

THE LINDE GROUP

Linde

Catalogue

Specialty Gas and Equipment



Your Specialty Gas team just got bigger and more global.

BOC and Linde have come together to form the world's largest industrial gases company, and our new Linde Specialty Gas division is bigger and more global than ever.

We are focused on just two things: developing better gas technology and serving you wherever you are in the world.

From ultra high purity atmospheric and specialty gases, to custom gas delivery systems and safety products, we are dedicated to finding innovative ways to supply your laboratory and process applications in ways that are safe – both to the environment and to your bottom line.

Talk to Canada's leading Specialty Gas team. Call us at 1-866-385-5349, or visit us online at www.lindecana.com.



THE LINDE GROUP

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At Linde, It's All About Our Customers. Customer satisfaction is Linde's focus. Our goal is to respond to your needs as quickly and effectively as possible. The demanding requirements of today's scientific market are the driving force behind the development of all our products, technologies and support services. We assure you of prompt, courteous service with an unparalleled attention to detail.

Ordering Procedures

Our bilingual Customer Service team features dedicated professionals who have in-depth industry experience and technical expertise. They understand your requirements and can provide you with assistance on Linde's diverse range of products and services. When you need assistance or technical support, help is only a phone call away.

Customer Service Centre

Tel. 1-866-385-5349

Fax 1-866-385-5347

scientific@lindecana.com

Features of Linde Special Products Customer Service:

- Open 8 a.m. to 5 p.m., Monday to Friday, right across Canada
- One-stop centre for advice on all Linde specialty products and services
- Get product quotations with focus on value-added, cost-saving solutions
- Provide Material Safety Data Sheets upon request
- Receive an order confirmation with each transaction
- Review your transaction history and account status
- View and print invoice copies
- Check your cylinder holdings

To help us serve you, please include the following information when you order:

vName of purchaser

Purchase order number

Shipping address

Billing address (if different from shipping)

In addition, the following information should be included when ordering from these specific product groups:

Pure Gases

- Name of gas
- Purity of gas required
- Size and quantity of containers

Mixed Gases

- Mixture composition (names and concentrations of gases)
- Size and quantity of containers
- Mixture type (e.g. primary, certified or unanalyzed)

Gas Control Equipment

- Gas control equipment
- Name
- Model number
- Quantity
- Special instructions (if any)

The Linde Gases and Equipment Warranty

Linde warrants that each of the products described in this catalogue shall, at the time of shipment, conform to such description. Upon confirmation, Linde shall replace any product that does not so conform, provided that such product, or an adequate representative sample, is returned to Linde, with transportation charges prepaid and a Linde credit request tag affixed. This warranty shall not apply to any product that has been repaired or altered by anyone other than an authorized employee of Linde, or that has been subject to abuse, misuse, negligence or accident.

There are no warranties which extend beyond the description of each product set forth in this catalogue other than the foregoing warranty, and Linde makes no warranty of merchantability in respect to any such product.

User Responsibility

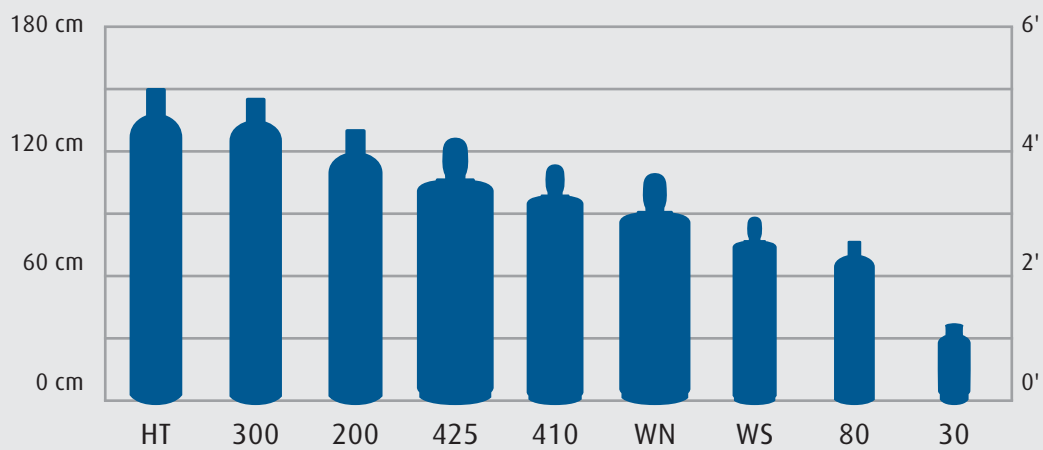
The products described in this catalogue will perform in conformity with the descriptions thereof (if any), when such products are maintained and used in accordance with the instructions provided. The products must be checked periodically. A defective product should not be used. A product that is broken, has parts missing, is plainly worn, is distorted or is contaminated should be replaced immediately. These products should not be repaired or altered. The user of these products shall have sole responsibility for any malfunction which results from improper use, faulty maintenance, improper repair, damage or alteration by anyone other than Linde.

Specialty Gas Cylinder Dimensions

Cylinder Size	Material	Minimal Dimensions Diameter x Height (cap included)	Average Tare Weight (kg)	Water Capacity (L)	Service Pressure (psig)
High Pressure Cylinders					
500	Steel	25 x 130 cm (10" x 51")	121	43.0	6,000
HT	Steel	25 x 149 cm (10" x 59")	83	50.0	4,500
HC	Steel	25 x 132 cm (10" x 52")	73	45.1	4,500
300	Steel	25 x 140 cm (10" x 55")	63	49.0	2400
200 and 204 (Nickel lined)	Steel	23 x 130 cm (9" x 51")	55	43.0	2,265 or 2,015
80	Steel	23 x 66 cm (9" x 26")	29	17.0	2,015
30 and 34 (Nickel lined)	Steel	15 x 48 cm (6" x 19")	13	6.75	2,015
10 (formerly DC)	Steel	10 x 33 cm (4" x 13")	5	2.25	2,015
302	Aluminum	25 x 147 cm (10" x 58")	41	46.3	2,216
152	Aluminum	20 x 122 cm (8" x 48")	22	29.5	2,015
82	Aluminum	18 x 84 cm (7" x 33")	14	15.9	2,015
32	Aluminum	18 x 41 cm (7" x 16")	7	5.9	2,015
LB	Steel	5 x 30 cm (2" x 12")	1.6	0.44	1,800
Acetylene Cylinders					
WN	Steel	30 x 124 cm (12" x 49")	80	71.75	250
WS	Steel	20 x 104 cm (8" x 41")	29	23.9	250
Low Pressure Cylinders					
425	Steel	37 x 124 cm (14.5" x 49")	40	108.8	240
LP100	Steel	30 x 140 cm (12" x 55")	51	85.0	480
410	Steel	25 x 140 cm (10" x 55")	41	55.8	480
150LB	Steel	25 x 122 cm (10" x 48")	48	54.4	480
Bulk Containers					
HCl Tonner	Steel	61 x 211 cm (24" x 83")	552	439	800
H ₂ S	Steel	76 x 206 cm (30" x 81")	1022	731	800
Transportable Cylinders					
6R and 6I	Aluminum (Refillable)	8.3 x 31.5 cm (3.25" x 12.4")	0.7	0.83	1,800
MM58	Aluminum (Disposable)	8.9 x 36.6 cm (3.5" x 14.4")	1.0	1.72	500
MM105	Steel (Disposable)	8.3 x 35.3 cm (3.25" x 13.9")	1.5	1.52	1,000
MM221	Steel (Disposable)	22.9 x 42.5 cm (9" x 16.75")	3.0	12.0	260
MM17	Steel (Disposable)	7 x 27.3 cm (2.75" x 10.75")	0.4	1.0	240

Cylinder Comparison Chart

BOC	Praxair	Airgas	Air Liquide	Matheson	Spectra	Scott	Linde
High Pressure Cylinders – Steel							
500	6K	3HP	50XPR	1U	–	–	046
300	T	300	50	1L	1	K	049
200	K	200	44	1A	2	A	044
80	Q	80	17	2	3	B	016
30	G	35	7	3	4	C	007
10	F	7	2	4	5	–	003
LB	LB	LB	LB	LB	LB	LB	LBS/LBR
High Pressure Cylinders - Aluminum							
152	AS	150A	30AL	1R	2A	AL	A31
82	AQ	80A	–	2R	3A	BL	A16
32	A3	33A	7AL	3R	4A	CL	A07
6R	–	–	–	6R	6A	–	–
Low Pressure Cylinders							
WN	A5	380	69	1B	–	XF	AC390
WS	CWS	140	23	–	–	–	AC145
425	FX	350	108	1F	–	XL	110
LP150	FC		–	1K	–	XG	126



General Terms and Conditions of Sale

All sales of the products described in this catalogue shall be governed only by the terms and conditions stated herein. No waiver or change of any of these terms or conditions shall be effective unless made in writing and signed by a duly authorized official of Linde.

In the event of a conflict between any terms and conditions stated on the Buyer's purchase order and Linde's terms and conditions, Linde's full terms and conditions shall prevail.

Buyer shall pay any and all taxes, assessments, excises or impositions levied upon any product or upon any storage, sale, transportation, delivery or use of consumption thereof.

Buyer shall examine and check each product upon receipt and, unless a written claim is delivered to Linde within ten days thereafter, all claims with respect to such product shall be conclusively deemed waived, and the Buyer shall be conclusively deemed to have accepted delivery of such product by Linde as full compliance with all of Linde's obligations to the Buyer with respect to such product.

Linde shall not be liable, under any circumstances, for an amount in excess of the purchase price of any product with respect to which any claim is made. Linde shall not be liable for special damages or for consequential damages under any circumstances. Linde shall not be liable for any failure of or delay in delivery caused by or resulting from any cause whatsoever beyond our reasonable control.

No credit will be allowed for goods or equipment returned without prior written approval.

By acceptance of delivery of each cylinder, fitting or cap, the Buyer agrees to indemnify and hold Linde harmless from and against all loss or damage arising out of injuries to or death of persons and damage to or destruction of property wherever the same may be, in any manner caused by, incident to or connected with any use thereof, or

with the contents thereof, subsequent to delivery of the product to the Buyer and prior to the return to Linde.

Suitability of the products ordered for any end use is the sole responsibility of the buyer. All orders accepted by Linde for any product shall be governed by and construed in accordance with the laws of the Province of Ontario.

No orders shall be binding unless accepted by Linde in writing, by one of its duly authorized officials.

Cylinders

All cylinders remain the property of Linde unless specifically sold outright. Cylinders are offered based on a daily or monthly rental program. Rental rates vary based on the material of construction of the cylinder and valve. On selected products, yearly lease rates are also available.

All cylinders, fittings, and caps provided by Linde in connection with the purchase of gases listed in this catalogue are loaned by Linde to the Buyer. All cylinders will be classified and shipped in compliance with all Transport Canada (TC) regulations.

After the cylinders have been emptied, they are to be promptly returned in good condition and repair, to the point from which they were shipped by Linde. The Buyer shall designate such empty cylinders, fittings and caps on the bill of lading covering the same (which it shall send to Linde) as "empty cylinders returned complete with fittings and caps." Buyers shall pay to Linde on demand the fair value for all cylinders, fittings and caps that have been damaged or not returned to Linde.

Each cylinder shall be marked at the time it is filled by Linde with a label identifying the contents thereof. Caution: the Buyer shall not use any cylinder that is not so marked when received, as use may be hazardous, but shall return each such cylinder to Linde for replacement.

Cylinder Information Identification

All Linde compressed gas cylinders, liquefied containers and trailers are marked with appropriate TC specifications and service pressures, and registered ownership symbol(s). Most Linde cylinders are identifiable by cylinder label and ownership name identification on the high pressure cylinder collar.

Returns

When empty cylinders, along with fittings and caps, are to be returned, shipping charges must be prepaid, to the location designated on the Linde shipping order which accompanies the cylinder. The customer will be charged for each standard cylinder cap that is damaged or not returned as well as each valve that is damaged or missing.

Customer Cylinders

Linde will fill customer owned cylinders under the following conditions.

- Linde must receive proof of ownership, and permission in writing prior to filling
- Cylinders must meet TC and Linde safety requirements
- Additional inspection and labeling charges may apply
- Linde will not fill reactive gases in customer owned cylinders
- Linde will not fill products listed in Linde sensitive product guidelines in customer owned cylinders. All product sales must comply with Linde Product Stewardship guidelines.

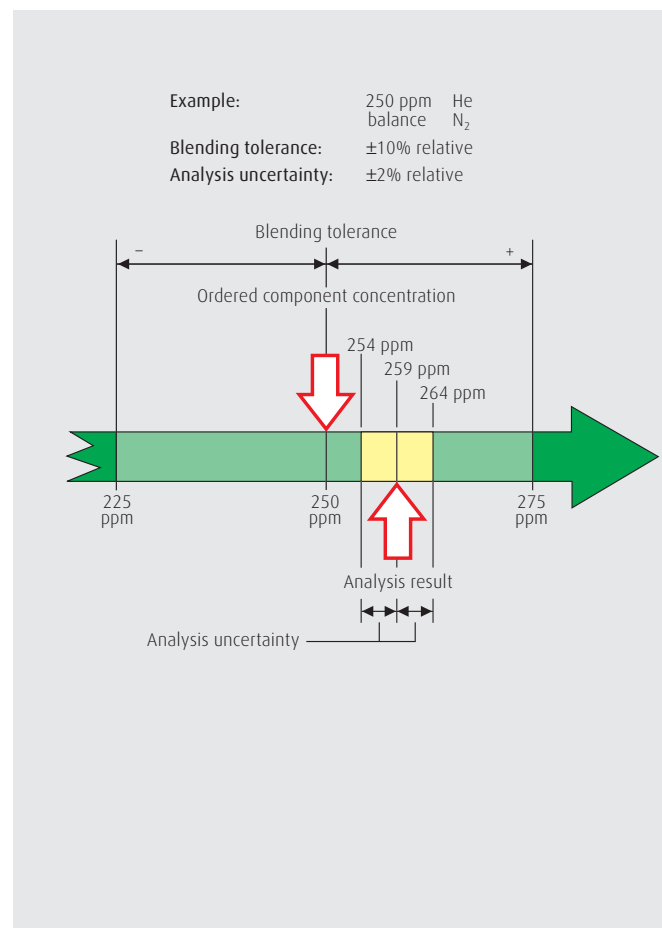
Linde reserves the right to refuse any customer owned cylinder at its discretion.

For a complete outline of our terms and conditions, go to our website: www.lindecana.com

Gas Purity and Mixture Accuracy

All gas products are quality controlled. When applicable, an analysis certificate is included with the product. If not included, it can be requested separately at time of order. Please check with your local Linde office to find out what is applicable for the products you order.

- Under the heading 'impurities', the maximum concentration of specified impurities is stated. The actual concentration can be less.
- Purity classification is expressed as a quality code (e.g. 5.5), where the number before the point represents the number of nines and the last number indicates the last decimal (5.5 = 99.9995%, and 6.0 = 99.9999%). The given percentage value represents the defined minimum purity of actual gas. In the case of liquefied gas, the purity always represents the vapourized liquid phase.
- Standard mixtures are delivered in molar units.
- R&D mixtures are specified by the customer and can be based on volume, weight or molar units or other concentration bases such as, $\mu\text{gram/litre}$ or mg/m^3 on request.
- For all products the material recommendation is valid for cylinder regulators, gas panels and point of use equipment. Central gas supply system recommendations are given with a symbol, and divided into three categories: green, blue and orange. For gas withdrawal with a cylinder regulator, suitable regulators are provided under 'Linde BASELINE™ and HiQ® Redline Series'. The recommended cylinder regulators are chosen to secure optimal results at all times.
- If nothing else is stated, the stated pressure is absolute.
- Blending tolerance is the maximum difference between the ordered concentration and the delivered mixture. The blending tolerance varies depending on preparation method and is normally given as percentage relative to the component. A blending tolerance of 10% for a gas mixture with the concentration 250 ppm means that the mixture will contain 250 ppm \pm 10% of the component. This means a true concentration between 225 ppm and 275 ppm.
- Analysis uncertainty is the maximum difference between the analysis result and the true concentration. Often the uncertainty is the most important quality parameter. The analysis uncertainty



is given as a percentage relative to the analyzed component concentration, which means that 2% analysis uncertainty applied to the blending tolerance example on this page will give an analysis result of 259 ppm \pm 2%, meaning a true concentration of 254–264 ppm.

- Shelf life is the guaranteed durability time of the analysis result, as long as the mixture has not received improper treatment, and as long as Linde's remarks have been complied with. The shelf lifetime starts when the product is verified/analyzed.
- Pure gases have CAS and UN numbers. The CAS number stands for Chemical Abstract Substance number and is unique for each substance. UN number is a similar type of register number for chemical substances and mixtures issued by the United Nations.

These numbers are given as an aid when searching in international databases.

- Transport data is based on Transport Canada (TC) and is valid for road transport in North America.
- n.a. stands for not applicable, e.g. risks for a ppm gas mixture with air as balance may not have any risk phrase since it is considered as 'polluted' air and not exceeding any safety limits.
- Cylinder size represents common standard sizes. Other sizes can be obtained upon request. Check with your local Linde office for additional information.
- Stated gas volumes/weights refer to minimum content in cases of products with pressure ranges or several supplied pressures.
- Liquefied air gases are delivered in dewars, or tanks at customer premises designed for the purpose. Please contact Linde locally for more specific information.
- Physical data reproduced by permission of DIPPR, the American Institute of Chemical Engineers.
- Note that national laws and regulations govern the permission to produce and use products that may be dangerous due to flammability and/or toxicity. Hence some of the mixtures contained herein may not be permissible in certain local markets.
- Linde reserves the right to make alterations to specifications, quantities, etc., for production or other reasons, subsequent to publication.
- The information contained herein has been prepared by qualified experts within Linde. While we believe that the information is accurate within the limits of the analytical methods employed and is complete to the extent of the specific analyzes performed, we make no warranty or representation as to the suitability of the use of the information for any particular purposes. The information is offered with the understanding that any use of the information is at the sole discretion and risk of the user. In any case Linde's liability arising out of the use of the information contained herein shall be limited to the fee established for providing such information.

Transport Canada Symbols for Gases



TC symbol for compressed



TC symbol for flammable



TC symbol for toxic



TC symbol for compressed and oxidizing



TC symbol for toxic and flammable



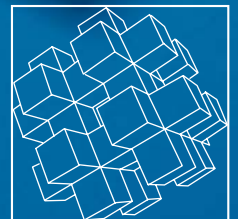
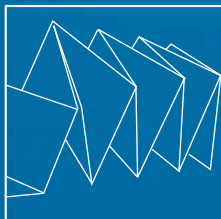
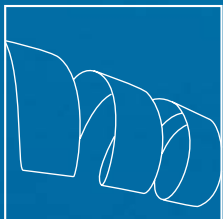
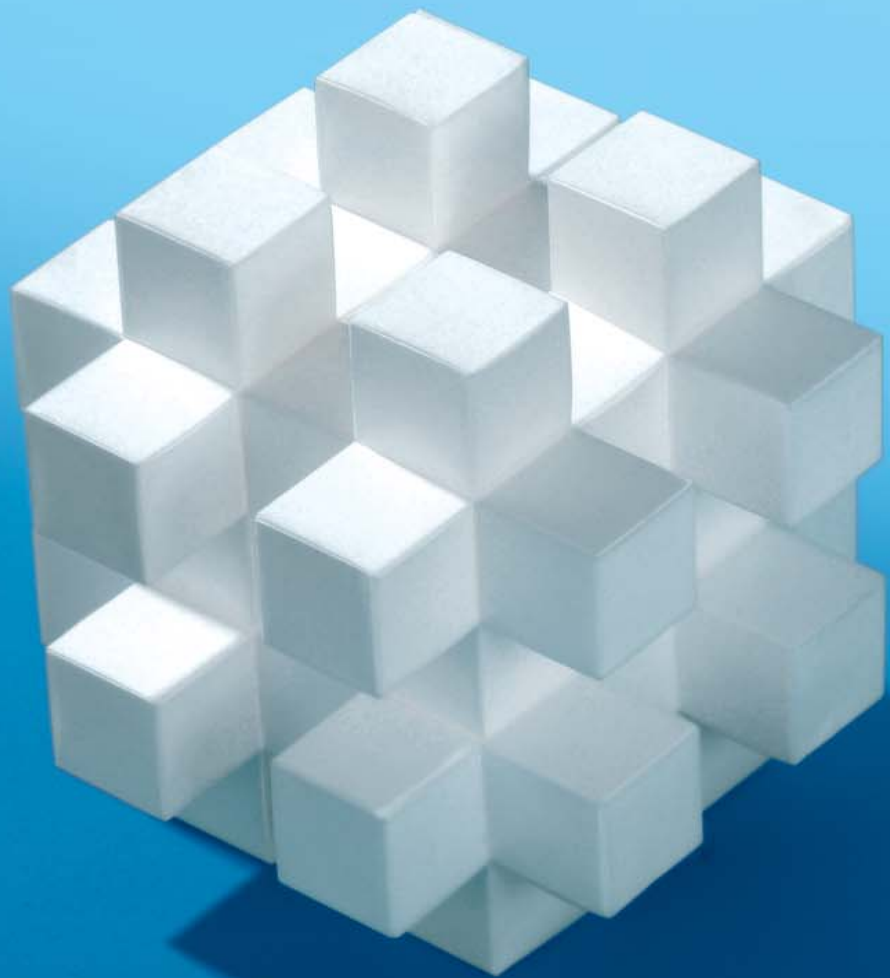
TC symbol for toxic and oxidizing



TC symbol for toxic and corrosive, etching



TC symbol for toxic, oxidizing and corrosive, etching



Pure Gases

The purity of a gas can often affect the results of a process or the accuracy of a measurement. In many cases, standard gas purities up to 5.0 may be sufficient. However, in some laboratories, a higher standard of reliability may be required in the development phase or for quality control to limit the number of variables.

Linde has a portfolio of more than 100 different products, many of them listed here, along with the various purity levels available. Often it may not just be a question of the purity that matters, but the degree of impurity that makes the real difference meaning, two gases of nominally identical purity may not necessarily have the same effect. Linde can help you determine what product purity will best suit your particular application. For help in choosing the right purity for your application, contact Linde Customer Service or your local Specialty Gas Representative. At Linde, the use of a wide range of state-of-the-art equipment to control production of our high-quality gases and calibration gas mixtures ensures your requirements are supplied in full, on time, in spec.

As a leader in the Canadian market for almost sixty years, Linde continues to work steadily to ensure our high-quality gas products can be used safely and with quality assured. All Specialty Gas regulators, manifolds and supply panels are designed to protect the integrity of the gas stream from supply to delivery point. We have made recommendations for the proper gas regulator for each of our gases listed. Individual information sheets are also available. The benefits of a high purity gas or mixture can be negated with the improper selection of a pressure regulator or gas manifold system. After all, your gas is only as good as your delivery system allows.

Note: Cylinder pressures and contents as listed are based upon the average water capacity of the cylinder, standard atmospheric conditions and temperatures of 21°C. They are subject to variation.

Specifications are expressed in mole/mole basis, gas phase unless otherwise specified.

General Symbols



Nickel- and chromium-plated brass equipment is recommended.



Use nickel- and chromium-plated brass or stainless steel equipment.



Only use stainless steel equipment.

Pure Gases

acetylene*	C ₂ H ₂	Specifications	Pressure (psig)	Size	Contents		Product Code
					m ³	ft ³	
Grade 2.6 (99.6%) <i>Atomic Absorption, Purified, A.A.</i>		PH ₃ < 15 ppm	250	WN	10.81	390	24001514
			250	WS	3.69	134	24001515

* Dissolved in acetone

C₂H₂

CGA



510

Shipping Name ACETYLENE, DISSOLVED

TDG Label Flammable gas

CAS Number 74-86-2

MSDS Number 030-01-0003

Hazard Class 2.1

PIN Number UN1001

Molecular Weight 26.04

Boiling Point -83.8°C (-118.8°F)

Specific Volume 0.918 m³/kg (14.7 ft³/lb)

Flammable Limits 2.5–81 % in Air

Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

C1061B

Single Stage Brass

See page 172

air	Specifications	Pressure (psig)	Size	Contents		Product Code
				m ³	ft ³	
Ambient CEM	CO < 0.5 ppm CO ₂ < 0.5 ppm NO _x < 0.1 ppm SO ₂ < 0.1 ppm THC < 0.1 ppm	2,640 2,200 2,000	300 200 152	8.49 6.31 4.07	306 227 143	24070271 24015854 24017298
Grade 0.1 <i>Ultra Zero, Zero 0.1, Zero 1, CO₂ Free</i>	CO < 1 ppm CO ₂ < 1 ppm H ₂ O < 2 ppm O ₂ 20-22% THC < 0.1 ppm	2,640 2,200 2,200	300 200 80	8.49 6.31 2.28	306 227 82	24064466 24064467 24064469
TOC <i>Total Organic Carbon</i>	CO < 0.5 ppm CO ₂ < 0.5 ppm O ₂ 20-22% THC < 0.1 ppm	2,640 2,200	300 200	8.49 6.31	306 227	24001980 24001979
Air Zero Emission Bar 97 <i>Vehicle Emission Zero</i>	CO < 1 ppm CO ₂ < 400 ppm NO < 1 ppm THC < 1 ppm	2,640 2,000	300 152	8.49 4.07	306 143	24069023 24001710
Zero 2 <i>Zero Gas</i>	CO < 5 ppm CO ₂ < 400 ppm H ₂ O < 4 ppm O ₂ 20-22% THC < 2 ppm	2,640 2,200 2,200	300 200 80	8.49 6.31 2.38	306 227 82	24064471 24064472 24064473
Extra Dry <i>E.D., Dry</i>	H ₂ O < 10 ppm O ₂ 20-22%	2,640 2,200 2,200	300 200 80	8.49 6.31 2.38	306 227 82	24064474 24064475 24064476
Air Diving Grade	Inquire	2,200	200	6.40	231	24080435

Air

CGA

590 (Diving Grade, 346)

Shipping Name

AIR, COMPRESSED

TDG Label

Non-flammable gas

CAS Number

132259-10-0

MSDS Number

001-01-0001

Hazard Class

2.2

PIN Number

UN1002

Molecular Weight

28.97

Boiling Point

-194.5°C (-382.1°F)

Specific Volume

0.833 m³/kg (13.3 ft³/lb)

Flammable Limits

Non-flammable

**Recommended Cylinder Regulator**

Equipment Series Material

BASELINE™

C1061B	Single Stage Brass	See page 172
C1061S	Single Stage Stainless Steel	See page 172
C1062B	Dual Stage Brass	See page 176
C1062S	Dual Stage Stainless Steel	See page 176

HiQ® REDLINE

C200/2B	Dual Stage Brass	See page 192
C200/2S	Dual Stage Stainless Steel	See page 192

Pure Gases

ammonia	NH ₃	Specifications	Pressure (psig)	Size	Contents		Product Code
					kg	lb	
Grade 5.0 (99.999%) <i>Ultra Pure, UHP</i>		CH ₄ < 1 ppm	114	152	15.45	34	24063968
		CO < 1 ppm					
		H ₂ O < 5 ppm					
		N ₂ < 5 ppm					
		O ₂ < 1 ppm					
Grade 4.0 (99.99%) <i>Anhydrous</i>		H ₂ O < 35 ppm	114	150	68.07	150	24001518
		Oil < 2 ppm	114	LP100	45.40	100	24001937
			114	200	22.68	50	24001517

NH₃

CGA



CGA 705

Shipping Name

AMMONIA, ANHYDROUS

TDG Label

Non-flammable gas, and corrosive

CAS Number

7764-41-7

MSDS Number

012-01-0009

Hazard Class

2.2 (8)

PIN Number

UN1005

Molecular Weight

17.03

Boiling Point

-33.4°C (-28.0°F)

Specific Volume

1.4m³/kg (22.6 ft³/lb)

Flammable Limits

15–28% in Air

Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

C1061S Single Stage Stainless Steel See page 172

HiQ® REDLINE

C200/1S Single Stage Stainless Steel See page 190

S203S Gas Panel See page 212

argon	Ar	Specifications	Pressure (psig)	Size	Contents		Product Code
					m ³	ft ³	
Grade 6.0 (99.9999%) <i>Research</i>		CO < 0.1 ppm CO ₂ < 0.1 ppm H ₂ O < 1 ppm N ₂ < 1 ppm O ₂ < 0.5 ppm THC < 0.1 ppm	2,640	200	6.73	243	24001524
BIP® <i>See page 28 for more information. *THC as CH₄</i>		H ₂ O < 20 ppb N ₂ < 1 ppb O ₂ < 10 ppb THC* < 100 ppb	2,640	300	9.18	331	24068702
Grade 5.3 (99.9993%) <i>UPC, Chromatographic</i>		H ₂ O < 1 ppm N ₂ < 8 ppm O ₂ < 2 ppm THC < 0.5 ppm	2,640 2,200	300 200	9.18 6.73	331 243	24068706 24068701
Grade 5.0 (99.999%) <i>Ultra Pure, UHP</i>		H ₂ O < 2 ppm O ₂ < 2 ppm THC < 0.5 ppm	2,640 2,200 2,200	300 200 80	9.18 6.73 2.42	331 243 87	24001306 24000021 24001307
Grade 4.8 (99.998%) <i>Zero Grade, Prepurified, High Purity, Low Oxygen</i>		H ₂ O < 3.5 ppm O ₂ < 4 ppm	4,500 2,640 2,200 2,200	HC 300 200 80	13.90 9.18 6.73 2.42	491 331 243 87	24001315 24001311 24001312 24001313
High Pressure			6,000	500	16.14	570	24017301

Ar



CGA 580 (4,500 psig 680; 6,000 psig 677)

Shipping Name ARGON, COMPRESSED

TDG Label Non-flammable gas

CAS Number 7440-37-1

MSDS Number 002-01-0001 (gas)

Hazard Class 2.2

PIN Number UN1006 (gas)

Molecular Weight 39.95

Boiling Point -185.9°C (-302.6°F)

Specific Volume 0.604 m³/kg (9.7 ft³/lb)

Flammable Limits Non-flammable

Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

C1061B	Single Stage Brass	See page 172
C1062B	Dual Stage Brass	See page 176
C3060	Dual Stage Brass (for CGA 677)	See page 184

HiQ® REDLINE

C200/2B	Dual Stage Brass	See page 192
C200/2S	Dual Stage Stainless Steel	See page 192

Pure Gases

argon	Ar	Specifications	Size	Contents		Product Code
				m ³	ft ³	
Liquid ICP <i>Argon, Refrigerated liquid</i>		H ₂ O < 5 ppm	PLC450 HP 350	299.81	10,588	24078295
		O ₂ < 3 ppm	PLC230 HP 350	162.80	5,749	24064551
		THC < 0.5 ppm	PLC180 HP 350	131.00	4,626	24064553
			PLC160 HP 230	119.00	4,202	24064556

Ar

CGA

580

Shipping Name

ARGON, REFRIGERATED LIQUID

TDG Label

Non-flammable gas

CAS Number

7440-37-1

MSDS Number

15-01-0004 (liquid refrigerated)

Hazard Class

2.2

PIN Number

UN1951 (liquid refrigerated)

Molecular Weight

39.95

Boiling Point

-185.9°C (-302.6°F)

Specific Volume

0.604 m³/kg (9.7 ft³/lb)

Flammable Limits

Non-flammable



Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

C1061B Single Stage Brass See page 172

C1061S Single Stage Stainless Steel See page 172

1,3-butadiene	C ₄ H ₆	Specifications	Pressure (psig)	Size	Contents		Product Code
					kg	lb	
Grade 2.5 (99.5%) <i>Instrument</i>		Inquire	21.4	200	20.41	45	24063918
Grade 2.0 (99% Liquid Phase) <i>CP, Commercial Grade</i>		1-Butene < 1,500 ppm C ₄ H ₈ < 1,500 ppm Cis-2-butene < 2,500 ppm H ₂ O < 10 ppm N ₂ < 150 ppm O ₂ < 50 ppm Propylene < 5 ppm Sulphur < 1 ppm Trans-2-butene < 2,500 ppm	21.4 21.4	425 80	61.23 7.71	135 17	24063921 24080803

C₄H₆

CGA



510

Shipping Name

BUTADIENES, STABILIZED

TDG Label

Flammable gas

CAS No.

106-99-0

MSDS No.

059-01-0010

Hazard Class

2.1

PIN Number

UN 1010

Molecular Weight

54.09

Boiling Point

-4.4°C (-24.1°F)

Specific Volume

0.43 m³/kg (6.9 ft³/lb)

Flammable Limits

2–12 % in air

Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

C1061B Single Stage Brass See page 172

C1061S Single Stage Stainless Steel See page 172

Pure Gases

n-butane	C ₄ H ₁₀	Specifications	Pressure (psig)	Size	Contents		Product Code
					kg	lb	
Grade 2.5 (99.5% Liquid Phase) <i>Instrument</i>	Air	< 500 ppm	16	425	54.43	120	24017470
	CH ₄	< 100 ppm	16	80	7.26	16	24080857
	C ₂ H ₆	< 250 ppm					
	C ₃ H ₈	< 1,000 ppm					
	C ₄ H ₁₀	< 2,500 ppm					
	H ₂ O	< 3 ppm					
	O ₂	< 50 ppm					
	N ₂	< 100 ppm					
	Pentanes	< 1,000 ppm					
	Sulphur	< 1 ppm					
Grade 2.0 (99% Liquid Phase) <i>CP</i>	CH ₄	< 500 ppm	16	425	54.43	120	24017325
	C ₂ H ₆	< 1,500 ppm	16	200	18.14	40	24017324
	C ₃ H ₈	< 2,500 ppm					
	C ₄ H ₁₀	< 3,000 ppm					
	H ₂ O	< 5 ppm					
	O ₂	< 50 ppm					
	N ₂	< 250 ppm					
	Pentanes	< 1,500 ppm					
Sulphur	< 1 ppm						

C₄H₁₀

CGA

510

Shipping Name

BUTANE

TDG Label

Flammable gas

CAS Number

106-97-8

MSDS Number

009-01-0003

Hazard Class

2.1

PIN Number

UN 1011

Molecular Weight

58.12

Boiling Point

-0.5°C (31.1°F)

Specific Volume

0.3995 m³/kg (6.4 f³/lb)

Flammable Limits

1.8–8.4 % in Air



Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

C1061B	Single Stage Brass	See page 172
C1061S	Single Stage Stainless Steel	See page 172

carbon dioxide	CO ₂	Specifications	Pressure (psig)	Size	Contents		Product Code
					kg	lb	
Grade 5.0 (99.999%) <i>Research</i>		CH ₄ < 0.5 ppm CO < 1 ppm H ₂ O < 2 ppm N ₂ < 8 ppm O ₂ < 2 ppm	830	152	18.14	40	24001530
Grade 4.0 (99.99%) <i>Coleman, Anaerobic</i>		H ₂ O < 10 ppm	830	200	25.85	57	24001324
		N ₂ < 50 ppm	830	200 (DT)	25.85	57	24062141
		O ₂ < 20 ppm	830	80	9.07	20	24001325
		THC < 10 ppm					
Grade 2.8 (99.8% Liquid Phase) <i>Bone Dry, Commercial</i>			830	200	25.85	57	24070340
			830	200 (DT)	25.85	57	24063833

CO₂

CGA

320

Shipping Name

CARBON DIOXIDE

TDG Label

Non-flammable gas

CAS Number

124-38-9

MSDS Number

014-01-0001 (gas)

Hazard Class

2.2

PIN Number

UN 1013 (gas)

Molecular Weight

44.01

Boiling Point

-78.4°C (-109.3°F)

Specific Volume

0.547 m³/kg (8.74 ft³/lb)

Flammable Limits

Non-flammable



Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

C1061B Single Stage Brass See page 172

C1061S Single Stage Stainless Steel See page 172

HiQ® REDLINE

C200/1B Single Stage Brass See page 190

C200/2B Dual Stage Brass See page 190

C200/1S Single Stage Stainless Steel See page 192

C200/2S Dual Stage Stainless Steel See page 192

Pure Gases

carbon dioxide	CO ₂	Specifications	Pressure (psig)	Size	Contents		Product Code
					m ³	ft ³	
Lasershield							
Lasershield 4.5 (99.995%)		H ₂ O < 5 ppm O ₂ < 10 ppm THC < 1 ppm	830	200	25.85	57	24001321
Lasershield 4.0 (99.99%)		H ₂ O < 10 ppm N ₂ < 70 ppm O ₂ < 20 ppm THC < 10 ppm	830	200 PCL230 HP 350	25.85 239.50	57 528	24001418 24064558
Supercritical Fluid							
SFC Grade 5.0 (99.999% Liquid Phase) with Helium Pressure @ 1,500 psig		H ₂ O < 1 ppm N ₂ < 5 ppm O ₂ < 5 ppm THC < 50 ppb	830	152 (DT)	18.14	40	24070761
SFC Grade 5.0 (99.999% Liquid Phase) without Helium Pressurization		H ₂ O < 1 ppm N ₂ < 5 ppm O ₂ < 5 ppm THC < 50 ppb	830	152 (DT)	18.14	40	24017467

CO₂

CGA

320

Shipping Name

CARBON DIOXIDE

TDG Label

Non-flammable gas

CAS Number

124-38-9

MSDS Number

014-01-0001 (gas)
023-01-0004 (liquid refrigerated)

Hazard Class

2.2

PIN Number

UN 1013 (gas)
UN 2187 (liquid refrigerated)

Molecular Weight

44.01

Boiling Point

-78.4°C (-109.3°F)

Specific Volume

0.547 m³/kg (8.74 ft³/lb)

Flammable Limits

Non-flammable



Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

C1061B	Single Stage Brass	See page 172
C1061S	Single Stage Stainless Steel	See page 172

HiQ® REDLINE

C200/2B	Dual Stage Brass	See page 192
C200/2S	Dual Stage Stainless Steel	See page 192

carbon monoxide CO	Specifications	Pressure (psig)	Size	Contents		Product Code
				m ³	ft ³	
Grade 4.0 (99.99%) <i>Research</i>	CO ₂ < 30 ppm H ₂ O < 10 ppm N ₂ < 40 ppm O ₂ < 10 ppm THC < 10 ppm	1,650 1,650	200 80	4.79 1.89	173 68	24001324 24063855
Grade 2.3 (99.3%) <i>CP</i>	CO ₂ < 100 ppm H ₂ O < 20 ppm N ₂ < 4,500 ppm O ₂ < 100 ppm	1,650 1,650	200 80	4.79 1.89	173 68	24001538 24001534
Grade 1.8 (98%) <i>Commercial</i>	H ₂ O < 20 ppm	1,650 1,650	200 80	4.79 1.89	173 68	24001952 24000046

CO

CGA



350

Shipping Name

CARBON MONOXIDE, COMPRESSED

TDG Label

Poison Gas and Flammable gas

CAS Number

630-08-0

MSDS Number

013-01-0010

Hazard Class

2.3 (2.1)

PIN Number

UN 1016

Molecular Weight

28.01

Boiling Point

-191.5°C (-312.7°F)

Specific Volume

0.8615 m³/kg (13.8 ft³/lb)

Flammable Limits

12.5–74 % in Air

Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

C1061B	Single Stage Brass	See page 172
C1061S	Single Stage Stainless Steel	See page 172
C1062B	Dual Stage Brass	See page 176
C1062S	Dual Stage Stainless Steel	See page 176

Pure Gases

chlorine	Cl ₂	Specifications	Pressure (psig)	Size	Contents		Product Code
					kg	lb	
Grade 4.0 (99.99%) <i>Ultra Pure, UHP</i>		CH ₄ < 1 ppm	85	30	6.80	15	24066844
		CO < 5 ppm	85	10	2.27	5	24017445
		CO ₂ < 30 ppm					
		N ₂ < 50 ppm					
		O ₂ < 50 ppm					
Grade 2.5 (99.5% Liquid Phase) <i>High Purity</i>		CCl ₄ < 50 ppm wt	85	150LB	68.04	150LB	V24063917
		H ₂ O < 50 ppm wt	85	30	6.80	15	24017627
		Total Chloromethanes < 75 ppm wt	85	10	2.27	5	24000031

Cl₂

CGA



660

Shipping Name

CHLORINE

TDG Label

Poison gas and corrosive

CAS Number

7782-50-5

MSDS Number

005-01-0009

Hazard Class

2.3 (8)

PIN Number

UN 1017

Molecular Weight

70.91

Boiling Point

-34.05°C (-29.3°F)

Specific Volume

0.3371 m³/kg (5.4 ft³/lb)

Flammable Limits

Non-flammable

Recommended Cylinder Regulator

Equipment Series Material

HiQ® REDLINE

C200/1S

Single Stage Stainless Steel

See page 190

deuterium	D ₂	Specifications	Pressure (psig)	Size	Contents litres	Product Code	
Grade 5.0 (99.999%) Chemical Purity, Isotopic 99.8% <i>Research</i>		³ H	< 0.002 uCi/L	2,000	200	6,200	24081301
		CO	< 1 ppm	1,980	80	2,000	24082033
		CO ₂	< 1 ppm	1,950	10	350	24082040
		H ₂	< 100 ppm				
		H ₂ O/D ₂ O	< 1 ppm				
		HD	< 3,000 ppm				
		N ₂	< 1 ppm				
		O ₂	< 1 ppm				
THC	< 1 ppm						
Grade 4.5 (99.995%) Chemical Purity, Isotopic 99.7% <i>Ultra Pure, UHP</i>		³ H	< 0.002 uCi/L	2,000	200	6,200	24063838
		CO	< 1 ppm	1,980	80	2,000	24001532
		CO ₂	< 2 ppm	1,950	10	350	24001531
		H ₂	< 150 ppm				
		H ₂ O/D ₂ O	< 5 ppm				
		HD	< 5,000 ppm				
		N ₂	< 5 ppm				
		O ₂	< 1 ppm				
THC	< 1 ppm						

D₂

CGA



350

Shipping Name

DEUTERIUM, COMPRESSED

TDG Label

Flammable gas

CAS Number

7782-39-0

MSDS Number

036-01-0003

Hazard Class

2.1

PIN Number

UN 1957

Molecular Weight

4.03

Boiling Point

-249.5°C (-417.3°F)

Specific Volume

5.99 m³/kg (96.0 ft³/lb)

Flammable Limits

4.9–75 % in Air

Recommended Cylinder Regulator

Equipment Series Material

HiQ® REDLINE

C200/2B	Dual Stage Brass	See page 192
C200/2S	Dual Stage Stainless Steel	See page 192

Pure Gases

ethane	C ₂ H ₆	Specifications	Pressure (psig)	Size	Contents		Product Code
					kg	lb	
Grade 2.0 (99% Liquid Phase) CP			543	200	14.52	32	24001857
			543	80	4.54	10	24001537

C₂H₆

CGA



350

Shipping Name

ETHANE, COMPRESSED

TDG Label

Flammable gas

CAS Number

78-84-0

MSDS Number

038-01-0003

Hazard Class

2.1

PIN Number

UN 1035

Molecular Weight

30.07

Boiling Point

-88.6°C (-127.5°F)

Specific Volume0.7991 m³/kg (12.8 ft³/lb)**Flammable Limits**

3-12.4 % in Air

Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

C1061B

Single Stage Brass

See page 172

ethylene	C ₂ H ₄	Specifications	Pressure (psig)	Size	Contents		Product Code
					kg	lb	
Grade 5.0 (99.999%) <i>Research</i>		C ₂ H ₂ < 1 ppm	1,250	200	13.60	30	24063963
		C ₂ H ₆ < 5 ppm	1,250	30	2.27	5	24017464
		C ₃ H ₆ < 1 ppm					
		C ₃ H ₈ < 1 ppm					
		CH ₄ < 1 ppm					
		CO < 1 ppm					
		CO ₂ < 2 ppm					
		H ₂ < 1 ppm					
		H ₂ O < 2 ppm					
		N ₂ < 2 ppm					
		O ₂ < 2 ppm					
	Grade 3.0 (99.9%) <i>Polymer</i>		H ₂ O < 5 ppm	1,250	200	13.60	30
		O ₂ < 10 ppm	1,250	80	4.99	10	24017336
Grade 2.5 (99.5%) <i>CP, Technical</i>			1,250	200	13.60	30	24001535
			1,250	80	4.99	10	24000036

C₂H₄

CGA



350

Shipping Name ETHYLENE, COMPRESSED**TDG Label** Flammable gas**CAS Number** 74-85-1**MSDS Number** 039-01-0003**Hazard Class** 2.1**PIN Number** UN 1962**Molecular Weight** 28.05**Boiling Point** -103.7°C (-154.7°F)**Specific Volume** 0.8615 m³/kg (13.8 ft³/lb)**Flammable Limits** 3.1-42 % in Air**Recommended Cylinder Regulator**

Equipment Series Material

BASELINE™

C1061B Single Stage Brass See page 172

HiQ® REDLINE

C200/1B Single Stage Brass See page 190

Pure Gases

helium	He	Specifications	Pressure (psig)	Size	Contents		Product Code
					m ³	ft ³	
Grade 6.0 (99.9999%) <i>Research</i>	CO	< 0.1 ppm	2,640	300	7.99	288	24001546
	CO ₂	< 0.1 ppm	2,200	200	5.93	214	24001544
	H ₂ O	< 0.2 ppm					
	N ₂	< 0.4 ppm					
	O ₂	< 0.1 ppm					
	THC	< 0.1 ppm					
BIP® <i>See page 28 for more information.</i> *THC as CH ₄ ** CFC = Halocarbon	CFC**	< 1 ppb	2,640	300	7.99	288	24068832
	H ₂ O	< 20 ppb					
	N ₂	< 1 ppm					
	O ₂	< 10 ppb					
	THC*	< 100 ppb					
Grade 5.3 (99.9993%) <i>UPC</i>	CO ₂	< 1 ppm	2,640	300	7.99	288	24069235
	H ₂ O	< 1 ppm					
	N ₂	< 5 ppm					
	O ₂	< 1 ppm					
	THC	< 0.5 ppm					
Grade 5.0 (99.999%) <i>Ultra Pure, UHP</i> <i>(MCPs available on request)</i>	CO ₂	< 1 ppm	2,640	300	7.99	288	24001333
	H ₂ O	< 5 ppm	2,200	200	5.93	214	24001334
	N ₂	< 8 ppm	2,000	80	2.18	80	24001335
	O ₂	< 4 ppm					
	THC	< 0.5 ppm					
Grade 4.7 (99.997%) <i>Zero Grade, High Purity</i>	H ₂ O	< 5 ppm	2,640	300	7.99	288	24001339
	O ₂	< 5 ppm	2,200	200	5.93	214	24001340
	THC	< 0.5 ppm	2,000	80	2.18	80	24001341
Lasershield							
Grade 4.7 (99.997%)	H ₂ O	< 3 ppm	2,640	300	7.99	288	24001337
	O ₂	< 3 ppm					
	THC	< 1 ppm					
Helium Diving Grade			580	200	6.03	217	24079102

He

CGA

580

Shipping Name

HELIUM, COMPRESSED

TDG Label

Non-flammable gas

CAS Number

7440-59-7

MSDS Number

033-01-0001 (gas)

Hazard Class

2.2

PIN Number

UN 1046 (gas)

Molecular Weight

4.003

Boiling Point

-268.9°C (-452.1°F)

Specific Volume

6.03 m³/kg (96.7 ft³/lb)

Flammable Limits

Non-flammable



Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

C1061B	Single Stage Brass	See page 172
C1061S	Single Stage Stainless Steel	See page 172
C1062B	Dual Stage Brass	See page 176
C1062S	Dual Stage Stainless Steel	See page 176

HiQ® REDLINE

C200/2B	Dual Stage Brass	See page 192
C200/2S	Dual Stage Stainless Steel	See page 192

helium	He	Specifications	Pressure (psig)	Size	Contents litres	Product Code
Liquid			PLC500	LP 022	500	24064571
			PLC250	LP 022	250	24064575
			PLC100	LP 022	100	24064574
			PLC60	LP 022	60	24064573
			PLC30	LP 022	30	24064572

He

CGA



580

Shipping Name

HELIUM, REFRIGERATED LIQUID

TDG Label

Non-flammable gas

CAS Number

7440-59-7

MSDS Number

032-01-0004 (liquid refrigerated)

Hazard Class

2.2

PIN Number

UN 1963 (liquid refrigerated)

Molecular Weight

4.003

Boiling Point

-268.9°C (-452.1°F)

Specific Volume6.03 m³/kg (96.7 ft³/lb)**Flammable Limits**

Non-flammable

Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

C1061B Single Stage Brass See page 172

C1061S Single Stage Stainless Steel See page 172

BIP® Technology

Setting the Standard in High Purity Gases

The Problem

In gas chromatography, surveys have shown that more than 70% of problems with GC analysis come from the impurities in the carrier gas used. Specifically, levels of Oxygen and Moisture in carrier gases can cause significant damage to expensive columns and the damage is usually done before being detected.

The Requirement

In today's competitive process and analytical markets, there is constant pressure to increase productivity, optimize processes and improve quality while minimizing costs. Add in ongoing environmental requirements and you have an increased demand for more accurate and reliable analyses of a wide range of complex chemical compounds. Until now, finding a consistent, premium-grade gas at affordable prices was a formidable challenge.

The Process

In-cylinder purification offers you the very highest purity levels for the most demanding laboratory applications. We start with our ultra high purity gas, which is filled into our BIP® cylinders. With total control over the cylinder condition and its contents, Linde is able to guarantee that the gas leaving the BIP® system will remain consistent, cylinder after cylinder, from start to finish.

The Solution

Linde BIP® Grade Helium, Nitrogen and Argon have a patented delivery system where the gas purification is built into each cylinder. BIP® allows total control over the cylinder condition and its contents, and lets Linde guarantee that the gas leaving each BIP® cylinder contains less than 10 ppb Oxygen and 20 ppb water. With BIP® cylinders, no special equipment is required, allowing continued use of your current Specialty Gas supply systems.

For more information contact Customer Service.



The Benefits

- Each cylinder has an individual internal purifier system to guarantee purity. No rogue cylinder contamination
- Reduces levels of Oxygen and Moisture to ppb levels
- Reduces baseline noise
- Allows better peak separation
- Extends the life of expensive GC columns
- Purification processes are proven much more efficient at higher gas pressures. As BIP® is always at cylinder pressure, it is much more efficient than downstream external in-line purifiers
- External Filter Systems are costly to maintain, and reduce productivity by taking the focus away from the GC. BIP® removes the requirement, and the expense

BIP® Equipment Recommendation

High Purity Dual Stage Regulator:

Model C200/2B100A580 Brass

Model C200/2S100A580 Stainless Steel

High Purity Single Stage Gas Supply Panel:

S202B100FH1580 Brass Single Gas Panel with Purge

S202S100FH1580 Stainless Steel Single Gas Panel with Purge

BIP® Specifications

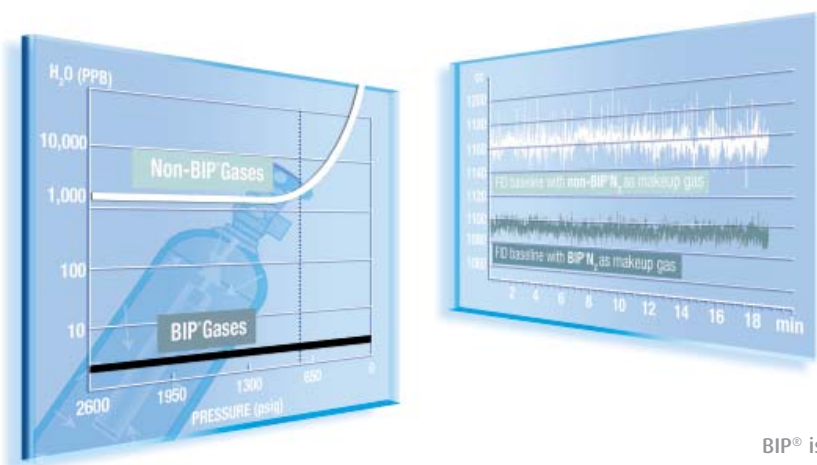
Grade	Argon		Helium		Nitrogen	
	5.3	BIP®	5.3	BIP®	5.3	BIP®
CFC**	-	-	-	< 1 ppb	-	< 1 ppb
CO	-	-	-	-	< 1 ppm	-
CO ₂	-	-	< 1 ppm	-	< 1 ppm	-
H ₂ O	< 1 ppm	< 20 ppb	< 1 ppm	< 20 ppb	< 1 ppm	< 20 ppb
N ₂	< 8 ppm	< 1 ppb	< 5 ppm	< 1 ppm	-	-
O ₂	< 2 ppm	< 10 ppb	< 1 ppm	< 10 ppb	< 2 ppm	< 10 ppb
THC*	< 0.5 ppm	< 100 ppb	< 0.5 ppm	< 100 ppb	< 0.5 ppm	< 100 ppb

*THC as CH₄

** CFC = Halocarbon

Certificate of Conformance on Source Material available on request

Note: These specifications are for the product gas after it has passed through the BIP® purifier system.



Pure Gases

hydrogen	H ₂	Specifications	Pressure (psig)	Size	Contents		Product Code
					m ³	ft ³	
Grade 5.5 (99.9995%) <i>Research</i>		CO < 0.5 ppm	2,400	300	7.15	258	24001945
		CO ₂ < 0.5 ppm	2,000	200	5.32	192	24000025
Grade 5.3 (99.9993%) <i>UPC</i>		H ₂ O < 2 ppm	2,400	300	7.15	258	24068763
		N ₂ < 7 ppm	2,000	200	5.32	192	24068836
Grade 5.0 (99.999%) <i>Ultra Pure, UHP</i>		O ₂ < 1 ppm	2,400	300	7.15	258	24001876
		H ₂ O < 3 ppm	2,000	200	5.32	192	24001551
Grade 4.0 (99.99%) <i>High Purity, HP, Extra Dry, Prepurified, Purified</i>		N ₂ < 5 ppm	2,400	300	7.15	258	24001548
		O ₂ < 2 ppm	2,000	200	5.32	192	24001554
Zero Gas		THC < 0.5 ppm	2,400	300	7.15	258	24001347
		H ₂ O < 8 ppm	2,200	200	5.32	192	24001565
		THC < 0.5 ppm	2,000	80	2.10	76	24001566

H₂

CGA

350

Shipping Name

HYDROGEN, COMPRESSED

TDG Label

Flammable gas

CAS Number

1333-74-0

MSDS Number

004-01-0003

Hazard Class

2.1

PIN Number

UN 1049

Molecular Weight

2.02

Boiling Point

-252.8°C (-423.0°F)

Specific Volume

12 m³/kg (191.3 ft³/lb)

Flammable Limits

4-75 % in Air



Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

C1061B	Single Stage Brass	See page 172
C1061S	Single Stage Stainless Steel	See page 172
C1062B	Dual Stage Brass	See page 176
C1062S	Dual Stage Stainless Steel	See page 176

HiQ® REDLINE

C200/2B	Dual Stage Brass	See page 192
C200/2S	Dual Stage Stainless Steel	See page 192

hydrogen chloride HCl	Specifications	Pressure (psig)	Size	Contents		Product Code
				kg	lb	
Grade 2.0 (99% Liquid Phase) <i>Technical Purity</i>		613	T.C.	272.15	600	24064821
		613	200 (DT)	24.95	55	24074379
		613	80	9.07	20	24063916

Trailers available on request

HCl

CGA



330

Shipping Name HYDROGEN CHLORIDE, ANHYDROUS

TDG Label Poison Gas and Corrosive

CAS Number 7647-01-0

MSDS Number 006-01-0023

Hazard Class 2.3 (8)

PIN Number UN 1050

Molecular Weight 36.46

Boiling Point -85°C (-121.1°F)

Specific Volume 0.6617 m³/kg (10.6 ft³/lb)

Flammable Limits Non-flammable

Recommended Cylinder Regulator

Equipment Series	Material	
C3210	Single Stage Monel	See page 186
HiQ® REDLINE		
C200/1S	Single Stage Stainless Steel	See page 190
S203S	Gas Panel	See page 212

Pure Gases

hydrogen sulphide	H ₂ S	Specifications	Pressure (psig)	Size	Contents		Product Code
					kg	lb	
Grade 2.5 (99.5%) <i>Ultra Pure, UP, CP</i>		CO ₂ < 0.01%	252	T.C.	478.54	1,055	V24077329
		CO _S < 0.02%	252	200	27.22	60	24082267
		CS ₂ < 0.01%	252	80	9.98	20	24001951
		THC < 0.01%					
		N ₂ < 0.01%					

H₂S

CGA



330

Shipping Name

HYDROGEN SULPHIDE

TDG Label

Poison gas and flammable gas

CAS Number

7783-06-4

MSDS Number

010-01-0010

Hazard Class

2.3 (2.1)

PIN Number

UN 1053

Molecular Weight

34.076

Boiling Point

-85°C (-60.3°F)

Specific Volume

0.70 m³/kg (11.23 ft³/lb)

Flammable Limits

4-44 % in Air

Recommended Cylinder Regulator

Equipment Series

Material

C3210

Single Stage Monel

See page 186

HiQ® REDLINE

C200/15

Single Stage Stainless Steel

See page 190

isobutane	C ₄ H ₁₀	Specifications*	Pressure (psig)	Size	Contents		Product Code
					kg	lb	
Grade 2.5 (99.5% Liquid Phase) <i>Instrument, CP</i>		Total impurities < 5,000 ppm	31	425	52.27	115	24017477
		C ₂ H ₆ < 250 ppm	31	200	15.88	35	24017476
		C ₃ H ₈ < 1,000 ppm					
		C ₄ H ₁₀ < 2,500 ppm					
		CH ₄ < 100 ppm					

* Impurities may vary slightly

C₄H₁₀

CGA



510

Shipping Name

ISOBUTANE

TDG Label

Flammable gas

CAS Number

75-28-5

MSDS Number

040-01-0003

Hazard Class

2.1

PIN Number

UN 1969

Molecular Weight

58.124

Boiling Point

-11.7°C (10.9°F)

Specific Volume

0.4034 m³/kg (6.5 ft³/lb)

Flammable Limits

1.8–8.4 % in Air

Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

C1061B

Single Stage Brass

See page 172

Pure Gases

isobutylene	C ₄ H ₈	Specifications*	Pressure (psig)	Size	Contents		Product Code	
					kg	lb		
Grade 2.0 (99% Liquid Phase) CP		C ₄ H ₁₀ < 2,500 ppm	24.3	425	52.27	115	24017342	
		H ₂ O < 25 ppm	24.3	200	15.88	35	24080150	
		n-Butane < 2,500 ppm						
		Pentanes < 500 ppm						

* Impurities may vary slightly

C₄H₈

CGA

510

Shipping Name

ISOBUTYLENE

TDG Label

Flammable gas

CAS No.

115-11-7

MSDS No.

024-01-0003

Hazard Class

2.1 (Flammable)

PIN No.

UN 1055

Molecular Weight

56.11

Boiling Point

-6.9°C (19.6°F)

Specific Volume

0.4174 m³/kg (6.7 ft³/lb)

Flammable Limits

1.8–9.6 % in Air



Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

C1061B

Single Stage Brass

See page 172

krypton	Kr	Specifications	Pressure (psig)	Size	Contents litres	Product Code
Grade 5.0 (99.999%) <i>Research</i>	Ar	< 2 ppm	1,350	200	5,000	24082137
	CF ₄	< 0.5 ppm	1,500	80	2,000	24017454
	CH ₄	< 0.5 ppm	2,000	10	500	24082138
	CO ₂	< 0.5 ppm	1,300	D1	400	P24081904
	H ₂	< 0.5 ppm	1,050	D2	200	P24081912
	H ₂ O	< 0.5 ppm	575	D2	100	P24081913
	N ₂	< 2 ppm	675	D3	50	P24081914
	O ₂	< 0.5 ppm	350	D3	25	P24081915
	Xe	< 5 ppm				
	Grade 4.5 (99.995%) <i>Ultra Pure, UHP</i>	Ar	< 2 ppm	1,350	200	5,000
CF ₄		< 1 ppm	1,500	80	2,000	24082134
CH ₄		< 1 ppm	2,000	10	500	24082135
CO ₂		< 1 ppm	1,300	D1	400	P24081866
H ₂		< 2 ppm	1,050	D2	200	P24081867
H ₂ O		< 1 ppm	575	D2	100	P24081901
N ₂		< 5 ppm	675	D3	50	P24081902
O ₂		< 1 ppm	350	D3	25	P24081903
Xe		< 25 ppm				

All Krypton is filled gravimetrically
– pressure may vary due to temperature

Kr

CGA

580

Shipping Name

KRYPTON, COMPRESSED

TDG Label

Non-flammable gas

CAS Number

7439-90-9

MSDS Number

041-01-0001

Hazard Class

2.2

PIN Number

UN 1056

Molecular Weight

83.80

Boiling Point

-153.4°C (-244°F)

Specific Volume

0.2878 m³/kg (4.6 ft³/lb)

Flammable Limits

Non-flammable



Recommended Cylinder Regulator

Equipment Series	Material
HiQ® REDLINE	
C200/2B	Dual Stage Brass
C200/2S	Dual Stage Stainless Steel

See page 192

See page 192

Pure Gases

methane	CH ₄	Specifications	Pressure (psig)	Size	Contents		Product Code	
					m ³	ft ³		
Grade 4.0 (99.99%) <i>Ultra Pure, UHP</i>		C ₂ H ₆ < 10 ppm	2,400	300	9.76	352	24001862	
		C ₃ + < 1 ppm	2,000	200	7.09	256	24001561	
		CO < 1 ppm	2,000	80	2.80	101	24001562	
		CO ₂ < 1 ppm						
		H ₂ O < 2 ppm						
		N ₂ < 75 ppm						
		O ₂ < 2 ppm						
Sulphur < 1 ppm								
Grade 2.0 (99%) <i>Purified, Technical, CP</i>			2,400	300	9.76	352	24063971	
			2,000	200	7.09	256	24001558	
			2,000	80	2.80	101	24063914	
Grade 1.3 (93%) <i>Natural Gas</i>			2,000	200	7.09	256	24001882	

CH₄

CGA

350

Shipping Name

METHANE, COMPRESSED

TDG Label

Flammable gas

CAS Number

74-82-8

MSDS Number

043-01-0003

Hazard Class

2.1

PIN Number

UN 1971

Molecular Weight

16.04

Boiling Point

-161.5°C (-258.7°F)

Specific Volume

1.4795 m³/kg (23.7 ft³/lb)

Flammable Limits

5-15.0 % in Air



Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

C1061B	Single Stage Brass	See page 172
C1061S	Single Stage Stainless Steel	See page 172
C1062B	Dual Stage Brass	See page 176
C1062S	Dual Stage Stainless Steel	See page 176

monomethylamine CH_3NH_2	Specifications	Pressure (psig)	Size	Contents		Product Code
				kg	lb	
Grade 2.5 (99.5% Liquid Phase) <i>CP</i>		705	425	57.14	120	V24071993
		705	30	2.27	5	24017391

 CH_3NH_2

CGA



705

Shipping Name

METHYLAMINE, ANHYDROUS

TDG Label

Flammable gas

CAS Number

74-89-5

MSDS Number

029-01-0016

Hazard Class

2.1

PIN Number

UN1061

Molecular Weight

31.058

Boiling Point

-6.1°C (21.0°F)

Specific Volume

1.4795 m³/kg (23.7 ft³/lb)

Flammable Limits

5–15.0 % in Air

Recommended Cylinder Regulator

Equipment Series	Material	
C3210	Single Stage Monel	See page 186
HiQ® REDLINE		
C200/1S	Single Stage Stainless Steel	See page 190

Pure Gases

neon	Ne	Specifications	Pressure (psig)	Size	Contents litres	Product Code
Grade 5.0 (99.999%) <i>Research</i>	CH ₄	< 0.5 ppm	2,400	300	7,500	24001848
	CO	< 0.5 ppm	1,760	200	5,000	24001853
	CO ₂	< 0.5 ppm	1,925	80	2,000	24077537
	H ₂ O	< 0.5 ppm	1,625	D1	400	P24081857
	He	< 8 ppm	1,250	D2	200	P24081858
	N ₂	< 1 ppm	600	D2	100	P24081859
	O ₂	< 0.5 ppm	745	D3	50	P24081870
			350	D3	25	P24081872
Grade 4.6 (99.996%) <i>Ultra Pure, UHP</i>	CH ₄	< 1 ppm	2,400	300	7,500	24001849
	CO	< 1 ppm	1,760	200	5,000	24001854
	CO ₂	< 1 ppm	1,925	80	2,000	24082139
	H ₂ O	< 1 ppm	1,625	D1	400	P24081873
	He	< 35 ppm	1,250	D2	200	P24081874
	N ₂	< 4 ppm	600	D2	100	P24081875
	O ₂	< 1 ppm	745	D3	50	P24081876
			350	D3	25	P24081877

Ne



CGA

580

Shipping Name

NEON, COMPRESSED

TDG Label

Non-flammable gas

CAS Number

7440-01-9

MSDS Number

042-01-0001

Hazard Class

2.2

PIN Number

UN 1065

Molecular Weight

20.18

Boiling Point

-246.1°C (-410.9°F)

Specific Volume

1.199 m³/kg (19.2 ft³/lb)

Flammable Limits

Non-flammable

Recommended Cylinder Regulator

Equipment Series Material

HiQ® REDLINE

C200/2B	Dual Stage Brass	See page 192
C200/2S	Dual Stage Stainless Steel	See page 192

nitric oxide	NO	Specifications	Pressure (psig)	Size	Contents		Product Code
					m ³	ft ³	
Grade 2.5 (99.5%) <i>Ultra Pure, UHP</i>		CO < 1,000 ppm H ₂ O < 20 ppm N ₂ < 3,000 ppm N ₂ O < 250 ppm	500	152	1.10	38	24074544
Grade 2.0 (99%) <i>CP</i>			500	200	1.59	56	24017393

NO

CGA

Shipping Name

TDG Label

CAS Number

MSDS Number

Hazard Class

PIN Number

Molecular Weight

Boiling Point

Specific Volume

Flammable Limits



660

NITRIC OXIDE, COMPRESSED

Poison, oxidizing and corrosive gas

10102-43-9

047-01-0022

2.3(5.1)(8)

UN 1660

20.18

-151.7°C (-241.1°F)

1.199 m³/kg (19.2 ft³/lb)

Non-flammable

Recommended Cylinder Regulator

Equipment Series

Material

C3210

Single Stage Monel

See page 186

HiQ® REDLINE

C200/1S

Single Stage Stainless Steel

See page 190

S203S

Gas Panel

See page 212

Pure Gases

nitrogen	N ₂	Specifications	Pressure (psig)	Size	Contents		Product Code
					m ³	ft ³	
Grade 6.0 (99.9999%) <i>Research, Low Oxygen</i>		CO < 0.1 ppm	2,640	300	8.32	300	24077946
		CO ₂ < 0.1 ppm	2,200	200	6.20	224	24077948
		H ₂ O < 0.2 ppm					
		O ₂ < 0.6 ppm					
		THC < 0.1 ppm					
BIP® <i>See page 28 for more information.</i> *THC as CH ₄ ** CFC = Halocarbon		CFC** < 1 ppb	2,640	300	8.32	300	24068857
		H ₂ O < 20 ppb					
		O ₂ < 10 ppb					
		THC* < 100 ppb					
VOC Free (99.9995%)		CO < 0.05 ppm	2,000	152	3.90	141	24017316
		CO ₂ < 0.3 ppm					
		H ₂ O < 2 ppm					
		O ₂ < 2 ppm					
		THC < 0.01 ppm					
		Total VOC < 0.01 ppm					
Emission Grade <i>Ambient CEM, Vehicle Emission Zero</i>		CO < 0.5 ppm	2,640	300	8.32	300	24068858
		CO ₂ < 1 ppm	2,200	200	6.20	224	24017451
		H ₂ O < 1 ppm					
		NOx < 0.1 ppm					
		O ₂ < 5 ppm					
		SO ₂ < 0.1 ppm					
		THC < 0.5 ppm					
Zero 0.2		THC < 0.2 ppm	2,640	300	8.32	300	24001368
			2,200	200	6.20	224	24001362
			2,200	80	2.25	81	24001363

*THC as CH₄N₂

CGA 580 (4,500 psig 680; 6,000 psig 677)

Shipping Name NITROGEN, COMPRESSED

TDG Label Non-flammable gas

CAS Number 7727-37-9

MSDS Number 003-01-0001 (gas)

Hazard Class 2.2

PIN Number UN 1066 (gas)

Molecular Weight 28.01

Boiling Point -195.8°C (-320.4°F)

Specific Volume 0.8673 m³/kg (13.8 ft³/lb)

Flammable Limits Non-flammable

Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

C1061B	Single Stage Brass	See page 172
C1062B	Dual Stage Brass	See page 176

HiQ® REDLINE

C200/2B	Dual Stage Brass	See page 192
C200/2S	Dual Stage Stainless Steel	See page 192

nitrogen (con't)	N ₂	Specifications	Pressure (psig)	Size	Contents		Product Code
					m ³	ft ³	
Grade 5.3 (99.9993%) <i>UPC</i>		CO < 1 ppm	2,640	MCP 16-300	133.12	4,701	24068855
		CO ₂ < 1 ppm	2,640	300	8.32	300	24068853
		H ₂ O < 1 ppm	2,200	200	6.20	224	24068852
		O ₂ < 2 ppm	2,200	80	2.25	81	24068851
		THC < 0.5 ppm					
Grade 5.0 (99.999%) <i>Ultra Pure, UHP</i>		H ₂ O < 1 ppm	2,640	300	8.32	300	24001364
		O ₂ < 2 ppm	2,200	200	6.20	224	24001365
		THC < 0.5 ppm	2,200	80	2.25	81	24001366
Grade 4.8 (99.998%) <i>P.P., Pre-purified</i>		H ₂ O < 5 ppm	2,640	MCP 16-300	133.12	4,701	24073966
		O ₂ < 3 ppm	2,640	300	8.32	300	24001369
		THC < 0.5 ppm	2,200	200	6.20	224	24001370
			2,200	80	2.25	81	24001371
High Pressure			6,000	500	13.70	494	24017315
			4,500	HT	11.80	426	24001425
Lasershield							
Grade 5.0 (99.999%)		H ₂ O < 5 ppm	2,640	300	8.32	300	24001422
		O ₂ < 3 ppm					
		THC < 1 ppm					
Grade 4.8 (99.998%)		H ₂ O < 5 ppm	2,640	300	8.32	300	24001360
		O ₂ < 5 ppm					
		THC < 1 ppm					

N₂

CGA

580 (4,500 psig 680; 6,000 psig 677)

Shipping Name

NITROGEN, COMPRESSED

TDG Label

Non-flammable gas

CAS Number

7727-37-9

MSDS Number

003-01-0001 (gas)

Hazard Class

2.2

PIN Number

UN 1066 (gas)

Molecular Weight

28.01

Boiling Point

-195.8°C (-320.4°F)

Specific Volume

0.8673 m³/kg (13.8 ft³/lb)

Flammable Limits

Non-flammable

Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

C1061B	Single Stage Brass	See page 172
C1062B	Dual Stage Brass	See page 176
C3060	Dual Stage Brass (for CGA 677)	See page 184

HiQ® REDLINE

C200/2B	Dual Stage Brass	See page 192
C200/2S	Dual Stage Stainless Steel	See page 192



Pure Gases

liquid nitrogen	N ₂	Specifications	Pressure (psig)	Size*	Contents		Product Code
					m ³	ft ³	
Liquid Grade 4.8 (99.998%) <i>Nitrogen, Refrigerated Liquid</i>		H ₂ O < 5 ppm	PLC450	HP 350	246.09	8,691	24064570
		O ₂ < 3 ppm	PLC230	HP 350	131.00	6,392	24064563
		THC < 0.5 ppm	PLC230	LP 050	153.00	5,403	24064560
			PLC180	LP 022	125.00	5,403	24064569
			PLC160	LP 022	96.00	4,414	24064561

* Subject to local availability

N₂

CGA

580



Shipping Name

NITROGEN, REFRIGERATED LIQUID

TDG Label

Non-flammable gas

CAS Number

7727-37-9

MSDS Number

016-01-0004 (liquid refrigerated)

Hazard Class

2.2

PIN Number

UN 1977 (liquid refrigerated)

Molecular Weight

28.01

Boiling Point

-195.8°C (-320.4°F)

Specific Volume

0.8673 m³/kg (13.8 ft³/lb)

Flammable Limits

Non-flammable

Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

C1061B

Single Stage Brass

See page 172

nitrous oxide	N ₂ O	Specifications	Pressure (psig)	Size	Contents		Product Code
					kg	lb	
Grade 4.0 (99.99%) <i>Ultra Pure, UHP</i>		CH ₄ < 2 ppm CO < 2 ppm CO ₂ < 2 ppm O ₂ < 4 ppm N ₂ < 10 ppm	745	200	27.22	60	24079024
			745	80	9.07	20	24001296
Grade 2.0 (99% Liquid Phase) <i>CP, Atomic Absorption, A.A.</i>			745	200	27.22	60	24001383
			745	80	9.07	20	24001296

N₂O

CGA



326

Shipping Name

NITROUS OXIDE

TDG Label

Non-flammable gas and oxidizing gas

CAS Number

10024-97-2

MSDS Number

034-01-0006

Hazard Class

2.2 (5.1)

PIN Number

UN 1070

Molecular Weight

44.01

Boiling Point

-88.5°C (-127.2°F)

Specific Volume

0.5431 m³/kg (8.7 ft³/lb)

Flammable Limits

Oxidizer, supports combustion

Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

C1061B	Single Stage Brass	See page 172
C1061S	Single Stage Stainless Steel	See page 172

Pure Gases

oxygen	O ₂	Specifications	Pressure (psig)	Size	Contents		Product Code
					m ³	ft ³	
Grade 5.0 (99.999%) <i>Research, TOC</i>	Ar	< 5 ppm	2,640	300	9.32	333	24068827
	CO	< 0.5 ppm	2,200	200	6.76	244	24060140
	CO ₂	< 0.5 ppm					
	H ₂ O	< 1 ppm					
	Kr	< 1 ppm					
	N ₂	< 2 ppm					
THC	< 0.5 ppm						
Grade 4.7 (99.997%) <i>UPC</i>	Ar	< 10 ppm	2,640	300	9.32	333	24075459
	CO	< 1 ppm	2,200	200	6.76	244	24001818
	CO ₂	< 1 ppm	2,200	80	2.67	92	24001822
	H ₂ O	< 1 ppm					
	Kr	< 10 ppm					
	N ₂	< 5 ppm					
THC	< 1 ppm						
Grade 4.5 (99.995%) <i>Ultra Pure, UHP, Zero 0.2</i>	Ar	< 20 ppm	2,640	300	9.32	333	24001826
	CO	< 1 ppm	2,200	200	6.76	244	24001827
	CO ₂	< 1 ppm	2,200	80	2.67	92	24001828
	H ₂ O	< 1 ppm					
	Kr	< 15 ppm					
	N ₂	< 10 ppm					
THC	< 1 ppm						
Grade 2.6 (99.6%) <i>Extra Dry</i>	H ₂ O	< 5 ppm	2,640	300	9.32	333	24001395
			2,200	200	6.76	244	24001396
			2,200	80	2.67	92	24001397
Oxygen Diving Grade				200	6.90	249	24078232

O₂

CGA



540

Shipping Name

OXYGEN, COMPRESSED

TDG Label

Non-flammable gas and oxidizing gas

CAS Number

7782-44-7

MSDS Number

026-01-0006

Hazard Class

2.2 (5.1)

PIN Number

UN 1072

Molecular Weight

32

Boiling Point

-182.9°C (-297.3°F)

Specific Volume

0.7554 m³/kg (12.1 ft³/lb)

Flammable Limits

Vigorously supports combustion

Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

C1061B	Single Stage Brass	See page 172
C1062B	Dual Stage Brass	See page 176

HiQ® REDLINE

C200/2B	Dual Stage Brass	See page 192
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propane	C ₃ H ₈	Specifications	Pressure (psig)	Size	Contents		Product Code
					kg	lb	
Grade 2.5 (99.5% Liquid Phase) <i>Instrument</i>		Air (vapour phase) < 500 ppm	109	425	45.36	100	24001833
			109	200	15.88	35	24064067
Grade 2.0 (99% Liquid Phase) <i>CP</i>			109	425	45.36	100	24064065
			109	200	15.88	35	24064066
			109	80	5.90	13	24064055

C₃H₈

CGA

Shipping Name

TDG Label

CAS Number

MSDS No

TC Class

PIN Number

Molecular Weight

Boiling Point

Specific Volume

Flammable Limits



510

PROPANE

Flammable gas

74-98-6

011-01-0003

2.1

UN 1978

44.1

-42.1°C (-43.7°F)

0.5306 m³/kg (8.5 ft³/lb)

2.1–9.5 % in Air.

Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

C1061B

Single Stage Brass

See page 172

Pure Gases

propylene	C ₃ H ₆	Specifications	Pressure (psig)	Size	Contents		Product Code
					kg	lb	
Grade 2.5 (99.5% Liquid Phase) <i>Polymer, CP</i>		C ₂ H ₆ < 250 ppm C ₃ H ₈ < 3,500 ppm C ₄ H ₁₀ < 500 ppm CH ₄ < 100 ppm H ₂ O < 3 ppm O ₂ < 25 ppm N ₂ < 75 ppm Sulphur < 1 ppm	136	425	45.36	100	24064073

Impurities may vary slightly, all measurements are ppm weight unless otherwise stated.

C₃H₆

CGA

510

Shipping Name

PROPYLENE

TDG Label

Flammable gas

CAS Number

115-07-1

MSDS Number

049-01-0003

Hazard Class

2.1

PIN Number

UN 1077

Molecular Weight

42.08

Boiling Point

-47.7°C (-53.9°F)

Specific Volume

0.5656 m³/kg (9.4 ft³/lb)

Flammable Limits

2.4–11.0 % in Air



Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

C1061B

Single Stage Brass

See page 172

sulphur dioxide	SO ₂	Specifications	Pressure (psig)	Size	Contents		Product Code
					kg	lb	
Grade 3.8 (99.98% Liquid Phase) <i>Anhydrous</i>		H ₂ O < 100 ppm	34	410	68.04	150	24017398
		H ₂ SO ₄ < 25 ppm	34	200	45.36	100	24017397
		Non Volatile Residue < 50 ppm					

SO₂

CGA



660

Shipping Name

SULPHUR DIOXIDE

DOT/TDG Label

Poison gas and corrosive

CAS Number

7446-09-5

MSDS Number

007-01-0009

Hazard Class

2.3 (8)

PIN Number

UN 1079

Molecular Weight

64.06

Boiling Point

-10°C (14°F)

Specific Volume

0.3683 m³/kg (5.9 ft³/lb)

Flammable Limits

Non-flammable

Recommended Cylinder Regulator

Equipment Series

Material

C3210

Single Stage Monel

See page 186

HiQ® REDLINE

C200/1S

Single Stage Stainless Steel

See page 190

S203S

Single Gas Panel

See page 212

Pure Gases

sulphur hexafluoride SF ₆	Specifications	Pressure (psig)	Size	Contents		Product Code
				kg	lb	
Grade 4.0 (99.99%) <i>Instrument, Ultra Pure, UHP</i>	Air < 50 ppm	320	200	52.16	115	24017484
	CF ₄ < 80 ppm	320	80	15.88	10	24068994
Grade 3.0 (99.9% Liquid Phase wt/wt basis) <i>CP, Insulator</i>	Acidity < 0.000004 %	320	200	52.16	115	24001844
	Air < 500 ppm	320	80	15.88	10	24001402
	CF ₄ < 500 ppm	320	10	2.27	5	24001846
	H ₂ O < 25 ppm					
	Oil < 0.0002 %					
	SO ₂ F ₂ ND					

SF₆

CGA

590

Shipping Name

SULPHUR HEXAFLUORIDE

TDG Label

Non-flammable gas

CAS Number

2551-62-4

MSDS No:

050-01-0001

Hazard Class

2.2

PIN Number

UN 1080

Molecular Weight

146.05

Boiling Point

-63.8°C (-83.0°F)

Specific Volume

0.16 m³/kg (2.5 ft³/lb)

Flammable Limits

Non-flammable

Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

C1061B Single Stage Brass See page 172

C1061S Single Stage Stainless Steel See page 172



xenon	Xe	Specifications	Pressure (psig)	Size	Contents litres	Product Code
Grade 5.0 (99.999%) <i>99.999%, Research</i>	Ar	< 1 ppm	900	200	5,000	-
	CF ₄	< 0.5 ppm	900	80	2,000	-
	CO ₂	< 1 ppm	900	10	500	-
	H ₂	< 2 ppm	825	D1	400	P24081856
	H ₂ O	< 0.5 ppm	750	D2	200	P24081871
	Kr	< 5 ppm	480	D2	100	P24081884
	N ₂	< 2 ppm	525	D3	50	P24081854
	O ₂	< 0.5 ppm	300	D3	25	P24081886
	THC	< 0.5 ppm				
Grade 4.5 (99.999%) <i>Ultra Pure, UHP</i>	Ar	< 10 ppm	900	200	5,000	-
	CF ₄	< 1 ppm	900	80	2,000	-
	CO ₂	< 2 ppm	900	10	500	-
	H ₂	< 5 ppm	825	D1	400	P24081896
	H ₂ O	< 1 ppm	750	D2	200	P24081897
	Kr	< 25 ppm	480	D2	100	P24081899
	N ₂	< 5 ppm	525	D3	50	P24081910
	O ₂	< 1 ppm	300	D3	25	P24081911
	THC	< 1 ppm				

All Xenon is filled gravimetrically
- pressure may vary due to temperature.

