He	GPR-1600UHP GPR-1600MS GPR-1200MS
	1-5 ppm purity N2 (5 nines) generated cryogenically, ceramic membrane, pressure swing adsorption (PSA) skid and deoxo catalytic processes	0-10 ppm O2 Spot checking	N2, Ar, H2, He	GPR-1600MS GPR-1600 GPR-1200 GPR-1100
	Low ppm purity H2 produced by: electrolysis, catalytic partial oxidation of hydrocarbons and by dissolving solid sodium chloride into mercury bath	0-10 ppm O2 Spot checking	H2	GPR-1600MS GPR-1600 GPR-1200 GPR-1100
	ppm level N2 (4 nines) generated by pressure swing adsorption (PSA) skid and deoxo catalytic	<1000 ppm O2 Spot checking	Air	GPR-1900 GPR-1200 GPR-1100
	Transport of ppm level N2 via pipelines and tanker trucks to end users	0-10 ppm O2 Spot checking	N2, Ar, H2, He	GPR-1600 GPR-1200 GPR-1100
	Gas cylinder certification: specialty mixes including welding gas	0-10 ppm to 95% O2 Spot checking	Varies	GPR-1600 GPR-2600 GPR-1200 GPR-2000
	N2 (3 nines) generated from a membrane process mounted on portable skid	0.1% to 5% O2 Spot checking	Air	GPR-2900 GPR-2000
	O2 product purity of air separation process	98-100%	Air	GPR-3100
	High purity (medical grade) O2 generated cryogenically	>99.5% O2 Spot checking	Ar	GPR-3100 GPR-35
	O2 generated by pressure swing adsorption (PSA) and vacuum pressure swing adsorption (VPSA) processes mounted on portable skids used	50% to 95% O2 Spot checking	Air	GPR-3100 GPR-2600 GPR-2900 GPR-3500MO
	Synthetic air blenders for hospital back-up	20.9% O2	O2	GPR-2900
	O2 deficiency in control rooms	<20.0%, <19.5% O2	Air, N2	GPR-35
O2 deficiency/excess conditions inside N2 / O2 generator containers mounted on skids	<19.5%, >23.5% O2	Air, N2, O2	GPR-35	



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Antiquities	ppm level inert N2 blanketing of various artifacts within museums, eliminates corrosion	0 – 1 % O2	N2	GPR-2500
Automotive	Membrane skid generated N2 (3 nines) for production of low purity diesel fuel (81% N2) that reduces NOx emissions	0.1% to 5% O2 Spot checking	Air	GPR-2900 GPR-2000
Aviation	Membrane skid generated N2 (3 nines) for inerting aircraft fuel tanks	0.1% to 5% O2 Spot checking	Air	GPR-2900 GPR-2000
Beverage	Quality control of CO2 delivery tankers	0-10 ppm O2	CO2	GPR-1600 GPR-1200
	Quality control of CO2 cylinders used in beverage dispensing	0-10 ppm O2	CO2	GPR-1600 GPR-1200
	Head space monitoring of fermentors, brew tanks and storage tanks	0-10 ppm O2	CO2	GPR-1600 GPR-1200
	CO2 injection into fermentation process	0-10 ppm O2	CO2	GPR-1600 GPR-1200
	Carbonation in bottling process	0-1% O2	CO2	GPR-2600
	Off-line fermentors	0-10 ppm O2	CO2	GPR-1600 GPR-1200
	Head space monitoring of fermentors, brew tanks and storage tanks	0-10 ppm O2	CO2	GPR-1600 GPR-1200
	Head space monitoring of wood barrels	0-10 ppm O2	CO2	GPR-1600 GPR-1200
	Oxygen deficiency	19.5% O2	CO2, air	GPR-35
Curing Oven	Low level O2 measurement for inert blanketing during the curing process.	0 – 100 ppm O2	Varies	GPR-1600
Electrical Transformer	Low level monitoring of switch boxes, excess oxygen can cause arcing	0 – 10 ppm O2	SF6	GPR-1200
Electronics	High ppb cryogenic N2 Purity for production furnaces	0-1 ppm O2 Spot checking	N2, Ar, H2, He	GPR-1600MS GPR-1200MS
	ppm purity cryogenic, ceramic membrane, pressure swing adsorption (PSA) skid and deoxo catalytic generated N2 (5 nines)	0-10 ppm O2 Spot checking	N2, Ar, H2, He	GPR-1600 GPR-1200 GPR-1100
	ppm purity of furnace fuel gas for sintering	10 ppm to 100% O2	Fuel gas	GPR-1600



