



CONTROLLING
PRESSURE & VACUUM

Technical Information Booklet

Let's Get Connected

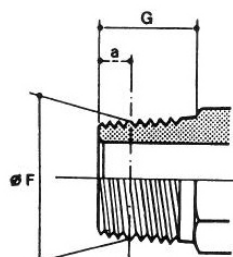
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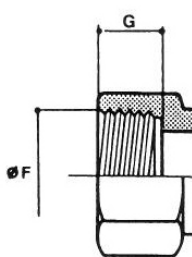


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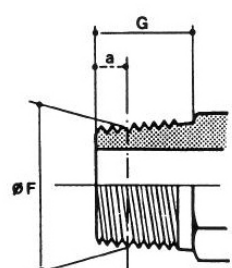
Standard Thread Sizes

NPT – ANSI B2.1

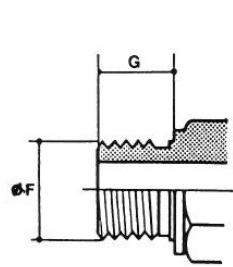
		Inches	Ø F	No. of threads to inch	a	G
		1/8"	10,2	27	4,5	9,5
		1/4"	13,5	18	5	14,3
		3/8"	17	18	6	14,3
		1/2"	21,2	14	8,1	19,1
		3/4"	26,5	14	8,6	19,1
		1"	33,2	11 1/2	10,1	23,8
		1" 1/4	41,9	11 1/2	10,6	23,8
		1" 1/2	48	11 1/2	10,6	26,2

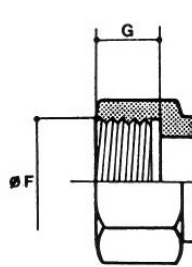
		Inches	Ø F	No. of threads to inch	G
		1/8"	10,2	27	9,5
		1/4"	13,5	18	14,3
		3/8"	17	18	14,3
		1/2"	21,2	14	19,1

BSP Taper B.S. 21-1985

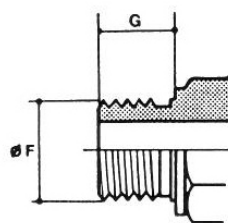
		Inches	mm	Ø F	No. of threads to inch	a	G
		1/8"	5.10	9,7	28	4	9,5
		1/4"	8.13	13,1	19	6	14,3
		3/8"	12.17	16,6	19	6,4	14,3
		1/2"	15.21	20,9	14	8,2	19,1
		3/4"	21.27	26,4	14	9,5	19,1
		1"	26.34	33,2	11	10,4	23,8
		1" 1/4	33.42	41,9	11	12,7	23,8
		1" 1/2	40.49	47,8	11	12,7	26,2
		2"	59.60	59,6	11	15,9	27,0

BSP Parallel B.S. 2779-1973

		Inches	mm	Ø F	No. of threads to inch	G
		1/8"	5.10	9,7	28	8
		1/4"	8.13	13,1	19	10
		3/8"	12.17	16,6	19	10
		1/2"	15.21	20,9	14	12
		3/4"	21.17	26,4	14	16
		1"	26.34	33,2	11	16
		1" 1/4	33.42	41,9	11	18
		1" 1/2	40.49	47,8	11	18
		2"	50.60	59,6	11	20

		Inches	mm	Ø F	No. of threads to inch	G
		1/8"	5.10	9,7	28	8
		1/4"	8.13	13,1	19	11
		3/8"	12.17	16,6	19	11,4
		1/2"	15.21	20,9	14	15
		3/4"	21.27	26,4	14	16,3
		1"	26.34	33,2	11	19,1
		1" 1/4	33.42	41,9	11	21,4
		1" 1/2	40.49	47,8	11	21,4

ISO Metric

		Ø F	G
		8 x 100	8
		10 x 100	8
		12 x 100	8
		12 x 150	10
		12 x 125	8
		14 x 125	10
		14 x 150	10
		16 x 150	10
		18 x 150	12
		20 x 150	12

		Ø F	G
		24 x 150	14
		26 x 150	16
		27 x 150	16
		30 x 200	16
		33 x 150	16
		33 x 200	16
		39 x 200	18
		42 x 200	18
		45 x 200	18
		48 x 200	18



Conversion Factors

Conversion Factors

Density

	To Obtain				
	gms/cm ³	kg/m ³	lbs/ft ³	lbs/in ³	lbs/U.S. gal
Multiply	By				
gms/cm ³	—	1000	62.428	0.0361273	8.3454
kg/m ³	0.001	—	0.062428	3.61273 x 10 ⁻⁵	0.0083454
lbs/ft ³	0.0160185	16.018463	—	5.78704 x 10 ⁻⁴	0.13368
lbs/in ³	27.679905	27,679.9	1728	—	231
lbs/U.S. gal	0.1198264	119.8264	7.4805195	0.004329	—

Flow

	To Obtain							
	cm ³ /min (ml/min)	cm ³ /sec (ml/sec)	ft ³ /hr	ft ³ /min	m ³ /hr	m ³ /min	L/hr	Lpm
Multiply	By							
cm ³ /min (ml/min)	—	0.0166667	0.0021189	0.0000353	0.00006	0.000001	0.06	0.001
cm ³ /sec (ml/sec)	60	—	0.1271340	0.0021189	0.0036	0.00006	3.6	0.06
ft ³ /hr	471.9474	7.865790	—	0.0166667	0.0283168	0.0004719	28.31685	0.4719474
ft ³ /min	28,316.85	471.9474	60	—	1.699008	0.0283168	1699.008	28.31685
m ³ /hr	16,666.67	277.7778	35.31467	0.5885777	—	0.0166667	1000	16.66667
m ³ /min	1,000,000	16,666.67	2118.876	35.31467	60	—	60,000	1000
L/hr	16.66667	0.2777778	0.0353147	0.0005885	0.001	0.0000167	—	0.0166667
Lpm	1000	16.66667	2.118876	0.0353147	0.06	0.001	60	—

Length

	To Obtain							
	Å	cm	ft	in	m	micron	mm	yd
Multiply	By							
Å	—	1 x 10 ⁻⁸	3.2808399 x 10 ⁻¹⁰	3.937008 x 10 ⁻⁹	1 x 10 ⁻¹⁰	0.0001	0.0000001	1.0936133 x 10 ⁻¹⁰
cm	1 x 10 ⁸	—	0.0328084	0.3937008	0.01	10,000	10	0.0109361
ft	3.048 x 10 ⁹	30.48	—	12	0.3048	304,800	304.8	0.3333333
in	2.54 x 10 ⁸	2.54	0.0833333	—	0.0254	25,400	25.4	0.0277778
m	1 x 10 ¹⁰	100	3.2808399	39.3700787	—	1,000,000	1000	1.0936133
micron	10,000	0.0001	3.2808399 x 10 ⁻⁶	3.9370079 x 10 ⁻⁵	0.0000010	—	0.001	1.0936133 x 10 ⁻⁶
mm	10,000,000	0.1	0.00328084	0.03937008	0.001	1,000	—	0.0010936
yd	9.144 x 10 ⁹	91.44	3	36	0.9144	914,400	914.4	—



Conversion Factors

Conversion Factors (continued)

Pressure

	To Obtain								
	atm	bars	ft of H ₂ O at 60°F	in of Hg at 0°C	in of H ₂ O at 60°F	kg/cm ²	kpa	mm of Hg at 0°C (torr)	psi
Multiply	By								
atm	—	1.01325	33.932	29.921	407.1827	1.0332	101.3171	760	14.696
bars	0.98692	—	33.4883	29.530	401.8596	1.019716	100	750.062	14.50368
ft of H ₂ O at 60°F	0.02947	0.029891	—	0.882646	12	0.03048	2.9890	22.4198	0.433107
in of Hg at 0°C	0.03342	0.033864	1.1340	—	13.6	0.034532	3.376895	25.4	0.49115
in of H ₂ O at 60°F	0.00246	0.002499	0.083333	0.073556	—	0.00254	0.249089	1.86832	0.03609
kg/cm ²	0.96787	0.980665	32.8084	28.95903	393.7008	—	98.03922	735.5592	14.22334
kpa	0.00987	0.010	0.33456	0.29613	4.01472	0.01020	—	7.5006	0.14504
mm of Hg at 0°C (torr)	0.00132	0.001333	0.044603	0.03937	0.535240	0.001360	0.133322	—	0.019337
psi	0.06805	0.068948	2.3089	2.0360	27.70851	0.070307	6.89465	51.715	—

Temperature

	To Obtain			
	°C	°F	°K	°R
Multiply	BY			
°C + 17.78	—	1.8	—	—
°C + 273.16	—	—	1	—
°F - 32	5/9	—	—	—
°F + 459.72	—	—	—	1
°K - 273.16	1	—	—	—
°R - 459.72	—	1	—	—

