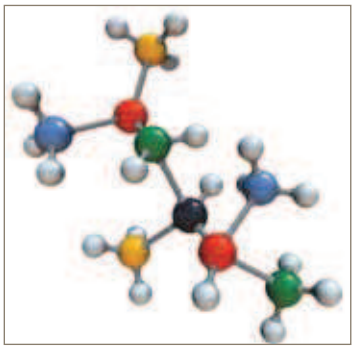


Analytical Gas Systems

aerospace
climate control
electromechanical
filtration
fluid & gas handling
hydraulics
pneumatics
process control
sealing & shielding

Parker domnick hunter

ENGINEERING YOUR SUCCESS.

Parker domnick hunter
Technology you can trust

Parker domnick hunter is the leading provider of Gas Systems for the Analytical Instrument market. Generators are specifically designed to meet the stringent gas requirements for all the leading Analytical Instrument manufacturers including Agilent, Thermo Fisher, Waters, Shimadzu, AB Sciex, Perkin Elmer and many others.

Utilising Parker's range of patented proprietary technologies, there are 1,000's of systems installed worldwide. These technologies offer some unique performance benefits, including guaranteed ultra high purity gas, silent operation, minimal moving parts and minimal operator attention. It is **technology you can trust.**

Improved instrument performance
Consistent gas quality and pressure improves stability and ensures greater reproducibility of results.

Convenience
No changing of gas cylinders or liquid dewars. On-demand supply 24/7 - generate gas as and when required.

Safety
Eliminate high pressure gas cylinders and liquid dewars from your laboratory.

Eliminates manual handling, reducing Health and Safety risks.

Cost
Payback in less than 18 months. Minimal ongoing maintenance costs.
No more gas costs, delivery and rental charges.

The End for High-Pressure Gas Cylinders?

High-pressure gas cylinders are a common sight in many laboratories: a default for supplying analytical instruments with their gas requirements, high-pressure gas cylinders are familiar and provide the gas that's required, so it could be said that the old adage, 'if it isn't broke, don't fix it', could well apply.

Despite this, increasing numbers of analytical instrument users are choosing to supply their GC FID, LC/MS and other types of instrument with gas via an analytical gas generator. Driving this decision will be a combination of factors broadly grouped into four areas; safety, cost, convenience and purity.

Safety Concerns...
High-pressure gas cylinders can provoke safety concerns in a number of different ways, some with potentially fatal consequences. The presence of high-pressure gas cylinders in the laboratory has been likened to sharing the laboratory with a potential missile. This stems from the behaviour of a cylinder that suddenly de-pressurises. There is enough force released with a European 'L' size cylinder to accelerate the cylinder to something like 66mph or 108km/h in around 1/10 seconds. Cylinders weigh in at 200lb (98kg), so there'll be enough momentum to cause some severe damage.

It's because of this potential 'missile scenario' that cylinders tend to be strapped down to something fixed. Even restrained, should a large cylinder suddenly vent its contents into the laboratory, then there are potentially fatal consequences. For example, if a high-pressure cylinder of nitrogen suddenly vented into the atmosphere of a laboratory, then more than 9,000 litres of un-breathable gas would be released. This would dramatically reduce the oxygen content of the air – presenting the possibility of asphyxiation. The risk of oxygen displacement from the atmosphere is also associated with liquefied gases whose volume will increase as much as 1,000 fold when in the gas phase. This means liquid nitrogen dewars can also be hazardous.

If the gas suddenly venting was a potentially explosive gas, as in the case of hydrogen, the result could be much more dramatic. Hydrogen will form an explosive mixture at just 4% volume in air.

These possibilities are the life threatening safety concerns associated with high-pressure gas cylinders. However, there is still the potential for other non-fatal injuries. The practice of rolling cylinders on their bottom edge comes with the risk of trapping toes or feet. With the 'smaller' cylinders there is also potential for heavy lifting injuries when being placed on a bench top.

Costs Increase Whilst Convenience and Purity are Reduced...
With high pressure cylinders the storage requirements are dictated by safety concerns, such as separating hydrogen cylinders and cylinders of oxidising gases. These often result in cylinders being some distance from where the gas is used and hence long gas lines. Whilst the longer gas lines result from the positioning of cylinders for safety concerns, the impact will be in the areas of cost, convenience and purity.

