

## Gas Mixtures, Certified and Primary

Gas Mixture Specifications

How to Order

Acetaldehyde

Acrylonitrile

Ammonia

Argon

Benzene

n-Butane

Carbon Dioxide

Carbon Disulfide

Carbon Monoxide

Carbonyl Sulfide

Chlorine

Ethane

Ethanol

Ethylene

Ethylene Oxide

Fluorine

Germane

Helium

N-Hexane

Hydrogen

Hydrogen Chloride

Hydrogen Fluoride

Hydrogen Sulfide

Isobutane

Methane

Methanol

Methyl Mercaptan

Nitric Oxide

Nitrogen

Nitrogen Dioxide

Oxygen

Propane

Propylene

Styrene

Sulfur Dioxide

Sulfur Hexafluoride

Toluene

Vinyl Chloride

# MIXTURE SPECIFICATIONS

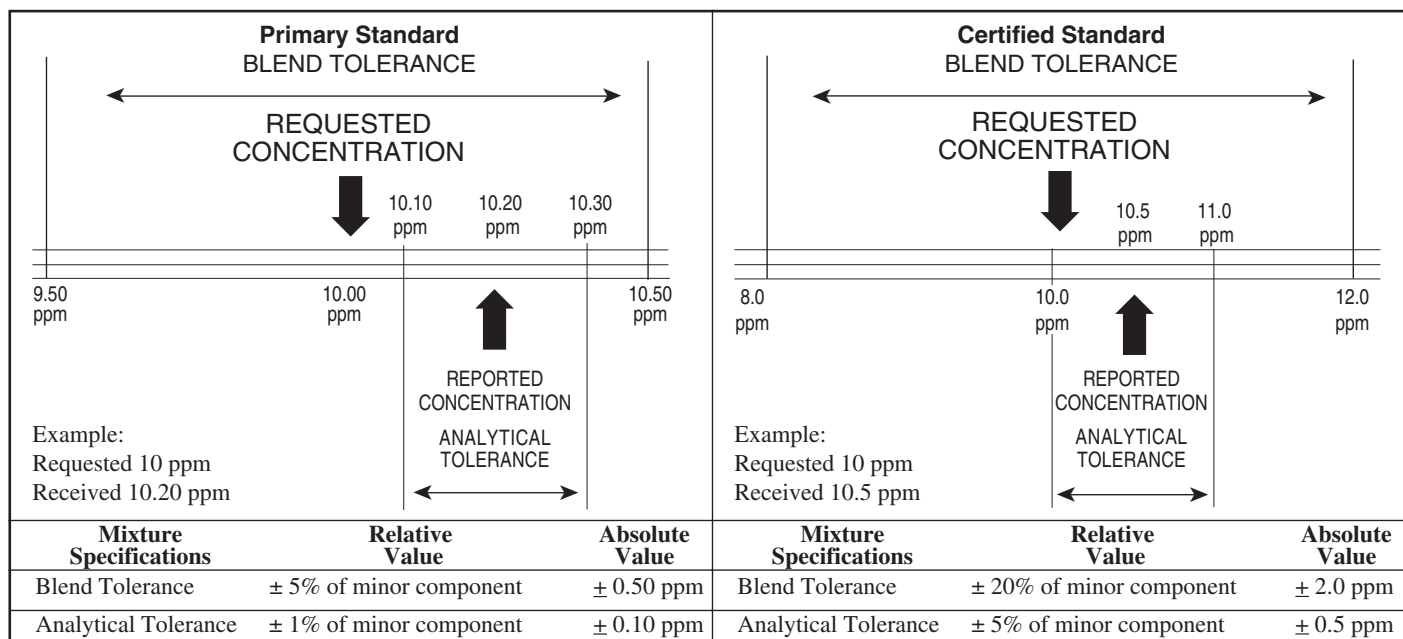
**Primary Standards:** Primary Standards should be used when the application requires the highest mixture accuracy and reliability. These mixtures are prepared gravimetrically on high precision electronic balances. The mixtures are then analyzed using SRM's, NTRM's or Linde Precision Lab Standards.

**Certified Standards:** Certified Standards are the most widely used calibration mixtures. Applications for these standards include, laboratory instrumentation calibration, biological and medical studies, chemical process industries and on environmental control measurements. These mixtures are prepared using either gravimetric, volumetric or partial pressure techniques. Cylinder concentration is named using a variety of analytical methods.

**Unanalyzed:** Unanalyzed mixtures are prepared using the same techniques as certified mixtures, but are not checked analytically.

	Minor Component Range	Grade of Mixture		
		Primary Standard*	Certified Standard*	EPA Protocol*
Blend Tolerance	10 ppb to 99 ppb	± 25% of each minor component	-----	-----
	100 ppb to 999 ppb		± 20% or 0.5 ppm (whichever is greater) of each minor component	± 10% or 0.5 ppm (whichever is greater) of each minor component
	1.0 ppm to 9.9 ppm	± 10% or 2 ppm (whichever is greater) of each minor component		
	10ppm to 99ppm		± 5% of each minor component	± 5% of each minor component
	100 ppm to 9999 ppm	± 1% of each minor component		
	1.0% to 50%			
Analytical Tolerance	10 ppb to 99 ppb	± 20% of each minor component	-----	-----
	100 ppb to 999 ppb		± 5% of each minor component	± 2% of each minor component
	1.0 ppm to 9.9 ppm	± 2% of each minor component		
	10ppm to 99.9ppm		± 1% of each minor component	± 1% of each minor component
	100 ppm to 9999 ppm			
	1.0% to 50%			

- It may be possible to produce mixtures with different tolerances upon request.
- These tolerances may vary for low molecular weight gases such as Hydrogen and Helium.
- For multi-component mixtures, tolerances may vary due to purity and/or stability of the raw material.



# How To Order Gas Mixtures

Locate the required product by consulting pages 62 through 90.  
Ordering information is highlighted in blue

<b>Argon Ar</b>																			
<b>in Helium</b> — (9)																			
Concentration	Specification	Product Code	Gas-Cylinder Data																
0.1-49%	Unanalyzed	501400	<table border="1"> <tr> <td>Cylinder Size</td> <td>007</td> <td>044</td> <td>(5) 049</td> </tr> <tr> <td>Pressure @70° PSIG</td> <td>2000</td> <td>2000</td> <td>2400</td> </tr> <tr> <td>Volume SCF</td> <td>33</td> <td>210</td> <td>300</td> </tr> <tr> <td>CGA valve outlet</td> <td>580</td> <td>580</td> <td>580</td> </tr> </table>	Cylinder Size	007	044	(5) 049	Pressure @70° PSIG	2000	2000	2400	Volume SCF	33	210	300	CGA valve outlet	580	580	580
Cylinder Size	007	044		(5) 049															
Pressure @70° PSIG	2000	2000		2400															
Volume SCF	33	210		300															
CGA valve outlet	580	580		580															
0.1-4.9 ppm	Certified	551900																	
5-99 ppm	Certified	552000																	
100-999 ppm	Certified	501600																	
0.1-49% — (7)	Certified — (8)	501500 — (6)																	
5-99 ppm	Primary	552100																	
100-999 ppm	Primary	501800																	
0.1-49%	Primary	501700																	
<b>in Hydrogen</b>																			
Concentration	Specification	Product Code	Gas-Cylinder Data																
0.1-49%	Unanalyzed	501900	<table border="1"> <tr> <td>Cylinder Size</td> <td>007</td> <td>044</td> <td>049</td> </tr> <tr> <td>Pressure @70° PSIG</td> <td>2000</td> <td>2000</td> <td>2400</td> </tr> <tr> <td>Volume SCF</td> <td>32</td> <td>208</td> <td>298</td> </tr> <tr> <td>CGA valve outlet</td> <td>350</td> <td>350</td> <td>350</td> </tr> </table>	Cylinder Size	007	044	049	Pressure @70° PSIG	2000	2000	2400	Volume SCF	32	208	298	CGA valve outlet	350	350	350
Cylinder Size	007	044		049															
Pressure @70° PSIG	2000	2000		2400															
Volume SCF	32	208		298															
CGA valve outlet	350	350		350															
5-99 ppm	Certified	552200																	
100-999 ppm	Certified	502100																	
0.1-49%	Certified	502000																	
5-99 ppm	Primary	552300																	
100-999 ppm	Primary	502300																	
0.1-49%	Primary	502200																	

Gas Mixtures

<b>Customer:</b> _____ (1)					
<b>Customer Number:</b> _____ <b>PO #</b> _____ (3)					
<b>Fax Number:</b> ( ) _____ <b>Phone Number:</b> ( ) _____					
<b>Shipping Address:</b> _____ (2)					
<b>Billing Address:</b> _____					
Quantity	Product Code	Cylinder Size	Minor Component(s) %/ ppm/ppb Concentrations	Balance Gas	Specification
1 (4)	501500 (6)	049 (5)	1% Argon (7)	Helium (9)	Certified (8)

- (1) Customer Name
- (2) Shipping Address
- (3) Purchase Order Number
- (4) Number of Cylinders Required
- (5) Cylinder Size or, if you are not sure of size, specify net volume required.
- (6) Product Code
- (7) Chemical Name and Concentration (in percent, ppm, or ppb) of each Component. Please do not use abbreviations or chemical symbols.
- (8) Specification:  
EPA Protocol Gas  
Primary Standard  
Certified Mixture  
Unanalyzed Mixture  
Other additional specifications
- (9) Balance Gas

# Acetaldehyde $\text{CH}_3\text{CHO}$

## in Helium

Concentration	Specification	Product Code	Gas-Cylinder Data			
2-500 ppm*	Certified	550000	Cylinder Size	A07	A16	A31
			Pressure @70° F PSIG**	2000	2000	2000
			Volume SCF	28	72	135
			CGA valve outlet	350	350	350

## in Nitrogen

Concentration	Specification	Product Code	Gas-Cylinder Data			
2-500 ppm*	Certified	550100	Cylinder Size	A07	A16	A31
			Pressure @70° F PSIG**	2000	2000	2000
			Volume SCF	30	76	142
			CGA valve outlet	350	350	350

**Regulator Recommendation:** High purity two stage see page 148.

\* Supplied in specially treated Stability Guard™ aluminum cylinders for guaranteed six (6) month stability.

