Laboratories

Overview

At the heart of every scientific endeavor is a laboratory where the research experiments and analytical procedures are accomplished. For over a hundred years, laboratories have counted on Praxair to fulfill their critical gas needs. Praxair offers a comprehensive range of gas products with the proper purity, compliance, and certification to meet the demands of any laboratory application. Praxair also offers the industry's leading collection of gas handling, distribution, and storage equipment to help lab personnel work safely and productively. Praxair's focus on quality and service gives laboratories the confidence to know that the only variables they need to worry about are in their experiments, not their gases.

Comprehensive Product Range
Supplying each application with the proper gas (grade, compliance, certification, scale).

Superior Reliability
Ensuring high quality products are there when they are needed.

Equipment and Systems Excellence
Connecting customers with everything needed to use, handle, and store gases efficiently and safely.

Productivity and Innovation Partner
Working with laboratories to identify and implement productivity and cost improvements.

Ease of Doing Business
Providing convenient e-commerce options and strong customer support.

Safety Focus
Making safety the top priority for every activity.

PRAXAIR
Making our planet more productive

Equipment and Systems Excellence

Praxair manufactures and supplies thousands of gas handling, storage, and safety solutions:

- regulators
- flow meters
- gas distribution systems
- gas purification accessories
- gas generators and back-up systems
- freezers and cryogenic systems
- valves, fittings, and CGA connections
- gas cabinets
- gas detection and safety equipment

...and much more.

Praxair designs and fabricates all gas distribution systems in-house using high quality components. For laboratories pursuing renovation or expansion, Praxair can design and implement a turn-key build-out.

Protect the purity of your gases and the quality of your lab's results with the right product for the right application.

See Section E for additional information on Praxair's full line of *ProSpec™* gas handling solutions