With any gas line there is the potential for leaks, and the longer the line the greater the potential. Hence the requirement to regularly leak-check the gas supply line – this both increases costs and decreases convenience - whilst leaks allow gas to escape and also allow impurities to enter the gas supply, which reduces purity and influences the accuracy of any analysis.

A Smarter Choice...
Analytical gas generators can remove the requirement for high-pressure cylinder gases for many analytical instrument users. Analytical gas generators are typically placed next to the instrument they're servicing. This removes any need for extended gas lines and with them associated problems impacting on purity, cost and convenience.

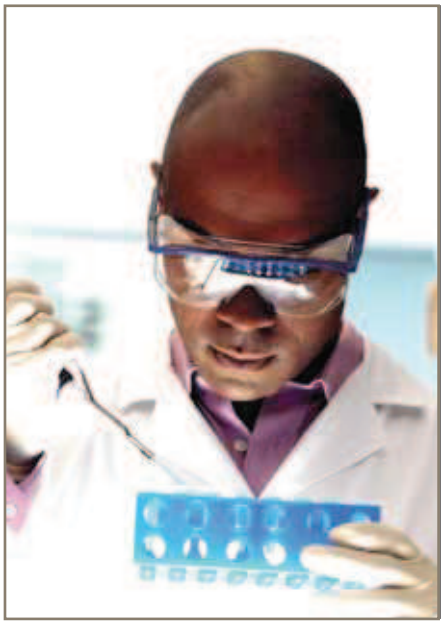
There are inherent features both in the design and the way in which generators operate which offer clear compelling reasons to switch from high-pressure gas cylinders. The latest gas generators utilise new technologies including adsorbents, catalysts, and specialist micro dryers, to produce ultra high purity gases. Generators are designed to be used at the point of use, simplifying and minimising the amount of pipe work, and guaranteeing ultra high purity gas reaching the instrument.

The generators are designed to run continuously with minimal annual maintenance and therefore minimal disruption to the gas supply. This all but eliminates the introduction of impurities, which can be reduced further by the installation of in line purifiers.

Increased Safety...
High-pressure gas cylinders will contain gas which is at a pressure of 200 to 300 times atmospheric pressure, and gas which is released to atmospheric pressure would have a volume in the region of 9,000 litres. Analytical gas generators operate at a fraction of this pressure and have very low volumes of stored gas within them. One of Parker domnick hunter's market leading hydrogen generators, for example, will have just 50 ml of stored gas, which will be at a maximum of around 5 times atmospheric pressure. Hence the missile concern is removed with a generator, and there's no large volume of gas to suddenly vent and make the atmosphere potentially explosive or deficient of life-supporting oxygen. Additional safety features are also incorporated in the design; for example, in Parker domnick hunter hydrogen generators there are leak detection auto shut-off devices.

Increased Convenience...
High-pressure gas cylinders will require regular replacement. Gas cylinders running out part way through analysis will result in unplanned downtime, and a replacement cylinder has to be collected and the old one removed which brings manual handling and safety concerns. After the new cylinder has been connected restarting the instrument, and waiting for stable baseline and

(continued)



re-calibration, are required before samples can be run. Life is more convenient with a gas generator as there's no unplanned downtime. Analytical gas generators only require simple quick maintenance which can be planned for – they don't unexpectedly run-out of gas halfway through analysis.

Increased Purity...
Analytical gas generators provide a constant source of gas. This removes the variations in purity between cylinders, helping to improve sensitive analyses. Purity is also preserved because there is no chance for impurities to enter the gas pipes, which may happen as cylinders are switched and regulators changed-over.

Reduced Cost...
High-pressure gas cylinders can also prove to be costly: typical payback periods for analytical gas generators are short – sometimes less than one year. The cost of using high pressure cylinders is not just the cost of the gas itself but other charges, some of which can be seen and others which are hidden. Cylinder rental and delivery charges are readily apparent, however there's also hidden costs. These must also be included to reveal the true cost.

Unlike cylinders, Analytical Gas Systems have no hidden costs. There are no recurring costs with generators for activities such as ordering replacement cylinders, there are no storage costs for the spare and empty cylinders, and there is no cost of lost productivity through the need to stop and replace cylinders.

Innovative Technology...
Parker domnick hunter analytical gas generators are world renowned for their reliability, dependability and long life. Since commercializing their first laboratory scale analytical gas generator in the 1980s, Parker domnick hunter now serve an installed customer base of over 40,000 gas generator users globally.