Volume

	To Obtain					
	cm ³ *	ft ³	in ³	m ³	gal (U.S. liquid)	L
Multiply	By					
cm ³ *	—	0.00003531	0.0610237	0.000001	0.0002641	0.001
ft ³	28,316.847	—	1728	0.02831685	7.480519	28.316847
in ³	16.387064	0.0005787	—	0.00001637	0.0043290	0.0163871
m ³	1,000,000	35.31467	61,023.74	—	264.172	1000
gal (U.S. liquid)	3785.412	0.13368056	231	0.00378541	—	3.785412
L	1000	0.03531467	61.02374	0.001	0.2641721	—

* 1 cm³ = 1 ml

Conversion Factors



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Conversion Factors (continued)

Weight

	To Obtain					
	gms	kg	mg	oz*	lbs*	tons (short, U.S.)
Multiply	By					
gms	—	0.001	1000	0.0352740	0.0022046	1.102×10^{-6}
kg	1000	—	1,000,000	35.273962	2.2046226	0.0011023
mg	0.001	0.000001	—	3.5274×10^{-5}	2.2046×10^{-6}	1.102×10^{-9}
oz*	28.34952	0.0283495	28,349.5	—	0.0625	3.125×10^{-5}
lbs*	453.59237	0.4535924	453,592	16	—	0.0005
tons (short, U.S.)	907,185	907.18474	9.07185×10^8	32,000	2000	—

*avoirdupois

Concentration

Exponential Equivalents

Concentration	Equivalent
1,000,000 ppm	100%
100,000 ppm	10.0%
10,000 ppm	1.0%
1,000 ppm	0.1%
100 ppm	0.01%
10 ppm	0.001%
1 ppm	0.0001%
1,000 ppb	1 ppm
100 ppb	0.1 ppm
10 ppb	0.01 ppm
1 ppb	0.001 ppm

Scientific Notation	Equivalent
1×10^{10}	10,000,000,000
1×10^9	1,000,000,000
1×10^8	100,000,000
1×10^7	10,000,000
1×10^6	1,000,000
1×10^5	100,000
1×10^4	10,000
1×10^3	1,000
1×10^2	100
1×10^1	10

Scientific Notation	Equivalent
1×10^{-1}	0.1
1×10^{-2}	0.01
1×10^{-3}	0.001
1×10^{-4}	0.0001
1×10^{-5}	0.00001
1×10^{-6}	0.000001
1×10^{-7}	0.0000001
1×10^{-8}	0.00000001
1×10^{-9}	0.000000001
1×10^{-10}	0.0000000001

Miscellaneous Physical Constants

Numerical Constant	Value	Units
Avogadro's Number	6.022045×10^{23}	Molecules/gm-mole
Gas-Law Constant R	1.98719	cal/(gm-mole)(°K)
	1.98719	Btu/(lb-mole)(°R)
	82.0568	(cm ³)(atm)/(gm-mole)(°K)
	0.0820568	(liter)(atm)/(gm-mole)(°K)
	10.7314	(ft ³)(lb)/(in ²)(lb-mole)(°R)
	0.730228	(ft ³)(atm)/(lb-mole)(°R)

The information presented in this bulletin is intended as a guide to the chemical resistance of materials used in the manufacture of Ham-Let Valves.

Many factors which influence corrosion rating, such as temperature fluctuations, concentration and aeration of fluids, high velocity or abrasions in the fluid stream, have been taken into account. The physical properties of a material are affected differently by each corrosive media and it is sometimes necessary to sacrifice valves with one property to gain a maximum resistant valve with another property.

An “A” rating is associated with internal moving parts, in direct contact with the media. in some cases a “B” rating can be given to body material in direct contact with media if the corrosion rate is not such as to cause any serious problem.

RATING EXPLANATION

A Excellent

B Good

C Poor

D Do not use

Blank = No information available

Ratings are based on media at room temperatures unless otherwise specified.

We advise that ratings given be used as a guide to the selection of valve materials and not as an absolute recommendation.

Although most of the suggested ratings in the corrosion data chart are based on experience, Ham-Let cannot accept responsibility for problems arising from use of this data. We do however recommend that in critical applications, tests will be conducted to verify the rating.

Corrosion Data



CONTROLLING
PRESSURE & VACUUM

CHEMICALS

	Aluminum	Brass	Carbon Steel	Ductile Iron / Cast Iron	316 Stainless Steel	17-4PH	Alloy 20	Monel	Hastelloy C	Buna N (Nitrile)	Delrin	EPDM/EPR	Viton	Flexible Graphite	Teflon-Reinforced or NGR
Acetaldehyde	B	C	C	C	A		A	A	A	D	A	B	C		A
Acetamine	B	B	B	B	B				A	A					A
Acetate Solvents	A	B	A	B	A			A	A	D	D		D		A
Acetic Acid, Aerated	B	F	D	D	A			A	A	C	D		C	A	A
Acetic Acid, Air Free	B	B	D	D	A	A	A	A	A	C	D		D	A	A
Acetic Acid, Crude	C	C	C	C	A	A	A	B	A	D	D		D	A	A
Acetic Acid Glacial					A	A			A	D		B	C	A	A
Acetic Acid, Pure	C	C	D	D	A	A	A	D	A	D	D		D	A	A
Acetic Acid 10%	C	C	C	C	A	A	A	B	A	D	B	B	D	A	A
Acetic Acid 80%	C	C	C	C	A	A	A	B	A	D	D	C	D	A	A
Acetic Acid Vapors	B	D			D	D	B	C	A	D				A	A
Acetic Anhydride	B	A	D	D	B	B	B	B	A	D	C	C	D	A	A
Acetone	A	A	A	A	A	A	A	A	A	D	A	A	D	A	A
Other Ketones	A	A	A	A	A	A	A	A	A	D	A	D	D	A	A
Acetyl Chloride	D	A		C	C			B	A	D	D	D	D		A
Acetylene	A	B	A	A	A	A	A	A	A	B	A	A	A		A
Acid Fumes	B	D	D	D	B		B			C	D				A
Acrylonite	B	A	A	C	A		B	A	A	D	D	D	C		A
Air	A	A	A	A	A		A	A	A	A	A	A	A		A
Alcohol, Amyl	B	B	B	C	A		B	B	B	C	A	A	B	A	A
Alcohol, Butyl	B	B	B	C	A		A	A	A	B	A	C	A	A	A
Alcohol, Diacetone	A	A	A	A	A		A	B	A	D	A	B	D	A	A
Alcohol, Ethyl	B	B	B	B	B		A		A	A	A	A	A	A	A
Alcohol, Fatty	B	B	B	B	A		A		A	B	A	A	A	A	A
Alcohol, Isopropyl	B	B	B	B	B		A	B	B	C	A	A	A	A	A
Alcohol, Methyl	B	B	B	B	A		A	A	A	B	A	A	C	A	A
Alcohol, Propyl	A	A	B	B	A		A	A	A	B	A	A	A	A	A
Alumunia	A	A							A	A	A	A			A
Aluminum Acetate	C	D		D	A	B	B	C	B	D	D	A	D	A	A
Aluminum Chloride Dry	B	B	C	D	C		D	B	B	B	A	A	A	A	A
Aluminum Chloride Solution	C			D	D	C	B	B	B	B	D		A	A	A
Aluminum Fluoride	C		D	D	C		B	B	B	A	C	A	A	A	A
Aluminum Hydroxide	A	A	D	D	A	B	B	B	A	A	C	A	A	A	A
Aluminum Nitrate	D	D		D	C		B	C	B	B	D	B	D	A	A
Aluminum Oxalate	B						A	B							A
Aluminum (Aluminum Potassium Sulfate)	D	D		D	B	C	B	C	A	B	D		B	A	A
Alum (Aluminum Sulfate)	C	C	D	D	B	A	B	C	A	A	D	A	A	A	A
Amines	B	B	B	C	A	A	A	B	B	D	C	C	D	A	A
Ammonia Alum	C				A		A		A	B	C			A	A
Ammonia, Anhydrous Liquid	A	D	A	B	A	A	A	B	A	B	D	B	D	A	A
Ammonia, Aqueous	B	C	C	C	A		A	A	A	D	A	B	C		A
Ammonia, Gas, Hot	B	B	B	B	B				A	A					A
Ammonia Liquor	A	B	A	B	A			A	A	D	D		D	A	A
Ammonia Solutions	B	F	D	D	A		A	A	A	C	D		C	A	A
Ammonium Acetate	B	B	D	D	A	A	A	A	A	C	D		D	A	A
Ammonium Bicarbonate	B	B	C	B	B		B	B		B	A	A	A		A
Ammonium Bromide 5%	D				B		B	B			A	A	A		A
Ammonium Carbonate	B	B	B	B	B		B	B		C	D	A	B		A
Ammonium Chloride	D	D	D	D	C	C	B	B	B	B	C	A	A	A	A
Ammonium Hydroxide 28%	C	D	C	C	B	A	A	F	B	B	D	B	A	A	A