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	ceramic powders into shapes	Spot checking		GPR-2600 GPR-1900 GPR-2900 GPR-1200 GPR-2000
	O2 contamination in controlled atmospheres used for various sealing, firing and soldering processes to join dissimilar materials	0-10 ppm O2 Spot checking	N2	GPR-1600 GPR-1200
	O2 contamination in N2 gases used in inert reflow soldering and wave soldering	0-10 ppm O2 Spot checking	N2	GPR-1600 GPR-1200
	O2 contamination in N2, H2 gases used in the packaging of integrated circuits	0-10 ppm O2 Spot checking	N2	GPR-1600 GPR-1200
	O2 deficiency in confined areas	<19.5-20.0% O2	Air, N2	GPR-35
	Content of breathing air respirator tanks	<20.9% O2, <10 ppm CO, <1000 ppm CO2	Compress-ed air	GPR-990
Fertilizer	Low level O2 monitoring during Ammonia production	0 – 10 ppm O2	N2, H2	GPR-1600
Fiber Optics	O2 impurity in inking process	0-10 ppm O2	N2	GPR-1600 GPR-1200
	Low level ppm O2 monitoring during the transmission of signals at different wavelengths.	0 – 10 ppm O2	N2	GPR-1600
Food	(MAP) Modified atmosphere packaging	0-5% O2	N2 or CO2	GPR-2500 GPR-20FP
	Protect personnel and equipment from possible explosive hazard (methane) resulting from decomposition of bio-ponds	0-5% O2	N2 or CO2	GPR-2800AIS
	Oxygen purity measurement during injection of pure oxygen into fish ponds, helps expedite fish growth	0 – 100% O2	O2	GPR-2900
	Low level O2 measurement in CO2 background gas during the stunning process for both pigs and poultry	0 – 1% O2	CO2	GPR-2600
Furnace	ppm and percent level measurement in a controled enclosure for heat treating	0 – 10 ppm, 0 – 5%	Varies	GPR-1900 GPR-2900
Glass	Pure O2 generated cryogenically, pressure	30% to 100% O2	Varies	GPR-3100



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	swing adsorption (PSA) and vacuum pressure swing adsorption (VPSA) processes mounted on skids replaces air to enrich existing processes and boost product yield and reduce NOx emissions	Spot checking		GPR-2600 GPR-2900 GPR-3500MO GPR-2000
Glove Box	ppm and percent level measurement in inert sealed enclosures used to isolate a particulate process from the environment	1 ppm to 100% O2	Varies	GPR-1900 GPR-2900
Light Bulbs	Low level ppm measurement of Ar, He and N2 during bulb filling procedure	0 – 100 ppm O2	Ar, He, N2	GPR-1600 GPR-1500
Landfill Gas	Percent level O2 measurement to monitor the quality of the gas as it is used to power incinerators and boilers	0 – 1%	Methane, N2, CO2, CO	GPR-2800AIS
Metals Processing	ppm purity of furnace fuel gas for sintering metal powders into shapes and desired strength	<1 ppm O2 Spot checking	N2, H2	GPR-1600MS, GPR-1900MS, GPR-1600 GPR-1900 GPR-1200MS GPR-1200
	Pure O2 generated cryogenically, pressure swing adsorption (PSA) and vacuum pressure swing adsorption (VPSA) processes mounted on skids replaces air to enrich existing processes and boost product yield and reduce NOx emissions - zinc recovery processes - gold leaching processes - various brazing processes - processing scrap aluminum - improve heat transfer in electric-arc steel making furnaces	30% to 100% O2 Spot checking	Varies	GPR-3100 GPR-2600 GPR-2900 GPR-3500MO, GPR-2000
	Low ppm purity H2 for heat treating and annealing finishing processes to produce desired hardness and brightness	0-10 ppm O2 Spot checking	H2, N2	GPR-1600 GPR-1200 GPR-1100
Military	Membrane skid generated N2 (3 nines) inerting fuel storage tanks on ships	0.1% to 5% O2 Spot checking	Air	GPR-2600 GPR-2900 GPR-2000
	Low ppm Mustard and Saran gas used to produce biological weapons	0 – 10 ppm O2	Mustard, Saran	GPR-1600
	Low ppm N2 for sidewinder cylinder missile	0 – 10 ppm O2	N2	GPR-1200