Multi-Gas Point-of-Use-Panel, see page E•303

5029 Protocol Station, see page E•281

4092 Regulator, see page E•266

Dual Cylinder Rack with Automatic Switch-Over, see page E•297

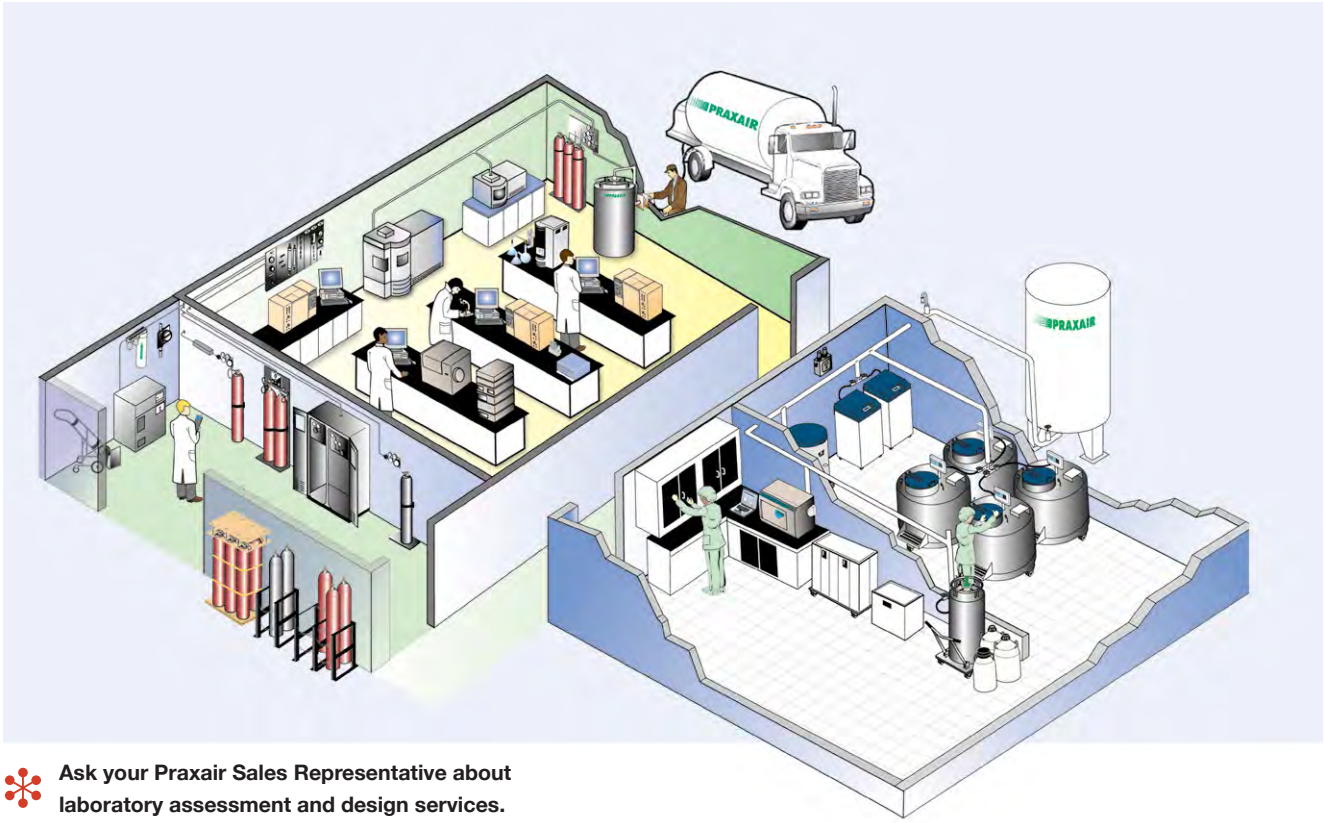
Laboratories

Equipment and Services

Laboratory Assessment Service

Praxair applies its extensive experience with specialty gases and equipment to help laboratory managers and scientists review their gas needs and select the proper gas products and delivery systems. Praxair's Laboratory Assessment Program examines all aspects of gas use, handling, and storage to help laboratories reduce costs and mitigate risk.

Laboratory Assessment Benefits
Achieve consistent work quality
Improve productivity
Optimize supply modes
Protect instrumentation and equipment
Better utilize bench and floor space
Implement appropriate safety measures
Streamline transaction processing
Ensure appropriate product grades and certifications
Improve asset management



Ask your Praxair Sales Representative about laboratory assessment and design services.

We're here to help!

Praxair's Gas Grade Recommendations

Analytical Method/ Detector	Instrument Gases	Page Number	Analytical Range < 100 ppm	Analytical Range > 100 ppm	Type of Analysis Impurity Considerations
Gas Chromatography					
TCD (Thermal Conductivity Detector)	Ar	B•26	AR 5.5TG	AR 5.0UH	**Universal Detector** Atmospheric contaminants can oxidize the detector filament giving rise to negative peaks and reduced sensitivity.
	He	B•53	HE 5.5TG	HE 5.0UH	
	H_2	B•54	HY 6.0RS	HY 5.0UH	
	N_2	B•65	NI 5.5TG	NI 5.0UH	
FID (Flame Ionization Detector)	Air	B•24	AI 0.0UZ	AI 0.0UZ	**Organic Compounds** Hydrocarbons in carrier and fuel gases can give rise to baseline noise and reduced detector sensitivity. Oxygen and water cause column deterioration and affect retention time on critical separations.
	Ar	B•26	AR 5.5TG	AR 5.0UH/ AR 4.8Z	
	He	B•53	HE 5.5TG	HE 5.0UH/ HE 4.6Z	
	H_2	B•54	HY 6.0RS	HY 5.0UH/ HY 4.5Z	
	N_2	B•65	NI 5.5TG	NI 5.0UH/ NI 4.8Z	
	40% H_2 in He	D•218	IG F12UH	IG F11	
	40% H_2 in N_2	D•218	IG F14UH	IG F13	
ECD (Electron Capture Detector)	He	B•53	HE 5.5EC/ HE 5.5TG	HE 5.5TG	**Electronegative Functional Groups** Detector response and column life are reduced by oxygen and water. Hydrocarbons and halocarbons can produce baseline noise, negative peaks, and plumbing contamination.
	N_2	B•65	NI 5.5EC/ NI 5.5TG	NI 5.5TG	
	5% CH_4 in Ar (ECD P-5)	D•218	IG ECD1	IG ECD1	
	10% CH_4 in Ar (ECD P-10)	D•218	IG ECD2	IG ECD2	
FPD (Flame Photometric Detector)	Air	B•24	AI 0.0UZ	AI 0.0Z	**Sulfur or Phosphorous Compounds** Organics can yield baseline noise and carbon dioxide can suppress detector response.
	He	B•53	HE 5.5TG	HE 5.0UH	
	H_2	B•54	HY 6.0RS	HY 5.0UH	
	N_2	B•65	NI 5.5TG	NI 5.0UH	
PID (Photo Ionization Detector)	He	B•53	HE 5.5TG	N/A	**Selective Detector Dependent on UV Source** Organics can yield baseline noise and carbon dioxide can suppress detector response.
	H_2	B•54	HY 6.0RS	N/A	
	N_2	B•65	NI 5.5TG	N/A	
MS (Mass Spectrometer)	Ar	B•26	AR 5.5TG	AR 5.0UH	**Universal Detector** Organics can yield baseline noise and carbon dioxide can suppress detector response.
	He	B•53	HE 5.5TG	HE 5.0UH	
	H_2	B•54	HY 6.0RS	HY 5.0UH	
	N_2	B•65	NI 5.5TG	NI 5.0UH	
DID (Discharge Ionization Detector)	He	B•53	HE 6.0RS	N/A	**Universal Detector** Atmospheric impurities can cause baseline noise signal polarity and reduced detector stability and sensitivity.
	He Purge	B•53	HE 5.0UH	N/A	
USD (Ultrasonic Detector)	Ar	B•26	AR 5.0UH	AR 5.0UH/ IAR 4.8Z	**Universal Detector** Atmospheric impurities can cause baseline noise signal polarity and reduced detector stability and sensitivity.
	He	B•53	HE 5.0UH	HE 5.0UH/ HE 4.6Z	