Ratings: **A**=Excellent **B**=Good **C**=Poor **D**=Do not use **Blank**=No Information

Corrosion Data



CONTROLLING
PRESSURE & VACUUM

CHEMICALS

	Aluminum	Brass	Carbon Steel	Ductile Iron / Cast Iron	316 Stainless Steel	17-4PH	Alloy20	Monel	Hastelloy C	Buna N (Nitrile)	Delrin	EPDM/EPR	Viton	Flexible Graphite	Teflon-Reinforced or NGR
Ammonium Hydroxide Concentrated	C	D	C	C	A	A	A	C	B	C	D	A	A	A	A
Ammonium Monosulfate	D				B		B	B	B		D				A
Ammonium Nitrate	B	D	D	D	A	A	A	D	B	A	D	A	A		A
Ammonium Oxalate 5%	A				A		A	B			A				A
Ammonium Persulfate	C	C			A		A	D		D	D	B	B		A
Ammonium Phosphate	C	D	D	D	B		B	C	A	C	C	A	A		A
Ammonium Phosphate Di-basic	B	C	D	D	B		B	C	A	A	A		A		A
Ammonium Phosphate Tri-basic	C	C	D	D	B		B	C	A	A	A		A		A
Ammonium Sulfate	C	C	C	D	B	B	B	B	A	B	B	A	B	A	A
Ammonium Sulfide	C	D	D	D	B		B	B	A	A	A	A	D		A
Ammonium Sulfite	C	C	C	C	A		B	D		B	A	B	A		A
Amyl Acetate	B	B	C	C	B	A	A	B	A	D	A	B	D		A
Amyl Chloride	D	B		B	A		A	B	B	D	A	D	D		A
Aniline	C	D	C	C	B		A	B	B	D	D	C	C	A	A
Aniline Dyes	C	C	C	C	A		A	A		C	A	C	B		A
Apple Juice	B	C	D	D	B		A	A		A	A	B	A		A
Aqua Regia (Strong Acid)	D	D	D	D	B		B			D	D	D	D	D	A
Aromatic Solvents	A	A	C	B	A		A	B		D	A	D	D		A
Arsenic Acid	D	D	D	D	B		B	D	B	A	D	B	A	A	A
Asphalt Emulsion	C	A	B	B	A		A	A	A	D	A	D	A		A
Asphalt Liquid	C	A	B	B	A		A	A	A	C	A	D	A		A
Barium Carbonate	C	B	B	B	B		B	B	A	B	A	A	A		A
Barium Chloride	D	B	C	C	B	B	C	B		A	A	A	A		A
Barium Cyanide	D	C		C	B		B	D		B	A	A	B		A
Barium Hydrate	D	D			A		A	B			A				A
Barium Hydroxide	D	C	C	B	B	A	A	B		A	A	B	A		A
Barium Nitrate	B				A		A			A	A				A
Barium Sulfate	D	C	C	C	A		A	B		A	A	B	A		A
Barium Sulfide	D	D	C	D	B		B	C		A	A	A	A		A
Beer	A	B	D	D	A	A	A	A		B	A	A	A		A
Beet Sugar Liquors	A	A	B	B	A		A	A		A	A	B	A		A
Benzaldehyde	A	A	A	C	A		A	B	B	D	A	A	D		A
Benzene (Benzol)	B	B	B	B	B	B	A	A	B	D	C	D	B	A	A
Benzoic Acid	B	B	D	D	B	A	B	B	A	C	A	D	B		A
Beryllium Sulfate	B	B		B	B		A	B		B	A	B	B		A
Bleaching Powder Wet		B			C		B	A	D	D	B	B	B		A
Blood (Meat Juices)	B	B		D	A	A	A		B	A	B	B	B		A
Borax (Sodium Borate)	C	D	C	C	A		A	A	B	A	A	A	A		A
Bordeaux Mixture					A					A					A
Borax Liquors	C	A	C	C	B		A	B		A	A	A	A		A
Boric Acid	B	C	D	D	B		B	B	A	B	A	B	A	A	A
Brake Fluid	B	B		B	B	A		B		D	B	B	D		A
Brines, Saturated	C	B	D	C	B		B	B	A	A	A	A	A		A
Bromine, Dry	C	B	D	D	D		B	A	A	D	D	D	B	B	A
Bunker Oils (Fuel)	A	B	B	B	A		A	A		B	A		A		A
Butadiene	B	C	B	B	A		A	C	B	C	A	C	B		D
Butane	A	A	B	B	A		A	B	A	B	A	D	A		A
Butter					A		A			B	A				A
Buttermilk	A	D	D	D	A		A	D		A	A	B	A		A
Butyl Acetate	B	B		B	B		A	B	B	D	B	D	D		A

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Corrosion Data



CONTROLLING
PRESSURE & VACUUM

CHEMICALS

	Aluminum	Brass	Carbon Steel	Ductile Iron / Cast Iron	316 Stainless Steel	17-4PH	Alloy20	Monel	Hastelloy C	Buna N (Nitrile)	Delrin	EPDM/EPR	Viton	Flexible Graphite	Teflon-Reinforced or NGR
Butylene	A	A	A	A	A		A	A		D	A	D	D		A
Butyric Acid	B	C	D	D	B		B	B	A	C	A	C	C		A
Calcium Bisulfite	C	C	D	D	B		B	B	B	A	D	D	A		A
Calcium Carbonate	C	C	D	D	B		B	B	B	A	A	B	A		A
Calcium Chlorate	B	D		C	B		B	B		B	D	B	B	B	A
Calcium Chloride	C	B	C	C	B	B	B	B	A	A	A	B	A		A
Calcium Hydroxide	D	C	C	C	B		B	A	A	A	A	A	A		A
Calcium Nitrate	B				B		B			B	C	B			A
Calcium Phosphate	D	C		C	B		B			B	B	B	B		A
Calcium Silicate	D	C		C	B		B			B	A	B	B		A
Calcium Sulfate	B	C	C	C	B	B	B	B	B	A	A	B	A		A
Caliche Liquor			B		A		A			B	A				A
Camphor	C	C		C	B		C	C		B	A	B	B		A
Cane Sugar Liquors	A	B		B	A		A	B		B	A	B	B		A
Carbonated Beverages	B	B	D	B	B	B	B	C		B	A	B	B	A	A
Carbonated Water	A	B	B	A	A	B	A	B		A	A	A	A	A	A
Carbon Bisulfide	A	C	B	B	B		B	B		D	A	D	A		A
Carbon Dioxide, Dry	A	A	A	B	A	A	A	A		C	A	B	B	A	A
Carbonic Acid	A	D	D	D	B	B	A	B		B	A	B	A	A	A
Carbon Monoxide	A	A		B	A	A	A	A	A	B	A	B	B		A
Carbon Tetrachloride, Dry	B	C	B	C	A	A	A	A	A	D	A	D	B	A	A
Carbon Tetrachloride, Wet		D	D	D	B		B	B	B	D	B	D	B	A	A
Casein	C	C		C	B		B	C		B	A	B	B		A
Caster Oil	A	A	B	B	A		A	A	A	A	A	B	A		A
Caustic Potash					A		A	B		B	D				A
Caustic Soda	D		B	B	A		A	A		C	D	B	B		A
Cellulose Acetate	B	B		B	B			B	B	D	C	B	D		A
China Wood Oil (Tung)	A	C	C	C	A		A	A	A	A	A	D	A		A
Chlorinated Solvents	D	C	C	C	A		A	B		D	A	D	C		A
Chlorinated Water	C				C	D	A	D	D	B	D		A	B	A
Chlorine Gas, Dry	B	C	B	B	B	C	A	A	A	C	D	D	B	A	A
Chlorobenzene, Dry	B	B	B	B	A		A	B	B	D	B	D	A		A
Chloroform, Dry	D	B	B	C	A	B	A	A	B	D	A	D	B		A
Chlorophyll, Dry	B	B		B	B		A	B		B		B	B		A
Chlorosulfonic Acid, Dry	B	C	B	B	B		B	B	A	D	D	D	D		A
Chrome Alum	C	C	B	C	A		A	B		B	B	B	B		A
Chromic Acid<50%	C	D	D	D	C	C	B	C	B	D	D	C	C		A
Chromic Acid>50%	D	D	D	C	C	D	B	D	B	D	D	C	C		A
Chromium Sulfate	B	C		D	B		C	B		B	C	B	B		A
Cider	B				A		B	A		A					A
Citric Acid	B	C	D	D	B	C	A	B	A	B	A	B	A	A	A
Citrus Juices	C	B	D	D	B		A	A		A	A		A		A
Coca Cola Syrup					A		A			B	A		B		A
Coconut Oil	B	B	C	C	B		A	B		A	A	A	A		A
Coffee	A	A		D	A		A	B		A	A	A	A		B
Coffee Extracts, Hot	A	B	C	C	A		A	A		A	D	D	B		A
Coke Oven Gas	A	C	B	B	A		A	B		C	A	D	A		A
Cooking Oil	B	B	B	B	A		A	A		A	A	D	A		A
Copper Acetate	D	D	D	D	A		A	C	B	C	D	B	D		A
Copper Carbonate	D				A		A				A				A