\*\* Above 250 ppm cylinder contents and pressure will vary.

# Acrylonitrile $\text{CH}_2\text{CHCN}$

## in Helium

Concentration	Specification	Product Code	Gas-Cylinder Data			
2-500 ppm*	Certified	550200	Cylinder Size	A07	A16	A31
			Pressure @70° F PSIG**	2000	2000	2000
			Volume SCF	28	72	135
			CGA valve outlet	350	350	350

## in Nitrogen

Concentration	Specification	Product Code	Gas-Cylinder Data			
2-500 ppm*	Certified	550300	Cylinder Size	A07	A16	A31
			Pressure @70° F PSIG**	2000	2000	2000
			Volume SCF	30	76	142
			CGA valve outlet	350	350	350

**Regulator Recommendation:** High purity two stage, see page 148.

\* Supplied in specially treated Stability Guard™ aluminum cylinders for guaranteed six (6) month stability.

\*\* Above 300 ppm cylinder contents and pressure will vary.

# Ammonia $\text{NH}_3$

## in Air Ultra Zero

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-6%**	Unanalyzed	550700	Cylinder Size	007	016	044
1-49 ppm*	Certified	550800	Pressure @70° F PSIG	2000	2000	2000
50-999 ppm*	Certified	550900	Volume SCF	34	85	215
0.1-6%**	Certified	551000	CGA valve outlet	705	705	705

## in Helium

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-10%**	Unanalyzed	500500	Cylinder Size	007	016	044
1-49 ppm*	Certified	550400	Pressure @70° F PSIG	2000	2000	2000
50-999 ppm*	Certified	500700	Volume SCF	34	79	200
0.1-10%**	Certified	500600	CGA valve outlet	705	705	705

## in Nitrogen

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-10%**	Unanalyzed	500800	Cylinder Size	007	016	044
1-49 ppm*	Certified	551300	Pressure @70° F PSIG	2000	2000	2000
50-999 ppm*	Certified	587100	Volume SCF	35	82	209
0.1-10%**	Certified	500900	CGA valve outlet	705	705	705

## in Hydrogen

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-10%**	Unanalyzed	501100	Cylinder Size	007	016	044
1-49 ppm*	Certified	551600	Pressure @70° F PSIG	2000	2000	2000
50-999 ppm*	Certified	501300	Volume SCF	31	78	197
0.1-10%**	Certified	501200	CGA valve outlet	705	705	705

**Regulator Recommendation:** Stainless steel two stage, see page 148.

\* Supplied in specially treated Stability Guard™ aluminum cylinders for guaranteed six (6) months stability.

\*\* Above 3% cylinder contents and pressure will vary.

# Argon Ar

## in Helium

Concentration	Specification	Product Code	Gas-Cylinder Data		
0.1- 49%	Unanalyzed	501400			
0.1- 4.9 ppm	Certified	551900	Cylinder Size	007	044 049
5-99 ppm	Certified	552000	Pressure @70°F PSIG	2000	2000 2400
100 -999 ppm	Certified	501600	Volume SCF	33	210 300
0.1- 49%	Certified	501500	CGA valve outlet	580	580 580
5-99 ppm	Primary	552100			
100 -999 ppm	Primary	501800			
0.1- 49%	Primary	501700			

## in Hydrogen

Concentration	Specification	Product Code	Gas-Cylinder Data		
0.1- 49%	Unanalyzed	501900			
5-99 ppm	Certified	552200	Cylinder Size	007	044 049
100 -999 ppm	Certified	502100	Pressure @70°F PSIG	2000	2000 2400
0.1- 49%	Certified	502000	Volume SCF	32	208 298
5-99 ppm	Primary	552300	CGA valve outlet	350	350 350
100 -999 ppm	Primary	502300			
0.1- 49%	Primary	502200			

## in Nitrogen

Concentration	Specification	Product Code	Gas-Cylinder Data		
0.1- 49%	Unanalyzed	502400			
5-99 ppm	Certified	552400	Cylinder Size	007	044 049
100 -999 ppm	Certified	502600	Pressure @70°F PSIG	2000	2000 2400
0.1- 49%	Certified	502500	Volume SCF	34	217 307
5-99 ppm	Primary	552500	CGA valve outlet	580	580 580
100 -999 ppm	Primary	502800			
0.1-49%	Primary	502700			

## in Oxygen UHP

Concentration	Specification	Product Code	Gas-Cylinder Data		
0.1- 49%	Unanalyzed	502900			
3-99 ppm	Certified	552600	Cylinder Size	007	044 049
100 -999 ppm	Certified	503100	Pressure @70°F PSIG	2000	2000 2400
0.1- 49%	Certified	503000	Volume SCF	35	220 309
3-99 ppm	Primary	552700	CGA valve outlet	296	296 296
100 -999 ppm	Primary	503300			
0.1- 49%	Primary	503200			

**Regulator Recommendation:** High purity two stage, see page 148.

# Benzene $C_6H_6$

**in Air Ultra Zero**

Concentration	Specification	Product Code	Gas-Cylinder Data			
1-9.9 ppm	Certified	552800	Cylinder Size	A07	A16	A31
10-99 ppm	Certified	539800	Pressure @70°F PSIG	2000	2000	2000
100-1000 ppm*	Certified	552900	Volume SCF	30	77	146
1-9 ppm	Primary	553000	CGA valve outlet	590	590	590
10-99 ppm	Primary	539900				
100-1000 ppm*	Primary	553100				

**in Helium**

Concentration	Specification	Product Code	Gas-Cylinder Data			
1-9.9 ppm	Certified	553200	Cylinder Size	A07	A16	A31
10-100 ppm	Certified	540100	Pressure @70°F PSIG	2000	2000	2000
1-9 ppm	Primary	553300	Volume SCF	28	73	137
10-100 ppm	Primary	540200	CGA valve outlet	350	350	350

**in Nitrogen**

Concentration	Specification	Product Code	Gas-Cylinder Data			
1-9.9 ppm	Certified	553400	Cylinder Size	A07	A16	A31
10-100 ppm	Certified	540300	Pressure @70°F PSIG	2000	2000	2000
10-999 ppb**	Primary	553500	Volume SCF	29	74	138
1-9 ppm	Primary	553600	CGA valve outlet	350	350	350
10-100 ppm	Primary	540400				

**Regulator Recommendation:** High purity two stage, see page 148.

\* Above 200 ppm cylinder contents and pressure will vary.

\*\* Supplied in specially treated Stability Guard™ aluminum cylinders for guaranteed twelve (12) months stability.



**Gas Detector with Alarm, see page 204.**

**Linde's gas detectors provide an economical means to detect a number of toxic, corrosive and flammable gases.**

Linde Specialty Gas can manufacture stable VOC gas mixtures with concentration levels as low as parts per billion.

<b>n-Butane</b> $C_4H_{10}$							
<b>in Air Ultra Zero</b>							
Concentration	Specification	Product Code	Gas-Cylinder Data				
1-9.9 ppm	Certified	553700	Cylinder Size	007	016	044	
10-99 ppm	Certified	503600		Pressure @70°F PSIG	2000	2000	2000
100-6000 ppm	Certified	553800		Volume SCF	33	84	215
1-9 ppm	Primary	503800		CGA valve outlet	590	590	590
10-99 ppm	Primary	553900					
100-6000 ppm	Primary	554000					
<b>in Helium</b>							
Concentration	Specification	Product Code	Gas-Cylinder Data				
0.1-1%*	Unanalyzed	504000	Cylinder Size	007	016	044	
1-99 ppm	Certified	554300		Pressure @70°F PSIG	2000	2000	2000
100-999 ppm	Certified	504200		Volume SCF	31	79	200
0.1-1%*	Certified	504100		CGA valve outlet	350	350	350
1-99 ppm	Primary	554400					
100-999 ppm	Primary	504400					
0.1-1%*	Primary	504300					
<b>in Nitrogen</b>							
Concentration	Specification	Product Code	Gas-Cylinder Data				
0.1-1%*	Unanalyzed	504600	Cylinder Size	007	016	044	
1-99 ppm	Certified	554500		Pressure @70°F PSIG	2000	2000	2000
100-999 ppm	Certified	504800		Volume SCF	32	82	209
0.1-1%*	Certified	504700		CGA valve outlet	350	350	350
1-99 ppm	Primary	554600					
100-999 ppm	Primary	505000					
0.1-1%*	Primary	504900					
<b>Regulator Recommendation: High purity two stage, see page 148.</b>							
* Above 0.68% cylinder contents and pressure will vary.							