Part of the reason behind this is the unique innovative technology employed in Parker domnick hunter generators, from carbon molecular sieve, to the use of robust hydrogen membranes.

A Smarter Choice for LC/MS...
Providing nitrogen for uses such as LC/MS, Parker domnick hunter's pressure swing adsorption nitrogen generators represent state-of-the-art technology. The carbon molecular bed simply and efficiently separates compressed air into nitrogen. The carbon molecular bed achieves this due to its selective adsorption capabilities for different gases – oxygen and other unwanted constituents of the compressed air are simply removed by desorption – the complete process is monitored by a sophisticated control system.

These generators, when connected to an existing compressed air supply, will provide a constant supply of nitrogen with limited moving parts inside the generator. This means that the generator is very quiet whilst operating and there are minimal replacement parts.

A Smarter Choice for GC...
Hydrogen offers advantages for GC users when used as a carrier gas. The Van Deemter curves illustrate the wide range over which high efficiency is obtained, making hydrogen the best carrier gas for samples containing compounds which elute over a wide temperature range. The risks associated with high-pressure gas cylinders have already been outlined – hence a gas generator is the smarter choice for hydrogen. The optimised design of Parker domnick hunter hydrogen generators take deionised water and, through electrolysis, separate the hydrogen. This is then purified using desiccants, and specialist micro dryers.

An End For Cylinders?
With the improvements that gas generators offer in the areas of safety, purity, convenience and cost there's little reason to use high-pressure gas cylinders with instruments such as GC and LC/ MS. The range of Parker domnick hunter analytical gas generators also extends its technologically innovative approach to other techniques such as FT-IR, TOC, ICP, ELSD and Atomic Absorption.

C02 Free Air Generators

for FT-IR & TOC Applications

The Parker Zander K-MT-LAB CO_2 removal purifier employs, robust, field proven technology to produce ultra high purity CO_2 free air for critical FT-IR and TOC purge applications. Flow rates range from 1.5 L/min to 100 L/min, with purities <1 ppm residual $C0_2$ and <0.003 ppm residual hydrocarbons.

The K-MT-LAB CO_2 removal purifiers provide a continues stream of ultra high purity CO_2 free air from a single compact system. K-MT-LAB systems employ both upstream and downstream filtration to safeguard your analytical workflow.

Innovative design and technology facilitate maximum instrument uptime, attractive return on investment and proven analytical performance eliminating the need for other modes of supply.

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www.parker.com/dhfns

Product Features:

- **Complete compact and modular design for critical applications**
- **Produces a continuous supply CO_2 free air 24 hours a day**
- **Ultra high purity reduces signal/noise ratio, improving analytical performance**
- **Protects delicate optic surfaces and air bearings against moisture**
- **Eliminate inconvenient and potentially dangerous synthetic air cylinders**
- **Compact, reliable with minimal operator attention and maintenance**

Technical Data

Cleanroom air generator K-MT-LAB	K-MTLAB 1	K-MTLAB 3	K-MTLAB 6
Outlet fl ow rate	1.5 Nl/min	20 Nl/min	100 Nl/min
Regeneration gas volume	10 Nl/min	36 Nl/min	75 Nl/min
Inlet flow rate	11.5 Nl/min	56 Nl/min	175 Nl/min
Inlet temperature	+ 5°C to + 30°C		
CO_2 outlet concentration	< 1 ppm at max. 380 ppm at the inlet		
Residual hydrocarbons	< 0.003 ppm		
Particle separation	0.01 µm		
Pressure dewpoint	up to - 70°C		
Operating pressure	5 barü		
Initial differential pressure incl. filtration	300 mbar		
Connections	G 1/4”	G 1/4”	G 3/8”

Weights and Dimensions

Model	Height (H)		Width (W)		Depth (D)		Weight	
	mm	in	mm	in	mm	in	kg	lb
K-MTLAB1	401	15.8	372	14.6	210	8.2	14	30.8
K-MTLAB3	827	32.5	429	16.8	210	8.2	20	44
K-MTLAB6	1185	46.6	580	22.8	300	11.8	54	119

Preventative Maintenance

Preventative Maintenance Kit	Part Number	Change Frequency
Filter cartridges, condensate drain, silencer, reset module	KM 18 LAB 1-3	18 months
	KM 18 LAB 6	
Filter cartridges, condensate drain, silencer, main valves, seal set, reset module	KM 36 LAB 1-3	36 months
	KM 36 LAB 6	
Desiccant pack, 2.0 kg of molecular filter granulate *	DESPAC 2 LAB	