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Corrosion Data



CONTROLLING
PRESSURE & VACUUM

CHEMICALS

	Aluminum	Brass	Carbon Steel	Ductile Iron / Cast Iron	316 Stainless Steel	17-4PH	Alloy20	Monel	Hastelloy C	Buna N (Nitrile)	Delrin	EPDM/EPR	Viton	Flexible Graphite	Teflon-Reinforced or NGR
Copper Cyanide	D	D		D	A		A	C		A	A	B	B		A
Copper Nitrate	D	D	D	D	B		B	D		A	A	B	A		A
Copper Sulfate	D	D	D	D	B	B	B	C	A	A	A	A	A	A	A
Corn Oil	B	B	C	C	B		B	B		A	A	C	A		A
Cottonseed Oil	B	B	C	C	B		B	B		A	A	C	B		A
Cresol					B		B			D	D	D	D		A
Creosote Oil	B	B	B	B	B	B	A	B	B	C	D	D	A		A
Cresylic Acid	C	C	C	D	B		B	B		D	D	D	B		A
Crude Oil, Sour	B	C	B	C	A		A	B		A	A	D	A		A
Crude Oil, Sweet	A	B	B	B	A		A	A		A	A		A		A
Cupric Nitrate	D				A		A	D			D				A
Cutting Oils, Water Emulsions	A	A	B	B	A		A			A	A		A		A
Cyanide Plating Solution	D	D		D	B		B	D		B	D	B	B		A
Cyclohexane	A	A	A	A	A		A	B	B	C	A	D	A		A
Cyclohexanone	B	B			A		A	B	B	D	A				A
Detergents, Synthetic	B	B		B	B		A	B		B	A	B	A		A
Dextrin	B	B		B	B		B	B		B	A	B	B		A
Dichloroethane				C	C		B	B		D	D	D			A
Dichloroethyl Ether	B	B		B	B		B			D	D	D	D		A
Diesel Oil Fuels	A	A		A	A		A	A		A	A	D	A		A
Diethylamine	B	B	A	B	A		A	B		B	A	C	D		A
Diethyl Benzene					A		B			D	C	D			A
Diethylene Glycol	B	B	A	A	A		A	B		A	A	A	B		A
Diethyl Sulfate	B	B		B	B		B	B		C	A	C	B		A
Dimethyl Formamide	B	B		B	A		A	B		B	A	D	D		A
Dimethyl Phthalate										B	C		D		A
Dioxane	B	B		B	B		B	B		D	C	C	D	A	A
Dipentane (Pinene)	A	A		A	A		A			B	A	D	B		A
Disodium phosphate	B			B	B		B	C		B	A		B		A
Dowtherm	A	A	B	B	A		A	A		D	A	D	A	A	A
Drilling Mud	B	B	B	B	A		A	A		B	A	A	A		A
Dry Cleaning Fluids	A	C	B	B	A		A	A		B	D	A	B		A
Drying Oil	C	C	C	B	B		B	B		B	A	A			A
Enamel		A									B	A			A
Epsom Salts (MgSo4)	A	B	C	C	B		B	B		B	A	A	A		A
Ethane	A	B	C	C	B		B	B		A	A	D	A		A
Ethers	A	B	A	B	A	B	A	B		D	C	C	C		A
Ethyl Acetate	A	C	B	C	B	A	B	B		D	C	C	D		A
Ethyl Acrylate	C	B	C	C	A		A	B	A	D	D	B	C	D	A
Ethyl Benzene							A		A	C	A	D			A
Ethyl Bromide	B	A		B	B		C	B		B	A	B	B		A
Ethyl Chloride, Dry	B	B	B	B	A	A	A	B	B	C	A	C	B		B
Ethyl Chloride, Wet	D	C	C	D	B		B	B	B	C	A	B	B		A
Ethylene Chloride	C				A		A	B	B	D	A		D		A
Ethylene Dichloride				B			A			D	C	D	D	A	A
Ethylene Glycol	A	B	B	B	B	A	A	B	A	A	A	A	A		A
Ethylene Oxide	C	C	B	B	B		B	B	A	D	A	D	D		A
Ethyl Ether		B		C	A		A	A	B	D	A	D	D		A
Ethyl Silicate	B	B		B	B		B	B		B	A	B	B		A
Ethyl Sulfate	A				B		B			B	A	C	A		A

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Corrosion Data



CONTROLLING
PRESSURE & VACUUM

CHEMICALS

	Aluminum	Brass	Carbon Steel	Ductile Iron / Cast Iron	316 Stainless Steel	17-4PH	Alloy20	Monel	Hastelloy C	Buna N (Nitrile)	Delrin	EPDM/EPR	Viton	Flexible Graphite	Teflon-Reinforced or NGR
Fatty Acids	B	C	D	D	A		A	B	A	B	A	D	A	A	A
Ferric Hydroxide	D	D	D	D	A		A	A	B	B	A	A	A		A
Ferric Nitrate	D	D	D	D	C	B	A	D	B	A	A	A	A		A
Ferric Sulfate	D	D	D	D	B	B	A			A	A	A	A		A
Ferrous Ammonium Citrate	B				B		B			A	A				A
Ferrous Chloride	D	B	D	D	D		D	D	D	A	A	A	A	A	A
Ferrous Sulfate	C	B	D	D	B		B	B	B	A	A	A	A	A	A
Ferrous Sulfate, Saturated	C	C	C	C	A		A	B	B	C	A	B	B		A
Fertilizer Solutions	B	C	B	B	B		B	B		B	A				A
Fish Oils	C	B	B	B	A		A	A		A	A	D	A		A
Flue Gases	C	B		B	A		A	B		C	C	D	C		A
Fluoboric Acid	B				B		A			A	D				A
Fluorosilicic Acid	D	B	D	D	B		B	A	B	C	C	C	C		A
Formaldehyde, Cold	A	A	A	B	A	A	A	A	B	B	A	B	D		A
Formaldehyde, Hot	B	B	D	D	C		B	B	B	B	A				A
Formic Acid, Cold	D	B	D	D	B	B	A	B	A	D	D		B	A	A
Formic Acid, Hot	D	B	D	D	B	D	B	B	B	D	D		A	A	A
Freon Gas, Dry	B	B	B	B	A	A	A	B	B	C	C	C	C	A	A
Freon 11, MF,112, BF	B	B		C	A		A	B	B	C	A	C	D	A	A
Freon 12, 12, 32, 114, 115	A	A		B	A		A	B	B	B	A	A	D	A	
Freon 21, 31	B	B		C	A		A	B	B	D	A	D	D	A	
Freon 22	A	A		B			A		B	D	A	D	D	A	
Freon 113, TF	B	B		C	A		A	B	B	B	A	C	C	A	
Freon, Wet	D	D		D	C	B	B	B	B	B	A	C	D	A	A
Fruit Juices	B	B	D	D	A		A	B		A	A	A	A		A
Fuel Oil	A	B	B	B	A		A	B		A	A	D	A		A
Fumaric Acid							A			B	A				A
Furfural	A	A	A	B	A	B	A	B	B	D	A	C	D		A
Gallic Acid 5%	A	C	D	D	B		B	B	B	B	A	C	A		A
Gas, Manufactured	B	B	B	B	B		B	A		A	A		A		A
Gas, Natural	B	B	B	B	A		B	A		A	A	D	A		A
Gas, Odorizers	A	A	B	B	B		A	B		B	A		A		A
Gasoline, Aviation	A	A	A	B	A		A		A	C	A		A	A	A
Gasoline, Leaded	A	A	A	A	A		A	B		C	A		A	A	A
Gasoline, Motor	A	A	A	B		A	A	A		C	A	D	A	A	A
Gasoline, Refined	A	B	B	B	A		A	B	A	C	A	D	A	A	A
Gasoline, Sour	A	B	B	B	A		A	C	A	C	A	D	A	A	A
Gasoline, Unleaded	A	A	A	B	A		A	A	A	C	A		A	A	A
Gelatine	A	A	D	D	A		A	B		A	A	A	A		A
Glucose	A	A	B	B	A		A	A	A	A	A	A	A		A
Glue	A	B	A	B	B		A	B	A	A	A	B	A		A
Glycerine (Glycerol)	A	B	C	B	A	A	A	A	A	C	A	A	B	A	
Glycol Amine	C	D		B	B	A			D	A	C	D	D	A	
Glycol	A	B	C	B	B		A	B		A	C	A	A		A
Graphite	B	B		C	B		A	B		B	B	A	B		A
Grease	B	C	A	A	A		A	B		A	A	D	A		A
Helium Gas	B	B		B	A		A	B	A	B	A	B	B		A
Heptane	A	A	B	B	A		A	B	A	A	A	D	A		A
Hexane	A	B	B	B	A		A	B	A	A	A	D	A		A
Hexanol, Tertiary	A	A	A	A	A		A	A	A	A	A	D	B		A