Linde Specialty Gases offers mixtures made with gas components recommended by the Gas Processors Association (GPA). These calibration standards are prepared gravimetrically traceable to the National Institute of Standards and Technology (NIST) and verified analytically. See page 113 for Standard Natural Gas Mixtures.



# Carbon Dioxide $\text{CO}_2$

## in Air

Concentration	Specification	Product Code	Gas-Cylinder Data							
0.1-28%*	Unanalyzed	505200	Cylinder Size	007	044	049				
1-99 ppm	Certified	555000								
100-999 ppm	Certified	505400								
0.1-28%*	Certified	505300								
1-99 ppm	Primary	555100					Pressure @70°F PSIG	2000	2000	2400
100-999 ppm	Primary	505600					Volume SCF	35	217	297
0.1-28%*	Primary	505500					CGA valve outlet	590	590	590

## in Argon

Concentration	Specification	Product Code	Gas-Cylinder Data							
0.1-28%*	Unanalyzed	505700	Cylinder Size	007	044	049				
1-99 ppm	Certified	555500								
100-999 ppm	Certified	505900								
0.1-28%*	Certified	505800								
1-99 ppm	Primary	555600					Pressure @70°F PSIG	2000	2000	2400
100-999 ppm	Primary	506100					Volume SCF	35	217	297
0.1-28%*	Primary	506000					CGA valve outlet	580	580	580

## in Helium

Concentration	Specification	Product Code	Gas-Cylinder Data							
0.1-28%*	Unanalyzed	506200	Cylinder Size	007	044	049				
1-99 ppm	Certified	555700								
100-999 ppm	Certified	506400								
0.1-28%*	Certified	506300								
1-99 ppm	Primary	555800					Pressure @70°F PSIG	2000	2000	2400
100-999 ppm	Primary	506600					Volume SCF	32	205	270
0.1-28%*	Primary	506500					CGA valve outlet	580	580	580

## in Hydrogen

Concentration	Specification	Product Code	Gas-Cylinder Data							
0.1-28%*	Unanalyzed	506700	Cylinder Size	007	044	049				
1-99 ppm	Certified	555900								
100-999 ppm	Certified	506900								
0.1-28%*	Certified	506800								
1-99 ppm	Primary	556000					Pressure @70°F PSIG	2000	2000	2400
100-999 ppm	Primary	507100					Volume SCF	31	203	268
0.1-28%*	Primary	507000					CGA valve outlet	350	350	350

## in Nitrogen

Concentration	Specification	Product Code	Gas-Cylinder Data							
0.1-28%*	Unanalyzed	507200	Cylinder Size	007	044	049				
1-99 ppm	Certified	556100								
100-999 ppm	Certified	507400								
0.1-28%*	Certified	507300								
1-99 ppm	Primary	556200					Pressure @70°F PSIG	2000	2000	2400
100-999 ppm	Primary	507600					Volume SCF	33	212	292
0.1-28%*	Primary	507500					CGA valve outlet	580	580	580

## in Oxygen

Concentration	Specification	Product Code	Gas-Cylinder Data							
0.1-28%*	Unanalyzed	507700	Cylinder Size	007	044	049				
1-99 ppm	Certified	556600								
100-999 ppm	Certified	507900								
0.1-28%*	Certified	507800								
1-99 ppm	Primary	556700					Pressure @70°F PSIG	2000	2000	2400
100-999 ppm	Primary	508100					Volume SCF	35	227	312
0.1-28%*	Primary	508000					CGA valve outlet	296	296	296

**Regulator Recommendation: High purity two stage, see page 148.** \*Cylinder contents and pressure will vary above 20%.

# Carbon Disulfide $CS_2$

## in Helium

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-1.0 ppm*	Certified	556800	Cylinder Size	A07	A16	A31
1.1-99 ppm	Certified	556900	Pressure @70°F PSIG	2000	2000	2000
100-1000 ppm	Certified	557100	Volume SCF	28	72	136
0.1-1.0 ppm*	Primary	557200	CGA valve outlet	330	330	330
1.1-99 ppm	Primary	557300				
100-1000 ppm	Primary	587200				

## in Nitrogen

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-1.0 ppm*	Certified	557400	Cylinder Size	A07	A16	A31
1.1-99 ppm	Certified	557500	Pressure @70°F PSIG	2000	2000	2400
100-1000 ppm	Certified	557600	Volume SCF	29	73	139
0.1-1.0 ppm*	Primary	557700	CGA valve outlet	330	330	330
1.1-99 ppm	Primary	557800				
100-1000 ppm	Primary	587300				

**Regulator Recommendation: Stainless steel two stage, see page 148.**

**Carbon Disulfide is also available with hydrocarbon balance gases.**

\* Supplied in specially treated Stability Guard™ aluminum cylinders for guaranteed six (6) months stability.

# Carbon Monoxide **CO**

## in Air Ultra Zero

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1- 4%	Unanalyzed	508200	<b>Cylinder Size</b> 007            016            044 <b>Pressure @70°F PSIG</b> 1340           1340           1340 <b>Volume SCF</b> 28             70             178 <b>CGA valve outlet</b> 590            590            590			
10 -999 ppb*	Certified	557900				
1-99 ppm*	Certified	558100				
100 -999 ppm	Certified	508500				
0.1-4%	Certified	508400				
1-99 ppm*	Primary	558200				
100 -999 ppm	Primary	508700				
0.1- 4%	Primary	508600				

## in Argon

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1- 49%	Unanalyzed	508800	<b>Cylinder Size</b> 007            016            044 <b>Pressure @70°F PSIG</b> 1340           1340           1340 <b>Volume SCF</b> 29             74             186 <b>CGA valve outlet</b> 350            350            350			
1-99 ppm*	Certified	558600				
100 -999 ppm	Certified	509100				
0.1- 49%	Certified	509000				
1-99 ppm*	Primary	558700				
100 -999 ppm	Primary	509300				
0.1- 49% ppm	Primary	509200				

## in Helium

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1- 49%	Unanalyzed	509400	<b>Cylinder Size</b> 007            016            044 <b>Pressure @70°F PSIG</b> 1340           1340           1340 <b>Volume SCF</b> 26             65             166 <b>CGA valve outlet</b> 350            350            350			
1-99 ppm*	Certified	558800				
100 -999 ppm	Certified	509700				
0.1- 49%	Certified	509600				
1-99 ppm*	Primary	558900				
100 -999 ppm	Primary	509900				
0.1- 49% ppm	Primary	509800				

## in Hydrogen

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1- 49%	Unanalyzed	510000	<b>Cylinder Size</b> 007            016            044 <b>Pressure @70°F PSIG</b> 1340           1340           1340 <b>Volume SCF</b> 26             65             165 <b>CGA valve outlet</b> 350            350            350			
10 -999 ppb*	Certified	559100				
1-99 ppm*	Certified	559000				
100 -999 ppm	Certified	510300				
0.1- 49%	Certified	510200				
1-99 ppm*	Primary	559200				
100 -999 ppm	Primary	510500				
0.1- 49% ppm	Primary	510400				

## in Nitrogen

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1- 49%	Unanalyzed	510600	<b>Cylinder Size</b> 007            044            049 <b>Pressure @70°F PSIG</b> 1340           1340           1450 <b>Volume SCF</b> 28             173            230 <b>CGA valve outlet</b> 350            350            350			
1-99 ppm*	Certified	559300				
100 -999 ppm	Certified	510900				
0.1- 49%	Certified	510800				
1-99 ppm*	Primary	559400				
100 -999 ppm	Primary	511100				
0.1- 49% ppm	Primary	511000				

**Regulator Recommendation: Stainless steel two stage, see page 148. EPA protocol gases, see pages 94 and 95.**

\* Supplied in Stability Guard™ aluminum cylinders only.

# Carbonyl Sulfide $\text{COS}$

## in Helium

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-1.0 ppm*	Certified	559800	<b>Cylinder Size</b> Pressure @ 70 F PSIG Volume SCF CGA valve outlet	A07	A16	A31
1.1-9.9 ppm*	Certified	559900		2000	2000	2000
10 -99 ppm	Certified	560000		28	72	136
100 -999 ppm	Certified	560100		330	330	330
0.1-3%**	Certified	560200				
0.1-1.0 ppm*	Primary	560300				
1.1-9.9 ppm*	Primary	560400				
10 -99 ppm	Primary	560500				
100 -999 ppm	Primary	560600				
0.1-3%**	Primary	560700				

## in Nitrogen

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-1.0 ppm*	Certified	560800	<b>Cylinder Size</b> Pressure @ 70 F PSIG Volume SCF CGA valve outlet	A07	A16	A31
1.1-9.9 ppm*	Certified	560900		2000	2000	2000
10 -99 ppm	Certified	561000		29	73	139
100 -999 ppm	Certified	561100		330	330	330
0.1-3%**	Certified	561200				
0.1-1.0 ppm*	Primary	561300				
1.1-9.9 ppm*	Primary	561400				
10 -99 ppm	Primary	561500				
100 -999 ppm	Primary	561600				
0.1-3%**	Primary	561700				

**Regulator recommendation:** Stainless steel two stage, see page 148.

\* Supplied in specially treated Stability Guard™ aluminum cylinders for guaranteed six (6) month stability.