Praxair's Gas Grade Recommendations

Analytical Method Detector	Instrument Gases	Page Number	Analytical Range < 100 ppm	Analytical Range > 100 ppm	Type of Analysis Impurity Considerations
Optical Spectometry – Absorption					
IR (Infrared)	Air	B•24	AI 0.0UZ	AI 0.0Z	**Polyatomic and Heteroatomic Compounds** Oxygen can oxidize a sample. Moisture interferes with IR spectra. Impurities coinciding with analyte peaks can cause inaccuracies.
	Ar	B•26	AR 5.0UH	AR 5.0UH	
	N_2	B•65	NI 5.0UH	NI 5.0UH	
	LN_2	B•85	Liquid	Liquid	
AA (Atomic Absorption)	Air	B•24	AI 0.0Z	AI 0.0Z	**Elemental Analysis** Impurities can cause the flame to discolor or burn unevenly. Furnace atmospheres require low oxygen and moisture levels to maintain instrument sensitivity.
	Ar	B•26	AR 5.0UH	AR 5.0UH	
	C_2H_2	B•23	AC 2.6AA	AC 2.6AA	
	n-C_4H_{10}	B•31	BU 2.5IS	BU 2.5IS	
	H_2	B•54	HY 4.5Z	HY 4.5Z	
	N_2	B•65	NI 5.0UH	NI 5.0UH	
	N_2O	B•69	NS 2.5AA	NS 2.5AA	

Gas Grade Legend

AA – Atomic Absorption
EC – Electron Capture Detector
IS – Instrument
RS – Research/Chromatographic
TG – Trace Analytical
UH – Ultra High Purity
UZ – Ultra Zero
Z – Zero

Please refer to designated page numbers for available cylinder styles, contents, and other information.

Please refer to the Instrumentation Mixture Summary on page D•218 for additional information regarding mixtures.

Please refer to the Regulator Reference Guide on page E•241 for help in selecting the appropriate cylinder regulator.

Application Note: Helium and Hydrogen Carrier Gases for Gas Chromatography

Helium and hydrogen are the most common carrier gases used for gas chromatography applications. These two gases deliver similar optimum achievable separation efficiencies (theoretical plates). Hydrogen offers advantages versus helium in having a higher and broader range of linear velocities for which near-optimum separation efficiency can be achieved, especially for applications requiring longer columns (higher inlet pressures). The higher linear velocities available to hydrogen enable significant potential reductions in analysis time. Unlike inert helium, hydrogen has the potential to react with some analytes; such reactions are uncommon under normal gas chromatography conditions. Users should note that conversion from one carrier gas to another can involve significant changes to standard operating procedures. In executing a conversion from helium to hydrogen, one must consider not only compatibility of the gas chromatograph but also the associated plumbing and connected components (e.g., filters or mass spectrometer). Hydrogen presents flammability and asphyxiation hazards, and appropriate safety precautions should be taken in accordance with careful risk assessment when working with hydrogen in a lab. Helium is typically supplied via cylinders, while hydrogen can be supplied via cylinders or on-site generators. With decades of experience in supplying gases for analytical instruments, Praxair is prepared to help users identify and move forward their preferred best gas solutions for their particular applications.