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	refilling			
	Low Percent N2 for tire filling applications	0 – 1 % O2	N2	AII-3000A
	Oxygen Purity measurement utilized for high altitude breathing when required for the crew or oxygen saturation for paratroops.	0 – 100 % O2 Spot Checking	O2	GPR-2900 GPR-3500MO
	Oxygen Purity measurement provide point of analysis in self contained oxygen concentrators for field hospitals	0 – 100 % O2	O2	GPR-2900
Natural Gas	Vacuum extraction techniques create the possibility of O2 contamination that exceed contractual limits	0-100 ppm O2 Spot checking	CH4, CO2, H2S	GPR-1500AIS GPR-1200 GPR-1100
	Corrosion in gathering lines (air, H2O, H2S react to form sulfuric acid	0-100 ppm O2	CH4, CO2, H2S	GPR-1200 GPR-1100
	Protection of catalyst and regeneration beds	0-100 ppm O2	CH4, CO2, H2S	GPR-1200 GPR-1100
	Processing of 'cleaned' natural gas	0-100 ppm O2	CH4, CO2, H2S	GPR-18 ATEX GPR-1800AIS
	Protection of field personnel, gathering equipment, compressors and booster stations from the possible explosive hazard	0-100 ppm O2	CH4, CO2, H2S	GPR-1200 GPR-1100
	Percent O2 measurement of landfill gas feed generator	0 – 1%	CH4, CO2	GPR-2000
Ozone Generation	Pressure swing adsorption (PSA) and vacuum pressure swing adsorption (VPSA) skid generated O2	50% to 95% O2 Spot checking	Air	GPR-3100 GPR-2600 GPR-2900 GPR-3500MO
Petrochem	Low ppm level O2 contamination can act as a catalyst of undesirable polymerization during steam cracking hydrocarbon feedstocks (ethane, propane, butane, naphtha, natural gas, etc.) to produce olefin feedstocks (ethylene, propylene, butadiene, H2 and others) that are then separated and purified; and, increasing O2 levels indicate an air leak creating a potentially explosive hazard	250 ppb to 5 ppm Spot checking	Hydrocarbon feedstocks, ethylene, propylene, butadiene	GPR-18MS ATEX GPR-18 ATEX GPR-1200MS GPR-1200
	ppm level O2 contamination of pipelines	<5 ppm O2	Ethylene,	GPR-18 ATEX



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Industry	Service	Measurement	Gas Stream	Analyzer
	containing natural gas and olefin feedstocks assures quality of polyolefin product; and, increasing O ₂ levels indicate an air leak creating a potentially explosive hazard	Spot checking	propylene, butadiene	GPR-1200 GPR-1100
	Low ppm level O ₂ contamination of Ziegler-Natta and metallocene catalysts used to initiate and control the polymerization reaction to assure product quality and processing performance of plastics such as polyethylene, polypropylene, polyesters, etc.	50 ppb to 10 ppm O ₂ Spot checking	Ethylene, propylene, butadiene, N ₂ blanket	GPR-18MS ATEX GPR-18 ATEX GPR-1200MS GPR-1200
	ppm level N ₂ for inert blanking of chemicals and refined feedstocks during storage and/or transport by barge, rail, truck tanker or pipeline	0-10 ppm O ₂ Spot checking	N ₂	GPR-18 ATEX GPR-1800 AIS GPR-1200 GPR-1100
	ppm level N ₂ for inert blanking of hydrocarbon processing or storage on offshore platform	0-10 ppm O ₂ Spot checking	N ₂	GPR-18 ATEX GPR-1200 GPR-1100
	O ₂ impurity in hydrogen mixed with air to produce hydrogen peroxide (H ₂ O ₂)	0-10 ppm O ₂	Air	GPR-1600 GPR-1200
	O ₂ impurity in production of sodium benzoate a food preservative	0-10% O ₂ Spot checking	Air	GPR-28 ATEX GPR-2000P
	High purity O ₂ generated cryogenically used in conjunction with newly developed closed loop processes enable producers of intermediate products to switch from olefin feedstocks to less expensive alkane feedstocks (butane, ethane and propane), recirculate offgases and smaller vessel size (additional cost savings) while reducing the potential for explosive hazards. Products: - acrylonitrile (propane in lieu of propylene) - ethylene oxide & ethylene dichloride - vinyl acetate monomer - caprolactam - maleic anhydride	100% O ₂ Spot checking	Varies	GPR-3100 GPR-3500MO
	Pure O ₂ generated cryogenically, pressure swing adsorption (PSA) and vacuum pressure swing adsorption (VPSA) processes mounted on skids replaces air to enrich existing processes and boost product yield and reduce NO _x emissions: - fluid catalytic cracking	30% to 100% O ₂ Spot checking	Varies	GPR-3100 GPR-2600 GPR-2900 GPR-3500MO GPR-2000