\*\* Available in steel cylinders only.

# Chlorine $\text{Cl}_2$

## in Helium

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-3.5%*	Unanalyzed	538800	<b>Cylinder Size</b> Pressure @ 70°F PSIG Volume SCF CGA valve outlet	A07	A16	A31
1-999 ppm	Certified	539000		2000	2000	2000
0.1-3.5%*	Certified	538900		30	70	132
				330	330	330

## in Nitrogen

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-3.5%*	Unanalyzed	539300	<b>Cylinder Size</b> Pressure @ 70°F PSIG Volume SCF CGA valve outlet	A07	A16	A31
1-999 ppm	Certified	539500		2000	2000	2000
0.1-3.5%*	Certified	539400		31	72	135
				330	330	330

**Regulator Recommendation:** Stainless steel two stage, see page 148.

\* Cylinder content and pressure will vary according to concentrations.

# Ethane $C_2H_6$

## in Air Ultra Zero

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.5-99 ppm	Certified	561800	Cylinder Size                    007                    016                    044 Pressure @70°F PSIG        2000                    2000                    2000 Volume SCF                        33                        83                        213 CGA valve outlet                590                        590                        590			
100-999 ppm	Certified	511200				
0.1-1.5%	Certified	539600				
1-99 ppm	Primary	561900				
100 -999 ppm	Primary	511300				
0.1-1.5%	Primary	539700				

## in Helium

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-15%	Unanalyzed	511800	Cylinder Size                    007                    016                    044 Pressure @70°F PSIG        2000                    2000                    2000 Volume SCF                        31                        81                        207 CGA valve outlet                350                        350                        350			
0.5-99 ppm	Certified	562300				
100 -999 ppm	Certified	512000				
0.1-15%	Certified	511900				
1-99 ppm	Primary	562400				
100 -999 ppm	Primary	512200				
0.1-15%	Primary	512100				

## in Nitrogen

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-15%	Unanalyzed	512800	Cylinder Size                    007                    016                    044 Pressure @70°F PSIG        2000                    2000                    2000 Volume SCF                        32                        82                        209 CGA valve outlet                350                        350                        350			
0.5-99 ppm	Certified	562500				
100 -999 ppm	Certified	513000				
0.1-15%	Certified	512900				
1-99 ppm	Primary	562600				
100 -999 ppm	Primary	513200				
0.1-15%	Primary	513100				

**Regulator Recommendation: High purity two stage, see page 148.**

# Ethanol $C_2H_5OH$

## in Nitrogen

Concentration	Specification	Product Code	Gas-Cylinder Data			
1-9.9 ppm*	Certified	563000	Cylinder Size                    A07                    A16                    A31 Pressure @70°F PSIG        2000                    2000                    2000 Volume SCF                        28                        75                        140 CGA valve outlet                350                        350                        350			
10-99 ppm*	Certified	563100				
100-999 ppm*°	Certified	563200				

**Regulator Recommendation: High purity two stage, see page 148.**

\* Supplied in Stability Guard™ aluminum cylinders for guaranteed six (6) months stability.

° Cylinder content and pressure will vary according to concentrations.

# Ethylene $C_2H_4$

**in Air Ultra Zero**

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.5-99 ppm	Certified	563300	Cylinder Size	007	016	044
100 -999 ppm	Certified	513500				
0.1-1.3%	Certified	513400				
1-99 ppm	Primary	563400				
100-999 ppm	Primary	513700				
0.1-1.3%	Primary	513600				
			Pressure @70°F PSIG	2000	2000	2000
			Volume SCF	33	84	214
			CGA valve outlet	590	590	590

**in Helium**

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-15%	Unanalyzed	513800	Cylinder Size	007	016	044
0.5-99 ppm	Certified	563800				
100 -999 ppm	Certified	514000				
0.1-15%	Certified	513900				
1-99 ppm	Primary	563900				
100 -999 ppm	Primary	514200				
0.1-15%	Primary	514100	Pressure @70°F PSIG	2000	2000	2400
			Volume SCF	31	78	200
			CGA valve outlet	350	350	350

**in Nitrogen**

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-15%	Unanalyzed	514800	Cylinder Size	007	016	044
0.5-99 ppm	Certified	564000				
100 -999 ppm	Certified	515000				
0.1-15%	Certified	514900				
1-99 ppm	Primary	564100				
100 -999 ppm	Primary	515200				
0.1-15%	Primary	515100	Pressure @70°F PSIG	2000	2000	2000
			Volume SCF	32	83	210
			CGA valve outlet	350	350	350

**Regulator Recommendation: High purity two stage, see page 148.**

# Ethylene Oxide $C_2H_4O$

**in Nitrogen**

Concentration	Specification	Product Code	Gas-Cylinder Data			
1-99 ppm	Certified	564800	Cylinder Size	A07	A16	A31
100 -999 ppm	Certified	538100	Pressure @70°F PSIG	2000	2000	2000
0.1-1%*	Certified	538000	Volume SCF	28	73	140
			CGA valve outlet	350	350	350

**Regulator Recommendation: High purity two stage, see page 148.**

**Supplied in Stability Guard™ aluminum cylinders for guaranteed six (6) months stability.**

**For medical calibration standards, see page 98.**

\* Cylinder content and pressure will vary according to concentrations.

# Fluorine



## in Helium

Concentration	Specification	Product Code	Gas-Cylinder Data		
2-10%	Primary	538200	Cylinder Size	044	049
			Pressure @70°F PSIG	500	500
			Volume liters	1500	1700
			CGA valve outlet	679	679

## in Nitrogen

Concentration	Specification	Product Code	Gas-Cylinder Data		
2-10%	Primary	538500	Cylinder Size	044	049
			Pressure @70°F PSIG	500	500
			Volume liters	1500	1700
			CGA valve outlet	679	679

**Regulator Recommendation: Monel two stage, see page 165.**

**For Fluorine excimer laser gases, see page 114.**

# Germane



## in Hydrogen

Concentration	Specification	Product Code	SAP	Gas-Cylinder Data	
1%	Certified	500170	14666	Cylinder Size	049
5%	Certified		14668	Pressure @70°F PSIG	935
10%	Certified		14667	Volume SCF	111
20%	Certified		14669	CGA valve outlet	632

**Regulator Recommendation: Ultra High Purity panels, see page 182.**

# Helium He

## in Air Ultra Zero

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-49%	Unanalyzed	564900	Cylinder Size	007	044	049
1-99 ppm	Certified	565000				
100-999 ppm	Certified	515400				
0.1-49%	Certified	515300				
1-99 ppm	Primary	565100				
100-999 ppm	Primary	565200				
0.1-49%	Primary	565300				
			Pressure @70°F PSIG	2000	2000	2400
			Volume SCF	32	220	294
			CGA valve outlet	590	590	590

## in Argon

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-49%	Unanalyzed	515500	Cylinder Size	007	044	049
1-99 ppm	Certified	565400				
100-999 ppm	Certified	515700				
0.1-49%	Certified	515600				
1-99 ppm	Primary	565500				
100-999 ppm	Primary	515900				
0.1-49%	Primary	515800				
			Pressure @70°F PSIG	2000	2000	2400
			Volume SCF	33	222	300
			CGA valve outlet	580	580	580

## in Hydrogen

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-49%	Unanalyzed	543900	Cylinder Size	007	044	049
1-99 ppm	Certified	565600				
100-999 ppm	Certified	516100				
0.1-49%	Certified	516000				
1-99 ppm	Primary	565700				
100-999 ppm	Primary	516300				
0.1-49%	Primary	516200				
			Pressure @70°F PSIG	2000	2000	2400
			Volume SCF	30	198	264
			CGA valve outlet	350	350	350

## in Nitrogen

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-49%	Unanalyzed	516400	Cylinder Size	007	044	049
1-99 ppm	Certified	565800				
100-999 ppm	Certified	516600				
0.1-49%	Certified	516500				
1-99 ppm	Primary	565900				
100-999 ppm	Primary	516800				
0.1-49%	Primary	516700				
			Pressure @70°F PSIG	2000	2000	2400
			Volume SCF	32	210	281
			CGA valve outlet	580	580	580

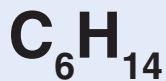
## in Oxygen

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-49%	Unanalyzed	516900	Cylinder Size	007	044	049
1-99 ppm	Certified	566000				
100-999 ppm	Certified	517100				
0.1-49%	Certified	517000				
1-99 ppm	Primary	566100				
100-999 ppm	Primary	517300				
0.1-49%	Primary	517200				
			Pressure @70°F PSIG	2000	2000	2400
			Volume SCF	32	220	295
			CGA valve outlet	580	296	296

**Regulator Recommendation:** High purity two stage, see page 148.



# n-Hexane



## in Air Ultra Zero

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-99 ppm <sup>°</sup>	Certified	540500	Cylinder Size Pressure @70°F PSIG Volume SCF CGA valve outlet	A07	A16	A31
100-999 ppm**	Certified	517400				
0.1-0.5%**	Certified	566200				
0.1-99 ppm <sup>°</sup>	Primary	540600				
100-999 ppm**	Primary	517500				
0.1-0.5%**	Primary	566300				

## in Nitrogen

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-99 ppm <sup>°</sup>	Certified	544400	Cylinder Size Pressure @70°F PSIG Volume SCF CGA valve outlet	A07	A16	A31
100-999 ppm**	Certified	518000				
0.1-0.5%**	Certified	566700				
0.1-99 ppm <sup>°</sup>	Primary	540700				
100-999 ppm**	Primary	518100				
0.1-0.5%**	Primary	566800				

### Regulator Recommendation: High purity two stage, see page 148.

<sup>°</sup> Supplied in specially treated Stability Guard™ aluminum cylinder for guaranteed twelve (12) months stability.