Xe



CGA

580

Shipping Name

XENON, COMPRESSED

TDG Label

Non-flammable gas

CAS Number

7440-63-3

MSDS Number

045-01-0001

Hazard Class

2.2

PIN Number

UN2036

Molecular Weight

131.3

Boiling Point

-108.1°C (-162.6°F)

Specific Volume

180 m³/kg (2.9 ft³/lb)

Flammable Limits

Non-flammable

Recommended Cylinder Regulator

Equipment Series Material

HiQ® REDLINE

C200/2B	Dual Stage Brass	See page 192
C200/2S	Dual Stage Stainless Steel	See page 192

Cryogenic Containers

Linde has a complete range of advanced cryogenic refrigerators and dewars to meet your needs – flexibly, efficiently and economically. From cryosurgery to sample storage, our comprehensive series of high-performance containers incorporate durable and lightweight construction to maximize holding times for optimum capacities. Combined with our Cryospeed liquid gas service, Linde offers the complete delivery solution for your cryogenic needs.

- Environmental and biological shippers
- High capacity refrigerators for storing large quantities of materials at cryogenic temperatures
- Aluminum refrigerators designed for large vial capacities up to 6,000 vials in box type racks
- Cryogenic dewars for storing and dispensing small amounts of liquid nitrogen
- All Stainless Steel Freezers designed for -190°C vapour storage for large vial capacities up to 80K in box type racks
- XT Series (extended time) – Refrigerators designed for long-term storage of materials at cryogenic temperatures
- Liquid nitrogen storage with controllable temperatures between -100°C and -196°C



For complete product details contact Linde Customer Service, or your local Specialty Gas Representative

Cryospeed Liquid Gas Service

Cryospeed can provide a wide range of solutions to meet customer requirements, from personal protective equipment and risk management advice, to Cryogenic Gas Safety Workshop programs.

In addition, Cryospeed offers technical and safety advice, either via your local Linde Sales Representative, CSSO or the Linde Customer Service Centre. The CSSO is trained to handle many queries, but will direct more complex ones to appropriate personnel, so as to ensure the customer receives an adequate answer. All queries to the Customer Service Centre are logged, complete with follow-up checks, to ensure that customers' needs are fully met.

Reliability of Supply

- No run-outs
- Prescheduled delivery, on-time supply

Quality

- Consistent purity
- Dedicated vessel: no cross-contamination

Flexibility

- Accessibility to constrained areas
- Flexible schedule

Hands-Free Supply

- No cylinder handling for permanent installations

Reduced Losses

- No residual product return as with cylinders
- No safety blow-off from back-up cylinders
- No downtime during delivery

Reduction in Labour Costs and Increased Productivity

- Eliminate changeover and its handling costs
- Reduce time for ordering, receiving and inventorying, and storage handling of full and empty cylinders

Workplace Safety

- Eliminate job-related injuries associated with cylinder handling
- Eliminate potentially dangerous clutter of cylinders

Gas Products

The Cryospeed service is available in Canada's main urban centres, for the following products:

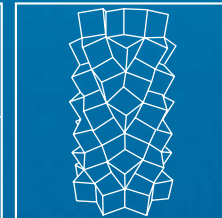
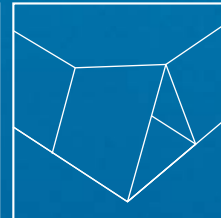
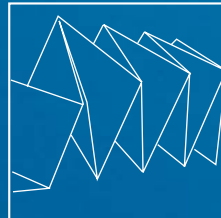
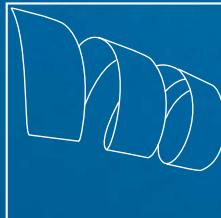
- Argon
- Nitrogen

On site mix (modular units) services are available for fabrication applications:

- Pure Argon and Carbon Dioxide cylinders

Linde can fulfil your full gas requirements, whether via Cryospeed, a full range of cylinder gases, bulk products or any combination of these as your needs and circumstances dictate.





Mixtures

Linde is a recognized leader in the production of specialty gas mixtures used in process and analytical applications across the country. As the first gas company to manufacture mixtures in Canada, we are proud of our competence and production capability to match and surpass most industry and customer demands.

We also like to stress that it is the most appropriate purity or accuracy that is important. It is our business to see the gas or mixture you use is the one that best corresponds to the task you use it for. Sometimes it may not just be a question of the purity that matters, but the degree of impurity that makes the difference - two gases with nominally identical purity may not necessarily have the same effect. Linde's knowledge and long-term experience with an extensive range of applications give us a clear picture of the most widely requested and relevant gas mixtures for each application. This helps us effectively fast-track your selection procedures.

While our mixture listing covers many of today's common requirements, Linde recognizes the infinite combinations our customers may demand, as well as customized mixture tolerances. If you do not see your requirement here, contact our Customer Service Centre and we will create one for you.

General Symbols



Blending tolerance expressed in relative percentage.



Analysis uncertainty expressed in relative percentage.



Shelf life expressed as number of months.



Nickel- and chromium-plated brass equipment is recommended.



Use nickel- and chromium-plated brass or stainless steel equipment.



Only use stainless steel equipment.

Mixture Specifications

Tighter operating controls have been placed on many industries to optimize production, conform to more stringent environmental and personal safety regulations, and adopt higher levels of system automation. All of these factors influence the need for tighter calibration specifications used for process stream monitoring, impurity analysis and control, environmental compliance, health and safety monitoring, and basic research and development.

Linde offers three standards of gas mixtures. The grade availability for each individual component will vary depending on reactivity, stability, certification capabilities and traceability requirements. Linde also recognizes that some applications may require blending tolerances and/or analytical accuracies that may be outside our standard blends. Linde is pleased to offer mixtures on request that can meet these requirements, including Gravimetric Weight blends and Custom Tolerance mixtures. Contact your Specialty Gas Representative or Customer Service for your special mixture.

Primary Standards

Primary Standards should be used when the application requires the highest in mixture accuracy and reliability. These mixtures are prepared by weight on high precision electronic balances. While certification accuracy is dependent on the level of the component, typical certification accuracy is either 1% relative or 0.02% absolute: whichever is less. All primary standard blends come with a certification of analysis, shelf life and traceability statements where required.

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 environmental control measurements. These mixtures are prepared using either gravimetric, volumetric or partial pressure techniques, where cylinder concentrations are verified using a variety of analytical methods.

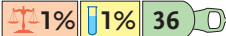
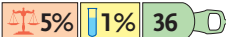
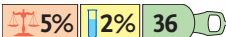
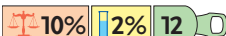
Unanalyzed

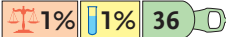

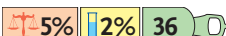
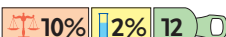
Unanalyzed mixtures are prepared using the same techniques as certified mixtures, but are not checked analytically nor guaranteed.

	Minor Component Range	Grade of Mixtures		
		Primary Standards	Certified Standard	EPA Protocol
Blend Tolerance	10 ppb-99 ppb	±25% of each minor component	± 20% or 0.5 ppm (whichever is greater) of each minor component	±10% or 0.5 ppm (whichever is greater) of each minor component
	100 ppb-999 ppb			
	1.0 ppm-9.9 ppm	±10% of each minor component		
	10 ppm-99 ppm	± 5% of each minor component	±10% or 2 ppm (whichever is greater) of each minor component	±5% or 2 ppm (whichever is greater) of each minor component
	100 ppm-9,999 ppm			
	1.0%-50%	± 1% of each minor component	± 5% of each minor component	±5% of each minor component
Analytical Tolerance	10 ppb-99 ppb	±20% of each minor component	±5% of each minor component	±2% of each minor component
	100 ppb-999 ppb			
	1.0 ppm-9.9 ppm	±2% of each minor component	±2% of each minor component	±1% of each minor component
	10 ppm-99 ppm			
	100 ppm-9,999 ppm	±1% of each minor component	±2% of each minor component	±1% of each minor component
	1.0%-50%			

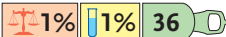
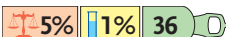


These tolerances may vary for:

- Mixtures containing low molecular weight gases such as hydrogen and helium
- Mixtures containing components that present adsorption, stability or other blending difficulties
- Multi-component mixtures, due to purity and/or stability of the raw material, as well as the number and concentration of the components

Ammonia in Air 0.1		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1–3.75%		Primary	705	200 152	5.91	213
2,000–9,999 ppm					4.06	146
1–3.75%		Certified	705	200 152	5.91	213
10 ppm–9,999 ppm					4.06	146

Ammonia in Helium or Nitrogen*		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1–4%		Primary	705	200 152	5.35	143
2,000–9,999 ppm					3.67	132
1–4%		Certified	705	200 152	5.35	143
10 ppm–9,999 ppm					3.67	132

*Volumes may vary based on balance gas

Ammonia in Hydrogen		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1–4%		Primary	705	200 152	5.91	213
2,000–9,999 ppm					4.06	146
1–4%		Certified	705	200 152	5.91	213
10 ppm–9,999 ppm					4.06	146



Recommended Cylinder Regulator

Equipment Series Material

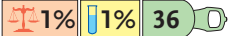
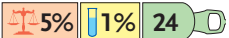
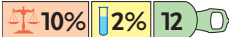
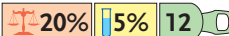

BASELINE™

C1062S Dual Stage Stainless Steel See page 176

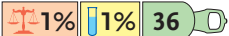
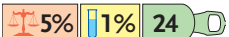

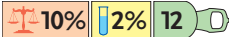


HiQ® REDLINE

C200/2S Dual Stage Stainless Steel See page 192

Mixtures

Argon in Helium or Nitrogen *		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1-50%		Primary	580	300	7.97	287
100-9,999 ppm				200	5.88	212
				80	2.32	84
1-50%		Certified	580	300	7.97	287
10-9,999 ppm				200	5.88	212
5-9.9 ppm				152	4.21	152
				80	2.32	84
				32	0.74	26
1-50%		Unanalyzed	580	300	7.97	287
				200	5.88	212

*Volumes may vary based on balance gas

Argon in Hydrogen		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1-50%		Primary	350	300	7.41	267
100-9,999 ppm				200	5.50	198
				80	2.17	78
1-50%		Certified	350	300	7.41	267
10-9,999 ppm				200	5.50	198
5-9.9 ppm				80	2.17	78
1-50%		Unanalyzed	350	300	7.41	267
				200	5.50	198



Recommended Cylinder Regulator

Equipment Series Material

BASELINE™
















C1062B Single Stage Brass See page 176

HiQ® REDLINE

C200/2B Dual Stage Brass See page 192

C200/2S Dual Stage Stainless Steel See page 192

Argon in Oxygen

		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1-50%	  36 	Primary	296	300	8.39	303
100-9,999 ppm	  24 			200	6.13	221
				80	2.42	87
1-50%	  36 	Certified	296	300	8.39	303
10-9,999 ppm	  12 			200	6.13	221
				80	2.42	87
1-50%	  36 	Unanalyzed	296	300	8.39	303
				200	6.13	221



Recommended Cylinder Regulator

Equipment Series Material

























BASELINE™

C1062B Dual Stage Brass See page 176

HiQ® REDLINE

C200/2B Dual Stage Brass See page 192

Mixtures

Benzene in Air 0.1		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
100–200 ppm	 5%  1%  	Primary	590	152 32	3.90	141
20–99 ppm	 5%  2%  				0.80	29
20–200 ppm	 10%  2%  	Certified	590	152 32	3.90 0.80	141 29
<i>* May be subject to Flamox review</i>						
Benzene in Nitrogen		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
100–200 ppm	 5%  1%  	Primary	350	152 32	3.90	141
20–99 ppm	 5%  2%  				0.80	29
20–200 ppm	 10%  2%  	Certified	350	152 32	3.90 0.80	141 29



Recommended Cylinder Regulator

Equipment Series Material

HiQ® REDLINE

C200/2S

Dual Stage Stainless Steel

See page 192

n-Butane in Air 0.1		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
100–200 ppm		Primary	590	300	7.83	277
10–99 ppm				200	5.80	209
1–9.9 ppm				80	2.29	83
10–200 ppm		Certified	590	300	7.83	277
1–9.9 ppm				200	5.80	209
				80	2.29	83
<i>* May be subject to Flamox review</i>						
n-Butane in Helium		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
100–9,000 ppm		Primary	350	300	7.15	258
50–99 ppm				200	5.40	195
10–9,000 ppm				80	2.14	77
10–9,000 ppm		Certified	350	300	7.15	258
1–9.9 ppm				200	5.40	195
				80	2.14	77
n-Butane in Nitrogen		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
10–9,000 ppm		Primary	350	300	7.56	273
50–99 ppm				200	5.71	206
				80	2.26	82
10–9,000 ppm		Certified	350	300	7.56	273
1–9.9 ppm				200	5.71	206
				80	2.26	82



Recommended Cylinder Regulator

Equipment Series Material
















BASELINE™
















C1062B Dual Stage Brass See page 176

HiQ® REDLINE

C200/2B Dual Stage Brass See page 192

Mixtures

Carbon Dioxide in Air		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1-30%	  36 	Primary	590	300	8.05	290
100-9,999 ppm	  36 			200	6.52	235
				80	2.58	93
1-30%	  36 	Certified	590	300	8.05	290
10-9,999 ppm	  36 			200	6.52	235
				152	3.96	140
		80	2.58	93		
0.5-30%	  36 	Unanalyzed	590	300	8.05	290
				200	6.52	235

Carbon Dioxide in Argon or Nitrogen*		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1-30%	  36 	Primary	580	300	8.71	314
100-9,999 ppm	  36 			200	7.01	253
				80	2.42	85
1-30%	  36 	Certified	580	300	8.71	314
10-9,999 ppm	  36 			200	7.01	253
				152	4.20	148
		80	2.42	85		
0.5-30%	  36 	Unanalyzed	580	300	8.71	314
				200	7.01	253

*Volumes may vary based on balance gas



Recommended Cylinder Regulator

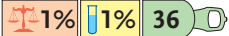
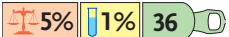
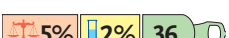
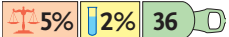
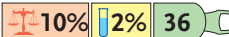




Equipment Series Material


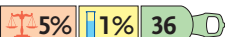
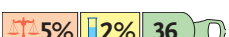
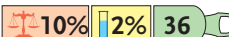
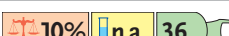



HiQ® REDLINE

C200/2B

Dual Stage Brass

See page 192

Carbon Dioxide in Helium		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1-30%		Primary	580	300	7.00	252
100-9,999 ppm				200	5.69	205
				80	2.25	81
1-30%		Certified	580	300	7.00	252
100-9,999 ppm				200	5.69	205
				152	3.72	131
		80	2.25	81		
1-30%		Unanalyzed	580	300	7.00	252
				200	5.69	205

Carbon Dioxide in Oxygen		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1-30%		Primary	296	300	8.76	316
100-9,999 ppm				200	7.05	254
				80	2.79	101
1-30%		Certified	296	300	8.76	316
100-9,999 ppm				200	7.05	254
				152	4.22	149
		80	2.79	101		
0.5-30%		Unanalyzed	296	300	8.76	316
				200	7.05	254



Recommended Cylinder Regulator

Equipment Series Material

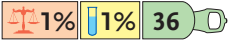
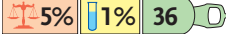
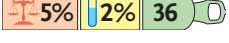
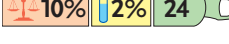
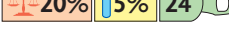
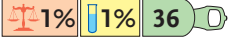
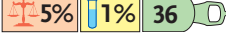
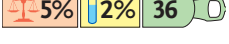
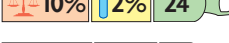

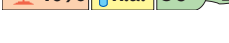
HiQ® REDLINE

C200/2B

Dual Stage Brass

See page 192

Mixtures

Carbon Monoxide in Air		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1-6.25%		Primary	590	200	4.80	173
1,000-9,999 ppm						
1-6.25%		Certified	590	200 152	4.80 3.96	173 143
10-9,999 ppm						
0.5-9.9 ppm						
<i>* May be subject to Flamox review</i>						
Carbon Monoxide in Nitrogen		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1-50%		Primary	350	200	4.74	171
1,000-9,999 ppm						
1-50%		Certified	350	200 152	4.74 3.90	171 141
10-9,999 ppm						
0.5-9.9 ppm						
0.1-50%		Unanalyzed	350	200	4.74	171



Recommended Cylinder Regulator

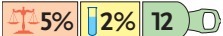


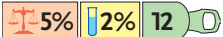
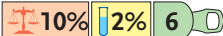

Equipment Series Material

HiQ® REDLINE

C200/2S

Dual Stage Stainless Steel

See page 192

Chlorine in Air 0.1		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1-3.5%		Certified	330	204/200 34/30	5.79 0.91	209 33
10-9,999 ppm						
5-9.9 ppm						
Chlorine in Argon, Helium or Nitrogen		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1-3.5%		Certified	330	204/200 34/30	5.79 0.91	209 33
10-9,999 ppm						
5-9.9 ppm						

*Volumes may vary based on balance gas



Recommended Cylinder Regulator

Equipment Series Material








































HiQ® REDLINE

C200/2S

Dual Stage Stainless Steel

See page 192

Mixtures

Ethane in Air 0.1		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1-1.5%	  36 	Primary	590	300	7.84	283
100-9,999 ppm	  36 			200	5.80	209
50-99 ppm	  36 			80	2.29	83
1-1.5%	  36 	Certified	590	300	7.84	283
10-9,999 ppm	  36 			200	5.80	209
1-9.9 ppm	  36 			80	2.29	83
<i>* May be subject to Flamox review</i>						
Ethane in Nitrogen		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1-10%	  36 	Primary	350	300	7.99	288
100-9,999 ppm	  36 			200	5.92	213
50-99 ppm	  36 			80	2.34	84
1-10%	  36 	Certified	350	300	7.99	288
10-9,999 ppm	  36 			200	5.92	213
1-9.9 ppm	  36 			80	2.34	84
0.1-10%	  36 	Unanalyzed	350	300	7.99	288
				200	5.92	213



Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

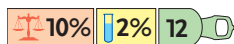
C1062B Dual Stage Brass See page 176

HiQ® REDLINE

C200/2B Dual Stage Brass See page 192

Ethanol in Nitrogen

10–300 ppm



Type	CGA	Size	Contents (approx.)	
			m ³	ft ³
Certified	350	152 32	3.88 0.78	140 28



Recommended Cylinder Regulator

Equipment Series Material







































BASELINE™

C1062S Dual Stage Stainless Steel See page 176

HiQ® REDLINE

C200/2S Dual Stage Stainless Steel See page 192

Mixtures

Ethylene in Air 0.1		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1-1.35%	  36 	Primary	590	300	7.82	282
100-9,999 ppm	  36 			200	5.79	208
50-99 ppm	  36 			152	3.90	141
				80	2.29	83
1-1.35%	  36 	Certified	590	300	7.82	282
10-9,999 ppm	  36 			200	5.79	208
1-9.9 ppm	  36 			152	3.90	141
				80	2.29	83
<i>* May be subject to Flamox review</i>						
Ethylene in Nitrogen		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1-10%	  36 	Primary	350	300	7.92	286
100-9,999 ppm	  36 			200	5.87	212
50-99 ppm	  36 			152	3.92	142
				80	2.32	84
1-10%	  36 	Certified	350	300	7.92	286
10-9,999 ppm	  36 			200	5.87	212
1-9.9 ppm	  36 			152	3.92	142
				80	2.32	84
0.1-10%	  36 	Unanalyzed	350	300	7.92	286
				200	5.87	212



Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

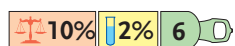
C1062B Dual Stage Brass See page 176

HiQ® REDLINE

C200/2B Dual Stage Brass See page 192

Ethylene Oxide in Air 0.1 or Nitrogen*

10 –1000 ppm



*Volumes may vary based on balance gas

Type	CGA	Size	Contents (approx.)	
			m ³	ft ³
Certified	350	152 32	3.90 0.78	141 28



Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

C1062S Dual Stage Stainless Steel See page 176

HiQ® REDLINE

C200/2S Dual Stage Stainless Steel See page 192

Mixtures

Helium in Argon or Nitrogen*	Type	CGA	Size	Contents (approx.)	
				m ³	ft ³
1-50%	Primary	580	300	7.41	267
500-9,999 ppm			200	5.50	198
			80	2.17	78
1-50%	Certified	580	300	7.41	267
10-9,999 ppm			200	5.50	198
1-9.9 ppm			80	2.17	78
0.1-50%	Unanalyzed	580	300 200	7.41 5.50	267 198

*Volumes may vary based on balance gas



Recommended Cylinder Regulator

Equipment Series Material

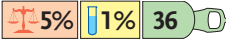
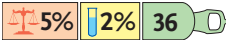
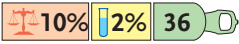

BASELINE™

C1062B Dual Stage Brass See page 176

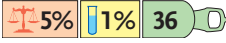
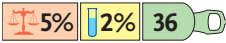
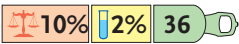
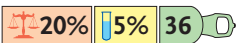
HiQ® REDLINE

C200/2S Dual Stage Stainless Steel See page 192

C200/2B Dual Stage Brass See page 192

Hexane in Air 0.1		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
100–700 ppm		Primary	590	200	5.77	214
50–99 ppm				152	3.96	144
10–700 ppm		Certified	590	32	0.79	28
0.5–9.9 ppm				200	5.77	214
				152	3.96	144
				32	0.79	28

* May be subject to Flamox review
 * Concentrations above 700 ppm will be supplied at reduced pressure

Hexane in Nitrogen		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
100–700 ppm		Primary	350	200	5.69	208
50–99 ppm				152	3.90	140
10–700 ppm		Certified	350	32	0.78	28
0.5–9.9 ppm				200	5.69	208
				152	3.90	140
				32	0.78	28

* Concentrations above 700 ppm will be supplied at reduced pressure



Recommended Cylinder Regulator

Equipment Series Material

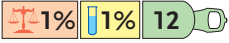
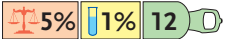
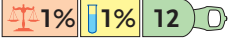
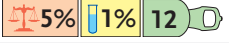
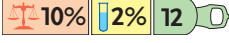
BASELINE™

C1062B Dual Stage Brass See page 176

HiQ® REDLINE

C200/2B Dual Stage Brass See page 192

Mixtures

Hydrogen in Air		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1-2%		Primary	590	300	7.76	289
1,000-9,999 ppm				200	5.75	214
				80	2.27	78
1-2%		Certified	590	300	7.76	289
10-9,999 ppm				200	5.75	214
5-9.9 ppm				80	2.27	78
<i>*May be subject to Flamox Review</i>						
Hydrogen in Argon, Helium or Nitrogen*		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1-50%		Primary	350	300	7.41	267
1,000-9,999 ppm				200	5.50	198
				80	2.17	78
1-50%		Certified	350	300	7.41	267
10-9,999 ppm				200	5.50	198
5-9.9 ppm				80	2.17	78
0.1-50%		Unanalyzed	350	300	7.41	267
				200	5.50	198

**Volumes may vary based on balance gas*

Recommended Cylinder Regulator

Equipment Series Material

BASELINE™
















C1062B Dual Stage Brass See page 176

HiQ® REDLINE

C200/2S Dual Stage Stainless Steel See page 192

C200/2B Dual Stage Brass See page 192



Hydrogen Chloride in Nitrogen		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1-5%	  	Certified	330	204 34	5.79	209
20-9,999 ppm	  				0.91	33
Hydrogen Cyanide in Nitrogen		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1-5%	  	Certified	350	200 152 32	0.82	30
10-9,999 ppm	  				3.70	133
<i>* Concentrations > 2,500 ppm will be supplied at a reduced pressure</i>					0.74	26
Hydrogen Fluoride in Nitrogen		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
100-5,000 ppm	  	Certified	330	204 34	4.34 0.67	157 24



Recommended Cylinder Regulator

Equipment Series Material


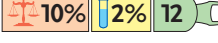

HiQ® REDLINE

C200/2S

Dual Stage Stainless Steel

See page 192

Mixtures

Hydrogen Sulphide in Hydrogen		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1%		Certified	330	152 32	3.66 0.72	132 28
10–9,999 ppm						
0.5–9.9 ppm						
Hydrogen Sulphide in Methane		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1%		Certified	330	152 32	4.90 0.98	177 35
10–9,999 ppm						
0.5–9.9 ppm						
Hydrogen Sulphide in Nitrogen		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1–5%		Primary	330	200 152 32	5.77 3.99 0.80	208 144 29
1,000–9,999 ppm						
1–5%		Certified	330	200 152 32	5.77 3.99 0.80	208 144 29
10–9,999 ppm						
0.5–9.9 ppm						



Recommended Cylinder Regulator

Equipment Series Material

HiQ® REDLINE

C200/2S

Dual Stage Stainless Steel

See page 192

Isobutane in Air 0.1		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
100–9,000 ppm		Primary	590	300	8.01	289
50–99 ppm				200	5.93	214
				80	2.22	80
10–9,000 ppm		Certified	590	300	8.01	289
1–9.9 ppm				200	5.93	214
				80	2.22	80
<i>*May be subject to Flamox Review</i>						
Isobutane in Nitrogen		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
100–9,000 ppm		Primary	350	300	7.71	278
50–99 ppm				200	5.77	208
				80	2.14	77
10–9,000 ppm		Certified	350	300	7.71	278
1–9.9 ppm				200	5.77	208
				80	2.14	77
0.1–0.9%		Unanalyzed	350	300	7.71	278
				200	5.77	208



Recommended Cylinder Regulator

Equipment Series Material


BASELINE™

C1062B Dual Stage Brass See page 176

HiQ® REDLINE

C200/2B Dual Stage Brass See page 192

Mixtures

Methane in Air 0.1		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1–2.5%	 1%  1%  36 	Primary	590	300	7.82	282
100–9,999 ppm	 5%  1%  36 			200	5.79	209
10–99 ppm	 5%  2%  36 			80	2.29	83
1–2.5%	 5%  2%  36 	Certified	590	300	7.82	282
10–9,999 ppm	 10%  2%  36 			200	5.79	209
1–9.9 ppm	 20%  5%  36 			80	2.29	83
<i>*May be subject to Flamox Review</i>						
Methane in Argon or Nitrogen*		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1–10%	 1%  1%  36 	Primary	350	300	8.47	305
100–9,999 ppm	 5%  1%  36 			200	6.20	224
50–99 ppm	 5%  2%  36 			80	2.42	87
1–10%	 5%  2%  36 	Certified	350	300	8.47	305
10–9,999 ppm	 10%  2%  36 			200	6.20	224
1–9.9 ppm	 20%  5%  36 			80	2.42	87
0.1 – 10%	 10%  n.a.  36 	Unanalyzed	350	300	8.47	305
				200	6.20	224

**Volumes may vary based on balance gas*

Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

C1062B Dual Stage Brass See page 176

HiQ® REDLINE

C200/2B Dual Stage Brass See page 192

C200/2S Dual Stage Stainless Steel See page 192



Methane in Hydrogen	Type	CGA	Size	Contents (approx.)	
				m ³	ft ³
1-10%	Primary	350	300	7.71	273
100-9,999 ppm			200	5.34	193
50-99 ppm			80	2.11	76
1-10%	Certified	350	300	7.71	273
10-9,999 ppm			200	5.34	193
1-9.9 ppm			80	2.11	76
0.1-10%	Unanalyzed	350	300	7.71	273
			200	5.34	193



Recommended Cylinder Regulator

Equipment Series Material

BASELINE™




C1062B Dual Stage Brass See page 176




HiQ® REDLINE

C200/2B Dual Stage Brass See page 192

C200/2S Dual Stage Stainless Steel See page 192

Mixtures

Methanol in Air 0.1		Type	CGA	Size	Contents (approx.)	
10–900 ppm		Certified	590	152 32	m ³ 2.37 0.48	ft ³ 86 18
		 10%	 2%	 12		

Methanol in Nitrogen		Type	CGA	Size	Contents (approx.)	
10–900 ppm		Certified	350	152 32	m ³ 2.35 0.47	ft ³ 85 17
		 10%	 2%	 12		



Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

C1062B	Dual Stage Brass	See page 176
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HiQ® REDLINE

C200/2B	Dual Stage Brass	See page 192
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Methyl Mercaptan in Helium, Methane or Nitrogen

- 1% 
- 1,000–9,999 ppm 

Type	CGA	Size	Contents (approx.)	
			m ³	ft ³
Certified	350	152 32	3.16	114
			0.63	23



Recommended Cylinder Regulator

Equipment Series Material

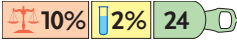
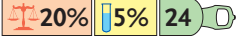
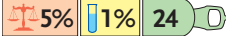

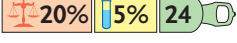
HiQ® REDLINE

C200/2S

Dual Stage Stainless Steel

See page 192

Mixtures

Nitric Oxide in Helium		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
10–9,900 ppm		Certified	660	200	5.68	205
0.4–9.9 ppm				152	3.90	141
				32	0.78	28
Nitric Oxide in Nitrogen		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
100–5,000 ppm		Primary	660	152	3.90	141
				32	0.78	28
10–9,900 ppm		Certified	660	200	5.68	205
0.4–9.9 ppm				152	3.90	141
				32	0.78	28



Recommended Cylinder Regulator










Equipment Series Material

BASELINE™








C1062S Dual Stage Stainless Steel See page 176

HiQ® REDLINE

C200/2S Dual Stage Stainless Steel See page 192

Nitrogen in Argon or Helium*		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1-50%	  24 	Primary	580	300	7.97	287
100-9,999 ppm	  24 			200	5.88	212
				80	2.33	84
1-50%	  24 	Certified	580	300	7.97	287
10-9,999 ppm	  24 			200	5.88	212
1-9.9 ppm	  24 			80	2.33	84
0.1-50%	  24 	Unanalyzed	580	300	7.97	287
				200	5.88	212

*Volumes may vary based on balance gas

Nitrogen in Hydrogen		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1-50%	  24 	Primary	350	300	7.27	262
100-9,999 ppm	  24 			200	5.41	195
				80	2.14	77
1-50%	  24 	Certified	350	300	7.27	262
10-9,999 ppm	  24 			200	5.41	195
1-9.9 ppm	  24 			80	2.14	77
0.1-50%	  24 	Unanalyzed	350	300	7.27	262
				200	5.41	195



Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

C1062B Dual Stage Brass See page 176

HiQ® REDLINE

C200/2B Dual Stage Brass See page 192

Mixtures

Nitrogen Dioxide in Air 0.1


1%   

10–9,999 ppm   

5–9.9 ppm   

Nitrogen Dioxide in Nitrogen

1%   

10–9,999 ppm   

5–9.9 ppm   

Note: NO₂/N₂ will have a 0.5% O₂ content

	Type	CGA	Size	Contents (approx.)	
				m ³	ft ³
	Certified	660	152 32	1.20 0.24	43 9
	Certified	660	152 32	1.20 0.24	43 9



Recommended Cylinder Regulator

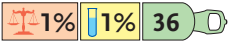
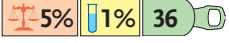
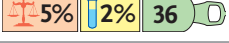
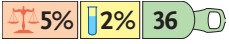
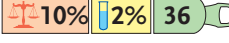
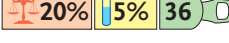
Equipment Series Material

BASELINE™

C1062S Dual Stage Stainless Steel See page 176

HiQ® REDLINE

C200/2S Dual Stage Stainless Steel See page 192

Nitrous Oxide in Nitrogen		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1-10%		Primary	590	300 200 80	7.96	287
100-9,999 ppm					5.89	194
10-99 ppm					2.33	84
1-10%		Certified	590	300 200 80	7.96	287
10-9,999 ppm					5.89	194
1-9.9 ppm					2.33	84



Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

C1062B Dual Stage Brass See page 176

HiQ® REDLINE

C200/2B Dual Stage Brass See page 192

C200/2S Dual Stage Stainless Steel See page 192

Mixtures

Oxygen in Argon or Nitrogen		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1-50%	 1%  1%  36	Primary	See note below	300	8.39	303
1,000-9,999 ppm	 5%  1%  24			200	6.13	221
				152	4.21	152
1-50%	 5%  2%  36	Certified	See note below	300	8.39	303
10-9,999 ppm	 10%  2%  12			200	6.13	221
1-9.9 ppm	 20%  5%  12			152	4.21	152
0.1-50%	 10%  n.a.  24	Unanalyzed	See note below	300	8.39	303
				200	6.13	221

**Volumes may vary based on balance gas*

Oxygen in Helium		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1-50%	 1%  1%  36	Primary	See note below	300	7.31	264
1,000-9,999 ppm	 5%  1%  24			200	5.43	196
1-50%	 5%  2%  36	Certified	See note below	300	7.31	264
10-9,999 ppm	 10%  2%  12			200	5.43	196
1-9.9 ppm	 20%  5%  12			152	3.71	131
0.1-50%	 10%  n.a.  24	Unanalyzed	See note below	300	7.31	264
				200	5.43	196

Note:

O₂ ≤ 5% use CGA 580
 O₂ > 5-23% use CGA 590
 O₂ > 23% CGA 296



Recommended Cylinder Regulator










Equipment Series Material

BASELINE™

C1062B Dual Stage Brass See page 176

HiQ® REDLINE

C200/2B Dual Stage Brass See page 192

Propane in Air		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1-1.1%	 1%  1% 	Primary	590	300	7.84	283
100-9,999 ppm	 5%  1% 			200	5.80	209
10-99 ppm	 5%  2% 			152	3.96	143
1-1.1%	 5%  2% 	Certified	590	300	7.84	283
10-9,999 ppm	 10%  2% 			200	5.80	209
1-9.9 ppm	 20%  5% 			152	3.96	143
<i>* May be subject to Flamox review</i>						
Propane in Nitrogen		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1-4%	 1%  1% 	Primary	350	300	7.75	279
100-9,999 ppm	 5%  1% 			200	5.80	209
10-99 ppm	 5%  2% 			152	3.98	144
1-4%	 5%  2% 	Certified	350	300	7.75	279
10-9,999 ppm	 10%  2% 			200	5.80	209
1-9.9 ppm	 20%  5% 			152	3.98	144
0.1-4%	 10%  n.a. 	Unanalyzed	350	300	7.75	279
				200	5.80	209



Recommended Cylinder Regulator

Equipment Series Material

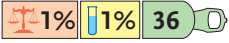
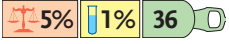
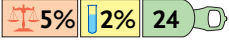
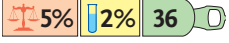
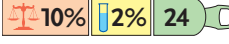

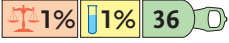
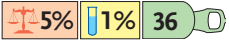
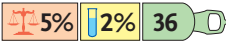
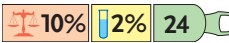
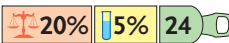
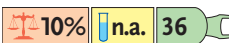
BASELINE™

C1062B Dual Stage Brass See page 176

HiQ® REDLINE

C200/2B Dual Stage Brass See page 192

Mixtures

Propylene in Air 0.1		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1%		Primary	590	300	7.84	283
100–9,999 ppm				200	5.80	209
50–99 ppm				152	3.96	143
				80	2.29	83
1%		Certified	590	300	7.84	283
10–9,999 ppm				200	5.80	209
1–9.9 ppm				152	3.96	143
				80	2.29	83
<i>*May be subject to Flamox Review</i>						
Propylene Nitrogen		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1–6%		Primary	350	300	6.30	227
100–9,999 ppm				200	5.53	199
				80	2.19	79
1–6%		Certified	350	300	6.30	227
10–9,999 ppm				200	5.53	199
				152	3.90	143
				80	2.19	79
1–9.9 ppm						
0.1–6%		Unanalyzed	350	300	6.30	227
				200	5.53	199



Recommended Cylinder Regulator

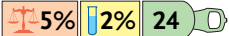
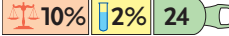

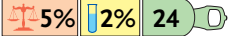


Equipment Series Material

BASELINE™

C1062B Dual Stage Brass See page 176

HiQ® REDLINE

C200/2B Dual Stage Brass See page 192

Sulphur Dioxide in Air 0.1		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1%		Certified	660	200	5.80	209
10-9,999 ppm				152	3.99	144
0.4-9.9 ppm				32	0.80	29
Sulphur Dioxide in Nitrogen		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1%		Certified	660	200	5.71	206
10-9,999 ppm				152	3.92	414
0.4-9.9 ppm				32	0.78	28



Recommended Cylinder Regulator

Equipment Series Material

HiQ® REDLINE

C200/25

Dual Stage Stainless Steel

See page 192

Mixtures

Sulphur Hexafluoride in Air 0.1		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1-10%		Primary	590	300	8.15	289
100-9,999 ppm				200	6.06	219
50-99 ppm				80	2.39	84
1-10%		Certified	590	300	8.15	277
10-9,999 ppm				200	6.06	219
1-9.9 ppm				152	3.96	140
0.1-10%		Unanalyzed	590	300	8.15	289
				200	6.06	219
Sulphur Hexafluoride in Nitrogen		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
1-10%		Primary	580	300	8.01	289
100-9,999 ppm				200	5.93	214
50-99 ppm				80	2.35	85
1-10%		Certified	580	300	8.01	289
10-9,999 ppm				200	5.93	214
1-9.9 ppm				152	3.90	138
0.1-10%		Unanalyzed	580	300	8.01	289
				200	5.93	214

Recommended Cylinder Regulator

Equipment Series Material

BASELINE™







C1062B Dual Stage Brass See page 176

HiQ® REDLINE




C200/2B Dual Stage Brass See page 192




C200/2S Dual Stage Stainless Steel See page 192






Vinyl Chloride in Nitrogen		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
10–5,000 ppm	  	Certified	350	152 32	4.05	146
100 ppb – 9.9 ppm	  				0.82	30

Moisture Mixtures (as water)

Water in Argon or Nitrogen*		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
50–140 ppm	  	Certified	580	152	3.90	141
<i>Water mixtures only available in size 152</i> <i>*Volumes may vary based on balance gas</i>						

Water in Helium		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
50–140 ppm	  	Certified	580	152	3.74	135
<i>Water mixtures only available in size 152</i>						

Water in Hydrogen		Type	CGA	Size	Contents (approx.)	
					m ³	ft ³
50–140 ppm	  	Certified	350	152	3.66	132
<i>Water mixtures only available in size 152</i>						



Recommended Cylinder Regulator

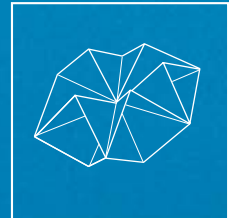
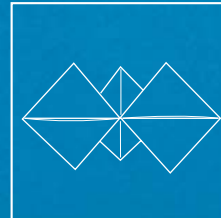
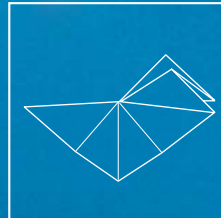
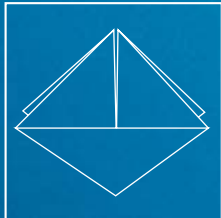
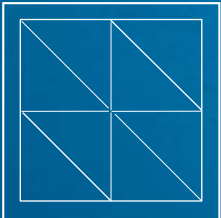
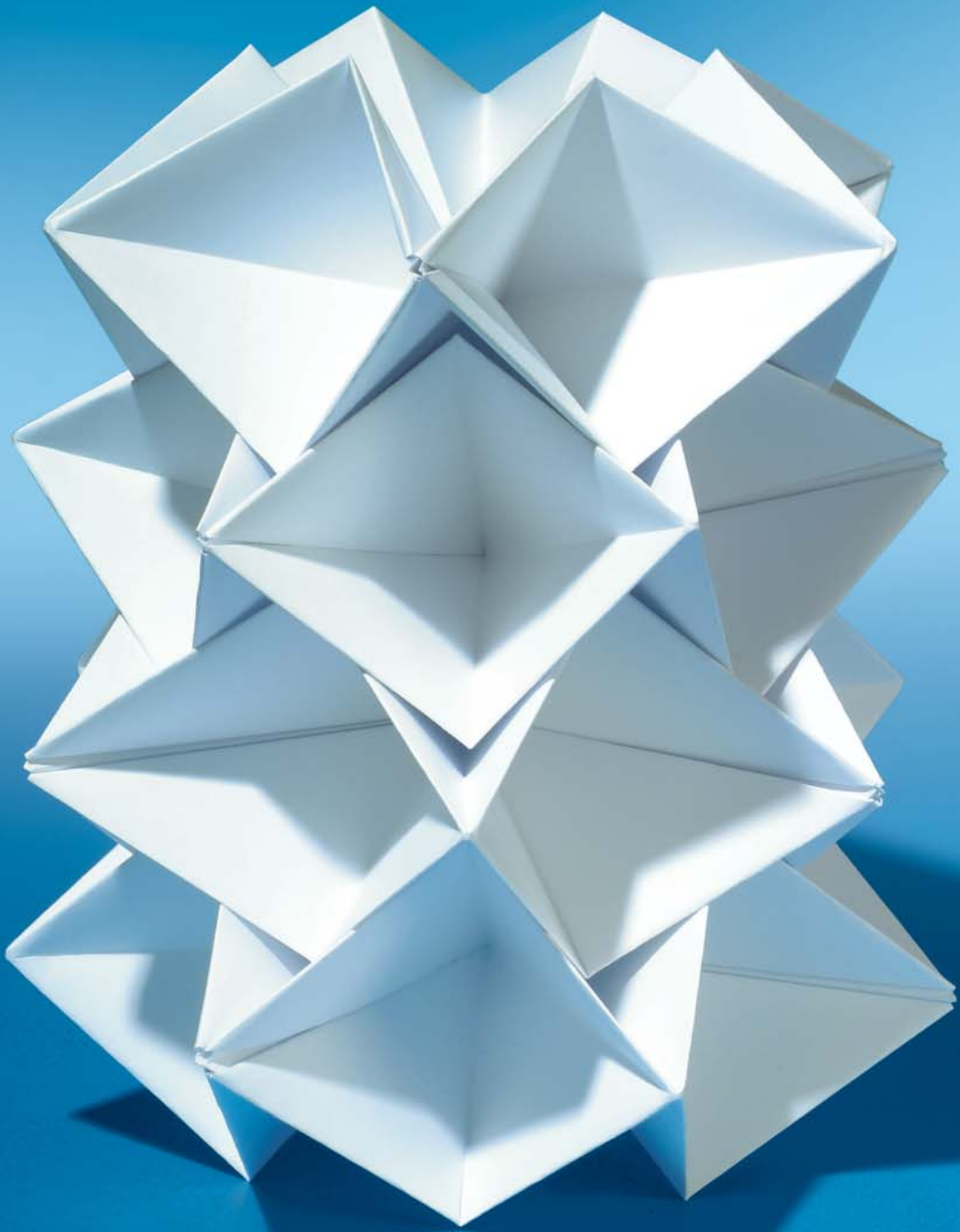
Equipment Series Material

HiQ® REDLINE

C200/2S

Dual Stage Stainless Steel

See page 192



Special Application Mixtures

Linde's knowledge and long-term experience with an extensive range of applications give us a clear picture of the most widely requested and relevant gas mixtures for each application. This helps us effectively fast-track your selection procedures. In many cases we have standard manufactured stock for mixtures used in some of the following applications:

- Diving Gas
- Electron Capture
- Fuel Gases
- Laser Gases
- Nuclear Counter Gases
- Instrument Support

While our mixture listing covers many of today's common requirements, Linde recognizes the infinite combinations our customers may demand. If you do not see your requirement here, contact our Customer Service Centre and we will create one for you.

Diving Gas Standards

Recent studies have shown that in some cases medical or aviator grade products previously supplied do not meet the specifications for diving gases as published in CSA Z-275.2.92. Linde uses quality controlled raw gas materials to ensure all our diving grade gases and gas mixtures meet these minimum specifications, as well as those published in DND 87-003-000/SG-001 (99-4-12).

Diving Gas Standards	CGA	Size	Contents		Product Code
			m ³	ft ³	
Oxygen 40% in N ₂	296	200	6.03	206	24075939
Oxygen 60% in N ₂	296	200	6.13	206	24075950
Helium 50% in N ₂	580	200	6.10	206	24079637
Tri Mix He 10% O ₂ 21% in N ₂	590	200	5.70	206	24078394
Tri Mix He 20% O ₂ 21% in N ₂	590	200	5.70	206	24078749
Tri Mix O ₂ 21% He 35% in N ₂	590	200	5.70	206	24078900
Tri Mix O ₂ 18% He 45% in N ₂	590	200	5.70	206	24078978
Tri Mix O ₂ 15% He 55% in N ₂	590	200	5.70	206	24078601



Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

C1061B

Single Stage Brass

See page 176

Electron Capture Detector (ECD) Mixtures

Methane 4.0 in Argon 5.0	Typical Impurities	CGA	Size	Contents		Product Code
				m ³	ft ³	
5% (Ultra P-5)	H ₂ O < 1 ppm O ₂ < 1 ppm	350	300	8.49	306	24017270
			200	6.27	226	24017269
Methane in Argon	Typical Impurities	CGA	Size	Contents		Product Code
				m ³	ft ³	
5% (P-5)	H ₂ O < 5 ppm O ₂ < 2 ppm	350	300	8.49	306	20417266
			200	6.27	226	20417265



Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

C1062B Dual Stage Brass See page 176

HiQ® REDLINE

C200/2B Dual Stage Brass See page 192

Thermal Conductivity Detector Mixture

Hydrogen in Helium

8.5%

CGA	Size	Contents		Product Code
		m ³	ft ³	
350	200	5.55	200	24017291



Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

C1062B Dual Stage Brass See page 176

HiQ® REDLINE

C200/2B Dual Stage Brass See page 192

Nuclear Counter Mixtures

Butane in Helium	CGA	Size	Contents		Product Code			
			m ³	ft ³				
1.3%	350	200	5.55	200	24017223			
Isobutane in Helium	CGA	Size	Contents		Product Code			
			m ³	ft ³				
0.95%	350	200	5.55	200	24017255			
Methane in Argon	CGA	Size	Contents		Product Code			
			m ³	ft ³				
			10% (Ultra P-10)	350	300	8.49	306	24017220
			H ₂ O < 5 ppm O ₂ < 5 ppm		200	6.27	226	24017219
10% (P-10)	350	300	8.49	306	24017217			
		200	6.27	226	24017216			
Tri-Component Mixture	CGA	Size	Contents		Product Code			
			m ³	ft ³				
8% Methane 46% Nitrogen 46% Helium	350	300	7.35	265	24081883			



Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

C1062B Dual Stage Brass See page 176

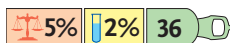
HiQ® REDLINE

C200/2B Dual Stage Brass See page 192

Flame Ionization Detector Mixtures

Hydrogen in Helium (Helifuel FID 0.1)	CGA	Size	Contents		Product Code
			m ³	ft ³	
40%, THC < 0.1 ppm, H ₂ O < 2 ppm	350	200	5.55	200	24075741
Hydrogen in Helium (Helifuel FID Zero)	CGA	Size	Contents		Product Code
			m ³	ft ³	
40%, THC < 0.5 ppm	350	200	5.55	200	24063839
Hydrogen in Nitrogen (Nitrifuel FID Zero)	CGA	Size	Contents		Product Code
			m ³	ft ³	
40%, THC < 0.5 ppm	350	300 200	7.71 5.77	278 208	24063964 24063966

Flame Resistance of Cloth Test	Type	CGA	Size	Contents		Product Code
				m ³	ft ³	
3% Ethane 18% Carbon Monoxide 24% Methane 55% Hydrogen	Certified	350	200	4.51	163	24077793



Preparation Tolerance is 1% Absolute per component (+/-1%)



Recommended Cylinder Regulator

Equipment Series Material

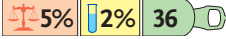
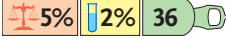
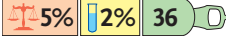
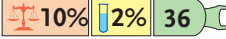
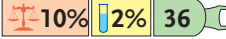

HiQ® REDLINE

C200/2B

Dual Stage Brass

See page 192

Flammable Limit Gas Mixtures

Hydrogen in Air		Type	CGA	Size	Contents		Product Code
					m ³	ft ³	
2% (50% LEL)		Certified	590	200	5.93	214	24073892
Methane in Air		Type	CGA	Size	Contents		Product Code
					m ³	ft ³	
2.50% (50% LEL)		Certified	590	200	5.93	214	24062735
1.25% (25% LEL)		Certified	590	200	5.93	214	24081880
0.50% (10% LEL)		Certified	590	200	5.93	214	24067853
0.25% (5% LEL)		Certified	590	200	5.93	214	24081882
Propane in Air		Type	CGA	Size	Contents		Product Code
					m ³	ft ³	
1.1% (50% LEL)		Certified	590	200	4.38	158	24077253



Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

C1062B Dual Stage Brass See page 176

HiQ® REDLINE

C200/2B Dual Stage Brass See page 192

Furnace Atmosphere Mixture

Carbon Dioxide in Carbon Monoxide

40%

CGA	Size	Contents		Product Code
		m ³	ft ³	
350	152	4.08	147	24081214



Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

C1062B Dual Stage Brass See page 176

HiQ® REDLINE

C200/2B Dual Stage Brass See page 192

Leak Detection Mixtures

Helium in Nitrogen	CGA	Size	Contents		Product Code
			m ³	ft ³	
0.5–10%	580	300	7.71	278	–
		200	5.77	208	–
Sulphur Hexafluoride in Nitrogen	CGA	Size	Contents		Product Code
			m ³	ft ³	
0.1–5%	580	300	7.71	278	–
		200	5.77	208	–



Recommended Cylinder Regulator

Equipment Series Material

BASELINE™

C1062B Dual Stage Brass See page 176

HiQ® REDLINE

C200/2B Dual Stage Brass See page 192

Laser Mixtures

Lasershield	CGA	Size	Contents		Product Code
			m ³	ft ³	
Lasershield 1	580	300	7.46	269	24069564
Lasershield 2	580	300	7.46	269	24069566
Lasershield 3	580	300	7.51	271	24069567
Lasershield 4	580	300	7.54	272	24069568
Lasershield 5	580	300	7.39	266	24069569
Lasershield 6*	350	152	4.01	147	24080543
Lasershield 7	580	300	7.49	271	24073909

Lasershield Components

	% CO	% CO ₂	% N ₂	% He
Lasershield 1	-	4.5	13.5	82
Lasershield 2	-	9	13.5	77.5
Lasershield 3	-	12	12	76
Lasershield 4	-	5	55	40
Lasershield 5	-	3.4	15.6	81
Lasershield 6*	4	8	60	28
Lasershield 7	-	1.7	23.4	74.9

* Requires Aluminum Cylinder

Guaranteed Specifications

- < 5 ppm H₂O
- < 5 ppm O₂
- < 1ppm THC

LASERLINE, developed by Linde AG, represents a complete program of Products (gases and equipment) and Services (installation, consultation and research) managed by a global team of experts with extensive laser experience. The overall goal is to support the laser manufacturers in their effort to foster laser technology and to provide the optimum gas supply solution to the laser user.

LASERLINE is your easy access to more than 20 years of experience in laser processing and laser related gas supply solutions. Our toll-free service hotline 1-866-385-5349 provides you with free advice on laser technology.



LMH-360 complete laser gas supply system for laser resonators that require separate gases.

Excimer Laser Mixtures

Fluorine in Neon	CGA	Spectra Size	Contents litres
1%	670/679	2	6,000
	670/679	2	5,000
	670/679	3	2,000
Fluorine in Helium or Neon*	CGA	Spectra Size	Contents litres
1-5%	670/679	1	1,700
	670/679	2	1,501
	670/679	3	566
	670/679	4	283
<i>*Volumes may vary based on balance gas</i>			
Hydrogen Chloride in Helium or Neon*	CGA	Spectra Size	Contents litres
1-5%	330	3	1,133
	330	4	566
	330	5	198
<i>*Volumes may vary based on balance gas</i>			
5 % HCl, 1% Hydrogen, in Helium or Neon*	CGA	Spectra Size	Contents litres
1-5%	330	3	1,133
	330	4	566
	330	5	198
<i>*Volumes may vary based on balance gas</i>			



Natural Gas Standards

Linde offers a variety of Natural Gas Cylinder Standards for process, or calibration requirements. From pipeline reference standards to NIST traceable requirements, Linde has the right mix for your application.

BTU Standards	Components		CGA	Size	Contents		Product Code
					m ³	ft ³	
BTU 1010 Methane Calibration <i>Ideal BTU Value = 1,010 @ 14.696 psia, 60°F (GPA 2172)</i>			350	200	8.10	286	24076292
BTU-1028 Calorific Standard	Balance	Methane	510	425	19.50	68	24075863
	Carbon Dioxide	3.00%					
	Ethane	3.50%					
	Heptane	0.02%					
	Hexane	0.05%					
	Isobutane	0.40%					
	Isopentane	0.15%					
	n-Butane	0.40%					
	Nitrogen	2.50%					
	Neopentane	0.10%					
	Pentane	0.15%					
	Propane	1.00%					
BTU Standard 1298, GPA Reference Standard*	Balance	Methane	510	425	0.85	30	24082213
	Carbon Dioxide	1%					
	Ethane	9%					
	Helium	0.5%					
	Isobutane	3%					
	Isopentane	1%					
	n-Butane	3%					
	Nitrogen	5%					
	Pentane	1%					
	Propane	6%					
Pipeline Natural Gas Standards	Components		CGA	Size	Contents		Product Code
					m ³	ft ³	
Pipeline Natural Gas	Balance	Methane	350	200	7.22	255	24076293
	Carbon Dioxide	1%					
	Ethane	1.75%					
	Hexane	10 ppm					
	Isobutane	0.1%					
	Isopentane	20 ppm					
	n-Butane	0.1%					
	Nitrogen	2%					
	Oxygen	0.2%					
	Pentane	20 ppm					
	Propane	0.1%					

*The Gas Processors Association's "GPA Standard of Analysis for Natural Gas and Similar Gaseous Mixtures by Gas Chromatography" (GPA Publication 2261-72) and ASTM's method D-1945-62T recommend this specialty gas mixture for calibration and analysis



Recommended Cylinder Regulator

Equipment Series Material

HiQ® REDLINE

C200/2B

Dual Stage Brass

See page 192

Liquid Hydrocarbon Standards

Considered by many as the industry leader in Canada, Linde has been manufacturing quality liquefied Hydrocarbon standards for more than 40 years. With component requirements that sometimes exceed 20 or more, Linde uses special preparation on both steel and aluminum cylinders to ensure stability during the shelf life of the standard.

Liquid Hydrocarbon Standards come with a full length eductor tubes (FLET) and Helium head pressure to retain the consistency of the mixture during use. Cylinder weight contents can vary based on mixture composition and the required liquid fill density. There are more than 100 potential components available and Linde quality controls all materials before mixing to ensure all standards meet our minimal preparation and analytical requirements. Typical balance gases used for Hydrocarbon Standards include:

- 1,3-Butadiene
- 1-Butene
- Pentane
- Isobutane
- 2-Butene
- Propane
- n-Butane
- Isopentane
- Propylene

Liquid standards are also available in Constant Pressure or "Piston" cylinders. Mixture pressure is maintained by pressurizing one side of the floating piston with an inert gas such as helium. The floating piston effectively separates the liquid from the inert gas and the constant pressure on the piston prevents lighter components from volatilizing. Constant Pressure cylinders supply the most accurate liquid phase calibration standards available and should be used for the most demanding applications such as product sales and custody transfer. Typical content is 500 to 1,000 cc. Constant pressure cylinders are supplied by the customer or purchased along with the mixture. Constant Pressure cylinders are shipped in TC approved transport cases.

Transportables

Many applications require the use of smaller non-standard cylinders, to assist where gas quantity, size and/or weight can be a consideration. Linde's line of small transportable cylinders offers a solution to larger cylinders wherever small gas quantities are required. There are two product families:

Linde Non-refillable containers offer small gas quantities at reduced pressures in portable steel or aluminium cylinders. Often referred to as disposables, or lecture bottles, non-refillable cylinders are purchased with the gas, removing any concern over cylinder rental charges. Non-refillable cylinders can be used with most standard non-poisonous pure gas or gas mixtures, with many available from current production at short notice. To save both time and expense, they are often shipped directly to our customers from the manufacturing plant. The purchaser becomes responsible for the environmental disposal requirements of the cylinders after use.

The Linde ECOCYL® cylinder program offers a unique and environmentally-friendly solution to the problem of cylinder disposal. ECOCYL® cylinders are small, refillable cylinders with a fixed pressure regulator and a flow meter fully integrated into the cylinder's protective cowling. The result is a safe, easy and ready-to-use system. The end user only needs to open the cylinder valve and choose from the preset flow ranges. ECOCYL® cylinders can be used with most standard pure gas or gas mixtures, with many available from current production at short notice.

Linde MM17 Transportable mixtures are certified to the following: 10–25 ppm +/- 10% of the minor component(s); > 25 ppm +/- 5% of the minor component(s). MM17 cylinders are for use for remote safety and industrial hygiene applications. For laboratory calibrations, we recommend our ECOCYL® combination package.



Transportable MM17*

Technical Data

Available Binary Mixtures

n-Butane in Air	10% LEL (0.17%), 20% LEL (0.34%), 50% LEL (0.75%)
Carbon Dioxide in Air	100 ppm, 1000 ppm, 2.5%
Carbon Dioxide in Nitrogen	1000 ppm, 2.5%, 5%, 10%
Carbon Monoxide in Air	25 ppm, 50 ppm, 100 ppm, 200 ppm, 300 ppm
Carbon Monoxide in Nitrogen	50 ppm, 1000 ppm
Hexane in Air	1.5% LEL (180 ppm), 2.5% LEL (300 ppm), 4% LEL (480 ppm)
Isobutylene in Air	50 ppm, 100 ppm
Methane in Air	10 ppm, 100 ppm, 20% LEL (1%), 30% LEL (1.5%), 50% LEL (2.5%)
Oxygen in Nitrogen	15%, 19.5%, 20.9%
Propane in Air	10 ppm, 30% LEL (0.66%), 50% LEL (1.1%)

Multi Component Blends

CO ₂	Methane	Pentane	Oxygen	Balance
100 ppm	50% LEL	–	–	Air
100 ppm	–	30% LEL	–	Air
35 ppm	–	10% LEL	18%	Nitrogen
50 ppm	50% LEL	–	12%	Nitrogen
50 ppm	50% LEL	–	17%	Nitrogen
100 ppm	25% LEL	–	17%	Nitrogen
100 ppm	25% LEL	–	19%	Nitrogen
100 ppm	50% LEL	–	12%	Nitrogen
100 ppm	50% LEL	–	16%	Nitrogen
200 ppm	50% LEL	–	19%	Nitrogen

Content	17L (0.6 ft ³)
Pressure	240 psi
Dimensions	27.3 x 7.3 cm (10.75" x 2.75")
Internal Volume	1.0 L
Material	Steel
Weight	0.4 kg (1 lb)
Outlet	CGA 600

MM17 are available for Air, Argon, Helium, Hydrogen, Nitrogen, and Propane. MM17 cylinders are non-refillable one time use only.

* Typically sold in cases of 12 cylinders

Transportables

Transportable MM105

Technical Data

Available Binary Mixtures

n-Butane in Air	10% LEL (0.17%), 20% LEL (0.34%), 50% LEL (0.75%)
Carbon Dioxide in Air	100 ppm, 1000 ppm, 2.5%, 5%
Carbon Dioxide in Nitrogen	1000 ppm, 2.5%, 5%, 10%
Carbon Monoxide in Air	25 ppm, 50 ppm, 100 ppm, 200 ppm, 300 ppm
Carbon Monoxide in Nitrogen	50 ppm, 1000 ppm
Hexane in Air	1.5% LEL (180 ppm), 2.5% LEL (300 ppm), 4% LEL (480 ppm)
Isobutylene in Air	50 ppm, 100 ppm
Methane in Air	10 ppm, 100 ppm, 20% LEL (1%), 30% LEL (1.5%), 50% LEL (2.5%)
Oxygen in Nitrogen	15%, 19.5%, 20.9%
Propane in Air	10 ppm, 30% LEL (0.66%), 50% LEL (1.1%)

Multi Component Blends

CO ₂	Methane	Pentane	Oxygen	Balance
100 ppm	50% LEL	-	-	Air
100 ppm	-	30% LEL	-	Air
35 ppm	-	10% LEL	18%	Nitrogen
50 ppm	50% LEL	-	12%	Nitrogen
50 ppm	50% LEL	-	17%	Nitrogen
100 ppm	25% LEL	-	17%	Nitrogen
100 ppm	25% LEL	-	19%	Nitrogen
100 ppm	50% LEL	-	12%	Nitrogen
100 ppm	50% LEL	-	16%	Nitrogen
200 ppm	50% LEL	-	19%	Nitrogen

Content	105L (3.7 ft ³)
Pressure	1,000 psig
Typical Use	Non-flammable mixtures
Dimensions	34.3 x 8.3 cm (13.9" x 3.25")
Internal Volume	1.52 L
Material	Steel
Weight	1.5 kg (3 lbs)
Outlet	C10

MM105 Transportable mixtures are certified to the following analytical uncertainty:

10–25 ppm	+/-10% of the minor component(s)
> 25 ppm	+/- 5% of the minor component(s)

MM105 cylinders are for use for Safety and Industrial Hygiene applications. For Laboratory small cylinder calibrations, we recommend our ECOCYL® combination package.

MM105 are available for Air, Argon, Helium and Nitrogen. MM105 cylinders are non-refillable one time use only.

Transportable MM221

Technical Data

Available Binary Mixtures

Butane in Air	10% LEL (0.17%), 20% LEL (0.34%), 50% LEL (0.75%)
Carbon Dioxide in Air	100 ppm, 1,000 ppm, 2.5%, 5%
Carbon Dioxide in Nitrogen	1,000 ppm, 2.5%, 5%, 10%
Carbon Monoxide in Air	25 ppm, 50 ppm, 100 ppm, 200 ppm, 300 ppm
Carbon Monoxide in Nitrogen	50 ppm, 1,000 ppm
Hexane in Air	1.5% LEL (180 ppm), 2.5% LEL (300 ppm), 4% LEL (480 ppm)
Isobutylene in Air	50 ppm, 100 ppm
Methane in Air	10 ppm, 100 ppm, 20% LEL (1%), 30% LEL (1.5%), 50% LEL (2.5%)
Oxygen in Nitrogen	15%, 19.5%, 20.9%
Propane in Air	10 ppm, 30% LEL (0.66%), 50% LEL (1.1%)

Multi Component Blends

CO ₂	Methane	Pentane	Oxygen	Balance
100 ppm	50% LEL	-	-	Air
100 ppm	-	30% LEL	-	Air
35 ppm	-	10% LEL	18%	Nitrogen
50 ppm	50% LEL	-	12%	Nitrogen
50 ppm	50% LEL	-	17%	Nitrogen
100 ppm	25% LEL	-	17%	Nitrogen
100 ppm	25% LEL	-	19%	Nitrogen
100 ppm	50% LEL	-	12%	Nitrogen
100 ppm	50% LEL	-	16%	Nitrogen
200 ppm	50% LEL	-	19%	Nitrogen

Content	221L (7.8 ft ³)
Pressure	260 psi
Typical Use	Non-flammable mixtures
Dimensions	22.9 x 42.5 cm (9" x 16.75")
Internal Volume	12 L
Material	Steel
Weight	3.0 kg (6.3 lbs)
Outlet	CGA 165

MM221 Transportable mixtures are certified to the following analytical uncertainty:

10–25 ppm	+/-10% of the minor component(s)
> 25 ppm	+/- 5% of the minor component(s)

MM221 cylinders are for use for Safety and Industrial Hygiene applications. For Laboratory small cylinder calibrations, we recommend our ECOCYL® combination package.

MM221 are available for Air, Argon, Helium and Nitrogen. MM221 cylinders are non-refillable one time use only.

Transportables

Transportable MM58

Technical Data

Available Binary Mixtures

Ammonia in Nitrogen	25 ppm, 50 ppm, 200 ppm
Butane in Air	10% LEL(0.17%), 20% LEL (0.34%), 50% LEL (0.75%)
Carbon Dioxide in Air	100 ppm, 1,000 ppm, 2.5%, 5%
Carbon Dioxide in Nitrogen	1,000 ppm, 2.5%, 5%, 10%
Carbon Monoxide in Air	25 ppm, 50 ppm, 100 ppm, 200 ppm, 300 ppm
Carbon Monoxide in Nitrogen	50 ppm, 1,000 ppm
Chlorine in Nitrogen	5 ppm, 10 ppm, 50 ppm
Hexane in Air	1.5% LEL (180 ppm), 2.5% LEL (300 ppm), 4% LEL (480 ppm)
Hydrogen in Air	200 ppm, 800 ppm, 50% LEL (2%)
Hydrogen Sulphide in Air	25 ppm, 50 ppm, 100 ppm
Hydrogen Sulphide in Nitrogen	10 ppm, 25 ppm, 50 ppm, 100 ppm
Isobutylene in Air	50 ppm, 100 ppm
Methane in Air	10 ppm, 100 ppm, 20% LEL (1%), 30% LEL (1.5%), 50% LEL (2.5%)
Oxygen in Nitrogen	15%, 19.5%, 20.9%
Propane in Air	10 ppm, 30% LEL (0.66%), 50% LEL (1.1%)

Multi Component Blends

CO	H ₂ S	Methane	O ₂	Pentane	Propane	Balance
-	25 ppm	-	-	25% LEL	-	Nitrogen
35 ppm	10 ppm	-	-	10% LEL	-	Nitrogen
50 ppm	10 ppm	50% LEL	20.9%	-	-	Nitrogen
50 ppm	25 ppm	-	-	-	50% LEL	Nitrogen
50 ppm	25 ppm	-	-	25% LEL	-	Nitrogen
50 ppm	25 ppm	-	-	50% LEL	-	Nitrogen
50 ppm	25 ppm	50% LEL	12%	-	-	Nitrogen
50 ppm	25 ppm	50% LEL	18%	-	-	Nitrogen
50 ppm	25 ppm	50% LEL	19%	-	-	Nitrogen
50 ppm	25 ppm	50% LEL	20.9%	-	-	Nitrogen
100 ppm	25 ppm	-	-	-	50% LEL	Nitrogen
100 ppm	25 ppm	-	-	25% LEL	-	Nitrogen
100 ppm	25 ppm	-	-	50% LEL	-	Nitrogen
100 ppm	25 ppm	50% LEL	18%	-	-	Nitrogen
100 ppm	25 ppm	50% LEL	19%	-	-	Nitrogen
100 ppm	25 ppm	50% LEL	20.9%	-	-	Nitrogen
300 ppm	10 ppm	60% LEL	15%	-	-	Nitrogen

Size	MM58
Content	58 L (7.0 ft ³)
Pressure	500 psi
Dimensions	8.9 x 36.6 cm (3.5" x 14.4")
Internal Volume	1.72 L
Material	Aluminum
Weight	1.0 kg (2.2 lbs)
Outlet	C10 (5/8" – 18UNF)

MM58 Transportable mixtures are certified to the following analytical uncertainty:

10-25 ppm	+/-10% of the minor component(s)
> 25 ppm	+/- 5% of the minor component(s)

MM58 cylinders are for use for Safety and Industrial Hygiene applications. For Laboratory small cylinder calibrations, we recommend our ECOCYL® combination package.

MM58 are available for Air, Argon, Helium and Nitrogen. MM58 cylinders are non-refillable one time use only.

Portable 6R Cylinder Package – Refillable

Technical Data

Available Binary Mixtures

Ammonia in Nitrogen	25 ppm, 50 ppm, 200 ppm
Butane in Air	10% LEL (0.17%), 20% LEL (0.34%), 50% LEL (0.75%)
Carbon Dioxide in Air	100 ppm, 1000 ppm, 2.5%, 5%
Carbon Dioxide in Nitrogen	1000 ppm, 2.5%, 5%, 10%
Carbon Monoxide in Air	25 ppm, 50 ppm, 100 ppm, 200 ppm, 300 ppm
Carbon Monoxide in Nitrogen	50 ppm, 1000 ppm
Chlorine in Nitrogen	5 ppm, 10 ppm, 50 ppm
Hexane in Air	1.5% LEL (180 ppm), 2.5% LEL (300 ppm), 4% LEL (480 ppm)
Hydrogen in Air	200 ppm, 800 ppm, 50% LEL (2%)
Hydrogen Sulphide in Air	25 ppm, 50 ppm, 100 ppm
Hydrogen Sulphide in Nitrogen	10 ppm, 25 ppm, 50 ppm, 100 ppm
Isobutylene in Air	50 ppm, 100 ppm
Methane in Air	10 ppm, 100 ppm, 20% LEL (1%), 30% LEL (1.5%) 50% LEL (2.5%)
Oxygen in Nitrogen	15%, 19.5 %, 20.9%
Propane in Air	10 ppm, 30% LEL (0.66%), 50% LEL (1.1%)

Multi Component Blends

CO	H ₂ S	Methane	O ₂	Pentane	Propane	Balance
-	25 ppm	-	-	25% LEL	-	Nitrogen
35 ppm	10 ppm	-	-	10% LEL	-	Nitrogen
50 ppm	10 ppm	50% LEL	20.9%	-	-	Nitrogen
50 ppm	25 ppm	-	-	-	50% LEL	Nitrogen
50 ppm	25 ppm	-	-	25% LEL	-	Nitrogen
50 ppm	25 ppm	-	-	50% LEL	-	Nitrogen
50 ppm	25 ppm	50% LEL	12%	-	-	Nitrogen
50 ppm	25 ppm	50% LEL	18%	-	-	Nitrogen
50 ppm	25 ppm	50% LEL	19%	-	-	Nitrogen
50 ppm	25 ppm	50% LEL	20.9%	-	-	Nitrogen
100 ppm	25 ppm	-	-	-	50% LEL	Nitrogen
100 ppm	25 ppm	-	-	25% LEL	-	Nitrogen
100 ppm	25 ppm	-	-	50% LEL	-	Nitrogen
100 ppm	25 ppm	50% LEL	18%	-	-	Nitrogen
100 ppm	25 ppm	50% LEL	19%	-	-	Nitrogen
100 ppm	25 ppm	50% LEL	20.9%	-	-	Nitrogen
300 ppm	10 ppm	60% LEL	15%	-	-	Nitrogen

Size	6R/6I
Content	103L (3.6 ft ³)
Pressure	1,800 psi
Dimensions	8.3 x 31.5 cm (3.25" x 12.4")
Internal Volume	0.83 L
Material	Aluminum
Weight	0.7 kg (2.2 lbs)
Outlet	CGA 180

6I cylinders are pretreated cylinders for use with low ppm reactive mixtures.

6R cylinders are available for Air, Argon, Helium, Hydrogen, Nitrogen and Oxygen. 6R Cylinders are refillable.

ECOCYL®

Portable Calibration Gas (PCG) Packaging System

Portable Calibration Gases Reinvented

Linde's innovative, high-capacity ECOCYL® cylinders are an economically superior alternative to comparably-sized disposable cylinders and lecture bottles.

- Completely refillable, conveniently returnable
- Contains up to 300% more product than most comparable disposable cylinders
- ECOCYL® yields significantly improved per litre economics
- Eliminates user-supplied regulator/flowmeters

ECOCYL® is an environmentally responsible solution.

- Refillable empties are returned to Linde
- No piles of lecture bottles and empty disposable cylinders
- No disposal costs can save over \$300 per lecture bottle

Environmentally Responsible. Economically Attractive

Advanced design and self-contained pressure and flow control provide maximum safety and productivity.

- Built-in regulator and multi-setting flowmeter
- Eliminates down time due to lost or broken regulators
- Cowling protects valve and flow control from falls or damaging impacts
- Ergonomic carrying handle is an integral feature of the cowling
- Linde technical and safety support included

ECOCYL® features precision flow control.

- Requires no costly separate manual flow control valve
- Linde-supplied precision manual flow control valve is built into the cylinder valve
- Extremely consistent flow at very low flow rates
- Linde is responsible for valve and cylinder maintenance

You benefit from product packaging versatility.

- Liquefied and non-liquefied gases
- Flammable gases
- Ideal size and capacity for pharmaceutical and university research settings
- Universal hose barb connection accommodates most common hoses
- Model VAH for acid gases
- Model VSH for alkaline gases
- Wide variety of gases available from Linde

ECOCYL® is a Linde patented product



2006 CGA
Environmental
Recognition
Program
Award Winner

RSH



Using the shoulder strap, the ECOCYL® is easy to carry on long, fixed-sensor calibration tours.

Lecture Bottles

Product	Grade	Content	CGA Connection	Product Number
Air	Extra Dry	56 L	170	P24017297
Ammonia	4.0	454 g	180	P24001506
Argon	4.8	56 L	170	P24063947
1,3 Butadiene	2.0	170 g	170	P24071365
1-Butene	2.0	170 g	170	P24069797
Boron Trichloride	3.0	170 g	180	P24076988
n-Butane	2.0	170 g	180	P24063924
Carbon Dioxide	2.8	170 g	170	P24063944
Carbon Monoxide	2.3	50 L	170	P24063943
Chlorine	2.5	58 g	180	P24001902
Cis-2-butene	2.5	170 g	170	P24017332
Deuterium	4.5	50 L	170	P24017322
Dimethyl Ether	2.8	170 g	170	P24017353
Ethane	2.0	113 g	170	P24063948
Ethylene	2.5	113 g	170	P24063925
Helium	4.7	50 L	170	P24017304
Hydrogen	4.0	56 L	170	P24017306
Hydrogen Bromide	2.8	5 g	180	P24062105
Hydrogen Chloride	2.5	454 g	180	P24001921
Hydrogen Fluoride	4.0	227 g	180	P24069791
Hydrogen Sulphide	2.5	227 g	180	P24061488
Isobutane	2.5	170 g	170	P24078117
Methane	2.0	56 L	170	P24063946
Methyl Chloride	3.0	227 g	170	P24017363
Methyl Mercaptan	2.5	227 g	180	P24063830
Monomethylamine	2.5	170 g	180	P24017392
Neon	4.6	25 L	170	P24001854
Nitrogen	4.8	56 L	170	P24017308
Nitrous Oxide	4.0	227 g	180	P24069070
Oxygen	2.6	56 L	170	P24064063
Propane	2.5	142 g	170	P24064062
Propylene	2.5	142 g	170	P24017349
Sulphur Dioxide	3.8	454 g	180	P24064059
Sulphur Hexafluoride	3.0	227 g	170	P24017320

Please inquire on availability of other products not shown above

Transportable Regulators

Model P2700 Series

Fixed Flow Regulators

Description

The P2700 is a compact, fixed flow regulator used with the Linde MM58 and MM105 Transportable series of non-refillable containers. With preset flow ranges, the P2700 is designed for fixed flow of mild corrosive, and non corrosive calibration gases for safety and industrial hygiene gas detection applications.

Design Features/Components

Inlet Pressure	3,500 psi maximum (24,000 kPa)
Outlet Pressure	30 psig (200 kPa) preset
Flow Settings	0.5, 1.0, 1.5 and 2.5 SLPM
Connection	
Inlet	CGA C10: 5/8"-18 UNF standard
Outlet	1/8" hose barb

Materials of Construction

Body	316 stainless steel or brass
Piston	316 stainless steel
Valve Seal	Teflon
Piston Seals	Viton
Gauge	316 stainless steel

Ordering Information

Model	Material of Construction	Outlet Range
P2700	B Brass	A 0.5 SLPM
	S Stainless Steel	B 1.0 SLPM
		C 1.5 SLPM
		D 2.5 SLPM



Model P2300

Single Stage Regulator

Description

Compact, the P2300 series single stage regulators are designed for use with the Linde MM17 Transportable series of non-refillable containers.

Design Features/Components

Inlet Pressure	3,000 psi maximum (20,700 kPa)
Outlet Pressure	Adjustable 0-30 psig
Connection	
Inlet	CGA 600
Outlet	1/8" hose barb

Materials of Construction

Body	Brass
Piston	Neoprene
Valve Seal	Teflon
Piston Seals	Viton
Gauge	316 stainless steel

Ordering Information

Model	Material of Construction
P2300-600	Brass Variable Flow Regulator with CGA600 inlet connection



Model P2900 and P2100

Variable Flow Regulators

Description

The P2900 has been developed for applications where variable flow is required. Outlet flow is controlled by a "click" style wheel, with flow indicator, and is complete with inlet gauge for cylinder pressure monitoring. Flow settings in SLPM of 0.25, 0.3, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 5.0, 6.0 and 8.0. Recommended for the Linde MM58, 6R, MM105 and Lecture Bottle Transportable series of non-refillable containers.

Ordering Information

Model	Material of Construction
P2900-C10	Brass Variable Flow Regulator with C10 inlet connection
P2900-180	Brass Variable Flow Regulator with Lecture Bottle Connection



Description

Model P2100 variable flow regulator is for use with MM221 cylinders. For use with portable and/or laboratory instrumentation that requires calibration.

Design Features/Components

- Brass body
- Stainless steel pistons
- Hose barb outlet
- Selectable flow rates from 0-3 SLPM: 0.3, 0.5, 0.7, 0.9, 1.2, 1.5, 2.0, 2.5, 3.0
- 50 psig (340 kPa) delivery pressure

Materials of Construction

Body	Nickel plated brass
Piston	316 stainless steel
Seat	Teflon
Seals	Viton
Gauge	Nickel plated brass

Ordering Information

Model	Material of Construction
P2100	Brass Variable Flow Regulator with CGA165 inlet connection

Model P2500 Series

Lecture Bottle Regulators

Description

Linde offers an economical and lightweight compact regulator for use with corrosive and non corrosive gases in lecture bottles. Recommended for the Linde 6R Transportable series of non-refillable containers.

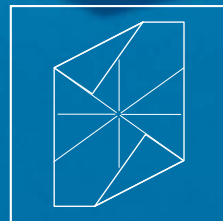
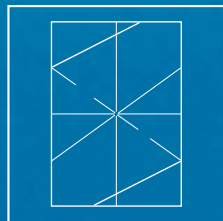
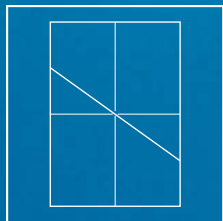
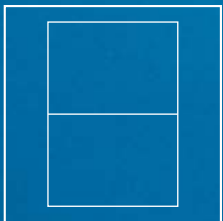
Design Features/Components

- Barstock body
- SS diaphragm
- 1 1/2" inlet and delivery pressure gauges
- Equipped with needle valve
- 1/8" MPTM outlet connection
- 50 micron metal filter protects seat from contamination

Ordering Information

Model	Material of Construction	Outlet Range	CGA
P2501	B Brass	A 0-25 psig	170
	S Stainless Steel	B 0-50 psig	
	C 5-100 psig		
P2502	S Stainless Steel	A 0-25 psig	180
		B 0-50 psig	
		C 5-100 psig	





Environmental Mixtures

Environmental issues have a great impact on our daily lives. The background to this is that we are continuously gaining a better understanding of the mechanisms of our ecosystems. To this end, today's industry must carefully monitor its environmental emissions and use precise reference standards to obtain accurate measurements. Linde Specialty Gases, has been a pioneer in producing highly accurate calibration gas standards for a wide variety of emissions applications.

Linde's environmental solutions help ensure regulatory compliance, reduce emissions, increase capacity, improve economics and achieve a broad range of environmental benefits. Linde manufactures EPA Protocol and Environmental Daily Working Standards at our facility in Whitby, Ontario. In addition, Linde can also offer the complete line of Spectra Environmental products. Manufactured in Alpha, New Jersey Spectra Environmental is ISO Certified, and is recognized around the world as the pre-eminent manufacturer of calibration gas standards for the environmental monitoring community.

Among the key environmental market segments we serve are:

- Utilities
- Co-generation
- Pulp and paper plants
- Petrochemical
- Natural gas turbine pumping stations
- Incinerators, including waste-to-energy plants
- Independent testing laboratories doing ambient monitoring (air, soil, and water)
- Environmental laboratories
- Boilers and industrial furnaces
- Cement kilns
- Independent stack testing and remote monitoring stations
- Photochemical air monitoring systems (PAMS)



EPA Protocol Gas Standards for Continuous Emission Monitoring

40CFR Parts 50, 58, 60 and 75 specify that gaseous pollutant concentration standards used for calibration and audit of continuous emission monitors (CEM) and ambient air quality analyzers be analyzed according to EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards 600/R-97/121. Linde EPA Standards are manufactured, analyzed and certified to meet all of the requirements of EPA-600/R-97/121 (Revised 1997).

The following components and concentrations are available from Linde as EPA Protocol Gas Standards either as binary standards or in multi-component blends. You may also specify Spectra manufactured product.

Cylinder content will vary based on the components.

2 Component in Air or Nitrogen	Range	Size	Contents	
			m ³	ft ³
Carbon Dioxide	1–20%	152	3.96	142
Carbon Monoxide	20–2,500 ppm	32	0.85	31
Hydrogen Sulphide	> 1 ppm			
Methane	> 1 ppm			
Nitric Oxide	2–3,900 ppm			
Nitrogen Dioxide	20–100 ppm			
Oxygen	1–22.6%			
Propane	> 1 ppm			
Sulphur Dioxide*	20–2,500 ppm			
Sulphur Dioxide**	> 2,500 ppm			
*G1 Method				
**G2 Method				
Multi-Component in Nitrogen	Range	Size	Contents	
			m ³	ft ³
Carbon Dioxide	> 400 ppm	152	3.96	142
Carbon Monoxide	> 20 ppm	32	0.85	31
Nitric Oxide	> 2 ppm			
Oxygen	> 8%			
Propane	> 1 ppm			
Sulphur Dioxide	> 40 ppm			

Environmental Daily Standards (EDS1)

Linde's EDS1 standards are designed for daily calibration requirements for continuous emissions monitors as specified in 40CFR60. EDS1 standard comes with a 1% certification of minor components. While directly traceable to a NIST SRM, EDS1 standards are not required to be certified using the EPA 600/R Protocol procedure.