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Industry	Service	Measurement	Gas Stream	Analyzer
	<ul style="list-style-type: none"> - sulfur recovery (reduce content in vehicle fuels and use heavier crude feedstocks without being constrained by the capacity of the sulfur plant) - sulfuric acid regeneration (used in the production of titanium dioxide) - aluminum smelters - glass smelters 			
Pharmaceutcl	Percent O2 analysis in N2 career gas with solvents present	0 – 5%	N2, Solvents	GPR-2000
	Percent O2 monitoring of centrifuges during drying process	0 – 2%	N2	GPR-2000
Plastics	ppm and percent level monitoring during electron bean and / or UV curing	0 – 100ppm 0 – 1 %	N2	GPR-1600 GPR-2600
Power Generation	Alert to any upset air contamination of H2 cooling gas to avoid potential for explosion	0-25% O2	H2, Air	GPR-28 ATEX
	Low level monitoring of H2 cooling gas for turbine generators	0 – 10 ppm O2 Spot Checking	H2	GPR-18 ATEX GPR-1200
	Low level monitoring of Tritium recovery in Nuclear reactors	0 – 10 ppm O2	Tritium Deuterium	GPR-1600
	ppm monitoring of waste gas at Nuclear Power Plants	0 – 10 ppm O2	N2, Ar, H2, He	GPR-1600
Pulp & Paper	Cryogenic, pressure swing adsorption (PSA) and vacuum pressure swing adsorption (VPSA) skid generated O2 for delignification and bleaching	50% to 95% O2 Spot checking	Air	GPR-3100 GPR-2600 GPR-29 00 GPR-3500MO
Refinery	Percent measureing of O2 in flue gas at stack incinerator during sulfur recovery	0 – 1%, 0 – 5% O2	Flue Gas	GPR-2000
Semiconductr	Ultra High Purity N2 for heat treating silicon wafers	0-100 ppb O2	N2, H2	GPR-1600UHP
	Analysis at point of use – at tool location	0 – 100 ppb O2	N2, H2, Ar	GPR-1600UHP
	Contamination of N2, H2, Ar carrier gases	0-100 ppb O2	N2, H2, Ar	GPR-1600UHP GPR-1600MS
	Contamination of H2 scavenger gases used in atmosphere soldering and annealing copper films.	0-100 ppb O2	N2, H2	GPR-1600UHP GPR-1600MS GPR-1600



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	Non-invasive leak detection in UHP gas distribution systems with mobile cart	Spot check		GPR-1600UHP GPR-1600MS
	ppm purity cryogenic, ceramic membrane, pressure swing adsorption (PSA) skid and deoxo catalytic generated N2 (5 nines) for wafer oxidation furnaces	0-10 ppm O2 Spot checking	N2, H2	GPR-1600 GPR-1200
	O2 deficiency in confined areas	<19.5-20.0% O2	Air, N2	GPR-35
Steel	Cryogenic, pressure swing adsorption (PSA) and vacuum pressure swing adsorption (VPSA) skid generated O2 that improve heat transfer in electric-arc steel making furnaces increasing the yield and reducing NOx emissions	50% to 95% O2 Spot checking	Air	GPR-3100 GPR-2600 GPR-29 00 GPR-3500MO
	Low ppm purity H2 for heat treating and annealing processes producing desired hardness and brightness	0-10 ppm O2 Spot checking	H2, N2	GPR-1600 GPR-1200 GPR-1100
	Membrane separated N2 skids	0.1% to 5% O2	Air	GPR-2900
	ppm level N2 / Ar inert blanketing to prevent slag oxidation on steel on the caster or tundish	0 – 10 ppm O2 Spot Checking	N2, Ar	GPR-1600 GPR-1200 GPR-1100
	percent level O2 monitoring of Coke plant storage tanks & coke oven gas before electrostatic precipitator	0 – 5%, 0 – 10%	Oven Gas	GPR-2000
Shipping	ppm level N2 for inert blanketing of refined feedstocks and other hydrocarbon cargo during transport	0-10 ppm O2 Spot checking	N2	GPR-1600 GPR-1200 GPR-1100
	Ppm level N2 for inert blanketing of vegetables and other perishable goods	0 – 10 ppm O2 Spot checking	N2	GPR-1600 GPR-1200 GPR-1100
	Purging of cargo hulls and holds to eliminate bugs and micro organisms; prevents contamination of local water ways	0 – 1% O2	N2	GPR-2600
Waste Water Treatment	O2 impurity in production of hydrogen peroxide H2O2 for oxygenating water	0-10 ppm O2	H2	GPR-1600 GPR-1200
	Oxygen purity measurement of pure oxygen injected into waste water, facilitates bacteria growth	90 – 100% O2	O2	GPR-3100



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Welding Gas	Low level O2 monitoring of blanket gas compositions used to blanket a weld	0 – 1000 ppm O2 0 – 1% O2	Varies Varies	GPR-1000 AII-3000A
Window	Percent level O2 in Ar to certify double pane window meets Energystar requirement	0 – 1%	Ar	GPR-20F
Veterinary Medicine	Oxygen therapy is frequently used for pets recovering from disease or surgery	0 – 100%	O2, Air	AII-3000A