\*\* Cylinder pressure and contents will vary above 400 ppm.

Linde Specialty Gas can manufacture stable VOC gas mixtures with concentration levels as low as parts per trillion. See page 107.

These VOC calibration gas standards are used in the following applications:

- Stationary source monitoring
- Industrial processes and hygiene
- Incinerator emissions
- Ambient air monitoring

# Hydrogen $H_2$

## in Air

Concentration	Specification	Product Code	Gas-Cylinder Data			
1-99 ppm	Certified	567200	Cylinder Size Pressure @70°F PSIG Volume SCF CGA valve outlet	007	016	044
100 -999 ppm	Certified	567300				
0.1-1%	Certified	567400				
1-99 ppm	Primary	567500				
100 -999 ppm	Primary	567600				
0.1-1%	Primary	567700				

## in Argon

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1- 49%	Unanalyzed	518200	Cylinder Size Pressure @70°F PSIG Volume SCF CGA valve outlet	007	044	049
1-99 ppm	Certified	567800				
100 -999 ppm	Certified	518400				
0.1- 49%	Certified	518300				
1-99 ppm	Primary	567900				
100 -999 ppm	Primary	518600				
0.1- 49%	Primary	518500				

## in Helium

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1- 49%*	Unanalyzed	518700	Cylinder Size Pressure @70°F PSIG Volume SCF CGA valve outlet	007	044	049
0.5-99 ppm	Certified	568000				
100 -999 ppm	Certified	518900				
0.1- 49%*	Certified	518800				
0.5-99 ppm	Primary	568100				
100 -999 ppm	Primary	544500				
0.1- 49%*	Primary	519000				

## in Nitrogen

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1- 49%*	Unanalyzed	519100	Cylinder Size Pressure @70°F PSIG Volume SCF CGA valve outlet	007	044	049
0.5-99 ppm	Certified	568200				
100 -999 ppm	Certified	519300				
0.1- 49%*	Certified	519200				
0.5-99 ppm	Primary	568300				
100 -999 ppm	Primary	519500				
0.1- 49%*	Primary	519400				

**Regulator Recommendation:** High purity two stage, see page 148.

\* For Flame Ionization Detector (FID fuel) mixtures, see page 103.

<b>Hydrogen Chloride</b>			<b>HCl</b>			
<b>in Hydrogen</b>						
Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1- 10%	Unanalyzed	519600	Cylinder Size	007	044	049
5- 49 ppm	Certified	519900	Pressure @70° F PSIG	2000	2000	2400
50 -999 ppm	Certified	519800	Volume SCF	32	200	265
0.1-10%	Certified	519700	CGA valve outlet	330	330	330
<b>in Nitrogen</b>						
Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-10%	Unanalyzed	520000	Cylinder Size	007	044	049
5- 49 ppm	Certified	520300	Pressure @70° F PSIG	2000	2000	2400
50 -999 ppm	Certified	520200	Volume SCF	35	220	287
0.1-10%	Certified	520100	CGA valve outlet	330	330	330
<b>Regulator Recommendation: Stainless steel two stage, see page 148.</b>						

<b>Hydrogen Sulfide</b>			<b>H<sub>2</sub>S</b>			
<b>in Methane UHP</b>						
Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-10%°	Unanalyzed	544900	Cylinder Size	007	016	044
0.1-10%°	Certified	545200	Pressure @70° F PSIG	2000	2000	2000
100-999 ppm*	Certified	545100	Volume SCF	40	100	259
10-99 ppm*	Certified	545000	CGA valve outlet	330	330	330
100-999 ppm*	Primary	569200				
<b>in Hydrogen</b>						
Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-10%°	Unanalyzed	542900	Cylinder Size	007	016	044
0.1-10%°	Certified	543000	Pressure @70° F PSIG	2000	2000	2000
			Volume SCF	31	78	199
			CGA valve outlet	330	330	330
<b>in Nitrogen</b>						
Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-10%*	Unanalyzed	569400	Cylinder Size	A07	A16	A31
0.1-10%*	Certified	569500	Pressure @70° F PSIG	2000	2000	2000
1-9.9 ppm*	Certified	569800	Volume SCF	30	77	140
10-99 ppm*	Certified	569700	CGA valve outlet	330	330	330
100-999 ppm*	Certified	569600				
0.1-0.9 ppm*	Certified	569900				
1-9.9 ppm*	Primary	570200				
10-99 ppm*	Primary	570100				
100-999 ppm*	Primary	570000				
<b>Regulator Recommendation: Stainless steel two stage, see page 148.</b>						
* Supplied in specially treated Stability Guard™ aluminum cylinders guaranteed for six (6) months stability.						
° Above over 7% concentration, will be at reduced pressure and contents. EPA Protocol gases, see pages 105 and 106.						

# Hydrogen Fluoride HF

## in Helium

Concentration	Specification	Product Code	Gas-Cylinder Data		
0.1- 0.5%	Certified	543500	Cylinder Size	044	049
100 -999 ppm	Certified	543600	Pressure @70° F PSIG	2000	2400
			Volume SCF	205	305
			CGA valve outlet	330	330

## in Nitrogen

Concentration	Specification	Product Code	Gas-Cylinder Data		
0.1- 0.5%	Certified	543700	Cylinder Size	044	049
100 -999 ppm	Certified	543800	Pressure @70° F PSIG	2000	2400
			Volume SCF	205	305
			CGA valve outlet	330	330

**Regulator Recommendation: Two stage corrosive gas, see page 165.**

# Isobutane $C_4H_{10}$

## in Air

Concentration	Specification	Product Code	Gas-Cylinder Data				
1-99 ppm	Certified	570300	Cylinder Size	007	016	044	
100 -999 ppm	Certified	570400		Pressure @70° F PSIG	2000	2000	2000
0.1- 0.9%	Certified	570500		Volume SCF	34	85	215
1-99 ppm	Primary	570600		CGA valve outlet	590	590	590
100 -999 ppm	Primary	570700					
0.1- 0.9%	Primary	570800					

## in Helium

Concentration	Specification	Product Code	Gas-Cylinder Data				
0.1-1.0%	Unanalyzed	521900	Cylinder Size	007	016	044	
1-99 ppm	Certified	571200		Pressure @70° F PSIG	2000	2000	2000
100 -999 ppm	Certified	522100		Volume SCF	31	78	200
0.1-1.0%	Certified	522000		CGA valve outlet	350	350	350
1-99 ppm	Primary	571300					
100 -999 ppm	Primary	522300					

## in Nitrogen

Concentration	Specification	Product Code	Gas-Cylinder Data				
0.1-1.0%	Unanalyzed	522900	Cylinder Size	007	016	044	
1-99 ppm	Certified	571400		Pressure @70° F PSIG	2000	2000	2000
100 -999 ppm	Certified	523100		Volume SCF	33	84	210
0.1-1.0%	Certified	523000		CGA valve outlet	350	350	350
1-99 ppm	Primary	571500					
100 -999 ppm	Primary	523300					

**Regulator Recommendation: High purity two stage, see page 148.**

# Methane $\text{CH}_4$

## in Air

Concentration	Specification	Product Code	Gas-Cylinder Data		
1-99 ppm	Certified	571900	<b>Cylinder Size</b> 007            016            044 <b>Pressure @70° F PSIG</b> 2000            2000            2000 <b>Volume SCF</b> 33                84                214 <b>CGA valve outlet</b> 590                590                590		
100-999 ppm	Certified	523600			
0.1-2.5%	Certified	523500			
1-99 ppm	Primary	572000			
100-999 ppm	Primary	523800			
0.1-2.5%	Primary	523700			

## in Argon\*

Concentration	Specification	Product Code	Gas-Cylinder Data		
0.1-49%	Unanalyzed	523900	<b>Cylinder Size</b> 007            016            044 <b>Pressure @70° F PSIG</b> 2000            2000            2000 <b>Volume SCF</b> 37                94                238 <b>CGA valve outlet</b> 350                350                350		
1-99 ppm	Certified	572400			
100-999 ppm	Certified	524100			
0.1-49%	Certified	524000			
1-99 ppm	Primary	572500			
100-999 ppm	Primary	524300			
0.1-49%	Primary	524200			