2 Component in Air or Nitrogen	Range	Size	Contents	
			m ³	ft ³
Carbon Dioxide	> 1%	152	3.96	142
Carbon Monoxide	> 20 ppm	32	0.85	31
Hydrogen Sulphide	> 2 ppm			
Methane	5–100 ppm			
Nitric Oxide	2–3,900 ppm			
Oxygen	0.5–30%			
Propane	> 1 ppm			
Sulphur Dioxide	20 ppm–2%			

Minor components are directly traceable using NTRM's or SRM and have 1% certification accuracy

Environmental Daily Standards (EDS2)

Linde's EDS2 standards are designed for daily calibration requirements for continuous emissions monitors as specified in 40CFR60. EDS2 standards provide a 2% certification on minor components. While directly traceable to a NIST SRM, EDS2 standards are not required to be certified using the EPA 600/R Protocol procedure.

CEM Calibration Mixtures	Range	Size	Contents	
			m ³	ft ³
Carbon Dioxide	> 0.1%	152	3.96	142
Carbon Monoxide	> 10 ppm	32	0.85	31
Hydrogen Sulphide	> 2 ppm			
Methane	2–100 ppm			
Nitric Oxide	2–5,000 ppm			
Nitrogen Dioxide	20–100 ppm			
Oxygen	0.1–30%			
Propane	> 1 ppm			
Sulphur Dioxide	> 20 ppm			

Vehicle Emission Standards

Vehicle Emission Standards

High Range Mixture 8% CO, 12% CO₂, 3,200 ppm C₃H₈,
3,000 ppm NO in Nitrogen

CGA	Size	Contents		Product Code
		m ³	ft ³	
165	MM221	221	7.8	P24001933

Spectra Gas Environmental Standards

Linde is pleased to offer environmental products manufactured by our sister company, Spectra Gas. The Spectra Environmental Division is recognized around the world as the pre-eminent manufacturer of calibration gas standards for the environmental monitoring community. The dedicated research and development professionals of Spectra allow us to routinely provide you with the leading edge products that you require. Whether it is providing a parts per trillion (ppt) Mercury standard, a 100 component @ 100 parts per billion (ppb) VOC standard, a stable ppm HCl standard, or many other unique standards, analysts know that they can rely upon Spectra.

Your needs may be at the percent level or at the part-per-trillion (ppt) level. You may be monitoring stack emissions, auto emissions or ambient air. In all cases, the Spectra proprietary cylinder passivation processes, combined with the highest quality manufacturing techniques and the latest in analytical analysis, provide you with the standards you require.

Spectra quality and accuracy is a culmination of decades of experience and personnel training resulting in a multi-step manufacturing and analysis process. Spectra Shield™, the unique Spectra cylinder cleaning, conditioning and passivation processes ensure you that standards supplied by Spectra are uncontaminated and that the cylinder's contents will be stable for the certified shelf life.

All Spectra Environmental products are produced utilizing the highest quality raw materials. All of the weights, balances and scales are calibrated directly to NIST (National Institute of Standards and Technology), and all standards supplied by Spectra's Environmental Division, including air and nitrogen, are analyzed before shipping. The laboratory uses the latest state-of-the-art equipment and analytical techniques such as:

- NDIR (non-dispersive infrared)
- FTIR (fourier transform infrared)
- GC (gas chromatography)
- MS (mass spectrometer)
- CVAA (cold vapour atomic absorbance)
- Chemiluminescence
- Paramagnetic
- Electrochemical



Certified Environmental Calibration Standards

Certified and Primary calibration gas standards are used for instrument calibration and other monitoring and measurement applications where either use of an EPA Protocol calibration standard is not required or an EPA Protocol standard is not available.

As with all environmental standards, Certified Environmental Calibration Standards are produced gravimetrically directly traceable to NIST standards in cylinders that have been individually passivated by the proprietary Spectra Shield™ process.

In addition, where NIST or comparable international standards are available, analysis are performed utilizing these international standards. Where standards are not available from international metrology organizations, Spectra employs in-house developed analysis technology and standards to provide you with the most accurate and reliable standards available.

Each cylinder is individually analyzed and supplied with a Certificate of Analysis (C of A).

Concentration Range	Typical Specifications			
	Certified Standards		Primary Standards	
	Blend Tolerance	Analysis	Blend Tolerance	Analysis
< 100 pb	Inquire	Inquire	Inquire	Inquire
100 ppb to 999 ppb	±20%	±10%	±10%	±5%
1 ppm to 999 ppm	±10%	±5%	±5%	±1%
> 1%	±5%	±2%	±1%	±0.02% absolute

Certified and primary calibration gas standards are available in size 152,82 and 32 aluminum cylinders and where appropriate in size 2, 3 and 4 internally polished and passivated steel cylinders

All certified and primary calibration gas standards are filled to the maximum pressure and volume as determined by the cylinder, the vapour pressure of the mixture, or restrictions due to flammable-oxidizer (Flamox) requirements.



Certified Environmental Calibration Standards

Component	Balance	Available Concentrations
Ammonia (NH ₃)	Zero Air	25 ppm–6% †
Ammonia (NH ₃)	N ₂	1 ppm–10% †
Benzene (C ₆ H ₆)	Zero Air	1 ppm–1000 ppm § †
Benzene (C ₆ H ₆)	N ₂	10 ppb–1000 ppm §
Carbon Dioxide (CO ₂)	Zero Air	1 ppm–20%
Carbon Dioxide (CO ₂)	N ₂	1 ppm–20%
Carbon Monoxide (CO)	Zero Air	500 ppb–3% †
Carbon Monoxide (CO)	N ₂	500 ppb–20%
Ethylene Oxide (C ₂ H ₂ O)	N ₂	1 ppm–1% §
Hexane (C ₆ H ₁₄)	Zero Air	100 ppb–5000 ppm †
Hexane (C ₆ H ₁₄)	N ₂	10 ppb–5000 ppm §
Hydrogen Chloride (HCl)	N ₂	10 ppm–1%
Hydrogen Sulphide (H ₂ S)	Zero Air	5 ppm–1000 ppm
Hydrogen Sulphide (H ₂ S)	N ₂	1 ppm–3%
Mercury (Hg)	N ₂	2 ug/m ³ –60 ug/m ³
Methane (CH ₄)	Zero Air/N ₂	1 ppm–2.5% †
Methane (CH ₄)	N ₂	1 ppm–10%
Nitric Oxide (NO)	N ₂	500 ppb–2%
Nitrogen Dioxide (NO ₂)	Zero Air	25 ppm–0.5%
Phosphine (PH ₃)	N ₂	100 ppb–1,000 ppm
Propane (C ₃ H ₈)	Zero Air	10 ppb–1% § †
Propane (C ₃ H ₈)	N ₂	10 ppb–25%
Sulphur Dioxide (SO ₂)	Zero Air	5 ppm–2%
Sulphur Dioxide (SO ₂)	N ₂	500 ppb–2%
Sulphur Hexafluoride (SF ₆)	Zero Air	100 ppb–1%
Sulphur Hexafluoride (SF ₆)	N ₂	100 ppb–1%
Toluene (C ₆ H ₅ CH ₃)	Zero Air	1 ppm–100 ppm §
Toluene (C ₆ H ₅ CH ₃)	N ₂	25 ppb–100 ppm §
Vinyl Chloride (C ₂ H ₃ Cl)	Zero Air	100 ppb–2000 ppm §
Vinyl Chloride (C ₂ H ₃ Cl)	N ₂	100 ppb–2000 ppm §

§ Vapour pressure constraints will limit fill pressure/volume at higher concentrations of this standard.

† Flammability constraints will limit fill pressure/volume at higher concentrations of this standard.

Please inquire for other components and concentrations.



Methods 26, 26A & 321 Calibration Gas Standards

HCl and HCl/SF₆ Calibration Gas Standards

US EPA Methods 26 and 26A are utilized for the determination of HCl emissions from combustions stacks, primarily waste incinerators. US EPA Method 321 is utilized for HCl emissions from Portland cement plants.

In particular, US EPA Method 321, Gaseous HCl Emissions at Portland Cement Kilns by Fourier Transform Infrared (FTIR) Spectroscopy, states in paragraph 9.1.1 that:

“An HCl standard of approximately 50 ppm in a balance of ultra pure nitrogen is recommended. The SF₆ (tracer) concentration shall be 2–5 ppm depending upon the measurement path length. The spike ratio (spike flow/total flow) shall be no greater than 1:10, and an ideal spike concentration should approximate the native effluent concentration.”

Spectra Gases supplies both HCl in nitrogen and HCl spiked with SF₆ in nitrogen for use as a calibration standard for US EPA Methods 26, 26A and 321. HCl concentrations below 1000 ppm are supplied in aluminium cylinders that have been passivated by the proprietary Spectra Shield™ process. HCl concentrations above 1000 ppm are supplied in steel cylinders, which have been highly polished then passivated by the proprietary Spectra Shield™ process. Whether supplied in aluminium or steel cylinders these HCl and HCl/SF₆ standards have guaranteed stability periods of 12 months.

Component	Concentration	Blend	Analytical	CGA
HCl balance N ₂	10 ppm to 100 ppm	10%	5%	330
HCl balance N ₂	100 ppm to 1%	10%	5%	330
HCl/SF ₆ balance N ₂	10 ppm HCl/2 ppm SF ₆	10%	5%	330
HCl/SF ₆ balance N ₂	50 ppm HCl/2 ppm SF ₆	10%	5%	330



Gaseous Mercury (Hg^0) Calibration Standards

With current and proposed worldwide regulations mandating the monitoring and/or control of mercury emissions, it is extremely important to have a reliable standard for required periodic calibration of the monitoring equipment. Through the efforts of the Research and Development Program of Spectra Gases, and our proprietary cylinder passivation procedures, a stable gaseous mercury calibration gas standard is now available.

Spectra supplies mercury calibration gas in high pressure, high volume cylinders. The mercury is present in the metallic state, Hg^0 , in a balance gas of research grade nitrogen, N_2 .

Cylinder Size	152
Cylinder Dimensions (DxH)	20 cm x 122 cm (8" x 48")
Cylinder Weight	22 kg (50 lbs)
Cylinder Internal Volume	30 L (1.06 ft ³)
Cylinder Gas Volume	4,000 L (141 ft ³)
Cylinder Pressure	2,000 psig (14,000 kpa)
Concentration Range ¹	Up to 6 ug/m ³
Stability Guarantee ²	6–12 months
Cylinder Outlet	CGA 660
Recommended Regulator	See below

¹ At concentrations > 30 ug/m³ cylinder pressure and gas volume are decreased due to vapour pressure constraints.

² 12 months on concentrations greater 10 ug/m³

Spectra recommends that only a pre-conditioned, low internal volume regulator be utilized for mercury calibration gases.

Our Miniature Regulator is well suited for use with mercury standards, providing a low flow rate with accurate pressure control. A metal diaphragm and KEL-F seat, along with pre-conditioning, make this regulator ideally suited for mercury calibration standards.



VOC Standards Make vs. Buy

Occasionally we receive questions about the advisability and practicality of an air toxics laboratory producing their own VOC standards. In order to provide accurate guidance we queried many laboratories. Both governmental and private laboratory personnel were asked for their opinions on the pros and cons of manufacturing and then utilizing VOC standards for air toxics analysis.

All of the respondents voiced concern over a laboratory being able to product accurate, uniform, and stable standards. Including:

- Training of personnel – Where and how were the personnel trained?
- Experience of personnel – How many years of experience do the personnel have in VOC standards preparation and analysis? One commentator indicated that the minimum experience level should be five years.
- Quality concerns – Is the facility audited to ISO 9000 standards? Is the laboratory's production of VOC standards incorporated in their QA procedures?
- Proper reagents – Highest available purity VOC's and VOC free N₂ exclusively utilized. The availability of two discrete batches of reagent indicated to be desirable.
- Proper equipment – These include such items as compressors, heated vessels and transfer equipment, N₂ clean-up equipment, gauges, balances, etc. All measurement devices should be NIST traceable and be within current validation period.
- Availability of standards – Both liquid and gaseous.
- Stability testing – What studies has the laboratory conducted to indicate that the prepared standard is stable for an hour, day, week, month, or year? Several comments were received stating that in their opinion the use of a liquid injection into a Summa canister followed by N₂ pressurization was not an acceptable method of standard preparation.

A number of governmental agency laboratories indicated that they would have potential problems in accepting data obtained utilizing self-made standards unless the standards were analyzed, and the accuracy was certified by an independent laboratory. Alternately the use of commercially produced standards to verify the self-made standards was also indicated to be viable.

100% of the respondents indicated that at first thought the primary reason for producing VOC standards internally was as a cost saving measure. However, they all concluded that in actuality this is not the case. In the words of one laboratory manager:

"As a production laboratory, we make money by running samples, lots of them, and time spent on standards prep is time taken away from something else... running the instrument, crunching data, spitting out reports. It (producing our own standards) would cost us more in the long run!"

There was uniform consensus that once all factors are considered there is no compelling reason for a laboratory to manufacture VOC standards in lieu of purchasing them from a qualified vendor.



BTEX Calibration Standards

Environmental regulations require accurate, traceable low concentration organic gas calibration standards to calibrate instruments used in:

- Ambient air monitoring
- Measurement of incinerator emissions
- Measurement of fugitive emissions from chemical processing equipment
- Measurement of industrial stationary sources
- Measurement of landfill gases

Spectra offers a four component, BTEX Standard-1, and a six component, BTEX Standard-2, calibration standards in concentrations from 100 ppb to 10 ppm in a balance gas of VOC zero grade nitrogen (N₂). All concentrations are directly traceable to NIST gravimetrically and analytically by comparison with NIST certified standards.

BTEX standards are available in a variety of cylinders; most common are the size 6R, 104 liters at 1800 psig and the 152, 4,000 litres at 2,000 psig.

BTEX Standard-1

Benzene (71-43-2) Toluene (108-88-3)

Ethyl Benzene (100-41-4) o-Xylene (95-47-6)

BTEX Standard-2

Benzene (71-43-2) m-Xylene(108-38-3)

Ethyl Benzene (100-41-4) o-Xylene (95-47-6)

Toluene (108-8-3) p-Xylene (106-42-3)

BTEX Standard-3

Benzene (71-43-2) m-Xylene (108-38-3)

Ethyl Benzene (100-41-4) o-Xylene (95-47-6)

Toluene (108-88-3) p-Xylene (106-42-3)

Tert-butyl Methyl Ether
(MTBE) (1634-04-4)

Specifications

Blend Tolerance	100 ppb-1 ppm ± 10%
	> 1 ppm-10 ppm ± 5%
Analytical Accuracy	> 100 ppb-1 ppm ± 5%
	> 1 ppm-10 ppm ± 1%
Stability	12 months

Note: CAS numbers are in brackets, i.e. (00-00-0)

Please inquire for information on other concentrations, tolerances, and cylinder sizes.



Method TO-14A Calibration Standards

US EPA's Compendium Method TO-14A, "Determination of Volatile Organic Compounds (VOCs) In Ambient Air Using Specially Prepared Canisters With Subsequent Analysis By Gas Chromatography" is used extensively by analysts for both ambient air studies and indoor air quality (IAQ) studies.

Spectra's TO-14A calibration standards are manufactured using exacting gravimetric techniques with all gravimetric measurements directly traceable to NIST (National Institute of Standards and Technology). Furthermore Spectra's 39 component mix is directly traceable analytically to NIST.

Spectra's base TO-14A calibration standard consists of 39 components at concentrations of either 1 ppm or 100 ppb in a balance of VOC free nitrogen (N₂) with other concentrations available as custom mixtures. All TO-14A standards have one-year stability. In addition Spectra supplies 41 and 43 component TO-14A standards, as well as, a variety of subsets.

39 Component TO-14A

Benzene (71-43-2)	Dichlorodifluoromethane (75-71-8) (Halocarbon 12)
Bromomethane (74-83-9)	1,1,2-Trichlorotrifluoroethane (76-13-1) (Halocarbon 113)
Carbon Tetrachloride (56-23-5)	Dichlorotetrafluoroethane (76-14-2) (Halocarbon 114)
Chlorobenzene (108-90-7)	Hexachloro-1,3-Butadiene (87-68-3)
Chloromethane (74-87-3)	Styrene (100-42-5)
1,2-Dibromoethane (106-93-4)	1,1,2,2-Tetrachloroethane (79-34-5)
1,3-Dichlorobenzene (95-50-1)	Tetrachloroethylene (127-18-4)
1,4-Dichlorobenzene (541-73-1)	Toluene (108-88-3)
p-Dichlorobenzene (106-46-7)	1,2,4-Trichlorobenzene (120-82-1)
1,1-Dichloroethane (75-34-3)	1,1,1-Trichloroethane (71-55-6)
1,2-Dichloroethane (107-06-2)	1,1,2-Trichloroethane (79-00-5)
1,1-Dichloroethene (75-35-4)	Trichloroethene (79-01-6)
cis-1,2-Dichloroethene (156-59-2)	1,2,4-Trimethylbenzene (95-63-6)
1,2-Dichloropropane (78-87-5)	1,3,5-Trimethylbenzene (108-67-8)
cis-1,3-Dichloropropene (10061-01-5)	Vinyl Chloride (75-01-4)
trans-1,3-Dichloropropylene (10061-02-6)	o-Xylene (95-47-6)
Chloroethane (75-00-3)	m-Xylene (108-38-3)
Ethyl Benzene (100-41-4)	p-Xylene (106-42-3)
Trichlorofluoromethane (75-69-4) (Halocarbon 11)	

Note: CAS numbers are in brackets, i.e. (00-00-0)

To enhance your QA/QC procedures, Spectra stocks at least two individual batches of each VOC raw material. This allows you to order two independent TO-14A Calibration Standards.

41 Component TO-14A

39 component plus 1,3-Butadiene (106-99-0) and Acrylonitrile (107-13-1)

43 Component TO-14A

41 component plus 3-Chloropropene (107-05-1) and 4-Ethyltoluene (622-96-8)



Method TO-14A Calibration Standard Subsets

All are available at standard concentrations of 1 ppm and 100 ppb in a balance gas of VOC free nitrogen (N₂). Other concentrations are available as custom mixtures.

TO-14 A Subset 1 (1 Year stability)

Benzene (71-43-2)

Benzyl Chloride * (100-44-7)

Chlorobenzene (108-90-7)

* stability is not guaranteed

1,3-Dichlorobenzene (541-73-1)

Toluene (108-88-3)

o-Xylene (95-47-6)

TO-14 A Subset 2 (1 Year stability)

Acetonitrile (75-05-8)

1,3-Butadiene (106-99-0)

Carbon Tetrachloride (56-23-5)

Chloroform (67-66-3)

Methylene Chloride (75-09-2)

Trichlorofluoromethane (75-69-4)

TO-14A CFC/HFC Standard (1 Year stability)

Trichlorofluoromethane (Halocarbon 11) (75-69-4)

Dichlorodifluoromethane (Halocarbon 12) (75-71-8)

1,1,2-Trichloro-1, 2,2-Trifluoroethane (Halocarbon 113) (76-13-1)

1,2-Dichlorotetrafluoroethane (Halocarbon 114) (76-14-2)

TO-14A Internal Standard (1 Year stability)

Bromochloromethane (74-97-5)

Chlorobenzene-d5 (3114-55-4)

1,4-Difluorobenzene (540-36-3)

TO-14A Internal Standard/Tuning Standard (1 Year stability)

Bromochloromethane (74-97-5)

1-Bromo-4-Fluorobenzene (4-Bromofluorobenzene)

(460-00-4)

Chlorobenzene-d5 (3114-55-4)

1,4-Difluorobenzene (540-36-3)

Regulator Recommendation

Various independent and Agency laboratories have indicated that to ensure repeatability with low level calibration gases it is best to utilize the same regulator for initial assay and for daily usage, thus minimizing the sources for potential variances and possible cross contamination. If a regulator is purchased along with the TO-14A standard, Spectra Gases will perform the initial assay and certification analysis utilizing the regulator and cylinder as a matched set.

Standard Available Cylinders

Cylinder Size	Volume	Pressure	CGA
152	4,000 litres	2,000 psig	350
6R	104 litres	1,800 psig	180



Method TO-15/TO-17 Calibration Standards

The TO-15/TO-17 Calibration Standard consists of 64 components at standard concentrations of 1 ppm or 100 ppb in a balance gas of VOC free nitrogen (N₂). Other concentrations are available as custom mixtures. Stability of 1 ppm TO-15 standard in a size 152 cylinder is 12 months. All other concentrations or cylinder sizes are 6 months.

Whether you are performing Compendium Method TO-15; "Determination of Volatile Organic Compounds (VOCs) In Air Collected in Specially Prepared Canisters And Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS)" or Compendium Method TO-17; "Determination of Volatile Organic Compounds in Ambient Air Using Active Sampling Onto Sorbent Tubes", Spectra's Calibration Standard is the standard of choice.

Acrolein (107-02-8)	1,2 Dibromoethane (106-93-4)
Acetone (67-64-1)	4-Ethyltoluene (622-96-8)
Benzene (71-43-2)	Halocarbon 11 (Trichlorofluoromethane) (75-69-4)
Benzyl Chloride* (100-44-7)	Halocarbon 12 (Dichlorodifluoromethane) (75-71-8)
Bromoform (75-25-2)	Halocarbon 113(1,1,2-Trichlorotrifluoroethane) (76-13-1)
Bromomethane (74-83-9)	Halocarbon 114 (1,2-Dichlorotetrafluoroethane) (76-14-2)
Bromodichloromethane (75-27-4)	Heptane (142-82-5)
1,3-Butadiene (106-99-0)	Hexachloro-1,3-Butadiene (87-68-3)
2-Butanone (MEK) (78-93-3)	Hexane (110-54-3)
Carbon Disulphide* (75-15-0)	2-Hexanone (MBK) (591-78-6)
Carbon Tetrachloride (56-23-5)	4-Methyl-2-Pentanone (MIBK) (108-10-1)
Chlorobenzene (108-90-7)	Methylene Chloride (75-09-2)
Chlorethane (75-00-3)	Methyl-tert-butylether (MTBE) (1634-04-4)
Chloroform (67-66-3)	Methylmethacrylate (80-62-8)
Cyclohexane (110-82-7)	2-Propanol (67-63-0)
Chloromethane (74-87-3)	Propylene (115-07-1)
Dibromochloromethane (124-48-1)	Styrene (100-42-5)
1,2-Dichlorobenzene (95-50-1)	1,1,2,2-Tetrachloroethane (79-34-5)
1,3-Dichlorobenzene (541-73-1)	Tetrachloroethene (127-18-4)
1,4-Dichlorobenzene (106-46-7)	Tetrahydrofuran (109-99-9)
1,1-Dichloroethane (75-34-3)	Toluene (108-88-3)
1,2-Dichloroethane (107-06-2)	1,1,1-Trichloroethane (71-55-6)
1,1-Dichlorethene (75-35-4)	1,1,2-Trichloroethane (79-00-5)
cis-1,2-Dichloroethene (156-59-2)	Trichloroethene (79-01-6)
trans-1,2-Dichloroethene (156-60-5)	1,2,4-Trichlorobenzene (120-82-1)
1,2-Dichloropropane (78-87-5)	1,2,4-Trimethylbenzene (95-63-6)
cis-1,3-Dichloropropene (10061-01-5)	1,3,5-Trimethylbenzene (108-67-8)
trans-1,3-Dichloropropene (10061-02-6)	Vinyl Acetate (108-05-4)
1,4-Dioxane (123-91-1)	Vinyl Chloride (75-01-4)
Ethanol* (64-17-5)	o-Xylene (95-47-6)
Ethyl Acetate (141-78-6)	m-Xylene (108-38-3)
Ethyl Benzene (100-41-4)	p-Xylene (106-42-3)

* No stability guarantee on these compounds.

Note: CAS numbers are in brackets, i.e. (00-00-0)

To enhance your QA/QC procedures Spectra stocks at least two individual batches of each VOC raw material allowing you to order two independent TO-15/TO-17 Calibration Standards.



TO-15/TO-17 Subset Calibration Standards

The TO-15/TO-17 Subset Calibration Standard consists of 25 components which are not contained in the TO-14 Calibration Standard. It is available from stock at standard concentrations of 1 ppm or 100 ppb in a balance gas of VOC free nitrogen (N₂). Other concentrations are available as custom mixtures.

Stability of 1 ppm TO-15 standard in a size 152 cylinder is 12 months. All other concentrations or cylinder sizes are six months.

Acetone (67-64-1)	4-Ethyltoluene (622-96-8)
Allyl Chloride (107-05-1)	n-Heptane (142-82-5)
Benzyl Chloride* (100-44-7)	n-Hexane (110-54-3)
Bromodichloromethane (75-27-4)	2-Hexanone (MBK) (591-78-6)
Bromoform (75-25-2)	4-Methyl-2-Pentanone (MIBK) (108-10-1)
1,3-Butadiene (106-99-0)	Methyl-Tert-Butylether (MTBE) (1634-04-4)
2-Butanone (MEK) (78-93-3)	2-Propanol (67-63-0)
Carbon Disulphide* (75-15-0)	Propylene (115-07-1)
Cyclohexane (110-82-7)	Tetrahydrofuran (109-99-9)
Dibromochloromethane (124-48-1)	Vinyl Acetate (108-05-4)
trans-1,2-Dichloroethene (156-60-5)	Vinyl Bromide (593-60-2)
1,4-Dioxane (123-91-1)	2,2,4-Trimethylpentane (540-84-1)
Ethyl Acetate (141-78-6)	

* No stability guarantee on these components
152, 1 ppm 1 year. All other concentrations, six months.

Regulator Recommendation

Various independent and Agency laboratories have indicated that to ensure repeatability with low level calibration gases it is best to utilize the same regulator for initial assay and for daily usage, thus minimizing the sources for potential variances and possible cross contamination. If a regulator is purchased along with the TO-15/TO-17 Calibration Standard, Spectra Gas will perform the initial assay and certification of analysis utilizing regulator and cylinder as a matched set.

Standard Available Cylinders

Cylinder Size	Volume	Pressure	CGA
152	4,000 litres	2,000 psig	350
6R	104 litres	1,800 psig	180

Stability of 1 ppm standard in a size 152 cylinder is guaranteed for a minimum of 12 months, all other concentrations and cylinder sizes are guaranteed for a minimum of six months.



U.S. EPA PAMS Calibration Standards

The United States Environmental Protection Agency's ozone precursor monitoring program known as PAMS, Photochemical Assessment Monitoring System, utilizes Spectra Gases standards for program quality assurance.

Under the 1990 Clean Air Act Amendments, EPA has required more extensive monitoring of ozone and its precursors in areas with persistently high ozone levels (mostly large metropolitan areas). In these areas, the States have established ambient air monitoring sites which collect and report detailed data for volatile organic compounds, nitrogen oxides, ozone and meteorological parameters. Analyses of these data help the EPA and the States to better understand the underlying causes of ozone pollution, to devise effective remedies and measure environmental improvement.

The standard that Spectra supplies is manufactured using exacting micro-gravimetric techniques with all measurements directly traceable to NIST (National Institute of Standards and Technology).

Spectra offers the PAMS standard at the EPA specified concentrations expressed as ppb C (parts per billion expressed as carbon) and also at 100 ppb v/v and 1 ppm v/v. The PAMS calibration standard is supplied in a size 152 cylinder with a guaranteed stability of 12 months or a size 6R cylinder with a six month stability guarantee.

To enhance your QA/QC procedures, Spectra stocks at least two individual batches of each VOC raw material. This allows you to order two independent US EPA PAMS Calibration Standards from Spectra.

Regulator Recommendation

Various independent and Agency laboratories have indicated that to ensure repeatability with low level calibration gases it is best to utilize the same regulator for initial assay and for daily usage, thus minimizing the sources for potential variances and possible cross contamination. If a regulator is purchased along with the PAMS standard, Spectra Gases will perform the initial assay and certification analysis utilizing the regulator and cylinder as a matched set.



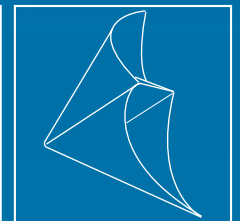
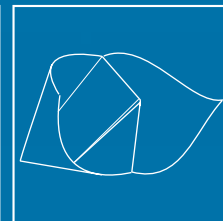
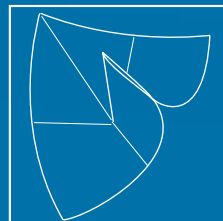
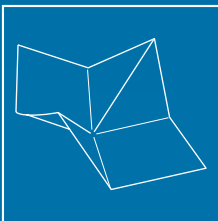
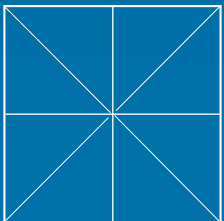
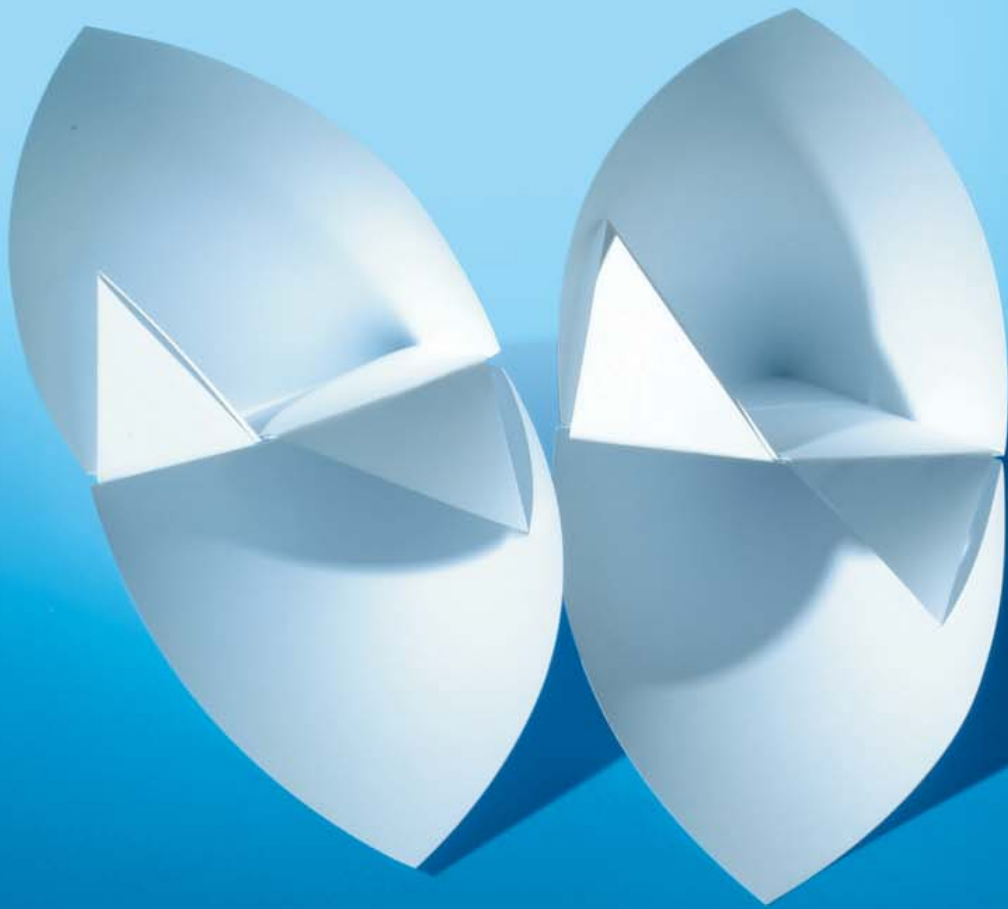
U.S. EPA PAMS Calibration Standards

Number following the compounds is the concentration in ppb C (parts per billion expressed as carbon) as specified by the U.S. EPA.

Acetylene 40 (74-86-2)	Isopropylbenzene 40 (98-82-8)
Benzene 30 (71-43-2)	n-Octane 30 (111-65-9)
n-Butane 40 (106-97-8)	n-Pentane 25 (109-66-0)
1-Butene 30 (106-98-9)	1-Pentene 25 (109-67-1)
Cis-2-butene 35 (590-18-1)	Methylcyclohexane 30 (108-87-2)
Trans-2-butene 25 (624-64-6)	Methylcyclopentane 25 (96-37-7)
Cyclohexane 40 (110-82-7)	2-Methylheptane 25 (592-27-8)
Cyclopentane 20 (287-92-3)	3-Methylheptane 25 (589-81-1)
n-Decane 30 (124-18-5)	2-Methylhexane 25 (591-76-4)
m-Diethylbenzene 40 (141-93-5)	3-Methylhexane 25 (589-34-4)
p-Diethylbenzene 25 (105-05-5)	2-Methylpentane 20 (107-83-5)
2,2-Dimethylbutane 40 (75-83-2)	3-Methylpentane 40 (96-14-0)
2,3-Dimethylbutane 50 (79-29-8)	n-Nonane 25 (111-84-2)
2,3-Dimethylpentane 50 (565-59-3)	Cis-2-Pentene 35 (627-20-3)
2,4-Dimethylpentane 40 (108-08-7)	Trans-2-Pentene 25 (646-04-8)
n-Dodecane 40 (112-40-3)	Propane 40 (74-98-6)
Ethane 25 (74-84-0)	n-Propylbenzene 30 (103-65-1)
Ethyl Benzene 25 (100-41-4)	Propylene 25 (115-07-1)
Ethylene 20 (74-85-1)	Styrene 40 (100-42-5)
o-Ethyltoluene 30 (611-14-3)	Toluene 40 (108-88-3)
m-Ethyltoluene 25 (620-14-4)	1,2,3-Trimethylbenzene 25 (526-73-8)
p-Ethyltoluene 40 (622-96-8)	1,2,4-Trimethylbenzene 40 (95-63-6)
n-Heptane 25 (142-82-5)	1,3,5-Trimethylbenzene 25 (108-67-8)
n-Hexane 30 (110-54-3)	2,2,4-Trimethylpentane 30 (540-84-1)
1-Hexane 60 (592-41-6)	2,3,4-Trimethylpentane 25 (565-75-3)
Isobutane 25 (75-28-5)	n-Undecane 30 (1120-21-4)
Isopentane 40 (78-78-4)	o-Xylene 25 (95-47-6)
Isoprene 40 (78-79-5)	m/p-Xylene (combined) 40 (108-38-3/106-42-3)

Note: CAS numbers are in brackets, i.e. (00-00-0)





Electronic Grade Gases

Linde is a leading supplier of pure gas products and gas mixtures to the semiconductor manufacturing and electronics industry. The Linde Group has developed and manufactured some of the most unique semiconductor materials available anywhere in the world. We accomplish this by continually developing the most advanced manufacturing processes in our industry. Our cylinder surface treatment technology is just one example of how we support our customers' strict requirements. From research to production, regardless of the specific application, Linde can assist you.

Contact Customer Service for recommended electronic grade gas equipment.

Electronic Grade Pure Gases

ammonia	NH ₃	Specifications	Pressure (psig)	Size	Contents		
					kg	lbs	
Nitride 99.9995%		CO	< 0.5 ppm	114	152	14	30
		CO ₂	< 0.5 ppm				
		H ₂ O	< 1 ppm				
		N ₂	< 1 ppm				
		O ₂	< 1 ppm				
		THC (CH ₄)	< 1 ppm				
Electronic 99.999%		CO	< 0.5 ppm	114	200	23	50
		CO ₂	< 0.5 ppm	114	152	14	30
		H ₂ O	< 2 ppm	114	32	2	3
		N ₂	< 5 ppm				
		O ₂	< 1 ppm				
		THC (CH ₄)	< 1 ppm				

NH₃

CGA 660

DISS 720

TDG Label Non-flammable gas and corrosive

Hazard Class 2.2 (8)

argon	Ar	Specifications	Pressure (psig)	Size	Contents	
					m ³	ft ³
ULSI 99.9999%		CO + CO ₂ < 0.1 ppm H ₂ < 0.1 ppm H ₂ O < 0.2 ppm N ₂ < 0.4 ppm O ₂ < 0.1 ppm THC (CH ₄) < 0.1 ppm	2,000	152	4.30	152
VLSI 99.999%		CO + CO ₂ < 1 ppm H ₂ O < 1 ppm N ₂ < 4 ppm O ₂ < 1 ppm THC (CH ₄) < 0.5 ppm	2,640 2,200	300 200	9.50 7.10	336 250



Ar

CGA 580

DISS 718

TDG Label Non-flammable gas

Hazard Class 2.2

Electronic Grade Pure Gases

arsine	AsH ₃	Specifications	Pressure (psig)	Size	Contents	
					kg	lbs
VLSI 99.9993%		Ar + O ₂ < 1 ppm	205	152	9	20
		CH ₄ < 0.5 ppm	205	32	1.8	4
Electronic 99.997%		CO < 0.5 ppm				
		CO ₂ < 0.5 ppm				
		H ₂ O < 1 ppm				
		N ₂ < 1 ppm				
		PH ₃ < 2 ppm				
		Ar + O ₂ < 5 ppm	205	152	9	20
		CH ₄ < 5 ppm	205	152	1.8	4
		CO < 1 ppm				
		CO ₂ < 1 ppm				
		H ₂ O < 4 ppm				
		N ₂ < 5 ppm				
		PH ₃ < 5 ppm				

AsH₃

CGA 350

DISS 632

TDG Label Poison gas and flammable gas

Hazard Class 2.3 (8)

boron trichloride	BCl ₃	Specifications*	Pressure (psig)	Size	Contents	
					kg	lbs
VLSI 99.999%*		CH ₄ < 0.5 ppm	4.4	204	50	110
		Cl ₂ < 2 ppm	4.4	84	18	40
		CO < 0.5 ppm	4.4	34	4.5	10
		CO ₂ < 1 ppm				
		COCl ₂ < 0.5 ppm				
		HCl < 50 ppm				
		N ₂ < 4 ppm				
		O ₂ + Ar < 1 ppm				
VLSI II 99.999%		CH ₄ < 0.5 ppm	4.4	204	50	110
		Cl ₂ < 2 ppm	4.4	84	18	40
		CO < 0.5 ppm	4.4	34	4.5	10
		CO ₂ < 1 ppm				
		COCl ₂ < 0.5 ppm				
		HCl < 50 ppm				
		N ₂ < 4 ppm				
		O ₂ + Ar < 1 ppm				

* Metal impurities available on request



BCl₃

CGA 660

DISS 634

TDG Label Poison gas and corrosive

Hazard Class 2.3 (8)

Electronic Grade Pure Gases

boron trifluoride	BF ₃	Specifications	Pressure (psig)	Size	Contents	
					kg	lbs
VLSI 99.99%		CO ₂ < 10 ppm	1,050	10	0.7	1.6
		N ₂ < 15 ppm	1,030	6	0.5	1
		O ₂ < 5 ppm	800	2	0.1	0.15
		SiF ₄ < 20 ppm				
		SO ₂ < 10 ppm				
Electronic 99.5%		Air < 4000 ppm	1,050	10	0.7	1.6
		SiF ₄ < 200 ppm	1,030	6	0.5	1
		SO ₂ < 20 ppm	800	2	0.1	0.15

BF₃

CGA 330

DISS 642

TDG Label Poison gas

Hazard Class 2.3

boron-11 trifluoride	$^{11}\text{BF}_3$	Specifications	Pressure (psig)	Size	Contents g
VLSI		Ar < 25 ppm ^{11}B Enrichment > 99.0% ^{10}B < 1.0% CO ₂ < 25 ppm HF < 25 ppm N ₂ < 25 ppm O ₂ < 25 ppm SO ₂ < 25 ppm SiF ₄ < 500 ppm	410 650	6 2	130 70

 $^{11}\text{BF}_3$

CGA 330

DISS 642

TDG Label Poison gas

Hazard Class 2.3

Electronic Grade Pure Gases

carbon dioxide	CO ₂	Specifications	Pressure (psig)	Size	Contents	
					kg	lbs
Ultra -Clean 99.999%		C ₁ to C ₃ THC's < 2 ppm C ₄ + Organic Compounds < 50 ppb H ₂ O < 2 ppm	838	152	18	40

Cylinder will be equipped with dip tube for liquid withdrawal



CO₂
 CGA 320
 DISS 716
 TDG Label Non-flammable gas
 Hazard Class 2.2

carbon monoxide	CO	Specifications	Pressure (psig)	Size	Contents	
					m ³	ft ³
ULSI 99.995%		C ₂ H ₆ < 0.5 ppm C ₃ H ₈ < 0.5 ppm CH ₄ < 0.5 ppm CO ₂ < 15 ppm Dimethyl Ether < 1 ppm H ₂ < 1 ppm H ₂ O < 1 ppm Iron Pentacarbonyl < 0.5 ppm N ₂ < 10 ppm O ₂ < 0.5 ppm THC < 0.5 ppm	2,000	152	4.00	141



CO

CGA 350

DISS 724

TDG Label Poison gas and flammable gas

Hazard Class 2.3 (2.1)

Electronic Grade Pure Gases

chlorine	Cl ₂	Specifications	Pressure (psig)	Size	Contents	
					kg	lbs
VLSI 99.999%*		CH ₄ < 0.5 ppm	85	209	52	115
		CO < 0.5 ppm	85	89	20	44
		CO ₂ < 5 ppm	85	39	7	15
		H ₂ < 1 ppm				
		H ₂ O < 2 ppm				
		N ₂ < 4 ppm				
		O ₂ + Ar < 1 ppm				
VLSI II 99.999%		CH ₄ < 0.5 ppm	85	204	52	115
		CO < 0.5 ppm	85	84	20	44
		CO ₂ < 5 ppm	85	34	7	15
		H ₂ < 1 ppm				
		H ₂ O < 2 ppm				
		N ₂ < 4 ppm				
		O ₂ + Ar < 1 ppm				
Electronic 99.99%		CH ₄ < 2 ppm	85	204	52	115
		CO ₂ < 50 ppm	85	84	20	44
		H ₂ < 5 ppm	85	34	7	15
		H ₂ O < 3 ppm				
		N ₂ < 20 ppm				
		O ₂ + Ar < 10 ppm				

* Metal impurities available on request



Cl₂

CGA 660

DISS 728

TDG Label Poison gas and oxidizing gas

Hazard Class 2.3 (5.1)

dichlorosilane	SiH_2Cl_2	Specifications	Pressure (psig)	Size	Contents	
					kg	lbs
ULSI 99%		Al < 1.0 ppbw	9	204	41	90
		As < 0.2 ppbw	9	84	14	30
		B < 0.1 ppbw	9	34	4.5	10
		C < 1 ppmw				
		Fe < 50 ppbw				
		P < 0.3 ppbw				
		Resistivity > 400 ohm-cm				
		SiH_3Cl < 0.3% wt				
		Total Other Chlorosilanes < 1.0% wt				



SiH_2Cl_2

CGA 678

DISS 636

TDG Label Poison gas and flammable gas

Hazard Class 2.3 (2.1)

Electronic Grade Pure Gases

disilane	Si_2H_6	Specifications	Pressure (psig)	Size	Contents g
Electronic 99.998%*		Ar + O ₂ < 1 ppm Chlorosilanes < 0.2 ppm CO ₂ < 1 ppm H ₂ O < 1 ppm Higher Silanes (Si ₄ H ₁₀ + Si ₃ H ₈) < 50 ppm N ₂ < 2 ppm Resistivity > 1000 ohm-cm SiH ₄ < 1000 ppm Siloxanes < 5 ppm THC < 1 ppm	33 33	152 32	5,000 500

* Purity excludes higher silanes and SiH₄



Si₂H₆

CGA 350

DISS 632

TDG Label Flammable gas

Hazard Class 2.1

halocarbon 14 carbon tetrafluoride	CF ₄	Specifications		Pressure (psig)	Size	Contents	
						kg	lbs
VLSI 99.999%*	Acidity (HF)	< 0.1 ppmw	2,000	200	32	70	
	CH ₄	< 1 ppm	2,000	152	18	40	
	CO + CO ₂	< 2 ppm	2,000	32	4	9	
	H ₂ O	< 0.5 ppm					
	N ₂	< 20 ppm					
	O ₂	< 5 ppm					
	Other Halocarbons	< 2 ppm					
	SF ₆	< 1 ppm					
Electronic 99.996%*	Acidity (HF)	< 1 ppmw	2,000	200	32	70	
	CH ₄	< 5 ppm	2,000	80	11	24	
	CO + CO ₂	< 15 ppm	2,000	30	4.5	10	
	H ₂ O	< 1 ppm					
	N ₂	< 200 ppm					
	O ₂	< 40 ppm					
	Other Halocarbons	< 10 ppm					
	SF ₆	< 5 ppm					

* Purity excludes air (N₂ + O₂)

CF₄

CGA 320

DISS 716

TDG Label Non-flammable gas

Hazard Class 2.2

Electronic Grade Pure Gases

halocarbon 32 difluoromethane	CH ₂ F ₂	Specifications		Pressure (psig)	Size	Contents	
						kg	lbs
VLSI 99.99%		Acidity	< 0.2 ppmw	215	200	30	65
		CO ₂	< 5 ppm	215	152	18	40
		H ₂ O	< 15 ppm	215	30	7	15
		N ₂	< 40 ppm				
		O ₂	< 10 ppm				
		Other Halocarbons	< 50 ppm				



CH₂F₂

CGA 350

DISS 724

TDG Label Flammable gas

Hazard Class 2.1

halocarbon 116 hexafluoroethane C_2F_6	Specifications	Pressure (psig)	Size	Contents	
				kg	lbs
VLSI 99.999%*	Acidity (HCl) < 0.1 ppmw CO < 1 ppm CO ₂ < 1 ppm H ₂ O < 2 ppm N ₂ < 10 ppm O ₂ < 2 ppm Other Halocarbons < 10 ppm	445 445	200 152	43 30	95 65
halocarbon 318 octafluorocyclobutane C_4F_8	Specifications	Pressure (psig)	Size	Contents	
VLSI 99.99%*	Acidity (HF) < 1 ppmw Air (N ₂ + O ₂) < 50 ppm H ₂ O < 10 ppm Other HFC < 100 ppm	25 25	152 32	20 5	44 11

* Purity excludes air (N₂ + O₂)



C_2F_6 , C_3F_8 , C_4F_8

CGA 660

DISS 716

TDG Label Non-flammable gas

Hazard Class 2.2

Electronic Grade Pure Gases

helium	He	Specifications	Pressure (psig)	Size	Contents		
					m ³	ft ³	
ULSI 99.9999%		CO	< 0.05 ppm	2,200	302	6.50	231
		CO ₂	< 0.05 ppm	2,000	152	3.80	134
		H ₂ O	< 0.2 ppm				
		N ₂	< 0.4 ppm				
		O ₂	< 0.2 ppm				
		THC (CH ₄)	< 0.1 ppm				
VLSI 99.9995%		CO ₂	< 0.5 ppm	2,200	302	6.50	231
		H ₂ O	< 1 ppm	2,000	152	3.80	134
		N ₂	< 1 ppm				
		O ₂	< 0.5 ppm				
		THC (CH ₄)	< 0.2 ppm				
Electronic 99.999%		CO ₂	< 0.5 ppm	2,640	300	8.20	291
		H ₂ O	< 1 ppm	2,200	200	6.20	219
		N ₂	< 4 ppm				
		O ₂	< 1 ppm				
		THC (CH ₄)	< 0.5 ppm				



He

CGA 580

DISS 718

TDG Label Non-flammable gas

Hazard Class 2.2

hydrogen	H ₂	Specifications	Pressure (psig)	Size	Contents	
					m ³	ft ³
VLSI 99.9995%		CO + CO ₂ < 0.5 ppm H ₂ O < 1 ppm N ₂ < 1 ppm O ₂ < 0.5 ppm THC (CH ₄) < 0.5 ppm	2,640	300	8.00	284
Electronic 99.999%		CO + CO ₂ < 1 ppm H ₂ O < 3 ppm N ₂ < 4 ppm O ₂ < 1 ppm THC (CH ₄) < 1 ppm	2,640	300	8.00	284



H₂
CGA 350
DISS 724
TDG Label Flammable gas
Hazard Class 2.1

Electronic Grade Pure Gases

hydrogen chloride	HCl	Specifications	Pressure (psig)	Size	Contents	
					kg	lbs
ULSI 99.999%*		CO < 1 ppm CO ₂ < 2 ppm H ₂ O < 1 ppm N ₂ < 2 ppm O ₂ < 1 ppm THC (CH ₄) < 1 ppm	613	204	27	60
VLSI 99.999%*		CO < 1 ppm CO ₂ < 4 ppm H ₂ O < 1 ppm N ₂ < 2 ppm O ₂ < 1 ppm THC (CH ₄) < 1 ppm	613	204 34	27 4	60 8
Electronic 99.997%		CO < 1 ppm CO ₂ < 5 ppm H ₂ O < 2 ppm N ₂ < 10 ppm O ₂ < 4 ppm THC (CH ₄) < 2 ppm	613	204	27	60

* Metal impurities available on request



HCl

CGA 330

DISS 634

TDG Label Poison gas and corrosive

Hazard Class 2.3 (8)

methylsilane	CH ₃ SiH ₃	Specifications		Pressure (psig)	Size	Contents	
						kg	
Electronic 99.98%	Ar + O ₂	< 2 ppm	193	200	15	33	
	(CH ₃) ₂ SiH ₂	< 100 ppm	193	30	2.5	6	
	CH ₄	< 50 ppm					
	Chlorosilanes	< 50 ppm					
	CO ₂	< 10 ppm					
	N ₂	< 10 ppm					
	Other Methylsilanes	< 50 ppm					
	SiH ₄	< 50 ppm					

CH₃SiH₃

DISS 632

TDG Label Flammable gas

Hazard Class 2.1

Electronic Grade Pure Gases

nitrogen	N ₂	Specifications	Pressure (psig)	Size	Contents	
					m ³	ft ³
ULSI 99.9999%		CO + CO ₂ < 0.2 ppm H ₂ < 0.1 ppm H ₂ O < 0.2 ppm O ₂ < 0.1 ppm THC (CH ₄) < 0.1 ppm	2,000	152	4.00	142
VLSI 99.9995%		CO + CO ₂ < 0.5 ppm H ₂ < 1 ppm H ₂ O < 1 ppm O ₂ < 1 ppm THC (CH ₄) < 0.2 ppm	2,000	152	4.00	142
Electronic 99.999%		H ₂ O < 1 ppm O ₂ < 1 ppm THC (CH ₄) < 0.5 ppm	2,640 2,200	300 200	8.60 6.50	304 230

N₂

CGA 580

DISS 718

TDG Label Non-flammable gas

Hazard Class 2.2

nitrogen trifluoride	NF ₃	Specifications	Pressure (psig)	Size	Contents	
					kg	lbs
VLSI 99.99%		Acidity (HF) < 1 ppm CF ₄ < 40 ppm CO < 1 ppm CO ₂ < 3 ppm H ₂ O < 5 ppm N ₂ < 5 ppm N ₂ O < 3 ppm O ₂ + Ar < 5 ppm SF ₆ < 10 ppm THC (CH ₄) < 5 ppm	1,570	204	22	48
Electronic 99.97%		Acidity (HF) < 0.3 ppm CF ₄ < 250 ppm CO < 10 ppm CO ₂ < 5 ppm H ₂ O < 1 ppm N ₂ < 10 ppm N ₂ O < 5 ppm O ₂ + Ar < 5 ppm SF ₆ < 10 ppm THC (CH ₄) < 5 ppm	1,570	204	22	48

NF₃

CGA 640

DISS 670

TDG Label Non-flammable gas and oxidizing gas

Hazard Class 2.2

Electronic Grade Pure Gases

nitrous oxide	N ₂ O	Specifications	Pressure (psig)	Size	Contents	
					kg	lbs
VLSI 99.999%		CH ₄ < 0.5 ppm	745	152	18	40
		CO < 0.1 ppm	745	32	3	6
		CO ₂ < 0.5 ppm				
		H ₂ O < 3 ppm				
		N ₂ < 3 ppm				
		NH ₃ < 1 ppm				
		NO < 1 ppm				
		NO ₂ < 1 ppm				
		O ₂ + Ar < 1 ppm				
Electronic 99.998%		CH ₄ < 1 ppm	745	152	18	40
		CO < 1 ppm	745	32	3	6
		CO ₂ < 2 ppm				
		H ₂ O < 3 ppm				
		N ₂ < 10 ppm				
		O ₂ + Ar < 2 ppm				

N₂O

CGA 326

DISS 712

TDG Label Non-flammable gas and oxidizing gas

Hazard Class 2.2 (5.1)

oxygen	O ₂	Specifications	Pressure (psig)	Size	Contents	
					m ³	ft ³
ULSI 99.999%		Ar < 5 ppm	2,640	300	9.5	337
		CO + CO ₂ < 0.5 ppm	2,200	200	7.1	251
		H ₂ O < 1 ppm				
		Kr < 1 ppm				
		N ₂ < 2 ppm				
		THC (CH ₄) < 0.5 ppm				
VLSI 99.994%		Ar < 35 ppm	2,640	300	9.5	337
		CO + CO ₂ < 2 ppm	2,200	200	7.1	251
		H ₂ O < 1 ppm				
		N ₂ < 10 ppm				
		THC (CH ₄) < 1 ppm				

O₂

CGA 540

DISS 714

TDG Label Non-flammable gas and oxidizing gas

Hazard Class 2.2 (5.1)

Electronic Grade Pure Gases

phosphine	PH ₃	Specifications	Pressure (psig)	Size	Contents		
					kg	lbs	
VLSI 99.9992%		Ar + O ₂	< 1 ppm	593	152	4.5	10
		AsH ₃	< 2 ppm	593	32	0.9	2
		CO	< 1 ppm				
		CO ₂	< 1 ppm				
		H ₂ O	< 1 ppm				
		N ₂	< 1 ppm				
		THC (CH ₄)	< 1 ppm				
Electronic 99.996%		Ar + O ₂	< 4 ppm	593	200	7	15
		AsH ₃	< 5 ppm	593	80	2	5
		CO	< 1 ppm	593	30	0.9	2
		CO ₂	< 2 ppm	593	7x	0.1	0.15
		H ₂ O	< 2 ppm				
		N ₂	< 20 ppm				
		THC (CH ₄)	< 4 ppm				

PH₃

CGA 350

DISS 632

TDG Label Poison gas and flammable gas

Hazard Class 1.3

silane	SiH ₄	Specifications	Pressure (psig)	Size	Contents kg
VLSI 99.9995%*†		Chlorosilanes < 1 ppm	950	152	5
		CO < 0.5 ppm	950	82	2.5
		CO ₂ < 0.5 ppm	600	32	0.5
		H ₂ < 50 ppm			
		N ₂ < 1 ppm			
		O ₂ + Ar < 1 ppm			
		Resistivity > 7,500 ohm-cm			
Semiconductor 99.995% †		Chlorosilanes < 1 ppm	1100	204	10
		CO < 1 ppm	900	204	5
		CO ₂ < 1 ppm			
		H ₂ < 75 ppm			
		N ₂ < 5 ppm			
		O ₂ + Ar < 5 ppm			
		Resistivity > 5,000 ohm-cm			

* Metal impurities available on request

† Purity excludes H₂



SiH₄

CGA 350

DISS 632

TDG Label Poison gas and flammable gas

Hazard Class 2.1

Electronic Grade Pure Gases

silicon tetrafluoride	SiF ₄	Specifications	Pressure (psig)	Size	Contents	
					kg	lbs
VLSI 99.999%		CO < 0.1 ppm CO ₂ < 2 ppm N ₂ < 4 ppm O ₂ < 0.5 ppm THC < 0.1 ppm	1,000	204	23	50

SiF₄

CGA 330

DISS 642

TDG Label Corrosive

Hazard Class 8

sulphur hexafluoride SF ₆	Specifications	Pressure (psig)	Size	Contents		
				kg	lbs	
VLSI 99.996%	Acidity (HF)	< 0.4 ppmw	310	152	30	65
	CF ₄	< 5 ppm	310	82	18	40
	CO	< 0.5 ppm				
	CO ₂	< 0.5 ppm				
	H ₂ O	< 5 ppm				
	N ₂	< 20 ppm				
	O ₂	< 5 ppm				
THC (CH ₄)	< 0.1 ppm					
Electronic 99.8%	CF ₄	< 500 ppm	310	200	43	95
	H ₂ O	< 70 ppm	310	80	18	40
	N ₂	< 400 ppm				
	O ₂	< 100 ppm				

SF₆

CGA 590

DISS 716

TDG Label Non-flammable gas

Hazard Class 2.2

Electronic Grade Pure Gases

trichlorosilane	SiHCl ₃	Specifications	Pressure (psig)	Size	Contents		
					kg	lbs	
VLSI 99.95%		B	< 0.06 ppba	10	L600	249	550
		C	< 5 ppma	10	L100	41	90
		Donor	< 0.07 ppba				
		Fe	< 5 ppba				
		Other Chlorosilanes	< 500 ppm				
		Resistivity	> 600 ohm-cm				



SiHCl₃

Valve Outlet Vapour: 1/2" FNTF
Liquid: 1/2" FNTF

TDG Label Flammable gas and corrosive

Hazard Class 4.3

trimethylsilane (CH ₃) ₃ SiH	Specifications	Pressure (psig)	Size	Contents	
				kg	lbs
VLSI 99.999%*	Ar + O ₂ < 2 ppm	10	200	20	44
	CO < 2 ppm	10	200	12	26
	CO ₂ < 1 ppm	10	30	3	7
	H ₂ O < 1 ppm				
	N ₂ < 1 ppm				
	THC < 1 ppm				
	Total Chlorides < 1 ppm				

* Metal impurities available on request



(CH₃)₃SiH

DISS 632

TDG Label Flammable gas

Hazard Class 2.1

Electronic Grade Pure Gases

tungsten hexafluoride WF_6	Specifications	Pressure (psig)	Size	Contents	
				kg	lbs
ULSI 99.999%*	Acidity (HF) < 10 ppmw	2.4	44	55	121
	CF_4 < 1 ppm	2.4	41	13.6	30
	CO < 0.5 ppm	2.4	40	3.4	7
	CO_2 < 1 ppm				
	N_2 < 1 ppm				
	O_2 + Ar < 1 ppm				
	SF_6 < 1 ppm				
	SiF_4 < 1 ppm				
Electronic 99.9%*	Acidity (HF) < 200 ppmw	2.4	204	90.8	200
	CF_4 < 10 ppm	2.4	84	45	100
	CO < 5 ppm	2.4	34	18	40
	CO_2 < 5 ppm				
	N_2 < 50 ppm				
	SF_6 < 10 ppm				
	SiF_4 < 10 ppm				

* Metal impurities available on request



WF_6

CGA 670

DISS 638

TDG Label Poison gas

Hazard Class 2.3

Electronic Grade Mixtures

arsine		Type	CGA	Size	Contents	
					m ³	ft ³
10 ppm	Arsine, 4.7 in Argon 5.0	Certified	350	32	0.93	33
5 ppm	Arsine, 4.7 in Argon 5.0	Certified	350	32	0.93	33
10 ppm	Arsine 5.3 in Nitrogen 5.0	Certified	350	152	3.96	140
10 ppm	Arsine 4.7 in Nitrogen 5.0	Certified	350	152	3.96	140
15%	Arsine 5.3 in Hydrogen	Certified	350	2	.024	0.85

Higher purities available on request

silane		Type	CGA	Size	Contents	
					m ³	ft ³
0.5%	Silane 4.5 in Hydrogen 5.0	Certified	350	200	5.49	194
5%	Silane 5.5 in Argon 5.0	Certified	350	32	0.96	34
5%	Silane 4.5 in Argon 5.0	Certified	350	32	0.96	34
2%	Silane 5.5 in Helium 5.5	Certified	350	200	5.58	197
2%	Silane 5.5 in Helium 5.5	Certified	350	152	3.79	134

Higher purities available on request

Electronic Grade Mixtures

phosphine		Type	CGA	Size	Contents	
					m ³	ft ³
5%	Phosphine 4.6 in Nitrogen 5.0	Certified	DISS 632	200	5.35	189
5%	Phosphine 5.2 in Nitrogen 5.0	Certified	DISS 632	200	5.35	189
10%	Phosphine 4.6 in Nitrogen 5.0	Certified	350	30	0.82	29
1%	Phosphine 5.2 in Nitrogen 5.0	Certified	350	30	0.82	29
15%	Phosphine 4.6 in Hydrogen 5.0	Certified	350	12	0.34	12
15%	Phosphine 5.2 in Hydrogen 5.5	Certified	350	12	0.34	12
20%	Phosphine 5.2 in Silane 5.0	Certified	350	200	2.99	106
10%	Phosphine 4.6 in Argon 5.0	Certified	350	200	5.91	209
1%	Phosphine 4.6 in Argon 5.0	Certified	350	152	4.30	152
1%	Phosphine 5.2 in Argon 6.0	Certified	350	200	6.34	224
100 ppm	Phosphine 5.2 in Helium 5.5	Certified	350	152	3.79	134
100 ppm	Phosphine 4.6 in Helium 5.0	Certified	350	152	3.79	134
10 ppm	Phosphine 5.2 in Helium 5.5	Certified	350	152	3.79	134
10 ppm	Phosphine 4.6 in Helium 5.0	Certified	350	152	3.79	134

Higher purities available on request

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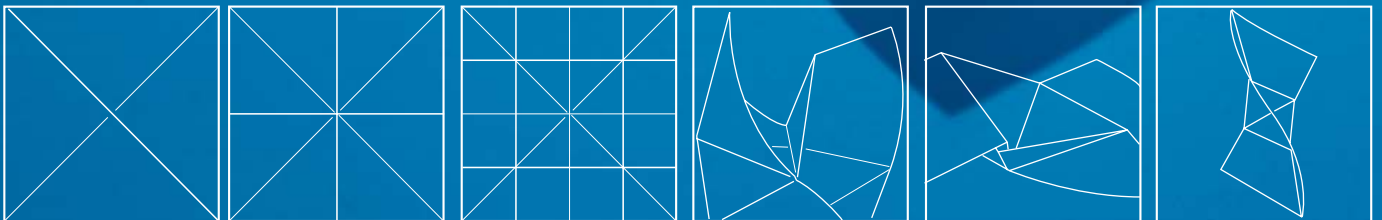
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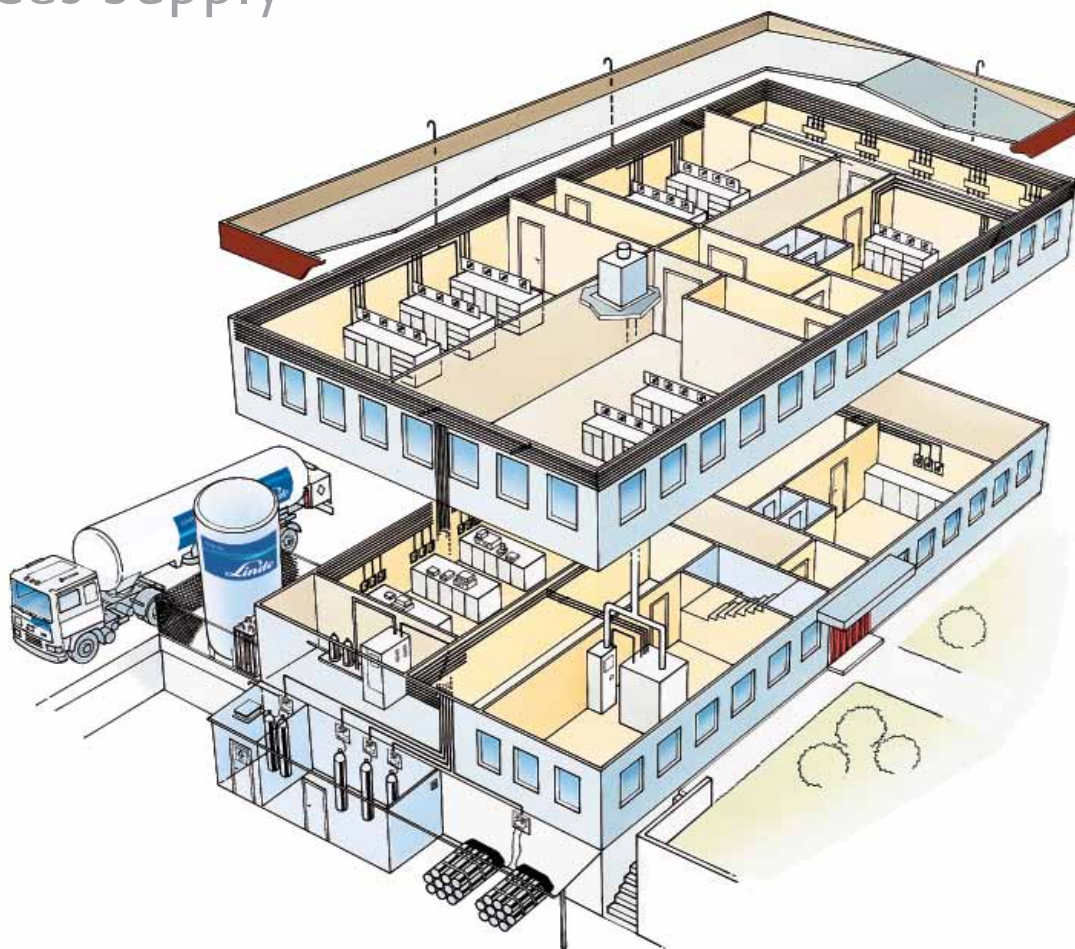


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Due to their special properties, specialty gases place particular demands on components for distribution, control and monitoring. Either because the applications require that the gases shall maintain their high purity throughout the point of use, or because their chemical and physical properties require special design of the central gas supply system.

Central Gas Supply



The advantages of a HiQ® REDLINE central gas supply system are:

Increased Safety

- The risk of accidents is reduced, as there is no need to handle gas cylinders inside the work place. Only low-pressure equipment and small gas quantities are present in the work place.
- Gas cylinders are collected under one roof, which facilitates removal from labs and work areas.
- The handling of high-pressure cylinders and the connection of toxic gases should be carried out by trained staff. If a problem with leaking gas should occur, ventilation is essential. This is especially important while handling flammable and toxic gases, and is simplified by the central gas supply approach.

Improved Operating Economy

- A continuous gas supply to each work station means less wasted time and fewer unplanned disruptions for changing gas cylinders.
- Fewer and larger gas cylinders which together supply all users, means more effective emptying of the cylinders which in turn give lower costs for gas and cylinder rental as well as transport charges. In addition, the store monitoring and purchasing can be centralized and rationalized.

Better Working Environment

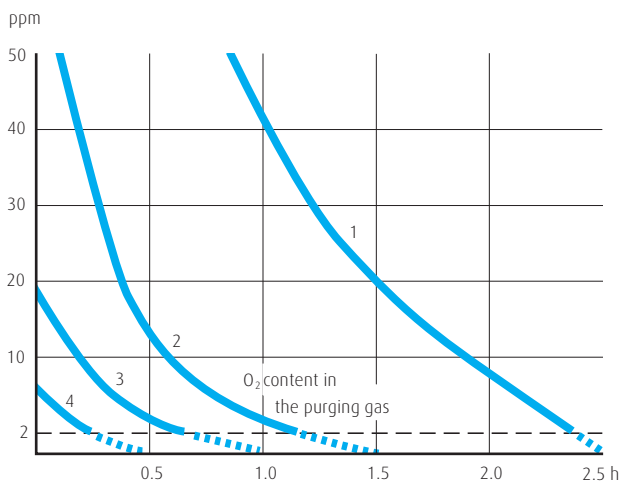
- The work place can be designed more appropriately.
- Heavy gas cylinders containing toxic gases under high pressure can involve great risks, which are now relocated.
- Outlets positioned at every work station are convenient and easy to use.

Turnkey Deliveries

- Together with the customer we carry out a requirement analysis. Thereafter, planning and installation takes place.
- A service agreement guarantees a troublefree gas supply without unplanned operating stoppages.

Quality Requirements Govern the Choice of Material

The gas to be distributed and the level of contamination that can be accepted in the gas determine the choice of component material in a gas supply system. The inner surface finish of components is of great importance to the final purity of the gas at the point of use. A better surface finish will make the pipe system easier to clean and reduce the risk of particles being released into the gas stream.



- 1 = Constant flow 10 l/h
- 2 = 5 x pressurized @ 50 psig/depressurized
- 3 = 7 x pressurized @ 50 psig/depressurized
- 4 = 10 x pressurized @ 50 psig/depressurized

The figure illustrates the relation between purge time, purging method and the purity realized with regard to the oxygen content in a gas system.

Copper

Copper has been used within gas supply technology for a long time and is still an option when using industrial grade gas. Make sure only to use cleaned copper tubing.

Stainless Steel

Over the past years, stainless steel has become the number one choice of material for pure gas applications. This is primarily because the material is easy to clean and can be supplied with a very good surface finish.

The increasing use of chemically reactive gases and the great demands made on purity have also contributed towards this trend towards Stainless steel. Welding methods have been developed which provide advantages with assembly in confined areas and which make it possible to join Stainless steel systems while still maintaining a high level of cleanliness and finish. Stainless steel is also chosen for aesthetic reasons or where the environment is aggressive and can give

rise to corrosion. As a general guide the selection of components for a gas supply system is always based on the chosen gas quality.

Standard Purity Specialty Gases

(Equivalent to 2.5 [99.5%] to 6.0 [99.9999%]) Component: Stainless steel or brass depending on the gas to be used. Threaded connectors, type NPT, or compression fittings.

Piping: Washed Stainless steel.

Connection: Orbital welding compression couplings, designed to clamp onto the pipe. The coupling requires the pipe to have a good degree of roundness (Stainless steel) and gives a seal equivalent to 10^{-6} atm cc/s.

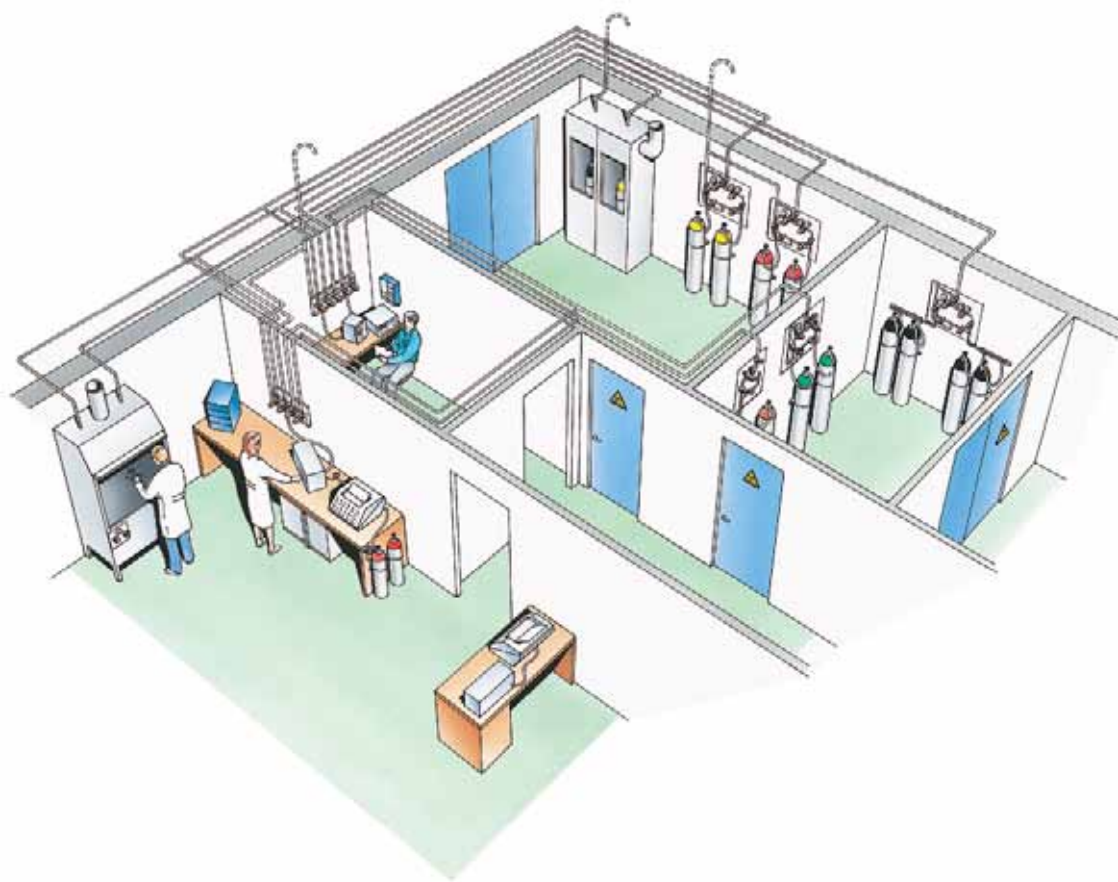
Electronic Grade Purity Specialty Gases

(Equivalent to 6.0 [99.9999] or higher) Component: Stainless steel or brass depending on the gas to be used. Threaded connectors, type NPT, or compression fittings.

Piping: Washed stainless steel.

Connection: VCR couplings, welded onto the pipes and valves. Using a pointed profile that, under great pressure from two sides, is pressed into metallic packing and seals the couplings. The coupling gives a seal equivalent to 10^{-8} – 10^{-10} atm cc/s.

Central Gas Supply



System Design Can Be Broken Down Into Three Stages:

- Determine the maximum contamination level for the gas.
- Select the components to be used for the gas supply system.
- Design, assemble and commission the system. Linde has extensive know-how within the gas industry and experience of gas media and applications – everything from component selection, via system design to installation and start-up – as well as all technical documentation. Linde acts as advisor and consultant together with the user in order to assess the requirements and conditions of the project in question. It is extremely important to look at the system in its entirety, both from an economic and safety point of view.

Highlighted below are some of the areas that greatly affect the whole system.

Distribution and Storage

- Arrange if possible a storage area for the gas cylinders in a separate building.
- Connected gas cylinders are placed in a separate area, preferably adjacent to the access area. Avoid transporting gas cylinders indoors.
- The gases are stored (separately) according to fixed directives depending on their physical characteristics. Ventilation is provided based on safety requirements regarding the amount and type of gas used.

Gas Cabinets and Piping Systems

- Separate gas cabinets should be considered for corrosive gases and toxic gases.
- When using extremely dangerous gases consideration is made to flow control and emergency stop functions.
- Gas piping should be run in such a manner that the risk of mechanical damage is eliminated.

Detection and Alarms

- The need of detection is assessed. Regard should be taken to future requirements concerning types of gas and suitable flexibility to avoid unnecessary costs at a later stage.
- The possibility of an auto-stop if a leak is indicated. This can be achieved using detection equipment.
- The need of an alarm to an operating centre and/or an evacuation alarm within a certain area is defined.

Linde has well-trained assembly teams with vast experience of specialty gas installations.

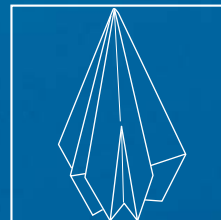
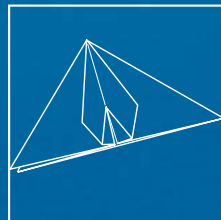
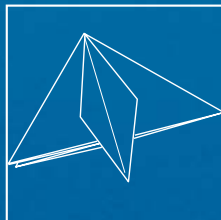
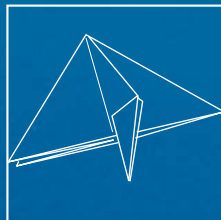
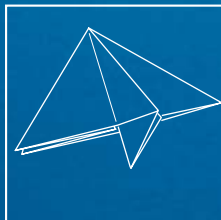
Gas Distribution Equipment

Specialty Gases place particular demands on components for control, distribution and monitoring, either through the application requiring that gas purity be maintained throughout the point of use, or because their chemical and physical properties requires special design of the central gas supply.

Linde offers a variety of supply options designed to maintain the integrity of your gas between the supply cylinder and the instrument or reactor. From simple regulator supply to a fully integrated gas supply system, Linde works with our customers to design and plan the gas supply system to meet not only today's needs, but the needs of the future.

BASELINE™ equipment is the entry point into the world of specialty gas equipment. **BASELINE™** regulators are designed to offer a more stable operation than industrial equipment can provide, at a competitive price. Typical applications are gas and liquid chromatography, carrier gases, zero and span calibration gases, high purity chamber pressurization, liquified hydrocarbon gas control and control of cryogenic gases. **BASELINE™** is designed for control of gases up to 5.0 ultra pure grade materials.

HiQ® REDLINE is part of the Linde HiQ® program, a worldwide standard product initiative that is synonymous with expertise and performance in specialty gas products. The HiQ® REDLINE equipment has an overall superior design and unique style in the marketplace. Specifically, the regulators offered in this product line utilize a bar stock body and premium diaphragm and seal materials. There are several advantages with the HiQ® REDLINE bar stock body: reduced internal volumes, which allows for more effective purging and removal of contaminants and moisture; low Ra surface finish, which minimizes particle shedding; and tight grain structure that helps prevent the regulators internal surface from adsorbing contaminants and moisture. These advantages make HiQ® REDLINE equipment a superior product and the best choice for your specialty gas distribution needs.



Regulators

Regulators are used in gas delivery systems to reduce the pressure from a high pressure source to a safe working pressure for use. A pressure regulator should always be used when positive control of the pressure in a gas stream is required. A pressure regulator is as much a safety device as it is an important tool.

Basic Regulator Types

There are two basic types of pressure regulators: a single stage type and a dual stage type. The outward appearance of the two distinctly different types is somewhat similar and may be difficult to distinguish. Most pressure regulators are fitted with two gauges to monitor pressures (most line regulators only have one). The high pressure gauge is connected internally to the inlet side of the regulator and is used to monitor the source pressure. The low pressure gauge is connected internally to the outlet side of the regulator and is used to monitor the outlet pressure.

As an option, an outlet valve is affixed to the outlet port of the regulator. This valve is to be used to turn the flow of gas on or off for brief periods of time. It should never be used to throttle or control the flow of gas emitted from a regulator. This practice could cause serious damage to both the regulator and its operator. Flow should always be controlled by some other piece of equipment such as a rotameter or mass flowmeter.

Dual Stage regulators reduce the source pressure down to the desired delivery pressure in two steps. Each stage consists of a spring, diaphragm, and control valve. The first stage reduces the inlet pressure to about three times the maximum working pressure. The final pressure reduction occurs in the second stage. The advantage of a dual stage regulator is its ability to deliver a constant pressure, even with a decrease in inlet pressure. For example, as a cylinder of gas is depleted, the cylinder pressure drops. Under these conditions, single stage regulators exhibit a "decaying inlet characteristic"; where the delivery pressure increases as a result of the decrease in inlet pressure. In a dual stage regulator, the second stage compensates for this increase, providing a constant delivery pressure regardless of inlet pressure conditions. The dual stage regulator is recommended for applications where a continuous supply of gas is required; such as the gas supplied to analytical instruments where constant delivery pressure is critical.

Single Stage regulators perform the same function as the two stage regulator using a single step reduction of source to outlet pressure. For this reason, the outlet pressure cannot be as accurately controlled as the source pressure decays. We highly recommend single stage regulators only be used in circumstances where the operator can monitor and adjust the regulator as needed or where the regulator is supplied a nearly constant source pressure.

Line Regulators are single stage regulators that are used to provide point-of-use pressure monitoring and control. For example, a lab may have gas cylinders located in a room on the first floor. The gas may be piped to instruments located in a lab on the second floor. In this case, it is difficult to monitor the gas pressure directly at the instruments, since the regulators are located on the cylinders on the first floor. A line regulator may be installed near the instruments for convenience of monitoring the delivery pressure at the point of use. These regulators are installed directly into gas lines, and have a single delivery pressure gauge.

Regulators

BASELINE™ C1061

Single Stage Cylinder Regulator

Description

The BASELINE™ C1061 Series regulator is intended for primary pressure control of non-corrosive, high purity or liquefied gases up to grade 5.0.

Available in either Chrome plated Brass (B), or 316 Stainless Steel (S), the C1061 offers outlet pressure control up to 500 psig/3,450 kPa, and is available with diaphragm shutoff valve (A), control needle outlet valve (B) or 1/4" FNPT (C).

Where required, the C1061 can be supplied with applicable TSSA/CRN registration.