Catalogue: 174004758_00_EN 03/11

Parker domnick hunter

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Applications by Market

Application found in this market

X Application in this market is a major target area

Applications

	Pharmaceutical	Biotechnology	Chemical	Oil & Gas	Governmental	Academia	Food & Beverage	Environmental	Semiconductor
Products for Gas Chromatography									
GC - Flame Ionisation Detector (FID)	X		X	X				X	
GC - Flame Photometric Detector (FPD)									
GC - Nitrogen Phosphorous Detector (NPD)									
GC - Electron Capture Detector (ECD)									
GC - Thermal Conductivity Detector (TCD)									
GC - Automatic Thermal Desorption (ATD)									
GC - Atomic Emission Detector (AED)									
GC - Electrolytic Conductivity Detector (ELCD & Hall ELCD)									
GC/MS - Carrier Gas									
Products for LC/MS Instruments									
LC/MS - Nebulization Gas (Nitrogen)	X	X			X	X			
LC/MS - Source Gas									
LC/MS - Exhaust Gas									
LC/MS - Sheath Gas									
LC/MS - Collision Cell Gas/Drift Gas									
LC/MS - Matrix Assisted Laser Desorption Ionisation									
LC/MS - Multiple Instrument Supply									
FT/MS - Fourier Transform Mass Spectrometry									
Products for Spectroscopy									
Fourier-Transform Infra Red Spectrometer, FT-IR	X	X	X			X			
Nuclear Magnetic Resonance, NMR						X			
Inductively Coupled Plasma - Mass Spectrometry (ICP-MS)									
Induct Optical Emission Spectrometers (ICP-OES)									
Atomic Adsorption (AA - Flame)									
Particle Sizing									
Products for Analysers									
Total Organic Carbon Analyser (TOC)	X		X					X	
Total Hydrocarbon Analyser (THA)									
Differential Scanning Calorimetry (DSC)									
Thermal Gravimetric Analyser (TGA)									
C02 Analyser									
Chemisorption/Physisorption									
Other Laboratory Applications									
Sample Preparation/Solvent Evaporators	X	X	X			X			
Circular Dichroism (CD)									
Evaporative Light Scattering Detector (ELSD)	X	X				X			
Corona Charged Aerosol Detector (CAD)									
Condensation Nucleation Light Scattering Detector (CNLSD)									
C02 Incubators (IVF, Stem Cell & Regenerative Medicine)									
Chemical Vapour Deposition Instrumentation (CVD)									
Plasma Cleaning Instrumentation (UCP)									
Digital Radiography (Edge, General Electric, Varian Medical)									
Hydrogenation (Organic Chemistry)									

Applications Guide

Key
UHP = Ultra High Purity, >99.99 - >99.9999% with respect to oxygen
Zero Grade = Free from residual hydrocarbons
HP = High Purity, >98 >99.9% with respect to oxygen
CDA = Clean Dry Air