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Praxair's Gas Grade Recommendations

Analytical Method Detector	Instrument Gases	Page Number	Analytical Range < 100 ppm	Analytical Range > 100 ppm	Type of Analysis Impurity Considerations
Optical Spectrometry – Atomic Emission					
ICP (Inductively Coupled Plasma)	Ar	B•26	AR 4.8IC	AR 4.8IC	**Elemental Analysis** (see application note below)
	LAr	B•82	AR 4.8IC	AR 4.8IC	
	N_2	B•65	NI 5.0UH	NI 5.0UH	
Flame	Air	B•24	AI 0.0Z	AI 0.0Z	**Elemental Analysis**
	C_2H_2	B•23	AC 2.6AA	AC 2.6AA	
	n-C_4H_{10}	B•31	BU 2.5IS	BU 2.5IS	
	H_2	B•54	HY 4.5Z	HY 4.5Z	
	N_2O	B•69	NS 2.5AA	NS 2.5AA	
Arc or Spark	Ar	B•26	AR 5.0UH	AR 4.8	**Elemental Analysis**
	H_2	B•54	HY 5.0UH	HY 4.5Z	
	5% Ar in H_2	D•218	IG NC6	IG NC6	
Optical Spectrometry – Chemiluminescence					
Chemiluminescence	Air	B•24	AI 0.0CE	AI 0.0CE	**Atmospheric Pollutants – NO_x, SO_x, O_3**
	N_2	B•65	NI 5.5CE	NI 5.5CE	
	O_2	B•70	OX 4.3UH	OX 4.3UH	
Optical Spectrometry – Fluorescence					
XRF (X-Ray Flourescence)	10% CH_4 in Ar	D•218	IG P10	IG P10	**Elemental Analysis**
	1.3% n-C_4H_{10} in He	D•218	IG NC4	IG NC4	
	0.95% i-C_4H_{10} in He	D•218	IG NC5	IG NC5	
	LN_2	B•85	NI 4.8LC	NI 4.8LC	
UVF (Ultra-Violet Fluorescence)	Air	B•24	AI 0.0VC	AI 0.0VC	**SO_2 - H_2S - Organic Compounds**
	N_2	B•65	NI 5.5CE	NI 5.5CE	

Application Note: Using Argon with ICP

Inductively coupled plasma (ICP) is a popular means of preparing analytes for atomic emission spectrometry (ICP-AES) and mass spectrometry (ICP-MS). In both methods, the high temperature, ionizing environment of the plasma converts analyte molecules into excited-state atoms and ions. AES methods identify and quantify elements in the analyte on the basis of the electromagnetic radiation emitted by the excited-state species, while MS methods separate and quantify the ions on the basis of their mass-to-charge ratio. Argon is almost always used as the plasma gas for ICP applications. High purity argon is required to sustain a robust plasma, prevent instrument contamination, and avoid interferences with analytes. Praxair offers a variety of argon grades to meet the requirements of most instruments; the AR4.8IC grade is most commonly used. Argon is purified from atmospheric air and may contain trace levels of krypton, which can interfere with ICP-MS analyses for selenium and strontium. Argon flow rates for ICP often exceed 10 liters per minute, making these applications good candidates for cryogenic liquid supply options. Liquid supply via dewars or microbulk can reduce unit costs and disruptions associated with changing cylinders. Cylinders better preserve product and lab space when ICP instrument usage is infrequent. Praxair can help ICP users choose the right grades and supply options for their needs.