Ratings: **A**=Excellent **B**=Good **C**=Poor **D**=Do not use **Blank**=No Information

Corrosion Data



CONTROLLING
PRESSURE & VACUUM

CHEMICALS

	Aluminum	Brass	Carbon Steel	Ductile Iron / Cast Iron	316 Stainless Steel	17-4PH	Alloy20	Monel	Hastelloy C	Buna N (Nitrile)	Delrin	EPDM/EPR	Viton	Flexible Graphite	Teflon-Reinforced or NGR
Hydraulic Oil Petroleum Base	A	B	A	B	A		A	A		A	A	D	A		A
Hydrazine	C	D	D	D	B		B	D		C	D	B	D		A
Hydrocyanic Acid	A	D	D	C	A		A	C	B	B	D	B	A		A
Hydrofluosilicic Acid	D	A	D	D	C		C	B		B	A	B	A	A	A
Hydrogen Gas, Cold	A	B	B	B	A		A	A		B	A	B	A		A
Hydrogen Gas, Hot	C		B		B		A		A	B	A	B			A
Hydrogen Peroxide, Concentrated	A	D	D	D	B		B	D	D	D	D	B	B		A
Hydrogen Peroxide, Dilute	A	C	D	D	B		B	D	D	A	D	B	A		A
Hydrogen Sulfide, Dry	A	C	B	B	A	B	B	B	B	C	C	A	A	A	A
Hydrogen Sulfide, Wet	B	D	C	D	B		B	C	D	C	C	B	A	A	A
Hypo (Sodium Thiosulfate)	B	C	D	D	B		B	B		C	A	A	A		A
Illuminating Gas	A	A	A	A	A		A	A		A	A	D	A		A
Ink-Newsprint	C	C	D	D	A		A	B		A	A	B	A		A
Iodoform	C	C	B	C	A		A	C		A	A		A		A
Iso-Butane					B		B			B	A	D			A
Iso-Octane	A	A	A	B	A		B		A	A	A	D	A		A
Isopropyl Acetate					B				D	D	A	D		A	A
Isopropyl Ether	B	A	A	B	A		B	A	C	C	A	D	D	A	A
JP-4 Fuel	A	A	A	B	A		A	A	A	A	A		A		A
JP-5 Fuel	A	A	A	A	A		B	A	B	B	A		A		A
JP-6 Fuel	A	A	A	A	A		A	A	A	A	A		A		A
Kerosene	A	A	B	B	A		A	A	A	A	A	D	A	A	A
Ketchup	D	D	D	D	A		A	B		A	A		A		A
Ketones	A	A	A	A	A		A	A		D	A	D	D		A
Laquer (and Solvent)	A	A	C	C	A		A	A		D	A	D	D		A
Lactic Acid Concentrated Cold	C	D	D	D	A	D	A	D	A	B	D	B	B	A	A
Lactic Acid Concentrated Hot	C	D	D	D	B	D	A	D	B	C	D	B	B	A	A
Lactic Acid Dilute Cold	A	D	D	D	A	B	A	C	A	B	D	B	A	A	A
Lactic Acid Dilute Hot	B	D	D	D	A	D	A	D	B	C	D		D	A	A
Lactose	B	B		C	B		B	B		B	A	B	B		A
Lard	A	B		A	A		A			B	A	C			A
Lard Oil	B	B	C	C	B		A	B		A	A	B	A		A
Lead Acetate	D	C	D	D	B		B	B		A	A	B	B		A
Lead Sulfate	D	C		D	B		B	B		B	A	B	B		A
Lecithin	C	C		C	B		B	B		D	A	D	B		A
Linoleic Acid	A	B	B	B	A		A	B		B	A	D	B		A
Linseed Oil	A	B	A	A	A		A	B		A	A	D	A		A
Lithium Chloride	D	B		B	B		A	B		B	A	B	B		A
LPG	A	A	B	B	B		B	B		A	A	D	A		A
Lubricating Oil Petroleum Base	A	B	A	A	A		A	B		A	A	D	A		A
Ludox	D	D		B	B		B	B		B	B	B	B		A
Magnesium Bisulfate	B	B	B	B	A		A	B		B	A	B	B		A
Magnesium Bisulfate	C	D		D	B		B	B		B	A	B	B		A
Magnesium Carbonate	B	A		B	A		A	B		B	A	B	B		A
Magnesium Chloride	C	B	C	D	B	C	B	B	A	A	A	A	A		A
Magnesium Hydroxide	D	B	B	B	A	A	A	B	B	A	A	A	A		A
Magnesium Hydroxide Hot	D	D	B	B	A	A	A	A	B	B	A		B		A
Magnesium Nitrate	B				A		A	B		B	A				A
Magnesium Sulfate	B	B	B	B	A	A	A	B	A	A	A	A	A		A
Maleic Acid	B	B	B	C	B		B	B	A	B	A	D	A		A

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Corrosion Data



CONTROLLING
PRESSURE & VACUUM

CHEMICALS

	Aluminum	Brass	Carbon Steel	Ductile Iron / Cast Iron	316 Stainless Steel	17-4PH	Alloy20	Monel	Hastelloy C	Buna N (Nitrile)	Delrin	EPDM/EPR	Viton	Flexible Graphite	Teflon-Reinforced or NGR
Maleic Anhydride	B	B		B	B		B	B	B	D	C	D	B		A
Malic Acid	B	B	D	D	B		B	B		A	A		A		A
Malt Beverages					A		B	A		A	A	B	A		A
Managanese Carbonate	B				B		A			B	A				A
Manganese Sulfate	B	B		D	A		A	B		B	A	B	B	A	A
Mayonnaise	D	D	D	D	A		A	B		A	A		A		A
Meat Juices	B	D			A		A			B	A				A
Melamine Resins				D	C		C			B	A				A
Methanol	B	B		B	A		A	B		B	C	D	B		A
Mercuric Chloride	D	D	D	D	B		B	D	B	A	A	A	A		A
Mercuric Cyanide	D	D	D	D	A		A	C	B	A	A	A	A		A
Mercurous Nitrate	D	D			A		A	D							A
Mercury	D	D	A	A	A		A	B	B	A	A	A	A		A
Methane	A	A	B	B	A		A	B	A	A	A		A		A
Methyl Acetate	A	A	B	B	A		A	B	A	D	B	B	D		A
Methyl Acetone	A	A	A	A	A		A	A		D	B	A	D		A
Methylamine	A	D	B	B	A		A	C	B	D	A	B	D		A
Methyl Bromide 100%	C	C		D	B		A	B		B	A	D	B		A
Methyl Cellosolve	A	A	B	B	A		A	B	B	C	A	B	D		A
Metyl Cellulose					A		A		B	D	A				A
Methyl Chloride	D	B	B	B	A		A	B		D	A	D	B		A
Methyl Ethyl Ketone	A	A	A	A	A		A	A	B	D	A	B	D	A	A
Methylene Chloride	C	A	B	B	A		A	B	B	D	A	D	C		A
Methyl Formate	C	A	C	C	B		A	B	B	D	A	B	D		A
Methyl Isobutyle Ketone					A		A			D	A			A	A
Milk & Milk Products	A	B	D	D	A		A	B		A	A	A	A		A
Mineral Oils	A	B	B	B	A		A	A		A	A	D	A		A
Mineral Spirits	A	B	B	B	B		B	B		A	A		A		A
Mixed Acids (Cold)	D	D	C	C	B		B	C		D	D	D	B		A
Molasses, Crude	B	A	A	A	A		A	A		A	A		A		A
Molasses, Edible	A	A	C	C	A		A	A		A	A		A		A
Molybdc Acid					A		A			A	A				A
Monochloro Benzene Dry					B		B	B		D	C			A	A
Morphine	B	B		B	A		A	B		D	A	B	D		A
Mustard	B	A	B	B	A		A	A		A	A		A		A
Naptha	A	B	B	B	B		B	B	A	B	A	D	A		A
Napthalene	B	B	B	B	B		B	B	B	D	A	D	A		A
Natural Gas, Sour	B	B	B	B	A		A	D	A	A	A	D	A		A
Nickel Ammonium Sulfate	D	D	D	D	A		A	C		A	C	B	D		A
Nickel Chloride	D	D	D	D	B		A	B	A	A	D	B	A	A	A
Nickel Nitrate	C	D	D	D	B		A	B		A	C	A	A		A
Nickel Sulfate	D	D	D	D	B		A	B	B	A	C	B	A	A	A
Nicotinic Acid	A	A	B	C	A		A	A		D	C	D	B	A	A
Nitric Acid 10%	D	D	D	D	A	A	A	D		C	D		A	A	A
Nitric Acid 30%	D	D	D	D	A	D	A	D		C	D	B	A	B	A
Nitric Acid 80%	B	D	D	D	C	D	B	D		D	D	B	B	B	A
Nitric Acid 100%	B	D	D	D	A	D	A	D		D	D	D	B	B	A
Nitric Acid Anhydrous	B	D	D	C	A	D	A	D		D	D	D	A	B	A
Nitrobenzene	C	D	B	B	A		A	B	B	D	B	C	C		A
Nitrogen	A	A	A	A			A	A		A	A	B	A		A