Instrument	Gas Requirement	Purity	Flow rate	Generator	Technology
Product for Gas Chromatography (GC)					
GC - Flame Ionisation Detector (FID)	H2 as fuel gas	UHP	30-50 ml/min	Hydrogen 'H' or 'H-MD'	PEM + Desiccant or PEM + Micro dryer
	H2 as carrier gas (displacing Helium)	UHP	up to 200 ml/min	Hydrogen, 'H-MD'	PEM + Micro Dryer
	Zero Air as flame support gas	Zero Grade	300-500 ml/min	Zero Air UHP-ZA-S	Catalytic Module
	N2 for packed carrier gas	Zero Grade	20-50 ml/min	Zero Nitrogen, G5	N2 PSA + Catalytic Module
	N2 as detector make-up gas	Zero Grade	30-50 ml/min	Zero Nitrogen, G5	N2 PSA + Catalytic Module
GC - Flame Photometric Detector (FPD)	Hydrogen as fuel gas	UHP	60-90 ml/min	Hydrogen 'H' or 'H-MD'	PEM + Desiccant or PEM + Micro dryer
	Zero Air as flame support gas	Zero Grade	90-120 ml/min	Zero Air UHP-ZA-S	Catalytic Module
GC - Nitrogen Phosphorous Detector (NPD)	Hydrogen as carrier gas (displacing Helium)	UHP	up to 50 ml/min	Hydrogen, 'H-MD'	PEM + Micro Dryer
	Nitrogen as detector make-up gas	Zero Grade	up to 30 ml/min	Zero Nitrogen, G5	N2 PSA + Catalytic Module
GC - Electron Capture Detector (ECD)	Nitrogen as carrier gas	Zero Grade	up to 60 ml/min	Zero Nitrogen, G5	N2 PSA + Catalytic Module
	Nitrogen as detector make-up gas	Zero Grade	up to 100 ml/min	Zero Nitrogen, G5	N2 PSA + Catalytic Module
GC - Thermal Conductivity Detector (TCD)	Hydrogen as carrier gas	UHP	up to 50 ml/min	Hydrogen 'H' or 'H-MD'	PEM + Desiccant or PEM + Micro dryer
GC - Automatic Thermal Desorption (ATD)	Nitrogen as purge gas	UHP	up to 150 ml/min	UHP Nitrogen, G1 or G2	N2 PSA
GC - Atomic Emission Detector (AED)	Nitrogen as carrier gas	Zero Grade	up to 1 ml/min	Zero Nitrogen, G5	N2 PSA + Catalytic Module
GC - Electrolytic Conductivity Detector (ELCD & Hall ELCD)	Hydrogen as reaction gas	UHP	70 to 200 ml/min	Hydrogen 'H' or 'H-MD'	PEM + Desiccant or PEM + Micro dryer
GC/MS - Carrier Gas	Hydrogen as carrier gas (displacing Helium)	UHP	up to 50 ml/min	Hydrogen, 'H-MD'	PEM + Micro Dryer
Products for LC/MS Instruments					
LC/MS - Nebulisation Gas	Nitrogen used to nebulise liquid into aerosol	HP	up to 32 L/min	Nitrogen, LCMS-15 to 50	N2 PSA
			34 - 228 L/min	Nitrogen, Midi Gas Lab	N2 PSA
			up to 567 L/min	Nitrogen, Maxi Gas Lab	N2 PSA
LC/MS - Source Gas	Nitrogen used as a source gas	HP	up to 17 L/min	TriGas, LCMS-5000 series	N2 Membrane
	Zero Air as source gas to remove hydrocarbons	Zero Grade	up to 17 L/min	TriGas, LCMS-5000 series	Catalytic Module
		Zero Grade	up to 17 L/min	Zero Air HP-ZA	Catalytic Module
LC/MS - Exhaust Gas	Nitrogen for exhaust gas purge	HP	up to 8 L/min	TriGas, LCMS-5000 series	N2 Membrane
	Clean Dry Air for exhaust gas purge	CDA	up to 8 L/min	TriGas, LCMS-5000 series	CDA Membrane
LC/MS - Sheath Gas	Nitrogen used as inerting/blanket gas	HP	up to 32 L/min	Nitrogen, LCMS-15 to 50	N2 PSA
			34 - 228 L/min	Nitrogen, Midi Gas Lab	N2 PSA
			up to 567 L/min	Nitrogen, Maxi Gas Lab	N2 PSA
LC/MS - Collision Cell Gas	Nitrogen used as collision gas	UHP	up to 25 ml/min	Nitrogen, G5	N2 PSA
LC/MS - Matrix Assisted Laser Desorption Ionisation	Nitrogen as laser purge guide	UHP	up to 5 L/min	Nitrogen, G4	N2 PSA
LC/MS - Multiple Instrument Supply	Nitrogen as nebulisation/sheath/exhaust gas	HP	Various	Nitrogen, Midi Gas Lab	N2 PSA
				Maxi Gas Lab	N2 PSA
FT/MS - Fourier Transform Mass Spectrometry	Nitrogen as laser flush/purge gas	HP	up to 100 L/min	Nitrogen, Midi Gas Lab	N2 PSA
				Maxi Gas Lab	N2 PSA