Technical Data

	psig	kPa
Max Inlet Pressure	3,000	21,000
Inlet Pressure Gauge	4,500	31,000
Outlet Ranges	0-15	0-100
	0-50	0-340
	0-100	0-690
	0-150	0-1,030
	0-250	0-1,720
	0-500	0-3,450
Outlet Gauge Range	30"-0-30	-2-200
	30"-0-100	-2-700
	30"-0-200	-2-1,400
	0-400	0-2,800
	0-1,000	0-7,000
Connection		
Inlet	CGA per gas application	
Outlet	1/4" FNPT or variable compression fitting	
Operating Temperature	-40°-+60°C	-40°-140°F
Weight*	1.6 kg	3.5 lb

*variable based on outlet option

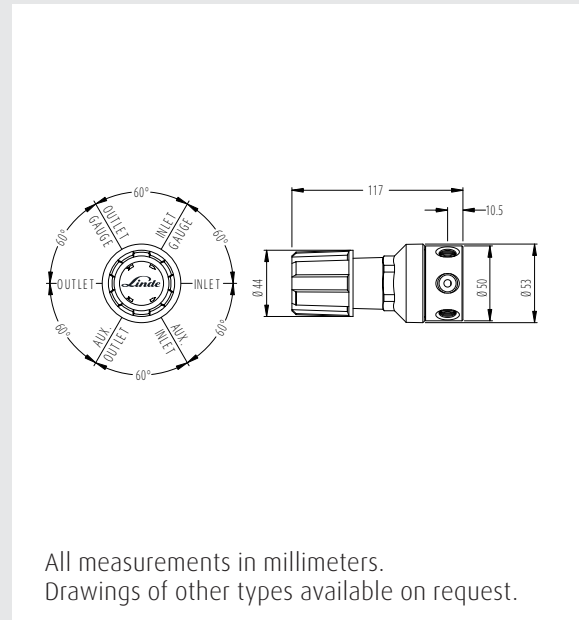
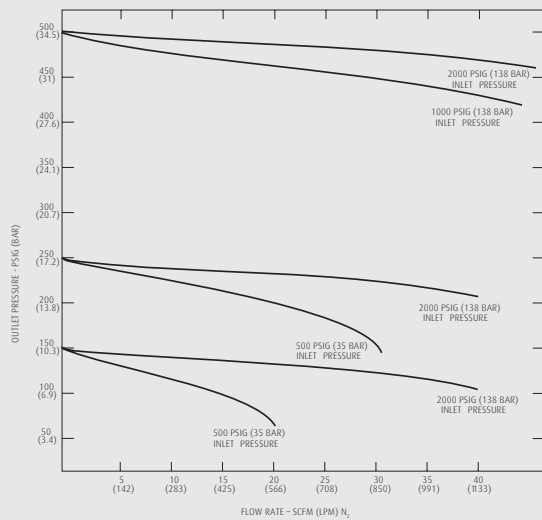
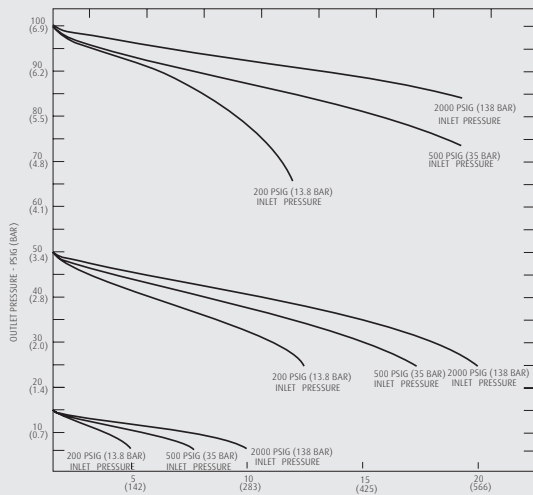
Flow Capacity (Cv) 0.1

Materials of Construction

Housing/Body	Chrome plated brass barstock with chrome plated zinc bonnet or 316L stainless steel with chrome plated zinc bonnet
Diaphragm	Stainless steel 316L
Seals	PTFE
Seat	PTFE
Filter	10 micron sintered bronze
Outlet Valve	Available with diaphragm or needle valve outlet



BASELINE™ C1061 – Single Stage Cylinder Regulator



All measurements in millimeters.
 Drawings of other types available on request.

Model	Material of Construction	Outlet Range	Outlet Valve	Connection	
				Inlet	Outlet
C1061	B – Brass	015	A – diaphragm	CGA	N4 1/4" FNPT
		050	B – needle valve		C4 1/4" compression
	100	C – no valve		C8 1/8" compression	
	150			C3 3/8" compression	
	250				
		500			

Regulators

BASELINE™ CH1061

High Pressure Single Stage Cylinder Regulator

Description

The BASELINE™ CH1061 Series regulator is intended for primary pressure control of non-corrosive, high purity gases up to grade 5.0, with a requirement for inlet pressures up to 4,500 psig/31,000 kPa.

Available in either Chrome plated Brass (B), or 316 Stainless Steel (S), the CH1061 offers outlet pressure control up to 500 psig/3,450 kPa, and is available with diaphragm shutoff valve (A), control needle outlet valve (B) or 1/4" FNPT (C).

Where required, the CH1061 can be supplied with applicable TSSA/CRN registration.

Technical Data

	psig	kPa
Max Inlet Pressure	4,500	31,000
Inlet Pressure Gauge	5,000	35,000
Outlet Ranges	0-50	0-340
	0-100	0-690
	0-150	0-1,030
	0-250	0-1,720
	0-500	0-3,450
Outlet Gauge Range	30"-0-100	-2-700
	30"-0-200	-2-1,400
	0-400	0-2,800
	0-1,000	0-7,000
Connection		
Inlet	CGA per gas application	
Outlet	1/4" FNPT or variable Compression fitting	
Operating Temperature	-40°-+60°C	-40°-140°F
Weight*	1.6 kg	3.5 lb

*variable based on outlet option

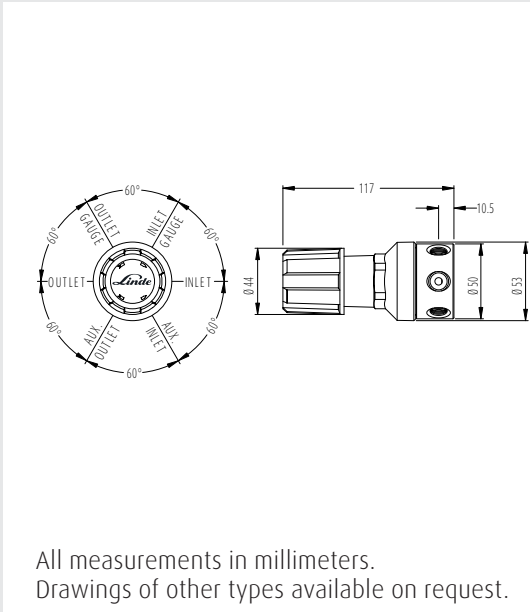
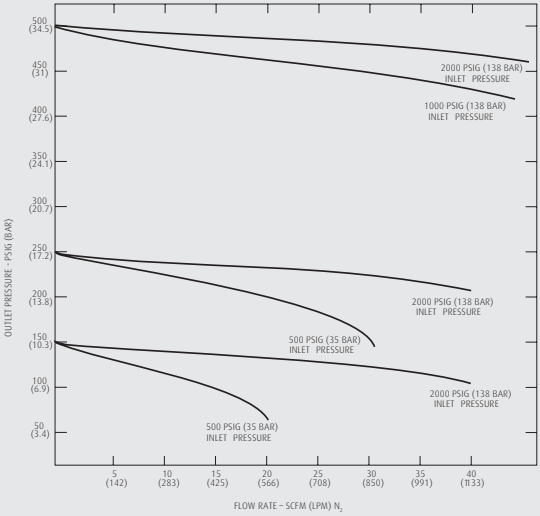
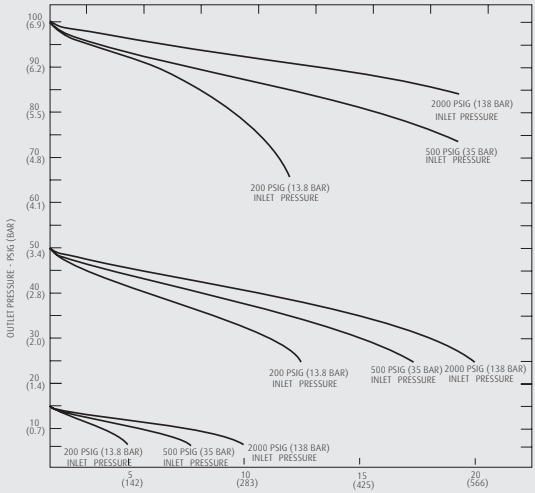
Flow Capacity (Cv) 0.1

Materials of Construction

Housing/Body	Chrome plated brass barstock with chrome plated zinc bonnet or 316L stainless steel with chrome plated zinc bonnet
Diaphragm	Stainless steel 316L
Seals	PCTFE
Seat	PCTFE
Filter	10 micron sintered bronze
Outlet Valve	Available with diaphragm or needle valve outlet



BASELINE™ CH1061 – High Pressure Single Stage Cylinder Regulator



All measurements in millimeters. Drawings of other types available on request.

Model	Material of Construction	Outlet Range	Outlet Valve	Connection	
				Inlet	Outlet
CH1061	B – Brass	050	A – diaphragm	CGA	N4 1/4" FNPT
		100	B – needle valve		C4 1/4" compression
	150	C – no valve		C8 1/8" compression	
	250			C3 3/8" compression	
	500				

Regulators

BASELINE™ C1062

Dual Stage Cylinder Regulator

Description

The BASELINE™ C1062 Series regulator is intended for primary pressure control of non-corrosive, high purity gases up to grade 5.0 in applications that require constant pressure control regardless of source supply pressure.

Available in either Chrome plated Brass (B), or 316 Stainless Steel (S), the C1062 offers outlet pressure control up to 250 psig/1,720 kPa, and is available with diaphragm shutoff valve (A), control needle outlet valve (B) or 1/4" FNPT (C).

Where required, the C1062 can be supplied with applicable TSSA/CRN registration.

Technical Data

	psig	kPa
Max Inlet Pressure	3,000	21,000
Inlet Pressure Gauge	4,500	35,000
Outlet Ranges	0-15	0-100
	0-50	0-340
	0-100	0-690
	0-150	0-1,030
	0-250	0-1,720
Outlet Gauge Range	30"-0-30	-2-200
	30"-0-100	-2-700
	30"-0-200	-2-1,400
	0-400	0-2,800
Connection		
Inlet	CGA per gas application	
Outlet	1/4" FNPT or variable Compression fitting	
Operating Temperature	-40°-+60°C	-40°-140°F
Weight*	2.1 kg	4.6 lb

*variable based on outlet option

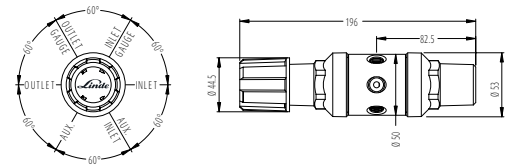
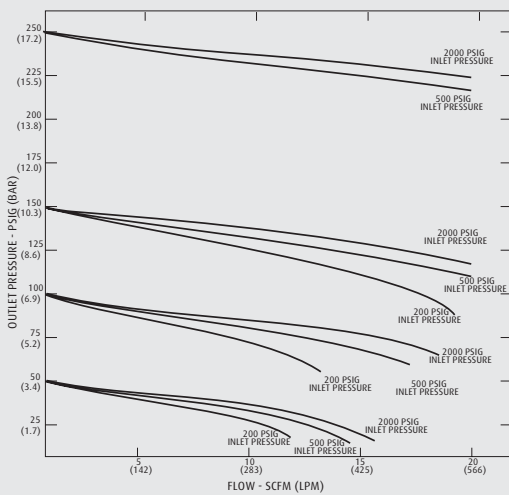
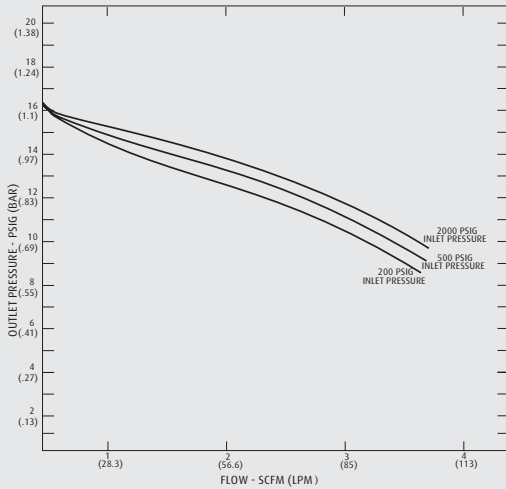
Flow Capacity (Cv) 0.1

Materials of Construction

Housing/Body	Chrome plated brass barstock with chrome plated zinc bonnet or 316L Stainless steel with chrome plated zinc bonnet
Diaphragm	Stainless steel 316L
Seals	PTFE
Seat	PTFE
Filter	10 micron sintered bronze
Outlet Valve	Available with diaphragm or needle valve outlet



BASELINE™ C1062 – Dual Stage Cylinder Regulator



All measurements in millimeters.
 Drawings of other types available on request.

Model	Material of Construction	Outlet Range	Outlet Valve	Connection	
				Inlet	Outlet
C1062	B – Brass	015	A – diaphragm	CGA	N4 1/4" FNPT
		050	B – needle valve		C4 1/4" compression
	100	C – no valve		C8 1/8" compression	
	150			C3 3/8" compression	
	250				

Regulators

BASELINE™ CH1062

High Pressure Dual Stage Cylinder Regulator

Description

The BASELINE™ CH1062 Series regulator is intended for primary pressure control of non-corrosive, high purity gases up to grade 5.0, in applications that require constant pressure control regardless of source supply pressure, with a requirement for inlet pressures up to 4,500 psig/31,000 kPa.

Available in either Chrome plated Brass (B), or 316 Stainless Steel (S), the CH1062 offers outlet pressure control up to 500 psig/3,450 kPa, and is available with diaphragm shutoff valve (A), control needle outlet valve (B) or 1/4" FNPT (C).

Where required, the CH1062 can be supplied with applicable TSSA/CRN registration.

Technical Data

	psig	kPa
Max Inlet Pressure	4,500	31,000
Inlet Pressure Gauge	5,000	35,000
Outlet Ranges	0-50	0-340
	0-100	0-690
	0-150	0-1,030
	0-250	0-1,720
Outlet Gauge Range	30"-0-100	-2-700
	30"-0-200	-2-1,400
	0-400	0-2,800
Connection		
Inlet	CGA per gas application	
Outlet	1/4" FNPT or variable Compression fitting	
Operating Temperature	-40°-+60°C	-40°-140°F
Weight*	2.1 kg	4.6 lb

*variable based on outlet option

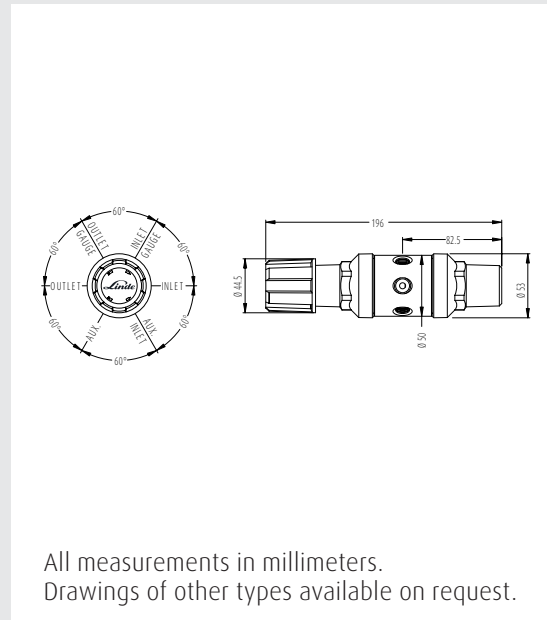
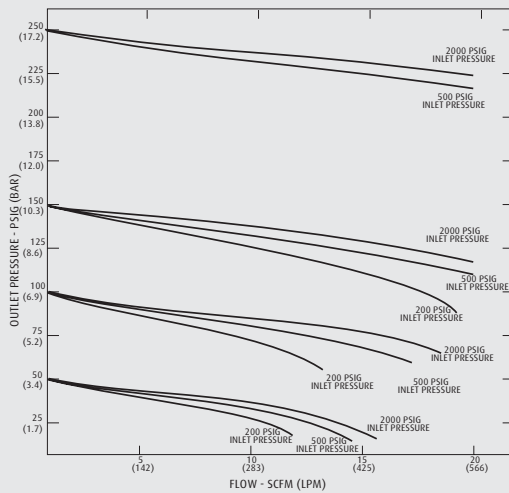
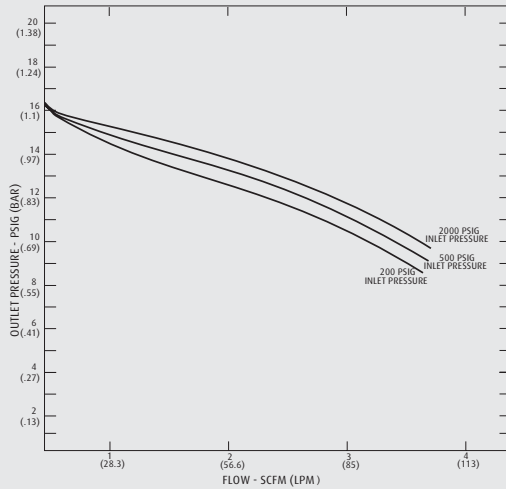
Flow Capacity (Cv) 0.1

Materials of Construction

Housing/Body	Chrome plated brass barstock with chrome plated zinc bonnet
Diaphragm	Stainless steel 316L
Seals	PCTFE
Seat	PCTFE
Filter	10 micron sintered bronze
Outlet Valve	Available with diaphragm or needle valve outlet



BASELINE™ CH1062 – High Pressure Dual Stage Cylinder Regulator



All measurements in millimeters.
Drawings of other types available on request.

Model	Material of Construction	Outlet Range	Outlet Valve	Connection	
				Inlet	Outlet
CH1062	B – Brass	050	A – diaphragm	CGA	N4 1/4" FNPT
	S – Stainless Steel	100	B – needle valve		C4 1/4" compression
		150	C – no valve		C8 1/8" compression
		250			C3 3/8" compression

Regulators

BASELINE™ R104

Four-Port Line Regulator

Description

The BASELINE™ R104 Series Line regulator is intended for secondary pressure control of non-corrosive, high purity or liquefied gases up to grade 5.0.

Available in either Chrome plated Brass (B), or 316 Stainless Steel (S), the R104 offers outlet pressure control up to 500 psig/3,450 kPa, and is available with diaphragm shutoff valve (A), control needle outlet valve (B) or 1/4" FNPT (C).

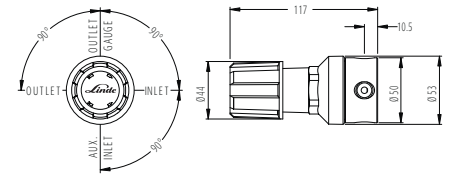
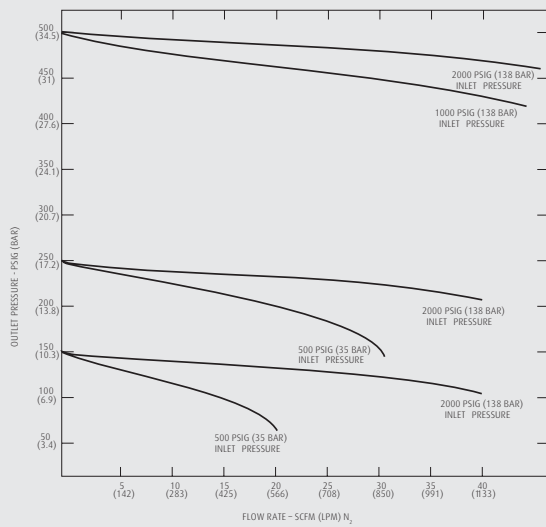
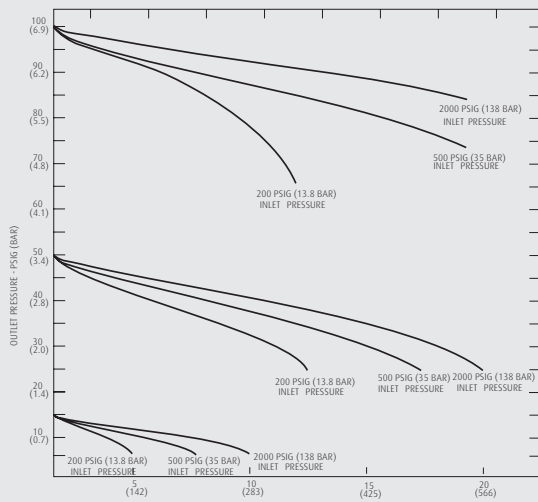
Where required, the R104 can be supplied with applicable TSSA/CRN registration.

Technical Data

	psig	kPa
Max Inlet Pressure	3,000	20,700
Inlet Pressure Gauge	-	-
Outlet Ranges	0-15	0-100
	0-50	0-340
	0-100	0-690
	0-150	0-1,030
	0-250	0-1,720
	0-500	0-3,450
Connection		
Inlet	1/4" FNPT or variable compression fitting	
Outlet	1/4" FNPT or variable compression fitting	
Operating Temperature	-40°-+60°C	-40°-140°F
Weight*	0.9 kg	1.9 lb
<i>*variable based on outlet option</i>		
Flow Capacity (Cv)	0.1 for outlet pressure below 50 psig/340 kPa 0.2 for outlet pressure above 50 psig/340 kPa	
Materials of Construction		
Housing/Body	Chrome plated brass barstock with chrome plated zinc bonnet or 316L stainless steel with chrome plated zinc bonnet	
Diaphragm	Stainless steel 316L	
Seals	PTFE	
Seat	PTFE	
Filter	10 micron sintered bronze	
Outlet Valve	Available with diaphragm or needle valve outlet	



BASELINE™ R104 – Four Port Line Regulator



All measurements in millimeters.
 Drawings of other types available on request.

Model	Material of Construction	Outlet Range	Outlet Valve	Connection	
				Inlet	Outlet
R104	B – Brass	015	A – diaphragm	N4 1/4" FNPT	N4 1/4" FNPT
	S – Stainless Steel	050	B – needle valve	C4 1/4" compression	C4 1/4" compression
		100	C – no valve	C3 3/8" compression	C3 3/8" compression
		150			
		250			
500					

Regulators

Model C81-2

Dual-Stage General Purpose Low Delivery Pressure Brass Regulator

Description

General-purpose regulator designed to reduce full cylinder pressure (maximum 3,000 psig/20,700 kPa) down to very low working pressures (0.1 to 2 psig).

Applications

- Regulation of fuel supply to burners.
- Purging low-pressure environmental chambers.
- Maintaining low pressure blankets of inert gas on fuel and chemical storage facilities

Design Features/Components

- General purpose forged brass body
- 2 1/2" inlet and delivery pressure gauges
- Equipped with outlet needle valve
- Porous metal filter protects seat from contamination
- 1/4" MNPT outlet connection

Ordering Information

Model*	Delivery Pressure Range	Delivery Pressure Gauge	Cylinder Pressure Gauge
C81-2-CGA	0.1 – 2 psig	0.1 – 3 psig	0 – 3,000 psig

*Note: Some CGA limitations may apply.

Options

Model	Description
CON-0208-B0	1/4" Compression Tube Outlet Connection (Brass)

Technical Data

	psig	kPa
Max Inlet Pressure	3,000 psig	20,700 kPa
Flow Capacity (Cv)	0.53	
Operating Temperature	-29°–60°C	-20°–140°F
Porting (Regulator Body)	1/4" FNPT	
Porting Configuration	2 High, 2 Low	
Shipping Weight	3.2 kg	7 lbs
Materials of Construction		
Gauges	Chrome plated brass	
Body	Chrome plated forged brass	
Bonnet	Chrome plated forged brass (1 st and 2 nd stages)	
Diaphragms	First Stage – Neoprene Second Stage – Neoprene	
Seats	First Stage – PTFE Second Stage – PTFE	
Seals	Neoprene/Teflon	



Models C3030 and C3040

Single-Stage High-Purity/High Delivery Pressure Brass Regulators

Description

High-purity brass regulators designed for delivery pressures up to 2,500 psig.

Applications

- Applications requiring delivery pressures up to 2,500 psig
- Delivery of gas to manufacturing processes, charging of systems, purging

Design Features/Components

- High-purity brass barstock body
- 316 stainless steel piston (Model C3030 and C3040 Series)
- 2 1/2" inlet and delivery pressure gauges
- Equipped with outlet needle valve
- 1/4" MNPT outlet connection
- Porous metal filter protects seat from contamination
- Panel mountable

Ordering Information

Model	Delivery Pressure Range	Delivery Pressure Gauge	Cylinder Pressure Gauge
C3030-CGA	100-1,500 psig	0-2,000 psig	0-4,000 psig
C3040-CGA	100 - 2,500 psig	0-3,000 psig	0-4,000 psig

Options

Model	Description
ADP-0163-BO	Bonnet Vent Fitting to 1/8" Hose
ADP-0162-BO	Bonnet Vent Adapter to 1/8" FNPT
KIT-0204-SA	Bonnet Panel Mounting Kit

Technical Data

	psig	kPa
Maximum Inlet Pressure	3,000	20,700
Maximum Flow Rate (at 2,500 psig, N ₂)		
Model 3030	4,600 SCFH	2,170 SLPM
Model 3040	4,600 SCFH	2,170 SLPM
Flow Capacity (Cv)	0.06	
Operating Temperature	-26°-74°C	-15°-165°F
Porting (Regulator Body)	1/4" FNPT	
Porting Configuration	2 High, 2 Low	
Shipping Weight	2.3 kg	5 lbs
Materials of Construction		
Gauges	Chrome plated brass	
Body	Nickel plated brass barstock	
Bonnet	Nickel plated brass	
Piston	316 stainless steel	
Seat	Kel-F 81	
Seals	Teflon and Viton A	



Regulators

Models C3060 and C3060S Series

Single-Stage High-Purity/High Delivery Pressure Brass and Stainless Steel Regulator

Description

High purity brass or stainless steel regulators designed for delivery pressures up to 6,000 psig.

Applications

- Applications requiring up to 6,000 psig delivery pressure
- Delivery of gas to manufacturing processes, charging of systems, purging

Design Features/Components

- High purity brass (C3060 Series) or stainless steel barstock (C3060S) body
- High-purity 303 stainless steel pistons
- 2 1/2" (C3060 Series) or 2" (C3060S Series) inlet and delivery pressure gauges
- Equipped with outlet needle valve (models with CGA connections)
- 1/4" compression fitting
- Porous metal filter protects seat from contamination
- Cleaned for oxygen service to 3,000 psig maximum
- Self-relieving (for use with inert gases)

Ordering Information

Model	Delivery Pressure Range	Delivery Pressure Gauge	Cylinder Pressure Gauge
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Brass Regulators*

C3064-1/4	200–4,000 psig	0–5,000 psig	0–7,500 psig
C3066-1/4	200–6,000 psig	0–7,500 psig	0–7,500 psig
C3064-CGA	200–4,000 psig	0–5,000 psig	0–7,500 psig
C3066-677	200–6,000 psig	0–7,500 psig	0–7,500 psig

*Note: Some CGA limitations may apply.

Stainless Steel Regulators*

C3064S-1/4	200–4,000 psig	0–5,000 psig	0–10,000 psig
C3066S-1/4	200–6,000 psig	0–10,000 psig	0–10,000 psig
C3064S-CGA	200–4,000 psig	0–5,000 psig	0–10,000 psig
C3066S-677	200–6,000 psig	0–10,000 psig	0–10,000 psig

*Note: Some CGA limitations may apply.

Technical Data

	psig	kPa
Maximum Inlet Pressure		
Model C3060 Series	6,000 psig	41,400 kPa
Model C3060S Series	10,000 psig	69,000 kPa
Maximum Flow Rate (at 5,000 psig, N ₂)	Model C3064 9,600 SCFH (4,531 SLPM)	
Flow Capacity (Cv)	0.06	
Operating Temperature	-40°–74°C	-40°–165°F
Porting (Regulator Body)	1/4" FNPT	
Porting Configuration	2 High, 2 Low	
Shipping Weight	3.6 kg	8 lbs
Materials of Construction		
	C3060 Series	C3060S Series
Gauges	Nickel plated brass	316 Stainless steel
Body	Nickel plated brass barstock	303 Stainless steel
Bonnet	Nickel plated brass	Nickel plated brass
Piston	303 Stainless steel	303 Stainless steel
Seat	Vespel	Vespel
Seals	Viton/teflon	Viton/teflon



Model C3200 Series

Single-Stage High-Purity/High Flow Brass and Stainless Steel Regulator

Description

High-purity regulators for use with high flow rate applications.

Applications

- Applications requiring a high flow rate, such as purging of large reactor or storage vessels.

Design Features/Components

- High-purity nickel plated brass barstock or 316 stainless steel body
- 316 stainless steel diaphragm
- Panel mountable
- Bonnets are ported and threaded to pipe gases away from the work area
- Available as an in-line regulator or a cylinder regulator

Ordering Information

Model	Delivery Pressure Range	Delivery Pressure Gauge
Stainless Steel In-Line Regulator Models		
C3200	0-50 psig	0-100 psig
C3201	0-100 psig	30"-0-200 psig
C3203	0-150 psig	30"-0-300 psig
C3204	0-250 psig	0-400 psig
Brass In-Line Regulator Models		
C3240	0-50 psig	0-100 psig
C3241	0-100 psig	30"-0-200 psig
C3243	0-150 psig	0-400 psig
C3244	0-250 psig	0-400 psig

Cylinder Regulator Models

Model	Delivery Pressure Range	Delivery Pressure Gauge	Cylinder Pressure Gauge
Stainless Steel Models			
C3200-CGA	0-50 psig	0-100 psig	0-3000 psig
C3201-CGA	0-100 psig	30"-0-200 psig	0-3000 psig
C3203-CGA	0-150 psig	30"-0-300 psig	0-3000 psig
C3204-CGA	0-250 psig	0-400 psig	0-3000 psig
Brass Models			
C3240-CGA	0-50 psig	0-100 psig	0-3000 psig
C3241-CGA	0-100 psig	30"-0-200 psig	0-3000 psig
C3243-CGA	0-150 psig	0-400 psig	0-3000 psig
C3244-CGA	0-250 psig	0-400 psig	0-3000 psig

Available CGA's: Brass: 320, 346, 580, 590. Stainless Steel: 320, 326, 330, 346, 580, 590, 660, 705

Technical Data

	In-Line Regulator	Cylinder Regulator
Maximum Inlet Pressure	3,000 psig (20,700 kPa)	3,000 psig (20,700 kPa)
Maximum Flow Rate (at 2,500 psig N₂)	Delivery Pressure 50 psig (340 kPa) 100 psig (690 kPa) 125 psig (860 kPa) 200 psig (740 kPa)	Flow Rate 6,000 SCFH (2,832 SLPM) 9,000 SCFH (4,248 SLPM) 12,000 SCFH (5,664 SLPM) 15,000 SCFH (7,080 SLPM)
Flow Capacity (Cv)	1.0	1.0
Operating Temperature	-40°-74°C (-40°-165°F)	-40°-74°C (-40°-165°F)
Inlet Ports	1/2" FNPT	1/2" FNPT
Outlet Ports	1/2" FNPT	1/2" FNPT
Outlet Connection	-	1/2" compression
Gauge Ports	1/4" FNPT	1/4" FNPT
Bonnet Vent Port	1/16" FNPT	1/16" FNPT
Shipping Weight	1.8 kg (4 lbs)	2.3 kg (5 lbs)
Materials of Construction		
Body	316 stainless steel or nickel plated brass barstock	
Bonnet	Stainless steel	
Diaphragm	Teflon lined 316 stainless steel	
Seat	Kel-F 81	
Seals	Teflon	



Regulators

Model C3210 Series

Single-Stage Deluxe Corrosion Resistant Monel Regulator

Description

Corrosive service regulators constructed of Monel for superior corrosion resistance.

Applications

- Pressure regulation of acid forming halogen gases, such as hydrogen bromide, hydrogen chloride, hydrogen fluoride, and silicon tetrafluoride; and fluorine (Model C3225A)
- Dispensing of corrosive calibration gases
- Research and development applications where a corrosion resistant regulator is required for either corrosive ambient conditions or corrosive gas service
- Applications requiring extended regulator lifespan in severe conditions

Design Features/Components

- Monel construction for excellent corrosion resistance
- Kel-F seat material for use with chlorinated compounds
- Bronze filled Teflon® for fluorinated compounds (Model C3225A)
- 2 1/2" Monel gauges
- Equipped with Monel needle valve on outlet
- Porous metal filter protects seat from contamination
- 1/4" MNPT outlet connection
- 1/4" Monel compression fitting available as an option

Ordering Information

Model*	Delivery Pressure Range	Delivery Pressure Gauge	Cylinder Pressure Gauge
C3215A -CGA	1-50 psig	0-100 psig	None
C3216A -CGA	3-200 psig	0-300 psig	None
C3217A -CGA	1-50 psig	0-100 psig	0-1,000 psig
C3218A -CGA	3-200 psig	0-300 psig	0-1,000 psig
C3219A -CGA	1-50 psig	0-100 psig	0-3,000 psig
C3220A -CGA	3-200 psig	0-300 psig	0-3,000 psig
C3225A -670	1-50 psig	0-100 psig	0-1,000 psig
C3225A -679	1-50 psig	0-100 psig	0-1,000 psig

*Note: Some CGA limitations may apply.

Options

Model	Description
4755-CGA	Tee Purge Assembly
4775-CGA	Cross Purge Assembly
CON-0208-MA	1/4" Monel Compression Fitting
402	Check Valve - Monel

Technical Data

	psig	kPa
Maximum Inlet Pressure	3,000	20,700
Model C3225A	1,000	6,900
Maximum Flow Rate (at 2,000 psig, N ₂)		
Model C3215A, C3217A, and C3219A	1,500 SCFH	700 SLPM
Model C3216A, C3218A, C3220A	600 SCFH	280 SLPM
Model C3225A	450 SCFH	210 SLPM
Flow Capacity (Cv)	0.195	
Operating Temperature	7°-66°C	-20°-150°F
Porting (Regulator Body)	1/4" FNPT	
Porting Configuration	2 High, 2 Low	
Shipping Weight	2.7 kg	6 lbs
Materials of Construction		
Gauges	Monel	
Body	Monel	
Bonnet	Chrome-plated brass	
Diaphragm	Monel	
Valve Stem	Monel	
Valve Spring	Monel	
Seat	Kel-F	
Seat (Model C3225A)	Bronze filled Teflon®	
Seals	Kel-F	



Model C3700 Series

Technical Data

Low Pressure Line Regulator

Description

General-purpose line regulators designed for low inlet pressure and low delivery pressure applications with non-corrosive gases.

Applications

- Control of constant fuel burner flame
- Inert gas blanketing at low pressures

Design Features/Components

- Zinc body
- Rubber diaphragm
- 2 1/2" delivery pressure gauge
- Porous metal filter protects seat from contamination
- 1/4" MNPT inlet/outlet connection with loose hose barb
- Pressure adjusting screw protected by "security cap"

Ordering Information

Model*	Delivery Pressure Range	Delivery Pressure Gauge
C3701	2–25" water column	0–35" water column
C3702	0.5–5.0 psig	0-10-30 psig*
C3703	5–10 psig	0-10-30 psig*

*Compressed resolution between 10–30 psig

** The Model 3700 Series cannot be supplied with CGA connections.

Options

Model	Description
6005-3232	Hose Assembly to connect inlet of Model 3700 Series to outlet of other regulators. Maximum pressure: 250 psig

	psig	kPa
Max Inlet Pressure	250	1,720
Maximum Flow Rate (at 200 psig, N ₂)	Model 3701: Less than 35 SLPM Model 3702: 260 SCFH (123 SLPM) Model 3703: 350 SCFH (165 SLPM)	
Flow Capacity (Cv)	0.8	
Operating Temperature	-40°–65°C	-40°–150°F
Porting (Regulator Body)	1/4" FNPT	
Materials of Construction		
Gauges	Chrome plated brass	
Body	Cast zinc	
Bonnet	Die cast zinc	
Diaphragms	Natural rubber	
Seats	Natural rubber	
Seals	Natural rubber	



Regulators

Model R480 Series

Single Stage High Flow Regulator for Corrosive Gases

Description

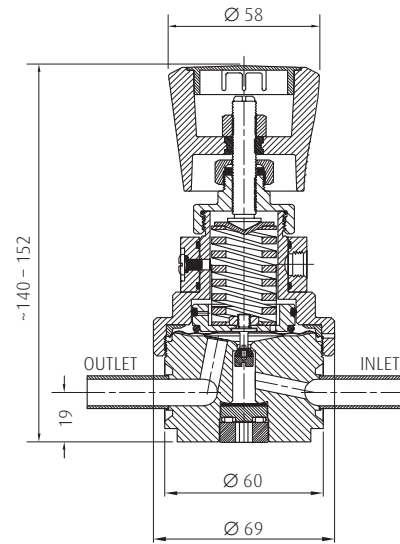
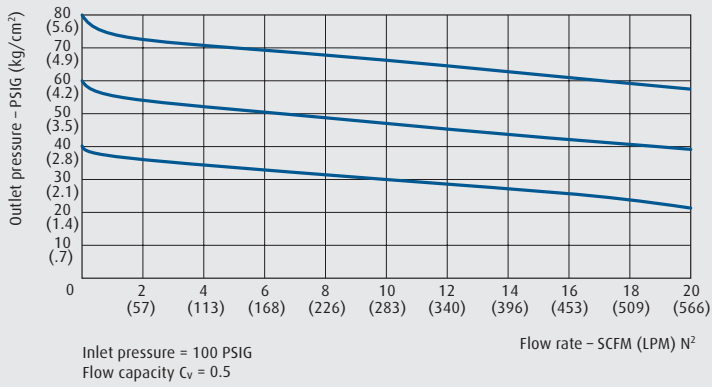
The R480 regulators are intended for primary pressure control of corrosive gases at high flow levels. The regulator has an internally springless and threadless design and positive shut-off seal, tied diaphragm design with positionable captured vent bonnet. Other advantages are: excellent leak integrity (created by metal to metal diaphragm to body seal) and smooth unobstructed flow path that allows for complete purging.



Technical Data

	psig	kPa
Max primary pressure	3,500	24,000
Outlet pressure	0-30 0-60 0-100 0-150	0-200 0-400 0-690 0-1,030
Inboard leak rate	10^{-9} atm C/sec He	
Connection	Welded tube stubbs	
Operating temperature	-40°-180°C	-40°-350°F
Materials of Construction		
Housing	Stainless steel 316L/Hastelloy®	
Seals	Stainless steel 316L/Hastelloy®	
Diaphragm	Stainless steel 316L/Hastelloy®	
Seating	Vespel®	

Model R480 – Single Stage High Flow Regulator for Corrosive Gases



All measurements in millimeters.
Drawings of other types available on request.

Model	Material of Construction	Outlet Range	Outlet Valve
R480	S – Stainless Steel	030	C – no valve
	H – Hastelloy	060	
		100	
		150	

Regulators

HiQ® REDLINE C200/1

Single Stage Cylinder Regulator

Description

The REDLINE C200/1 Series single stage cylinder regulator has been designed for use with specialty gases where demands for purity integrity, tightness and safety are high. When inlet pressure drops by 145 psig, outlet pressure will rise by less than 1.5 psig.

Available in either Chrome plated Brass (B), or 316 Stainless Steel (S), the C200/1 offers outlet pressure control up to 500 psig/ 3,450 kPa, and is available with diaphragm shutoff valve (A) or 1/4" FNPT (C).

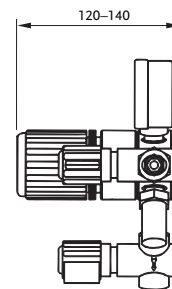
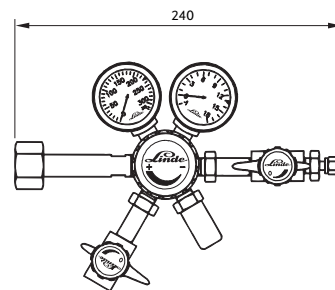
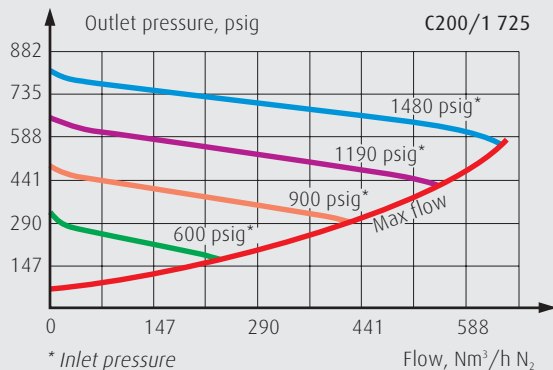
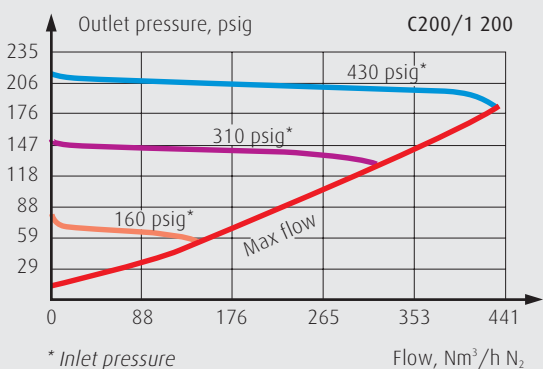
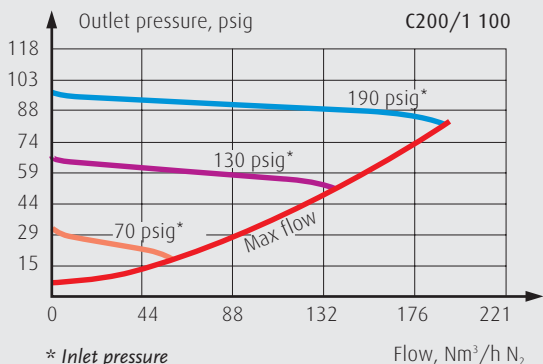
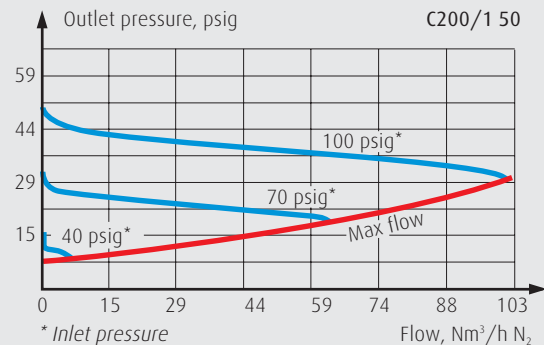
For corrosive gas applications use of a S203 gas panel is recommended.

Technical Data

	psig	kPa
Max Inlet Pressure	3,300	23,000
Inlet Pressure Gauge	4,500	31,000
Flow Capacity (Cv)		0.1
Outlet Ranges	0-50 0-100 0-200 0-725	0-340 0-690 0-1,720 0-6,240
Outlet Gauge Range	-15-75 -15-150 0-360 0-1,150	-100-510 -100-1,030 0-2,540 0-8,110
Connection		
Inlet	CGA per gas application	
Outlet	1/4" FNPT or variable compression fitting	
Operating Temperature	-40°-60°C	-40°-140°F
Weight*	1.5 kg	3.3 lb
<i>*variable based on outlet option</i>		
Materials of Construction		
Housing/Body	Ni/cr plated brass with chrome plated bonnet or 316L stainless steel with chrome plated bonnet	
Diaphragm	Hastelloy®	
Seals	PVDF PCTFE	
Seat	PCTFE	
Outlet Valve	Available with diaphragm valve	



HiQ® REDLINE C200/1 – Single Stage Cylinder Regulator



All measurements in millimeters.
Drawings of other types available on request.

Model	Material of Construction	Outlet Range	Outlet Valve	Connection	
				Inlet	Outlet
C200/1	B – Brass	050	A – diaphragm	CGA	N4 1/4" FNPT
	S – Stainless Steel	100	C – no valve		C4 1/4" compression
		200			C8 1/8" compression
		725			C3 3/8" compression

Regulators

HiQ® REDLINE C200/2

Dual Stage Cylinder Regulator

Description

The REDLINE C200/2 Series dual stage cylinder regulator has been designed for use with specialty gases where demands for purity, integrity, tightness and safety are high. The C200/2 dual stage cylinder regulator is preferred in applications that require constant pressure control, regardless of source supply pressure. When inlet pressure drops by 145 psig, outlet pressure will rise by less than 0.1 psig.

Available in either Chrome plated Brass (B), or 316 Stainless Steel (S), the C200/2 offers outlet pressure control up to 200 psig/ 1,720 kPa, and is available with diaphragm shutoff valve (A) or 1/4" FNPT (C).

For corrosive gas applications use of a S203 gas panel is recommended.

Technical Data

	psig	kPa
Max Inlet Pressure	3,300	23,000
Inlet Pressure Gauge	4,500	31,000
Flow Capacity (Cv)		0.1
Outlet Ranges	0-50	0-340
	0-100	0-690
	0-150	0-1,030
Outlet Gauge Range	-15-75	-100-510
	-15-150	-100-1,030
	-15-260	-100-1,830
Connection	CGA per gas application	
Inlet	1/4" FNPT or variable	
Outlet	compression fitting	
Operating Temperature	-40°-+60°C	-40°-140°F
Weight*	1.5 kg	3.3 lb

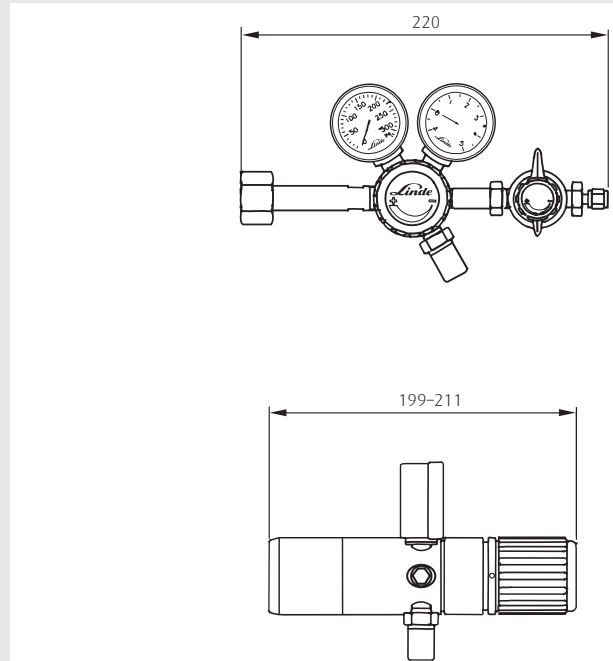
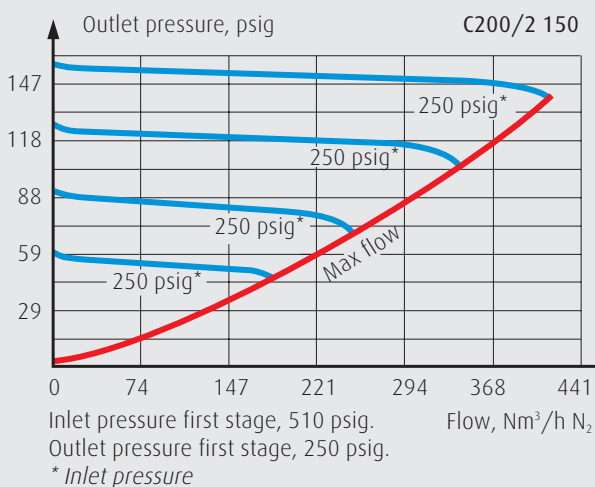
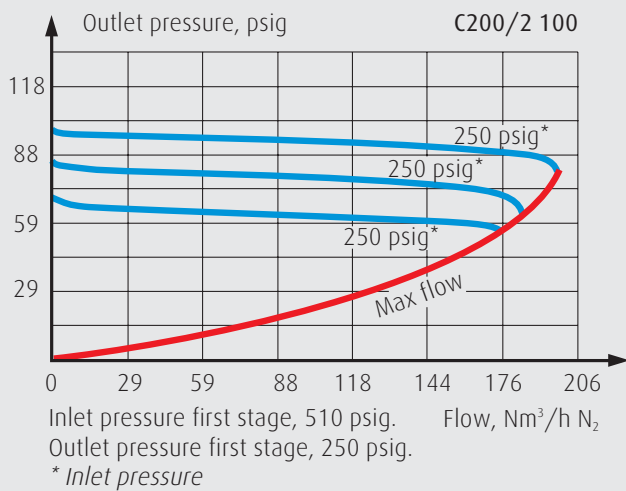
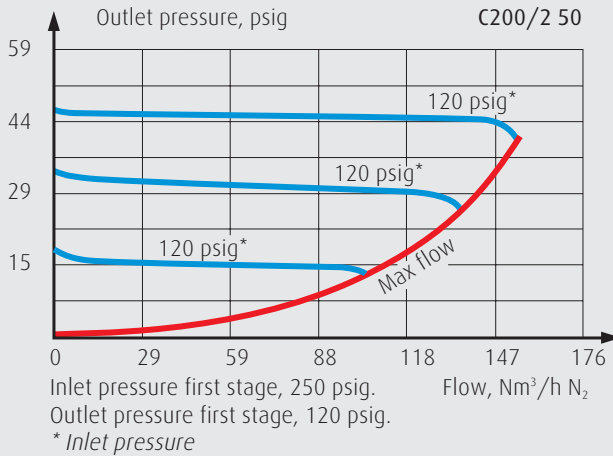
*variable based on outlet option

Materials of Construction

Housing/Body	Ni/cr plated brass with chrome plated bonnet or 316L stainless steel with chrome plated bonnet	
Diaphragm	Hastelloy®	
Seals	PVDF	PCTFE
Seat	PCTFE	
Outlet Valve	Available with diaphragm valve	



HiQ® REDLINE C200/2 – Dual Stage Cylinder Regulator



All measurements in millimeters.
Drawings of other types available on request.

Model	Material of Construction	Outlet Range	Outlet Valve	Connection	
				Inlet	Outlet
C200/2	B - Brass	050	A - diaphragm	CGA	N4 1/4" FNPT
	S - Stainless Steel	100	C - no valve		C4 1/4" compression
		150			C8 1/8" compression
					C3 3/8" compression

Regulators

HiQ® REDLINE C12HV/1

Single Stage Cylinder Regulator

Description

The REDLINE C12HV/1 Series single stage cylinder regulator has been designed for use with specialty gases where demands for purity integrity, tightness and safety are high. When inlet pressure drops by 145 psig, outlet pressure will rise by less than 1.5 psig.

Available in either Chrome plated Brass (B), or 316 Stainless Steel (S), the C12HV/1 offers outlet pressure control up to 50 psig/ 340 kPa, and is available with diaphragm shutoff valve (A) or 1/4" FNPT (C).

Technical Data

	psig	kPa
Max Inlet Pressure	175	1,200
Outlet Pressure (abs.)	1.5–30 3–50	10–200 20–340
Outlet Gauge Range	-15–50 -15–75	-100–340 -100–510
Max Flow (N ₂)	84 SCFH	40 SLPM
Connection		
Inlet	CGA per gas application	
Outlet	1/4" FNPT or variable compression fitting	
Operating Temperature	-40°–50°C	-40°–122°F
Weight*	1.5 kg	3.3 lb

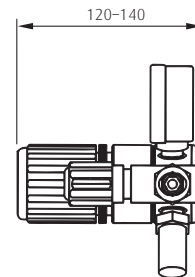
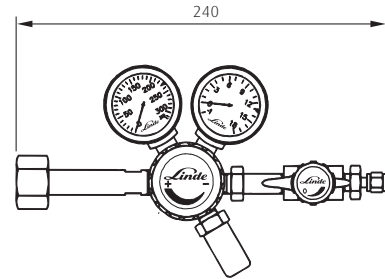
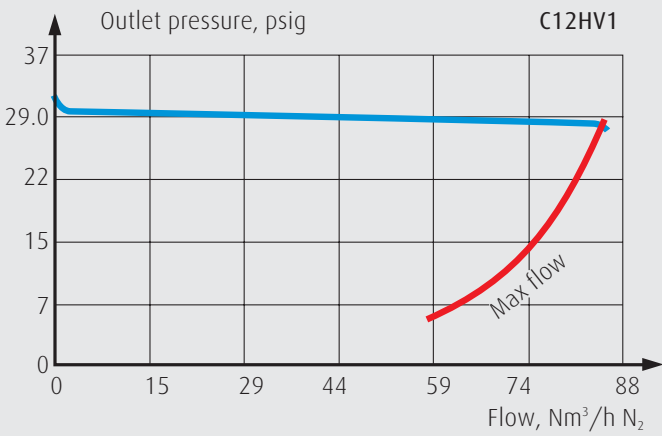
*variable based on outlet option

Materials of Construction

Housing/Body	Ni/cr plated brass with chrome plated bonnet or 316L stainless steel with chrome plated bonnet	
Seals	PVDF	PCTFE
Membrane	Hastelloy®	
Seat	PCTFE	
Outlet Valve	Available with diaphragm valve	



HiQ® REDLINE C12HV/1 – Single Stage Cylinder Regulator



All measurements in millimeters.
Drawings of other types available on request.

Model	Material of Construction	Outlet Range	Outlet Valve	Connection	
				Inlet	Outlet
C12HV/1	B - Brass	030	A - diaphragm	CGA	N4 1/4" FNPT
	S - Stainless Steel	050	C - no valve		C4 1/4" compression
					C8 1/8" compression
					C3 3/8" compression

Regulators

HiQ® REDLINE R200/1

Single Stage Line Regulator

Description

The REDLINE R200/1 Series line regulator intended for use as a second pressure regulating step in a central gas supply system. It is especially developed for pure gases and gas mixtures. The membrane is in Hastelloy® so that diffusion into the system is minimized. Three different outlet pressure ranges offer great flexibility for point of use applications. When inlet pressure drops by 145 psig, outlet pressure will rise by less than 1.5 psig.

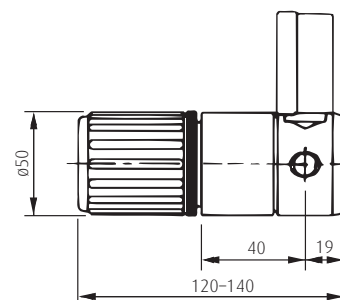
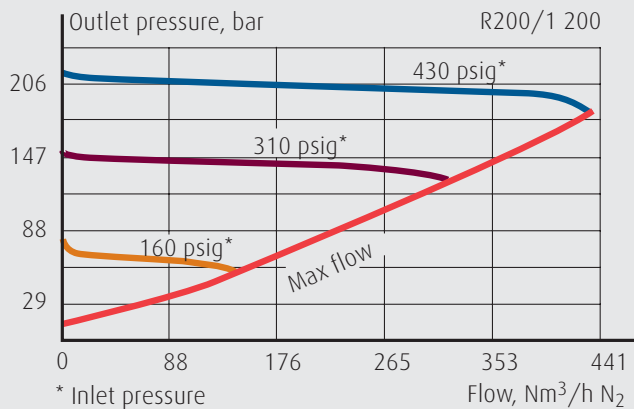
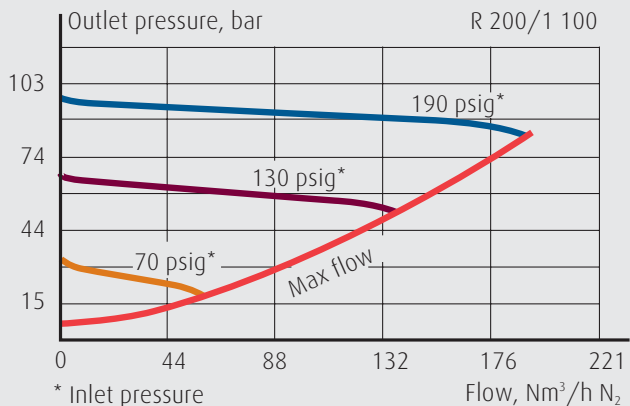
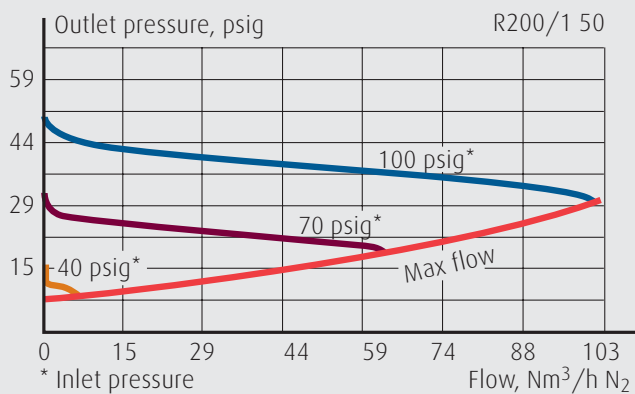
Available in either Chrome plated Brass (B), or 316 Stainless Steel (S), the R200/1 offers outlet pressure control up to 250 psig/ 2,720 kPa, and is available with diaphragm shutoff valve (A) or 1/4" FNPT (C).



Technical Data

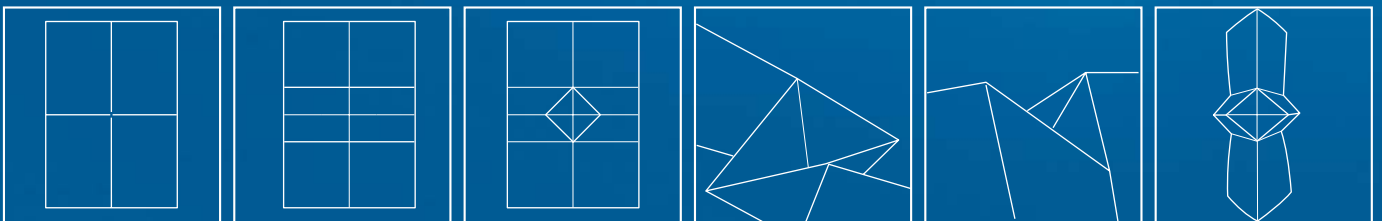
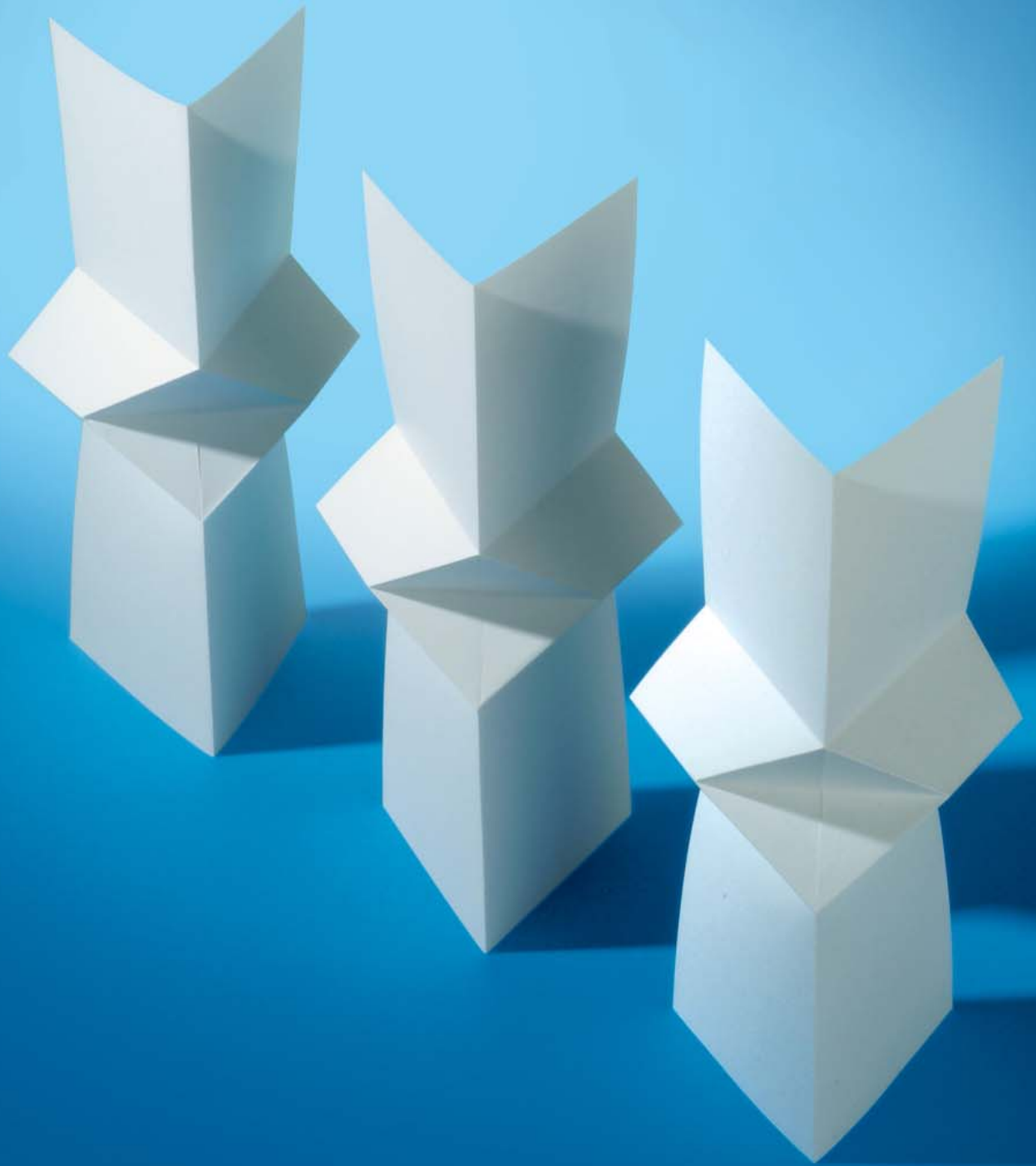
	psig	kPa
Max primary pressure	3,300	23,000
Outlet pressure	0-50 0-100 0-200	0-340 0-690 0-1,220
Outlet gauge range	-15-75 -15-150 -15-260	-1-500 -1-1,030 -1-1,720
Connections	1/4" FNPT or variable compression fitting	
Operating temperature	-40°-50°C	-40°-122°F
Weight	1.3 kg	2.9 lb
Materials of Construction		
Housing/Body	Ni/cr plated brass with chrome plated bonnet or 316L stainless steel with chrome plated bonnet	
Seals	PVDF	PCTFE
Membrane	Hastelloy®	
Seating	PCTFE	

HiQ® REDLINE R200/1 – Single Stage Regulator



All measurements in millimeters.
 Drawings of other types available on request.

Model	Material of Construction	Outlet Range	Outlet Valve	Connection	
				Inlet	Outlet
R200/1	B – Brass	50	A – diaphragm	N4 1/4" FNPT	N4 1/4" FNPT
	S – Stainless Steel	100	C – no valve	C4 1/4" compression	C4 1/4" compression
		200		C3 3/8" compression	C3 3/8" compression



Switchovers and Gas Panels

Specialty Gases place particular demands on components for control, distribution and monitoring, either through the application requiring that gas purity be maintained throughout the point of use, or because their chemical and physical properties requires special design of the central gas supply.

Linde offers a variety of supply options designed to maintain the integrity of your gas between the supply cylinder and the instrument or reactor. From simple regulator supply to a fully integrated gas supply system, Linde works with our customers to design and plan the gas supply system to meet not only today's needs, but the needs of the future.

Switchovers

BASELINE™ C701

Technical Data

Single Stage, Semi-automatic Switchover

Description

The BASELINE™ C701 Series Switchover is a semi-automatic switchover designed to supply a continuous supply of high purity, non-corrosive gas.

Available inlet options include 3' Stainless steel flex hoses (FH), manifold connectors (MA) or 1/4" FNPT (N4).

Where required, the BASELINE™ C701 can be supplied with applicable TSSA/CRN registration.

A final line regulator (/F models) may be installed on the outlet, delivering consistent pressure control.

Model	Material of Construction	Outlet Range	Connection		Process Gas Outlet
			Type	Inlet	
C701	B- Brass	100	FH2	CGA	N4 1/4" FNPT
	S - Stainless Steel	200	MA		C4 1/4" compression
		500	N4		

	psig	kPa
Max Inlet Pressure	3,000	20,700
Outlet Pressure	100	690
	200	1,740
	500	3,450

Connection

Process Gas In	1/4" FNPT
Process Gas Out	1/4" FNPT or 1/4"compression

Flow Capacity (CV) 0.1

Materials of Construction

Housing/Body Chrome Plated Brass Barstock with Chrome Plated Zinc Bonnet or 316L Stainless Steel with Chrome Plated Zinc Bonnet

Diaphragm Stainless Steel 316L

Seals PTFE

Seat PTFE

Filter 10 Micron Sintered Bronze

Operating Temperature -40--60°C -40°F-140°F



Model 539 Series IntelliSwitch™

Technical Data

IntelliSwitch™ High Flow, Cryogenic or High Pressure Supply Fully Automatic Switchover

Description

The IntelliSwitch™ electronic switchover is the next generation of gas management systems. The IntelliSwitch provides continuous gas supply from liquid cylinders, high-pressure cylinders, or a combination of the two allowing the end-user to select the most economical mode of gas supply by the touch of a button. Microprocessor control lowers yearly gas cost by eliminating liquid cylinder vent loss and excess residual return, which makes the IntelliSwitch the perfect choice for laboratory, pilot plant or process applications.

Specifications

- Microprocessor control; fully automatic priority assignment
- Field adjustable parameters enables process flexibility
- On-site source selection; liquid cylinder or high-pressure service
- Low loss technology reduces residual return
- Electronic economizer eliminates vent loss from 230, 350 or 500 PSIG liquid cylinders
- Process gas or air actuated pilot valves; simple installation
- RS 232 or 485 communications provides remote monitoring of supply

Low Loss Principle

The Low Loss Principle consists of two features, the Look-Back and the Economizer. When the IntelliSwitch electronics sense that the primary bank pressure is low, it automatically switches to the reserve bank. After a period of time, the system looks back at the depleted source to sense if it has rebuilt pressure. If it has, the system switches back and continues to draw product from this source, eliminating false switchovers and reducing residual return.

The Electronic Economizer has selectable settings for 230, 350 & 500 psig liquid cylinders. The IntelliSwitch continuously monitors the pressure in the reserve bank. When the pressure goes above the Economizer setting, the IntelliSwitch will draw gas from the headspace of the reserve bank, preventing vent losses.

	psig	kPa
Max Inlet Pressure	3,000	20,700
Power Requirements	110 or 220 VAC	
Temperature Range	-18°-60°C	0°-140°F
Flow Capacity (Cv)	1.0	
Filter	40 – micron	
Connection		
Inlet	1/2" FNPT	
Outlet	1/2" FNPT	
Weight	30 kg	67 lbs
Materials		
Regulator and Valve Bodies	Brass barstock	
Valve Stems	316L stainless steel	
Valve Seats	PTCFE	
Seals	PTFE and Viton	
Enclosure	Power-coated steel	



Ordering Information

Model	Outlet Pressure	Right Side Connections	Left Side Connections	Assembly	Inlet
539	2 0-50 psig	0 1/2" FNPT	0 1/2" FNPT	0 110 VAC External Pilot	Please specify inlet connection (if applicable) CGA; DIN 477; BS 341 and others available
	3 0-100 psig	1 Diaphragm Valve with 36" stainless flexible pigtail	1 Diaphragm Valve with 36" stainless flexible pigtail	1 220 VAC External Pilot	
	4 0-150 psig	2 Diaphragm Valve with 72" stainless flexible pigtail	2 Diaphragm Valve with 72" stainless flexible pigtail	2 110 VAC Internal Pilot	
	5 0-200 psig	3 Manifold Connector	3 Manifold Connector	3 220 VAC Internal Pilot	

Switchovers

HiQ® REDLINE A208

Single stage, semi-automatic switchover with internal gas purging, designed for high purity gases and mixtures.

Description

Gas panel A208 is a semi-automatic switchover designed for uninterrupted gas supply. Switch-over between the two connected cylinders or bundles occurs when the pressure of one side (the primary side) falls below a pre-set pressure level. This is achieved by two integrated regulators (factory-set to slightly different delivery pressure levels) which are connected at their outlet ports.

Available inlet options include 3' Stainless steel flex hoses (FH), Stainless steel coil pigtailed (CS), manifold connectors (MA) or 1/4" FNPT (N4).

Semi-automatic switchovers should be connected to an alarm so that the cylinders will be switched on time. The panel can be equipped with contact gauge (/C models) for automatic surveillance. When applicable the panel can be ordered with residual gas line (/R models) connecting the relief valve with the purge outlet.

A final line regulator (/F models) may be installed on the outlet, delivering consistent pressure control.

Technical Data

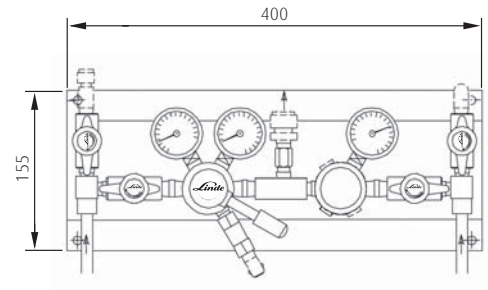
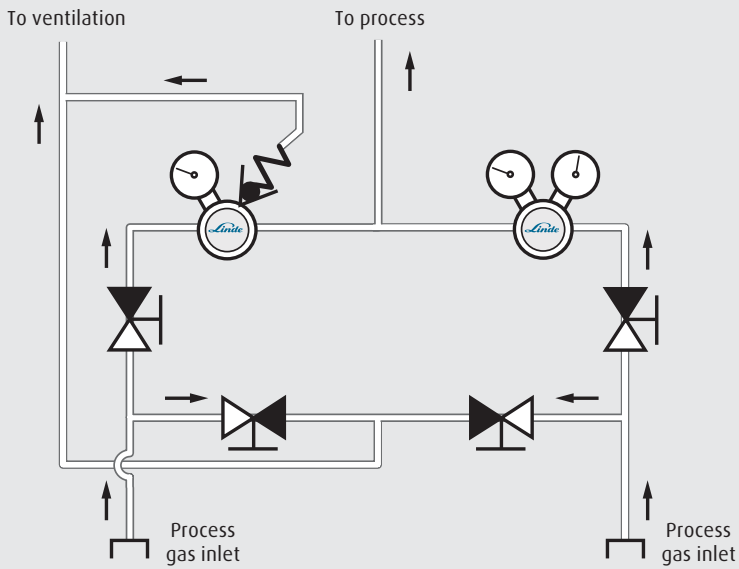
	psig	kPa
Max Inlet Pressure	3,300	23,000
Outlet pressure	8-100	50-690
	35-200	250-1,380
	35-725	250-5,000
Connection		
Process gas in	1/4" FNPT	
Process gas out	1/4" FNPT or 1/4" compression	
Purge gas outlet	1/4" compression	
Material		
Housing	Brass, Ni/Cr plated or stainless steel 316L	
Operating temperature	-20°-70°C	-4°-158°F

Highlights

- Continuous supply of pure gases
- Automatic switch over without auxiliary power
- Positive indication of active cylinder
- Process – gas purging system
- High flow capacity
- Compact design



HiQ® REDLINE A208 – Semi-automatic Switchover



All measurements in millimeters.
 Drawings of other types available on request.

Model	Materials of Construction	Outlet Range	Connections		Process Gas Outlet
			Type	Inlet	
A208	B - Brass	200	FH2	CGA	N4 1/4" FNPT
	S - Stainless Steel	725	FH4		C4 1/4" compression
			CS2		/F050
			MA		/F100
			N4		

Switchovers

HiQ® REDLINE A209

Single stage, semi-automatic switchover with external gas purging, designed for reactive, toxic and corrosive gases.

Description

Gas panel A209 is a semi-automatic switchover designed for uninterrupted gas supply. Switch-over between the two connected cylinders or bundles occurs when the pressure of one side (the primary side) falls below a pre-set pressure level. This is achieved by two integrated regulators (factory-set to slightly different delivery pressure levels) which are connected at their outlet ports.

Available inlet options include 3' Stainless steel flex hoses (FH), Stainless steel coil pigtailed (CS), manifold connectors (MA) or 1/4" FNPT (N4).

Semi-automatic switchover should be connected to an alarm so that the cylinders will be switched on time. The panel can also be equipped with contact gauge (/C models) for automatic surveillance. When applicable the panel can be ordered with residual gas line (/R models) connecting the relief valve with the purge outlet.

A final line regulator (/F models) may be installed on the outlet, delivering consistent pressure control.

Technical Data

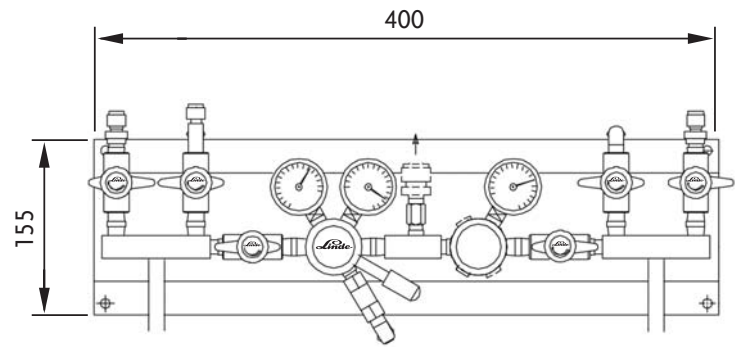
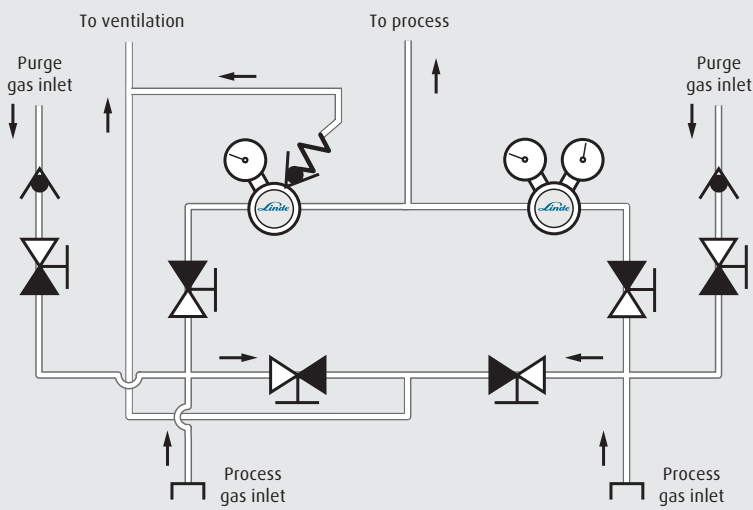
	psig	kPa
Max Inlet Pressure	3,300	23,000
Outlet pressure	8-100	50-690
	35-200	250-1,380
	35-725	250-5,000
Connection		
Process gas in	1/4" FNPT	
Process gas out	1/4" FNPT or 1/4" compression	
Purge gas outlet	1/4" compression	
Material		
Housing	Brass, Ni/Cr plated or stainless steel 316L	
Operating temperature	-20°-70°C	-4°-158°F

Highlights

- Continuous supply of pure gases
- Automatic switch over without auxiliary power
- Positive indication of active cylinder
- Process – gas cross-purging system
- High flow capacity
- Compact design



HiQ® REDLINE A209 – Semi-automatic Switchover



All measurements in millimeters.
 Drawings of other types available on request.

Model	Materials of Construction	Outlet Range	Connections		Process Gas Outlet
			Type	Inlet	
A209	B - Brass	200	FH2	CGA	N4 1/4" FNPT
	S - Stainless Steel	725	FH4		C4 1/4" compression
			CS2		/F050
			MA		/F100
			N4		

Gas Panels

HiQ® REDLINE S200

Single stage gas supply panel designed for pure gases and mixtures.

Description

Gas panel S200 is designed for single cylinders or bundles. It is mounted on a stainless steel console and consists of a pressure regulator, inlet and outlet pressure gauges, a relief valve and a shut-off valve for the process gas.

Available inlet options include 3' Stainless steel flex hoses (FH), Stainless steel coil pigtails (CS), manifold connectors (MA) or 1/4" FNPT (N4).

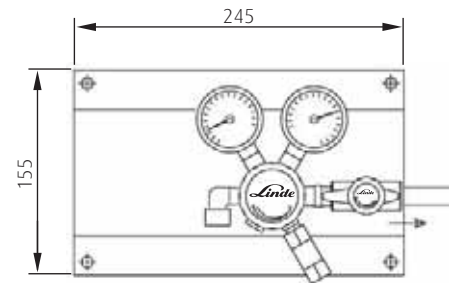
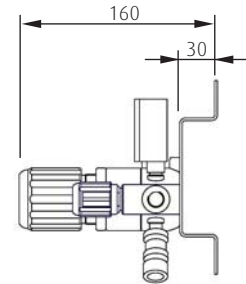
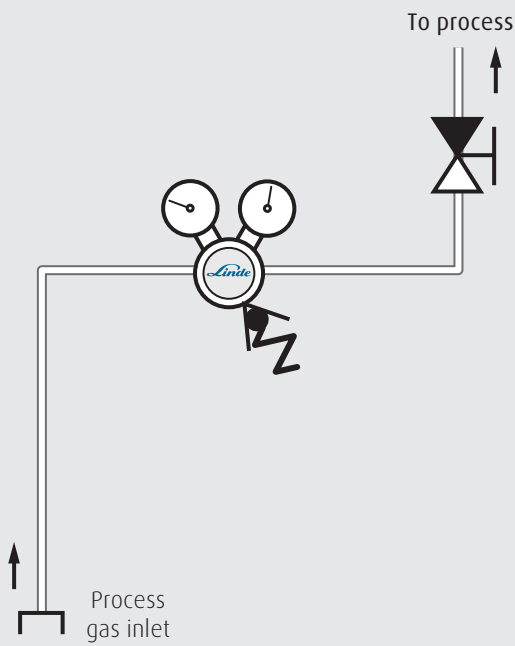
The panel can also be equipped with contact gauge (/C models) for automatic surveillance. When applicable the panel can be ordered with residual gas line (/R models) connecting the relief valve with the purge outlet.

Technical Data

	psig	kPa
Max Inlet Pressure	3,300	23,000
Outlet pressure	8-100 35-200 35-725	50-690 250-1,380 250-5,000
Outlet gauge range	-15-150 0-360 0-1,400	-100-1,030 0-2,500 0-8,100
Connection		
Process gas in	1/4" FNPT	
Process gas out	1/4" FNPT or 1/4" compression	
Material		
Housing	Brass Ni/Cr plated or Stainless steel 316L	
Seals	PCTFE	PVDF
Membrane	Hastelloy®	
Operating temperature	-20°-70°C	-4°-158°F



HiQ® REDLINE S200 – Single Gas Panel



All measurements in millimeters.
 Drawings of other types available on request.

Model	Materials of Construction	Outlet Range	Connections		Process Gas Outlet
			Type	Inlet	
S200	B - Brass	100	FH1	CGA	N4 1/4" FNPT
	S - Stainless Steel	200	CS1		C4 1/4" compression
		725	MA		
			N4		

Gas Panels

HiQ® REDLINE S201

Single stage gas supply panel with internal gas purging, designed for high purity gases and mixtures (including flammable).

Description

Gas panel S201 is designed for single cylinders or bundles. It is equipped with internal gas purging to avoid contaminants entering the process line after changing the cylinders. It is mounted on a stainless steel console and consists of a pressure regulator, inlet and outlet pressure gauges, a relief valve and shut-off valves for the process gas at the high pressure end and for the purging gas.

Available inlet options include 3' Stainless steel flex hoses (FH), Stainless steel coil pigtailed (CS), manifold connectors (MA) or 1/4" FNPT (N4).

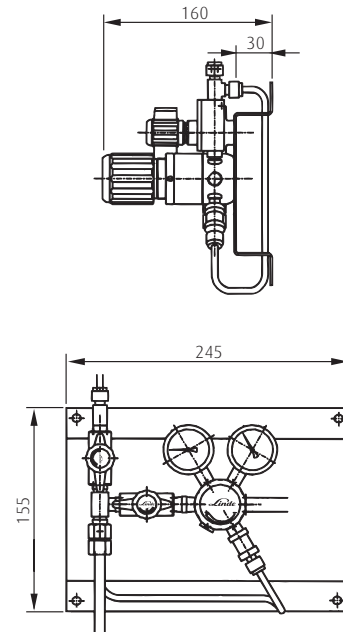
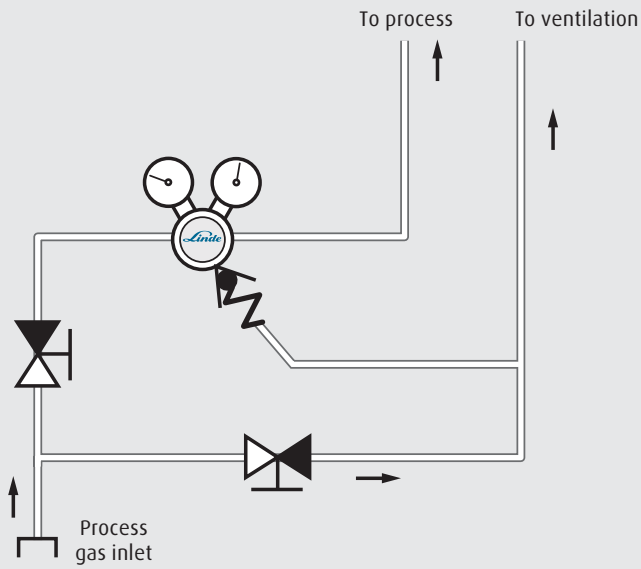
The panel can also be equipped with contact gauge (/C models) for automatic surveillance. When applicable the panel can be ordered with residual gas line (/R models) connecting the relief valve with the purge outlet.

Technical Data

	psig	kPa
Max Inlet Pressure	3,300	23,000
Outlet pressure	8-100 35-200 35-725	50-690 250-1,380 250-5,000
Outlet gauge range	-15-150 0-360 0-1,400	-100-1,030 0-2,500 0-8,100
Connection		
Process gas in	1/4" FNPT	
Process gas out	1/4" FNPT or 1/4" compression	
Purge gas outlet	1/4" compression	
Material		
Housing	Brass Ni/Cr plated or Stainless steel 316L	
Seals	PCTFE	PVDF
Membrane	Hastelloy®	
Operating temperature	-20°-70°C	-4°-158°F



HiQ® REDLINE S201 – Single Gas Panel



All measurements in millimeters.
 Drawings of other types available on request.