## in Helium

Concentration	Specification	Product Code	Gas-Cylinder Data		
0.1-49%	Unanalyzed	524400	<b>Cylinder Size</b> 007            016            044 <b>Pressure @70° F PSIG</b> 2000            2000            2000 <b>Volume SCF</b> 32                79                200 <b>CGA valve outlet</b> 350                350                350		
1-99 ppm	Certified	572600			
100-999 ppm	Certified	524600			
0.1-49%	Certified	524500			
1-99 ppm	Primary	572700			
100-999 ppm	Primary	524800			
0.1-49%	Primary	524700			

## in Hydrogen

Concentration	Specification	Product Code	Gas-Cylinder Data		
0.1-49%	Unanalyzed	524900	<b>Cylinder Size</b> 007            016            044 <b>Pressure @70° F PSIG</b> 2000            2000            2000 <b>Volume SCF</b> 31                81                206 <b>CGA valve outlet</b> 350                350                350		
1-99 ppm	Certified	572800			
100-999 ppm	Certified	525100			
0.1-49%	Certified	525000			
1-99 ppm	Primary	572900			
100-999 ppm	Primary	525300			
0.1-49%	Primary	525200			

## in Nitrogen

Concentration	Specification	Product Code	Gas-Cylinder Data		
0.1-49%	Unanalyzed	525400	<b>Cylinder Size</b> 007            016            044 <b>Pressure @70° F PSIG</b> 2000            2000            2000 <b>Volume SCF</b> 34                83                210 <b>CGA valve outlet</b> 350                350                350		
1-99 ppm	Certified	573000			
100-999 ppm	Certified	525600			
0.1-49%	Certified	525500			
1-99 ppm	Primary	573100			
100-999 ppm	Primary	525800			
0.1-49%	Primary	525700			

**Regulator Recommendation: High purity two stage, see page 148.**

**EPA Protocol gases, see pages 105 and 106.**

**Natural gas and BTU mixtures, see page 113.**

\* Electron Capture and Nuclear Counter mixtures, see page 102.

# Methanol $\text{CH}_3\text{OH}$

## in Nitrogen

Concentration	Specification	Product Code	Gas-Cylinder Data			
1.0 -9.9 ppm*	Certified	573500	Cylinder Size	A07	A16	A31
10 -99 ppm*	Certified	573600	Pressure @70° F PSIG	2000	2000	2000
100 -999 ppm* <sup>o</sup>	Certified	573700	Volume SCF	28	75	142
0.1- 0.5%* <sup>o</sup>	Certified	573800	CGA valve outlet	350	350	350

**Regulator Recommendation:** High purity two stage, see page 148.

\* Supplied in specially treated Stability Guard aluminum cylinders guaranteed for a six (6) months stability.

<sup>o</sup> Above 250 ppm cylinder contents and pressure will vary.

# Methyl Mercaptan $\text{CH}_3\text{SH}$

## in Helium

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1- 0.9 ppm	Certified	574300	Cylinder Size	A07	A16	A31
1.0 -99 ppm	Certified	574400	Pressure @70° F PSIG	2000	2000	2000
100 -999 ppm	Certified	526000	Volume SCF	26	69	133
0.1-1%*	Certified	525900	CGA valve outlet	330	330	330

## in Nitrogen

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1- 0.9 ppm	Certified	574600	Cylinder Size	A07	A16	A31
1.0 -99 ppm	Certified	574700	Pressure @70° F PSIG	2000	2000	2000
100 -999 ppm	Certified	526300	Volume SCF	28	74	140
0.1-1%*	Certified	526200	CGA valve outlet	330	330	330

**Regulator Recommendation:** Stainless steel two stage, see page 148.

\* Above 0.46% cylinder contents and pressure will vary.

**Two Stage High Purity  
Regulator, see page 148.**



# Nitric Oxide NO

## in Helium

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-0.9 ppm	Certified	574900	Cylinder Size Pressure @70° F PSIG Volume SCF CGA valve outlet	A07	A16	A31
1-9.9 ppm	Certified	575000		2000	2000	2000
10-99 ppm	Certified	575100		30	80	142
100-999 ppm	Certified	575200		660	660	660
0.1-5%* <sup>o</sup>	Certified	575300				
1-9.9 ppm	Primary	575400				
10-99 ppm	Primary	575500				
100-999 ppm	Primary	575600				

## in Nitrogen Oxygen Free

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-1.0%*	Unanalyzed	526800	Cylinder Size Cyl. Pressure @70° F PSIG Volume SCF CGA valve outlet	A07	A16	A31
5-99 ppm	Certified	545400		2000	2000	2000
100-999 ppm	Certified	527000		28	75	140
0.1-1.0%*	Certified	526900		660	660	660
0.1-0.9 ppm	Primary	545700				
1.0-9.9	Primary	545600				
10-99	Primary	545500				
100-9999	Primary	545300				

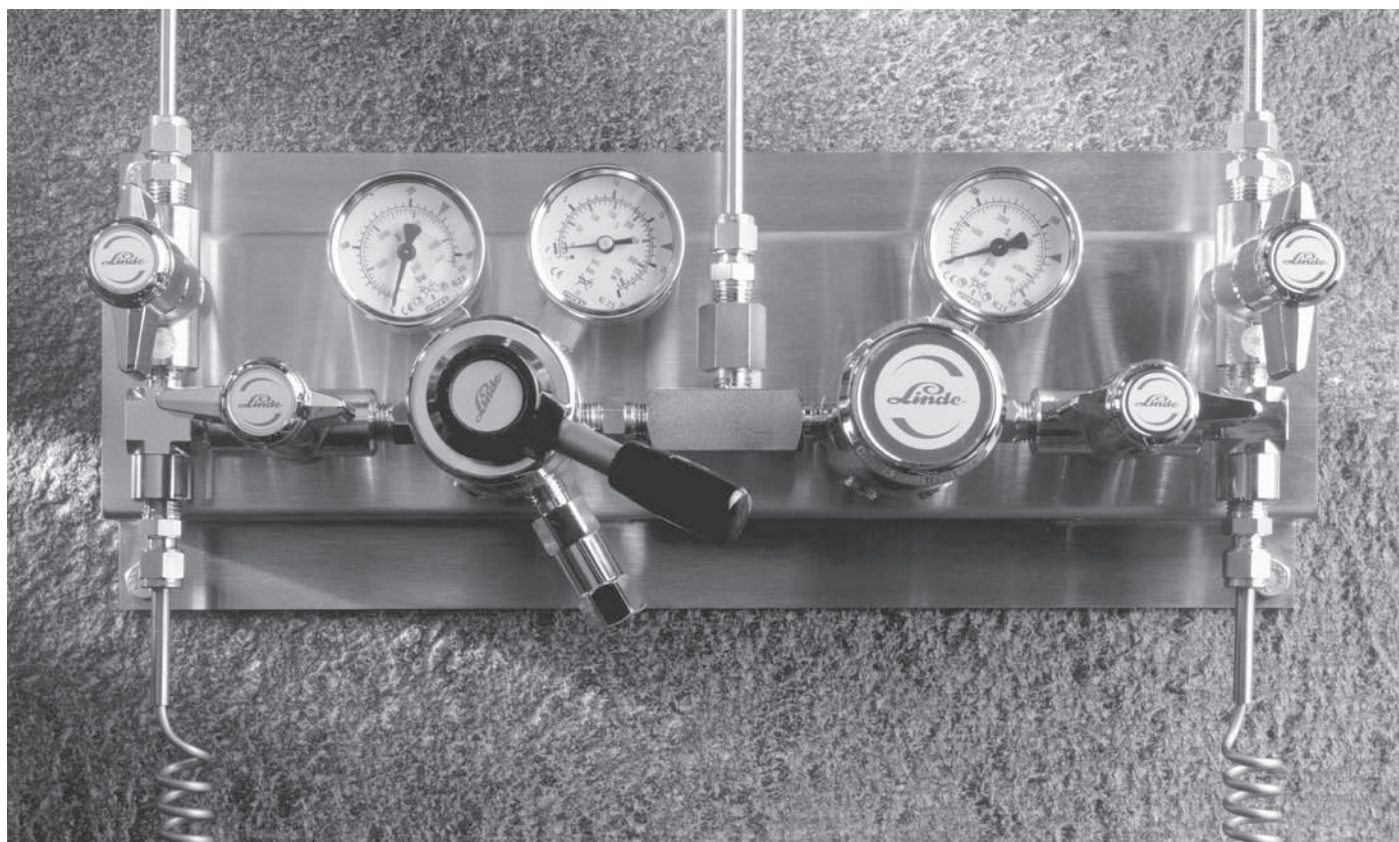
EPA Protocol gases, see pages 105 and 106.

Regulator Recommendation: Stainless steel two stage, see page 148.

Automotive Test mixtures, see page 109-112.

\* Available in steel cylinders only.

<sup>o</sup> Above 2.3% cylinder contents and pressure will vary.



A208 - Semi-Automatic Gas Panel, see page 178.