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Corrosion Data



CONTROLLING
PRESSURE & VACUUM

CHEMICALS

	Aluminum	Brass	Carbon Steel	Ductile Iron / Cast Iron	316 Stainless Steel	17-4PH	Alloy20	Monel	Hastelloy C	Buna N (Nitrile)	Delrin	EPDM/EPR	Viton	Flexible Graphite	Teflon-Reinforced or NGR
Nitrus Acid 10%	D	D	D	D	B		B	D		C	B		A		A
Nitrous Gases	B	D	B	C	A		A	D		B	B		A		A
Nitrous Oxide	C	B	B	C	B		B	D	B	B	A		A		A
Oils & Fats	B				A		A			B	B	D			A
Oils, Animal	A	A	A	A	A		A	B	A	A	A	B	B		A
Oils, Petroleum	A	B	A	A	A		A	A	A	A	A	A	D		A
Oils, Petroleum Sour	A	C	B	C	A		A	A	A	A	B	A	D		A
Oils, Water Mixture	A	A	B	B	A		A		A	A	A	A			A
Olaic Acid	B				B		B	A	A		D	C			A
Oleic Acid	B	B	C	C	B		A	B	B	B	B	C	D	A	A
Oleum	B	C	B	D	B		B	C	B	D	D	D	C		A
Oleum Spirits	D	D	D	D	B		B	D		C	D	D	A		A
Olive Oil	B	C	B	B	A		A	A		A	A	B	A		A
Oxalic Acid	C	B	D	D	B	D	B	B		C	C	B	A	A	A
Oxygen	A	A	B	B	A	A	A	A	A	B	D	A	A		A
Ozone, Dry	A	A	A	A	A		A	A	A	D	C	A	B		A
Ozone, Wet	B	B	C	C	A		A	A	A	D	C	B	B		A
Paints & Solvents	A	A	A	A	A		A	A		D	A	D	B		A
Palmitic Acid	B	B	C	C	B		B	B		B	A	B	A		A
Palm Oil	A	B	C	C	B		A	A		B	A	D	A		A
Paper Pulp	D	B		B	A		A	B		B	A	B	B		
Paraffin	A	A	B	B	A		A	A	A	A	A	D	A		A
Paraformaldehyde	B	B	B	B	B		B	B		B	A	D			A
Paraldehyde					B		B			B	A	D		A	A
Pentane	A	A	B	B	A		A	B		A	A	D	A	A	A
Perchlorethylene, Dry	B	C	B	B	A		A	B	B	D	B	D	A		A
Petrolatum (Vaseline Petroleum Jelly)	B	B	C	C	B		A	A		A	A		A		A
Phenol	A	B	D	D	A	B	A	A		D	C	D	B		A
Phosphate Ester 10%	D	D	A	A	A		A	A	A	D	A	A	A		A
Phosphate Acid 10%	D	D	D	D	D	B	B	D		B	D	B	A	A	A
Phosphoric Acid 50% Cold	D	D	D	D	B	B	B	C		B	D	B	A	A	A
Phosphoric Acid 50% Hot	D	D	D	D	D	D	B	C		B	D	B	A	A	A
Phosphoric Acid 85% Cold	D	D	B	B	A	C	B	A		C	D		B	A	A
Phosphoric Acid 85% Hot	D	D	C	C	B	D	B			C	D		A	A	A
Phosphoric Anhydride	A				A		A			D	B		B	A	A
Phosphorous Trichloride	D		B	C	A		A			D	D	B	B	A	A
Phthalic Acid	B	B	C	C	B		B	A	B	C	B		A		A
Phthalic Anhydride	B	B	C	C	B		B	A	A	C	A		A		A
Picric Acid	C	C	D	D	B	C	B	D	B	C	C	B	B		A
Pineapple Juice	A	C	C	C	A		A	A		A	A		A		A
Pine Oil	B	B	B	B	A		A	B		A	A	D	A		A
Pitch (Bitumen)					A		A			C	A	D			A
Polysulfide	D	D		B	B		A	B		B	D	B	B		A
Polyvinyl Acetate	B	B		B	B		B	B			A	B			A
Polyvinyl Chloride	B	B		B	B		B	B			A	B			A
Potassium Bicarbonate	A				A		A	B		B	A				A
Potassium Bichromate	A				A		A	A		B	B		B		A
Potassium Bisulfate	B				A		A	B		B	B	B	A		A
Potassium Bisulfate	C	C	D	D	B		B	D		A	A	B	A		A
Potassium Bromide	C	C	D	D	A	C	B	B		A	A		A		A

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Corrosion Data



CONTROLLING
PRESSURE & VACUUM

CHEMICALS

	Aluminum	Brass	Carbon Steel	Ductile Iron / Cast Iron	316 Stainless Steel	17-4PH	Alloy20	Monel	Hastelloy C	Buna N (Nitrile)	Delrin	EPDM/EPBR	Viton	Flexible Graphite	Teflon-Reinforced or NGR
Potassium Carbonate	D	B	B	B	B	A	B	B		A	A	B	A		A
Potassium Chlorate	C	B	B	B	B	B	B	C		A	A	B	A		A
Potassium Chloride	D	C	C	B	B	B	A	B	B	A	A	A	A		A
Potassium Chromate	B	B		B	B		B	B		B	A	B	B		A
Potassium Cyanide	D	D	B	B	B		B	B	B	A	A	A	A		A
Potassium Dichromate	A	D	C	C	B		A	B		A	A	B	A		A
Potassium Ferricyanide	B	D	C	C	A	B	B	B		A	A	B	A		A
Potassium Ferrocyanide	B	B	C	C	B		B	A		A	A		A		A
Potassium Hydroxide Dilute Cold	D	D	A	A	B	B	B	A		A	D		D		A*
Potassium Hydroxide to 70%, Cold	D	D	B	B	B	C	B	A		B	D	B	D		A*
Potassium Hydroxide Dilute Hot	D	D	B	B	B	C	B	A		B	D	A			A*
Potassium Hydroxide to 70%, Hot	D	D	A	B	B	D	B	A		C	D				A*
Potassium Iodide	D	D	C	C	B	B	B	C		A	A	B	A		A
Potassium Nitrate	A	B	B	B	B	B	B	B	B	A	A	B	A		A
Potassium Oxalate	C				A		A			A	A				A
Potassium Permanganate	B	B	B	B	B	B	B	B	B	A	A	B	A		A
Potassium Phosphate	D	C		C	B		B	B	B	A	A	A	A		A
Potassium Phosphate Di-basic	B	B	A	A	A		A	B	B	A	A	B	A		A
Potassium Phosphate Tri-basic	D		A	A	B		B	B		B	A	B	A		A
Potassium Sulfate	A	B	B	C	A	A	A	B		A	A	A	A		A
Potassium Sulfide	B	B	B	B	A		A	C	A	A	A	B	B		A
Potassium Sulfite	B	B	B	B	A		A	C	B	B	A	D	B		A
Producer Gas	B	B	B	B	B	A	B	A		A	A	D	A		A
Propane Gas	A	A	B	B	B	A	A	B	A	A	A	D	A		A
Propyl Bromide	B	B		B	B		A	B		B	A	B	B		A
Propylene Glycol	A	B	B	B	B		B	B		A	C	B	A		A
Pyridine	B		B	B	B		A			D	D		D		A
Pyrogallic Acid	B	B	B	B	B	B	A	B		A	A		A		A
Quench Oil	A	B	B	B	A		A			A	A		A		A
Quinine, Sulfate, Dry					A	B	A	B			A				A
Resins & Rosins	A	A	C	C	A	B	A	A		C	A		A		A
Resorcinol					B		B								A
Road Tar	A	A	A	A	A		A	A		B	A	D	A		A
Roof Pitch	A	A	A	A	A		A	A		B	A		A		A
Rosin Emulsion	A	B	C	C	A		A	A		D	A		B		A
R P-1 Fuel	A	A	A	A	A		A	A		B	A		A		A
Rubber Latex Emulsions	A	A	B	B	A		A			A	A		A		A
Rubber Solvents	A	A	A	A	A		A	A		D	C		D		A
Salad Oil	B	B	C	C	B		A	B		A	A	B	A		A
Salicylic Acid	C	C	D	D	A		B	B		A	A	B	A		A
Salt (NaCl)	B	B	C	C	B		A	A		A	A		A		A
Salt Brine	B	B		D	B		B	B		A	A	B	B		A
Sauerkraut Brine					B		B				C				A
Sea Water	C	C	D	D	B		B	A		A	A	A	A		A
Sewage	C	C	C	D	B	A	B	B		A	B	B	B		A
Shellac	A	A	A	B	A		A	A		A	A				A
Silicone Fluids	B	B		B	B		B			B	A		B		A
Silver Bromide	D				A	C	A	B			D				A
Silver Cyanide	D	D		D	A		A	B		B	D		B		A
Silver Nitrate	D	D	D	D	A		A	D		C	A	A	A		A