Model	Materials of Construction	Outlet Range	Connections		Process Gas Outlet
			Type	Inlet	
S201	B - Brass	100	FH1	CGA	N4 1/4" FNPT
	S - Stainless Steel	200	CS1		C4 1/4" compression
		725	MA		
			N4		

Gas Panels

HiQ® REDLINE S202

Single stage gas supply panel with internal gas purging, designed for pure gases and mixtures.

Description

Gas panel S202 is designed for single cylinders or bundles. It is equipped with internal gas purging to avoid contaminants entering the process line after changing the cylinders. It is mounted on a stainless steel console and consists of a pressure regulator, inlet and outlet pressure gauges, a relief valve and shut-off valves for the process gas at high and low pressure ends and for the purging gas.

Available inlet options include 3' Stainless steel flex hoses (FH), Stainless steel coil pigtailed (CS), manifold connectors (MA) or 1/4" FNPT (N4).

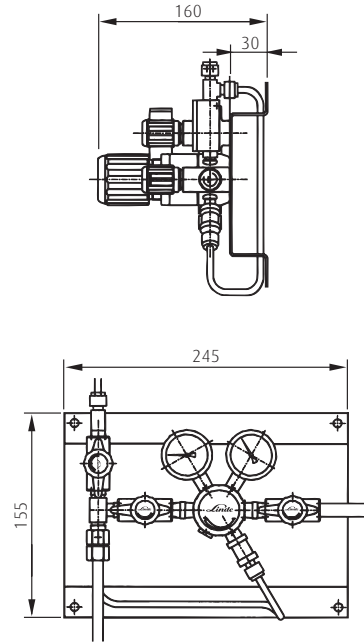
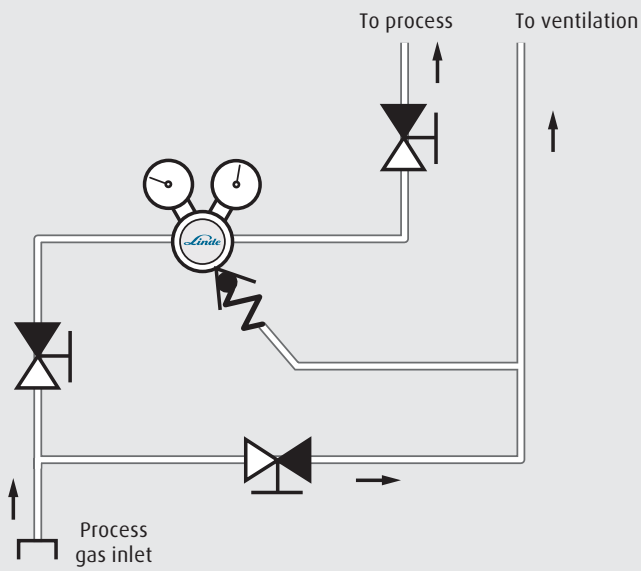
The panel can also be equipped with contact gauge (/C models) for automatic surveillance. When applicable the panel can be ordered with residual gas line (/R models) connecting the relief valve with the purge outlet.

Technical Data

	psig	kPa
Max Inlet Pressure	3,300	23,000
Outlet pressure	8-100 35-200 35-725	50-690 250-1,380 250-5,000
Outlet gauge range	-15-150 0-360 0-1,400	-100-1,030 0-2,500 0-8,100
Connection		
Process gas in	1/4" FNPT	
Process gas out	1/4" FNPT or 1/4" compression	
Material		
Housing	Brass Ni/Cr plated or Stainless steel 316L	
Seals	PCTFE	PVDF
Membrane	Hastelloy®	
Operating temperature	-20°-70°C	-4°-158°F



HiQ® REDLINE S202 – Single Gas Panel



All measurements in millimeters.
 Drawings of other types available on request.

Model	Materials of Construction	Outlet Range	Connections		Process Gas Outlet
			Type	Inlet	
S202	B - Brass	100	FH1	CGA	N4 1/4" FNPT
	S - Stainless Steel	200	CS1		C4 1/4" compression
		725	MA		
			N4		

Gas Panels

HiQ® REDLINE S203

Single stage gas supply panel with external gas purging, designed for reactive, toxic and corrosive gases.

Description

Gas panel S203 is designed for single cylinders or bundles. It is equipped with external gas purging to allow purging of the high pressure side before disconnecting cylinders. It is mounted on a stainless steel console and consists of a pressure regulator, inlet and outlet pressure gauges, a relief valve and shut-off valves for the process gas at high and low pressure ends and for the purging gas.

Available inlet options include 3' Stainless steel flex hoses (FH), Stainless steel coil pigtailed (CS), manifold connectors (MA) or 1/4" FNPT (N4).

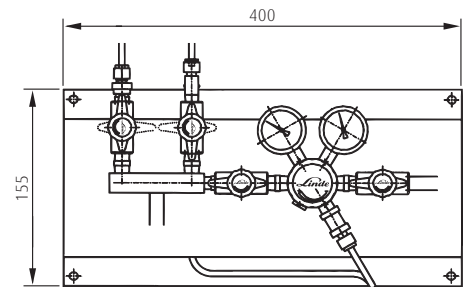
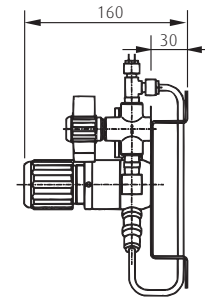
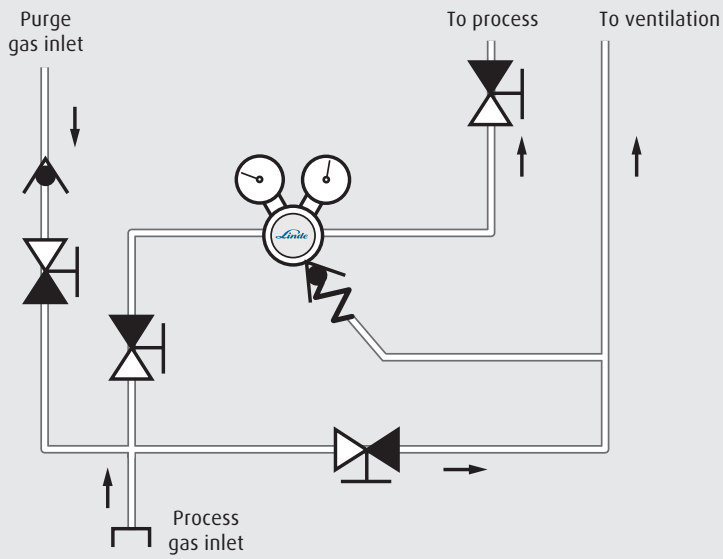
The panel can also be equipped with contact gauge (/C models) for automatic surveillance. When applicable the panel can be ordered with residual gas line (/R models) connecting the relief valve with the purge outlet.

Technical Data

	psig	kPa
Max Inlet Pressure	3,300	23,000
Outlet pressure	8-100 35-200 35-725	50-690 250-1,380 250-5,000
Outlet gauge range	-15-150 0-360 0-1,400	-100-1,030 0-2,500 0-8,100
Connection		
Process gas in	1/4" FNPT	
Process gas out	1/4" FNPT or 1/4" compression	
Purge gas inlet	1/4" compression	
Purge gas outlet	1/4" compression	
Material		
Housing	Brass Ni/Cr plated or Stainless steel 316L	
Seals	PCTFE	PVDF
Membrane	Hastelloy®	
Operating temperature	-20°-70°C	-4°-158°F



HiQ® REDLINE S203 – Single Gas Panel



All measurements in millimeters.
 Drawings of other types available on request.

Model	Materials of Construction	Outlet Range	Connections		Process Gas Outlet
			Type	Inlet	
S203	B - Brass	100	FH1	CGA	N4 1/4" FNPT
	S - Stainless Steel	200	CS1		C4 1/4" compression
		725	MA		
			N4		

Gas Panels

HiQ® REDLINE D204

Single stage gas supply panel with internal gas purging designed for high purity gases and mixtures (including flammables), with connection for 2x1 cylinder.

Description

Gas panel D204 is designed for double cylinders or bundles. It is equipped with internal gas purging to avoid contaminants entering the process line after changing the cylinders. It is mounted on a stainless steel console and consists of a pressure regulator, inlet and outlet pressure gauges, a relief valve and shut-off valves for the process gas at the high pressure end and for the purging gas. The gas supply is uninterrupted during cylinder change. Switch-over is manual.

Available inlet options include 3' Stainless steel flex hoses (FH), Stainless steel coil pigtailed (CS), manifold connectors (MA) or 1/4" FNPT (N4).

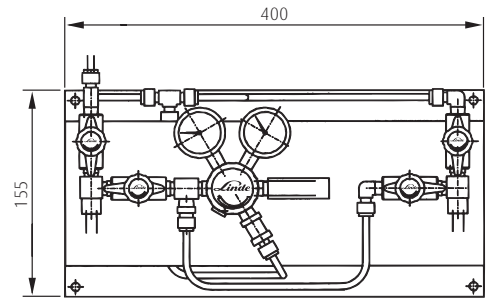
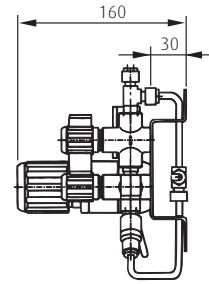
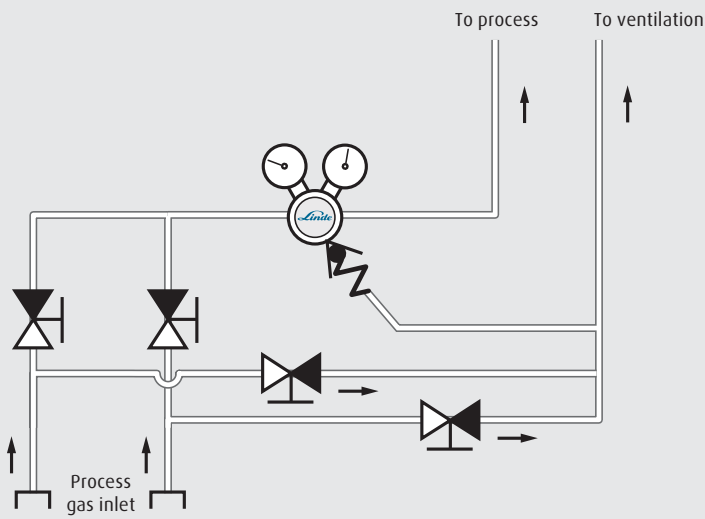
The panel can also be equipped with contact gauge (/C models) for automatic surveillance. When applicable the panel can be ordered with residual gas line (/R models) connecting the relief valve with the purge outlet.

Technical Data

	psig	kPa
Max Inlet Pressure	3,300	23,000
Outlet pressure	8-100 35-200 35-725	50-690 250-1,380 250-5,000
Outlet gauge range	-15-150 0-360 0-1,400	-100-1,030 0-2,500 0-8,100
Connection		
Process gas in	1/4" FNPT	
Process gas out	1/4" FNPT or 1/4" compression	
Material		
Housing	Brass Ni/Cr plated or Stainless steel 316L	
Seals	PCTFE	PVDF
Membrane	Hastelloy®	
Operating temperature	-20°-70°C	-4°-158°F

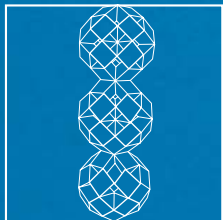
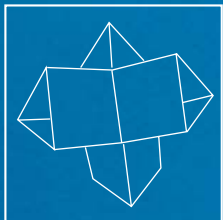
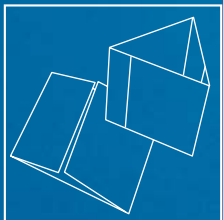
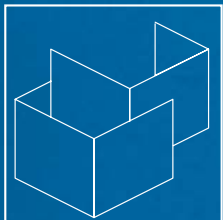
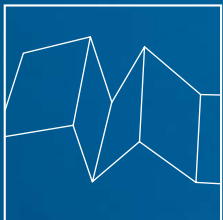


HiQ® REDLINE D204 – Double Gas Panel



All measurements in millimeters.
 Drawings of other types available on request.

Model	Materials of Construction	Outlet Range	Connections		Process Gas Outlet
			Type	Inlet	
D204	B - Brass	100	FH1	CGA	N4 1/4" FNPT
	S - Stainless Steel	200	CS1		C4 1/4" compression
		725	MA		
			N4		



HiQ® REDLINE Point of use – where all the action is

The point of use regulator is the second stage of a central gas supply system.

Together with the gas panel, it guarantees a very stable outlet pressure and handles any pressure changes that may be caused in the system. When used together with a semi-automatic switchover, it handles the pressure changes that are due to the changes from the secondary to primary side.

The HiQ® REDLINE system is a modular system which allows maximum freedom. Each point of use can be individually equipped or stripped by the functions: shut-off, pressure regulation and flow regulation. In this way the point of use at the work place can be updated at any point to fit the present needs.

HiQ® Specialty Gas Concept – the visible difference.

HiQ, the specialty gas concept from Linde, can make the difference where that difference really counts. More than just a range of high quality gases and services, this concept represents a commitment. The commitment to quality contributes directly to the success of customers, large and small, around the world. All these customers share a common need for the very highest quality.

HiQ products include gases of the highest purity or mixing accuracy as well as the equipment, gas supply systems, knowledge and service to assure the highest quality from cylinder to point of use. It's that simple. So too is the commitment – to be the best.

Flat, stable baselines. Sound bottom lines. HiQ products contribute daily to flat, stable baselines and enhanced quality. They serve in applications as varied as environmental monitoring and the analysis of packaged food shelf life. They contribute in the development of new production technologies in fields such as petrochemicals and pharmaceuticals. The further technology pushes forward, the further we develop our gases and supply systems, producing new mixtures and gases with impurities down to the parts per billion level.

Point of Use Regulators

HiQ® REDLINE W40

Wall Design Point of Use Regulators

Description

The point of use regulator is especially developed for specialty gases with high demands of purity, tightness and safety. The W40 point of use regulator is intended for wall-mounting with external gas supply line. Design F is a version with fixed pressure and flow meter.

Model	Type	Material of Construction	Outlet Range
W40	A	B - Brass	000 (Type A only)
	B	S - Stainless Steel	015
	C		050 (Type F only)
	F		100 150

Technical Data

	psig	kPa
Max primary pressure	550	3,800
Secondary pressure	1.5-15	10-100
	8-100	50-690
	15-150	100-1,030
Pressure gauge scale	-15-20	-100-140
	-15-150	-100-1,030
	-15-260	-100-1,830

Max flow (N₂)

Model W40BB015	700 SCFH	330 SLPM
Model W40BB100	2,100 SCFH	990 SLPM
Model W40BB150	3,850 SCFH	1,820 SLPM

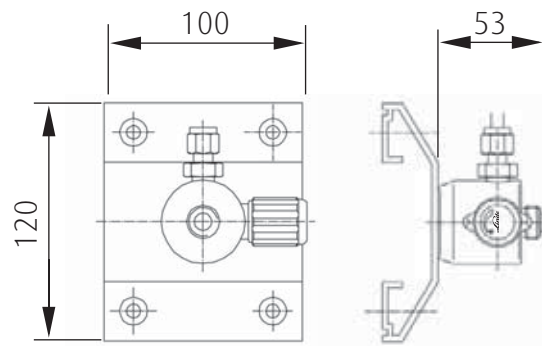
Materials of Construction

Brass, Ni/Cr plated or stainless steel 316L

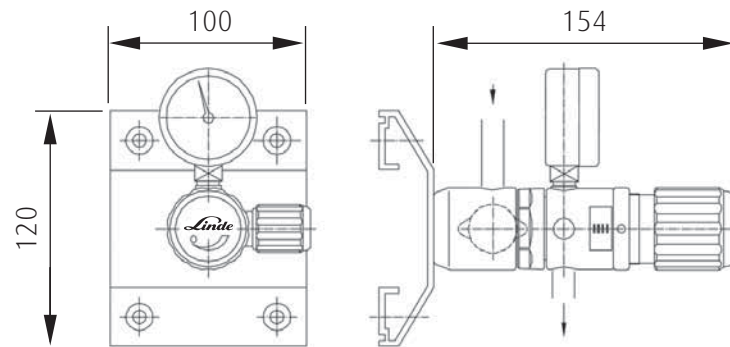
Operating temperature	-20°-70°C	-4°-158°F
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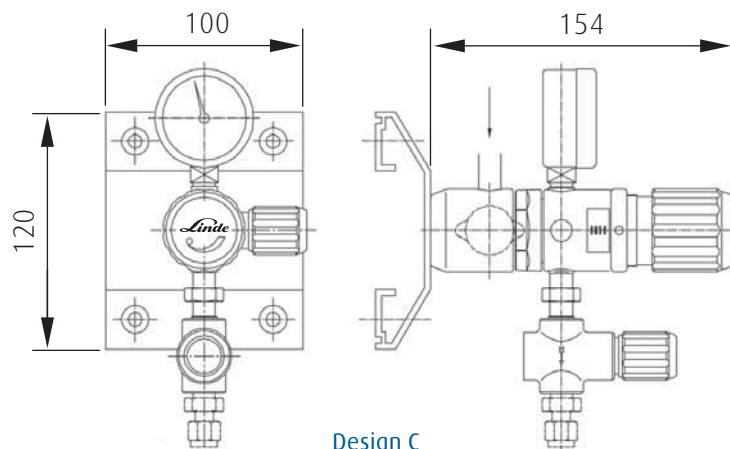
HiQ® REDLINE W40 – Wall Design Point of Use Regulators



Design A



Design B



Design C

All measurements in millimeters.
Drawings of other types available on request.

Point of Use Regulators

HiQ® REDLINE B40

Technical Data

Bench Design Point of Use Regulators

Description

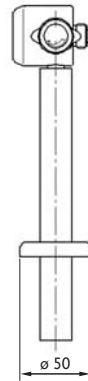
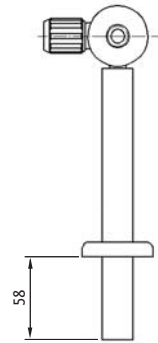
The point of use regulator is especially developed for specialty gases with high demands of purity, tightness and safety. The B40 point of use regulator is intended for mounting on a bench (e.g. a laboratory desk), with a gas supply line from below through the table stand. Design F is a version with fixed pressure and flow meter.

Model	Type	Material of Construction	Outlet Range
B40	A	B - Brass	000 (Type A only)
	B	S - Stainless Steel	015
	C		050 (Type F only)
	F		100 150

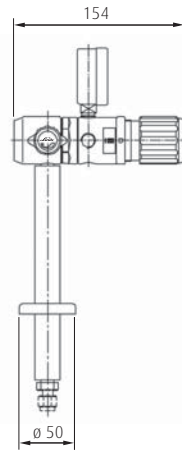
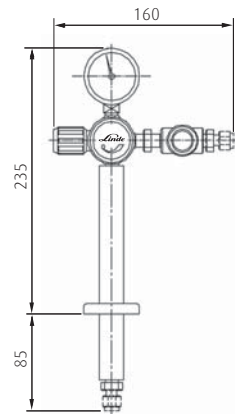
	psig	kPa
Max primary pressure	550	3,800
Secondary pressure	1.5-15	10-100
	8-100	50-690
	15-150	100-1,030
Pressure gauge scale	-15-20	-100-140
	-15-150	-100-1,030
	-15-260	-100-1,830
Max flow (N₂)		
Model B40BB015	700 SCFH	330 SLPM
Model B40BB100	2,100 SCFH	990 SLPM
Model B40BB150	3,850 SCFH	1,820 SLPM
Materials of Construction		
	Brass, Ni/Cr plated or stainless steel 316L	
Operating temperature	-20°-70°C	-4°-158°F



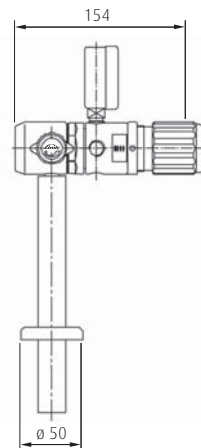
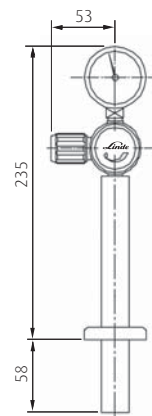
HiQ® REDLINE B40 – Bench Design Point of Use Regulators



Design A



Design B



Design C

All measurements in millimeters.
Drawings of other types available on request.

Point of Use Regulators

HiQ® REDLINE L40

Laboratory Cupboard Design Point of Use Regulators

Description

The point of use regulator is especially developed for specialty gases with high demands of purity, tightness and safety. The L40 point of use regulator is intended for mounting with gas supply line hidden behind a wall. Design F is a version with fixed pressure and flow meter.

Model	Type	Material of Construction	Outlet Range
L40	A	B - Brass	000 (Type A only)
	B	S - Stainless Steel	015
	C		050 (Type F only)
	F		100 150

Technical Data

	psig	kPa
Max primary pressure	550	3,800
Secondary pressure	1.5-15	10-100
	8-100	50-690
	15-150	100-1,030
Pressure gauge scale	-15-20	-100-140
	-15-150	-100-1,030
	-15-260	-100-1,830

Max flow (N₂)

Model L40BB015	700 SCFH	330 SLPM
Model L40BB100	2,100 SCFH	990 SLPM
Model L40BB150	3,850 SCFH	1,820 SLPM

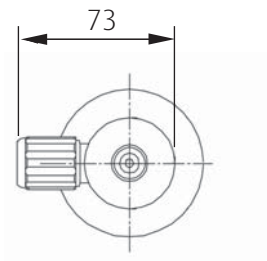
Materials of Construction

Brass, Ni/Cr plated or stainless steel 316L

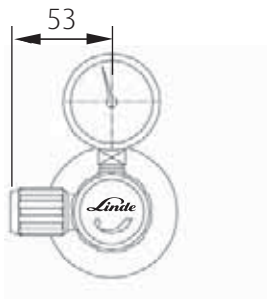
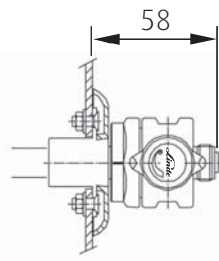
Operating temperature	-20°-70°C	-4°-158°F
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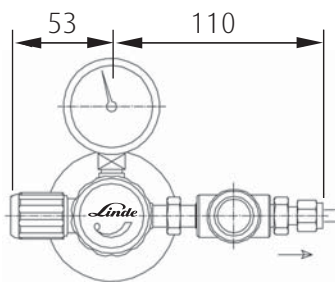
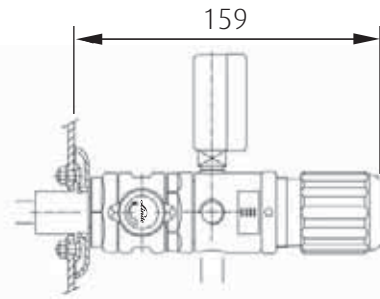
HiQ® REDLINE L40 – Laboratory Cupboard Design Point of Use Regulators



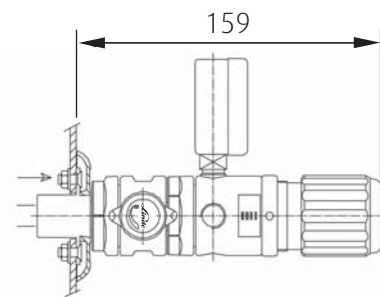
Design A



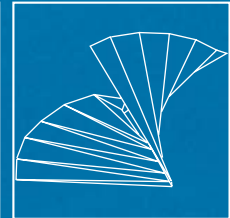
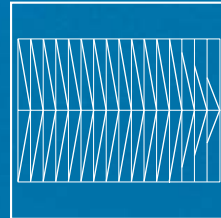
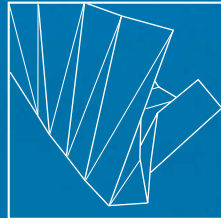
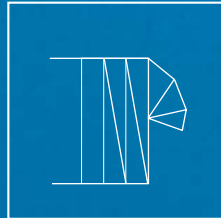
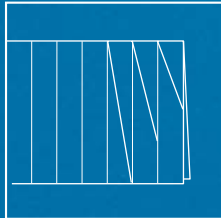
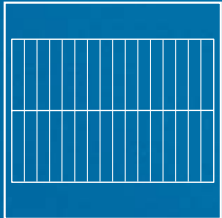
Design B



Design C



All measurements in millimeters.
Drawings of other types available on request.



Flowmeters

Flowmeters are used in fluid systems (liquid and gas) to indicate the rate of flow of the fluid. They can also control the rate of flow if they are equipped with a flow control valve.

Rotameters are a particular kind of flowmeter, based on the variable area principle. They provide a simple, precise and economical means of indicating flow rates in fluid systems.

This variable area principle consists of three basic elements : A uniformly tapered flow tube, a float and a measurement scale. A control valve may be added if flow control is also desired.

In operation, the rotameter is positioned vertically in the fluid system with the smallest diameter end of the tapered flow tube at the bottom. This is the fluid inlet. The float, typically spherical, is located inside the flow tube and is engineered so that its diameter is nearly identical to the flow tube's inlet diameter.

When fluid — gas or liquid — is introduced into the tube, the float is lifted from its initial position at the inlet, allowing the fluid to pass between it and the tube wall. As the float rises, more and more fluid flows by the float because the tapered tube's diameter is increasing. Ultimately, a point is reached where the flow area is large enough to allow the entire volume of the fluid to flow past the float. This flow area is called the annular passage. The float is now stationary at that level within the tube, as its weight is being supported by the fluid forces which caused it to rise. This position corresponds to a point on the tube's measurement scale and provides an indication of the fluid's flow rate.

One way to change the capacity, or flow range, of a rotameter is to change the float material, and thus its density, while keeping the flow tube and float size constant. Floats, which are made from less dense materials, will rise higher in the tube and therefore will yield lower flow capacities for the same diameter flow tube.

Floats made from more dense materials will rise less, thereby yielding higher flow capacities. Relative flow capacities for some common float materials are shown in **Figure 1**.

Selecting The Right Size

There are certain factors which affect the measurement of a fluid's flow rate with a rotameter. The fluid's temperature, pressure and specific gravity all impact gas flow measurements.

Flow capacities (ranges) for the flowmeters described in this catalogue are given for air at standard conditions — 14.7 psia (101.3 kPa Abs) and 21°C (70°F). Sizing a meter for a gas other than air, or for your specific application pressure and/or temperature, requires that you first determine the equivalent flow capacity in air at standard conditions. Once determined, the flow capacity tables in this catalogue can be applied directly. Reference scale tables can be requested for each flowmeter ordered which will provide conversion to your desired fluid or conditions.

Note that for flowmeters calibrated at standard conditions with a valve on the inlet, readings on the tube are correct provided that the outlet pressure is close to atmospheric. When the valve is on the outlet, readings are correct if the inlet gas pressure is equal to the pressure for which the tube was calibrated.

For your convenience, **Table 1** provides correction factors for gases other than air at standard conditions. Call a customer service representative if you require further assistance in sizing a rotameter for your particular application.

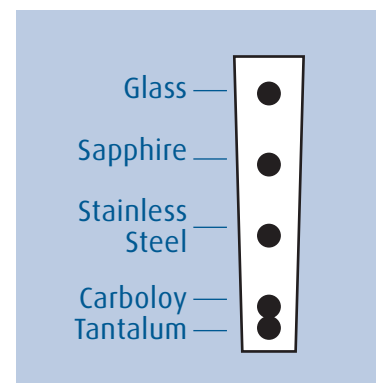


Figure 1

Basic Flowmeter Principles

Table 1: Flow Rate Factors for Gases Other Than Air

Gas	Factor	Gas	Factor	Gas	Factor
Acetylene	0.95	Halocarbon 11	2.18	Hydrogen Chloride	1.13
Air	1.00	Halocarbon 12	2.05	Hydrogen Sulfide	1.08
Ammonia	0.77	Halocarbon 13	1.90	Isobutane	1.42
Argon	1.18	Halocarbon 13B	2.27	Isobutylene	1.39
1,3 Butadiene	1.37	Halocarbon 14	1.74	Methane (Natural Gas)	0.75
Butane	1.42	Halocarbon 21	1.89	Methyl Fluoride	1.09
1-Butene	1.39	Halocarbon 22	1.73	Monomethylamine	1.04
Carbon Dioxide	1.23	Halocarbon 23	1.56	Neon	0.83
Carbon Monoxide	0.98	Halocarbon 113	2.54	Nitrogen	0.98
Chlorine	1.57	Halocarbon 114	2.43	Nitrogen Dioxide	1.60
Cracked Ammonia	0.54	Halocarbon 116	2.18	Nitrous Oxide	1.23
Cyclopropane	1.21	Halocarbon 115	2.31	Oxygen	1.05
Difluoroethane	1.51	Halocarbon 142B	1.86	Propane	1.23
Dimethyl Ether	1.26	Halocarbon 152A	1.51	Propylene	1.21
Ethane	1.02	Helium	0.37	Sulfur Dioxide	1.50
Ethylene	0.98	Hydrogen	0.26	Sulfur Hexafluoride	2.25

For other gases or for non-standard temperatures and pressures, call a customer service representative.

Note that for flowmeters calibrated at standard conditions with a valve on the inlet, readings on the tube are correct provided that the outlet pressure is close to atmospheric. When the valve is on the outlet, readings are correct if the inlet gas pressure is equal to the pressure for which the tube was calibrated.

To estimate which flow tube should be purchased when measuring the flow of a gas other than air, multiply the flow rate desired by its factor above to find the air flow equivalent. The flow tube whose range (capacity) covers this flow rate should be the one purchased. Be sure to keep units consistent. Air Equivalent = Gas Flow Rate Desired x Factor. These factors assume standard operating conditions: temperature 21°C (70°F); pressure 14.7 psia (101.3 kPa Abs).

Flowmeter Measurement Scales

Depending upon the model, the flowmeter's measurement scale can be either direct reading or in reference scale units.

Direct reading tubes are straightforward. The measurement scale on each of these tubes reads actual flow at standard conditions in a choice of English or Metric units. Tubes with direct reading scales include the following series flowmeters:

- FM-1000
- FM-1100
- FM-1127
- PG-1000
- PM-1000

Reference scale tubes, on the other hand, provide a uniformly calibrated scale in arbitrary millimeter (mm) units. Obtaining actual flow rates with these tubes requires the use of a reference scale flow correlation table

(available from Linde) which relates the mm scale reading to an actual flow rate. Reference scale tubes are useful when measuring flow rates for gases other than air and/or for non-standard conditions. Tubes with reference scales include the following series flowmeters:

- FM-1050

A sometimes confusing matter in flowmeter size terminology is that variable area flowmeters are often defined by their measurement scale length, that is, the distance between the zero and full scale marking. Scale length is typically indicated in millimeter (mm) units. The FM-1050, for example, uses a 150mm tube and the FM-1000 uses a 65mm tube. Note that this scale length has no relationship at all with whether the flowmeter is a direct reading or a reference scale tube.

Flowmeters

Tube-Cube®

The Tube-Cube® is an innovative design developed and patented by Matheson Trigas. It allows the interchange of flow tubes within a single frame. With the Tube-Cube® you can quickly and easily change flow ranges without having to disconnect the flowmeter from your system to change the entire frame. The Tube-Cube® is standard equipment with the FM-1050 and FM-1000 Series Flowmeters and tube assemblies.

Description

The Tube-Cube® was designed from its inception so that it could be fitted into any standard 150 mm or 65 mm flowmeter unit*. This includes all meters supplied prior to the Tube-Cube® style design as well as those of most other manufacturers. Retrofit Kits complete with end seal adapters (filler plugs and O-ring) are available.

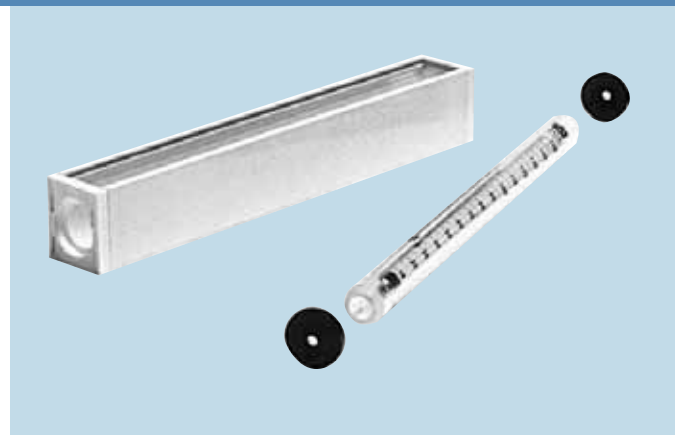
The Tube-Cube® offers you:

- Easier and faster installation
- Automatic centering and alignment
- Elimination of chipped tube ends
- Insurance of safer and proper installation. (Whenever the tube is installed the seals are correctly located)
- Protection from tube breakage because the glass tube is always encased in a protective plastic rectangle that can't roll off a bench
- 1.5 X magnification of meter scale and float for easier, more accurate reading

The Tube-Cube® consists of two side plates of ABS resin, two molded end pieces of high density polypropylene, and a clear molded acrylic front shield which also serves as a magnifying lens. This lens magnifies the flowmeter tube numerals and float by a factor of 1.5 to allow more precise flow reading than is possible with conventional flowmeter shields.

The flowmeter tube end seals are also contained in the Tube-Cube® package. These seals assure that the glass tube is precisely centered and positively retained within the Tube-Cube®. These end seals are Viton as standard but are also available with Teflon in fluid contact, Buna N, and EPR (Ethylene Propylene Rubber) when specified as optional extras.

To complete the package, a yellow, flexible, polished vinyl rear panel is fitted into the Tube-Cube®. This panel not only provides a reflective, easy tube reading background, but it also acts as a protective rear cube-cover which keeps dust and dirt out of the Tube-Cube® itself.



Materials of Construction

Centering Seal	Buna-N, Viton, EPR, Teflon or Kalrez
Tube-Cube®	ABS plastic, polypropylene
End Seal Adapters	Filler plugs –aluminum, brass, 316 stainless steel or Monel O-rings – Buna-N, Viton or EPR (Retro-fit Kits)

Five Easy Steps



1. Loosen end seal



2. Remove Tube-Cube®



3. Select replacement Tube-Cube®



4. Reposition Tube-Cube®



5. Tighten end seal

Flowmeters

Model FM-1050 Series

High Accuracy Flowmeter (150mm)

Description

FM-1050 Series Flowmeters provide the most accurate indication and precise control of fluids available for a wide range of applications. This versatile meter is functionally and dimensionally interchangeable with other current designs while incorporating many innovative features.

All FM-1050 Series glass metering tubes have integral float guides to ensure a guaranteed $\pm 5\%$ ($\pm 1\%$ with optional calibration) of full-scale accuracy. Both glass and stainless steel floats are included. The meters are available in a range of 150mm reference indicating scales. Be sure to request calibration data for the gas(es) you will be measuring.

Standard with this series is the uniquely designed Tube-Cube®. The "cube", a unitized tube holder, aligns the tube quickly and easily for simple tube installation or replacement. The Tube-Cube® provides protection during handling, reducing chipped tube ends, broken tubes and misalignment. The 1.5 X scale magnification lens allows for a more accurate reading. End seals in the FM-1050 are direct acting and nonrotating for fast alignment and convenient service access.

There are also three valve options available:

- No valve for those who just want indication
- Utility (six-turn) valve for those who desire control as well as indication
- High accuracy (fifteen-turn) valve, for very precise control and repeatability

Design Features/Components

- High-resolution 150mm scale length
- Precision tapered, fluted metering tube
- Low-pressure drop for increased available flow rates at low feed pressures
- Standard front panel mounting requires minimum hardware – easy installation, quick access
- Available utility and high accuracy valves do not require special fittings
- Simplified, direct acting, nonrotating compression plug for quick and easy tube sealing



Specifications

Pressure rating	250 psig (1,720 kPa) maximum
Temperature rating	121°C (250°F) maximum
Accuracy	$\pm 5\%$ of full scale flow rate
Optional accuracies	$\pm 1\%$ and $\pm 3\%$ of full scale for reference scales only
Repeatability	0.25% of scale reading
Range	10 to 1, i.e. 100% to 10% of full scale mm or linear flow with conversion curves and/or factors
Scale Readings	Special direct reading scales available
Shipping Weight	0.45 kg (1 lb)

Materials of Construction

Wetted End Blocks, Fittings and Internal Parts	Anodized aluminum, brass, 316 stainless steel, Kynar or Monel
Seal Materials	Buna-N or Viton – standard; EPR, Kalrez or Teflon – optional
Side Plates	Painted or anodized aluminum
Metering Tube	Borosilicate glass enclosed in Tube-Cube® holder
Piping Connections	Aluminum, brass, 316 stainless steel or Monel 1/8" FNPT horizontal
Float Materials	Black glass and 316 stainless steel – standard; Sapphire, Carboly or Tantalum – optional
Scale	Ceramic ink on glass tube, length 150mm

Flow Tube Capacities for FM-1050 Series Flowmeters, Reference Scales

Tube No.	Float Material	CO ₂ (SCCM)	AR (SCCM)	O ₂ (SCCM)	Air (SCCM)	N ₂ (SCCM)	Natural Gas (SCCM)	He (SCCM)	H ₂ (SCCM)	Utility Valve Size	HA Valve Size
E910	Glass	0.31-108	0.23-88	0.25-97	0.13-104	0.29-108	0.47-162	0.26-144	0.56-269	7	1
E100	Glass & S.S.	6.8-200	4.6-140	5.2-145	6-150	6.5-175	9-270	5.3-160	11.7-360	7	2
E200	Glass & S.S.	11-280	7-220	8-240	10-270	10.5-275	14.5-410	9-260	19-560	7	2
E300	Glass & S.S.	36-750	32-690	35-770	38-840	39-850	56-1180	47-1350	99-2500	7	3
E406	Glass & S.S.	72-1450	75-1490	83-1660	88-1800	90-1850	111-2430	163-3680	278-6509	7	4
		(SLPM)	(SLPM)	(SLPM)	(SLPM)	(SLPM)	(SLPM)	(SLPM)	(SLPM)		
E500	Glass & S.S.	0.22-4.4	0.21-41.3	0.24-4.69	0.23-4.6	0.25-5	0.35-6.9	0.51-10.4	0.81-16.2	8	5
E606	Glass & S.S.	0.34-66	0.34-6.7	0.38-7.4	0.4-7.6	0.42-7.9	0.53-10	0.81-16.5	1.3-26.4	8	5
E700	Glass & S.S.	0.77-14.4	0.76-14.3	0.85-16.1	0.88-16	0.91-17.2	1.26-22.6	2-39.8	3.09-59.6	9	6
E800	Glass & S.S.	2.05-37.4	2.06-38.1	2.32-43.1	2.4-44	2.47-46	3.21-59.3	5.71-110.7	8.6-161.1	9	6

All flow rates are at 70°F and 14.7 psia

Note: Reference tubes are supplied with correlation charts for air and water flow rates at STP. If you require a correlation chart for other gases or liquids, or at pressures or temperatures other than standard, please indicate such when ordering.

*0-100 calibrated correlated reference tube scale only

Ordering Information

Model Series	Number of Metering Tubes	End Blocks/ Seal Materials	Valve Types	Connections	Accessories	Connection Orientation	Flow Tube (Capacities)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

Model Number Generator For FM-1050 Series Glass Tube Flowmeters

Model Series

E = Model FM-1050 Glass Tube Flowmeter with 150mm tube

Number of Metering Tubes

- 1 = Single Tube Unit
- 2 = Two Tube Unit
- 3 = Three Tube Unit
- 4 = Four Tube Unit

End Blocks/Seal Material

- 1 = Aluminum with Buna-N Seals
- 3 = Chrome Plated Brass with Buna-N Seals
- 4 = 316 Stainless Steel with Viton Seals
- 5 = Monel with Viton Seals
- 6 = 316 Stainless Steel with Teflon Seals
- 7 = Monel with Teflon Seals
- A = Aluminum with Viton Seals
- B = Chrome Plated Brass with Viton Seals
- D = 316 Stainless Steel with Buna-N Seals

E = 316 Stainless Steel with EPR Seals

F = Monel with Buna-N Seals

K = Kynar with Viton Seals

L = Kynar with EPR Seals

N = 316 Stainless Steel with Kalrez Seals

Valve Types

- A = Utility Valve on Inlet
- B = Utility Valve on Outlet
- C = High Accuracy Valve on Inlet
- D = High Accuracy Valve on Outlet
- G = Valve Plug on Inlet
- H = Valve Plug on Outlet
- K = Valve Cavity only
- Y = No Valve/No Plug

Connections

- 1 = 1/8" NPT Female
- 2 = 1/4" NPT Female
- 3 = 1/8" Tube

4 = 1/4" Tube

5 = 1/8" Hose

6 = 1/4" Hose (3/16"-3/8" Hose Tapered)

D = 1/8" NPT Inlet & 1/4" Hose Outlet

E = 1/8" NPT Inlet & 1/4" Tube Outlet

H = 1/8" Tube Inlet & 1/4" Tube Outlet

Accessories

- 0 = None
- 1 = Bezel & Bracket — Clear Anodized Aluminum
- 5 = Base Plate Assembly
- 7 = Bezel & Bracket — Black Anodized Aluminum

Connection Orientation

- 1 = Back In and Back Out

Flow Tube (Capacities)

EXXX = See Capacity Table For FM-1050 Series Flowmeters

Additional Options

- ± 1 % Accuracy, Full Scale, With Certification, Gases, No Direct Read
- ± 2 % Accuracy, Full Scale, With Certification, Gases, No Direct Read
- ± 3 % Accuracy, Full Scale, With Certification, Gases, Direct Read
- Clean for O₂ Service

These are Reference Scale Flowmeters. Be sure to request calibration data for the gas(es) you will be measuring.

Flowmeters

Model FM-1000 Series

Compact High Accuracy Flowmeter (65mm)

Description

The FM-1000 Series Flowmeters incorporate the innovative design of the FM-1050 in a more compact unit without reducing standards of accuracy. This is the rotameter of choice for those interested in conserving space. The same $\pm 5\%$ full-scale accuracy is guaranteed for the 65mm scale length of these flowmeters.

Unlike the FM-1050 series which uses reference scales, the FM-1000 Series flowmeters are direct reading for air, and are available in either English or Metric units. Choose between a black glass or a stainless steel float. These flow tubes are fluted to provide better float stability.

The FM-1000 Series glass metering tubes are enclosed in the Tube-Cube[®]. Protection of the tube, magnified tube scale for easy reading and alignment during replacement are afforded with this unitized holder. Integral fluted float guides for optimum float performance are standard with all tubes unless otherwise specified.

Like the FM-1050 there are three valve options available:

- No valve for those who just want indication
- Utility (six-turn) valve for those who desire control as well as indication
- High accuracy (fifteen-turn) valve for very precise control

Design Features/Components

- Rugged, compact design
- Precision tapered, fluted metering tube
- Tube-Cube[®] unitized glass tube holding assembly
- Reflective plastic background and 1.5 X magnification lens for excellent readability
- Safety blow-out back panel
- Full 10 to 1 (100% to 10% full scale) metering range
- Low-pressure drop for increased flow rates at low feed pressures
- Easy installation and quick service access
- Available utility and high accuracy valves do not require special fittings
- Corrosion resistant options: all wetted parts of 316 stainless steel or Monel with Viton or Teflon seals
- Custom scales and flow curves available



Specifications

Pressure Rating	250 psig (1,720 kPa) maximum
Temperature Rating	121°C (250°F) maximum
Accuracy	$\pm 5\%$ of full scale flow rate – contact customer service for higher accuracies
Repeatability:	0.25% of scale reading
Range	10–1, i.e., 100% to 10% of full scale
Scale Reading	Direct reading air (special other scales available)
Shipping Weight	0.45 kg (1 lb)

Materials of Construction

Wetted End Blocks, Fittings and Internal Parts	Anodized aluminum, brass, 316 stainless steel, Kynar or Monel
Seal Materials	Buna-N or Viton – standard; Teflon, EPR, or Kalrez – option
Side Plates	Painted or anodized aluminum
Metering Tube	Borosilicate glass enclosed in Tube-Cube [®] holder
Piping Connections	Aluminum, brass, 316 stainless steel or Monel 1/8" FNPT horizontal on inlet and outlet (see Accessories for optional connections)
Float Materials	Black glass or 316 stainless steel –standard; sapphire, ceramic, Carboloy or Tantalum – optional
Scale	Ceramic ink on glass tube, length 65mm

Flow Tube Capacities for FM-1000 Series Flowmeters, Direct Reading Scales

Float Material	Tube No.	Air (SLPM)*	Tube No.	Air (SCFH)*	Tube No.	Water (CCM)	Tube No.	Water (GPH)	Utility Valve Size†	HA Valve Size†
Glass	J009	10–130 ccm	J011	0.02–0.024	J013	0.4–1.5	J015	0.004–0.02	7	2
Stainless Steel	J010	20–300 ccm	J012	0.05–0.65	J014	0.5–6.5	J016	0.01–0.1	7	2
Glass	J009	100–500 ccm	J111	0.2–1.1	J113	1–8	J115	0.02–0.13	7	3
Stainless Steel	J010	200–1000 ccm	J112	0.4–2.2	J114	4–24	J116	0.06–0.36	7	3
Glass	J209	0.1–1	J211	0.2–2.8	J213	2–20	J215	0.02–0.32	8	4
Stainless Steel	J210	0.1–2.1	J212	0.2–4.4	J214	5–55	J216	0.05–0.9	8	4
Glass	J409	0.5–5	J411	1–11	J413	10–140	J415	0.1–2.2	8	5
Stainless Steel	J410	0.5–9.5	J412	2–20	J414	20–280	J416	0.2–4.4	8	6
Glass	J509	2–24	J511	5–55	J515	50–600	J518	1–10	9	6
Stainless Steel	J510	2–50	J512	10–100	J516	100–1500	J519	2–24	9	6
Carboloy	J511	5–70	J514	10–150	J517	0.2–2.2 lpm	J520	2–34	9	6

*All air flow rates are at 70°F and 14.7 psia
 †At 10 psig inlet pressure

Ordering Information

Model Series	Number of Metering Tubes	End Blocks/ Seal Materials	Valve Types	Connections	Accessories	Connection Orientation	Flow Tube (Capacities)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

Model Number Generator For FM-1000 Series Glass Tube Flowmeters

Model Series

J = Model FM-1000 Glass Tube Flowmeter with 65mm tube

Number Of Metering Tubes

- 1 = Single Tube Unit
- 2 = Two Tube Unit
- 3 = Three Tube Unit
- 4 = Four Tube Unit

End Blocks/Seal Material

- 1 = Aluminum with Buna-N Seal
- 3 = Chrome Plated Brass with Buna-N Seals
- 4 = 316 Stainless Steel with Viton Seal
- 5 = Monel with Viton Seal
- 6 = 316 Stainless Steel with Teflon Seals
- 7 = Monel with Teflon Seals
- A = Aluminum with Viton Seals
- B = Chrome Plated Brass with Viton Seals
- D = 316 Stainless Steel with Buna-N Seals

- E = 316 Stainless Steel with EPR Seals
- F = Monel with Buna-N Seals
- K = Kynar with Viton Seals
- L = Kynar with EPR Seals
- N = 316 Stainless Steel with Kalrez Seal

Valve Types

- A = Utility Valve on Inlet
- B = Utility Valve on Outlet
- C = High Accuracy Valve on Inlet
- D = High Accuracy Valve on Outlet
- G = Valve Plug on Inlet
- H = Valve Plug on Outlet
- K = Valve Cavity only
- Y = No Valve/No Plug

Connections

- 1 = 1/8" NPT Female
- 2 = 1/4" NPT Female
- 3 = 1/8" Tube
- 4 = 1/4" Tube
- 5 = 1/8" Hose
- 6 = 1/4" Hose (3/16"-3/8" Hose Tapered)
- D = 1/8" NPT Inlet & 1/4" Hose Outlet
- E = 1/8" NPT Inlet & 1/4" Tube Outlet
- H = 1/8" Tube Inlet & 1/4" Tube Outlet

Accessories

- 0 = None
- 1 = Bezel & Bracket— Clear Anodized Aluminum
- 5 = Base Plate Assembly
- 7 = Bezel & Bracket — Black Anodized Aluminum

Connection Orientation

- 1 = Back In and Back Out

Flow Tube (Capacities)

JXXX = See Capacity Table For FM-1000 Series Flowmeters

Additional Options

- ± 1% Accuracy, Full Scale, With Certification, Gases, No Direct Read
- ± 2% Accuracy, Full Scale, With Certification, Gases, No Direct Read
- ± 3% Accuracy, Full Scale, With Certification, Gases, Direct Read
- Clean for O₂ Service

The FM-1000 Series are direct reading scale flowmeters for air. Inquire for other tube scales available.

Flowmeters

Model FM-1100 Series and Model FM-1127 Series

High Capacity Flowmeters (70MM, 127MM)

Description

The FM-1100 and FM-1127 Series Flowmeters are offered as a simplified solution to the problem of fluid flow indication at higher capacity levels than the FM-1050 and FM-1000 Series Flowmeters. These meters are designed to withstand the physical abuse and environmental corrosion of industrial applications.

The FM-1100 is available in several ranges of 70mm direct reading scales, and the FM-1127 in 127mm direct reading scales. Choose between English or Metric units.

A one-piece aluminium channel frame encloses the end blocks, fittings and glass-metering element for maximum meter protection and safety. Eight standard connection variations are made possible by three off-the-shelf end block configurations.

The precision tapered metering tube has integral float guides to ensure float fidelity. The scale is permanently screened on an acrylic window inset in the meter case, which makes it interchangeable for economical alteration of meter applications. A float/scale correlation symbol is marked on the window to eliminate error during application changes. The reading edge of the machined float provides precision read-out delineation. Reading edge instructions are also screened on the scale window.

Design Features/Components

- Precision tapered, fluted metering tube
- Fully protected assembly using aluminum meter case
- Unobstructed flow path area for low pressure drop increases available flow rates at low feed pressures
- Precision machined float
- Spring float stops absorb line shock
- Float/Scale correlation symbol and float reading edge instructions permanently screened on meter window
- Corrosion resistant option: all wetted parts of 316 stainless steel, with Viton or EPR seals
- Custom scales and flow curves available



Specifications

Pressure Rating	200 psig (1,380 kPa) maximum @ 93°C (200°F)
Temperature Rating	121°C (250°F) maximum
Accuracy	±10% of full scale flow rate
Range	10 to 1, i.e., 100% to 10% of full scale
Scale Reading	Direct reading air (special other scales available)
Shipping Weight	0.9 kg (2 lbs)

Materials of Construction

Wetted End Blocks, Fittings and Internal Parts	Brass or 316 stainless steel
Seal Materials	Buna-N or Viton – standard; Teflon, Kalrez or EPR – optional
Meter Case	Black painted or anodized aluminum with acrylic window
Metering Tube	Borosilicate glass
Piping Connections	Brass or 316 stainless steel 3/8" FNPT (see Accessories for optional connections)
Float Material	316 stainless steel
Scale	Permanently screened on inside of meter window, length FM-1100 –70mm or FM-1127 –127mm

Flow Tube Capacities For FM-1100 And FM-1127 Series Flowmeters, Direct Reading Scales

FM-1100 Series							
Tube No.	Air (SCFM)*	Tube No.	Air (SLPM)	Tube No.	Water (GPH)	Tube No.	Water (LPM)
A121	0.5-4	A125	10-120	A111	0.1-1	A116	0.5-3.5
A122	1-9	A126	20-260	A112	0.2-2	A117	0.5-8
A123	1-12	A127	20-340	A113	0.2-3	A118	1-10
A124	1-15	A128	50-500	A114	0.5-4	A119	1-15
-	-	-	-	A115	0.5-5	A120	2-20

*All air flow rates are at 70°F and 14.7 psia

FM-1127 Series							
Tube No.	Air (SCFM)*	Tube No.	Air (SLPM)	Tube No.	Water (GPH)	Tube No.	Water (LPM)
B121	0.2-4	B125	5-120	B111	0.05-1	B116	0.2-3.5
B122	0.5-9	B126	20-260	B112	0.1-2	B117	0.5-8
B123	0.5-11	B127	20-320	B113	0.2-2	B118	0.5-12
B124	1-16	B128	20-500	B114	0.2-4	B119	1-16
-	-	-	-	B115	0.5-5	B120	1-22

*All air flow rates are at 70°F and 14.7 psia

Ordering Information

Model Series	Number of Metering Tubes	End Blocks/ Seal Materials	Valve Types	Connections	Accessories	Connection Orientation	Flow Tube (Capacities)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

Model Number Generator For FM-1000 Series Glass Tube Flowmeters

Model Series

A = Model FM-1100 Glass Tube Flowmeter with 70mm tube

B = Model FM-1127 Glass Tube Flowmeter with 127mm tube

Valve Types

J = Valve on Inlet

L = Valve on Outlet

Y = No Valve/No Plug

Accessories

0 = None

8 = Externally Threaded Connections for Panel Mounting

Connection Orientation

1 = Back In and Back Out

2 = Vertical In and Vertical Out

3 = Vertical In/Back Out

4 = Back In/Vertical Out

Additional Options

- ± 5 % Accuracy, Full Scale, With Certification
- ± 10 % Accuracy, Full Scale, With Certification
- Clean for O₂ Service

Number Of Metering Tubes

1 = Single Tube Unit

Connections

2 = 1/4" NPT Female

7 = 3/8" NPT Female

8 = 1/2" NPT Female

End Blocks/Seal Material

4 = 316 Stainless Steel with Viton Seals

8 = Brass with Buna-N Seals

C = Brass with Viton Seals

D = 316 Stainless Steel with Buna-N Seals

E = 316 Stainless Steel with EPR Seals

N = 316 Stainless Steel with Kalrez Seals

Flow Tube (Capacities)

AXXX = See Capacity Table For FM-1100 Series Flowmeters

BXXX = See Capacity Table For FM-1127 Series Flowmeters

These are Direct Reading Scale Flowmeters. Inquire for other tube scales available.

Flowmeters

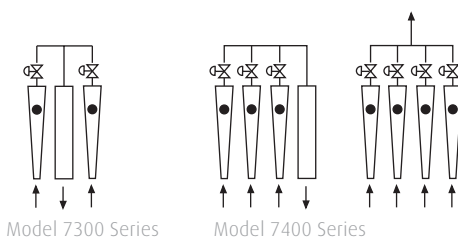
Model 7300 and 7400 Series

Proportioners and Mixers

Description

Linde's Model 7300 and 7400 Series Flowmeters are 150mm multi-tube flowmeter manifolds used for proportioning or mixing multiple gas streams. They are available in three basic configurations.

- Two gases in – One stream out (proportioner)
- Three gases in – One stream out (mixer)
- Four gases in – One stream out (mixer)



Model 7300 Series

Model 7400 Series

Tubes are available in several 150mm reference scale flow ranges. Be sure to request calibration data for the gases you will be metering. All tubes are supplied with a single glass float.

Standard with the 7300 and 7400 series is the uniquely designed Tube Cube[®]. Also, FM-1050 150mm flow tubes are used.

Tubes are backpressure compensated by mounting the control valve (utility or high accuracy) on the outlet side of the tube. A highly sensitive pressure regulator is recommended for each of the inlet gas streams to avoid fluctuations in gas flow, which could cause inaccuracies in mixing concentration.



Specifications

Pressure Rating	200 psig (1,380 kPa) maximum
Temperature Rating	30°–120°C (20°–250°F)

To ensure that you receive the correct model for your application, please specify:

- Pressure (20 or 50 psig)
- Total flow rate
- Percent of each gas
- Special calibration

Flow Tube Capacities for 7300 and 7400 Series Proportioners and Mixers, Reference Scales

Tube No.	Float Material	Air (SCCM)	Utility Valve Size	HA Valve Size
E910*	Glass	0.13-104	7	1
E101	Glass	6-60	7	1
E201	Glass	10-100	7	1
E301	Glass	38-380	7	3
E401	Glass	88-880	7	3
(SLPM)				
E501	Glass	0.23-23	8	4
E601	Glass	0.4-4	8	5
E701	Glass	0.88-8.8	9	6
E801	Glass	2.4-24	9	6

All flow rates are at 70°F and 14.7 psia

*0-100 calibrated correlated reference tube scale only.

Ordering Information

Model Series	Number of Metering Tubes	End Blocks/ Seal Materials	Valve Types	Connections	Accessories	Connection Orientation	Flow Tube (Capacities)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

Model Number Generator For FM-1000 Series Glass Tube Flowmeters

Model Series

F = Model FM-1050 Glass Tube MultiTube Mixers with 150mm tube

G = Model FM-1050 Glass Tube Proportioners with 150mm tube

Number Of Metering Tubes*

2 = Two Tube Unit

3 = Three Tube Unit

4 = Four Tube Unit

*Two Tube Only for Proportioners

End Blocks/Seal Material

1 = Aluminum with Buna-N Seals

4 = 316 Stainless Steel with Viton Seals

6 = 316 Stainless Steel with Teflon Seals

A = Aluminum with Viton Seals

D = 316 Stainless Steel with Buna-N Seals

E = 316 Stainless Steel with EPR Seals

N = 316 Stainless Steel with Kalrez Seals

Valve Types

B = Utility Valve on Outlet

D = High Accuracy Valve on Outlet

K = Hole Only

Connections

1 = 1/8" NPT Female

2 = 1/4" NPT Female

3 = 1/8" Tube

4 = 1/4" Tube

5 = 1/8" Hose

6 = 1/4" Hose (3/16"-3/8" Hose Tapered)

Accessories

0 = None

5 = Base Plate Assembly

9 = Clean for Oxygen Service

Z = ±1% Accuracy (Full Scale)

Connection Orientation

1 = Back In/Back Out

Flow Tube (Capacities)

EXXX = See Capacity Table For 7300 and 7400 Series Flowmeters

Additional Options

- ± 5 % Accuracy, Full Scale, With Certification
- ± 10 % Accuracy, Full Scale, With Certification
- Silk Screen Charge
- Clean for O₂ Service

Flowmeters

Model PG-1000 Series

Economical Flowmeters (50mm)

Description

The PG-1000 Series Flowmeters are designed to allow reliable flow indication of gases at low capacities, while maintaining a rugged, economical plastic construction. A glass metering tube ensures dependable, accurate performance throughout the meter's capacity range.

The PG-1000 Series flowmeters are direct reading for air, and are available in either English or Metric units. Choose between a black glass or stainless steel float.

The superior construction features of the PG-1000 Series Flowmeters result in a sturdy design with optimum gas metering characteristics. Complete annealing during production ensures each meter body is stress free. Threadless plastic blocks eliminate crazing and fracture, and the metal support frame absorbs all connection strain.

The glass metering tube is sealed directly into the acrylic body by means of a spring-loaded O-ring, and is interchangeable. The scale is permanently fused on the metering tube, close to the flow area, to reduce parallax and improve readout.

Design Features/Components

- Precision tapered glass metering tube
- Aluminum frame absorbs connection strain
- Reduced scale parallax
- Removable tube for capacity change
- 50mm scale length
- Low-end flow measurement of 0.06 SCFH
- 10 to 1 or greater meter range
- Low-pressure drop
- Meter support frame flanges allow variety of panel mounting positions
- Control valve available installed at inlet or outlet



Specifications

Pressure Rating	100 psig (690 kPa) maximum
Temperature Rating	71°C (160°F) maximum
Accuracy	±10 % of full scale flow rate
Repeatability	1 % of scale reading
Range	10 to 1 or greater, i.e., 100% to 10% of full scale
Scale Readings	Direct reading for air (special other direct reading scales available)
Shipping Weight	0.45 kg (1 lb)

Materials of Construction

Wetted End Plugs and Valve Parts	Aluminum, Brass, or 316 Stainless Steel
Valve Stem	316 Stainless Steel
Seal Materials	Buna-N, Teflon, EPR, Kalrez, or Viton
Meter Block	Clear, cast acrylic plastic with removable glass metering tube; extruded aluminum support frame
Piping Connections	Aluminum, brass or 316 stainless steel 1/8" FNPT horizontal on inlet and outlet — standard; vertical on inlet and/or outlet — optional
Float Materials	Black glass or 316 stainless steel
Scale	Ceramic ink on glass tube, length 50mm

Flow Tube Capacities For PG-1000 Series Flowmeters, Direct Reading Scales

English Scale		Metric Scale		Float Material
Tube No.	Air (SCFH)	Tube No.	Air (SCCM)*	
U005	0.01–0.06	U001	2.5–25	Glass
U006	0.02–0.1	U002	5–50	Glass
U007	0.02–0.18	U003	20–100	Glass
U008	0.1–0.4	U004	50–200	Stainless Steel
U203	0.1–1	U201	50–500	Glass
U204	0.2–2	U202	100–1000	Stainless Steel
(SLPM)*				
U305	0.2–4.4	U301	0.1–2	Glass
U306	1–6	U302	0.2–3	Stainless Steel
U307	1–8	U303	0.2–4	Stainless Steel
U308	1–10	U304	0.5–5	Stainless Steel

*All flow rates are at 70°F and 14.7 psia

A 37mm scale is available- please consult Linde.

Ordering Information

Model Series	Number of Metering Tubes	End Blocks/ Seal Materials	Valve Types	Connections	Accessories	Connection Orientation	Flow Tube (Capacities)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

Model Number Generator For PG-1000 Series Flowmeters

U = Model PG-1000 Plastic Flowmeter with Glass Flow Tube

Number Of Metering Tubes

- 1 = Single Tube Unit
- 2 = Two Tube Unit
- 3 = Three Tube Unit
- 4 = Four Tube Unit

End Blocks/Seal Material

- 1 = Aluminum with Buna-N Seals
- 3 = Chrome Plated Brass with Buna-N Seals
- 4 = 316 Stainless Steel with Viton Seals
- 6 = 316 Stainless Steel with Teflon Seals
- A = Aluminum with Viton Seals
- B = Chrome Plated Brass with Viton Seals
- D = 316 Stainless Steel with Buna-N Seals
- E = 316 Stainless Steel with EPR Seals

M = Aluminum with Buna-N Seals and Brass Adapters

Valve Types

- E = Valve on Inlet
- F = Valve on Outlet
- G = Valve Plug on Inlet
- H = Valve Plug on Outlet
- Y = No Valve/No Plug

Connections

- 1 = 1/8" NPT Female
- 6 = 1/4" Hose (3/16"-3/8" Hose Tapered)
- D = 1/8" NPT Inlet & 1/4" Hose Outlet

Accessories

- 0 = None
- 1 = Bezel & Bracket – Clear Anodized Aluminum
- 2 = Brackets Only
- 5 = Base Plate Assembly
- 7 = Bezel & Bracket – Black Anodized Aluminum

Connection Orientation

- 1 = Back In and Back Out

Flow Tube (Capacities)

UXXX = See Capacity Table Above

Additional Options

- ± 5 % Accuracy, Full Scale, With Certification
- ± 10 % Accuracy, Full Scale, With Certification
- Silk Screen Charge
- Clean for O₂ Service

Flowmeters

Model PM-1000 Series

Economical Flowmeters (37mm)

Description

The PM-1000 Series acrylic flowmeters are a practical, low-cost approach to low flow rate indication of gases. A broad range of industrial applications involving non-corrosive fluids, normal atmospheres and less stringent accuracy demands are within the scope of this simplified, plain tapered tube design. State-of-the-art manufacturing techniques ensure each meter meets the performance demands of these applications.

The PM-1000 Series are direct reading for air, and are available in either English or Metric units. Choose between a black glass or stainless steel float.

Complete annealing during production ensures each meter body is stress free. No plastic threading is used, eliminating crazing and fracture of the acrylic. An extruded aluminum support frame for the meter body absorbs all connection strain. Support frame flanges and lock nuts provide for a variety of panel mounting arrangements. The simplified design of this meter allows quick, easy maintenance. High impact strength of the acrylic meter block completes this dependable design.

Design Features/Components

- Aluminum frame absorbs connections strain
- Reduced scale parallax
- 37 mm scale length
- Low-end flow measurement of 0.2 SCFH
- 10 to 1 or greater meter range
- Low-pressure drop
- Meter support frame flanges allow variety of panel mounting positions
- Control valve available installed at inlet or outlet



Specifications

Pressure Rating	100 psig (690 kPa) maximum
Temperature Rating	71°C (160°F) maximum
Accuracy	±10% of full scale flow rate
Repeatability	1% of scale reading
Range	10 to 1 greater, i.e. 1005 to 10% of full scale
Scale Readings	Direct reading air (special other direct reading scales available)
Shipping Weight	0.45 kg (1 lb)

Materials of Construction

Wetted End Plugs and Valve Parts	Aluminum, brass or 316 Stainless steel
Valve Stem	316 Stainless steel
Seal Materials	Buna-N, Teflon, EPR, Kalrez or Viton
Meter Block	Clear, cast acrylic plastic with plain tapered bore; extruded aluminum support frame
Piping Connections	Aluminum, brass, or 316 stainless steel 1/8" FNPT horizontal on inlet and outlet
Float Materials	Black glass or 316 stainless steel
Scale	Permanently screened on meter body, length 37 mm

Flow Tube Capacities For PM-1000 Series Flowmeters, Direct Reading Scales

English Scale				Metric Scale				Float Material
Tube No.	Air (SCFH)*	Tube No.	Water (GPH)	Tube No.	Air (SLPM)*	Tube No.	Water (CCM)	
N203	0.2-2.6	N207	0.05-0.4	N201	0.1-1 .2	N205	2-24	Glass
N204	0.5-5	N208	0.1-1	N202	0.2-2.4	N206	5-60	Stainless Steel
P403	1-14	P407	0.2-2.2	P401	0.5-6	P405	1-140	Glass
P404	2-26	P408	0.5-5	P402	1-12	P406	20-320	Stainless Steel
Q603	5-60	Q607	1-12	Q601	2.5-30	Q605	50-800	Glass
Q604	20-120	Q608	2-24	Q602	10-55	Q606	100-1500	Stainless Steel

*All air flow rates are at 70°F and 14.7 psia
A 50mm scale is available- please consult Linde.

Ordering Information

Model Series	Number of Metering Tubes	End Blocks/ Seal Materials	Valve Types	Connections	Accessories	Connection Orientation	Flow Tube (Capacities)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

Model Number Generator For PG-1000 Series Flowmeters

U = Model PG-1000 Plastic Flowmeter with Glass Flow Tube

Model Series

N= Model PM-1000 Plastic Flowmeter with NXXX Flow Tube Capacity
P = Model PM-1000 Plastic Flowmeter with PXXX Flow Tube Capacity
Q = Model QXXX Flow Tube Capacity

4 = 316 Stainless Steel with Viton Seals
6 = 316 Stainless Steel with Teflon Seals
A = Aluminum with Viton Seals
B = Chrome Plated Brass with Viton Seals
D = 316 Stainless Steel with Buna-N Seals
E = 316 Stainless Steel with EPR Seals
M= Aluminum with Buna-N Seals and Brass Adapters

Valve Types

E = Valve on Inlet
F = Valve on Outlet
G = Valve Plug on Inlet
H = Valve Plug on Outlet
Y = No Valve/No Plug

Number Of Metering Tubes

1 = Single Tube Unit
2 = Two Tube Unit
3 = Three Tube Unit
4 = Four Tube Unit

End Blocks/Seal Material

1 = Aluminum with Buna-N Seals
3 = Chrome Plated Brass with Buna-N Seals

Connections

1 = 1/8"NPT Female
6 = 1/4"Hose (3/16"-3/8"Hose Tapered)
D= 1/8"NPT Inlet & 1/4"Hose Outlet

Accessories

0 = None
1 = Bezel & Bracket — Clear Anodized Aluminum
2 = Brackets Only
5 = Base Plate Assembly
7 = Bezel & Bracket — Black Anodized Aluminum

Connection Orientation

1 = Back In and Back Out

Flow Tube (Capacities)

XXX = See Capacity Table For PM-1000 Series Flowmeters

Additional Options

- ± 5% Accuracy, Full Scale, With Certification
- ± 10% Accuracy, Full Scale, With Certification
- Silk Screen Charge
- Clean for O₂ Service

Flowmeter Replacement Parts

Model FM-1050, FM-1000, FM-1100 and FM-1127 Series

Description

The HCJ series Tube-Cube® is used in the FM-1000 and comes with a glass (GL), stainless steel (SS) or carbonyl (CA) float. The HCE series is used in the FM-1050 and, except for the 0910 tube, comes with both glass and stainless steel floats.

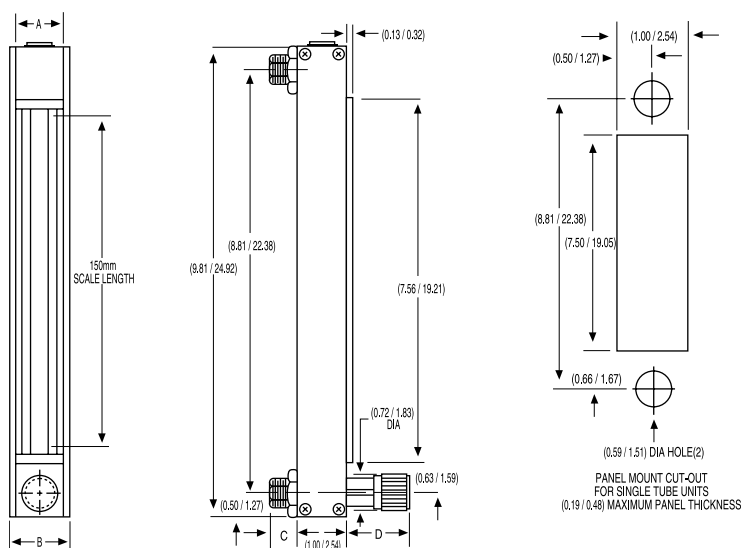
Changing your Tube-Cube® size may also necessitate the changing of the valve to maintain an acceptable degree of flow control. Linde valves are self-contained cartridges permitting easy interchange.

Ordering Information

Flow Range Air	Tube-Cube®	Float	Utility Valve Size P/N	High Accuracy Valve Size	Seal Kit Size
FM1050 Series					
0.13-104 SCCM	HCE-0910	GL	7,1	1	1
6-150 SCCM	HCE-0100	GL, S.S.	7,1	2	1
10-270 SCCM	HCE-0200	GL, S.S.	7,1	2	1
38-840 SCCM	HCE-0300	GL, S.S.	7,1	3	1
88-1800 SCCM	HCE-0406	GL, S.S.	7,1	4	1
0.23-4.6 SLPM	HCE-0500	GL S.S.	8,2	5	1
0.4-7.6 SLPM	HCE-0600	GL, S.S.	8,2	5	1
0.88-16 SLPM	HCE-0700	GL, S.S.	8,3	6	2
2.4-44 SLPM	HCE-0800	GL, S.S.	8,3	6	3
FM1000 Series					
10-130 SCCM	HCJ-009	GL	7,1	2	1
20-300 SCCM	HCJ-010	SS	7,1	2	1
100-500 SCCM	HCJ-0101	GL	7,1	3	1
200-1000 SCCM	HCJ-0110	SS	7,1	3	1
0.1-1 SLPM	HCJ-0209	GL	8,2	4	1
0.1-2.1 SLPM	HCJ-0210	SS	8,2	4	1
0.5-5 SLPM	HCJ-0409	GL	8,2	5	4
0.5-9.5 SLPM	HCJ-0410	SS	8,2	6	4
2-24 SLPM	HCJ-0509	GL	9,3	6	3
2-50 SLPM	HCJ-0510	SS	9,3	6	3
5-70 SLPM	HCJ-0511	CA	9,3	6	3
0.02 - 0.24 SCFH	HCJ-0011	GL	7,1	2	1
0.05-0.65 SCFH	HCJ-0012	SS	7,1	2	1
0.2-1.1 SCFH	HCJ-0111	GL	7,1	3	1
0.4-2.2 SCFH	HCJ-0112	SS	7,1	3	1
0.2-2.2 SCFH	HCJ-0211	GL	8,2	4	1
0.2-4.4 SCFH	HCJ-0212	SS	8,2	4	1
1-11 SCFH	HCJ-0411	GL	8,2	5	4
2-20 SCFH	HCJ-0412	SS	8,2	6	4
5-55 SCFH	HCJ-0512	GL	9,3	6	3
10-100 SCFH	HCJ-0513	SS	9,3	6	3
10-150 SCFH	HCJ-0514	CA	9,3	6	3
Flow Range Air	Flow Tube	Window/Scale	Float		
FM-1100/FM1127 Series					
0.2-4.0 SCFM	TBE-XXXX-GB	YYY-0121-PC	FLT-0001-SA		
0.5-9.0 SCFM	TBE-XXX-GB	YYY-0122-PC	FLT-0002-SA		
0.5-11.5 SCFM	TBE-XXX-GB	YYY-0123-PC	FLT-0002-SA		
1-16 SCFM	TBE-XXX-GB	YYY-0124-PC	FLT-0001-SA		
5-120 SLPM	TBE-XXX-GB	YYY-0125-PC	FLT-0003-SA		
20-260 SLPM	TBE-XXX-GB	YYY-0126-PC	FLT-0002-SA		
20-320 SLPM	TBE-XXX-GB	YYY-0127-PC	FLT-0002-SA		
20-500 SLPM	TBE-XXX-GB	YYY-0128-PC	FLT-0003-SA		
FM-1100 SERIES			FM-1127 SERIES		
XXXX=0400			XXX=0066		
YYY=WNA			YYY=WNB		

Flowmeter Engineering Drawings

Model FM-1050 Series Flowmeter



Technical Data

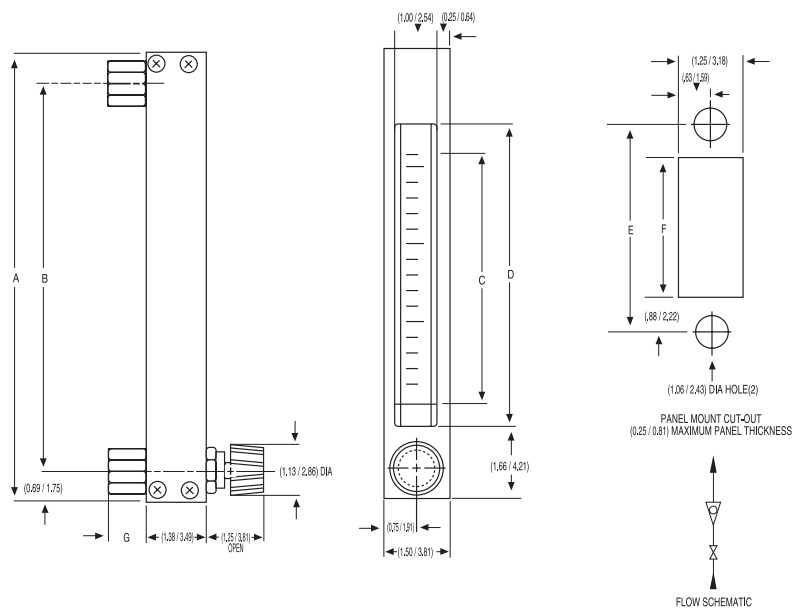
Number of Tubes	A		B	
	1	1.00	2.54	1.25
2	2.00	5.08	2.25	5.71
3	3.00	7.62	3.25	8.25
4	4.00	10.16	4.25	10.79

Connections	C	
	1/8" FNPT	0.63
1/4" FNPT	0.74	1.88
1/8" Compression*	1.33	3.38
1/4" Compression*	1.38	3.51
1/4" Hose (3/16"-3/8" Tapered)	1.78	4.52
1/8" Hose	1.30	3.30

*Dimension includes nut - hand tight (not at full compression)

Valve Options		
Utility Valve (Full Open)	1.25	3.18
High Accuracy (Full Open)	1.80	4.57

Model FM-1100 Series Flowmeter



Technical Data

Number of Tubes	A		B	
	1	1.00	2.54	1.25
2	2.00	5.08	2.25	5.71
3	3.00	7.62	3.25	8.25
4	4.00	10.16	4.25	10.79

Connections	C	
	1/8" FNPT	0.63
1/4" FNPT	0.74	1.88
1/8" Compression*	1.33	3.38
1/4" Compression*	1.38	3.51
1/4" Hose (3/16"-3/8" Tapered)	1.78	4.52
1/8" Hose	1.30	3.30

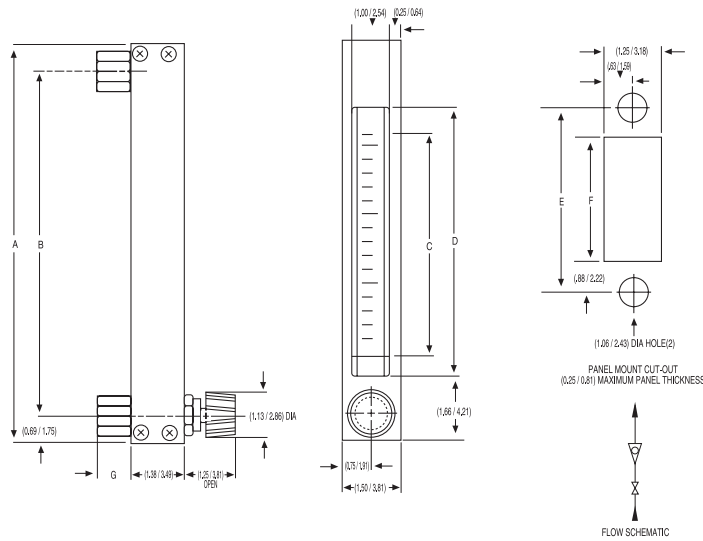
*Dimension includes nut - hand tight (not at full compression)

Valve Options		
Utility Valve (Full Open)	1.25	3.18
High Accuracy (Full Open)	1.80	4.57

Flowmeter Engineering Drawings

Model FM-1100 Series and FM-1127 Series Flowmeter

Technical Data



Connections

Connections	C	
1/4" FNPT*	1.75	4.45
3/8" FNPT	0.88	2.24
1/2" FNPT**	2.25	5.72

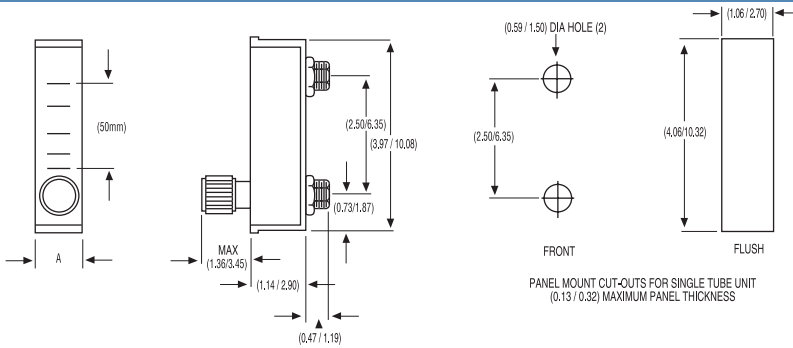
*Includes 3/8" FNPT - 1/4" FNPT adapter
 **Includes 3/8" FNPT - 1/2" FNPT adapter

Model	in		cm	
FM-1100	8.38	21.27	7.00	17.78
FM-1127	10.38	26.35	9.00	22.86

	mm		in		cm	
70 mm scale	5.00	12.70	7.00	17.78	5.25	13.35
127 mm scale	7.00	17.78	9.00	22.86	7.25	18.41

Model PG-1000 Series Flowmeter

Technical Data

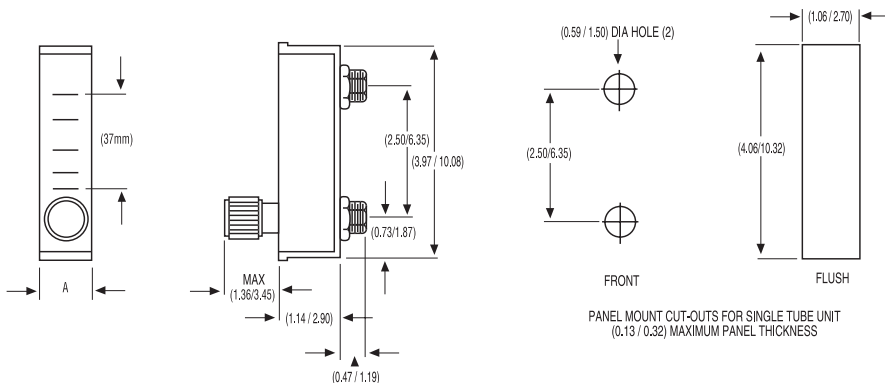


Number of Tubes

Number of Tubes	A	
	in	cm
1	1.00	2.54
2	2.00	5.08
3	3.00	7.62
4	4.00	10.16

Model PM-1000 Series Flowmeter

Technical Data



Number of Tubes

Number of Tubes	A	
	in	cm
1	1.00	2.54
2	2.00	5.08
3	3.00	7.62
4	4.00	10.16

Flowmeter Alarms

Model C7900 Series

Eagle-Eye™ Flowmeter Alarm

Description

The Eagle-Eye alarm is a non-contact sensor designed to alert the user when flow rates exceed defined thresholds. The Eagle-Eye alarm has red and green LED visual indicators and an audible buzzer indicator to provide flow rate status. A single unit can indicate either increased flow rate or decreased flow rate. The use of two units on a single flowmeter can provide both increasing and decreasing flow rates.