<b>Nitrogen</b> $N_2$					
<b>in Argon</b>					
Concentration	Specification	Product Code	Gas-Cylinder Data		
0.1-49%	Unanalyzed	527100	<b>Cylinder Size</b> 007                    016                    044 Pressure @70° F PSIG        2000                    2000                    2000 Volume SCF                        35                        88                        222 CGA valve outlet                580                        580                        580		
1-99 ppm	Certified	575800			
100-999 ppm	Certified	527300			
0.1-49%	Certified	527200			
1-99 ppm	Primary	575900			
100-999 ppm	Primary	541900			
0.1-49%	Primary	527400			
<b>in Helium</b>					
Concentration	Specification	Product Code	Gas-Cylinder Data		
0.1-49%	Unanalyzed	527500	<b>Cylinder Size</b> 007                    016                    044 Pressure @70° F PSIG        2000                    2000                    2000 Volume SCF                        31                        78                        199 CGA valve outlet                580                        580                        580		
1-99 ppm	Certified	576000			
100-999 ppm	Certified	527700			
0.1-49%	Certified	527600			
1-99 ppm	Primary	576100			
100-999 ppm	Primary	527900			
0.1-49%	Primary	527800			
<b>in Hydrogen</b>					
Concentration	Specification	Product Code	Gas-Cylinder Data		
0.1-49%	Unanalyzed	528000	<b>Cylinder Size</b> 007                    016                    044 Pressure @70° F PSIG        2000                    2000                    2000 Volume SCF                        32                        80                        201 CGA valve outlet                350                        350                        350		
1-99 ppm	Certified	576200			
100-999 ppm	Certified	528200			
0.1-49%	Certified	528100			
1-99 ppm	Primary	576300			
100-999 ppm	Primary	528400			
0.1-49%	Primary	528300			
<b>in Oxygen</b>					
Concentration	Specification	Product Code	Gas-Cylinder Data		
0.1-49%	Unanalyzed	528500	<b>Cylinder Size</b> 007                    016                    044 Pressure @70° F PSIG        2000                    2000                    2000 Volume SCF                        34                        87                        221 CGA valve outlet                296                        296                        296		
1-99 ppm	Certified	576400			
100-999 ppm	Certified	545800			
0.1-49%	Certified	528600			
1-99 ppm	Primary	576500			
100-999 ppm	Primary	545900			
0.1-49%	Primary	528700			
<b>Regulator Recommendation: High purity two stage, see page 148.</b>					

PURITY		IMPURITIES	
99.99999%	=	0.00001%	= 100 ppb
99.9999%	=	0.0001%	= 1 ppm
99.999%	=	0.001%	= 10 ppm
99.99%	=	0.01%	= 100 ppm
99.9%	=	0.1%	= 1,000 ppm
99%	=	1%	= 10,000 ppm



# Nitrogen Dioxide $\text{NO}_2$

## in Air

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-0.9 ppm	Certified	576600	Cylinder Size*                    A07                    A16                    A31 Pressure @70° F PSIG        2000                2000                2000 Volume SCF                            30                    77                    143 CGA valve outlet                    660                    660                    660			
1.0-9.9 ppm	Certified	576700				
10-99 ppm	Certified	576800				
100-9999	Certified	576900				
0.1-0.5%°	Certified	577000				
0.1-0.9 ppm	Primary	577100				
1.0-9.9 ppm	Primary	577200				
10-99 ppm	Primary	577300				
100-9999	Primary	577400				
0.1-0.5%°	Primary	577500				

## in Nitrogen\*

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-0.9 ppm	Certified	577600	Cylinder Size*                    A07                    A16                    A31 Pressure @70° F PSIG        2000                2000                2000 Volume SCF                            28                    75                    140 CGA valve outlet                    660                    660                    660			
1.0-9.9 ppm	Certified	577700				
10-99 ppm	Certified	577800				
100-999 ppm	Certified	577900				
0.1-0.5%°	Certified	578000				
1.0-9.9 ppm	Primary	578200				
10-99 ppm	Primary	578300				
100-999 ppm	Primary	578400				
0.1-0.5%°	Primary	578500				

**Regulator Recommendation:** Stainless steel two stage, see page 148.

\* Supplied in specially treated Stability Guard™ aluminum cylinders guaranteed for six (6) months stability.

\* May contain up to 1% oxygen.

° Above 1500 ppm cylinder contents and pressure will vary.

# Oxygen $O_2$

## in Argon

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-49%	Unanalyzed	529200				
0.1-0.9 ppm	Certified	579200				
1-99 ppm	Certified	579300	Cylinder Size	007	016	044
100-999 ppm	Certified	529400	Pressure @70° F PSIG	2000	2000	2000
0.1-49%	Certified	529300	Volume SCF	35	89	225
0.1-0.9 ppm	Primary	579400	CGA valve outlet	Over 23%=296	Over 23%=296	Over 23%=296
1-99 ppm	Primary	579500		5-23%=590	5-23%=590	5-23%=590
100-999 ppm	Primary	529600		Up To 5%=580	Up To 5%=580	Up To 5%=580
0.1-49%	Primary	529500				

## in Helium

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-49%	Unanalyzed	529700				
0.1-0.9 ppm	Certified	579700				
1-99 ppm	Certified	579800	Cylinder Size	007	016	044
100-999 ppm	Certified	529900	Pressure @70° F PSIG	2000	2000	2000
0.1-49%	Certified	529800	Volume SCF	31	78	199
0.1-0.9 ppm	Primary	579900	CGA valve outlet	Over 23%=296	Over 23%=296	Over 23%=296
1-99 ppm	Primary	580000		5-23%=590	5-23%=590	5-23%=590
100-999 ppm	Primary	530100		Up To 5%=580	Up To 5%=580	Up To 5%=580
0.1-49%	Primary	530000				

## in Nitrogen

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-49%	Unanalyzed	530200				
0.1-0.9 ppm	Certified	580200				
1-99 ppm	Certified	580300	Cylinder Size	007	016	044
100-999 ppm	Certified	530400	Pressure @70° F PSIG	2000	2000	2000
0.1-49%	Certified	530300	Volume SCF	32	82	209
0.1-0.9 ppm	Primary	580400	CGA valve outlet	Over 23%=296	Over 23%=296	Over 23%=296
1-99 ppm	Primary	580500		5-23%=590	5-23%=590	5-23%=590
100-999 ppm	Primary	530600		Up To 5%=580	Up To 5%=580	Up To 5%=580
0.1-49%	Primary	530500				

EPA Protocol Gases, see pages 105 and 106.

Regulator Recommendation: High purity two stage, see page 148.

# Propane $C_3H_8$

## in Air Ultra Zero

Concentration	Specification	Product Code	Gas-Cylinder Data			
1-99 ppm	Certified	580700	Cylinder Size Pressure @70° F PSIG Volume SCF CGA valve outlet	007	016	044
100-999 ppm	Certified	530800		2000	2000	2000
0.1-1.1%	Certified	530700		33	84	214
1-99 ppm	Primary	580800		590	590	590
100-999 ppm	Primary	531000				
0.1-1.1%	Primary	530900				

## in Helium

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-3%	Unanalyzed	531600	Cylinder Size Pressure @70° F PSIG Volume SCF CGA valve outlet	007	016	044
1-99 ppm	Certified	581200		2000	2000	2000
100-999 ppm	Certified	531800		30	77	198
0.1-3%	Certified	531700		350	350	350
1-99 ppm	Primary	581300				
100-999 ppm	Primary	532000				
0.1-3%	Primary	531900				

## in Nitrogen

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-3%	Unanalyzed	532500	Cylinder Size Pressure @70° F PSIG Volume SCF CGA valve outlet	007	016	044
1-99 ppm	Certified	581400		2000	2000	2000
100-999 ppm	Certified	532700		32	82	209
0.1-3%	Certified	532600		350	350	350
1-99 ppm	Primary	581500				
100-999 ppm	Primary	532900				
0.1-3%	Primary	532800				

EPA Protocol Gases, see pages 105 and 106.

Regulator Recommendation: High purity two stage, see page 148.

# Propylene $C_3H_6$

## in Air Ultra Zero

Concentration	Specification	Product Code	Gas-Cylinder Data			
1-99 ppm	Certified	581900	<b>Cylinder Size</b> 007            016            044 Pressure @70° F PSIG    2000            2000            2000 Volume SCF                33                84                214 CGA valve outlet            590                590                590			
100-999 ppm	Certified	533100				
0.1-1.0%	Certified	533000				
1-99 ppm	Primary	582000				
100-999 ppm	Primary	533300				
0.1-1.0%	Primary	533200				

## in Helium

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-3%	Unanalyzed	533900	<b>Cylinder Size</b> 007            016            044 Pressure @70° F PSIG    2000            2000            2000 Volume SCF                31                78                199 CGA valve outlet            350                350                350			
1-99 ppm	Certified	582400				
100-999 ppm	Certified	534100				
0.1-3%	Certified	534000				
1-99 ppm	Primary	582500				
100-999 ppm	Primary	534300				
0.1-3%	Primary	534200				

## in Nitrogen

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-3%	Unanalyzed	534800	<b>Cylinder Size</b> 007            016            044 Pressure @70° F PSIG    2000            2000            2000 Volume SCF                32                82                209 CGA valve outlet            350                350                350			
1-99 ppm	Certified	582600				
100-999 ppm	Certified	535000				
0.1-3%	Certified	534900				
1-99 ppm	Primary	582700				
100-999 ppm	Primary	535200				
0.1-3%	Primary	535100				

**Regulator Recommendation: High purity two stage, see page 148.**

# Styrene $C_8H_8$

## in Helium

Concentration	Specification	Product Code	Gas-Cylinder Data			
1-9.9 ppm	Certified	583300	<b>Cylinder Size</b> A07            A16            A31 Pressure @70° F PSIG    2000            2000            2000 Volume SCF                25                73                135 CGA valve outlet            350                350                350			
10-99 ppm*	Certified	583400				

## in Nitrogen

Concentration	Specification	Product Code	Gas-Cylinder Data			
1-9.9 ppm	Certified	583100	<b>Cylinder Size</b> A07            A16            A31 Pressure @70° F PSIG    2000            2000            2000 Volume SCF                27                75                140 CGA valve outlet            350                350                350			
10-99 ppm*	Certified	583200				

**Regulator Recommendation: Stainless steel two stage, see page 148.**

\* Above 15 ppm cylinder contents and pressure will vary.