Praxair's Gas Grade Recommendations

Analytical Method Detector	Instrument Gases	Page Number	Analytical Range < 100 ppm	Analytical Range > 100 ppm	"Type of Analysis Impurity Considerations"
Others					
NMR (Nuclear Magnetic Resonance)	LHe	B•84	Liquid	Liquid	**Analysis of Molecular Structure**
	LN_2	B•85	Liquid	Liquid	
MS (Mass Spectrometry)	Air	B•24	AI 0.0UZ	AI 0.0UZ	**All Compounds via Various Ionization Sources**
	Ar	B•26	AR 5.5TG/ AR 5.0UH	AR 5.0UH/ AR 4.8IC	
	LAr	B•82	AR 5.0	AR 5.0/ AR 4.8IC	
	He	B•53	HE 5.5TG	HE 5.0UH	
	H_2	B•54	HY 6.0RS	HY 5.0UH	
	N_2	B•65	NI 5.5TG/ NI 5.0UH	NI 5.0UH	
	LN_2	B•85	NI 5.0	NI 5.0/ NI 4.8	
	NH_3 in He	C•99	Certified Standard	Certified Standard	
Nuclear Counter	5% CH_4 in Ar	D•218	IG P5	IG P5	**Radioactivity**
	10% CH_4 in Ar	D•218	IG P10	IG P10	
	1.3% n-C_4H_{10} in He	D•218	IG NC4	IG NC4	
	0.95% i-C_4H_{10} in He	D•218	IG NC5	IG NC5	
Hydrometer	Air	B•24	AI 0.0UZ	AI 0.0Z	**Moisture in All Gases**
	N_2	B•65	NI 6.0RS	NI 5.0UH	
Paramagnetic Analyzer	N_2	B•65	N/A	NI 5.0UH	**Oxygen in All Gases**
	O_2 in N_2	C•127	Certified Standard	Certified Standard	
Combustion Analyzer	Ar	B•26	AR 5.0UH	AR 5.0UH	**Elemental Analysis – Carbon, Nitrogen, Sulfur**
	He	B•53	HE 5.0UH	HE 5.0UH	
	N_2	B•65	NI 5.0UH	NI 5.0UH	
	O_2	B•70	OX 5.0RS	OX 5.0RS	

Gas Grade Legend

CE – Continuous Emissions Monitoring
ICP – Inductively Coupled Plasma
RS – Research/Chromatographic
TG – Trace Analytical
UH – Ultra High Purity
UZ – Ultra Zero
VC – Volatile Organic Compound Free
Z – Zero

Please refer to designated page numbers for available cylinder styles, contents, and other information.

Please refer to the Instrumentation Mixture Summary on page D•218 for additional information regarding mixtures.

Please refer to the Regulator Reference Guide on page E•241 for help in selecting the appropriate cylinder regulator.

Instrument Mixture Summary

Part Number	Product Description	Mixture Application	Cylinder Style	CGA Connection
IG F11-K	40% H_2 in He (FID Fuel) (THC < 0.5 ppm)	Fuel Gas for GC-FID	K	350
IG F12UH-K	40% H_2 in He UHP (FID Fuel) (THC < 0.1 ppm)	Fuel Gas for GC-FID	K	350
IG F13-K	40% H_2 in N_2 (FID Fuel) (THC < 0.5 ppm)	Fuel Gas for GC-FID	K	350
IG F14UH-K	40% H_2 in N_2 UHP (FID Fuel) (THC < 0.1 ppm)	Fuel Gas for GC-FID	K	350
IG ECD1-K	5% CH_4 in Ar (ECD P-5)	Make-Up Gas for GC-ECD	K	350
IG ECD2-K	10% CH_4 in Ar (ECD P-10)	Make-Up Gas for GC-ECD	K	350
IG P5-K	5% CH_4 in Ar (P-5)	Proportional Counters	K	350
IG P10-K	10% CH_4 in Ar (P-10)	Proportional Counters and X-Ray Fluorescence	K	350
IG NC4-K	1.3% n-C_4H_{10} in He	Geiger-Muller Counters and X-Ray Fluorescence	K	350
IG NC5-K	0.95% i-C_4H_{10} in He	Geiger-Muller Counters and X-Ray Fluorescence	K	350
IG NC6-K	5% Ar in H_2	Spark Emission	K	350

Instrumentation mixtures are supplied as certified standards but can also be produced to meet primary standard or non-certified grade specifications.

Please refer to the Regulator Reference Guide on page E•241 for help in selecting the appropriate cylinder regulator.