Design Features/Components

- Integral red and green LED indicators and an audible buzzer provide operating status
- Field installable while flowmeter is in service
- Non-contact sensor is not affected by the fluid in the flow stream
- Multiple operating modes
 1. Standard - unit will alarm until reset by the user
 2. Automatic reset - unit will alarm until flow returns to acceptable levels
- Multiple units may be installed on a single flowmeter to provide both high and low level alarms
- Rugged splash resistant enclosure
- Advance power supply provides a low level digital output representing the operating status

Specifications

Body material: ABS

Spacer material: SBR

Operating temperature range: 0°C (32°F) to 71°C (160°F)

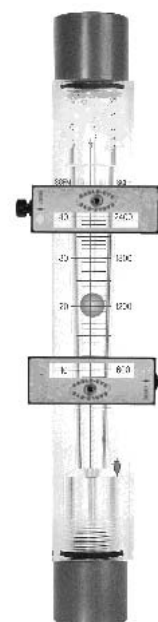
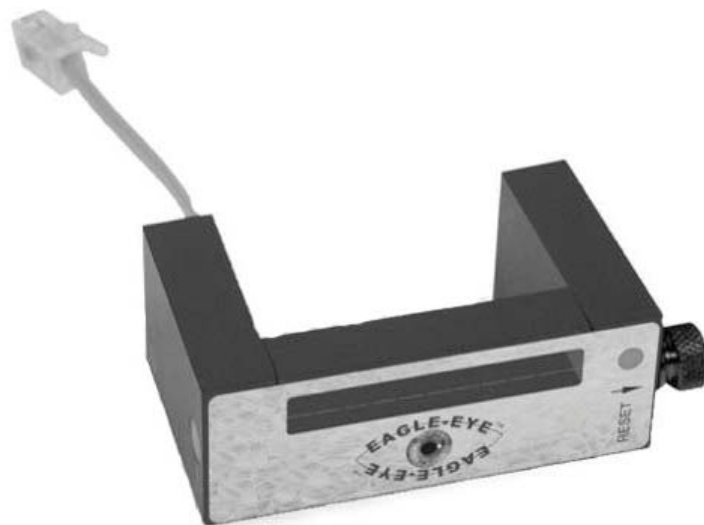
Buzzer volume: 90 dB

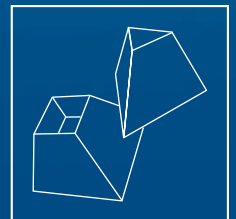
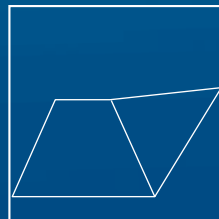
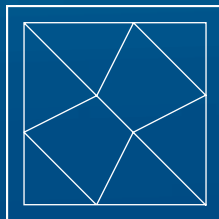
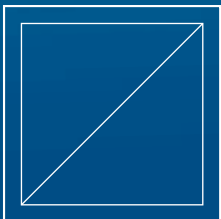
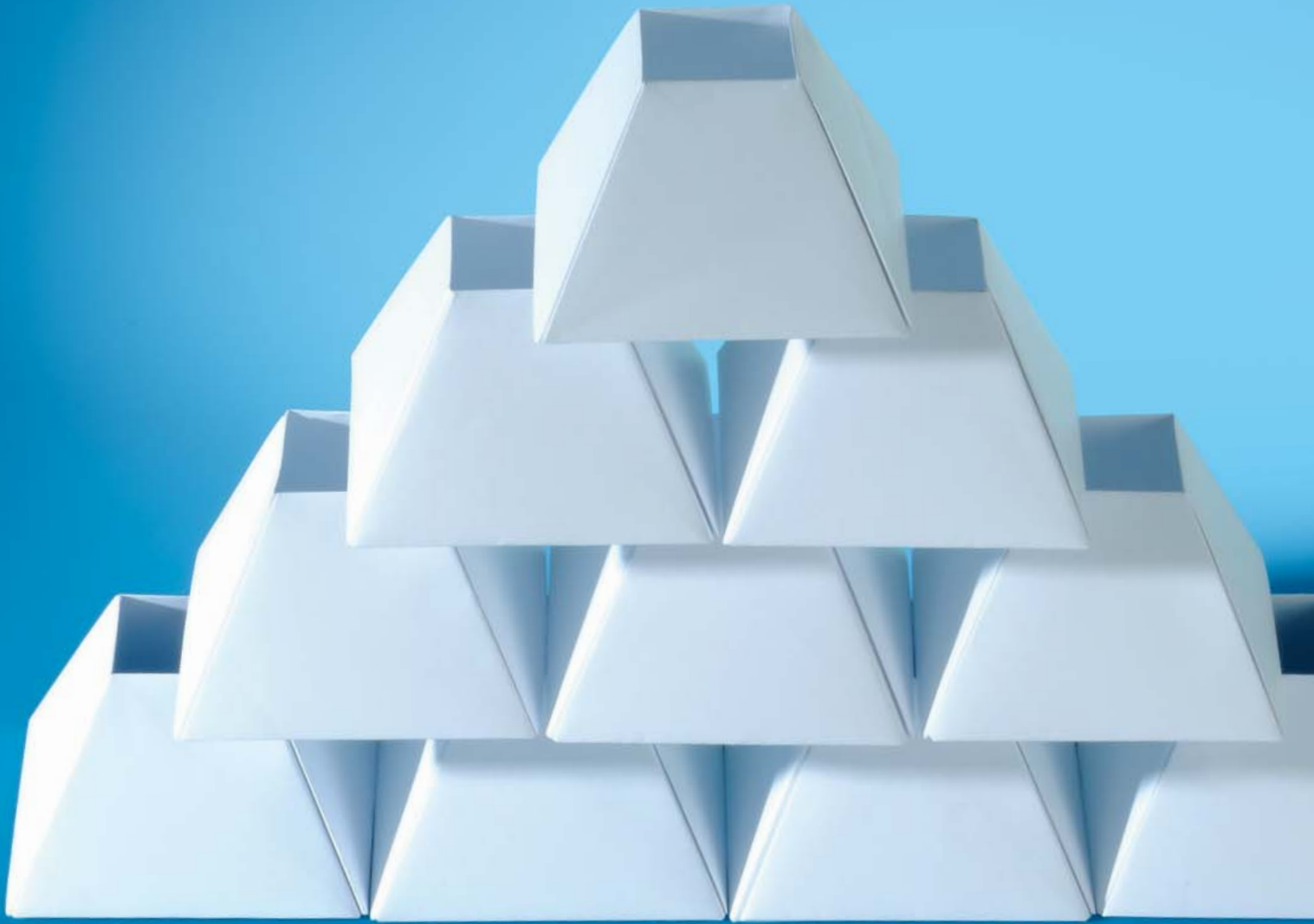
Supply voltage: 5 VDC regulated

Supply current: 250 mA

Ordering Information

Model	Description
C7923-AVA	for use with acrylic flowmeters
C7926-AVA	This unit can only be used on units with special side plates and Tube Cube assemblies.
C7924-AVA	for use with acrylic flowmeters
C7975-AVA	for use with acrylic flowmeters
C7920-PS	basic power supply for all models
C7920-AS	advanced power supply with battery backup and 0-5 VDC logic output for all models





Mass Flow Equipment

Linde mass flow controllers and mass flowmeters are among the most sophisticated flow sensing and control systems available. These units feature 316 stainless steel flow-sensing transducers and control valves, which are an integral part of the controllers.

Mass flow measuring devices generate a signal, which is proportional to the mass flow of gas, by detecting heat transport in an area of the gas stream. Since the specific heat of any gas is a unique property of the gas, and is essentially independent of pressure considerations, mass flow devices are absolute measuring instruments.

If the signal voltage is used only to indicate flow, the unit is considered a mass flowmeter. If the signal is used in conjunction with a reference signal and a controlling valve, the unit is considered a mass flow controller.

Series 8170 Mass Flowmeter Systems consist of a flow transducer, which senses the flow of gas, and a digital readout box that converts the analog signal to a direct reading digital display. Accuracy is $\pm 1\%$ full scale or one digit accuracy in flow control.

Series 8270 Mass Flow Controller Systems consist of a flow transducer that senses the flow of the gas, an electronically linked control valve, and a digital readout and control box that converts the analog signal to a direct reading digital display. Accuracy is $\pm 1\%$ (up to 30 SLPM) full scale or one digit accuracy in flow control.

Since these systems sense or control mass flow of a gas, the indicated flow is independent of system pressure or minor temperature variations. The systems are also calibrated to specific customer requirements.

Mass Flow Product Overview

Application	Features	Specifications	Function
8124 Series Totalizer <i>Compiles total amount of gas used over a period of time</i>	<ul style="list-style-type: none"> • 6 digit LED readout • 2 alarm setpoints • Half rack or bench mountable 	Accuracy <ul style="list-style-type: none"> • $\pm 1\%$ full scale 	Use with 8170 Mass Flowmeter System, 8270 Mass Flow Controller System, or 8280 Dyna-blender to compile the total amount of gas used, regardless of varying flow rates over a period of time.
8170 Series Mass Flowmeter System <i>Flow Measurement</i>	<ul style="list-style-type: none"> • Flowmeter Transducer (Model 8172/8173 series) • 8170 digital readout power supply box • Control cables & Connectors • Swagelok fittings on inlet and outlet • High/low alarm setpoints (user selectable) • Half rack or bench mountable 	Accuracy <ul style="list-style-type: none"> • $\pm 3\%$ over 300 SLPM • $\pm 1\%$ full scale for units up to 30 SLPM • $\pm 2\%$ for units 50–300 SLPM Repeatability <ul style="list-style-type: none"> • 0.2% for units up to 200 SLPM • 0.5% for units over 200 SLPM 	Applications requiring monitoring of a single gas flow. May also be used with Model 8124 Totalizer and Model 8280/84. This Model provides flow monitoring only: no flow control.
8175 Series Multiple Mass Flowmeter Readout Box <i>Flow measurement of up to four gas streams</i>	Includes <ul style="list-style-type: none"> • 4 position selector switch • Digital display • % of range • 4 individual cables for transducers • High/low alarm setpoints for each channel (user selectable) Full rack or bench mountable Required <ul style="list-style-type: none"> • A Model 8172 or 8173 Series Mass Flowmeter for each channel 	Resolution <ul style="list-style-type: none"> • 35 digit display Power <ul style="list-style-type: none"> • 110 VAC standard, 220 VAC – optional Output <ul style="list-style-type: none"> • 0 – 5 VDC • 4 – 20 mA (optional) 	Continuously monitors up to 4 mass flowmeters (one flowmeter displayed at a time). It is not required to use all 4 stations at the same time; they may be reserved for future expansion.
8270 Series Mass Flow Controller System <i>Flow Measurement and Flow Control</i>	<ul style="list-style-type: none"> • Flow controller transducer (Model 8272/8273 series) • 8270 digital readout/power supply box • Feedback circuit for flow control • Integral control valve • Control cables and connectoires • High/low alarm setpoints (user selectable) • Half rack or bench mountable 	Accuracy <ul style="list-style-type: none"> • $\pm 1\%$ of full scale for units up to 30 SLPM • $\pm 2\%$ for units up to 200 SLPM Repeatability <ul style="list-style-type: none"> • 0.2% for units up to 200 SLPM • 0.5% for units over 200 SLPM 	Applications requiring monitoring and controlling a single gas flow. May also be used with Model 8124 Totalizer and Model 8280/84

Application	Features	Specifications	Function
8274 Series Multiple Mass Flow Controller Box <i>Flow measurement and flow control of up to four gas streams</i>	Includes <ul style="list-style-type: none"> • 8 position selector switch (4 read and 4 set) • Digital display • % of range • Individual override control valve switches • Flow potentiometers for setting flow rate • 4 individual control cables for transducers • High/low alarm setpoints for each channel (user selectable) • Full rack or bench mountable Required <ul style="list-style-type: none"> • A Model 8272 or 8273 Series Mass Flow Controller for each channel 	Resolution <ul style="list-style-type: none"> • 3.5 digit display Power <ul style="list-style-type: none"> • 110 VAC standard, 220 VAC optional Output <ul style="list-style-type: none"> • 0–5 VDC • 4–20 mA (optional) 	Continuously monitors and controls up to 4 mass flow controllers (one controller displayed at a time) Each channel requires the use of a Model 8272 or 8273 Series Mass Flow Controller. It is not required to use all 4 stations at the same time; they may be reserved for expansion.
8280 Series Modular Dyna-Blender <i>Gas Blending</i>	Includes <ul style="list-style-type: none"> • Mass Flow controller transducer • 8280 control box with digital readout • Control cables for transducer • Patch cords for inputs • Half rack or bench mountable Required <ul style="list-style-type: none"> • Additional flow monitoring or control systems (8170, 8270, or 8280) 	Accuracy <ul style="list-style-type: none"> • $\pm 1\%$ full scale for units for up to 30 SLPM • $\pm 2\%$ for units 50–300 SLPM Repeatability <ul style="list-style-type: none"> • 0.2% for units up to 200 SLPM • 0.5% for units over 200 SLPM 	Each 8280 system controls one gas stream only. Use in conjunction with additional 8170, 8270, or 8280 systems for blending of multiple streams. Several units may be used together to blend additional streams.
8284 Series Multichannel Dyna-Blender <i>Gas blending</i>	Includes <ul style="list-style-type: none"> • 4 channels with individual potentiometers and control switches • 8 position set switch displays reading % of range • Control cables for transducers • Patch cords for inputs -Full rack or bench mountable Required <ul style="list-style-type: none"> • Model 8272 or 8273 Mass Flow Controller transducer for each channel 	Accuracy <ul style="list-style-type: none"> • $\pm 1\%$ full scale for units up to 30 SLPM • $\pm 2\%$ for units 50–300 SLPM Repeatability <ul style="list-style-type: none"> • 0.2% for units up to 200 SLPM • 0.5% for units over 200 SLPM 	Low cost blending of up to 4 gas streams for laboratory and process applications.

Mass Flow Equipment

Model 8170 Series

Mass Flowmeter System

Description

The complete 8170 Mass Flowmeter System offered by Linde consists of a flowmeter transducer (Model 8172/8173 Series), a digital readout /power supply box and the necessary cable and connectors. These flowmeters can be supplied with either compression fittings (standard) or optional male VCR compatible connections for easy installation into tubing and piping systems.

The Mass Flowmeter System produces a 0-5 VDC signal proportional to 0-100% of flow rate. This output signal from the digital readout box makes the 8170 Series Mass Flowmeters ideal for use with integrators, totalizers and data logging equipment. The Model 8124 Totalizer is used to compile the total amount of gas used over a period of time, regardless of varying flow rates.

The 8170 Mass Flowmeter Digital Readout Box is available standard for rack mounting in a 1/2 EIA rack or for benchtop use. Other standard features are high and low alarm setpoints selected by the user.

Design Features/Components

- 6 digits for accuracy
- $\pm 1\%$ accuracy
- 2 alarm setpoints
- Output contacts for alarms
- 0-5 VDC inputs
- Programmable from front panel or front panel with optional RS-232 connector
- Local and remote reset
- Local and remote hold (split timing)
- Bench mount or 1/2 EIA rack mount standard



Technical Data

Materials

Body	316 Stainless Steel	
By-pass	316 Stainless Steel	
Fittings:	316 Stainless Steel	
Standard Seals	Viton	
Proof Pressure	1500 psig	10,350 kPa
Minimum Differential Pressure	5 psid (19.5 kPa) (nominal)	
Maximum Operating Pressure		
(All models)	500 psig	3,450 kPa
Temperature Range	0°–50°C	32°–122°F

Accuracy

> 300 SLPM	$\pm 3\%$
<30 SLPM	$\pm 1\%$ of full scale
50 – 300 SLPM	$\pm 2\%$ of full scale

Standard Calibration

Temperature	0°C	32°F
Temperature Coefficient	0.05% per °C	
Response Time	0.5 seconds to 98% of scale (typical)	
<30 SLPM	2 seconds	
50 – 200 SLPM	3 seconds	
> 200 SLPM	2.5 seconds	

Repeatability

< 200 SLPM	0.2%
> 200 SLPM	0.5%
Flow Capacity	2%–100% of range selected
Signal Voltage Output	0-5 VDC
Voltage Input	115 VAC, 5 Watts, 230 VAC (optional)

Cable Lengths

Power Cord	1.8 m (6 ft)
Signal Cable	2.4 m (8 ft)
Alarm Contacts (Each Channel)	1 amp at 30 VDC maximum
Shipping Weight	3.6 kg (8 lbs)

Model	Range in N ₂ @ 0°C and 14.7 psia	Standard End Fittings
8170-0411	0-10 sccm	1/4" compression
8170-0421	0-20 sccm	1/4" compression
8170-0431	0-30 sccm	1/4" compression
8170-0451	0-50 sccm	1/4" compression
8170-0412	0-100 sccm	1/4" compression
8170-0422	0-200 sccm	1/4" compression
8170-0432	0-300 sccm	1/4" compression
8170-0452	0-500 sccm	1/4" compression
8170-0413	0-1 SLPM	1/4" compression
8170-0423	0-2 SLPM	1/4" compression
8170-0433	0-3 SLPM	1/4" compression
8170-0453	0-5 SLPM	1/4" compression
8170-0414	0-10 SLPM	1/4" compression
8170-0424	0-20 SLPM	1/4" compression
8170-0434	0-30 SLPM	1/4" compression
8170-0454	0-50 SLPM	3/8" compression
8170-0415	0-100 SLPM	3/8" compression
8170-0425	0- 200 SLPM	3/8" compression
8170-0435	0-300 SLPM	1/2" compression
8170-0455	0-500 SLPM	1/2" compression
8170-0416	0-1000 SLPM	3/4" compression

Additional Signal Cable Lengths

CBL-0125-XX	7.62 m (25 ft)
CBL-0126-XX	15.25 m (50 ft)
CBL-0127-XX	30.5 m (100 ft)
8292	230 VAC models
8293-4	1/4" VCR compatible end fittings
8293-6	3/8"/1/2" VCR compatible end fittings
8294	4 – 20 mA output
8295	PTFE Teflon seals
MKIT-0015-NB	Neoprene seal kit for ammonia service, up to 30 SLPM
8124	Totalizer for mass flowmeter
HAN-0007-AA	Full rack mounting adapter

Ordering Information

Model	Description
8124	Totalizer
8124-232	Totalizer with RS-232

Options

Model	Description
8291	Specific Gas Calibrations (Limitations Apply); Standard Calibration on Nitrogen, Corrected for Direct Reading

Mass Flow Equipment

Model 8270 Series

Mass Flow Controller System

Description

The complete 8270 Mass Flow Controller System offered by Linde consists of a flow controller transducer (Model 8272/8273 Series), a digital readout, power supply box, a feedback circuit to control the flow, an integral control valve and the necessary cable and connectors. An additional feature of the control box is a three-position selector switch to allow the user to conveniently switch between an open position (valve fully open), a closed position (valve fully closed) and a control position (unit functioning as a controller). The first two positions mentioned are override positions. These flow controllers can be supplied with either compression fittings (standard) or optional male VCR compatible connections for easy installation into tubing and piping systems.

In the "operating" or "control" mode the unit functions similar to a mass flowmeter but with the addition of a feedback circuit and control valve, which continuously monitor and control the flow of gas passing through the unit. When there is a flow imbalance sensed, an electronic logic circuit sends power to the control valve to maintain the flow setpoint by either throttling open or closed.

The 8270 Mass Flow Controller Digital Readout Box is available standard for rack mounting in a 1/2 EIA rack or for bench top use. Other standard features are high and low alarm setpoints selected by the user. The Model 8124 Totalizer is also available and can be used to compile the total amount of gas used over a period of time, regardless of varying flow rates.

Technical Data

Materials

Body	316 Stainless Steel	
By-pass	316 Stainless Steel	
Fittings	316 Stainless Steel	
Valve	316 Stainless Steel	
Standard Seals	Viton	
Valve Shut-off	Normally closed; bubble tight	
Standard Valve Seat	Viton	
Proof Pressure	1,500 psig	10,350 kPa
Minimum Differential Pressure (nominal)	5 psig	34.5 kPa
Maximum Differential Pressure	50 psig	345 kPa

Maximum Operating Pressure

< 500 sccm	300 psig	2,070 kPa
500 sccm–30 SLPM	500 psig	3,450 kPa
> 30 SLPM	150 psig	1,035 kPa
Temperature Range	0–50°C	32°–122°F
< 500 sccm	300 psig	2,070 kPa
500 sccm–30 SLPM	500 psig	3,450 kPa
> 30 SLPM	150 psig	1,035 kPa
Temperature Range	0°–50°C	32°–122°F

Accuracy

> 300 SLPM	± 3%
< 30 SLPM	± 1% of full scale
50–300 SLPM	± 2% of full scale

Standard Calibration

Temperature	0°C	32°F
Temperature Coefficient	< 0.1% per °C	
Response Time	0.5 seconds to 98% of scale	

Repeatability

≤ 200 SLPM	0.2%
> 200 SLPM	0.5%

Control Range

Series	0.2 ccm to 1,000 SLPM
Individual Unit	2% to 100% full scale
Signal Voltage Output	0–5 VDC; 4–20 mA (optional)
Voltage Input	115 VAC, 10 Watts, 230 VAC (optional)

Cable Lengths

Power Cord	1.83 m (6 ft)
Signal Cable	2.44 m (8 ft)
Alarm Contacts (Each Channel)	1 amp at 30 VDC maximum
Shipping Weight	3.6 kg (8 lbs)



Ordering Information

Model	Range in N ₂ @ 0°C and 14.7 psia	Standard End Fittings
8270-0411	0-10 sccm	1/4" compression
8270-0421	0-20 sccm	1/4" compression
8270-0431	0-30 sccm	1/4" compression
8270-0451	0-50 sccm	1/4" compression
8270-0412	0-100 sccm	1/4" compression
8270-0422	0-200 sccm	1/4" compression
8270-0432	0-300 sccm	1/4" compression
8270-0452	0-500 sccm	1/4" compression
8270-0413	0-1 SLPM	1/4" compression
8270-0423	0-2 SLPM	1/4" compression
8270-0433	0-3 SLPM	1/4" compression
8270-0453	0-5 SLPM	1/4" compression
8270-0414	0-10 SLPM	1/4" compression
8270-0424	0-20 SLPM	1/4" compression
8270-0434	0-30 SLPM	1/4" compression
8270-0454	0-50 SLPM	3/8" compression
8270-0415	0-100 SLPM	3/8" compression
8270-0425	0-200 SLPM	3/8" compression
8270-0435	0-300 SLPM	1/2" compression
8270-0455	0-500 SLPM	1/2" compression
8270-0416	0-1000 SLPM	3/4" compression

Additional Signal Cable Lengths

CBL-0125-XX	7.62 m (25 ft)
CBL-0126-XX	15.25 m (50 ft)
CBL-0127-XX	30.5 m (100 ft)
8292	230 VAC models
8293-4	1/4" VCR compatible end fittings
8293-6	3/8"/1/2" VCR compatible end fittings
8294	4 - 20 mA Output
8295	PTFE Teflon seals
MKIT-0015-NB	Neoprene seal kit for ammonia service, up to 30 SLPM
8124	Totalizer for mass flow controller
HAN-0007-AA	Full rack mounting adapter

Options

Model	Description
8291	Specific Gas Calibration (Limitations Apply)

Mass Flow Equipment

Model 8280 and 8284 Series

Technical Data

Dynamic Gas Blending Systems

Description

The 8280 and 8284 Series of Dynamic Gas Blending Systems are used to prepare accurate mixtures of different gases. These systems are dynamic with respect to flow conditions and have no ability to store gas for demand usage. These control systems function utilizing the Linde 8272/8273 Series Controller Transducers. There are two basic types of units: a Modular Dyna-Blender and a Multichannel Dyna-Blender.

Modular Dyna-Blender Model 8280

Linde's Modular Dyna-Blender, when used with an existing mass flowmeter or controller, accurately blends gases in a dynamic flowing system. Several units can be utilized to make multiple component mixtures. The unit requires the presence of an existing mass flowmeter or mass flow controller for mixing operations, or can be used as a stand alone controller.

The basis of the system is a mass flow controller transducer, which either responds to an external command signal or can be slaved to another mass flowmeter; mass flow controller or even another 8280 Dyna-Blender. This unit can also be used in conjunction with other equipment interfaced through user-supplied circuitry via a 0-5 VDC signal or 4-20 mA signal (optional) for dynamic flow systems. The Model 8124 Totalizer is also available and can be used to compile the total amount of gas used over a period of time, regardless of varying flow rates.

The 8280-control box may be ordered as a stand-alone item, or as part of a system (8280 control box, transducer assembly, and cable – see table for ordering information).

Multi-channel Dyna-Blender Model 8280

Linde's Multichannel Dyna-Blender accurately controls the flow rates of four different gases in a dynamic flowing system. Each of the four channels has individual potentiometers and control switches. The single display is operated by an eight-position switch and reads in percent of range. The unit can control gas mixtures up to four components in composition, with user-supplied manifolds.

The gas flow of the system can be controlled by the individual controller, or an external 0-5 VDC or 4-20 mA signal (optional) for remote operation. **Each individual channel requires a mass flow controller transducer, which must be ordered separately**

	Model 8280	Model 8284
Voltage Input	115 VAC, 10 Watts	115 VAC, 40 Watts
Signal Voltage Output	0-5 VDC; 4-20 mA (Optional)	0-5 VDC; 4-20 mA
Cable Lengths		
Power Cord	1.8 m (6 ft)	1.8 m (6 ft)
Signal Cable	2.4 m (8 ft)	2.4 m (8 ft)
Alarm Contacts Maximum		
(Each Channel)	1 amp at 30 VDC	1 amp at 30 VDC
Rack Mounting	1/2 rack (9.5")	Full rack (19")
Shipping Weight	3.6 kg (8 lbs)	5.9 kg (13 lbs)

Model	Range in N ₂ @ 0°C and 14.7 psia	Standard End Fittings
8280-0411	0–10 sccm	1/4" compression
8280-0421	0–20 sccm	1/4" compression
8280-0431	0–30 sccm	1/4" compression
8280-0451	0–50 sccm	1/4" compression
8280-0412	0–100 sccm	1/4" compression
8280-0422	0–200 sccm	1/4" compression
8280-0432	0–300 sccm	1/4" compression
8280-0452	0–500 sccm	1/4" compression
8280-0413	0–1 SLPM	1/4" compression
8280-0423	0–2 SLPM	1/4" compression
8280-0433	0–3 SLPM	1/4" compression
8280-0453	0–5 SLPM	1/4" compression
8280-0414	0–10 SLPM	1/4" compression
8280-0424	0–20 SLPM	1/4" compression
8280-0434	0–30 SLPM	1/4" compression
8280-0454	0–50 SLPM	3/8" compression
8280-0415	0–100 SLPM	3/8" compression
8280-0425	0–200 SLPM	3/8" compression
8280-0435	0–300 SLPM	1/2" compression
8280-0455	0–500 SLPM	1/2" compression
8280-0416	0–1000 SLPM	3/4" compression

Note: Model numbers listed above consist of a complete single channel Dyna-Blender System that includes a transducer assembly and 8280-control box.

Options

Model	Description
8292	230 VAC Models
8284-8294	8284 with 4–20 mA Input/Output – Modular Dyna-Blender (4 channel)*
8280-8294	8280 with 4–20 mA Input/Output*
8295	PTFE Teflon Seals
HAN-0007-AA	Full Rack Mounting Adapter

* Note: 0–5 VDC signal included

Ordering Information

Model	Description
8280	Modular Dyna-Blender Control Box
8284	Multichannel Dyna-Blender Control Box

The 8280-control box may be ordered as a stand-alone item, or as part of a system (8280 control box, transducer assembly, and cable – see the preceding table for system ordering information).

Mass Flow Equipment

Model 8175

Technical Data

Multiple Channel Mass Flowmeter Monitoring System

Description

The monitoring system box may be used with as many as four separate mass flowmeters to independently monitor up to four separate gas streams. The user of the flowmeters can order these separately and match the appropriate display to the individual application.

This unit allows the continuous monitoring of up to four mass flowmeters. The individual flow rates can be indicated on the digital readout by positioning the selector switch to the desired transducer. The system includes a four-position selector switch, a 0 to 100% of range digital display (only one channel can be read at a time), a power cord and four individual cables for the transducers. Also standard are high and low alarm setpoints (for each channel) selected by the user.

It is not necessary to employ all four stations on the initial system. Positions may be reserved for future expansion. Each individual channel requires a Model 8172 or 8173 Series flowmeter transducer, which must be ordered separately.

Ordering Information

Model	Description
8175	Multiple Mass Flowmeter Monitoring System

Options

Model	Description
8292	230 VAC
8175-8294	8175 w/4 -20 mA Output

Voltage Input	115 VAC, 20 Watts
Signal Voltage Output	0-5 VDC
Cable lengths	
Power Cord	1.8 m (6 ft)
Signal Cable	2.4 m (8 ft)
Alarm Contacts (Each Channel)	1 amp at 30 VDC maximum
Rack Mounting	Full 19" rack
Shipping Weight	5.9 kg (13 lbs)



Mass Flow Equipment

Model 8274

Technical Data

Multiple Channel Mass Flow Controller System

Description

This unit allows the independent monitoring and control of up to four mass flow controllers in use. The system continuously and simultaneously adjusts to maintain the preset point for each gas flow rate. The individual setpoint and flow rates can be indicated on the digital readout by positioning the selector switch to the desired controller. The control system includes an eight position (four read and four set) selector switch, a 0 to 100% of range digital display (only one channel can be read at a time), individual override control valve switches, flow potentiometers for setting flow rate, a power cord and four individual cables for the controllers. Also standard are high and low alarm setpoints selected by the user.

It is not necessary to employ all four stations on the initial system. Positions may be reserved for future expansion of the system. Each individual channel requires a Model 8272 or 8273 Series controller transducer, which must be ordered separately.

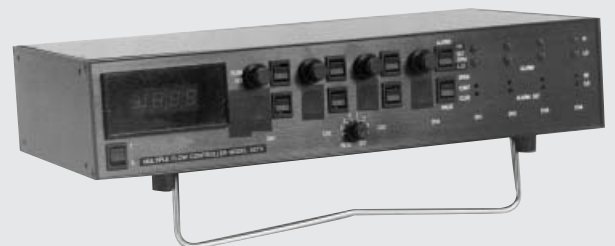
Ordering Information

Model	Description
8274	Multiple Mass Flow Controller System

Options

Model	Description
8274	Multiple Mass Flow Controller System
8292	230 VAC
8274-8294	8274 w/ 4 - 20 mA Output

Voltage Input	115 VAC, 40 Watts
Signal Voltage Output	0-5 VDC
Cable Lengths	
Power Cord	1.8 m (6 ft)
Signal Cable	2.4 m (8 ft)
Alarm Contacts	
(Each Channel)	1 amp at 30 VDC maximum
Rack Mounting	Full 19" rack
Shipping Weight	5.9 kg (13 lbs)



Mass Flow Equipment

Model 8124

Totalizer

Description

The Model 8124 Totalizer is used to compile the total amount of gas used, regardless of varying flow rates over a period of time. The total is continuously displayed on a six-digit LED readout and the resolution can be changed, depending upon the length of time required. Please specify full-scale flow range of mass flow equipment or range of counts per time frame for factory set-up.

Design Features/Components

- 6 digits for accuracy
- $\pm 1\%$ accuracy
- 2 alarm setpoints
- Output contacts for alarms
- 0-5 VDC inputs
- Programmable from front panel or front panel with optional RS-232 connector
- Local and remote reset
- Local and remote hold (split timing)
- Bench mount or 1/2 EIA rack mount standard



Ordering Information

Model	Description
8124	Totalizer
8124-232	Totalizer with RS-232

Models 8172 and 8272 Series

Technical Data

Transducer Assemblies

Description

Linde affords the user the ability to mix and match components to achieve a customized system. Listed below are the individual model numbers for the transducer assemblies for Linde's Mass Flowmeters and Mass Flow Controllers.

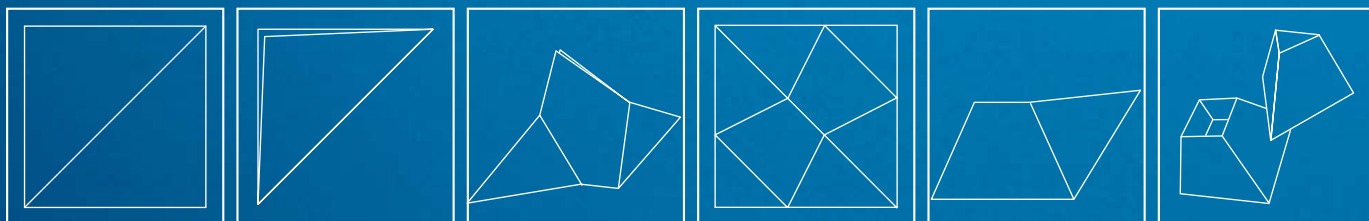
Transducer Assemblies for Controllers and Flowmeters

Flowmeter Transducer Model Number	Controller Transducer Model Number	Range in N ₂ @ 0°C and 14.7 psia	Standard End Fittings
8172-0411	8272-0411	0–10 sccm	1/4" compression
8172-0421	8272-0421	0–20 sccm	1/4" compression
8172-0431	8272-0431	0–30 sccm	1/4" compression
8172-0451	8272-0451	0–50 sccm	1/4" compression
8172-0412	8272-0412	0–100 sccm	1/4" compression
8172-0422	8272-0422	0–200 sccm	1/4" compression
8172-0432	8272-0432	0–300 sccm	1/4" compression
8172-0452	8272-0452	0–500 sccm	1/4" compression
8172-0413	8272-0413	0–1 SLPM	1/4" compression
8172-0423	8272-0423	0–2 SLPM	1/4" compression
8172-0433	8272-0433	0–3 SLPM	1/4" compression
8172-0453	8272-0453	0–5 SLPM	1/4" compression
8172-0414	8272-0414	0–10 SLPM	1/4" compression
8172-0424	8272-0424	0–20 SLPM	1/4" compression
8172-0434	8272-0434	0–30 SLPM	1/4" compression
8173-0454	8273-0454	0–50 SLPM	3/8" compression
8173-0415	8273-0415	0–100 SLPM	3/8" compression
8173-0425	8273-0425	0–200 SLPM	3/8" compression
8173-0435	8273-0435	0–300 SLPM	1/2" compression
8173-0455	8273-0455	0–500 SLPM	1/2" compression
8173-0416	8273-0416	0–1000 SLPM	3/4" compression

Note: transducer assemblies can be purchased as stand-alone units or as part of the 8170, 8270, or 8280 Mass Flow Systems.

Electrical Components

Model	Description
8170, 8175	Control Box for Mass Flowmeters
8124	Totalizer for Mass Flowmeters
8270, 8274	Control Box for Mass Flow Controllers
CBL-0124-XX	2.4 m (8 ft) standard signal cable
CBL-0125-XX	7.62 m (25 ft) signal cable
CBL-0126-XX	15.24 m (50 ft) signal cable
CBL-0127-XX	30.5 m (100 ft) signal cable



Accessories and Ancillary Equipment

Gas supply, distribution and flow equipment are only one part of the complete Linde offer. In addition, we offer a comprehensive range of accessories and other safety equipment to compliment our gas supply products. These include:

- Laboratory gas generators for hydrogen, nitrogen and ultra high purity air
- Gas line purification to protect the gas stream, and improve point of use purity performance
- Gas leak detectors, monitors, and fixed detection systems designed to ensure a safe working environment when using compressed gases or chemicals
- Cylinder gas cabinets for indoor, or outdoor storage protection for any compressed cylinder gases
- Cylinder blankets
- Valves, gauges and scales

Linde accessories add to our full scope solutions for customer gas handling and distribution supply needs.

HiQ[®] Specialty Gas Generators

Ultra Zero Air Series

Description

The Linde "ZAU" Ultra Zero Air generators reduce HC, NO_x and SO₂ pollutants to less than 0.1 ppm, CO₂ to less than 5 ppm and remove all kinds of particles. In the lab, they provide several advantages. Eliminating the need to use and store high-purity air in cylinders saves valuable laboratory floor space. The generator can also be wall-mounted, providing yet another way of saving space. Using an on-site gas generator also eliminates the need to recalibrate instruments after replacing empty cylinders with full ones. The operation of the generator requires low levels of electrical power. This complete turnkey system is engineered with the highest quality components, is easy to install, and requires only minimal annual maintenance. The "ZAU" Ultra Zero Air generator models utilize a 5-stage process to purify ambient air into high-purity analytical grade air. All main components are manufactured with high-grade stainless steel and installed systematically in cabinets for easy access and service.

Product Features

- Compact size requires minimal space
- Wall-mountable
- Built-in security lock on external housing
- Green, yellow and red indicating lights indicate power, warm-up, ready and fault notification of low/high catalyst temperature, low/high inlet pressure, and life expectancy/expiration of catalyst
- A digital thermal switch automatically shuts off the power supply to the catalyst in the event that the inlet compressed air is turned off, preventing catalyst damage due to overheating

Model	Description
ZAU 1500	Ultra Zero Air generator 1,500 ml/min
ZAU 3000	Ultra Zero Air generator 3,000 ml/min
ZAU 6000	Ultra Zero Air generator 6,000 ml/min
ZAU 15000	Ultra Zero Air generator 15,000 ml/min
ZAU 30000	Ultra Zero Air generator 30,000 ml/min

Maintenance

ZA-FILT	Replacement ext. air filter, housing and element
ZA-XCART	Replacement cartridge for external air filter
ZA-ICART	Replacement cartridge for internal air filter
ZA-ACC-6	Active carbon column for models 1.5-6 l/min
ZA-ACC-30	Active carbon column for models 15-30 l/min

Technical Data

Max outlet flow	1.5; 3.0; 6.0; 15; 30 l/min
Max outlet pressure	94 psig 650 kPa
Inlet air pressure range	65-145 psig 450-1,000 kPa
Product outlet purity	Hydrocarbons < 0.1 ppm
	Carbon dioxide < 5 ppm
	Carbon monoxide < 0.1 ppm
	Nitrogen oxides < 0.1 ppm
	Sulfur oxide < 0.1 ppm
	Ozone < 0.1 ppm
	Dew point < 70°C
	(< 2.5 ppm) (< 158°F)
	Particles (>0.5 micron removed) 99.99%
Max inlet impurities	Hydrocarbons 100 ppm
	Carbon dioxide 500 ppm
	Carbon monoxide 100 ppm
	Nitrogen oxides 50 ppm
Connections	
Outlet	1/4" compression
Inlet	1/4" compression
Outlet air temperature (ambient)	15°C 59°F
Max inlet temperature	40°C 104°F
Dimensions (WxDxH)	47 x 25 x 40 cm 18 x 10 x 16"
Weights	
ZAU 1500/3000	15 kg 33 lbs
ZAU 6000	21 kg 46 lbs
ZAU 15000/30000	25 kg 55 lbs

Certification  compliant 



Zero Air Series

Technical Data

Description

The Linde "ZAGC" Zero Air generators reduce HC pollutants to less than 0.1 ppm and remove all kinds of particles. In the lab, they provide several advantages. Eliminating the need to use and store high-purity air in cylinders saves valuable laboratory floor space. There is no need to continually buy replacement high-purity air in cylinders. Using an on-site gas generator also eliminates the need to recalibrate instruments after replacing empty cylinders with full ones. The operation of the generator requires low levels of electrical power. This complete turnkey system is engineered with the highest quality components, is easy to install, and requires only minimal annual maintenance. The "ZAGC" Zero Air generator models utilize a 3-stage process to purify ambient air into analytical grade air. All main components are manufactured with high-grade stainless steel and installed systematically in cabinets for easy access and service.

Product Features:

- Compact size requires minimal space
- Wall-mountable
- Built-in security lock on external housing
- Green, yellow and red indicating lights indicate power, warm-up, ready and fault notification of low/high catalyst temperature, low/high inlet pressure, and life expectancy/expiration of catalyst
- A digital thermal switch automatically shuts off the power supply to the catalyst in the event that the inlet compressed air is turned off, preventing catalyst damage due to overheating

Model	Description
ZAGC 1500	Zero Air generator 1,500 ml/min
ZAGC 3000	Zero Air generator 3,000 ml/min
ZAGC 6000	Zero Air generator 6,000 ml/min
ZAGC 15000	Zero Air generator 15,000 ml/min
ZAGC 30000	Zero Air generator 30,000 ml/min

Maintenance

ZA-FILT	Replacement ext. air filter, housing and element
ZA-XCART	Replacement cartridge for external air filter
ZA-ICART	Replacement cartridge for internal air filter
ZA-ACC-6	Active carbon column for models 1.5–6 l/min
ZA-ACC-30	Active carbon column for models 15–30 l/min

Max outlet flow	1.5; 3.0; 6.0; 15; 30 l/min
Max outlet pressure	94 psig 650 kPa
Inlet air pressure range	45–145 psig 300–1,000 kPa
Product outlet purity	Hydrocarbons < 0.1 ppm Carbon monoxide < 0.1 ppm Particles (>0.5 micron removed) 99.99%
Max inlet impurities	Hydrocarbons 100 ppm Carbon monoxide 100 ppm

Connections

Outlet	1/4" compression
Inlet	1/4" compression

Outlet air temperature (ambient)	15°C 59°F
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Max inlet temperature	40°C 104°F
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Dimensions (WxDxH)	47 x 25 x 40 cm 18 x 10 x 16"
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Weights

ZAGC 1500/3000	13 kg 29 lbs
ZAGC 6000	15 kg 33 lbs
ZAGC 15000/30000	22 kg 49 lbs

Certification  compliant 



HiQ[®] Specialty Gas Generators

Hydrogen Pure Gas Series

Description

The HiQ[®] hydrogen generator relies on the newest electrolytic membrane technology, which is significantly cleaner than conventional hydrogen generation. This new technology reduces maintenance and cleaning to a minimum. It permits a chemical-free, trouble-free and long-term production of hydrogen – simply from the electrolysis of deionized water. No free acids or alkalines are used, thus avoiding caustic impurities that might affect hydrogen quality and degrade the system.

Features

- LCD-based display and membrane control pad for simple operation
- Multiple alarms (low water level, poor water quality, low pressure, insufficient power supply)
- Requires deionized water instead of caustic electrolytic solutions
- Replaceable desiccant cartridge provides final purification step to remove moisture
- Cascading flow control allows multiple units to be connected for larger capacity flows (option)
- Cable interface permits remote computer monitoring of all functions (option)

Model	Description
PGH2 100	100 ml/min
PGH2 160	160 ml/min
PGH2 250	250 ml/min
PGH2 500	500 ml/min
PGH2 100-RC	100 ml/min
PGH2 160-RC	160 ml/min
PGH2 250-RC	250 ml/min
PGH2 500-RC	500 ml/min
PGH2 250-CF	250 ml/min
PGH2 500-CF	500 ml/min

Optional Features

PGH2-PCI-CC	With PC interface and control cable
PGH2-EXT-RC	With handheld external remote control unit
PGH2-H2O-RF	With automatic water refilling option

Maintenance

PGH2-DI-Bag	Deionizer bag, replacement
PGH2-DES-Cart	Desiccant cartridge with fittings, replacement
PGH2-RCC-10	Remote control cable (15-conductors) 10m
PGH2-RCC-10	Remote control cable (15-conductors) 25m
PGH2-RCC-10	Remote control cable (15-conductors) 50m

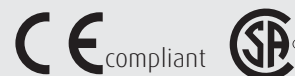
Technical Data

Max H ₂ flow rate	0.10; 0.16; 0.25; 0.50 l/min
Delivery pressure	1–100 psig 10–700 kPa
H ₂ purity	99.999% (5.0)
Electrolysis cell	Solid polymer membrane
Safety	Auto shut-off
Water	Deionized
User interface	Set points, system status, user parameter
Display	LCD display with set points, status, alarms
Options	I/O board containing: <ul style="list-style-type: none"> • RS232C bi-directional/2 ports • RS485 • Cascading up to 32 units • Potential free relay contacts • Software for PC-control capability (requires I/O board)

Dimensions (WxDxH)	22 x 33 x 40 cm	8.7 x 13 x 15.6"
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Weights		
PGH2 100/160/250	16.5 kg	36 lbs
PGH2 500	18 kg	40 lbs

Certification



Hydrogen No-Maintenance Series

Technical Data

Description

The HiQ® hydrogen generator is a no-maintenance device with innovative membrane-technology. Its advanced dual-column drying system automatically removes residual moisture from the hydrogen produced. The column materials are also regenerated automatically, and in the final purification not even a desiccant cartridge is needed.

For the electrolytic dissociation process, the HiQ® hydrogen generator requires no caustic chemical solutions. Instead, it uses harmless deionized water to produce a reliable, continuous output of 6.0 hydrogen (>99.9999% pure). System operating status and diagnostic data appear on a user-friendly digital display. In case of an internal error, the unit is put on standby by an auto-shut-off procedure. Selectable, multiple alarms alert to unwanted shifts in operating conditions such as low water level, poor water quality, low pressure (leak) and power supply conditions.

Hydrogen flow and water quality are monitored by continuous LCD indication. The gas delivery pressure is indicated by LCD and can be adjusted manually via a membrane control pad. A cable interface permits remote computer monitoring of all functions.

Model	Description
NMH2 100	100 ml/min
NMH2 160	160 ml/min
NMH2 250	250 ml/min
NMH2 500	500 ml/min
NMH2 100-RC	100 ml/min
NMH2 160-RC	160 ml/min
NMH2 250-RC	250 ml/min
NMH2 500-RC	500 ml/min
NMH2 250-CF	250 ml/min
NMH2 500-CF	500 ml/min

Optional Features

NMH2-PCI-CC	With PC interface and control cable
NMH2-EXT-RC	With handheld external remote control unit
NMH2-H2O-RF	With automatic water refilling option

Maintenance

NMH2-DI-Bag	Deionizer bag, replacement
NMH2-RCC-10	Remote control cable (15-conductors) 10m
NMH2-RCC-10	Remote control cable (15-conductors) 25m
NMH2-RCC-10	Remote control cable (15-conductors) 50m

Max H ₂ flow rate	0.10; 0.16; 0.25; 0.50 l/min	
Delivery pressure	1–155 psig	10–1,050 kPa
H ₂ purity	>99.9999% (>6.0)	
Electrolysis cell	Solid polymer membrane	
Safety	Auto shut-off and low internal volume (< 40ml)	
Auto-drying system	No maintenance of drying cartridges (exclusive system)	
Water	Deionized or distilled	
User interface	Set points, system status, user parameter	
Display	LCD display 128 x 64 pixels, set points, status, alarms	
Options	I/O board containing: <ul style="list-style-type: none"> • RS232C bi-directional/2 ports RS485 • Cascading up to 32 units • Potential free relay contacts • Software for PC-control capability (requires I/O board) 	

Dimensions (WxDxH)	23 x 35 x 43 cm	9 x 14 x 17"
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Weights

NMH2 100/160/250	17 kg	37.5 lbs
NMH2 500	18 kg	40 lbs

Certification



HiQ[®] Specialty Gas Generators

BORA Mini Nitrogen Series

Description

Delivering a continuous stream of pure nitrogen gas with low residual oxygen content, the BORA mini series is ideal for operation as nitrogen gas supply for all kinds of laboratory and chromatography applications. BORA mini nitrogen gas generators include an integral oil-free air compressor as standard equipment.

The BORA mini nitrogen gas generator uses the pressure swing adsorption (PSA) system, used in thousands of systems worldwide to remove oxygen, carbon dioxide and water from compressed air. The resulting stream of high purity nitrogen gas is ideal for applications including GC carrier, make-up gas, generally for all low flow applications.

The BORA mini series of nitrogen gas generators are incredibly miniaturized and very silent. Ideal for placement under or on a lab bench, the BORA series is the smallest sized high purity nitrogen generator available worldwide.

Advantages

- Nitrogen produced at low pressure and ambient temperature removes the need for high pressure cylinders or liquid dewars
- A constant, uninterrupted gas supply of guaranteed purity eliminates interruptions of analyses to change cylinders and reduces the amount of instrument re-calibrations required
- 99.999%+ (99.99%+ for model B-PSA-1300) pure nitrogen gas produced as standard. No need for costly downstream secondary filtration
- Integral oil-free air compressor guarantees continuous gas supply, independent of inhouse compressed air supply
- BORA mini gas generators are easily installed in the laboratory

Model	Description
B-PSA-500	BORA PSA mini, 500 ml/min, 230V
B-PSA-750	BORA PSA mini, 750 ml/min, 230V
B-PSA-1300	BORA PSA mini, 1300 ml/min, 230V
B-PSA-500/110	BORA PSA mini, 500 ml/min, 110V
B-PSA-750/110	BORA PSA mini, 750 ml/min, 110V
B-PSA-1300/110	BORA PSA mini, 1300 ml/min, 110V

Maintenance

B-PSA-AK-500	Annual maintenance kit/500 ml/min
B-PSA-AK-750	Annual maintenance kit/750 ml/min
B-PSA-AK-1300	Annual maintenance kit/1300 ml/min
B-PSA-4000K-500	4000 h filters kit/500 ml/min
B-PSA-4000K-750	4000 h filters kit/750 ml/min
B-PSA-4000K-1300	4000 h filters kit/1300 ml/min
B-PSA-24000K	24000 h maintenance kit

Technical Data

Max. N ₂ flow rate (at 20°C, 1 bar)	B-PSA-500	500 ml/min
	B-PSA-750	750 ml/min
	B-PSA-1300	1300 ml/min
Delivery pressure	58 psig	400 kPa
N ₂ purity	B-PSA-500/750	≥99.999%
	B-PSA-1300	≥99.995%
Oxygen content	B-PSA-500/750	<10 ppm
	B-PSA-1300	<50 ppm
Temperature range	10–40°C	50–104°F
Noise level	<50dB(A)	
Power	230V/50Hz; 110V/60Hz	
Dimensions (WxDxH)	35 x 40 x 30 cm	13.8 x 15.7 x 11.8"
	Weight	18 kg

Certification



Nitrogen SIROCCO DS-PSA Series

Technical Data

Description

The SIROCCO high purity nitrogen gas generators use the DS-PSA technique. Including integral oil-free air compressors as standard, the generators deliver a continuous stream of 99.999%+ pure nitrogen gas with a minimal residual oxygen content without the need for secondary purification. Version 3A includes a separate and independent compressed instrument air system. The SIROCCO series of nitrogen gas generators is ideal for operation as nitrogen gas supply for all kinds of laboratory and chromatography applications.

SIROCCO DS-PSA nitrogen gas generators use a patented DUAL STEP pressure swing adsorption (DS-PSA) system. Pressure swing adsorption is well known and the DUAL STEP system is a new innovation which is a much more economical and much more efficient technique compared with the traditional standard PSA technique. The DS-PSA system removes oxygen, carbon dioxide and water from compressed air. The resulting stream of high purity nitrogen gas (99.999%) is ideal for laboratory applications including GC carrier gas, make-up gas, and many other applications like ICP etc. Version DS-PSA-N2-3A also produces a 3 l/min flow at a pressure of 73 psi of clean air for other use. The compressed air system includes a filtration and drying system and is completely separated from the N₂ part of the generator.

Advantages

- Nitrogen produced at low pressure and ambient temperature removes the need for high pressure cylinders or liquid dewars
- A constant, uninterrupted gas supply of guaranteed purity eliminates interruptions of analyses to change cylinders and reduces the amount of instrument re-calibrations required
- Up to 99.999%+ pure nitrogen gas produced as standard. No need for costly downstream secondary filtration
- Integral oil-free air compressor guarantees continuous gas supply, independent of inhouse compressed air supply
- The gas generators can easily be installed in the laboratory

Model	Description
DS-PSA-N2-3	SIROCCO DS-PSA, 3 l/min, 230V
DS-PSA-N2-3A	SIROCCO DS-PSA, 3 l/min, air, 230V
DS-PSA-N2-5	SIROCCO DS-PSA, 5 l/min, 230V
DS-PSA-N2-3/110	SIROCCO DS-PSA, 3 l/min, 110V
DS-PSA-N2-3A/110	SIROCCO DS-PSA, 3 l/min, air, 110V
DS-PSA-N2-5/110	SIROCCO DS-PSA, 5 l/min, 110V

Maintenance

DS-PSA-AK	Annual maintenance kit
DS-PSA-4000K	4000 hours maintenance kit

Max. N₂ flow rate (at 20°C, 100 kPa)	DS-PSA-3	3 l/min
	DS-PSA-5	5 l/min
Delivery pressure ±0.5%	73 psig	500 kPa
N₂ purity	≥99.999%	
Oxygen content	<10 ppm	
Index of protection	IP2x (acc. IEC 60529, rev 2.1)	
Temperature range	10°–40°C	50°–104°F
Noise level	<60dB(A)	
Display	Microprocessor controlled graphic display, 128 x 64 pixels	
Power	230V/50Hz	
	110V/60Hz	
Power consumption	820W	
Dimensions (W/D/H)	48 x 83.5 x 64 cm	19 x 33 x 25.2"
Weight	110 kg	243 lbs



HiQ[®] Specialty Gas Generators

LC/MS 0 Nitrogen Generator Series

Description

The HiQ[®] LC/MS 0 series laboratory nitrogen generator is designed to deliver larger capacity flow rates required for LC/MS instrument operation. The LC/MS 0 generator comes without a compressor, and is intended for use where compressed air is available from an external source. No electrical installation is required. The system is built around an integral membrane and can deliver flow rates from 0 to 25 or 0 to 60 l/min with purities ranging from 98% to 99%. The feed pressure must be within the range of 100–155 psig (690–1,030 kPa). For best results the air feed temperature should be 20–25°C (68°–77°F).

The generator is supplied in a wall mounting cabinet.

Model	Description
LCMS-N2-0-25	LC/MS N ₂ generator excl. compressor, 25 l/min
LCMS-N2-0-60	LC/MS N ₂ generator excl. compressor, 60 l/min

Maintenance

LCMS-0-25-AK	Annual filter kit for LCMS-N2-0-25
LCMS-0-60-AK	Annual filter kit for LCMS-N2-0-60

Technical Data

Max. N ₂ flow rate (at 20°C)	25 l/min or 60 l/min	
Delivery pressure	Inlet pressure minus 15 psi (-100 kPa)	
N ₂ purity	98–99% (adjustable)	
Compressed air feed pressure	100–155 psig	690–1,030 kPa
Temperature range	10°–40°C	50°–104°F
Residual oil content	≤ 0.01 mg/m ³	
Pressure dew point	≤ 3°C	≤ 37°F
Connections		
Outlet	1/4" FNPT	
Inlet	1/4" FNPT	
Noise level	< 45dB(A)	
Dimensions (WxDxH)	28 x 19 x 81 cm	11 x 7.5 x 31.9"
Weight	22 kg	49 lbs



LC/MS 4 Nitrogen Generator Series

Technical Data

Description

The HiQ® LC/MS 4 laboratory nitrogen generator is specifically designed to deliver larger capacity flow rates required for LC/MS 4 instrument operation. The generator is a stand-alone unit that makes pure nitrogen out of ambient air. The system is built around an integral membrane system and oil-free direct drive compressors that deliver a continuous stream of pure, dry nitrogen. The system can deliver flow rates from 1 to 30 l/m, with purities ranging from 96% to 99.9%. For optimal floor mobility, the units are equipped with self-locking caster wheels.

The built-in air compressor (stage 1) compresses the air up to 45 psi. The first membrane tube removes the moisture and most of the oxygen together with other gases like CO₂, etc. The permeate from the first membrane tube is released back into the atmosphere. The pre-cleaned air then passes on to the 2nd and 3rd membrane tube where nitrogen with a purity higher than 98% is separated. The permeate from membrane tubes 2 and 3, which is moisture-free and reduced in oxygen content, is collected and recycled back to the inlet of the low-pressure pump.

The pure nitrogen collected after tube 3 is then boosted by a second compressor (stage 2) from 45–120 psig (3,000–8,500 kPa), which is the outlet pressure specification.

Advantages

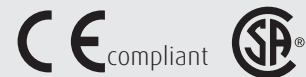
- Flow control valve allows variable flow rates and nitrogen purity levels
- Pressure indication provided for nitrogen supply outlet
- Integral oxygen sensor monitors purity
- Standard integral oil-free direct drive air compressor for turnkey operation
- Self-locking caster wheels provide mobility for installation

Model	Description
LCMS-N2-4	LC/MS nitrogen generator with compressors

Maintenance/Spare Parts

LCMS-4-AK	Annual maintenance kit for LC/MS 5536 nitrogen generator with compressors
LCMS-4-02S	Oxygen sensor for 5537 generator with compressors LC/MS nitrogen

Max. N ₂ flow rate	15 to 28 l/m (adjustable)	
Delivery pressure	120 psig	860 kPa
N ₂ purity	98–99% (adjustable)	
Air quality	Normal, clean ambient air, relative humidity < 90%	
Temperature range	10°–35°C	50°–95°F
Connections		
Outlet	1/4" FNPT	
Inlet	1/4" FNPT	
Noise level	< 58dB(A)	
Flow capacity	10–30 l/m	
Power consumption	900W	
Dimensions (WxDxH)	31 x 90 x 70 cm	12.2 x 35.4 x 27.6"
Weight	93 kg	204 lbs
Certification		



PUR-Gas™ In-Line Purifier Systems

Model PUR-IL Series

Technical Data

PUR-Gas™ In-Line Purifiers

Description

The PUR-Gas™ Purifier product line has been expanded to offer a range of high-performance gas purification products in the traditional “In-Line” (trap) design that is commonly utilized for point-of-use purification within the laboratory environment. The “In-Line” purifier configuration allows the purifier to be installed easily into your gas delivery lines* or mounted on the wall with mounting clips if bench-top space is limited. The unique “End Connectors” allow you to remove the spent purifier without tools and install a replacement in just seconds. During replacement of the purifiers, check valves within the “End Connectors” automatically seal the gas delivery lines to the atmosphere, eliminating diffusion of potential contaminants into the gas stream and maintaining existing gas purity. The PUR-Gas™ “In-Line” Purifiers provide superior contaminant removal to produce 99.9999% purity.

*most purifier positions require no additional support

Applications

- Point-of-use purification of all gases utilized with the operation of an FID equipped GC.
- Ideal for purification of carrier gases used with GC/MS, ECD, PID and NPD detectors.
- Removal of hydrocarbons and moisture from FID fuel gases.
- Purification of Nitrogen for LC/MS instruments.

Purifier Cartridge Capacity

PUR-Gas™ In-Line Model	Gas Purity Outlet	Carrier Gas	Visual Indicator	H ₂ O Capacity (g)	O ₂ Capacity (ml)	Hydrogen Capacity (g)	Estimated Life Span
Moisture Trap	> 6.0	He H ₂	No	21	n.a.		>2 years
Oxygen Trap	> 6.0	He	No	n.a.	3,000		>2 years
Hydrocarbon Trap	> 6.0	He H ₂ Air	No	n.a.	n.a.	36 (as n-butane)	>2 years
Triple Indicating Trap (moisture + Oxygen + hydrocarbons)	> 6.0	He	No	3	400	5 (as n-butane)	>2 years
Combi Trap (moisture + Oxygen + hydrocarbons)	> 6.0	He H ₂ Air	No	10	n.a.	18 (as n-butane)	>2 years
Triple Trap (moisture + Oxygen + hydrocarbons)	> 6.0	He	No	6	1,000	12 (as n-butane)	>2 years

Operating Pressure	150 psig maximum	1,030 kPa maximum
Maximum Flow Rate	Stainless Steel (std all models) or Glass w/Polycarbonate Casing (Indicating model only)	
Dimensions	3.2 cm x 20 cm	
Standard Models (DxL)	1.26" x 7.9" (w/o End Connectors)	
	3.2 cm x 25.4 cm	
	1.26" x 10" (with End Connectors)	
End Connectors	1/8" compression, Brass or Stainless Steel	
	1/4" compression, Brass or Stainless Steel	
Weight (Standard Models)	1.2 kg	2.65 lbs

Design Features/Components

- End Connectors eliminate “tools” typically required to install purifier replacements.
- Replacement purifiers can be installed within seconds, minimizing instrument downtime.
- Check valves integral to “End Connectors” prevent introduction of contaminants into gas delivery lines.
- Removal of hydrocarbons, oxygen and moisture can be performed within a single purifier filter.
- Visual “End Point” Indicator available for Moisture and Oxygen breakthrough optimizes purifier performance and signals time for replacement.

Ordering Information

Standard In-line "Trap" Models

Model	Description
PUR-IL-MT1	PUR-Gas™ In-Line Moisture (H ₂ O) Trap
PUR-IL-OT1	PUR-Gas™ In-Line Oxygen (O ₂) Trap
PUR-IL-HT1	PUR-Gas™ In-Line Hydrocarbon (HC) Trap
PUR-IL-OMT1	PUR-Gas™ In-Line Combi Oxygen/Moisture Trap
PUR-IL-TRT1	PUR-Gas™ In-Line Triple Oxygen/Moisture/HC Trap
PUR-IL-ITRT1	PUR-Gas™ "Breakthrough" In-Line (He filled) Triple Oxygen/Moisture/HC Indicator*
PUR-IL-TRT2	PUR-Gas™ In-Line Triple Oxygen/Moisture/HC Trap (He filled)

* "Indicating" Traps provide visual indication for determining the optimum time for replacement and maximizing operating effectiveness. (a) The housing for the "Indicating" In-Line Triple Trap is made from glass encased with a polycarbonate coating; all other in-line trap housings are stainless steel material and are "Non-Indicating." (b) The term "He filled" applies to those specific traps that have been purged and filled internally with helium gas; all remaining trap models are filled with argon gas and should be purged after installation.

"End-to-End" Tube Connectors (One set required for each In-Line Purifier purchased)

Model	Description
PUR-IL-CBR2	1/8" Brass in-line connector (set of two)
PUR-IL-CBR4	1/4" Brass in-line connector (set of two)
PUR-IL-CSS2	1/8" Stainless steel in-line connector (set of two)
PUR-IL-CSS4	1/4" Stainless steel in-line connector (set of two)
PUR-IL-DTCSS4	1/4" Stainless steel series in-line connector (quantity, one)**

**The "SERIES" In-Line Connector is a single connector ONLY used for connecting two or more traps in a direct end-to-end series installation arrangement where it is desired to have gas flow from one trap immediately (sequentially) into a second (or even third) trap connected in "Series" with the first trap.

Optional and Replacement Parts

Model	Description
PUR-IL-WMC4	Wall-Mount Clamp Set (for Standard Models)
PUR-IL-ORS10	Spare O-Ring Set for In-Line Connectors (package of 10)

Product Application Recommendations:

1. End-to-end connectors are primarily intended for use with stainless steel and brass tubing; connections to plastic tubing can be made; however, it is recommended that a metal insert be utilized at each inlet/outlet connection point where plastic tubing connections are required.
2. The proper installation orientation for all purifiers is in the "vertical" position.
3. Mounting screws for Wall-Mount Clamps are not included.

PUR-Gas™ Cartridge Purifier Systems

Model PUR Series

Technical Data

PUR-Gas™ Cartridge Purifiers

Description

Point-of-use, high-performance gas purifier system designed to provide superior contaminant reduction and utilizes removable purifier cartridges to produce 99.9999% purity. The basic system consists of a purifier cartridge installed on a compatible baseplate. The purifiers can be installed and replaced without interrupting the operating and analytical performance of the system. The metal and glass construction of the purifier cartridges eliminates diffusion of potential contaminants into the gas stream. During replacement of the purifier cartridges, check valves automatically close off the system to the atmosphere, further minimizing the introduction of contaminants.

Applications

- Point-of-use purification of all gases utilized with the operation of an FID equipped GC.
- Ideal for purification of carrier gases used with GC/MS, ECD, PID and NPD detectors.
- Removal of hydrocarbons and moisture from FID fuel gases.
- Purification of Nitrogen for LC/MS instruments.

Design Features/Components

- Easy installation enables “no tools required” purifier changeout.
- Multiple purifier baseplates allow customization of the system for specific applications.
- Replacement purifiers can be installed within seconds, minimizing instrument downtime.
- Check valves in baseplate design prevent diffusion of contaminants.
- Removal of hydrocarbons, oxygen and moisture can be performed with a single filter.
- Visual indicator on Moisture and Oxygen cartridges signals changeout to maintain uninterrupted service.

Operating Pressure	150 psig maximum	1,030 kPa maximum
Maximum Flow Rate	GCMS Systems: 3 L/min LCMS Systems: 20 L/min	
Dimensions & Weight (L x W x H)		
One position baseplate	8 cm x 9 cm x 3 cm (0.75 kg) 3.125" x 3.56" x 1.12" (1.65 lbs)	
Two position baseplate	8 cm x 20 cm x 3 cm (1.5 kg) 3.125" x 7.87" x 1.12" (3.4 lbs)	
Three position baseplate	8 cm x 30 cm x 3 cm (2.3 kg) 3.125" x 11.81" x 1.12" (5 lbs)	
Purifier Cartridge (new)	3.8 cm x 25.4 cm (0.3 kg) 1.5" dia. x 10" H (0.60 lbs)	
Purifier Cartridge Capacity	<i>(see table below)</i>	

Materials of Construction

	Baseplate	Purifier Cartridge
Body	Aluminum (Anodized)	Internal Structure: Borosilicate Glass External Housing: Polycarbonate Sleeve
Fittings	1/8" Brass Compression (Standard) 1/4" Brass, 1/8" or 1/4" SS (Optional)	–
Locking Ring	Chrome Plated Aluminum	–
O-Rings	Viton	–

Purifier Cartridge Capacity

Type of Purifier	Outlet Gas Quality	Usable For	Usable For Indicator Colour Change	Capacity		
				H ₂ O (gr)	O ₂ (ml)	Hydrocarbons
Moisture	> 6.0	Inert Carrier Gas, air, hydrogen	Brown to white	7.2	–	–
Oxygen	>6.0	Inert Carrier Gas	Green to grey	–	1,000	–
Hydrocarbon	>6.0	Inert Carrier Gas, air, hydrogen	No indicator	–	–	Not specified
Combi (moisture/ hydrocarbon)	>6.0	Inert Carrier Gas, air, hydrogen	Brown to white	3.6	–	Not specified
Triple (moisture/ oxygen/hydrocarbon)	>6.0	Inert Carrier Gas	Brown to white Green to grey	1.8	500	Not specified

The PUR-Gas™ Cartridge Purifier Systems are available in several baseplate configurations to address a wide variety of analytical applications. The baseplates can be permanently mounted to lab bench surfaces and are available in 1, 2 or 3 purifier positions, allowing the enduser to custom design a gas purifier system for a specific application; or provide the same purifier in a multiple system arrangement to prevent uninterrupted service and changeout convenience.

Ordering Information

Analytical Instrument Gas Purification Systems (Cartridge(s) and Baseplate)

Model	Description	Baseplate Type	Application
PUR-0229	GC/MS Carrier Gas Purification System (includes one position baseplate with 1/8" brass fittings and one triple purifier cartridge for carrier gas)	One position	Standard one position system for purifying the carrier gas used in GC/MS, ECD and NPD detectors
PUR-0223	Same as above with 1/4" Brass fittings		
PUR-0237	Same as above with 1/8" stainless steel fittings		
PUR-0241	Same as above with 1/4" stainless steel fittings		
PUR-0230	GC/MS FID Fuel Gas Purification System includes two-position baseplate, with 1/8" brass fittings and two combi purifiers for both hydrogen and zero air gases)	Two position	Standard two-position system for purifying both hydrogen and zero air fuel gases used in an FID operated GC
PUR-0234	Same as above with 1/4" brass fittings		
PUR-0238	Same as above with 1/8" stainless steel fittings		
PUR-0242	Same as above with 1/4" stainless steel fittings		
PUR-0231	GC/MS FID Gas Purification System (includes a three position baseplate; with 1/8" brass fittings, one triple purifier cartridge for carrier gas and two combi purifiers for both hydrogen and zero air gases)	Three position	Standard three position system
PUR-0235	Same as above with 1/4" brass fittings		
PUR-0239	Same as above with 1/8" stainless steel fittings		
PUR-0243	Same as above with 1/4" stainless steel fittings		
PUR-0232	LC/MS Gas Purification System includes two position baseplate, with 1/4" brass fittings and two charcoal purifiers for nitrogen gas	Two position	Unique two position system for purifying the nitrogen gas utilized in LC/MS instruments
PUR-0244	Same as above with 1/4" SS fittings		

PUR-Gas™ Purifier Systems

Model CTG and BAS Series

Replacement Purifier Cartridges and Baseplates

Ordering Information

Model	Description
CTG-0050	Moisture cartridge
CTG-0051	Oxygen cartridge
CTG-0052	Hydrocarbon cartridge
CTG-0053	Triple cartridge (O ₂ / H ₂ O / HC)
CTG-0054	Combi cartridge (H ₂ O / HC)
CTG-0055	LC/MS charcoal cartridge set (2)
CTG-0056	Moisture two pack bundle
CTG-0057	Oxygen two pack bundle
CTG-0058	Hydrocarbon two pack bundle
CTG-0059	Triple two-pack bundle
CTG-0060	Combi two-pack bundle
CTG-0061	GC/MS total gas purifier bundle; 1-triple + 2-combi cartridges
CTG-0062	Triple filter (helium packed)
CTG-0063	Triple filter (helium packed), 2 pack bundle
BAS-0014	1-Position standard baseplate with 1/8" brass fittings
BAS-0015	2-Position standard baseplate with 1/8" brass fittings
BAS-0016	3-Position standard baseplate with 1/8" brass fittings
BAS-0017	2-Position LC/MS baseplate with 1/4" brass fittings
BAS-0018	1-Position standard baseplate with 1/4" brass fittings
BAS-0019	2-Position standard baseplate with 1/4" brass fittings
BAS-0020	3-Position standard baseplate with 1/4" brass fittings
BAS-0022	1-Position standard baseplate with 1/8" SS fittings
BAS-0023	2-Position standard baseplate with 1/8" SS fittings
BAS-0024	3-Position standard baseplate with 1/8" SS fittings
BAS-0026	1-Position standard baseplate with 1/4" SS fittings
BAS-0027	2-Position standard baseplate with 1/4" SS fittings
BAS-0028	3-Position standard baseplate with 1/4" SS fittings
BAS-0029	2-Position LC/MS baseplate with 1/4" SS fittings

Options

Model	Description
CON-0577	O-ring replacement set
CON-0578	Wall-mount bracket fixture



In-Line Purifier Selection and Application Configurations

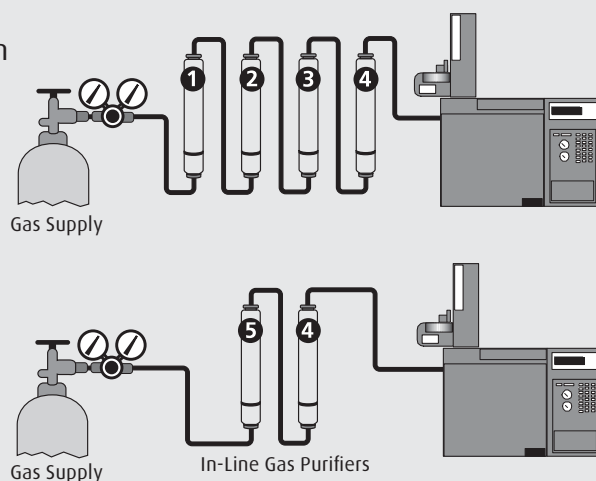
(refer to Selection Chart & Application Diagram below)
 A clean gas delivered to your analytical instrument supports the ability to produce consistent and reliable results. This also helps to lengthen column life and minimize background detector “noise.” Selecting the proper in-line purifiers for your gas application ensures protecting your analytical instruments from exposure to harmful contaminants, which can negatively affect the accuracy of the data and create operating problems. Purifier capacity is a measure of the amount of contaminant a purifier will remove prior to reaching its saturation point; which depends on the adsorbent’s performance and volume within the purifier. Ideally, purifiers need to be replaced before they become fully saturated. Purifier replacements are made by either replacing them at predetermined time intervals or by some form of visual indication if the purifier has this feature.

All gas purifiers should be installed in the “vertical” position to optimize contaminant removal and prevent channeling. “Channeling” occurs when a purifier is installed in the horizontal position and there is potential for the adsorbent material to settle within the purifier housing and the gas stream then tends to pass over the adsorbent material rather than through it; thus lowering the contaminant removal efficiency of the purifier.

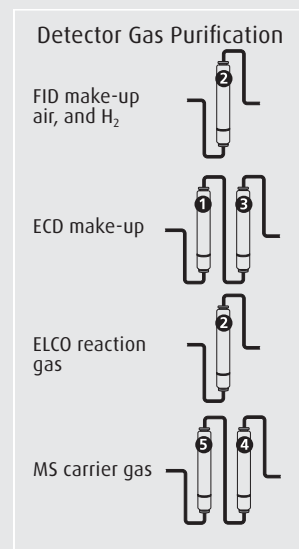


Analytical Instrument/System	Type Detector	Gas Stream	Recommended PUR-Gas™ Purifier
Capillary Column GC	ALL	Carrier Gas	Triple; moisture, oxygen and hydrocarbon
	FID	Make-Up	Hydrocarbon
	FID	Air	Moisture and hydrocarbon
	FID	Hydrogen	Moisture and hydrocarbon
	ECD	Make-Up	Triple; moisture, oxygen and hydrocarbon
Packed Column GC	ELCD	Reaction Gas	Hydrocarbon
	ALL	Carrier Gas	Triple; moisture, oxygen and hydrocarbon

Application Diagram Carrier and FID Gas Purification



- Purifier Selection Key:**
- 1 = Moisture Trap
 - 2 = Hydrocarbon Trap
 - 3 = Oxygen Trap
 - 4 = Indicating Oxygen Trap
 - 5 = Combination Trap for moisture, oxygen, and hydrocarbon removal



Gas Purifiers

Model 450B

High Pressure Gas Purifier

Description

The Model 450B replaceable cartridge gas purifier is useful in many laboratory and industrial applications where the introduction of oil and/or water can result in poor performance or equipment shutdown. It is not uncommon to find varying levels of these impurities in some industrial gases and occasionally even in specialty carrier gases. The small daily operating costs are easily justified by the prevention of a system shutdown and the subsequent cleaning and/or repair costs.

The units are especially useful in GC carrier gas lines to ensure that undesirable moisture does not enter the instrument. Water can contribute to inaccurate results and the rapid deterioration of expensive chromatography column separation phases. The model 8010-purifier shell must be used in conjunction with specially designed replaceable cartridges.

Models 451, 452, or 453 are filled with various adsorbents. Model 454 contains a 5 micron sintered bronze filter element. These cartridges are shipped in hermetically sealed cans with convenient pull-tab tops for easy opening. This improved packaging ensures full retention of capacity in storage until the time of use.

Materials of Construction

Shell body	Anodized aluminum
Shell head	Nickel plated brass
O-ring seal	Buna-N
Cartridges	451 Molecular Sieve 13x 452 Molecular Sieve 4A 453 Activated Charcoal 454 Sintered Bronze

Specifications

Max. Operating Pressure	3,000 psig (20,700 kPa) 500 psig (3,440 kPa) for oxygen
Operating Temperature	-40°–73.9°C (-40°–+165°F)
Inlet and Outlet Ports	1/4" FNPT
Dimensions (DxL)	5 cm x 14.6 cm (2" x 5.75")
Weight with Cartridge	0.68 kg (1.5 lbs)
Dew Point Achievable	-73°C (-100°F)

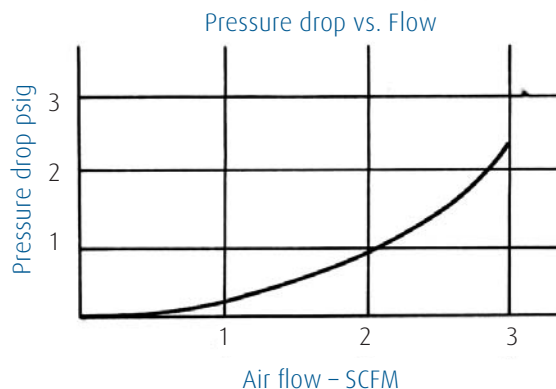


Ordering Information

Model	Description	Absorption Capacity	General Application
450B	Purifier Shell Only		
451	Molecular Sieve 13x	6.5 g water	Removal of oil & water
452	Molecular Sieve 4A	7.2 g water	Removal of water
453 [†]	Activated Charcoal Warning: Do not use with oxygen concentrations in excess of 21%)		Removal of heavy hydrocarbons acetone level control in acetylene used for atomic absorption
454 [§]	5 micron sintered bronze element		Particulate removal

[†] Not for use with acetylene

[§] For acetone control in acetylene



Model 460

High Capacity Gas Purifier

Description

The Model 460 replaceable cartridge gas purifier is similar to the Model 450B but is designed for higher capacities and a lower working pressure. The Model 460 is constructed of an aluminum shell that accepts a large capacity cartridge. This shell may be permanently mounted when installed in the gas line and can be serviced without disturbing the line connections. Spring pressure holds the replaceable cartridge tightly against the bottom gasket to prevent the gas to be purified from bypassing the cartridge. The side inlet is located at the bottom of the unit oriented 90° from the outlet located at the top of the unit.

The model 460-purifier shell must be used in conjunction with specially designed replaceable cartridges (Model 461, 462, or 463) filled with various adsorbents. These are described below. These cartridges are shipped in hermetically sealed cans with convenient pull-tab ends for easy opening. This improved packaging ensures full retention of capacity in storage until the time of use.

Materials of Construction

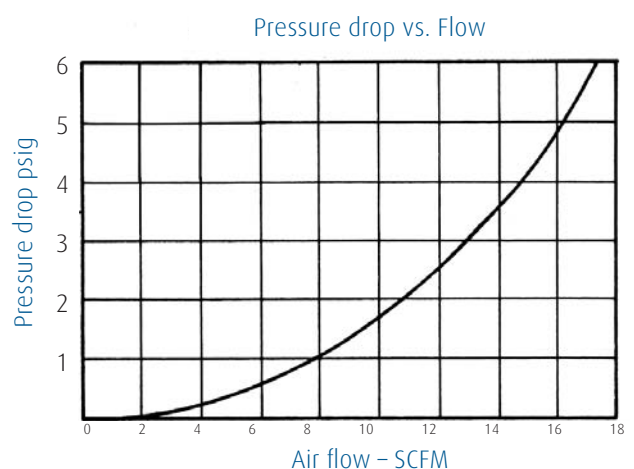
Shell body	Anodized aluminum
Strainer Assembly	Monel® and brass
Gaskets	Neoprene
Cartridges	461 Molecular Sieve 13x 462 Molecular Sieve 4A 463 Activated Charcoal

Specifications

Max. Operating Pressure	350 psig (2,400 kPa)
Operating Temperature	-40°–93.3°C (-40°–+200°F)
Inlet and Outlet Ports	1/4" MNPT
Dimensions (DxL)	12 cm x 39.7 cm (4.75" x 15.6")
Weight with Cartridge	6.5 kg (14.3 lbs)
Dew Point Achievable	-73°C (-100°F)

Ordering Information

Model	Description	Absorption Capacity	General Application
460	Purifier Shell Only		
461	Molecular Sieve 13X	126 g water	Removal of oil & water
462	Molecular Sieve 4A	134 g water	Removal of water
463	Activated Charcoal (Warning: Do not use with oxygen concentrations in excess of 21%)		Removal of heavy Hydrocarbons acetone level control in acetylene used for Atomic absorption



Oxygen Traps

Model C6200 Series

Oxygen Removing Purifier for Hydrogen

Description

This unit is a step above other indicating oxygen traps. The unit comes to you completely assembled and ready for installation. It is ideal for use in-line directly after our C6300 series oxygen removing trap to determine when to replace the larger unit. Used in this way the C6200 unit will last a considerable time if it is monitored regularly. A centimetre scale on the tube helps you to monitor the condition of the reactants.

The C6200 Series actually removes oxygen rather than convert it to another form of contamination. Oxygen reacts with the activated bed material to form manganese oxide that has a deep brown colour providing a dramatic and progressive colour change. The presence of moisture does not affect the oxygen removing capacity of the unit.

Design Features/Components

- Reduces oxygen to less than 15 ppb
- Reactive materials are contained in a glass tube protected by a clear plastic outer tube. The reactive materials are only in contact with glass and metal
- Centimeter scale on reaction tube helps to monitor activity.
- The expended reactant material is non-hazardous, nontoxic, non-flammable, and non-reactive
- Mounting clip available for convenient installation.
- Oxygen removing capacity: C6200 30mg
C6250 150mg
- Operating pressure: 100 psig (690 kPa)
- Dimensions: C6200 2.9 x 24.1 cm (1.13" x 9.5")
(Ø x L)
C6250 3.8 x 26.0 cm (1.5" x 10.25")

Ordering Information

Model	Connections
C6200-2*	1/8" compression
C6200-4*	1/4" compression
C6250-2*	1/8" compression
C6250-4*	1/4" compression
C6200C	Mounting clip for C6200
C8012C	Mounting clip for C6250

*Available with stainless steel compression fittings – add "SS" to part number



Model C6300 Series

Oxygen Traps

Description

These C6300 series oxygen traps contain a highly active, metal-containing, inert supported reagent filled into a one piece aluminum container. The trap is capable of reducing the oxygen content of a gas stream down to 99.99998% of its original concentration. Each unit is filled under a heated flow of ultra high purity helium to eliminate the need for extensive purging prior to GC or GC/MS operation.

The Series C6300 units are ideal for use with hydrogen and inert carrier gases commonly used with TC and FID gas chromatographs as well as argon-methane mixtures used with electron capture gas chromatographs. The all-metal housing virtually eliminates contamination and resultant signal noise that often occur with traps constructed of other materials. These units can also be used to treat carbon monoxide, carbon dioxide, alkanes, alkenes, aliphatic hydrocarbon gases and low boiling point aromatics, like benzene and toluene.