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Corrosion Data



CONTROLLING
PRESSURE & VACUUM

CHEMICALS

	Aluminum	Brass	Carbon Steel	Ductile Iron / Cast Iron	316 Stainless Steel	17-4PH	Alloy20	Monel	Hastelloy C	Buna N (Nitrile)	Delrin	EPDM/EPBR	Viton	Flexible Graphite	Teflon-Reinforced or NGR
Silver Plating sol.	B				A		A				D				A
Soap Solutions (Stearates)	C	A	A	B	A		A	A		A	A	A	A		A
Sodium Acetate	B	B	C	C	B		B	B	B	B	A	B	A		A
Sodium Aluminate	D	B	C	C	A		B	B	B	A	A	B	A		A
Sodium Benzoate	B				B		B	B			B				A
Sodium Bicarbonate	B	B	C	C	B		A	B		A	B	A	A		A
Sodium Bichromate	A				B		B			D	A				A
Sodium Bisulfate 10%	D	B	D	D	A		A	B		A	D	B	A		A
Sodium Bisulfite 10%	D	B	D	D	A		B	B	B	A	D	B	A		A
Sodium Borate	B	B	C	C	B		B	B		A	A	B	A		A
Sodium Bromide 10%	B	B	C	D	B		B	B		A	A	B	A		A
Sodium Carbonate (Soda Ash)	D	B	B	B	A		A	B	B	A	A	B	A		A
Sodium Chlorate	C	B	C	C	B		B	C	B	A	A	B	A	B	A
Sodium Chloride	B	B	C	C	B		A	A	B	A	A	B	A	A	A
Sodium Chromate	D	C	B	B	A		B	B		A	A	B	A		A
Sodium Citrate	D				B		B			A	A				A
Sodium Cyanide	D	D	B	B	A	B	A	B		A	A	B	A		A
Sodium Ferricyanide	A				A		A	B		A	A				A
Sodium Fluoride	C	C	D	D	B	B	A	B		A	A	B	A		A
Sodium Hydroxide 20% Cold	D	A	A	A	A	A	B	A		A	D	B	B	A	A*
Sodium Hydroxide 20% Hot	D	A	B	B	A	C	A	A		B	D	B	C	A	A*
Sodium Hydroxide 50% Cold	D	A	A	B	A	C	A	A		A	D	B	C	A	A*
Sodium Hydroxide 50% Hot	D	A	B	B	A	B	A	B		B	D		C	A	A*
Sodium Hydroxide 70% Cold	D	A	A	A	A	B	B	A		B	D	B	C	A	A*
Sodium Hydroxide 70% Hot	D	B	B	B	A	C	B	B		D	D	B	C	A	A*
Sodium Hypochlorite (Bleach)	D	D	D	D	D	D	C	D	A		D		A		A
Sodium Hyposulfite	B				B		B	B			A				A
Sodium Lactate	D				A		A	B			A				A
Sodium Metaphosphate	A	C	B	C	B	B	B		A	A	B	B		A	
Sodium Metasilicate Cold	B	B	C	C	A		A	A		B	A		B		A
Sodium Metasilicate Hot	B	B	D	D	A		A	A	A		A				A
Sodium Nitrate	A	B	B	B	A	B	A	B	B	C	A	B	A		A
Sodium Nitrite	A				B		B	C	B	C	B	A	B		A
Sodium Perborate	B	B	B	B	B	B	B	B	B	C	A	A	A		A
Sodium Peroxide	C	D	C	C	B	B	B	B	B	C	A	A	A		A
Sodium Phosphate	D	C	C	C	B	B	B	B	B	B	B	A	A		A
Sodium Phosphate Di-basic	D	C	C	C	B		B	B	B	A	A	A	A		A
Sodium Phosphate Tri-basic	D	C	C	C	B		B	B	B	B	A	A	A		A
Sodium Polyphosphate					B		B	B	B	B		A			A
Sodium Salicylate					A		A				A	A			A
Sodium Silicate	B	B	B	B	B		B	B		A	A	B	A		A
Sodium Silicate, Hot	C	C	C	C	B		B	B		A	A	B	A		A
Sodium Sulfate	B	B	B	B	A	B	A	A		A	A	A	A		A
Sodium Sulfide	C	D	B	B	B	A	B	B		A	A	B	A		A
Sodium Sulfite	B	C		A	A	A	A	B	B	A	A	B	B		A
Sodium Tetraborate				A	A		A			A	A	B			A
Sodium Thiosulfate	B	B	B	C	B	A	B	B		A	A	B	A		A
Soybean Oil	B	B	C	C	A		A	A		A	B	B	A		A
Starch	B	B	C	C	B		A	A		A	A	C	A		A
Steam (212°F)	A	A	A	A	A	A	A	B		D	D	B	C	A	A