# Sulfur Dioxide



## in Air (20.9% O<sub>2</sub>) Ultra Zero

Concentration	Specification	Product Code	Gas-Cylinder Data			
10-99 ppm	Certified	583700	Cylinder Size Pressure @70° F PSIG Volume SCF CGA valve outlet	A07	A16	A31
100-999 ppm	Certified	546300				
0.1-1%*°	Certified	535400				
1-9.9 ppm	Primary	583600				
10-99 ppm	Primary	546500				
100-9999	Primary	546400				

## in Nitrogen

Concentration	Specification	Product Code	Gas-Cylinder Data			
10-99 ppm	Certified	584200	Cylinder Size Pressure @70° F PSIG Volume SCF CGA valve outlet	A07	A16	A31
100-999 ppm	Certified	547100				
0.1-1%*°	Certified	536300				
1-9.9 ppm	Primary	584100				
10-99 ppm	Primary	547300				
100-9999	Primary	547200				

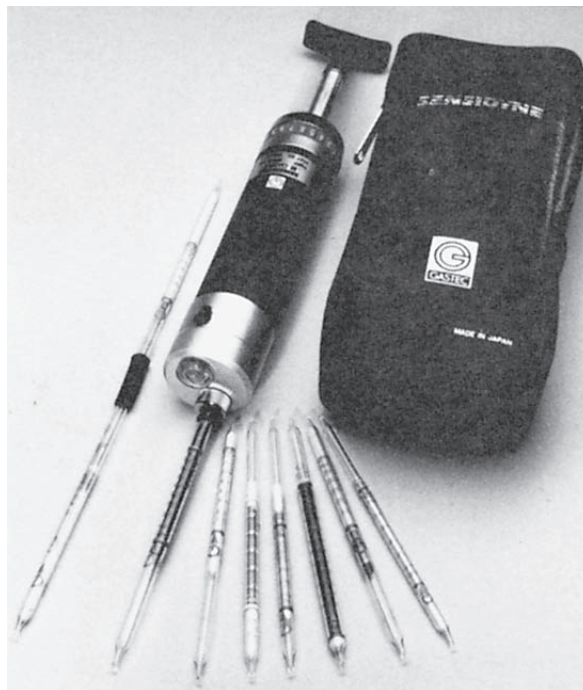
**EPA Protocol Gases, see page 105 and 106.**

**Regulator Recommendation: Stainless steel two stage, see page 148.**

\* Available in Linde steel cylinders.

\*\* For use in ambient air monitoring.

° Above 0.1% cylinder contents and pressure will vary.



Gas Detector Tubes, see page 228.

# Sulfur Hexafluoride



## in Air Ultra Zero

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-1%	Unanalyzed	536500	Cylinder Size Pressure @70° F PSIG Volume SCF CGA valve outlet	007	016	044
0.1-99 ppm	Certified	584400				
100-999 ppm	Certified	536700				
0.1-1%	Certified	536600				
0.1-99 ppm	Primary	584500				
100-999 ppm	Primary	547500				
0.1-1%	Primary	547400				

## in Nitrogen

Concentration	Specification	Product Code	Gas-Cylinder Data			
0.1-1%	Unanalyzed	537300	Cylinder Size Pressure @70° F PSIG Volume SCF CGA valve outlet	007	016	044
0.1-99 ppm	Certified	584700				
100-999 ppm	Certified	537500				
0.1-1%	Certified	537400				
0.1-99 ppm	Primary	584800				
100-999 ppm	Primary	547800				
0.1-1%	Primary	547700				

**Regulator Recommendation: High purity two stage, see page 148.**

\* Supplied in specially treated Stability Guard™ aluminum cylinders.



**Our Linde Mix 14  
aluminum refining  
formula takes the  
porosity out of  
the process.**

Linde Mix 14, see page 118.

# Toluene $C_7H_8$

## in Air Ultra Zero

Concentration	Specification	Product Code	Gas-Cylinder Data			
1-9.9 ppm	Certified	584900	Cylinder Size Pressure @70° F PSIG Volume SCF CGA valve outlet	A07	A16	A31
10-99 ppm*	Certified	585000		2000	2000	2000
100-250 ppm*	Certified	542100		29	76	144
1-9.9 ppm	Primary	585100		590	590	590
10-99 ppm*	Primary	585200				
100-250 ppm*	Primary	548000				

## in Nitrogen

Concentration	Specification	Product Code	Gas-Cylinder Data			
1-9.9 ppm	Primary	585400	Cylinder Size Pressure @70° F PSIG Volume SCF CGA valve outlet	A07	A16	A31
10-99 ppm*	Primary	585500		2000	2000	2000
100-250 ppm*	Primary	548200		28	74	140
251-500 ppm* <sup>o</sup>	Primary	585600		350	350	350
1-9.9 ppm	Certified	585700				
10-99 ppm*	Certified	585800				
100-250 ppm*	Certified	542300				
251-500 ppm* <sup>o</sup>	Certified	585900				

**Regulator Recommendation: High purity two stage, see page 148.**

<sup>o</sup> Offered in size 110 steel cylinders above 250 ppm, CGA outlet 510, 240 PSIA and 66 SCF.

\* Above 60 ppm cylinder contents and pressure will vary.

# Vinyl Chloride $CH_2:CHCL$

## in Air Ultra Zero

Concentration	Specification	Product Code	Gas-Cylinder Data			
1-9.9 ppm	Certified	586000	Cylinder Size Pressure @70° F PSIG Volume SCF CGA valve outlet	A07	A16	A31
10-49 ppm	Certified	586100		2000	2000	2000
50-2000 ppm	Certified	542400		30	77	145
1-99 ppm	Primary	586200		590	590	590
10-49 ppm	Primary	586300				
50-2000 ppm	Primary	586400				

## in Nitrogen

Concentration	Specification	Product Code	Gas-Cylinder Data			
1-9.9 ppm	Certified	586900	Cylinder Size Pressure @70° F PSIG Volume SCF CGA valve outlet	A07	A16	A31
10-49 ppm	Certified	542600		2000	2000	2000
50-2000 ppm	Certified	590200		29	75	141
1-9.9 ppm	Primary	586600		350	350	350
10-49 ppm	Primary	586700				
50-2000 ppm	Primary	586800				

**Regulator Recommendation: High purity two stage, see page 148.**

\* Supplied in specially treated Stability Guard™ aluminum cylinders.

# Multi-Component Mixtures

Linde Specialty Gases can formulate and supply the widest range of multi-component gas mixtures. These gas mixtures are typically used as calibration standards in process applications. Depending on the customer's analytical tolerance requirements, the mixtures are produced gravimetrically, volumetrically, or dynamically.

Minor Component	Major Component
Argon	Air
Butane	
Carbon Dioxide	Argon
Carbon Monoxide	
Ethane	Helium
Ethylene	
Helium	Hydrogen
Hydrogen	
Isobutane	Nitrogen
Methane	
Nitrogen	Oxygen
Oxygen	
Propane	
Propylene	



Any two or more of the Minor Components listed above may be mixed with any one of the Major Components listed above provided that the components are chemically compatible and safely below the lower flammability limits.

NOTE: Product codes represent a group of similar mixtures with individual gas part numbers.

MIXTURES	PRODUCT CODE	MIXTURES	PRODUCT CODE
Two Component Mixtures	500100	Seven Component Mixtures	605000
Three Component Mixtures	604600	Eight Component Mixtures	605100
Four Component Mixtures	604700	Nine Component Mixtures	605200
Five Component Mixtures	604800	Ten Component Mixtures	605300
Six Component Mixtures	604900		

Cylinder size, contents and price for Multi-Component Mixtures available upon request.

## Example of Multi-Component Mixtures:

Example 1		Example 2		Example 3	
Difluoromethane	1.0%	Carbon Dioxide	0.1%	n-Hexane	0.03%
Trifluoromethane	2.0%	Nitrous Oxide	0.1%	n-Butane	0.3%
Hexafluoromethane	2.0%	Helium	2.0%	n-Pentane	0.1%
Octafluoromethane	2.0%	Argon	2.0%	Isopentane	0.1%
Chloropentafluoroethane	2.0%	Oxygen	3.0%	Neopentane	0.1%
Trifluoroethylene	2.0%	Nitrogen	Balance	Isobutane	0.3%
Octafluorocyclobutane	2.0%			Propane	1.0%
Helium	Balance			Carbon Dioxide	1.0%
				Nitrogen	2.5%
				Ethane	5.0%
				Methane	Balance