Design Features/Components

- Reduces oxygen levels to less than 15ppb
- Scrubbing agent sphere size optimized to achieve maximum surface area and capacity to provide twice the surface area and capacity of "look-alike" units
- Filter design and aspect ratio prevents channeling and promotes even flow and efficient scrubbing
- Inlet and outlet fitted with 40 micron stainless steel frits
- All metal construction
- Bed material treated with ultra high purity helium
- Operating pressure: 250 psig (1,720 kPa)
- Oxygen removal capacity: C6300 630 mg
C6350 2300 mg
- Dimensions: C6300 3.2 x 28.6 cm (1.25" x 11.25")
(Ø x L)
C6350 6.0 x 43.2 cm (2.4" x 17")

Ordering Information

Model	Connections
C6300-2*	1/8" compression
C6300-4*	1/4" compression
C6350-8*	1/2" compression
C6200C	Mounting clip for C6300
C8050C	Mounting clip for C6350



CO₂ Traps and Indicating Moisture Traps

Model C6400 Series

Carbon Dioxide Traps

Description

The C6400 Series carbon dioxide trap is designed to remove CO₂ gas from air, argon, helium, hydrogen, or nitrogen. The trap body is constructed of borosilicate glass with nickel plated end fittings with stainless steel sintered frits.* The absorption media is a formulation of sodium hydroxide and calcium hydroxide with an high absorptive capacity and indicating properties. Typically, this material will absorb 15–20% of its weight in carbon dioxide before the material is saturated and needs to be replaced.

Replacement is indicated when the normally white colour of the material turns violet. If moisture is detrimental to your system, a moisture trap should be installed down stream from this unit to adsorb water evolved from the absorption of the carbon dioxide.

Design Features/Components

- Removes carbon dioxide to less than 0.5 ppm
- Inlet and outlet fitted with 40 micron stainless steel frits
- Reaction with carbon dioxide indicated by colour change from white to violet.
- CO₂ removing capacity: C6410 45 grams CO₂
C6425 90 grams CO₂
- Dimensions: C6410 3.8 x 31.8 cm (1.5" x 12.5") (Ø x L)
C6425 4.4 x 41.9 cm (1.75" x 16.5")

Gas traps should be mounted in a **vertical position** to ensure proper contact of the gas with the adsorbent. Use model 6400C or 8040C mounting clip with C6400 Series carbon dioxide trap.

Ordering Information

Model	Description	Connections
C6410-2	Carbon dioxide trap – 100 cc	1/8" compression
C6410-4	Carbon dioxide trap – 100 cc	1/4" compression
C8012C	Mounting clip for C65410 trap	
C6425-2	Carbon dioxide trap – 250 cc	1/8" compression
C6425-4	Carbon dioxide trap – 250 cc	1/4" compression
C8040C	Mounting clip for 6425 trap	

* Add suffix "SS" to part number for stainless steel compression fittings

* 8050 is a non-indicating trap



Models C8012, C8020, C8040 and C8050 Series

Indicating Moisture Traps

Description

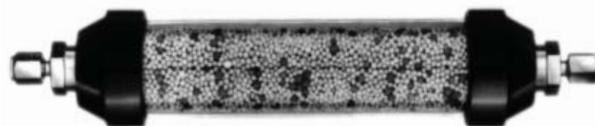
These units are designed to remove water, oil and organics from gases commonly used as gas chromatography carrier gases. They are constructed from Lexan® polycarbonate tubing with aluminum end caps sealed with Viton® o-rings, except for the C8050 which has a solid aluminum housing and is thus non-indicating. All units are filled with a mixture of molecular sieve 13X and indicating molecular sieve 4A. These are the highest capacity molecular sieves available and the preferred choice for gas drying. The blue indicating sieves turn buff colour at 20% relative humidity.

Design Features/Components

- Reduces water to less than 20 ppb
- Mixed spherically shaped 13X and 4A adsorbents provides superior bed packing with less resistance to flow
- Mounting clip available for convenient installation
- Moisture removal capacity: C8012 21.6 g
C8020 36.0 g
C8040 72.0 g
C8050 132 g
- Dimensions: C8012-2 or -4 3.8 x 22.9 cm (1.5" x 9.0") (Ø x L)
C8020-2 or -4 3.8 x 31.8 cm (1.5" x 12.5")
C8040-2 or -4 4.5 x 44.5 cm (1.75" x 17.5")
C8050-8 (2.4" x 17")
- Operating Pressure: C8012, 8020, 8040 125 psig (860 kPa)
C8050 250 psig (1,720 kPa)

Ordering Information

Model	Capacity	Connections
C8012-2*	120 cc	1/8" compression
C8012-4*	120 cc	1/4" compression
C8020-2*	200 cc	1/8" compression
C8020-4*	200 cc	1/4" compression
C8040-2*	400 cc	1/8" compression
C8040-4*	400 cc	1/4" compression
C8050-8*	735 cc	1/2" compression
C8012C		For mounting 8012 and 8020 units
C8040C		For mounting 8040 units only
C8050C		For mounting 8050 units only
C8040R	400 cc	Provides enough for three 120 cc, two 200 cc, or one 400 cc refill
C8050R	1500 cc	Provides enough for two refills



Indicating Moisture Traps and Hydrocarbon Traps

Model C8060

High Capacity Indicating Moisture Trap

Description

This trap is similar to the moisture traps on the opposite page but is capable of higher flow capacity and has greatly increased adsorption capacity. They are filled with a mixture of molecular sieve 13X and indicating molecular sieve 4A. These are the highest capacity molecular sieves available and the preferred choice for gas drying. The blue indicating sieves turn buff colour at 20% relative humidity.

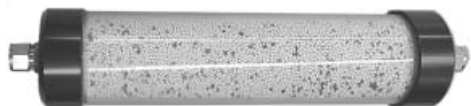
Design Features/Components

- Reduces water to less than 20 ppb
- Inlet and outlet o-ring sealed connectors are equipped with 100 micron stainless steel sintered frits to prevent particulates from entering your system
- Field refillable
- High flow capacity: up to 20 SCFM
- Maximum operating pressure: 125 psig (860 kPa)
- Moisture removal capacity: 245 g
- Dimensions (LxD): 48.3 x 7.6 cm (19" x 3")
- Connections: - 1/2" compression, stainless steel

Gas traps should be mounted in the **vertical position** to ensure proper contact of the gas with the adsorbent. Two 8060C mounting clips are recommended for proper secure mounting.

Ordering Information

Model	Connections
C8060-8SS	1/2" compression, stainless steel
C8060R	Provides enough molecular sieve mix for two refills
C8060C	Mounting clip (two per unit suggested)



Model C8200 Series

Hydrocarbon Traps

Description

These units are designed to remove organics, such as alcohols, aromatics, chlorinated hydrocarbons, esters, ethers, hydrocarbons, and ketones from air, hydrogen, and inert carrier gases used in gas chromatography. They are constructed of aluminum and filled with extremely high surface area coconut shell based activated carbon.

The C8200 is a refillable purifier. Since impregnated carbons do not readily desorb all compounds, we recommend that the units be changed or refilled on a regular schedule using our C8200R refill kit that provides enough material for two charges of an C8200 or the C8250R which provides one charge of an C8250.

Design Features/Components

- Removes organics from air, hydrogen, and inert carrier gases. Does not remove light hydrocarbons like methane.
- Highly active coconut shell based carbon efficiently removes many types of hydrocarbon compounds.
- All metal housing.
- Refillable 200 cc or 1600 cc capacity.
- 40 micron filters on the inlet and outlet.
- Mounting clip available for convenient installation.
- Working pressure: 250 psig (1,720 kPa)
- Dimensions: C8200 3.8 x 31.8 cm (1.5" x 12.5") (Ø x L)
C8250 6.1 x 43.2 cm (2.4" x 17")

Gas traps should be mounted in a **vertical position** to ensure proper contact of the gas with the adsorbent. Use model C8012C mounting clip with C8200 Series hydrocarbon trap.

Ordering Information

Model	Connections
C8200-2*	1/8" compression
C8200-4*	1/4" compression
C8250-8*	1/2" compression
C8250R	Refill kit - contains 3 charge
C8200R	Refill kit - contains 2 charges
C8012C	Mounting clip for 8200
C8050C	Mounting clip for 8250

* Available with stainless steel compression fittings - add "SS" to part number



Flash Arrestors

Model 6103A and 6104A Series

Flash Arrestors

Description

The Series 6103A and 6104A Flash Arrestors should be used in applications involving flammable gases. Both the 6103A and 6104A Series are dry type flashback protection devices, featuring high purity materials and design.

The Model 6103A Series is constructed of brass and butyl rubber, and is ideal for protecting fuel systems in laboratory applications.

The Model 6104A Series is constructed of stainless steel, Teflon, and Viton, and is designed for use in high purity flammable gas applications. The Model 6104A is ideal for use with high purity hydrogen systems.

Both the 6103A and 6104A Series Flash Arrestors may be used with the following gases:

Design Features/Components

- Prevents dangerous flashbacks.
- Meets OSHA requirements.
- Factory Mutual approved (Model 6103A Brass Flash Arrestor only)
- Provides positive shut-off of gas and checks the reverse flow of gas under most conditions.
- Extinguishes flame within the housing, which prevents the flame front from reaching the gas supply.
- Reusable – can be reset and reused after a flashback occurs (maximum of three times recommended).
- No gas flow restrictions under normal conditions since there are no porous filters or other surfaces to become clogged.
- Helium Leak Rate certification available.

Gas	Max. Operating Pressure**
Acetylene	15 psig
Natural Gas	15 psig
Oxygen	150 psig
Propane	50 psig
Hydrogen*	50 psig

The Model 6103A Series Flash Arrestors are Factory Mutual approved for use with the above gases and maximum pressure ratings.

WARNING: Flash arrestors should not be used with Silane or Nitrous Oxide



Specifications

	6103A	6104A
Body	Brass	316 Stainless Steel
Seat	Neoprene	Viton A
O-rings	Neoprene	Viton
Internal parts	Brass and Steel	Stainless Steel
Max service pressure	150 psig (1,030 kPa) (see gas list)	
Dimensions (Ø x L)	5.1 x 8.9 cm (2" x 3.5") (without fittings)	
Shipping Weight	0.9 kg (2 lbs)	

Ordering Information

Model	Inlet Connection	Outlet Connection
6103A-F	1/4" FNPT	1/4" FNPT
6103A-O	1/4" FNPT	1/4" FNPT
6103FL	9/16"-18 LHF	9/16"-18 LHF
6103OR	9/16"-18 RHF	9/16"-18 RHF
6104A§	1/4" FNPT	1/4" FNPT
6104A-V4M†	1/4" VCR Male	1/4" VCR Male

§ Flash arrestor ships with labels for flammables and oxidizer for the user to install.

† Make VCR x 1/4" NPT, threaded and teflon taped

*Notes: 1. Tests have proven that the 6103A and 6104A Series Flash Arrestors provide excellent flashback protection for situations in which air accidentally enters the hydrogen system and a flashback results the hydrogen system and a flashback results.

2. However, these Flash arrestors should not be used in installation where it is possible for pure oxygen to enter the hydrogen system.

**See individual model number labels and instructions for full listing.

Spargers and Multi Station Gas Supply Manifolds

Model 050-70000 Series

Sparger

Description

The Series 050-70000 spargers are used to inject an inert gas into a wide variety of liquefied foodstuffs during processing. The sparging technique preserves product quality by flushing out oxygen. The sparging process also fluffs and carbonates the product by super saturating it with tiny gas bubbles. Nitrogen, carbon dioxide, nitrous oxide, or argon are generally the gases of choice for this process.

Design Features/Components

- Unique infuser design assures optimum sparging results
- Tee design permits easy removal of infuser assembly for cleaning
- Available in four sizes 1", 1 1/2", 2" and 3"
- Constructed of 304 stainless steel with either ACME threads of quick-clamp sanitary fittings for the food processing industry (Other connection types available on request)
- Complete spargers and infuser assemblies available

Ordering Information

Complete Assemblies	1"	1.5"	2"	3"
Complete sparger With ACME threads	050-71000	050-71500	050-72000	050-73000
Complete Sparger With quick-clamp Sanitary fittings	050-71000TR	050-71500TR	050-72000TR	050-73000TR
Complete Infuser	050-71008	050-71508	050-72008	050-73008

Model Example

All components are available. Selection is dependent on actual application and sparger size.



Model M5 Series

Multi-Station Manifold System

Description

The Linde Multi-Station Manifold System offers a safe and efficient method of connecting multiple cylinders to a common gas supply line, providing a centralized distribution of gas for both high and low purity delivery requirements. Manifold Systems provide greater safety in the cylinder storage area by reducing repetitive cylinder handling and regulator requirements. Multi-Station Manifold Systems can be used as a manually operated system in conjunction with a line regulator to regulate downstream delivery pressure, or they can be used as an integrated part of a Linde Semi-automatic Switchover System or HiQ® REDLINE Gas Panel.

Furnished in Brass or Stainless Steel, Multi-Station Manifold systems provide delivery service for a broad range of gases and are rated for pressures of up to 3,000 psig (20,700 kPa). All Multi-Station Manifold Systems are single row configurations, with a diaphragm valve for each inlet port. All systems come with mounting brackets/clamps as standard components. Systems can be designed for either right side or left side cylinder set up.

To facilitate connection to cylinders use flexible hoses, or rigid pigtails, with check valves to eliminate contamination. Select models 5381, 5481, 6047 or 6048 for flexible hoses and models 5391 or 5491 for rigid pigtails.

Model	Materials of Construction	Supply Option	Supply Points
M5	B - Brass	R - Right to Left	2 - Two Station
	S - Stainless steel	L - Left to Right	3 - Three Station
			4 - Four Station
			5 - Five Station

Model Example

M5SR2 would be a two station Stainless Steel manifold for right side connection.



Stainless Steel Flexible Hoses and Pigtail Assemblies

Model 6040 Series

Stainless Steel Flexible Hoses

Description

These all-metal hoses have service pressures of up to 3000 psig. They are manufactured with 1/4" NPT Female connections. These 316 stainless steel hoses are supplied with stainless steel armour for greater safety and kink resistance. The Model 6042U, 6043U, and 6046U hoses have a 90° elbow connector on one end for easy close-quarters installation. Models with union allow easy connection without rotating the hose to tighten.

Ordering Information

Model	Description	Connector	Length	Shipping Weight
6042	6042 Stainless Steel flex hose	1/4" FNPT	0.45 m (1.5')	0.9 kg (2 lbs)
6042U	6042 Stainless Steel flex hose with Stainless Steel union	1/4" FNPT	0.45 m (1.5')	0.9 kg (2 lbs)
6043	6043 Stainless Steel flex hose	1/4" FNPT	0.9 m (3')	1.4 kg (3 lbs)
6043U	6043 Stainless Steel flex hose with stainless steel union	1/4" FNPT	0.9 m (3')	1.4 kg (3 lbs)
6046	6046 Stainless Steel flex hose	1/4" FNPT	1.8 m (6')	1.8 kg (4 lbs)
6046U	6046 Stainless Steel flex hose with Stainless Steel union	1/4" FNPT	1.8 m (6')	1.8 kg (4 lbs)
6047-CGA	6046 Stainless Steel flex hose with check valve	CGA 346 (Brass)	1.8 m (6')	2.3 kg (5 lbs)
6048-CGA	6046 Stainless Steel flex hose with check valve	CGA 665	1.8 m (6')	2.3 kg (5 lbs)



Model 6040 Series

Model 5300 and 5400 Series

Pigtail Assemblies

Description

These rigid pigtails provide a convenient means of connecting a cylinder to a manifold or a switchover system. They are available in brass or stainless steel, with or without check valves.

Ordering Information

Model	Description	Connector	Length	Shipping Weight
5390-CGA	Brass Pigtail	CGA 346 (Brass)	0.9 m (3')	1.4 kg (3 lbs)
5391-CGA	Brass Pigtail with check Valve	CGA 346 (Brass)	0.9 m (3')	1.8 kg (4 lbs)
5490-CGA	Stainless Steel Pigtail	CGA 665	0.9 m (3')	1.4 kg (3 lbs)
5491-CGA	Stainless Steel with check Valve	CGA 665	0.9 m (3')	1.8 kg (4 lbs)

Brass CGA's available: 296, 300, 320, 326, 346, 350, 510, 540, 580, 590



Ordering Information

Model	Description	Connector	Length	Shipping Weight
5380-CGA	Stainless Steel flex hose	CGA 346 (Brass)	0.9 m (3')	1.4 kg (3 lbs)
5381-CGA	Stainless Steel with check Valve	CGA 346 (Brass)	0.9 m (3')	1.8 kg (4 lbs)
5480-CGA	Stainless Steel flex hose	CGA 665	0.9 m (3')	1.4 kg (3 lbs)
5481-CGA	Stainless Steel with check Valve	CGA 665	0.9 m (3')	1.8 kg (4 lbs)

Stainless Steel CGA's available: 296, 300, 320, 326, 346, 350, 510, 540, 580, 590, 660, 678 (705)

Other Options for Connecting Cylinders to Manifolds or Switchover Systems

- Model 6040 Series Stainless Steel Flex Hoses

Gas Cabinets

Model 1170 Series

Gas Cabinets

Description

Linde Gas Cabinets have been designed for the safe use of toxic gases or chemicals in a controlled manner, protecting customers from exposure to dangerous materials. Originally developed for use in semiconductor manufacturing, with updated cylinder storage and building codes to consider, any industry using or processing hazardous chemicals and gases should consider the use of Linde Gas cabinets in strategic locations.

Linde offers two styles of cabinets. The original 1170 Series are designed for indoor applications, while the 1170HH cabinets incorporate several structural features making them weatherproof and are constructed from stainless steel materials to withstand harsh weather effects. Both are designed to meet or exceed Article 80 UFC requirements.

Design Features/Components

- Automatic door closure to ensure containment of leaks
- Modular U-Channel Supports make installation of gas control panels, cylinder supports, shelving, and other equipment easy
- Lockable access panel and wire reinforced safety glass viewing window have steel frames and are fully gasketed.
- Non-protruding paddle type latch prevents accidental opening and snagging. It slams and latches at three points and is fitted with a lock for security.
- Neoprene gaskets fit snugly around door to ensure a positive seal
- Interior and exterior is finished with gray 2-part polyurethane paint.
- Flat-top design, with exhaust stack.
- Cylinder restraints to ensure that all cylinders are held securely in place during storage and operation
- Low profile, one-inch reinforced threshold makes cylinder installation and removal easy.
- Standard inlet air louver or optional diffuser plate fitted with an inlet filter (P/N VEN-0101-XX) lets air into the cabinet.
- Rugged exterior construction of 12-gauge cold rolled steel with welding seams.
- Integral Fire sprinkler head, for extra protection with a fuse rating of 58°C (136°F).



Model 1170

Model	Cabinet Type	Overall Height	Depth	Width	Exhaust Flow Required (SCFM)	Exhaust Stack Diameter	Shipping Weight
1177	1 cylinder	200.1 cm (79")	48.3 cm (19")	45.7 cm (18")	175	10.2 cm (4")	136.1 kg (300 lbs)
1178	2 cylinder	200.1 cm (79")	48.3 cm (19")	66.0 cm (26")	250	15.2 cm (6")	172.4 kg (380 lbs)
1179	3 cylinder	200.1 cm (79")	48.3 cm (19")	101.6 cm (40")	450	20.3 cm (8")	244.9 kg (540 lbs)
1177HH	1 cylinder	200.1 cm (79")	48.3 cm (19")	45.7 cm (18")	175	10.2 cm (4")	136.1 kg (300 lbs)
1178HH	2 cylinder	200.1 cm (79")	48.3 cm (19")	66.0 cm (26")	250	15.2 cm (6")	172.4 kg (380 lbs)
1179HH	3 cylinder	200.1 cm (79")	48.3 cm (19")	101.6 cm (40")	450	20.3 cm (8")	244.9 kg (540 lbs)

Model 1190

Heavy Duty Gas Cabinet

Description

Linde HH series cabinets have the same features and benefits of the 1170 series. In addition, the HH series come complete with a rain gutter above the cabinet door to prevent rain from entering the cabinet, stainless steel hinges and hardware, and a rain hat to cover the stack.

Linde cabinets work well with HiQ® Redline panels or we can custom design a supply panel to meet your needs. Contact your local Specialty Gas Representative, or Customer Service for a quotation.

The mixing of gases or gas mixtures with different hazard classifications in the same cabinet is not a proper safety procedure. Please review your requirements with your Specialty Gas Representative prior to ordering.

Ordering Information

Model	Description
1190	HH Gas cabinet
11XX-6	Fusible link option
VEN-0101-XX	Optional diffuser plate with inlet air filter



Model 1190

Model 1191

Lecture Bottle Storage Cabinet

Description

The Model 1191 Lecture Bottle Storage Cabinet ensures safe storage of hazardous gases in lecture bottles. Two lecture bottle holders keep the lecture bottles safely in place. Minimum air velocity of 77'/min at 100 SCFM ensures proper venting to prevent any possible leaks from reaching the work environment. The compact size of the Cabinet allows for placement at the lab bench for easy access and handling. Safety glass window, key lock and NEMA 4 enclosure rating ensure additional safety. Equipped with two Model 504 Cylinder Holders.

Construction

Body	14 Gauge Cold Rolled Steel
Door	14 Gauge Cold Rolled Steel
Seams	Continuously welded
Gasket	Oil resistant
Finish	Grey polyester powder
Internal Finish	White enamel
Lecture Bottle Holders	2
Shipping Weight	22.7 kg (50 lbs)
Dimensions	
Cabinet – External (H x W x D)	61 x 51 x 22.5 cm (24" x 20" x 8.9")
Stack – Internal (D x H)	10 x 5 cm (4" x 2")

Ordering Information

Model	Description
1191	Lecture Bottle Storage Cabinet



Gauges

Model WG Series

Economical Gauges

Description

Linde offers a wide variety of economical gauges suitable for most laboratory and pilot plant operations, as well as regulator gauge replacement. All of the gauges offered by Linde are constructed with the inlet located on the bottom of the gauge and are cleaned for oxygen service. The operating temperature range for the economical gauges is from -40°C to 60°C (-40°F to 140°F). Linde Economical Gauges can be registered under TSSA where required.

Linde uses the North American dual unit measurement system for the majority of the gauges supplied. These gauges indicate both psig and kPa units of measure. All economical gauges are $\pm 3\%$ - 2% - 3% accuracy (ANSI/ASME Grade B). Accuracies are stated as a percentage of the full scale reading of the gauge. $\pm 3\%$ for the first third of the scale, $\pm 2\%$ for the middle third of the scale and $\pm 3\%$ for the last third of the scale.

Pressure Range		Brass Code	Stainless Steel Code
psi	kPa		
30" Hg. Vac.		WG210-B	WG210-SS
30"-0-15	30"-0-105	WG152-B	WG152-SS
30"-0-30	30"-0-210	WG153-B	WG153-SS
30"-0-60	30"-0-415	WG154-B	WG154-SS
30"-0-100	30"-0-700	WG155-B	WG155-SS
0-15	0-105	WG211-B	WG211-SS
0-30	0-210	WG212-B	WG212-SS
0-60	0-415	WG213-B	WG213-SS
0-100	0-700	WG214-B	WG214-SS
0-160	0-1115	WG215-B	WG215-SS
0-200	0-1400	WG216-B	WG216-SS
0-300	0-2100	WG217-B	WG217-SS
0-400	0-2800	WG219-B	WG219-SS
0-600	0-4200	WG218-B	WG218-SS
0-1,000	0-7,000	WG290-B	WG290-SS
0-2,000	0-14,000	WG288-B	WG288-SS
0-3,000	0-21,000	WG291-B	WG291-SS
0-5,000	0-35,000	WG292-B	WG292-SS

Test Gauges

Description

These highly sensitive gauges are accurate to $\pm 0.25\%$ of full scale. Supplied by Matheson-Trigas, these gauges are typically used to monitor critical process equipment within a facility. For ease of reading, they are 6" in diameter with very precise and incremental measurement graduations and mirrored scales. Construction is Monel and operating temperature range is from -30°C-66°C (-20°-150°F).

Ordering Information

psig	kPa	Model Monel
Absolute	0-100	63-5601M
0-14	0-100	63-5615M
0-60	0-400	63-5661M
0-100	0-700	63-5612M
0-200	0-1,400	63-5622M
0-3,500	0-25,000	63-5633M

Shipping Weight: 0.9 kg (2 lbs)

All Linde Specialty Gas gauges are cleaned for oxygen service. For non-standard gauge requirements, contact Customer Service.



Excess Flow Control Valve

6290 Series

Technical Data

Excess Flow Control Valve

Description

The Model 6290 Series Excess Flow Control Valve is a sensitive excess flow shut-off valve designed to operate with a wide range of inlet pressures. The Excess Flow Control Valve can be installed in any location without affecting performance. The capability of operating from 10 to 3,000 psig allows it to be used either between a high-pressure source and a pressure regulator, or in the low-pressure delivery line to a process. In both applications, this Control Valve will automatically shut off the delivery of gas if the flow exceeds the preset limit.

Operation

The shutoff mechanism of the Model 6290 Series Excess Flow Control Valve is incorporated within a stainless steel high purity valve. The actuating knob has been designed to manually operate the valve and clearly indicate the relative operating condition as either "Open" (Reset) or "Auto" (Shut-off).

Ordering Information

Model	1,000 psig	30 psig	Inlet/Outlet Connections
6295-A	4 slpm	0.5 SLPM	1/4" FNPT
6295-C	20 slpm	4 SLPM	1/4" FNPT
6295-F	100 slpm	25 SLPM	1/4" FNPT

Note: Face Seal is VCR compatible



Supply Pressure	10 to 3,500 psig (69 to 24,150 kPa)
Differential Pressure	Models A, C: 4 psig (28 kPa) Model F: 12 psig (83 kPa)
Temperature	-23°–93°C (-10°–200°F)
Leak Rate (He)	
Outboard	2 x 10 ⁻⁹ scc/sec
Inboard	2 x 10 ⁻¹⁰ scc/sec
Surface Finish	20 Micro-Inch
Shipping Weight:	0.9 kg (2 lbs)
Materials of Construction	
Wetted	
Body	316L Stainless Steel
Outboard Seal	Metal to metal
Seat	Kel-F
Poppet	316L Stainless Steel
Diaphragm	Elgiloy
Non-Wetted	
Knob	Anodized aluminum
Stem	416 Stainless steel (lubricated)
Cap	316 Stainless steel

Check Valve

Model 400 Series

Check Valves

Description

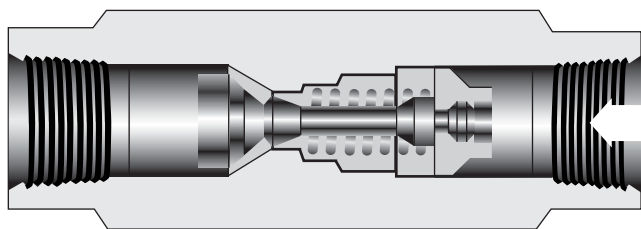
The Model 400 Series Check Valves prevent the reverse flow of gas and thus keep foreign matter out of gas lines, regulators and cylinders ahead of the valve. The valves are spring loaded with a positive stop to prevent over-stressing of the spring by sudden surges in gas pressure. An O-ring at the valve seat ensures quick and efficient sealing.

The valve has a one-piece body, which is available in Brass, Stainless Steel or Monel; and is easily disassembled for cleaning. This valve is designed for operation with pressures up to 3,000 psig; cracking pressure is approximately 1 psig. The flow capacity is 100 SCFH air at 10 psig inlet pressures. The inlet and outlet connections are 1/4" FNPT and the O-ring is replaceable.

Ordering Information

Model	Material of Construction
400V	Brass, Viton O-ring, Stainless steel
401V	316 Stainless Steel, Viton O-ring, Stainless steel spring
402V	Monel, Viton O-ring, Monel spring

Shipping Weight: 0.45 kg (1 lb)



Purge Assemblies

Model 4700 Series

Cross Purge Assemblies

Design Features/Components

- Eliminates the escape of hazardous gases when changing cylinders
- Reduces danger of contamination from atmospheric moisture and oxygen
- Minimizes the amount of gas lost during cylinder changes
- All stainless steel or corrosion resistant construction
- Rated for 3,000 psig (20,700 kPa)
- Packless valves throughout Purge Assemblies

Ordering Information

Model	Material of Construction
4774-CGA	All 316 Stainless steel
4775-CGA	Aluminum – Silicon Bronze with 316 Stainless steel block

Shipping Weight: 1.4 kg (3 lbs)

Options

Model	Description
MSP-0012-XX	Helium Rate Certification (2×10^{-8} scc/min for 5 minutes)

Note: Helium leak test can only be performed on cross purge assembly itself or on a new regulator with the cross purge assembly factory installed (order regulator with “no inlet” designation).



Tee Purge Assemblies

Design Features/Components

- Eliminates the escape of hazardous gases when changing cylinders
- Minimizes the amount of gas lost during cylinder changes
- Brass, Stainless Steel, Monel, or Monel/Al-Si-Bronze construction
- Check valve

Ordering Information

Model	Material of Construction
4753-350	Brass
4753-510	Brass
4753-580	Brass
4753-660	Brass
4754-180	Stainless Steel
4754-330	Stainless Steel
4754-350	Stainless Steel
4754-510	Stainless Steel
4754-580	Stainless Steel
4765-660	Stainless Steel
4755-330	Monel
4755-660	Monel

Shipping Weight: 1.4 kg (3 lbs)

Note: CGA's not listed may not be available for use. Please contact any Linde Special Gas Customer service Center for details.

When ordering a regulator for use with a cross purge or tee purge assembly, please specify the regulator model number with a “no inlet” designation, using an N4 suffix instead of a CGA number (e.g., C3215A-N4 for a model C3215A with no inlet CGA connection). This designation will provide a regulator with an FNPT inlet instead of a CGA connection, into which the cross purge or tee purge assembly can be installed.

Scales

Model CS620 and CS320 Series

Electronic Cylinder Scales For Liquefied and Cryogenic Gases

Description

The pressure of a liquefied gas remains constant as material is withdrawn as long as a liquid phase remains in the cylinder. When the liquid phase is exhausted the pressure drops very quickly and the cylinder empties without warning. This phenomenon renders a cylinder pressure gauge virtually useless. A similar situation arises when using cryogenic containers of liquid nitrogen, oxygen, and argon. The only way to monitor the contents of a cylinder of liquefied gas or a cryogenic container is by weight.

The CS620 and CS320 series electronic scales are designed to give a positive indication of the amount of product remaining in the cylinder as material is being withdrawn. These units allow the user to electronically subtract the tare weight of the cylinder so that only the net contents can be read directly. The built-in alarm can be set for any weight value from 0-100% of the scales capacity. The units provide a red LED visual alarm and an audible alarm with silence function. An integral solid-state relay is provided for the activation of external alarms or other equipment when the alarm set point is reached.

The scales are ruggedly constructed using one or more load cells in a sturdy stainless steel and/or aluminum diamond plate platform with mechanical stops at 150% of capacity to prevent damage.

The model CS620G-300 with a capacity of 136.1 kg (300 lbs) has a 24.1 x 24.1 cm (9.5" x 9.5") stainless steel platform that accommodates most compressed gas cylinders. For larger diameter cylinders, the CS320D-500 has a capacity of 226.8 kg (500 lbs) with a 50.8 x 68.6 cm (20" x 27") diamond plate steel platform. The model CS320M-1000 has a 453.6 kg (1,000 lbs) capacity and accommodates cryogenic containers with its 50.8 x 68.6 cm (20" x 27") aluminum diamond plate steel platform. A ramp is available for each model so that cylinders can easily be rolled on and of the scale platform without lifting.

Design Features/Components

- Controller has large 2.5 cm (1") high LCD digital display in water resistant housing
- Rugged load cell weighing technology with 136.1 kg, 226.8 kg or 453.6 kg (300, 500 or 1,000 lbs) capacity
- Weight resolution up to 0.1-pound
- Accuracy 0.1% of full scale
- Built-in visual alarm and audible alarm with silence function
- Built-in solid-state relay
- 0-100% of full-scale tare weight adjustment
- 0-100% of full-scale alarm set point adjustment
- Both large and small platform sizes available
- Easy unit conversion from pounds to kilograms

Applications

Recommended for use with all liquefied and cryogenic containers in applications where running out of gas will cause a serious disruption in operations or a loss of product.

Ordering Information

Model	Total Capacity	Resolution (lbs)	Platform Dimensions (WxDxH)
CS620G-300	136.1 kg (300 lbs)	0.1	23.5 x 23.5 x 3.8 cm (9.25" x 9.25" x 1.5")
CS320D-500	226.8 kg (500)	1.2	50.8 x 68.6 x 4.8 cm (20" x 27" x 1.9")
CS320M-1000	453.6 kg (1,000 lbs)	0.2	50.8 x 68.6 x 4.8 cm (20" x 27" x 1.9")

Options

620R	Ramp for 620G	22.9 x 13.9 x 3.8 cm (9" x 5.5" x 1.5")
320R	Ramp for 320D & 320M	50.8 x 45.7 x 4.8 cm (20" x 18" x 1.9")



CS620



CS320

Model CS900

Cylinder Scale For Liquefied Gases

Description

The pressure of a liquefied gas remains constant as material is withdrawn as long as a liquid phase remains in the cylinder. When the liquid phase is exhausted the pressure drops very quickly and empties without warning. This phenomenon renders a cylinder pressure gauge virtually useless. The only way to monitor the contents of a cylinder containing a liquefied gas is by weight.

The CS900 cylinder scale is designed to give a positive indication of the amount of product remaining in the cylinder. It allows the user to subtract the tare weight of the cylinder so that the net contents can be read directly. A colour-coded dial reads in pounds and kilograms. A non-skid ramp is available to make loading cylinders convenient and easy.

The scale is ruggedly constructed and features a stainless steel cover for durability

Design Features/Components

- Heavy-duty 16 gauge
- Stainless steel cover
- Dual dial scale – pounds and kilograms
- Colour-coded, easy to read dial

Applications

Recommended for use with all liquefied gases such as carbon dioxide, ammonia, nitrous oxide, fluorocarbons, hydrogen sulfide, sulfur dioxide, propane and heavier hydrocarbon gases

Specifications

Tare weight range: 0–68 kg (0–150 lbs)

Product weight range: 0–68 kg (0–150 lbs)

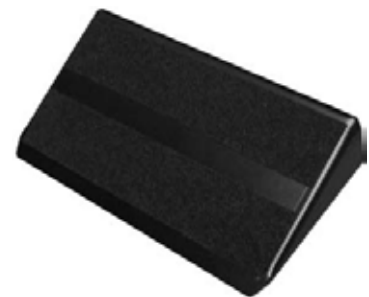
Total capacity: 136.1 kg (300 lbs) in 2 kg (5 lb) divisions

Readability: 0.5 kg (1 lb) by estimation

Dimensions: 27.3 x 26.0 x 5.0 cm (10.8" x 10.3" x 2")

Ordering Information

Model	Description
CS900	Scale with non-skid ramp
CS900-5	Scale only
CS900-6	Ramp only



Lecture Bottle Equipment

Model 30AR and 4300 Series

Lecture Bottle Control Valves

Description

These Lecture Bottle Control Valves have been specifically designed for use with gases supplied in lecture bottles. These valves function as metering valves and are rough controls for dispensing gas products from lecture bottles. They do not control pressure or backpressure from a source and/or delivery system. If greater accuracy is required for the application, Linde recommends the use of the appropriate lecture bottle regulator listed in the Regulator Section of this catalogue. The Lecture Bottle Control Valves should be used with gases compatible with the materials of construction listed under the Specifications.

Specifications

	Model 30AR	Model 4313	Model 4323	Model 4333
Body	Chromed Brass	Brass	316 Stainless Steel	AlSiBr
Stem	303 Stainless steel	303 Stainless steel	316 Stainless steel	316 Stainless steel
Packing	Teflon	Teflon	Teflon	Teflon
Tubing	n.a.	n.a.	316 Stainless Steel	Monel

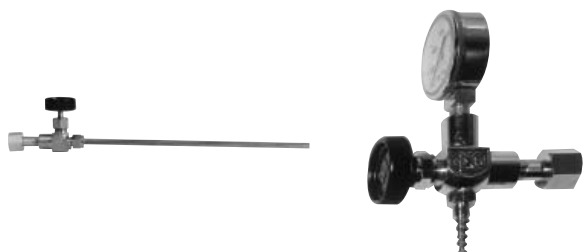
Shipping Weight: 0.9 kg (2 lbs)

Ordering Information

Model	Inlet Connection	Connection	Outlet Dimension Ø	Tubing Rating
30AR	CGA 170	1/4" ID Hose	n.a.	0-3,000 psig (0-20,700 kPa)
4313	CGA 170	1/4" Tube	n.a.	n.a.
4323A	CGA 180	1/4" Tube	25.4 x .64 cm (10"x1/4")	n.a.
4333	CGA 180	1/4" Tube	25.4 x .64 cm (10"x1/4")	n.a.

Options

Model	Description
WAS-0038-NA	Replacement gaskets for CGA 170
WAS-0039-PB	Replacement gaskets for CGA 180



Models 504 & 505

Lecture Bottle Holders

Description

Lecture bottles have rounded ends and require some means of support when in use. The Model 505 Non-Tip Stand is recommended when a regulator or other equipment is attached to the lecture bottle. The Model 504 Wall Mount Bracket is made of plastic coated steel and has spring steel clamps to ensure firm, safe support of the lecture bottle.

Ordering Information

Model	Type
504	Wall mount bracket
505	Non-tip stand

Shipping Weight: 0.9 kg (2 lbs)



Cylinder Restraints and Storage Systems

Models 510 and 6530 Series

One of the most overlooked and potentially hazardous situations faced by compressed gas users is the proper restraint of compressed gas cylinders. Whether in use or in storage, gas cylinders are required by code to be handled properly to prevent uncontrolled release of the cylinder's contents.

Wall Mounted Cylinder Holder

Description

This wall mounted cylinder holder secures cylinders to a wall or to the side of a workbench.

Ordering Information

Model	Description
510-WALL	With cylinder strap
510 C	With both cylinder strap and chain
510 R	With ratchet strap
508 02	Replacement strap

Shipping Weight: 0.9 kg (2 lbs)

Safe-T-Rack Gas Cylinder Storage

Description

The basic Safe-T-Rack models secure from two to six full size cylinders per rack. Safe-T-Racks are constructed of welded steel and can be anchored in concrete with 1/2" steel anchor bolts. Models come with single restraints. All Safe-T-Racks are finished in a tough exterior grade baked polyurethane finish.

Ordering Information

Model	Number of Cylinders	Cylinder Diameter	Rack Height	Rack Width	Rack Depth	Shipping Weight
6531	2	23.5 cm (9.25")	76.2 cm (30")	71.1 cm (28")	30.5 cm (12")	40.8 kg (90 lbs)
6532	4	23.5 cm (9.25")	76.2 cm (30")	71.1 cm (28")	60.9 cm (24")	45.4 kg (100 lbs)
6533	6	23.5 cm (9.25")	76.2 cm (30")	71.1 cm (28")	91.4 cm (36")	61.2 kg (135 lbs)



Model 510



Model 6530

Cylinder Handling Equipment & Special Cylinder Wrenches

Models 6502 and 6503

Cylinder Hand Trucks

Description

These heavy duty Cylinder Hand Trucks are specifically designed to handle and transport compressed gas cylinders easily and safely over most types of ground surfaces. They will eliminate the cause of serious accidents, which can occur when cylinders are rolled or dragged. These Cylinder Hand Trucks are well balanced and feature rear carriage supports making them exceptionally easy to maneuver within the most crowded laboratory or plant areas.

Design Features/Components

- Heavy-duty construction for extra strength
- Designed for use with most cylinder sizes; Model 6502 for 1A size cylinders only
- Large high load capacity wheels roll easily over door saddles, floor cracks, or yard areas without loss of control
- Precision balanced for easy loading
- Model 6502 features extra safety by incorporating rigid rear carriage supports
- Load capacity:
Model 6502 - 272 kg (600 lbs)
Model 6503 - 136 kg (300 lbs)

Ordering Information

Model	Type	Shipping Weight
6502	Double Cylinder Hand Truck	38.5 kg (85 lbs)
6503	Single Cylinder Hand Truck	15.9 kg (35 lbs)



Model 6502



Model 6503

Models 500, 90001 and 90003

Small Cylinder Stand

Description

This Cylinder Stand supports the number 3 and 4 size cylinders. It is constructed of nickel-plated steel and is a simple, safe, economical device to stabilize the position of small cylinders. It accommodates cylinders with diameters from 10.6 x 18.8 cm (4" to 7.4").

Specifications

Size (WxH): 32.4 x 28.5 cm 12.75" x 11.2"
Shipping Weight: 1.8 kg (4 lbs)

Ordering Information

Model	Description
500	Small Cylinder Stand



Cylinder Wrenches

Description

The Model 90001 universal cylinder wrench has three openings on one end (1 1/16", 1 1/8", 1 1/4") for tightening the various cylinder valve connections and most commonly used gas connections. The opposite end has a 3/8" square box for opening cylinder valves that do not have hand wheels.



Description

The configuration of the Model 90003 special wrench provides an easy method of opening extra tight, hand wheel operated cylinder valves and removing difficult cylinder caps.



Gas Warmers and Cylinder Blankets

Model 6284

In-line Gas Warmers

Description

The Model 6284 Series Gas Warmer will reduce the problems of regulator icing as gas is withdrawn from the cylinder. Install the warmer between the gas cylinder and your regulator, plug the power line into any convenient 110 VAC source, and maintain the gas flow rate at up to 75 SLPM (160 SCFH).

The warmer is thermostatically controlled to ensure the gas is not overheated and the warmer can be left unattended without gas flow.



Specifications

Material:	Brass
Dimensions (LxD):	16.5 x 5.5 cm (6.5" x 2.2")
Pressure Rating:	3,000 psig (20,700 kPa)
Power Requirements:	110VAC/50W
Maximum Heated Flow:	75 SLPM (160 SCFH)
Heater Temperature:	72°–85°C (160°–185°F)
Shipping Weight:	0.9 kg (2 lbs)

Ordering Information

Model	Information
6284-320	For Carbon Dioxide
6284-326	For Nitrous Oxide
6284-580	For Argon

Only available with CGA connections as listed.

Model Q2015 Series

Therma-Cal™ Gas Cylinder Blankets

Description

The Therma-Cal™ Gas Cylinder Blanket is used to maintain uniform composition of gas mixtures. Over time, a gas mixture may stratify into layers of the various components. The Therma-Cal™ Blanket combines the functions of a heating element and an insulating blanket to create convection current within the cylinder, which helps to keep the gas mixed and prevents separation. The cylinder blanket maintains a constant temperature a few degrees warmer on the lower third of the cylinder than on the upper third of the cylinder for ambient temperatures greater than 10°C (50°F). The heating element self-regulates its heat output, providing for the efficient use of electrical power by producing heat only when and where it is needed.



Design Features / Components

- 2 inch chemical resistant, rigid insulated jacket constructed of flame-retardant silicone impregnated fibreglass to withstand heat up to 260°C (500°F)
- Velcro fasteners for ease of installation
- 6-foot standard power cord (other lengths available)
- Heating design creates convection current inside the cylinder
- Rated for hazardous Class I, Division I, Groups C & D (Group B is available as an option)

Ordering Information

Model	Description	Dimensions
Q2015A	1R 150 Watts Fits 152 Cylinder	20.3 x 121 cm (8"x 48")
Q2015A	1A 150 Watts Fits 200 Cylinder	22.9 x 130 cm (9"x 51")
Q2015A	1F 150 Watts Fits 425 Cylinder	38.1 x 109 cm (15"x 43")

Accessories

Model	Description
121AR	30 cm (12") Rubber Floor Mat (Fits size 1R & 1A Cylinders)
181F	46 cm (18") Rubber Floor Mat (Fits size 1F Cylinders)
510-WALL	Wall Mount Cylinder Holder

Stationary Gas Detection Systems

Models 202 and 204

Alarm Boxes

Description

Linde offers its 202 and 204 series Gas Detection systems for perimeter and confined space measurement of toxic gases. Linde systems are wall-mounted, microprocessor-based control units. The 202 is a two-channel controller which can be used for one or two sensor channels, while the 204 is a four-channel controller which can be used for up to four sensor channels. Both the 202 and 204 can be used with either our standard sensor transmitter (SM95) or intelligent sensor transmitter (4-20IQ).

A front door keypad enables convenient operation of the controller without the need to open the weather proof enclosure. Standard features include: three alarm set points per channel, digital display per channel, common relays (optional individual relays), operates on 110/220 VAC (auto switching), and 24 VDC power supply to power sensor transmitters.

Contact your local Specialty Gas Sales representative or Customer Service to order your stationary gas detection system.



Models SM95 and 4-20IQ

Sensors

Description

Linde offers three different types of sensors, each having certain advantages depending on the application. This gives you the flexibility to choose the best sensor(s) for your particular application. In all, sensors for over 150 different toxic and combustible gases are available to choose from, in concentration ranges from several ppm up to %LEL. The three sensor types are Solid State, Catalytic Bead, and Electrochemical. Generally, these sensors are intended for use in ambient air monitoring. If future needs require, Linde sensor types can be easily retrofitted in the field. A brief description of each sensor type follows.

Solid State

Solid State sensors are made up of a heated metal oxide material which temporarily changes resistance in the presence of gas. Solid State sensors are available for the detection of over 150 different toxic and combustible gases, in ranges from low ppm to %LEL. A list of gases and ranges appears on the back of this brochure. Solid State sensors come with a one year warranty, and have a life expectancy in excess of ten years.

Electrochemical

Electrochemical sensors operate by producing a chemical reaction with the gas of interest. Sensors are available for certain toxic gases in ppm ranges, including: NH_3 , CO , Cl_2 , H_2 , HCl , HCN , H_2S , NO , NO_2 , O_2 , and SO_2 . For some of these gases, electrochemical sensors can offer a fairly high degree of selectivity. Electrochemical sensors have a life expectancy of one to two years and come with a one year warranty.

Catalytic Bead

Catalytic bead sensors operate by burning combustible gases, raising the temperature of the sensor. This temperature rise changes the resistance of the sensor and produces a signal proportional to the gas concentration. They detect combustible gases in higher concentrations (above 1,000 ppm) only. They are not selective and will respond to a wide range of combustible gases. However, since they only detect higher gas concentrations, they are not prone to interference from many toxic gases. Catalytic Bead sensors have a life expectancy of two years and come with a one year warranty.



Available Sensor Ranges

Acetic Acid	100, 200 ppm	Deuterium	50%, 100% LEL	Hydrogen	50, 100, 200, 500, 1000, 2000, 5000 ppm, 3%, 5% by Vol., 2% to 100% LEL	Natural Gas	1000, 2000 ppm, 2%, 4% by volume, % LEL
Acetone	100, 200, 500, 1000, 5000 ppm, % LEL	Diborane	10, 50 ppm	Hydrogen Bromide	50 ppm	Nitric Oxide	20, 50 ppm
Acetonitrile	100 ppm	Dibromoethane	50 ppm	Hydrogen Chloride	50, 100, 200, 400, 500, 1000 ppm	Nitrogen Dioxide	20, 50, 100 ppm
Acetylene	50 ppm, % LEL, 3% by volume	Dibutylamine	100% LEL	Hydrogen Cyanide	20, 30, 50, 100, 200, 1000, 10000 ppm	Nitrogen Trifluoride	50, 500, 1000 ppm
Acrolein (Acrylaldehyde)	50 ppm	Dichlorobutene	1% by volume	Hydrogen Fluoride	20, 50, 100, 200 ppm	Nonane	2000 ppm
Acrylic Acid	100 ppm	Dichloroethane (EDC)	50, 100 ppm, % LEL	Hydrogen Sulfide	5, 10, 20, 30, 50, 100, 300, 1000 ppm, % LEL	Oxygen	25% by volume
Acrylonitrile	50, 60, 80, 100, 200, 500 ppm, % LEL	Dichlorofluoroethane	100, 1000 ppm	Isobutane	1000, 3000 ppm, % LEL	Pentane	200, 1000 ppm, % LEL
Allyl Alcohol	% LEL	Dichloropentadiene	50 ppm	Isobutylene	% LEL	Perchloroethylene	200, 1000, 2000, 20000 ppm
Allyl Chloride	200 ppm	Dichlorosilane	50, 100 ppm	Isopentane	1000 ppm	Phenol	100 ppm
Ammonia	50, 70, 75, 100, 150, 200, 300, 400, 500, 1000, 2000, 2500, 4000, 5000 ppm, 1%, 2%, 10% by vol., 10%, 25%, 100% LEL	Diesel Fuel	50 ppm, 100% LEL	Isoprene	% LEL	Phosgene	50 ppm
Anisole	100 ppm	Diethyl Benzene	100% LEL	Isopropanol	200, 400, 500, 1000 ppm, % LEL	Phosphine	3, 5, 10, 20, 30, 50 ppm
Arsenic Pentafluoride	5 ppm	Diethyl Sulfide	10 ppm	JP4	1000 ppm, % LEL	Phosphorus Oxychloride	200 ppm
Arsine	1, 10 ppm	Difluorochloroethane (152A)	100% LEL	JP5	1000, 5000 ppm, % LEL	Picoline	% LEL
Benzene	50, 75, 100, 1000 ppm, % LEL	Dimethyl Ether	100% LEL	Methane	100, 200, 1000, 1500, 2000, 5000 ppm, 1%, 2% by volume, 100%, 200% LEL	Propane	100, 1000 ppm, 100% LEL
Biphenyl	50%, 100% LEL	Dimethylamine (DMA)	30, 50 ppm	Methanol	200, 300, 400, 500, 1000, 2000, 5000 ppm, 15%, 30%, 100% LEL	Propylene	100, 200, 1000, 5000 ppm, %LEL
Boron Trichloride	500 ppm	Epichlorohydrin	50, 100, 500, 1000 ppm	Methyl Acetate	30 ppm	Propylene Oxide	100 ppm, % LEL
Boron Trifluoride	500 ppm	Ethane	1000 ppm	Methyl Acrylate	60 ppm	Silane	10, 20, 50 ppm
Bromine	20 ppm	Ethanol	200, 1000, 2000 ppm, % LEL	Methyl Bromide	20, 50, 60, 100, 500, 1000, 10000, 40,000 ppm	Silicon Tetrachloride	1000 ppm
Butadiene	50, 100, 3,000 ppm, % LEL	Ethyl Acetate	200, 1000 ppm, % LEL	Methyl Butanol	% LEL	Silicon Tetrafluoride	1000 ppm
Butane	400, 1000 ppm, 100%, 200% LEL	Ethyl Benzene	200 ppm, % LEL	Methyl Cellosolve	% LEL	Styrene	200, 300 ppm, % LEL
Butanol	1000 ppm, 100% LEL	Ethyl Chloride	100 ppm, % LEL	Methyl Chloride	100, 200, 300, 2000, 10000 ppm, % LEL	Sulfur Dioxide	50, 100 ppm
Butene	100 %LEL	Ethyl Chlorocarbonate	1% by volume	Methyl Ethyl Ketone	100, 500, 1000, 4000 ppm, 100% LEL	Tetrahydrofuran	200, 300, 1000 ppm, % LEL
Butyl Acetate	100 ppm, % LEL	Ethyl Ether	100, 800, 1000 ppm, % LEL	Methyl Hydrazine	5 ppm	Tetraline	100 ppm
Carbon Disulfide	50, 60, 100 ppm, 5% by volume	Ethylene	100, 1000, 1200 ppm, % LEL	Methyl Isobutyl Ketone	200, 500, 2000 ppm, 50%, 100% LEL	Toluene	50, 100, 200, 500, 2000, 5000 ppm, % LEL
Carbon Monoxide	50, 100, 150, 200, 250, 300, 500, 1000, 3000, 5000 ppm, 3%, 5% by volume, % LEL	Ethylene Oxide	5, 10, 20, 30, 50, 75, 100, 150, 200, 300, 1000, 1500, 2000, 3000 ppm, % LEL	Methyl Mercaptan	30 ppm	Toluene Diisocyanate	15 ppm
Carbon Tetrachloride	50, 100, 10000 ppm	Fluorine	20, 100 ppm	Methyl Methacrylate	100 ppm, % LEL	Trichloroethane	50, 100, 500, 1000 ppm, 1% by volume
Cellosolve Acetate	100 ppm	Formaldehyde	15, 50, 100, 500, 1000 ppm	Methyl Tert Butyl Ether	100% LEL	Trichloroethylene	50, 100, 200, 300, 500, 1000, 2000 ppm, %LEL
Chlorine	10, 20, 50, 100, 200 ppm	Halocarbon-11	1000, 2000, 5000 ppm	Methylene Chloride	20, 100, 200, 300, 400, 500, 600, 1000, 2000, 3000, 5000 ppm, % LEL	Triethylamine (TEA)	100 ppm
Chlorine Dioxide	10, 20 ppm	Halocarbon-12	1000, 2000, 3000 ppm	Mineral Spirits	200, 3000 ppm, % LEL	Trifluoroethanol	25, 100 ppm
Chlorobutadiene	100% LEL	Halocarbon-22	100, 200, 500, 1000, 2000 ppm	Monochlorobenzene	100% LEL	Trimethylamine (TMA)	50 ppm
Chloroethanol	200 ppm	Halocarbon-113	100, 200, 500, 1000, 2000 ppm, 1% by vol.	Morpholine	500 ppm	Tungsten Hexafluoride	50 ppm
Chloroform	50, 100, 200 ppm	Halocarbon-114	1000, 2000, 20000 ppm	Naptha	1000 ppm, 100% LEL	Turpentine	% LEL
Chlorotrifluoroethylene	100% LEL	Halocarbon-123	1000 ppm			Vinyl Acetate	1000 ppm, % LEL
Cumene	100% LEL	Fuel Oil or Kerosene	100% LEL			Vinyl Chloride	20, 50, 100, 200, 400, 500, 1000, 4000, 10000 ppm, 10%, 100% LEL
Cyanogen Chloride	20 ppm	Gasoline	100, 1000, 2000, 20000 ppm., % LEL			Vinylidene Chloride	50 ppm
Cyclohexane	100 ppm, 100% LEL	Germane	10, 50 ppm			Xylene	100, 200, 300, 1000 ppm, 1% by volume
Cyclopentane	50 ppm	Heptane	1000 ppm, % LEL				
		Hexane	50, 100, 200, 2000, 2500, 3000 ppm, % LEL				
		Hexene	% LEL				
		Hydrazine	5, 10, 20, 100, 1000 ppm, 1% by volume				

General Purpose Gas Monitors and Detectors

Model 8057A

General Purpose Gas Monitor

Description

The Model 8057A General Purpose Gas Detector effectively monitors the workplace air for potentially dangerous gas leaks from tubing, equipment, containers, reaction vessels, cylinder valves, and pressurized systems. The unit continuously samples the air for hazardous gases and vapors.

It sounds an audible alarm and flashes an LED lamp when a potentially dangerous concentration of gas is detected. Headphones are provided for use in noisy environments. The entire unit is protected in a leather outer case and comes with shoulder strap and belt loop. Each unit is factory calibrated for maximum sensitivity. Rechargeable NiCad batteries (with charger) are standard.

Applications

The Model 8057A functions as a personal gas leak detector for production, QC, maintenance, and engineering personnel in a wide variety of process and laboratory locations and environments. Personnel no longer need be within the "sphere of influence" of a large multipoint gas detection system. They can now take their personal gas leak detectors with them, on site where needed.

Since personal protection is only as good as the sampling procedure used, different areas should be checked for gas leaks that could lead to potential worker exposure.

Design Features/Components

- Solid state/thermal conductivity sensor with a semiconductor platinum filament
- Threshold Limit Value (TLV) for most gases can be detected.
- Audible alarm and flashing LED alerts wearer of potentially dangerous gas levels.
- Small, portable unit weighs only 0.4 kg (0.9 lbs)
- Easily worn on the belt or over shoulder with its carrying strap.
- Rechargeable NiCad batteries (supplied with charger) give long operating life

Specifications

Detection Principle	Solid state/thermal conductivity sensor with low power drain automatic and continuous sampling
Detection Time	5–10 seconds depending on gas, concentration, and sensitivity setting
Detection Indication	Intermittent buzzer and LED lamp
Power Source	Four size "AA" rechargeable NiCad batteries, continuous operating time approx. 3 hrs. with full charge (charger included)
Recharging Time	14 hours from a fully discharged state
Operating Temperature	0°–40°C (32°–104°F)
Size (WxHxD)	6.8 x 15.5 x 3.2 cm (2.7" x 6.1" x 1.2")
Weight	0.4 kg (0.9 lbs)
Warranty	1 Year

Ordering Information

Model	Description
8057A	General Purpose Gas Detector, complete with 110 VAC Battery Charger, Four NiCad Batteries, Earphone, Filter Housing with Filter Element, Check Gas Vial, Sampling Probe and Leather Case.
8057-01	Pump Assembly (replacement)
8057-02	Sensor Assembly (replacement)
8057-03	Frame Assembly (replacement)
8057-04	Filter (package of 10) (replacement)
8057-05	Printed Circuit Board (replacement)
8057-06	Check Gas Vial (replacement)
8057-08	Replacement 110 VAC Charger
8057-09	Replacement 220 VAC Charger
8057-10	Viton Probe Tip (replacement)
8057-11	Battery Door (replacement)

For more detailed information, contact Customer Service.



Model 8066

LeakHunter Plus™ Gas Detector

Description

The Model 8066 LeakHunter Plus™ is a truly universal multi-functional leak detector specially engineered to perform superbly in both portable and bench-top applications. The 8066 will detect any gas that has a thermal conductivity that differs from that of the ambient air on which it was zeroed. Its advanced electronic design produces sensitive, stable, accurate readings to both locate and measure a wide variety of gas leaks quickly, precisely, and cleanly.

As a portable detector, the 8066 offers the convenience and flexibility of either one or two-handed operation. The flex-and-stay probe allows you to bend the probe to sniff around obstacles, with a probe extension included to extend your reach. The rechargeable NiCad batteries (included with charger) provide four hours of portable operation.

As a bench top detector, the 8066's detachable probe allows you to position the body of the unit on the bench and perform leak detection procedures with just the probe in hand. The body's no slip feet and a built-in incline stand make for a stable setup and easy viewing. The 8066's power adapter enables continuous AC operation; there's no need to periodically recharge the batteries.

The 8066 LeakHunter Plus™ can be used to simply locate leaks so they can be corrected, or it can be used to also measure how big they are. The following features make it an excellent quantitative leak detector:

- Calibration data for thirteen gases is stored in memory. At the touch of a button, the appropriate calibration data is selected depending upon the target gas to be detected.
- Leak rates are displayed in a large LCD readout. The user easily switches between units of cc/sec, cc/min, ft³/min or ppm.
- A peak hold function records and displays the maximum leak rate encountered as the probe passes through the suspect leak area.
- Built-in auto ranging automatically adjusts the instrument's sensitivity to the leak rate.



Applications

- In the Laboratory: Instruments such as chromatographs and GC/MS, reaction vessels, sampling cylinders, research apparatus, manifolds, regulators, and valves.
- In the Plant: Pressurized containers and storage vessels, piping, process and gas transfer lines, pilot plant reactions, tracer studies, refrigeration systems.
- On Production Lines: Quality assurance procedures in manufacturing, welds, seals and connectors, valves, waterproof enclosures, refrigeration and air conditioning units and military equipment.
- In the Hospital: Medical gas systems and piping, fittings and apparatus.
- In the Field: Tracer studies, helium and CO₂ pipelines, refrigeration lines.
- Environmental Compliance: Fugitive emissions.

CAUTION. The 8066 is not designed as intrinsically safe and should not be used to detect leaks of combustible gases.

Ordering Information

Model	Description
8066	LeakHunter Plus™ Gas Detector complete with "Flex-and-Stay" Standard and Extension Probes, 115 VAC Adapter/Charger w/NiCad Battery, Durable Carrying Case
8066-220	Same as above except with 220 VAC Charger in Lieu of Charger/Adapter
8066-02	Calibrated Leak Hardware
8066-03	Replacement Standard Probe
8066-04	Replacement Extension Probe
8066-05	Replacement 115 VAC Charger/Adapter
8066-06	Replacement 220 VAC Charger

For more detailed information, request contact Customer Service

Portable Gas Detection

Model 8099 Series

The Gas Sniper Portable Gas Detector

Description

The Gas Sniper Portable Gas Detector is one of the most versatile portable gas monitors available in the market today, and features ppm, %LEL or %Volume measurement capability to address a wide range of monitoring requirements. The Gas Sniper detects and monitors a wide range of standard gases including many toxic gases such as HCL, H₂S, NO, and SO₂. The Gas Sniper has the capability to monitor up to six gases simultaneously and is ideal for performing EPA Method 21 fugitive emission monitoring** of volatile organic compound (VOC) leaks from process equipment.

Product Features

- Simultaneous detection of up to six different gases
- Detects over 25 gases including a wide range of toxic gases
- Ergonomic design allows easy handling and transport
- PPM & LEL hydrocarbon detection
- High resolution LCD operating screen provides clear display of gas concentrations, alarms and diagnostic data
- Low flow alarm shuts pump off to avoid damage
- Hydrophobic filters standard in sensing probe
- Autocalibration
- Single gas calibration capability
- Methane elimination switch for environmental applications
- Security "Adjustment Lockout" Switch
- Alkaline or Ni-Cad battery operation
- Up to 30 hours of continuous operation
- Data-logging Kit option (up to four gases only)
- Remote alarm(s) option
- Carry Case option (for base unit and accessories)
- Extension Sensing Probes



Ordering Information

Model	Description
8099-01	Gas Sniper Portable Gas Detector with LEL/ppm (Methane) Sensor*
8099-02	Gas Sniper Portable Gas Detector with O ₂ Sensor
8099-03	Gas Sniper Portable Gas Detector with LEL (Methane), O ₂ , H ₂ S & CO Sensor
8099-04	Gas Sniper Portable Gas Detector with 1 Toxic Sensor
8099-05	Gas Sniper Portable Gas Detector with 2 Toxic Sensors

Options

Model	Description
8099-SC2	Gas Sniper Portable Gas Detector with 2 Sensors Configured
8099-SC3	Gas Sniper Portable Gas Detector with 3 Sensors Configured
8099-SC4	Gas Sniper Portable Gas Detector with 4 Sensors Configured
8099-SC5	Gas Sniper Portable Gas Detector with 5 Sensors Configured
8099-SC6	Gas Sniper Portable Gas Detector with 6 Sensors Configured

*The Gas Sniper can be configured with up to six gas sensors; only a maximum of two toxic sensors may be used in the Gas Sniper with any configuration.

**EPA Method 21 requires the use of a monitoring instrument that meets a series of specifications and performance criteria. Additional information can be found under EPA 40 CFR Ch.1, Pt.60, App.A, Method 21.

For additional information, contact Customer Service



Accessories and Replacement Parts

Model	Description
8099-NCBATD	Set of 4 Rechargeable Ni-Cad Batteries (Size D)
8099-NCCHAR115	Ni-Cad Battery Charger, 115 VAC with alkaline recognition
8099-HT5	1.5 m (5') Teflon Sampling Hose
8099-HT10	3 m (10') Teflon Sampling Hose
8099-HP6	1.8 m (6') Polyurethane Sampling Hose with 1641 Fittings
8099-HP10	3 m (10') Polyurethane Sampling Hose with 1641 Fittings
8099-HP15	4.5 m (15') Polyurethane Sampling Hose with 1641 Fittings
8099-HP20	6 m (20') Polyurethane Sampling Hose with 1641 Fittings
8099-CH115C	115 VAC Cont. Operation Adapter/Battery Charger with 6 m (20') Cable
8099-ORP-1	O-Ring for Hydrophobic Sensing Probe
8099-IA90	Internal Alarm-Extra Loud (90 db @ 2') feature, added to Gas Sniper
8099-MES	External Methane Elimination Switch, Added to Gas Sniper
8099-RAA20	Remote Audible Alarm with 6 m (20') Cable
8099-HSP10M	25.4 cm (10") Standard Hydrophobic Sensing Probe with Metal Fittings
8099-HSP10P	10" Hydrophobic Sensing Probe with Plastic Fittings (Toxic Gases)
8099-RFE5	Hydrophobic Filter Element (Set of 5)
8099-DLB	Data Logging Board (Factory Installed)
8099-DLDK	Data Logging Downloading Kit
8099-CHAR12	12 V-DC Battery Charger with Cigarette Lighter Plug
8099-ALKBATD	Set of 4 Alkaline Batteries (Size D)
8099-CCF1	Carry Case with foam for Gas Sniper and accessories
8099-INFIT	Standard Inlet Metal Fitting – Quick Disconnect (Female)
8099-PUMP	Pump (internal) with connector RP-GX-94
8099-SSPC	Shoulder Strap w/padded cushion

Selection Table

Model	Description	Full Scale Range
Standard Confined Space Gases		
SGS-CO2-5K	Carbon Dioxide	0-5000 ppm
SGS-CO2-10K	Carbon Dioxide	0-10,000 ppm
SGS-CO2-20V	Carbon Dioxide	0-20% Vol
SGS-CO2-60V	Carbon Dioxide	0-60% Vol
SGS-CH4-L/P	Hydrocarbons+	0-100% LEL; 0-50,000 ppm
SGS-O2	Oxygen	0-40% Vol
Toxic Gases*		
SGS-NH3-75	Ammonia	0-75 ppm
SGS-ASH3-1	Arsine	0-1 ppm
SGS-ASH3-2	Arsine	0-0.2 ppb
SGS-BR-1	Bromine	0-1 ppm
SGS-CO-150	Carbon Monoxide	0-150 ppm
SGS-CO-500	Carbon Monoxide	0-500 ppm
SGS-CL2-3	Chlorine	0-3 ppm
SGS-CLO2-1	Chlorine Dioxide	0-1 ppm
SGS-B2H6-03	Diborane	0-0.3 ppm
SGS-B2H6-30	Diborane	0-30 ppm
SGS-F2-5	Fluorine	0-5 ppm
SGS-N2H4-5	Hydrazine	0-5 ppm
SGS-HC-L/AR•	Hydrocarbons+	100% LEL
SGS-HBR-9	Hydrogen Bromide	0-9 ppm
SGS-HCL-15/R^	Hydrogen Chloride	0-15 ppm
SGS-HCL-15	Hydrogen Chloride	0-15 ppm
SGS-HCN-30	Hydrogen Cyanide	0-30 ppm
SGS-HF-9	Hydrogen Fluoride	0-9 ppm
SGS-H2S-1	Hydrogen Sulfide	0-1 ppm
SGS-H2S-30	Hydrogen Sulfide	0-30 ppm
SGS-H2S-100	Hydrogen Sulfide	0-100 ppm
SGS-CH4-L/AR•	Methane+	0-100% LEL
SGS-NO2-15	Nitrogen Dioxide	0-15 ppm
SGS-NO-100	Nitric Oxide	0-100 ppm
SGS-O3-1	Ozone	0-1 ppm
SGS-PH3-1	Phosphine	0-1 ppm
SGS-SIH4-15	Silane	0-15 ppm
SGS-SO2-10	Sulfur Dioxide	0-10 ppm

*The Gas Sniper can be configured with up to six gas sensors; only a maximum of two toxic sensors may be used in the Gas Sniper with any configuration.

+ Flammable gas

•“AR” denotes gas sensor has “auto ranging” capability; the sensor automatically ranges from % LEL to % Vol in concentration.

“R^” indicates sensor also has capability to detect CL₂.

Toxic Gas Detector System

Model 8014KA

Kitagawa Toxic Gas Detector System

Description

The Kitagawa Toxic Gas Detector System is a complete “sampling and analysis” kit for on-the-spot readings. It is an excellent method for day-to-day checking, screening, QC in the lab or plant and spot testing. Non-technical employees can operate the Kitagawa System with a minimum of training.

The Model 8014KA Toxic Gas Detector System provides accurate, dependable, and reproducible results in determining concentrations of toxic gases and vapours. It has been proven through extensive use by leading industrial companies and government agencies. One constant and reproducible sample volume reduces sampling and analysis errors — as opposed to other pump designs, there are no orifice changes or multiple strokes to keep track of. The same basic sampling technique applies to all Kitagawa Precision Detector Tubes.

Only three easy steps are required to operate the detector:

- (1) break off the tips of a fresh detector tube,
- (2) insert the tube with arrow pointing toward the pump into the pump’s sample inlet,
- (3) pull out the pump handle to automatically lock, drawing a 100 cc sample. A proprietary Sample Vue™ indicator shows when sampling is completed. Only one stroke is needed for most analyses; no need for multiple volumes or stroke counters.

Kitagawa precision detector tubes are formulated with high purity chemical reagents, which absorb and react with the gas or vapour being measured. The reaction causes a colorimetric stain, which varies in length to the concentration of the gas or vapour being measured. The length of stain is normally read directly off a scale printed on each tube. Four types of Kitagawa tubes provide the needed flexibility for different gases and sampling conditions.

SEI Certification

The Kitagawa precision sampling pump and several detector tubes are certified by the Safety Equipment Institute (SEI). SEI is a recognized organization that offers certification programs to assist the industrial safety equipment industry in providing the worker protective equipment that meets recognized standards.

Kitagawa Handbook

This handbook printed in 2006 contains all the information you need to know concerning the Kitagawa Toxic Gas Detector System. Detailed specifications for every tube, applications, system operating principles and much more, are all included in this comprehensive source of information. This book is a valuable reference guide for anyone using a Kitagawa Toxic Gas Detector System.



Detector Tubes

Substance Measuring	To be measured range (ppm)	Tube No.	Substance Measuring	To be measured range (ppm)	Tube No.
Acetaldehyde	0.004-1%	133A	Butyl ether	10-1000	111U(1)
Acetaldehyde	5-140	133SB ³	Butyl methacrylate	10-1000	111U(2)
Acetic Acid	1-50	216S	Butyric acid	1-50	216S
Acetic anhydride	1-50	216S	Carbon Dioxide	0.10-0.7	126B
Acetone	0.1-5.0%	102SA	Carbon Dioxide	0.1-5.2%	126SA [§]
Acetone	0.01-4.0%	102SC ³	Carbon Dioxide	0.05-1.0%	126SB
Acetone	100-5000	102SD [§]	Carbon Dioxide	100-4000	126SF
Acetylene	50-1000	101S	Carbon Dioxide	0.02-1.4%	126SG
Acetylene/Ethylene	20-300	280S	Carbon Dioxide	1.0-20.0%	126SH
	200-2000		Carbon Dioxide	5-50%	126UH
Acrolein	0.005-1.8%	1363	Carbon Disulfide	30-500	141SA* ³
Acrylic acid	1-50	216S	Carbon Disulfide	0.8-80	141SB ^{§,3}
Acrylonitrile	0.1-3.5%	128SA	Carbon monoxide	30-500	106S
Acrylonitrile	10-500	128B	Carbon Monoxide	5-1000	100
Acrylonitrile	1-120	128SC ³	Carbon Monoxide	10-1000	106B
Acrylonitrile	0.25-20	128SD [†]	Carbon Monoxide - in presence of ethylene and nitrogen oxides	10-100	106C
Air flow indicator tube		300	Carbon Monoxide	5 - 2000	106SA
Allyl alcohol	10-160	184S	Carbon Monoxide	1-50	106SC
Allyl chloride	0.1-12.0	132SC(1)	Carbon Monoxide	10-250	106S [§]
Ammonia	0.5-10.0%	105SA	Carbon Monoxide	0.1-2.0%	106SH
Ammonia	50-900	105SB	Carbon Monoxide	0.1-20%	106UH
Ammonia	5-260	105SC [§]	Carbon Tetrachloride	0.5-60	147S ³
Ammonia	0.2-20	105SD	Charcoal tube		800B
Ammonia	0.5-30%	105SH	Chlorine	1-40	109SA
Ammonia	0.1-1.0%	105SM	Chlorine	0.1-10.0	109SB [§]
Ammonia Super-High Sensitivity	10-80 µg/m ³	900NHH	Chlorine	0.05-2	109U
Ammonia Super-High Sensitivity	1-12 µg/m ³	901NHL	Free residual chlorine	0.4-5	234SA
Aniline	1-30	181S	Carbonyl Sulfide	5-60	239S [†]
Arsine	0.05-2.0	121U	Chloride ion	10-2000	201SA
Arsine	5-160	140SA	Chloride ion	3-200	201SB
Benzaldehyde	5-500	190U(6)	Chloride ion	1-60	201SC
Benzene - in presence of gasoline and/or other aromatic hydrocarbons	5-200	118SB [†]	Free residual Chlorine	0.4-5	234SA
Benzene	1-100	118SC [§]	Chlorine Dioxide	1-20	116
Benzene	0.1-75	118SD	Chlorobenzene	1-140	178S
Benzene	0.2-80	118SE	Chloroform	23-500	152S ³
Benzyl chloride	0.1-12.0	132SC(2)	Chloropicrin	0.05-16	172S ³
Bromine	1-20	114	Chloroprene	0.5-20	169S
Bromochloro-methane	0.4-80	157SB(1)	m-Chlorotoluene	0.1-12.0	132SC(3)
Bromoform	0.4-80	157SB(2)	o-Chlorotoluene	0.1-12.0	132SC(4)
Butadiene	0.03-2.6%	168SA	p-Chlorotoluene	0.1-12.0	132SC(5)
Butadiene	30-600	168SB	Copper ion	1-100 mg/L	203S
Butadiene	2.5-100	168SC	Cresol	0.5-25	183U
Butadiene	0.5-10.0	168SD	Crotonaldehyde	5-500	190U(1)
n-butane	0.05-0.6%	221SA	Cumene	10-1000	111U(4)
1-Butanol	5-100	190U	Cyanide ion	0.2-5	204S
2-Butanol	4-300	189U	Cyclohexene	10-1000	111U(5)
Butyl acetate	15-400	138U	Cyclohexane	0.01-0.6%	115S
Butyl acetate	0.01-1.4%	139SB	Cyclohexanol	5-500	206U
Butyl Acrylate	5-60	211U	Cyclohexanone	2-100	197U
			Decahydrone-phthalene	10-1000	111U(6)

Detector Tubes

Substance Measuring	To be measured range (ppm)	Tube No.	Substance Measuring	To be measured range (ppm)	Tube No.
n-Decane	10-1000	111U(7)	Furfuryl Alcohol	2-25	238S
Diacetone Alcohol	10-250	190U	Gasoline	0.05-0.6%	110S
Diborane	0.02-5	242S	General hydrocarbons	50-1400	187S
o-Dichlorobenzene	5-100	214S	Heptane	50-1400	113SB
p-Dichlorobenzene	10-150	215S	n-hexane	0.05-1.32%	113SA
p-Dichlorobenzene - IAQ,	0.01-0.40	730	n-hexane	50-1400	113SB ¹
1,1-Dichloroethane	10-160	235S ³	n-Hexane	5-800	113SC
1,1-Dichloroethylene	0.1-12.0	132SC(6)	Hydrazine	0.05-10	219S
1,2-Dichloroethane	5-50	230S ³	Hydrogen	0.05-0.8%	137U ^{**}
1,2-Dichloroethylene	5-400	145S ³	Hydrogen Chloride	20-1200	173SA
Dichloromethane	10-1000	180S ³	Hydrogen Chloride	0.4-40	173SB [§]
1,2-Dichloropropane	0.4-80	157SB(3)	Hydrogen cyanide	0.01-3.0%	112SA
1,3-Dichloropropane	0.1-12.0	132SC(7)	Hydrogen cyanide	0.5-100	112SB ^{§,3}
1,3-Dichloropropane	10-500	194S ³	Hydrogen cyanide	0.3-8	112SC
Dicyclopentadiene	5-500	190U(2)	Hydrogen Fluoride	0.1-300	156S [§]
Diethylamine	1-20	222S	Hydrogen peoxide	0.5-10.0	247S
Diethyl benzene	10-1000	111U(8)	Hydrogen selenide	1-600	167S
Diethyl ether	0.04-1.4%	107SA	Hydrogen Sulfide	1-60	120SD [§]
Diethyl ether	20-400	107U	Hydrogen Sulfide	0.2-6.0	120U
Dimethyl ether	0.01-1.2%	123S	Hydrogen Sulfide	0.05-1.2%	120SM
N, N-Dimethylacetamide	5-70	229S	Hydrogen Sulfide	.75-300	120SB
N,N-Dimethyl formamide	1-30	196S	Hydrogen Sulfide-in presence of Sulfur dioxide	0.005-0.16%	120SC
Dioxane	0.01-1.4%	139SB	Hydrogen Sulfide	0.5-40	120SE
Dioxane	20-1000	119U	Hydrogen Sulfide	25-2000	120SF
Epichlorohydrin	5-50	192S ¹	Hydrogen Sulfide	0.1-4.0%	120SH
Ethyl acetate	0.1-5.0%	111SA	Hydrogen Sulfide	2-20%	120UH
Ethyl acetate	10-1000	111U	Hydrogen Sulphide	0.025-0.4 gr/100 cf	120GR
Ethyl acrylate	5-60	211U	Hydrogen sulphide	0.25-4 gr/100 cf	120GT
Ethyl alcohol	0.05-5.0%	104SA	Hydrogen Sulfide	2.5-40%	120U ^{**}
Ethyl Benzene	10-500	179S	Hydrogen sulphide-Mercaptans	H ₂ S 1-30 R-SH 0.5-5	282S
Ethyl bromide	0.4-80	157SB(4)	Inorganic gases, qualitative		131
Ethyl cellusolve	5-500	190U	Iron ion	50-400	202
Ethyl Mercaptan	1-160	165SA	Isoamyl acetate	10-400	188U
Ethyl mercaptan in LP Gas	2.5-80	165SB	Isobutane	50-1400	113SB
Ethyl methacrylate	10-1000	111U(8)	Isobutylene	50-1400	113SB
Ethylene	0.1-100	108B	Isobutyl acetate	0.01-1.4%	139SB
Ethylene	20-1200	108SA	Isobutyl acetate	10-400	153U
Ethylene/Acetylene	200-2000 20-30	280S	Isopentyl acetate	10-400	188U
Ethylene oxide	0.1-14.0	122SD	Isobutyl acrylate	5-60	211U
Ethylene oxide	5-100	122SM	Isobutyl alcohol	5-100	208U
Ethylene dibromide	1-50	166S ³	Isopentyl Alcohol	5-100	209U
Ethylene glycol	20-250 mg/m ³	232SA ¹	Isophorone	2-100	197U(1)
Ethylene glycol	3-40 mg/m ³	232SB ¹	Isoprene	1-16	190U
Ethylene Oxide	0.01 - 4%	122SA	Isopropyl acetate	0.01-1.2%	139SB
Ethylene Oxide	5-100	122SB ^{1*}	Isopropyl acetate	10-1000	111U
Ethylene Oxide	1-15	122SC	Isopropyl alcohol	0.05-2.5%	150SA
Formaldehyde	1-35	171SB [§]	Isopropyl alcohol	20-1200	150U
Formaldehyde	20-1500	171SA ³	Isopropyl alcohol	0.01-4.0%	122SA
Formaldehyde	0.05-4.0	171SC	Isopropyl amine	1-20	222S(1)
Formaldehyde - IAQ	0.01-0.48	710	Isopropyl cellosolve	5-500	190U(3)
Formaldehyde - IAQ	0.05-2.0	710A			
Furan	0.01-4%	122Sa			

Substance Measuring	To be measured range (ppm)	Tube No.	Substance Measuring	To be measured range (ppm)	Tube No.
Isopropyl ether	10-1000	111U(9)	Nitrogen Oxides	0.5-30	175U ³
Isopropyl mercaptan	0.5-10	130U	n-Nonane	10-1000	111U(12)
Mercaptans	0.5-10	130U	Organic Compounds	5-2500	186
Mercaptans/H ₂ S	0.5-5 1-30	282S	Organic gases, qualitative		186B
Mercury vapour	0.1 - 10 mg/m ³	142S	Oxygen (Flame req'd)	2-24%	159SA [*]
Mesityl oxide	5-100	190U	Oxygen	2-24%	159SA
Methyl acetate	0.1-5%	111SA	Oxygen (no flame)	2-24%	159SB ^{**}
Methyl acrylate	5-60	211U	Oxygen (non-heating type)	1.5-24%	159SC [*]
Methyl alcohol	0.05-6.0%	119SA	Oxygen/Carbon Dioxide	2-10% 1-20%	281S
Methyl alcohol	20-1000	119U	Oxygen	0.025-3.0	182UI
Methylamine	1-20	227S	Ozone	50-1000	182SA
n-Methyl aniline	0.2-20	105SD	Ozone	2.5-100	182SB
Methyl Bromide	10-500	157SA ³	Pentane	50-1400	113SB [*]
Methyl Bromide	0.4-80	157SB ^{3,3}	Pentyl acetate	10-200	210U
Methyl bromide	0.5 - 10	157SC [*]	Phosgene	0.1 - 20	146S ³
Methyl butyl ketone	5-120	237S(1)	Phosphine in acetylene	20-800	121SA
Methyl cellosolve	5-500	190U	Phosphine in acetylene	5-90	121SB
Methyl chloroform (1,1,1-Tri-chloroethane)	15-400	160S ³	Phosphine	20-1400	121SC
Methyl cyclohexane	50-1400	113SB	Phosphine	0.25-20	121SD
Methyl cyclohexanol	5-200	199U	Phosphine	100-3200	121SH
Methyl cyclohexanone	2-100	198U	Phosphine	0.05-2.0	121U [§]
Methyl ether	0.01-1.2%	123S	a-Pinene	2.5-300	158S(1)
Methyl ethyl ketone	0.01-4%	122SA	Propane	0.02-0.5%	125SA
Methyl ethyl ketone	0.01-1.4%	139SB	1-Propanol	5-500	190U(4)
Methyl ethyl ketone	20-1500	139U	Propyl acetate	0.01-1.4%	139SB
Methyl iodide	2-40	176S ³	Propyl acetate	20-1000	151U
Methyl Isobutyl Ketone	5-300	155U	Propylene	50-1000	185S
Methyl isothiocyanate	10-1000	111U(10)	Propylene glycol	1-15	122SC(2)
Methyl Mercaptan	5-140	164SA	Propylene Oxide	1-15	122SC(1)
Methyl Mercaptan	50-1000	164SH	Propylene oxide	0.05-5.0%	163SA
Methyl Methacrylate	10-160	184S	Pyridine	0.05-10	219S(1)
Methyl styrene	10-500	193S	Pyridine	0.2-20	105SD
Mineral turpentine	10-1000	111U(11)	Salinity	0.01-0.8%	205SL
Monoethanol amine	0.5-50	224SA	Silane	0.5-50	240S
Morpholine	0.2-20	105SD	Silica-gel tube		801
Naphtalene	10-400	153U	Smoke tube (Air Flow Indicator)		300
Nickel carbonyl	20-700	129	Styrene	1 - 100	158S
Nitric Acid vapour	1-20	233S ³	Sulphide ion	0.5-10	200SB
Nitrogen Dioxide	20-1000	117SA	Sulphide ion	2-1000	200SA
Nitrogen Dioxide	0.5-30	117SB [§]	Sulfur Dioxide	0.1-3.0%	103SA
Nitrogen dioxide	0.1-1.0	117SD	Sulfur Dioxide	0.02-0.3%	103SB
Nitrogen dioxide - IAQ	0.01-0.2	740	Sulfur Dioxide - in flue gas	0.02-0.3%	103SF
Nitrogen oxide and dioxide - separately measurable	NO 10-300 NO ₂ 1-40	174A [§]	Sulfur Dioxide	1-60	103SD [§]
Nitrogen oxide and dioxide	NO 10-300 NO ₂ 1-40	174B	Sulfur Dioxide	0.25-10	103SE
Nitrogen Oxides	20-250	175SA [*]	Sulphur dioxide in Carbon dioxide	0.1-25	103SG
Nitrogen Oxides	100-2500	175SH	Sulphuric acid	0.5-5 mg/m ³	244U
			tert-Butyl methyl ether	10-1000	111U(3)

Detector Tubes

Substance Measuring	To be measured range (ppm)	Tube No.	Substance Measuring	To be measured range (ppm)	Tube No.
1,1,2,2-Tetrachloroethane	10-100	236S(1)	Trichloroethylene	0.2-36.8	134SB
Tetrachloroethylene	5-300	135SA ³	Trichlorotoluene	0.1-12.0	132SC(8)
Tetrachloroethylene	0.2-10	135SB ³	Triethylamine	1-20	213S
Tetrachloroethylene	0.1-2.0%	135SG	Trimethylamine	1-20	222S
Tetrachloroethylene	0.05-2%	135SH	1.2.4-Trimethylbenzene	10-1000	111U
Tetraethoxysilane	5-160	243U	TWA Carbon monoxide	5-400	500
Tetrahydrofuran	0.1-5.0%	102SA	TWA Ammonia	5-200	501
Tetrahydrofuran	20-400	162U	TWA Hydrogen Sulphide	1-20	502
Toluene	10-500	124SA [§]	TWA Sulphur dioxide	0.5-20	503
Toluene	2-100	124SB	TWA Toluene	20-200	504
Toluene	100-3000	124SH	Vinyl acetate	5-120	237S
Toluene - IAQ	0.05-1.0	721	Vinyl Chloride	0.05-1%	132SA
o-Toluidine	0.2 - 20	105SD	Vinyl Chloride	5-500	132SB ³
p-Toluidine	0.2-20	105SD	Vinyl Chloride	0.1-12	132SC [§]
1,1,2 Trichloroethane	10-100	236S ³	Water Vapour	1.7-33.8mg/l	177SA
1,1,1-Trichloroethane (Methyl chloroform)	15-400	160S	Water Vapour	0.05-2.0 mg/l	177U
Trichloroethylene	5-300	134SA ^{§,3}	Water Vapour	3-80 lb/MMCF	177UL
Trichloroethylene	0.05-2%	134SH	Water vapor	2-12 lb/MMCF	177UR
Trichloroethylene	0.05-2.0%	134SG	Xylene	5-1000	143SA [§]
			Xylene	5-200	143SB

§ SEI certified.