Instrument	Gas Requirement	Purity	Flow rate	Generator	Technology
Products for Spectroscopy					
Fourier-Transform Infra Red Spectrometer (FT-IR)	C02 free air for sample compartment, optics air bearing and microscope purge gas	C02 free air	up to 28 L/min	C02 free air generators	PSA - Desiccant
Nuclear Magnetic Resonance (NMR)	Air for lifting, spinning & ejecting, <400MHz	CDA	60-100 L/min	CDA, Mida	CDA PSA - Desiccant
	Nitrogen for lifting, spinning & ejecting, >400MHz	HP		Midi Gas Lab	N2 PSA
				Maxi Gas Lab	N2 PSA
Inductively Coupled Plasma - Mass Spectrometry (ICP-MS)	Hydrogen as collision cell reaction gas	UHP	up to 250 ml/min	Hydrogen, 'H-MD'	PEM + Micro Dryer
Inductively Coupled Plasma Optical Emission Spectrometers (ICP-OES)	Nitrogen as purge gas for plasma torch	UHP	up to 9 L/min	Nitrogen, G4	N2 PSA
Atomic Emission Spectrometers (AA - Flame)	Air for flame support gas	CDA	28-200 L/min	CDA, Midas	PSA - Desiccant
Particle Sizing Instruments	Air to purge and drying gas	CDA	up to 100 L/min	CDA, Midas	PSA - Desiccant
Products for Analysers					
Total Organic Carbon Analyser (TOC)	C02 free & Zero Grade air for carrier gas	C02 free air	100-500 ml/min	C02 Free Air	PSA - Desiccant
		Zero Grade		Zero Air, UHP-ZA-S	Catalytic Module
	Nitrogen for carrier gas	UHP	50-700 ml/min	Nitrogen, G2	N2 PSA
Total Hydrocarbon Analyser (THA)	Hydrogen as fuel gas	UHP	5-50 ml/min	Hydrogen 'H' or 'H-MD'	PEM + Desiccant or PEM + Micro dryer
	Zero Air as flame support gas	Zero Grade	50-500 ml/min	Zero Air, UHP-ZA-S	Catalytic Module
Differential Scanning Calorimetry (DSC)	Nitrogen as shield/sheath gas	UHP	100 ml/min	Nitrogen, G1	N2 PSA
Thermal Gravimetric Analyser (TGA)	Nitrogen as inerting/blanket furnace gas	UHP	300 ml/min	Nitrogen, G1	N2 PSA
C02 Analyser	C02 free air as calibration gas	C02 free air	550-1000 ml/min	C02 free air	PSA - Desiccant
Chemisorption/Physisorption	Hydrogen as measurement gas	UHP	up to 250 ml/min	Hydrogen, 'H-MD'	PEM + Micro Dryer
	Nitrogen as measurement gas	UHP	up to 250 ml/min	Nitrogen, G1	N2 PSA
Other Laboratory Applications					
Sample Preparation/Solvent Evaporators (TurboVap)	Nitrogen as inert evaporation gas	HP	6-50 L/min	Nitrogen, G4 or LCMS-50	N2 PSA
Circular Dichroism (CD)	Nitrogen as source and optics purge	UHP	up to 10 L/min	Nitrogen, CD-10	N2 PSA
Evaporative Light Scattering Detector (ELSD)	Nitrogen as nebulisation gas	HP	up to 8 L/min	Nitrogen, G4	N2 PSA
Corona Charged Aerosol Detector (CAD)	Nitrogen as nebulisation gas	HP	up to 8 L/min	Nitrogen, G4	N2 PSA
Condensation Nucleation Light Scattering Detector (CNLSD)	Nitrogen as nebulisation gas	HP	up to 8 L/min	Nitrogen, G4	N2 PSA
C02 Incubators (IVF, Stem Cell & Regenerative Medicine)	Nitrogen to create oxygen deficient atmosphere	HP	up to 12 L/min	Nitrogen, G4	N2 PSA
Chemical Vapour Deposition Instrumentation (CVD)	Hydrogen to aid deposition process	UHP	up to 1L/min	Hydrogen, 'H-MD'	PEM + Micro Dryer
	Nitrogen to aid deposition process	UHP	up to 1L/min	Nitrogen, G1 & G2	N2 PSA
Plasma Cleaning Instrumentation (UCP)	Hydrogen as a high efficiency process gas	UHP	up to 1000 ml/min	Hydrogen, 'H-MD'	PEM + Micro Dryer
Digital Radiography (Edge, General Electric, Varian Medical)	Nitrogen to inert/purge diode array	UHP	up to 550 ml/min	Nitrogen, G1	N2 PSA
Hydrogenation (Organic Chemistry)	Hydrogen as reaction gas	UHP	up to 250 ml/min	Hydrogen, 'H' range	PEM + Desiccant