† Pending SEI certification.ppm: parts per million mg/m³: approximate milligrams of substance per cubic meter of air.

³ Requires refrigeration (2°-10°C; 36°-50°F) for storage

All "S" and "U" tubes are direct reading.

All tubes are packaged 10 tubes per box unless otherwise noted.

* Five detector tubes, five pretreat tubes per box.

** Five detector tubes per box.

+ Five detector tubes per box, each tube for one NO/NO₂ test.

++ 3 x 5 detector tubes per box. Orifice to be inserted in 400B pump before sampling (P/N 001).

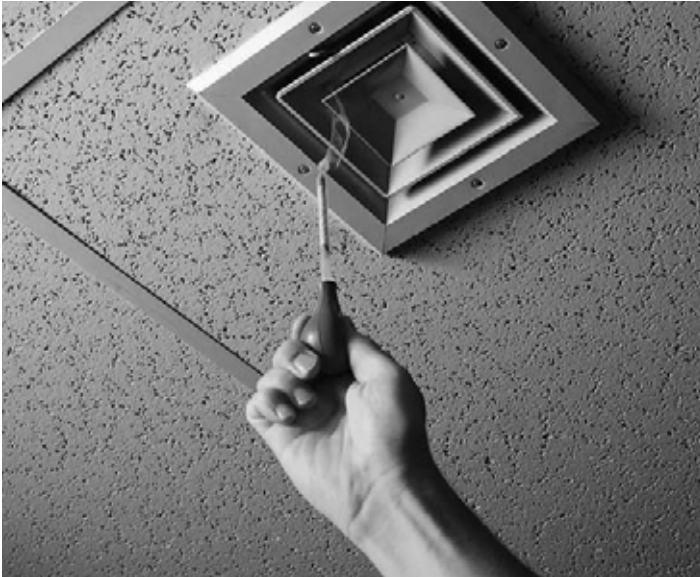
Note: all tubes will have a minimum of three months shelf life remaining when shipped, although they will typically contain more.

Ordering Information

Model	Description
8014KA	Toxic Gas Detector Kit - with Pump (SEI approved), Spare Parts, Carrying Case and Instruction Card. Order tubes separately.
400B	Precision Sampling Pump (replacement only)
002	Rubber Inlet Flange and Ring (pkg 6) (replacement)
003	Sampling Pump Lubricant (replacement)
017	5 Meter Extension Hose (with tube holder)
108	10 Meter Extension Hose (with tube holder)
300K	Air Flow Indicator Kit - with Aspirator Bulb, Case, and one box 300 Smoke Tubes.
300K2	Continuous Air Flow Indicator Kit
KBOOK	Kitagawa Handbook

Indoor Air Quality Test Kit

Model 8078



What is Indoor Air Quality?

Indoor Air Quality (IAQ) is normally associated with non-industrial environments such as office buildings, schools, hotels, residences, etc. As these structures typically do not employ readily identifiable hazardous materials, the cause of a poor indoor air quality condition can be difficult to troubleshoot.

Tighter building envelopes (designed to minimize heat and air conditioning losses), and HVAC systems balanced to recirculate a greater percentage of their air and bring in less fresh air from outside, tend to concentrate air contaminants over time rather than exhaust them outside or dilute them with fresh air. The contaminants are not actually due to new sources, but are now more noticeable because of their tendency to accumulate. For example, the following contaminants existed long before the problems associated with poor indoor air quality:

Formaldehyde	Particle board furniture and sub-flooring, foam insulation
Carbon Monoxide	Leaky furnaces/boilers, vehicle exhaust entrainment into building
Carbon Dioxide	Human respiration
Volatile Organic Carbons (VOC's)	Carpeting, adhesives, paints
Ozone	Photocopiers, Laser printers
Ammonia	Blueprint duplicators, cleaners
Trichloroethylene	Dry cleaning residue

Indoor Air Quality Test Kit

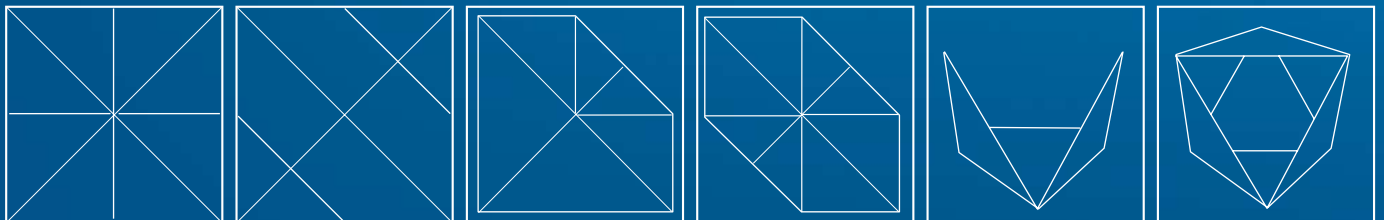
Description

The Linde Model 8078 is a complete kit for analyzing many parameters pertaining to indoor air quality. The heart of the Model 8078 kit is the Linde-Kitagawa precision air-sampling pump. It is used in conjunction with a variety of detector tubes. Included in the kit are tubes for measuring the concentration of formaldehyde, carbon monoxide, carbon dioxide and organic hydrocarbons. And although not included in the kit as standard, tubes are available for ammonia, ozone and a host of other gases and vapours. Qualitative tubes are also included for analysis of unknown materials. An airflow indicator kit (smoke tubes) is provided for determining ventilation patterns and efficiencies. A 10 m (32.8') extension sampling hose is provided for remote sampling in hard to reach places. All of these products are packaged with relevant maintenance items in a convenient, extremely durable carrying case.



Ordering Information

Model	Description
8078	Indoor Air Quality Test Kit, complete with the following items:
	(1) 400A Air Sampling Pump
	(1) 002 Spare Rubber Inlet Flanges (6)
	(1) 003 Maintenance Pump Lubricant
	(5) 106SB Carbon Monoxide Tubes, 5-50 ppm
	(7) 126SC Carbon Dioxide Tubes, 300-7,000 ppm
	(5) 187S General Hydrocarbons Tubes, 50-1,400 ppm
	(10) 171SB Formaldehyde Tubes, 1-35 ppm
	(1) 131 Qualitative Inorganic Tubes
	(2) 186B Qualitative Organic Tubes
	(1) 300K Air Flow Indicator Kit
	(1) 018 10m Extension Sampling Hose
	(1) Hard Shell Carrying Case



Physical Data

Physical and Chemical Information on Pure Gases

The aim throughout has been to present, in a condensed form, a large amount of accurate, reliable and up-to-date information on the fields of chemistry and physics for pure gases. Chemistry and physics, always closely related sciences, have been brought into more intimate relations by more recent results and research discoveries. The information contained herein can be used for a variety of tasks such as recalculation between volume and weight at a fixed temperature.

Physical Data

Gas Name	Chemical Formula	Liquid State				
		Molecular Weight g/mol	Density at b.p. 1 atm kg/l	Density 20°C kg/l	Vapour Pressure 20°C bar	Specific Heat kJ/kg · K
Acetylene	C ₂ H ₂	26.038	0.6179	0.3999	43.41	3.64 (15°C)
Air, synthetic		28.96	—	—	—	—
Ammonia	NH ₃	17.031	0.6814	0.6091	8.56	4.4 (-40°C)
Argon	Ar	39.948	1.3974	—	—	1.1 (b.p.)
Arsine	AsH ₃	77.945	1.6205	1.3401	14.75	—
Boron trichloride	BCl ₃	117.17	1.3457	1.3291	1.32	—
Boron trifluoride	BF ₃	67.806	1.5716	—	—	—
1,3-Butadiene	C ₄ H ₆	54.092	0.6508	0.6211	2.40	2.22 (15°C)
n-Butane	C ₄ H ₁₀	58.123	20.602	0.5788	2.08	2.35 (15°C)
iso-Butane	C ₄ H ₁₀	58.123	0.5949	0.5585	3.06	1.92 (15°C)
1-Butene	C ₄ H ₈	56.107	0.6261	0.5944	2.57	2.25 (15°C)
cis-2-Butene	C ₄ H ₈	56.107	0.6416	0.6227	1.81	—
iso-Butene	C ₄ H ₈	56.107	0.6274	0.5951	2.64	0.67 (15°C)
trans-2-Butene	C ₄ H ₈	56.107	0.6275	0.6053	1.99	—
Carbon dioxide	CO ₂	44.01	1.1806	0.774	57.37	1.97 (-20°C)
Carbon monoxide	CO	28.01	0.790	—	—	0.68 (b.p.)
Carbonyl sulfide	COS	60.076	1.1769	1.0068	11.06	—
Chlorine	Cl ₂	70.905	1.5622	1.4128	6.80	2.06 (b.p.)
Cyanogen chloride	CNCl	61.47	1.1969	1.1823	1.35	—
Cyclopropane	C ₃ H ₆	42.081	0.6989	0.626	6.29	—
Deuterium	D ₂	4.032	0.1605	—	—	—
Diborane	B ₂ H ₆	27.67	0.4288	—	—	—
Dichlorosilane	SiH ₂ Cl ₂	101.01	1.2014	1.1773	1.52	—
Dimethylamine	(CH ₃) ₂ NH	45.084	0.6704	0.6559	1.69	3.02 (0°C)
Dimethyl ether	C ₂ H ₆ O	46.069	0.7296	0.6633	5.09	—
2,2-Dimethylpropane	C ₅ H ₁₂	2.59	0.6036	0.5918	1.46	—
Ethane	C ₂ H ₆	30.07	0.5447	0.3385	37.70	3.79 (15°C)
Ethene	C ₂ H ₄	28.054	0.5698	—	—	—
Ethylene oxide	C ₂ H ₄ O	44.053	0.8827	0.8696	1.47	—
Ethylamine	C ₂ H ₅ NH ₂	45.084	0.6869	0.6828	1.15	—
Ethyl chloride	C ₂ H ₅ Cl	64.514	0.9064	0.8967	1.34	—
Fluorine	F ₂	37.997	1.5056	—	—	—

Gas Name	Chemical Formula	Liquid State				
		Molecular Weight g/mol	Density at b.p. 1 atm kg/l	Density 20°C kg/l	Vapour Pressure 20°C bar	Specific Heat kJ/kg · K
Helium	He	4.003	0.124	—	—	4.01 (b.p.)
Hydrogen	H ₂	2.016	0.075			8.78 (b.p.)
Hydrogen bromide	HBr	80.912	2.1521	1.7571	21.80	0.92 (15°C)
Hydrogen chloride	HCl	36.461	1.1933	0.8231	42.02	1.70 (b.p.)
Hydrogen fluoride	HF	20.006	0.9552	0.954	1.03	
Hydrogen sulphide	H ₂ S	34.082	0.943	0.7886	18.41	1.06 (21°C)
Krypton	Kr	83.8	2.4186			
Methane	CH ₄	16.043	0.4241			3.45 (b.p.)
Methylamine	CH ₃ NH ₂	31.057	0.6946	0.6617	2.96	3.28 (-14°C)
Methyl bromide	CH ₃ Br	94.939	1.71496	1.6755	1.84	
Methyl chloride	CH ₃ Cl	50.487	1.0073	0.9232	4.96	1.57 (20°C)
Methyl mercaptan	CH ₃ SH	48.109	0.8875	0.8689	1.70	1.85 (b.p.)
Neon	Ne	20.18	1.2039			1.85 (b.p.)
Nitric oxide	NO	30.006	1.2808			2.61 (b.p.)
Nitrogen	N ₂	28.014	0.8078			2.06 (b.p.)
Nitrogen dioxide	NO ₂	46.006	1.453	1.4552	0.96	1.55 (b.p.)
Nitrogen trifluoride	NF ₃	71.002	1.540			
Nitrous oxide	N ₂ O	44.013	1.2225	0.7848	51.27	1.74 (b.p.)
Octafluoropropane	C ₃ F ₈	188.02	1.6047	1.345	7.69	0.97 (b.p.)
Oxygen	O ₂	31.999	1.142			1.68 (b.p.)
Phosgene	COCl ₂	98.916	1.4021	1.3743	1.59	
Phosphine	PH ₃	33.998	0.7437	0.5071	35.17	
Propadiene	C ₃ H ₄	40.065	0.663	0.587	6.34	
Propane	C ₃ H ₈	44.097	0.583	0.5011	8.39	2.22 (b.p.)
Propene	C ₃ H ₆	42.081	0.6103	0.5112	10.25	2.57 (15°C)
Propyne	C ₃ H ₄	40.065	0.6721	0.6142	4.94	
R 11 Trichlorofluoromethane	CFCl ₃	137.37	0.4795	1.4884	0.89	0.89 (30°C)
R 12 Dichlorodifluoromethane	CF ₂ Cl ₂	120.91	1.4858	1.3251	5.63	0.98 (30°C)
R 13 Chlorotrifluoromethane	CF ₃ Cl	104.46	1.5229	0.9279	31.89	1.04 (-30°C)
R 13 b1 Bromotrifluoromethane	CF ₃ Br	148.91	1.9927	1.5725	14.34	0.88 (25°C)
R 14 Tetrafluoromethane	CF ₄	1.6067	1.6067			
R 23 Trifluoromethane	CHF ₃	1.4514	1.4514	0.8109	41.98	6.50 (25°C)

Physical Data

Gas Name	Chemical Formula	Liquid State				
		Molecular Weight g/mol	Density at b.p. 1 atm kg/l	Density 20°C kg/l	Vapour Pressure 20°C bar	Specific Heat kJ/kg · K
R 21 Dichlorofluoromethane	CH ₂ Cl ₂	1.4057	1.4057	1.3794	1.53	0.98 (b.p.)
R 22 Chlorodifluoromethane	CH ₂ F ₂ Cl	1.4122	1.4122	1.2125	8.97	1.28 (30°C)
R 114 1,2-Dichlorotetrafluoroethane	C ₂ Cl ₂ F ₄	170.92	1.5184	1.4706	1.84	1.03 (30°C)
R 115 Chloropentafluoroethane	C ₂ ClF ₅	154.47	1.5448	1.3114	8.00	1.19 (30°C)
R 116 Hexafluoroethane	C ₂ F ₆	138.01	1.5979			
R 134a Tetrafluoroethane	C ₂ H ₂ F ₄	102.03	1.375	1.224	5.71	1.40 (15°C)
R 142b 1-Chloro-1,1-difluoroethane	C ₂ H ₃ ClF ₂	100.5	1.2002	1.1213	2.90	
R 152a 1,1-Difluoroethane	C ₂ H ₄ F ₂	66.051	1.0141	0.9103	5.18	
Silane	SiH ₄	32.117	0.5826			
Silicon tetrafluoride	SiF ₄	104.08				
Sulphur dioxide	SO ₂	64.065	1.4628	1.3808	3.36	
Sulphur hexafluoride	SF ₆	146.06	1.8449	1.3744	21.61	0.67 (21°C)
Trimethylamine	(CH ₃) ₃ N	59.111	20.6552	0.6349	1.83	
Tungsten hexafluoride	WF ₆	297.84	3.430		1.10	
Vinyl bromide	C ₂ H ₃ Br	106.95	1.523	1.512	1.18	0.90 (15°C)
Vinyl chloride	C ₂ H ₃ Cl	62.499	0.9658	0.9115	3.42	1.35 (20°C)
Vinyl methyl ether	C ₃ H ₆ O	58.08	0.7699	0.7508	1.74	2.14 (0°C)
Xenon	Xe	131.29	2.9537			0.34 (b.p.)

Gas Name	Chemical Formula	Molecular Weight G/mol	Liquid state			
			Density at b.p. 1 atm lb/ft ³	Density 20°C lb/ft ³	Vapour Pressure 70°F psi (a)	Specific Heat 70°F BTU/lb•°F
Acetylene	C ₂ H ₂	26.038	38.539	24.673	646.21	
Air, synthetic		28.96				
Ammonia	NH ₃	17.031	42.500	37.926	128.51	1.150
Argon	Ar	39.948	87.158	73.351		
Arsine	AsH ₃	77.945	101.074	83.396	219.32	
Boron trichloride	BCl ₃	117.17	83.934	82.819	19.91	
Boron trifluoride	BF ₃	67.806	98.024	89.022		
1,3-Butadiene	C ₄ H ₆	54.092	40.591	38.686	36.07	0.541
n-Butane	C ₄ H ₁₀	58.123	1285.0	36.053	31.29	0.577
iso-Butane	C ₄ H ₁₀	58.123	37.105	34.780	45.81	0.576
1-Butene	C ₄ H ₈	56.107	39.051	37.017	38.58	0.541
cis-2-Butene	C ₄ H ₈	56.107	40.018	38.794	27.26	0.540
iso-Butene	C ₄ H ₈	56.107	39.132	37.064	39.59	0.552
trans-2-Butene	C ₄ H ₈	56.107	39.138	37.706	29.94	
Carbon dioxide	CO ₂	44.01	73.636	47.583	853.66	
Carbon monoxide	CO	28.01	49.274	40.831		
Carbonyl sulfide	COS	60.076	73.405	62.658	164.96	0.328
Chlorine	Cl ₂	70.905	97.437	87.990	101.64	
Cyanogen chloride	CNCl	61.47	74.653	73.667	20.41	0.630
Cyclopropane	C ₃ H ₆	42.081	43.591	39.011	94.11	
Deuterium	D ₂	40.32	10.010	62.179		
Diborane	B ₂ H ₆	27.67	26.745	82.819		
Dichlorosilane	SiH ₂ Cl ₂	101.01	74.934	73.351	22.90	0.310
Dimethylamine	(CH ₃) ₂ NH	45.084	41.814	40.868	25.47	
Dimethyl ether	C ₂ H ₆ O	46.069	45.506	41.300	76.35	
2,2-Dimethylpropane	C ₅ H ₁₂	2.59	37.647		21.93	
Ethane	C ₂ H ₆	30.07	33.974	20.844	559.92	
Ethene	C ₂ H ₄	28.054	35.539	20.844		
Ethylene oxide	C ₂ H ₄ O	44.053	56.534	54.189	22.13	0.477
Ethylamine	C ₂ H ₅ NH ₂	45.084	55.055	42.541	17.45	
Ethyl chloride	C ₂ H ₅ Cl	64.514	42.843			
Fluorine	F ₂	37.997	93.907	62.179		

Physical Data

Gas Name	Chemical Formula	Molecular Weight G/mol	Liquid state			
			Density at b.p. 1 atm lb/ft ³	Density 20°C lb/ft ³	Vapour Pressure 70°F psi (a)	Specific Heat 70°F BTU/lb•°F
Helium	He	4.003	7.734	73.351		
Hydrogen	H ₂	2.016	4.397	76.162		
Hydrogen bromide	HBr	80.912	134.42	109.30	324.57	0.180
Hydrogen chloride	HCl	36.461	74.428	51.028	625.37	
Hydrogen fluoride	HF	20.006	59.577	59.381	15.48	
Hydrogen sulphide	H ₂ S	34.082	58.817	49.070	274.52	
Krypton	Kr	83.8	150.85	73.351		
Methane	CH ₄	16.043	26.452	83.442		
Methylamine	CH ₃ NH ₂	31.057	43.323	41.218	44.63	
Methyl bromide	CH ₃ Br	94.939	107.26	104.41	27.76	
Methyl chloride	CH ₃ Cl	50.487	62.827	57.494	74.28	0.381
Methyl mercaptan	CH ₃ SH	48.109	55.355	54.150	25.67	
Neon	Ne	20.18	75.089	73.351		
Nitric oxide	NO	30.006	79.886	57.943		
Nitrogen	N ₂	28.014	50.384	194.64		
Nitrogen dioxide	NO ₂	46.006	90.626	90.668	14.66	
Nitrogen trifluoride	NF ₃	71.002	96.053	49.070		
Nitrous oxide	N ₂ O	44.013	76.250	48.457	761.88	
Octafluoropropane	C ₃ F ₈	188.02	100.09	83.586	115.05	
Oxygen	O ₂	31.999	71.229	62.179		
Phosgene	COCl ₂	98.916	87.452	85.639	24.00	
Phosphine	PH ₃	33.998	46.386	31.441	522.11	
Propadiene	C ₃ H ₄	40.065	41.352	36.539	94.72	
Propane	C ₃ H ₈	44.097	36.363	31.175	125.24	0.630
Propene	C ₃ H ₆	42.081	38.065	31.792	152.86	0.580
Propyne	C ₃ H ₄	40.065	41.920	38.241	74.09	
R 11 Trichlorofluoromethane	CFCl ₃	137.37	92.279	92.759	13.50	0.117
R 12 Dichlorodifluoromethane	CF ₂ Cl ₂	120.91	92.672	82.478	84.23	0.231
R 13 Chlorotrifluoromethane	CF ₃ Cl	104.46	94.986	56.927	474.18	
R 13 b1 Bromotrifluoromethane	CF ₃ Br	148.91	124.29	97.681	213.69	0.206
R 14 Tetrafluoromethane	CF ₄	88.005	100.21	56.927		
R 23 Trifluoromethane	CHF ₃	102.92	87.676	85.949	23.00	0.251

Gas Name	Chemical Formula	Molecular Weight G/mol	Liquid state			
			Density at b.p. 1 atm lb/ft ³	Density 20°C lb/ft ³	Vapour Pressure 70°F psi (a)	Specific Heat 70°F BTU/lb·°F
R 21 Dichlorofluoromethane	CH ₂ Cl ₂	86.468	88.082	75.430	134.12	0.294
R 22 Chlorodifluoromethane	CH ₂ F ₂ Cl	70.014	90.527	49.324	625.58	
R 114 1,2-Dichlorotetrafluoroethane	C ₂ Cl ₂ F ₄	170.92	94.706	91.599	27.43	0.155
R 115 Chloropentafluoroethane	C ₂ ClF ₅	154.47	96.352	81.543	119.53	
R 116 Hexafluoroethane	C ₂ F ₆	138.01	99.664	81.543		
R 134a Tetrafluoroethane	C ₂ H ₂ F ₄	102.03	85.761	76.162	85.69	0.340
R 142b 1-Chloro-1,1-difluoroethane	C ₂ H ₃ ClF ₂	100.5	74.859	69.809	43.59	0.307
R 152a 1,1-Difluoroethane	C ₂ H ₄ F ₂	66.051	62.251	56.656	77.60	0.391
Silane	SiH ₄	32.117	36.338	31.441		
Silicon tetrafluoride	SiF ₄	104.08				
Sulphur dioxide	SO ₂	64.065		86.004	50.67	
Sulphur hexafluoride	SF ₆	146.06		85.116	321.70	
Trimethylamine	(CH ₃) ₃ N	59.111		39.548	27.52	0.553
Tungsten hexafluoride	WF ₆	297.84	3.430		1.10	
Vinyl bromide	C ₂ H ₃ Br	106.95		94.220	17.74	
Vinyl chloride	C ₂ H ₃ Cl	62.499		56.785	51.26	0.324
Vinyl methyl ether	C ₃ H ₆ O	58.08		46.780	26.27	
Xenon	Xe	131.29		73.351		

Physical Data

Gas Name	Rel. spec. wgt, air = 1 (15°C, 1 bar)	Density 15°C 1 atm kg/m ³	Gaseous State		
			Specific heat (15°C) kJ/kg · K	Thermal conductivity μW/cm · K	Solubility in water at P = 1 bar l/kg
Acetylene	0.91	1.109	1.663	187 (0°C)	0.99 (20°C)
Air, synthetic	1.0	1.21	1.01	255	0.018
Ammonia	0.59	0.728	2.071	221 (0°C)	692 (15°C)
Argon	1.38	1.691	0.52	175 (0°C)	0.033 (20°C)
Arsine	2.73	3.334	0.488	116 (0°C)	0.20 (20°C)
Boron trichloride	4.19	5.162	0.526	86 (15°C)	Hydrolyzed
Boron trifluoride	2.35	2.882	0.733	157 (°C)	
1,3-Butadiene	1.94	2.547	1.447	132 (0°C)	0.230 (20°C)
n-Butane	2.09	2.537	1.647	138 (0°C)	0.034 (20°C)
iso-Butane	2.08	2.449	1.611	140 (0°C)	0.032 (20°C)
1-Butene	2.01	2.457	1.489	130 (0°C)	
cis-2-Butene	2.00	2.448	1.374	125 (15°C)	
iso-Butene	2.01	2.455	1.553	144 (0°C)	
trans-2-Butene	2.00	1.872	1.533	134 (15°C)	
Carbon dioxide	1.53	1.185	0.834	146 (0°C)	0.851 (20°C)
Carbon monoxide	0.97	2.574	1.04	232 (0°C)	0.022 (20°C)
Carbonyl sulfide	2.11	3.042	0.683	122 (0°C)	
Chlorine	2.49	2.678	0.477	80 (0°C)	2.3 (20°C)
Cyanogen chloride	2.18	1.812	0.733	90 (15°C)	
Cyclopropane	1.48	0.171	1.27	143 (0°C)	
Deuterium	0.14	1.181	7.215	1.301 (0°C)	
Diborane	0.97	4.426	2.031	210 (0°C)	
Dichlorosilane	3.60	1.965	0.603	97 (15°C)	Hydrolyzed
Dimethylamine	1.60	1.988	1.511	157 (15°C)	119 (60°C)
Dimethyl ether	1.63	3.198	1.416	141 (0°C)	
2,2-Dimethylpropane	2.59	1.283	1.614	140 (15°C)	
Ethane	1.05	1.194	1.723	180 (0°C)	0.047 (20°C)
Ethene	0.98	1.911	1.496	180 (0°C)	0.120 (20°C)
Ethylene oxide	1.55		1.054	121 (15°C)	
Ethylamine	1.61	2.819	1.572 (20°C)	162 (20°C)	
Ethyl chloride	2.29	1.608	0.944	108 (15°C)	1.99 (20°C)
Fluorine	1.31	0.169	0.819	238 (0°C)	

Gas Name	Rel. spec. wgt, air = 1 (15°C, 1 bar)	Density 15°C 1 atm kg/m ³	Gaseous State		
			Specific heat (15°C) kJ/kg · K	Thermal conductivity μW/cm · K	Solubility in water at P = 1 bar l/kg
Helium	0.14		5.193	1,460 (0°C)	0.083 (20°C)
Hydrogen	0.07	0.0852	14.242	1.606 (0°C)	0.0182 (20°C)
Hydrogen bromide	2.82	3.45	0.36	79 (0°C)	467 (25°C)
Hydrogen chloride	1.27	1.552	0.799	134 (0°C)	440 (20°C)
Hydrogen fluoride	0.71		1.456 (20°C)		
Hydrogen sulphide	1.19	1.454	1.00	129 (0°C)	2.5 (20°C)
Krypton	2.90	3.552	0.248	88 (0°C)	0.061 (20°C)
Methane	0.55	0.68	2.201	300 (0°C)	0.033 (20°C)
Methylamine	1.10	1.34	161	191 (0°C)	757 (25°C)
Methyl bromide	3.34	4.106	0.439	71 (15°C)	
Methyl chloride	1.78	2.173	0.791	92 (0°C)	3.4 (0°C)
Methyl mercaptan	1.70	2.084	1.028	127 (15°C)	11.2 (15°C)
Neon	0.70	0.853	1.03	461 (20°C)	0.010 (20°C)
Nitric oxide	1.04	1.27	0.999	235 (0°C)	0.046 (20°C)
Nitrogen	0.97	1.185	1.04	235 (0°C)	0.015 (20°C)
Nitrogen dioxide	2.75		0.815 (25°C)		Hydrolyzed
Nitrogen trifluoride	2.46	3.015	0.75 (25°C)		
Nitrous oxide	1.53	1.873	0.868	155 (0°C)	0.610 (20°C)
Octafluoropropane	6.53	8.163	0.769	100 (0°C)	
Oxygen	1.11	1.354	0.916	242 (0°C)	
Phosgene	3.50	4.308	0.577	83 (15°C)	
Phosphine	1.18	1.449	1.079	192 (0°C)	1.16 (24°C)
Propadiene	1.41	1.725	1.467	136 (0°C)	
Propane	1.56	1.901	1.642	159 (0°C)	0.39 (20°C)
Propene	1.48	1.809	1.498	150 (0°C)	0.182 (20°C)
Propyne	1.42	1.728	1.487	137 (0°C)	
R 11 Trichlorofluoromethane	4.92		0.567 (25°C)	78 (25°C)	0.180 (25°C)
R 12 Dichlorodifluoromethane	4.29	5.231	0.589	84 (0°C)	0.051 (25°C)
R 13 Chlorotrifluoromethane	3.65	4.465	0.629	107 (0°C)	0.019 (25°C)
R 13 b1 Bromotrifluoromethane	5.23	6.396	0.457	86 (0°C)	0.004 (25°C)
R 14 Tetrafluoromethane	3.05	3.737	0.68	133 (0°C)	0.004 (25°C)
R 23 Trifluoromethane	3.65	4.493	0.582	81 (15°C)	2.070 (25°C)

Physical Data

Gas Name	Rel. spec. wgt, air = 1 (15°C, 1 bar)	Density 15°C 1 atm kg/m ³	Gaseous State		
			Specific heat (15°C) kJ/kg · K	Thermal conductivity μW/cm · K	Solubility in water at P = 1 bar l/kg
R 21 Dichlorofluoromethane	3.04	3.719	0.644	92 (0°C)	0.775 (25°C)
R 22 Chlorodifluoromethane	2.44	2.986	0.719	109 (0°C)	0.313 (25°C)
R 114 1,2-Dichlorotetrafluoroethane	6.12	7.532	0.673	105 (15°C)	0.017 (25°C)
R 115 Chloropentafluoroethane	5.48	6.687	0.687	110 (0°C)	0.008 (25°C)
R 116 Hexafluoroethane	4.84	5.912	0.755	299 (0°C)	
R 134a Tetrafluoroethane	3.53	4.415	0.827	133 (0°C)	
R 142b 1-Chloro-1,1-difluoroethane	3.59	4.378	0.804	101 (0°C)	
R 152a 1,1-Difluoroethane	2.34	2.857	1.002	102 (0°C)	
Silane	1.12	1.366	1.307		Insoluble
Silicon tetrafluoride	3.61	4.431	0.696		
Sulphur dioxide	2.26	2.759	0.617	85 (0°C)	38.2 (20°C)
Sulphur hexafluoride	5.12	6.261	0.647	116 (0°C)	0.005 (25°C)
Trimethylamine	2.10	2.59	1.514	143 (15°C)	
Tungsten hexafluoride	10.60		0.379 (25°C)		
Vinyl bromide	3.72	4.653	0.509	88 (0°C)	
Vinyl chloride	2.21	2.703	0.841	105 (0°C)	
Vinyl methyl ether	2.03	2.537	1.334	157 (15°C)	
Xenon	4.56	5.586	0.158	52 (0°C)	0.120 (20°C)

Gas Name	Rel. spec. wgt, Air = 1	Density 70°F lb/ft ³	Gaseous State		
			Specific heat (70°F) BTU/lb·°F	Thermal Conductivity BTU/h,ft,°F	Solubility in water ft/lb at°F
Acetylene	0.91	0.068	0.401	0.0121	0.0160 (68°F)
Air, synthetic	1.0	0.075	0.239		0.0003 (68°F)
Ammonia	0.59	0.044	0.492	0.0141	11.0947 (68°F)
Argon	1.38	0.103	0.124	0.0107	0.0005 (68°F)
Arsine	2.73	0.204	0.117	0.0074	0.0032 (68°F)
Boron trichloride	4.19	0.315	0.127	0.0051	Hydrolyzed
Boron trifluoride	2.35	0.176	0.177	0.0094	
1,3-Butadiene	1.94	0.144	0.352	0.0088	0.0037 (69°F)
n-Butane	2.09	0.155	0.400	0.0092	0.0005 (68°F)
iso-Butane	2.08	0.155	0.392	0.0093	0.0005 (68°F)
1-Butene	2.01	0.149	0.361	0.0085	
cis-2-Butene	2.00	0.150	0.333	0.0076	
iso-Butene	2.01	0.149	0.376	0.0095	
trans-2-Butene	2.00	0.150	0.371	0.0081	
Carbon dioxide	1.53	0.114	0.201	0.0093	0.0136 (68°F)
Carbon monoxide	0.97	0.072	0.248	0.0143	0.004 (68°F)
Carbonyl sulfide	2.11	0.157	0.164	0.0077	
Chlorine	2.49	0.186	0.114	0.0051	0.0369 (69°F)
Cyanogen chloride	2.18	0.163	0.176	0.0053	
Cyclopropane	1.48	0.111	0.311	0.0094	
Deuterium	0.14	0.010	1.723	0.0791	
Diborane	0.97	0.072	0.494	0.0137	
Dichlorosilane	3.60	0.217	0.145	0.0058	Hydrolyzed
Dimethylamine	1.60	0.120	0.366	0.0094	1.9079 (140°F)
Dimethyl ether	1.63	0.121	0.343	0.0094	
2,2-Dimethylpropane	2.59	0.195	0.394	0.0084	
Ethane	1.05	0.078	0.418	0.0119	0.0008 (68°F)
Ethene	0.98	0.073	0.362	0.0117	0.0019 (68°F)
Ethylene oxide	1.55	0.117	0.257	0.0072	
Ethylamine	1.61	0.122	0.379	0.0096	
Ethyl chloride	2.29				0.0319 (68°F)
Fluorine	1.31	0.098	0.196	0.0148	

Physical Data

Gas Name	Rel. spec. wgt, Air = 1	Density 70°F lb/ft ³	Gaseous State		
			Specific heat (70°F) BTU/lb·°F	Thermal Conductivity BTU/h,ft,°F	Solubility in water ft/lb at°F
Helium	0.14	0.010	1.240	0.0882	0.0001 (68°F)
Hydrogen	0.07	0.005	3.406	0.0983	0.0003 (68°F)
Hydrogen bromide	2.82	0.211	0.086	0.0050	7.4873 (77°F)
Hydrogen chloride	1.27	0.095	0.191	0.0083	7.0545 (68°F)
Hydrogen fluoride	0.71	0.053	0.348		
Hydrogen sulphide	1.19	0.089	0.239	0.0082	0.0401 (68°F)
Krypton	2.90	0.217	0.059	0.0054	0.0010 (68°F)
Methane	0.55	0.042	0.529	0.0191	0.0005 (68°F)
Methylamine	1.10	0.082	0.389	0.0124	12.1369 (77°F)
Methyl bromide	3.34	0.251	0.106	0.0042	
Methyl chloride	1.78	0.133	0.191	0.0060	0.0545 (32°F)
Methyl mercaptan	1.70	0.127	0.248	0.0076	0.1796 (59°F)
Neon	0.70	0.052	0.246	0.0281	0.0002 (68°F)
Nitric oxide	1.04	0.078	0.239	0.0145	0.0007 (68°F)
Nitrogen	0.97	0.072	0.248	0.0144	0.0002 (68°F)
Nitrogen dioxide	2.75	0.121	0.195		Hydrolyzed
Nitrogen trifluoride	2.46	0.184	0.178	0.0122	
Nitrous oxide	1.53	0.114	0.209	0.0099	0.0098 (68°F)
Octafluoropropane	6.53	0.498	0.186	0.0066	
Oxygen	1.11	0.083	0.219	0.0150	0.0005 (68°F)
Phosgene	3.50	0.263	0.139	0.0049	
Phosphine	1.18	0.089	0.260	0.0121	0.0186 (75°F)
Propadiene	1.41	0.105	0.355		
Propane	1.56	0.116	0.399	0.0104	0.0006 (68°F)
Propene	1.48	0.111	0.364	0.0099	0.0029 (68°F)
Propyne	1.42	0.106	0.359	0.0091	
R 11 Trichlorofluoromethane	4.92		0.135	0.0045	0.0029 (77°F)
R 12 Dichlorodifluoromethane	4.29	0.319	0.142	0.0054	0.0008 (77°F)
R 13 Chlorotrifluoromethane	3.65	0.273	0.152	0.0069	0.0003 (77°F)
R 13 b1 Bromotrifluoromethane	5.23	0.391	0.110	0.0056	0.0001 (77°F)
R 14 Tetrafluoromethane	3.05	0.228	0.165	0.0085	0.0001 (77°F)
R 23 Trifluoromethane	3.65	0.274	0.140	0.0048	0.0332 (77°F)

Gas Name	Rel. spec. wgt, Air = 1	Density 70°F lb/ft ³	Gaseous State		
			Specific heat (70°F) BTU/lb·°F	Thermal Conductivity BTU/h,ft,°F	Solubility in water ft/lb at°F
R 21 Dichlorofluoromethane	3.04	0.227	0.156	0.0060	0.0124 (77°F)
R 22 Chlorodifluoromethane	2.44	0.182	0.174	0.0069	0.0050 (77°F)
R 114 1,2-Dichlorotetrafluoroethane	6.12	0.459	0.162	0.0063	0.0003 (77°F)
R 115 Chloropentafluoroethane	5.48	0.408	0.166	0.0071	0.0001 (77°F)
R 116 Hexafluoroethane	4.84	0.361	0.183	0.0197	
R 134a Tetrafluoroethane	3.53	0.270	0.200	0.0074	
R 142b 1-Chloro-1,1-difluoroethane	3.59	0.267	0.194	0.0066	
R 152a 1,1-Difluoroethane	2.34	0.174	0.243	0.0066	
Silane	1.12	1.115	0.083	0.316	insoluble
Silicon tetrafluoride	3.61	0.271	0.168		
Sulphur dioxide	2.26	0.169	0.148	0.0054	0.6125 (68°F)
Sulphur hexafluoride	5.12	0.382	0.157	0.0076	0.0001 (77°F)
Trimethylamine	2.10	0.158	0.367	0.0086	
Tungsten hexafluoride	10.60				
Vinyl bromide	3.72	0.284	0.123	0.0051	
Vinyl chloride	2.21	0.165	0.204	0.0068	
Vinyl methyl ether	2.03	0.155		0.0094	
Xenon	4.56	0.341	0.038	0.0032	0.0019 (68°F)

Physical Data

Gas Name	Boiling Point (1 atm)		Critical Point			Flammability in Air	
	Temperature °C	Heat of Vapourization Kj/kg	Temperature °C	Pressure bar	Density Kg/l	Lower Limit % Volume	Upper Limit % Volume
Acetylene	-84.15	634.2	35.17	61.391	0.2305	2.2	85.0
Air, synthetic			-141.7	36.6	0.331		
Ammonia	-33.43	1,369.8	132.5	112.78	0.235	15.0	27.0
Argon	-185.87	161.2	-122.29	48.981	0.5356	n.a.	n.a.
Arsine	-62.48	211.5	99.85	65.500	0.797	5.8	n.a.
Boron trichloride	12.5	204.3	178.8	38.706	0.7899	n.a.	n.a.
Boron trifluoride	-99.8	254.3	-12.25	49.852	0.5486	n.a.	n.a.
1,3-Butadiene	-4.41	415.6	152.22	43.299	0.2449	2.0	12.0
n-Butane	-0.5	389	152.03	37.969	0.228	1.8	8.4
iso-Butane	-11.72	368.1	134.99	36.480	0.2213	1.8	8.4
1-Butene	-6.25	400	146.44	40.196	0.2339	1.6	10.0
cis-2-Butene	3.72	417.6	162.43	42.058	0.2398	1.7	9.7
iso-Butene	-6.89	395.9	144.75	39.990	0.2349	1.8	9.6
trans-2-Butene	0.88	408.2	155.48	41.024	0.2356	1.7	9.7
Carbon dioxide		347.6	31.04	73.815	0.4682	n.a.	n.a.
Carbon monoxide	-191.45	211	-140.23	34.988	0.3009	12.5	74.0
Carbonyl sulfide	-50.15	311.7	105.65	63.490	0.4447	12.0	29.0
Chlorine	-34.03	287.9	144	77.108	0.573	n.a.	n.a.
Cyanogen chloride	12.85	435	175.85	59.900	0.3771		
Cyclopropane	-32.78	477.2	124.76	55.749	0.2585		
Deuterium	-249.5	293.2	-234.8	16.617	0.0669	5.0	75.0
Diborane	-92.5	516.8	16.65	40.530	0.1599	0.9	98.0
Dichlorosilane	8.3	249.5	175.85	44.300	0.443	4.1	98.8
Dimethylamine	6.88	590.8	164.5	53.094	0.2411	2.8	14.4
Dimethyl ether	-24.84	468.1	126.95	53.702	0.271	3.4	27.0
2,2-Dimethylpropane	9.5	315.2	160.63	31.992	0.2377	1.4	7.5
Ethane	-88.6	488.5	32.27	48.801	0.2033	3.0	12.4
Ethene	-103.68	479.9	9.21	50.318	0.2174	3.1	32.0
Ethylene oxide	10.7	583.3	196.0	71.941	0.314	3.0	100.0
Ethylamine	16.58	606.6	183.0	56.235	0.2477		
Ethyl chloride	12.27	383.6	187.2	52.689	0.3226		
Fluorine	-188.2	171.7	-128.84	52.152	0.574	n.a.	n.a.

Gas Name	Boiling Point (1 atm)		Critical Point			Flammability in Air	
	Temperature °C	Heat of Vapourization Kj/kg	Temperature °C	Pressure bar	Density Kg/l	Lower Limit % Volume	Upper Limit % Volume
Helium	-268.93	20.8	-267.95	2.2750	0.0699	n.a.	n.a.
Hydrogen	-252.76	442.8	-239.97	13.130	0.0314	4.0	74.5
Hydrogen bromide	-66.7	223.2	90	85.518	0.807	n.a.	n.a.
Hydrogen chloride	-85	444.6	51.5	83.087	0.450	n.a.	n.a.
Hydrogen fluoride	19.52	49.7	188	64.848	0.2899	n.a.	n.a.
Hydrogen sulphide	-60.35	554.2	100.38	89.629	0.3461	4.0	44.0
Krypton	-153.35	108.4	-63.8	55.020	0.9189	n.a.	n.a.
Methane	-161.49	508.9	-82.57	46.043	0.1616	5.0	15.0
Methylamine	-6.33	840.7	156.9	74.575	0.2017	4.9	20.7
Methyl bromide	3.56	255.7	193.85	80.000	0.6086	10.0	16.0
Methyl chloride	-24.22	426.8	143.1	66.793	0.3632	10.7	17.4
Methyl mercaptan	5.96	510.8	196.8	72.346	0.3318	4.0	22.0
Neon	-246.06	84.8	-228.75	26.530	0.4839	n.a.	n.a.
Nitric oxide	-151.77	451.6	-93	64.848	0.520	n.a.	n.a.
Nitrogen	-195.8	197.9	-147.05	33.944	0.3109	n.a.	n.a.
Nitrogen dioxide	20.85	828.5	158.2	101.33	0.5577	n.a.	n.a.
Nitrogen trifluoride	-129	163	-39.15	42.28	0.568	n.a.	n.a.
Nitrous oxide	-88.48	390.9	36.42	72.447	0.452	n.a.	n.a.
Octafluoropropane	-36.75	104.8	71.9	26.8	0.6718	n.a.	
Oxygen	-182.98	213.3	-118.57	50.430	0.436	n.a.	n.a.
Phosgene	7.56	250.5	181.85	56.742	0.520	n.a.	n.a.
Phosphine	-87.74	412.2	51.6	65.355	0.300		
Propadiene	-34.5	514.1	120	54.70	0.2473		
Propane	-42.04	426.3	96.67	42.492	0.2174	2.2	9.5
Propene	-47.69	438.8	92.42	46.650	0.2234	2.0	10.5
Propyne	-23.21	555.3	129.24	56.276	0.2443	1.7	12.0
R 11 Trichlorofluoromethane	23.82	183.1	198.05	44.076	0.5539		
R 12 Dichlorodifluoromethane	-29.79	170.4	111.8	41.249	0.5572	n.a.	n.a.
R 13 Chlorotrifluoromethane	-81.41	149.4	528.81	39.460	0.5794	n.a.	n.a.
R 13 b1 Bromotrifluoromethane	57.89	117.7	67	39.719	0.7446	n.a.	n.a.
R 14 Tetrafluoromethane	-128.06	132.8	-45.65	37.389	0.6286	n.a.	n.a.
R 23 Trifluoromethane	8.9	239.4	178.43	51.838	0.5251	n.a.	n.a.

Physical Data

Gas Name	Boiling Point (1 atm)		Critical Point			Flammability in Air	
	Temperature °C	Heat of Vapourization Kj/kg	Temperature °C	Pressure bar	Density Kg/l	Lower Limit % Volume	Upper Limit % Volume
R 21 Dichlorofluoromethane	-40.83	233.5	96.15	49.710	0.5209	n.a.	n.a.
R 22 Chlorodifluoromethane	-82.16	237.3	25.74	48.362	0.5252	n.a.	n.a.
R 114 1,2-Dichlorotetrafluoroethane	3.77	135.4	145.7	32.627	0.582	n.a.	n.a.
R 115 Chloropentafluoroethane	-39.11	125.1	80	31.573	0.613	n.a.	n.a.
R 116 Hexafluoroethane	-78.2	116.8	19.65	29.790	0.6161	n.a.	n.a.
R 134a Tetrafluoroethane	-26.0	216.6	101.15	40.64	0.5687	n.a.	n.a.
R 142b 1-Chloro-1,1-difluoroethane	-10.01	223.5	137.05	41.239	0.4351	9.0	15.0
R 152a 1,1-Difluoroethane	-25.8	329	113.45	44.988	0.3649	4.0	18.0
Silane	-112.15	387.8	3.450	48.43	0.242	1.0	100
Silicon tetrafluoride		142.9	-14.15	37.186	0.6308	n.a.	n.a.
Sulphur dioxide	-10.02	385.4	157.6	78.841	0.5251	n.a.	n.a.
Sulphur hexafluoride	-63.9	111	45.54	37.600	0.7357	n.a.	n.a.
Trimethylamine	2.87	396.6	160.1	40.733	0.2327	2.0	11.6
Tungsten hexafluoride	17.06	87.9	169.85	42.70	1.307	n.a.	n.a.
Vinyl bromide	15.8	231.1	199.85	71.8	0.593		24.9
Vinyl chloride	-13.37	365.2	158.85	56.700	0.3492	4.0	22.0
Vinyl methyl ether	5.5	421.3	163.85	46.7	0.3162	2.6	39.0
Xenon	-108.12	96.1	16.59	58.404	1.01126	n.a.	n.a.

Gas Name	Boiling Point (1 atm)		Critical Point			Flammability in Air	
	Temperature °F	Heat of Vapourization 70°F BTU/lb	Temperature °F	Pressure psi (a)	Density lb/ft ³	Lower Limit % Volume	Upper Limit % Volume
Acetylene	-119.45	126.391	95.33	890.42	14.39	2.2	85.0
Air, synthetic	-317.81		-221.24	547.18	19.54		
Ammonia	-28.15	508.275	270.52	1635.77	14.67	15.0	27.0
Argon	-302.55		-188.10	710.43	33.44	n.a.	n.a.
Arsine	-80.44	70.307	211.75	950.02	49.75	5.8	n.a.
Boron trichloride	54.52	85.871	353.86	561.40	49.31	n.a.	n.a.
Boron trifluoride	-147.62		9.97	723.06	34.24	n.a.	n.a.
1,3-Butadiene	24.08	167.210	306.02	628.01	15.29	2.0	12.0
n-Butane	31.12	156.668	305.67	550.71	14.23	1.8	8.4
iso-Butane	10.92	143.318	275.00	529.11	13.81	1.8	8.4
1-Butene	20.77	159.146	295.61	583.01	14.60	1.6	10.0
cis-2-Butene	38.72	171.736	324.39	610.01	14.97	1.7	9.7
iso-Butene	19.62	157.215	292.57	580.02	14.66	1.8	9.6
trans-2-Butene	33.60	166.781	311.88	595.02	14.71	1.7	9.7
Carbon dioxide	-69.81	61.891	87.89	1070.62	29.23	n.a.	n.a.
Carbon monoxide	-312.59		-220.39	507.47	18.78	12.5	74.0
Carbonyl sulfide	-58.23	107.332	222.19	920.87	27.76	12.0	29.0
Chlorine	-29.23	108.285	291.22	1118.38	35.77	n.a.	n.a.
Cyanogen chloride	55.20	183.806	348.55	868.80	23.54		
Cyclopropane	-26.98	176.402	256.59	808.59	16.14		
Deuterium	-417.07		-390-62	241.01	4.18	5.0	75.0
Diborane	-134.48		61.99	587.85	9.98	0.9	98.0
Dichlorosilane	46.96	104.154	348.55	642.53	27.66	4.1	98.8
Dimethylamine	44.40	244.023	328.12	770.08	15.05	2.8	14.4
Dimethyl ether	-12.69	177.401	260.53	778.90	16.92	3.4	27.0
2,2-Dimethylpropane	49.12	131.442				1.4	7.5
Ethane	-127.46	86.369	90.11	707.81	12.69	3.0	12.4
Ethene	-154.60		48.60	729.82	13.57	3.1	32.0
Ethylene oxide	51.28	245.385	384.82	1043.44	19.60	3.0	100.0
Ethylamine	61.86	257.945	361.42	815.64	15.46		
Ethyl chloride							
Fluorine	-306.74		-199.89	756.42	35.83	n.a.	n.a.

Physical Data

Gas Name	Boiling Point (1 atm)		Critical Point			Flammability in Air	
	Temperature °F	Heat of Vapourization 70°F BTU/lb	Temperature °F	Pressure psi (a)	Density lb/ft ³	Lower Limit % Volume	Upper Limit % Volume
Helium	-452.05		-450.29	33.00	4.36	n.a.	n.a.
Hydrogen	-422.95		-399.93	190.44	1.96	4.0	74.5
Hydrogen bromide	-88.04	69.029	194.02	1240.36	50.38	n.a.	n.a.
Hydrogen chloride	-120.98	113.120	124.72	1205.10	28.09	n.a.	n.a.
Hydrogen fluoride	67.16		370.42	940.56	18.10	n.a.	n.a.
Hydrogen sulphide	-76.61	182.314	212.70	1299.99	21.60	4.0	44.0
Krypton	-244.01		-82.82	798.02	57.36	n.a.	n.a.
Methane	-258.66		-116.61	667.81	10.09	5.0	15.0
Methylamine	20.63	335.510	314.44	1081.64	12.59	4.9	20.7
Methyl bromide	38.43	106.708	380.95	1160.33	37.99	10.0	16.0
Methyl chloride	-11.58	164.406	289.60	968.77	22.67	10.7	17.4
Methyl mercaptan	42.75	212.839	386.26	1049.31	20.71	4.0	22.0
Neon	-410.89		-379.73	384.79	30.21	n.a.	n.a.
Nitric oxide	-241.17		-135.38	940.56	32.46	n.a.	n.a.
Nitrogen	-320.42		-232.67	492.33	19.41	n.a.	n.a.
Nitrogen dioxide	69.55		316.78	1469.70	34.82	n.a.	n.a.
Nitrogen trifluoride	-200.29		-38.72	657.02	37.33	n.a.	n.a.
Nitrous oxide	-127.24	70.666	97.58	1050.78	28.22	n.a.	n.a.
Octafluoropropane	-34.13	33.672	161.44	388.72	39.26	n.a.	n.a.
Oxygen	-297.34		-181.41	731.44	27.22	n.a.	n.a.
Phosgene	45.63	104.449	359.35	822.99	32.46	n.a.	n.a.
Phosphine	-125.91	116.744	124.90	947.92	18.73		
Propadiene	-30.08	186.405	248.02	793.37	15.44		
Propane	-43.65	146.960	206.03	616.31	13.57	2.2	9.5
Propene	-53.82	147.470	198.38	676.62	13.94	2.0	10.5
Propyne	-9.76	208.082	264.65	816.23	15.25	1.7	12.0
R 11 Trichlorofluoromethane	74.90	79.208	388.51	639.2/8	34.58		
R 12 Dichlorodifluoromethane	-21.60	61.154	233.26	598.28	34.78	n.a.	n.a.
R 13 Chlorotrifluoromethane	-114.52	24.064	83.88	572.33	36.17	n.a.	n.a.
R 13 b1 Bromotrifluoromethane	-72.18	35.406	152.62	576.09	46.48	n.a.	n.a.
R 14 Tetrafluoromethane	-198.49		-50.15	542.29	39.24	n.a.	n.a.
R 23 Trifluoromethane	48.04	100.250	353.19	751.86	32.78	n.a.	n.a.

Gas Name	Boiling Point (1 atm)		Critical Point			Flammability in Air	
	Temperature °F	Heat of Vapourization 70°F BTU/lb	Temperature °F	Pressure psi (a)	Density lb/ft ³	Lower Limit % Volume	Upper Limit % Volume
R 21 Dichlorodifluoromethane	-41.47	79.594	205.09	721.00	32.52	n.a.	n.a.
R 22 Chlorodifluoromethane	-115.87	33.395	78.35	701.45	32.79	n.a.	n.a.
R 114 1,2-Dichlorotetrafluoroethane	38.81	55.491	294.28	473.23	36.33	n.a.	n.a.
R 115 Chloropentafluoroethane	-38.38	41.375	176.02	457.94	38.27	n.a.	n.a.
R 116 Hexafluoroethane	-108.74		67.39	432.08	38.46	n.a.	n.a.
R 134a Tetrafluoroethane	-14.78	78.666	214.09	589.45	31.69	n.a.	n.a.
R 142b 1-Chloro-1,1-difluoroethane	14.00	87.570	278.71	598.13	27.16	9.0	15.0
R 152a 1,1-Difluoroethane	-14.42	121.954	236.23	652.51	22.78	4.0	18.0
Silane	-169.85		25.81	702.48	15.11	1.0	100
Silicon tetrafluoride	-139.25		6.55	539.35	39.38	n.a.	n.a.
Sulphur dioxide	13.98	152.612	315.70	1143.52	32.78	n.a.	n.a.
Sulphur hexafluoride	-83.00	28.302	113.99	545.35	45.93	n.a.	n.a.
Trimethylamine	37.19	162.632	320.20	590.80	14.53	2.0	11.6
Tungsten hexafluoride						n.a.	n.a.
Vinyl bromide	60.46	98.433	391.75	1041.39	33.38		24.9
Vinyl chloride	7.95	140.958	317.95	822.38	21.80	4.0	22.0
Vinyl methyl ether	41.92	174.163	326.95	677.34	17.27	2.6	39.0
Xenon	-162.60		61.88	847.10	69.46	n.a.	n.a.

Gas Name	Chemical formula	Aluminum	Brass	Carbon steel	Copper	Monel®	Polyethylene	PVC	Stainless steel	Buna® N	Butyl rubber	Kel-F®	Neoprene®	Nylon®	Teflon®	Viton®
Ethylene oxide	C ₂ H ₄ O	✗	✗	✓	✗	✓			✓	✗	✗	✓	✗		✓	✗
Ethylamine	C ₂ H ₅ NH ₂	✓	✗	✓	✗	✓	✓	✓	✓		✓	✓	✓		✓	
Ethyl chloride	C ₂ H ₅ Cl	✓ ₁	✓ ₁	✓ ₁	✓ ₁	✓ ₁		✗	✓ ₁	✓	✗	✓	✓		✓	✓
Fluorine	F ₂	✓	✓	✓	✓	✓	✗	✗	✓	✗	✗	✓	✗		✓	✗
Germane	GeH ₄	✓	✓	✓	✓	✓			✓			✓		✓	✓	✓
Helium	He	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Hydrogen	H ₂	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
Hydrogen bromide	HBr	✗	✓ ₁	✓ ₁	✓ ₅	✗	✓	✓	✓ ₁	✗	✗	✓	✗		✓	✓
Hydrogen chloride	HCl	✗	✓ ₁	✓ ₁	✗	✓ ₈	✓	✓ ₇	✓ ₁		✗	✓ ₁₀	✗		✓ ₁₁	✓
Hydrogen fluoride	HF	✗	✓ ₃	✓ ₉	✗	✓ ₃	✓ ₇	✗	✗			✓ ₁₀	✓		✓ ₁₁	✓
Hydrogen selenide	HSe	✗	✗	✓	✗	✗			✓			✓		✓	✓	✓
Hydrogen sulphide	H ₂ S	✓ ₁	✗ ₁	✓	✓	✓	✓	✓	✓ ₁	✓	✓	✓ ₁₀	✓		✓ ₁₁	
Krypton	Kr	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Methane	CH ₄	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓
Methylamine	CH ₃ NH ₂	✓	✗	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Methyl bromide	CH ₃ Br	✗ ₆	✓	✓ ₁	✗	✓ ₁	✗	✗	✓ ₁	✗	✗	✓	✗		✓	
Methyl chloride	CH ₃ Cl	✗ ₆	✓	✓ ₁	✗	✓ ₁	✗	✗	✓ ₁	✗	✗	✓	✗		✓	
Methyl fluoride	CH ₃ F	✓	✓	✓	✓	✓		✓	✓	✓		✓	✓		✓	✓
Methyl mercaptan	CH ₃ SH	✗	✗	✓	✗	✗	✓	✓	✓		✓	✓	✓		✓	
Neon	Ne	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Nitric oxide	NO	✓ ₁	✗	✓ ₁	✗ ₁	✓	✓	✓	✓ ₁		✓	✓	✓		✓	✓
Nitrogen	N ₂	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Nitrogen dioxide	NO ₂	✓ ₁	✗	✓ ₁	✗	✓	✓	✗	✓			✓			✓	✗
Nitrogen trifluoride	NF ₃			✓ ₁₀	✓ ₁₃	✓ ₁₀			✓ ₁₀			✓			✓	
Nitrous oxide	N ₂ O	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Octafluoropropane	C ₃ F ₈	✓	✓	✓	✓	✓	✓	✓	✓			✓			✓	
Oxygen	O ₂	✗	✓	✓	✓	✓	✗	✗	✓		✓	✓	✓		✓	✓
Phosgene	COCl ₂	✗	✓	✓ ₁	✓ ₁	✓	✓	✓ ₇	✓ ₁	✓	✓	✓	✓		✓	✓
Phosphine	PH ₃	✗		✓		✗			✓			✓		✓	✓	
Propane	C ₃ H ₈	✓	✓	✓	✓	✓	✗	✓	✓	✓	✗	✓	✓		✓	✓

Material Compatibility

Gas Name	Chemical formula	Aluminum	Brass	Carbon steel	Copper	Monel®	Polyethylene	PVC	Stainless steel	Buna® N	Butyl rubber	Kel-F®	Neoprene®	Nylon®	Teflon®	Viton®
Propene	C ₃ H ₆	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓		✓	✓
Propyne	C ₃ H ₄	✓	✓	✓	✓	✗	✓		✓			✓	✓		✓	
R 11 Trichlorofluoromethane	CFCl ₃	✓	✓	✓	✓	✓			✓	✓		✓	✗		✓	✓
R 12 Dichlorodifluoromethane	CF ₂ Cl ₂	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓		✗	✓
R 13 Chlorotrifluoromethane	CF ₃ Cl	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	
R 13 b1 Bromotrifluoromethane	CF ₃ Br	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	
R 14 Tetrafluoromethane	CF ₄	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	
R 21 Dichlorofluoromethane	CHFCl ₂	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✗	✓	✓	
R 22 Chlorodifluoromethane	CHF ₂ Cl	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✗	✗	✗
R 23 Trifluoromethane	CHF ₃	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓		✓	
R 114 1,2-Dichlorotetrafluoroethane	C ₂ Cl ₂ F ₄	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
R 115 Chloropentafluoroethane	C ₂ ClF ₅	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	
R 116 Hexafluoroethane	C ₂ F ₆	✓	✓	✓	✓	✓			✓			✓			✓	
R 142b 1-Chloro-1,1-difluoroethane	C ₂ H ₃ ClF ₂	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✗
R 152a 1,1-Difluoroethane	C ₂ H ₄ F ₂	✓	✓	✓	✓	✓	✓ ₇	✓	✓	✓	✓	✓	✓	✓	✓	
Silane	SiH ₄	✓	✓	✓	✓	✓			✓			✓	✓	✓	✓	✓
Silicon tetrafluoride	SiF ₄	✗		✓ ₉	✓ ₁	✓	✓ ₇	✗	✗			✓ ₁₀	✓		✓ ₁₁	
Sulphur dioxide	SO ₂	✓ ₁	✓ ₁	✓ ₁		✓ ₁			✓ ₁	✗	✓	✓ ₁₀	✗	✗	✓ ₁₁	
Sulphur hexafluoride	SF ₆	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Trimethylamine	(CH ₃) ₃ N	✗	✗	✓	✗	✗	✓	✓	✓	✗	✓	✓	✓		✓	✗
Tungsten hexafluoride	WF ₆	✓ ₁₃		✓ ₁₀	✓ ₁₃	✓ ₁₀			✓ ₁₀			✓			✓	
Vinyl bromide	C ₂ H ₃ Br	✓ ₁	✗	✓	✗	✗	✓	✓	✓		✓	✓	✗	✓	✓	
Vinyl chloride	C ₂ H ₃ Cl	✓ ₁	✓ ₁	✓ ₁	✓ ₁	✓ ₁	✓ ₃		✓ ₁		✓	✓	✓	✓	✓	✓
Vinyl methyl ether	C ₃ H ₆ O	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓		✓	
Xenon	Xe	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Legend

- ✓ Good
- ✓ Fair
- ✗ Avoid
- Data missing

- 1 Avoid in presence of moisture
- 2 <65% Cu
- 3 Avoid in presence of oxygen
- 4 Up to 100 bar (1,450 psi)
- 5 In absence of oxygen

- 6 Possible forming of spontaneously flammable compounds
- 7 <50°C (120°F)
- 8 <100°C (210°F)

- 9 <150°C (300°F)
- 10 <180°C (360°F)
- 11 <250°C (480°F)
- 12 <350°C (660°F)
- 13 <400°C (750°F)

Conversion Tables

Dew Point – Moisture

Dew Point		Moisture	
°C	°F	vpm	Mg/m ³
-20	-4.0	1,030	790
-21	-5.8	940	710
-22	-7.6	860	640
-23	-9.4	765	580
-24	-11.2	697	527
-25	-13.0	625	478
-26	-14.8	553	430
-27	-16.6	517	390
-28	-18.4	467	352
-29	-20.2	426	318
-30	-22.0	380	288
-31	-23.8	342	260
-32	-25.6	309	232
-33	-27.4	276	210
-34	-29.2	249	188
-35	-31.0	222	168
-36	-32.8	200	151
-37	-34.6	179	135
-38	-36.4	162	122
-39	-38.2	144	109
-40	-40.0	128	97
-41	-41.8	114	86
-42	-43.6	102	77
-43	-45.4	90	68.5
-44	-47.2	80	61.0
-45	-49.0	71.9	54.1
-46	-50.8	63.5	48.0
-47	-57.6	56.2	42.5
-48	-54.4	49.9	37.8
-49	-56.2	44.0	33.3
-50	-58.0	39.0	29.5
-51	-59.8	34.2	26.0
-52	-61.6	30.4	23.0
-53	-63.4	26.7	20.3
-54	-65.2	23.4	17.8

Dew Point		Moisture	
°C	°F	vvpm	Mg/m ³
-55	-67.0	20.6	15.7
-56	-68.8	18.2	13.8
-57	-70.6	15.9	11.1
-58	-72.4	13.9	10.6
-59	-74.2	12.1	9.2
-60	-76.0	10.6	8.0
-61	-77.8	9.2	7.0
-62	-79.6	8.0	6.2
-63	-81.4	6.98	5.3
-64	-83.2	6.08	4.6
-65	-85.0	5.28	4.0
-66	-86.8	4.58	3.5
-67	-88.6	3.96	3.0
-68	-90.4	3.40	2.6
-69	-92.2	2.94	2.2
-70	-94.0	2.53	1.9
-71	-95.8	2.17	1.7
-72	-97.6	1.87	1.4
-73	-99.4	1.61	1.2
-74	-101.2	1.37	1.0
-75	-103.0	1.17	0.9
-76	-104.8	1.01	0.8
-77	-106.6	0.86	0.7
-78	-108.4	0.73	0.6
-79	-110.2	0.62	0.5
-80	-112.0	0.52	0.4
-81	-113.8	0.50	0.34
-82	-115.6	0.38	0.29
-83	-117.4	0.32	0.24
-84	-119.2	0.26	0.19
-85	-121.0	0.22	0.17
-86	-122.8	0.19	0.14
-87	-124.6	0.16	0.12
-88	-126.4	0.11	0.10
-89	-128.6	0.11	0.08

Conversion Tables

Pressure units (1 bar = 14.5 psi)

psi	Bar	kPa
1	0.07	7
2	0.14	14
5	0.34	34
10	0.69	69
20	1.38	138
30	2.07	207
50	3.45	345
100	6.89	690
300	20.68	2,068
500	34.47	3,447
1,000	68.95	6,895
2,000	137.90	13,790
4,000	275.79	27,579

bar	psi	kpa
0.1	1.45	10
0.5	7.25	50
1	14.50	100
2	29.00	200
5	72.52	500
10	145.03	1,000
20	290.06	2,000
50	725.15	5,000
100	1,450.30	10,000
200	2,900.60	20,000
300	4,350.90	30,000
400	5,801.20	40,000

Tightness – Leakage

cm ³ /sec (helium)	Time for leakage of 1 cm ³ helium at 1atm
1 x 10 ⁻¹	10 seconds
1 x 10 ⁻²	1.5 minutes
1 x 10 ⁻³	15.0 minutes
1 x 10 ⁻⁴	3 hours
1 x 10 ⁻⁵	30 hours
1 x 10 ⁻⁶	12 days
1 x 10 ⁻⁷	4 months
1 x 10 ⁻⁸	3 years
1 x 10 ⁻⁹	30 years
1 x 10 ⁻¹⁰	300 years
1 x 10 ⁻¹¹	3,000 years
1 x 10 ⁻¹²	30,000 years

Gas – Mass – Liquid

	m ³ gas (+15°C, 1013 mbar)	kg	Litre liquid (boiling point 1013 mbar)
1 m ³			
Acetylene	1.0	1.11	–
Argon	1.0	1.69	1.21
Helium	1.0	0.169	1.35
Hydrogen	1.0	0.085	1.20
Carbon Dioxide	1.0	1.87	2.29
Nitrogen	1.0	1.19	1.47
Oxygen	1.0	1.36	1.19
Propane	1.0	1.90	3.28

1 kg			
Acetylene	0.902	1.0	–
Argon	0.591	1.0	0.717
Helium	5.91	1.0	7.98
Hydrogen	11.74	1.0	14.10
Carbon Dioxide	0.534	1.0	1.22
Nitrogen	0.843	1.0	1.24
Oxygen	0.738	1.0	0.876
Propane	0.525	1.0	1.72

1 litre liquid			
Acetylene	–	–	–
Argon	0.825	1.39	1.0
Helium	0.741	0.125	1.0
Hydrogen	0.832	0.071	1.0
Carbon Dioxide	0.436	0.818	1.0
Nitrogen	0.681	0.807	1.0
Oxygen	0.842	1.14	1.0
Propane	0.305	0.582	1.0

ppm (part per million) – percentage

1 ppm	=	0.000%
10 ppm	=	0.001%
100 ppm	=	0.01%
1,000 ppm	=	0.1%
10,000 ppm	=	1.0%
100,000 ppm	=	10.0%
1,000,000 ppm	=	100.0%

Safety

Cylinder Handling

Safety is of paramount importance. There are no higher priorities than the health and safety of our employees, customers, suppliers and community. Below you will find important information on the safe handling and storage of our gas cylinders.

- Always wear gloves, safety glasses, and safety shoes with protective metal toes when moving cylinders.
- Always secure cylinders with proper restraint devices, to prevent them from falling over.
- Move cylinders only with approved cylinder hand carts.
- Do not roll a cylinder when there is adequate space to use a cart.
- Do not drag or slide cylinders.
- Review your intended path and ensure it is clear of obstructions (stones, ice, etc.). Always plan an emergency escape.
- Always keep the cylinder protective cap secured when the cylinder is not in use.
- Use only proper equipment to remove cylinder caps.
- Never tamper with the pressure relief device (part of the valve) on the cylinder.
- Do not remove or alter the product identification label.
- Firmly secure the cylinder prior to connecting valves or regulators.
- Do not move a cylinder with a regulator or valve attached.
- Close the valve and replace the cylinder thread cap (if supplied) and the cylinder valve cap prior to returning the empty cylinder to storage or your supplier. Suppliers may not transport cylinders without their protective valve cap.
- Ensure the supply line is empty before disconnection.
- After use, mark the cylinder with "MT" using an appropriate tag before returning to cylinder storage or your supplier.

If for any reason your cylinder has fallen, remember that it has a potential weight of up to 90.7 kg (200 lbs). Ensure you are wearing proper gloves and safety shoes before moving a cylinder. Remember to keep your back straight and bend your knees when lifting a cylinder. Inspect the cap area for damage before moving it and ensure it is not bent or loose. Lift the cylinder to an upright position, then inspect the cylinder and cap area again before use.

The effects of the unintentional release of energy by a compressed gas cylinder can have devastating results. Over 68 kg (150 lbs) of steel, traveling at high speed, can cause severe damage, personal injury and even death.

ALWAYS KNOW THE PROPERTIES OF A GAS PRIOR TO ITS USE!

Connecting and Using Regulators

- 1 Remove the protective valve cap and the valve dust cap (if supplied) from your cylinder.
- 2 Inspect the valve to make sure there is no foreign matter that could affect the connection.
- 3 Make sure the regulator has compatible materials of construction, and has the right cylinder connection. In many cases, the CGA connection is stamped into the side of the connection.
 - Never change connections or use adaptors.
 - Soft materials are used in a regulator to create pressure seals. These become enriched over time, and you can at best contaminate your gas line. At worst, you could end up mixing flammable and oxidizing gases which could cause a fire or explosion.
- 4 Make sure the cylinder and regulator are angled slightly so you are not looking directly into the regulator gauges.
- 5 Before you open the cylinder valve, check to make sure the hand knob is turned fully out, and not putting any pressure on the load spring. Turn the hand knob counter-clockwise to ensure this.
- 6 Be sure the outlet valve (if attached) is closed, so you do not flow gas before you are ready.
- 7 Slowly open the cylinder valve. Turn the valve all the way open. Once done, turn it closed by one-quarter of a turn. By doing this, you can ensure that *if* the contents of the cylinder leak out, the operator will know that the cylinder is empty by being able to slightly turn the valve. Many cylinder valves are damaged due to operators overstressing the valve by trying to open an already-open cylinder valve.
- 8 Once the inlet pressure is in the gas chamber, check the cylinder connection for leaks.
- 9 Slowly turn in the hand knob to get your required outlet pressure, then open your outlet valve. The gas can be used safely.
- 10 When you finish using your regulator for the day, turn off the cylinder, let the gas bleed out through your system, turn out the hand knob to release spring tension, and close the outlet valve. When required, remove your regulator, and replace the dust plug and valve safety cap.

Note: Never leave pressure in a regulator.

Safety

Emergency Planning

Wherever compressed gases are handled, a written emergency plan should be in place that covers the steps to be taken in the event of an accidental release of gas. This plan should consider the nature of the gases being handled (i.e., that is their chemical and physical properties) especially their toxicity, flammability and corrosiveness.

The plan should have alarm and evacuation protocols, assigned response personnel with trained assigned duties, and a list of what emergency equipment should be on hand. Finally, all personnel should receive the proper training for that equipment, and for the containment or disposal methods for the product involved.

Be sure to:

- Identify all potential hazards and environmental factors that could trigger an emergency
- Develop emergency procedures for the gases being used
- Delegate roles and responsibilities for emergencies and ensure clear communication exists at all times
- Be familiar with your gas supplier's emergency response system
- Develop procedures for security and control during an emergency, including the need for a bomb threat program, where applicable
- Conduct regular training
- Carry out regular safety drills, to ensure that all staff members are aware of their responsibilities
- Have a central, easily accessible location for MSDS information
- Be prepared to act quickly and safely, in the event of an emergency

Cylinder Storage

- Cylinders can be stored indoors or outdoors
- It is important to refer to local and federal regulations for cylinder storage guidelines (i.e., national fire code)
- A "no smoking" policy must be enforced around cylinder storage areas
- Storage locations must be designated for gas use only (i.e., no storage of other chemicals)
- Emergency contact numbers, full and empty placards as well as cylinder type placards should be posted and clearly visible
- Cylinders should be stored in the upright position
- Cylinders should be secured with proper restraint devices
- Segregate cylinders according to hazard class
- Separate oxidizers and flammables (including "empty" cylinders) with a minimum distance of 20 feet, or with a two-metre high firewall with a fire rating of one hour

If Stored Indoors

- Storage area should be well ventilated free of flame, sparks or electrical circuits
- Storage area should be level, fireproof and dry
- Storage temperature should always be below 52°C (125°F)
- Storage area should be located at ground level, whenever possible
- Cylinders should be stored in environmentally friendly areas

If Stored Outdoors

- Storage area should be free of flame, sparks or electrical circuits
- The area should be level, fireproof, dry and well drained
- Cylinders should be stored in environmentally friendly areas
- All cylinders should be sheltered from the elements, whenever possible
- Cylinders should not be exposed to direct sunlight, with ambient temperatures no higher than 50°C (122°F)
- Ensure cylinder/equipment protection from rain/snow/ice
- Cylinders should not be in direct contact with the ground

CGA Connections

Pure Gas CGA Selection Chart for Fittings

CGA Fittings Required	Pure Gas
510/300	Acetylene (510 - Female thread -MALE regulator) (300 - Male thread - FEMALE regulator)
590/346	Air
240/660/705	Ammonia
580/677/680	Argon
350	Arsine
660	Boron Trichloride
330	Boron Trifluoride
510	1,3-Butadiene
510	n-Butane
320	Carbon Dioxide
350	Carbon Monoxide
660	Chlorine
510	Cyclopropane
350	Deuterium
678	Dichlorosilane
350	Disilane
350	Ethane
350	Ethylene
510	Ethylene Oxide
320	Halocarbon 14
350	Halocarbon 32
660	Halocarbon 116
660	Halocarbon 318

CGA Fittings Required	Pure Gas
580/677/680	Helium
350	Hydrogen
330	Hydrogen Chloride
330	Hydrogen Sulphide
510	Isobutane
510	Isobutylene
580	Krypton
350	Methane
510	Methyl Chloride
705	Monomethylamine
580	Neon
660	Nitric Oxide
580/677/680	Nitrogen
640	Nitrogen Trifluoride
326	Nitrous Oxide
540	Oxygen*
350	Phosphine
510	Propane
510	Propylene
350	Silane
330	Silicon Tetrafluoride
660	Sulphur Dioxide
590	Sulphur Hexafluoride
670	Tungsten Hexafluoride
580	Xenon

* CGA varies with concentration of Oxygen:

CGA 580 ≤ 5 %

CGA 590 > 5-23 %

CGA 296 > 23%

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Safety First



Gas and Equipment Safety Seminars

Compressed gases present several hazards. There are many special precautions that must be taken in order to ensure safe storage and usage. Learn more about these safety considerations by attending a Linde Gas and Equipment Safety Seminar.

This seminar is a mixture of classroom and hands-on training provided by a trained Linde representative. Training materials are provided by Linde. The program can be tailored to meet your specific safety considerations for the products you use. Everyone who moves or handles gas cylinders should attend.

Seminar Topics include:

- Storage requirements and incompatibilities
- Handling guidelines
- Handling liquefied gases and refrigerated liquids
- Material Safety Data Sheets and WHMIS labels
- Recommended personnel protective equipment
- Usage area
- Equipment selection, installation and operation
- Hazard prevention
- Product stewardship
- Emergency Response

Linde also offers site reviews to observe safety challenges and concerns.

To learn more about our Gas and Equipment Safety Seminars and Site Reviews, contact your local Sales Representative, or our Customer Service Centre at:

Tel (866) 385-5349

Fax (866)-385-5347

scientific@lindecana.com

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origami

[origami] (jap., from ori 'folding' and kami 'paper'), the art of folding paper to create figures and artistic decoration. Existed in Japan already at the 9th century, when paper became a common material. Figures can be all from very simple to artistic and complex. They have been used both in ceremonies and as toys, pedagogical examples, wrappings, lamp screens, etc.

Source: Encyclopedia Britannica

Getting ahead through innovation

For more than 125 years Linde has offered more to our industrial gas customers - creating added value and competitive advantages that help you achieve greater profitability. Through the acquisition of BOC, we are now more prepared than ever to provide high quality gas solutions and world class technical support.

Linde offers a wide range of compressed and liquefied gases as well as chemicals, across a range of industries and applications. Linde gases are used in welding, steel production, refining, chemical processing, environmental protection and welding, as well as in food processing, glass production and electronics. We are also a leading global player in the development of environmentally friendly hydrogen technology.

At Linde, our Specialty Gas business is focused on just two things: developing better gas technology and serving you wherever you are in the world. From ultra high purity atmospheric and specialty gases, to custom gas delivery systems and safety products, we are dedicated to finding innovative ways to supply your laboratory and process applications.

Linde is backed by the global resources of the The Linde Group which, following the acquisition of The BOC Group, PLC, in 2006, makes it the world's leading industrial gases and engineering company. The Linde Group has more than two million customers in 70 countries, sales of \$18 billion (CDN) and 53,000 employees worldwide.