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Corrosion Data



CONTROLLING
PRESSURE & VACUUM

CHEMICALS

	Aluminum	Brass	Carbon Steel	Ductile Iron / Cast Iron	316 Stainless Steel	17-4PH	Alloy20	Monel	Hastelloy C	Buna N (Nitrile)	Delrin	EPDM/EPBR	Viton	Flexible Graphite	Teflon-Reinforced or NGR
Stearic Acid	A	C	C	C	B		B	B	A	A	A	B	A	A	A
Styrene	A	A	A	B	A		A	B	A	D	A	D	B	A	A
Sugar Liquids	A	A	B	B	A		A	A		A	A	B	A		A
Sugar, Syrups & Jam	B	B		C		A	A			A	A				A
Sulfate, Black Liquor	C	C	C	C	B	A	B	B		C	C	B	C		A
Sulfate, Green Liquor	B	C	C	C	B	A	B	B		C	A		C		A
Sulfate, White Liquor	B	C	C	C	B	B	D	C		C	D		C		A
Sulfur	A	D	C	C	B		A	B		D	A	B	B		A
Sulfur Chlorides	D	B	D	D	D		A	B		D	A	C	A	A	A
Sulfur Dioxide, Dry	A	B	B	B	A	A	B	B	A	D	A	A	A	A	A
Sulfur Dioxide, Wet	C	D			A	C	B	A	B	D	D	B		A	A
Sulfur Hexafluoride	A	B			A		A			A	A				A
Sulfur, Molten	A	D	C	B	B		A	D	B	D	D	B	B		A
Sulfur Trioxide		B	B	B	B	B	B	B	B	D	D		B	D	A
Sulfur Trioxide, Dry	A	B	B	B	B	B	B	B	B	D	A	B	A	D	A
Sulfuric Acid 0 to 77%	C	C	D	D	C		B	B		B	D		A	A	A
Sulfuric Acid 100%	D	C	C	B	A	B	A	D		D	D	C	B	D	A
Sulfurous Acid	C	D	D	D	B		B	D	B	C	C	C	A	A	A
Tall Oil	C	B	B	B	B		B	B	A	B	A	D	A		A
Tannic Acid (Tannin)	C	B	C	C	B	B	B	B	B	B	A	B	A		A*
Tanning Liquors	A				B		B			B	D				A*
Tar & Tar Oils	A	A	A	A	A	A	A	A		C	A	D	A		A*
Tartaric Acid	B	B	D	D	A	A	A	B	B	C	A	B	A		A*
Tetraethyl Lead	B	B	C	C	B		B	A		A	A				A*
Toluol (Toluene)	A	A	A	A	A		A	A	A	D	C	D	B		A*
Tomato Juice	A	C	C	C	A		A	B		A	A		A		A
Transformer Oil	A	B	A	B	A		A	A		A	A		A		A
Tributyl Phosphate	A	A	A	A	A		A	A		D	A	B	D		A
Trichlorethylene	A	B	B	C	B	A	B	B	A	D	A	D	B	A	A
Trichloroacetic Acid	D	B		D	D		B	B	A	C	D		D		A
Triethanolamine	B				B		B	B	A	C	A	B			A
Triethylamine		B			B		B		A	B	C				A
Trisodium Phosphate	D				B		B		A	A	A	B	B		A
Tung Oil	B	B	B	B	A		A	C	A	A	A	A	A		A
Turpentine	B	B	B	B	B	A	B	D	A	B	A	D	A		A
Urea	B	B	C	C	B		B	B	A	C	A	B	D		A
Uric Acid	D				A		A		A	A	B				A
Varnish	A	A	C	C	A		A	A	A	C	A	D	B		A
Vegetable Oils	A	B	B	B	A		A	B	A	A	A	D	A		A
Vinegar	C	B	D	D	A		A	B	A	D	B	A	D		A
Vinyl Acetate	B	B		B	B		B	B	A		D	A		A	A
Water, Distilled	A	A	D	D	A	A	A	A	A	C	A	B	A		A
Water, Fresh	A	A	C	C	A	A	A	A	A	C	A	B	A		A
Water, Acid Mine	D	D	D	D	B	B		D	C	B	A	A	D	A	A
Waxes	A	A	A	A	A		A	A	A	A	A	C	A		A
Whiskey & Wines	D	B	D	D	A		A	A	A	B	A	A	A		A
Xylene (Xylol), Dry	A	A	B	B	A		A	A	A	D	A	D	B		A
Zinc Bromide	D	B		D	B		B	B	A	B	A	B	B	A	A
Zinc Hydrosulfite	D	C	A	B	A		A	B	A	A	A	A	A		A
Zinc Sulfate	D	B	D	D	B		A	B	A	A	A	A	A	A	A

Ratings: **A**=Excellent **B**=Good **C**=Poor **D**=Do not use **Blank**=No Information

* Not with reinforced or polyfill



Gas Compatibility Data

Gas Compatibility Data

The compatibility data* shown on the following pages has been compiled to assist in evaluating the appropriate materials to use in handling various gases. It is extremely important that all gas control equipment be compatible with the gas being passed through it. The use of a device that is not compatible with the service gas may damage the unit and cause a leak that could result in property damage or personal injury. To reduce potentially dangerous situations, always check for compatibility of materials before using any gases in your gas control equipment.

Since combinations of gases are virtually unlimited, mixtures (except for Ethylene Oxide/Halocarbon and Ethylene Oxide/CO₂ sterilizing gas mixtures) are not listed in the Compatibility Chart. Before using a gas mixture or any gas not listed in the chart, we strongly urge you to contact your nearest Advanced Representative for information and assistance.

Directions

To use this chart, proceed as follows:

1. Locate the gas you are using in the first column.
2. Compare the materials of construction for the equipment you intend to use with the "materials of construction" shown in the Compatibility Chart. Then use the "Key to Materials Compatibility" to determine compatibility.

Key to Materials Compatibility

S: Satisfactory for use with the intended gas.

U: Unsatisfactory for use with the intended gas.

I: Insufficient data available to determine compatibility with the intended gas.

C1 thru C8: Conditionally acceptable for use with the intended gas as follows:

C1: Satisfactory with brass having a low (65–70% maximum) copper content. Brass with higher copper content is unacceptable.

C2: Satisfactory with acetylene; however, cylinder acetylene is packaged dissolved in a solvent (generally acetone) which may be incompatible with these elastomers.

C3: Compatibility varies depending on specific Kalrez® compound used. Consult E.I. DuPont for information on specific applications.

C4: Satisfactory with brass, except where acetylene or acetylides are present.

C5: Generally unsatisfactory, except where specific use conditions have proven acceptable.

C6: Satisfactory below 1000 psig.

C7: Satisfactory below 1000 psig where gas velocities do not exceed 30 ft./sec.

C8: Material compatibility depends on condition of use.

* This chart has been prepared for use with dry (anhydrous) gases at normal operating temperature of 70°F. Information may vary if different operating conditions exist. Systems and equipment used in oxidizer gas service (e.g., Oxygen or Nitrous Oxide) must be cleaned for oxidizer service.

Important

This information is for experienced operators who know the general principles and the safety precautions to be observed in handling specialty gases and associated equipment. If you are not certain you fully understand these safety precautions, we urge you to obtain and read the applicable Material Safety Data Sheet (MSDS) and Equipment Instruction Booklet.

The information contained in the Compatibility Chart has been compiled by Advanced from what it believes are authoritative sources and it is offered solely as a convenience to its customers. While Advanced believes that this information is accurate and factual as of the date of this publication, this information is intended to be used only as a guide in providing general information with respect to the products mentioned; and, therefore, it is not to be taken as a warranty or representation for which Advanced assumes legal responsibility.

Since the user's product formulation, specific use application, and conditions of use are all outside Advanced's control, Advanced makes no warranty or representation regarding the result which may be obtained by the user. It shall be the responsibility of the user to determine the suitability of the user's gas control equipment for use with the products mentioned.



Gas Compatibility Data

Gas Compatibility Chart

		Materials of Construction																	
		Metals							Plastics					Elastomers					
		Brass	303 Stainless Steel	316 Stainless Steel	Aluminum	Zinc	Copper	Monel	PCTFE	Teflon	Tefzel	Kynar	PVC	Polycarbonate	Kalrez	Viton	Buna-N	Neoprene	Polyurethane
Common Name	Chemical Formula	C1	S	S	I	U	U	S	S	S	S	S	I	I	S	C2	C2	C2	C2
Acetylene	C ₂ H ₂	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Air	—	S	S	S	S	I	U	S	S	S	S	S	I	I	S	S	S	S	I
Allene	C ₃ H ₄	U	S	S	S	U	U	S	S	S	S	U	S	U	C3	U	S	S	U
Ammonia	NH ₃	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Argon	Ar	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Arsine	AsH ₃	S	S	S	C5	I	S	S	S	S	S	S	S	I	S	S	S	S	U
Boron Trichloride	BCl ₃	U	S	S	I	I	S	S	S	S	S	I	S	I	C3	I	I	I	I
Boron Trifluoride	BF ₃	S	S	S	S	I	S	S	S	S	S	I	S	I	C3	I	I	I	I
1,3-Butadiene	C ₄ H ₆	S	S	S	S	S	S	S	S	S	S	S	S	U	S	S	U	S	U
Butane	C ₄ H ₁₀	S	S	S	S	S	S	S	S	S	S	S	S	U	S	S	S	S	S
1-Butene	C ₄ H ₈	S	S	S	S	S	S	S	S	S	S	S	S	U	S	S	S	S	S
Cis-2-Butene	C ₄ H ₈	S	S	S	S	S	S	S	S	S	S	S	S	U	S	S	S	S	S
Trans-2-Butene	C ₄ H ₈	S	S	S	S	S	S	S	S	S	S	S	S	U	S	S	S	S	S
Carbon Dioxide	CO ₂	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Carbon Monoxide	CO	S	S	S	S	S	S	S	S	S	S	S	S	S	S	I	S	S	S
Carbonyl Sulfide	COS	S	S	S	S	I	S	S	S	S	S	S	S	I	I	S	I	I	I
Chlorine	Cl ₂	U	S	S	U	U	U	S	S	S	S	S	U	U	S	S	U	U	U
Deuterium	D ₂	S	S	S	S	S	S	S	S	S	S	S	S	I	S	S	S	S	S
Diborane	B ₂ H ₆	S	S	S	S	I	S	S	S	S	S	I	I	I	S	I	I	I	I
Dichlorosilane	H ₂ SiCl ₂	I	S	S	I	I	I	S	S	S	S	S	I	I	S	I	I	I	I
Dimethyl Ether	C ₂ H ₆ O	S	S	S	S	S	S	S	S	S	S	S	S	U	S	S	S	S	I
Ethane	C ₂ H ₆	S	S	S	S	S	S	S	S	S	S	S	S	I	S	S	S	S	S
Ethyl Acetylene	C ₄ H ₆	I	S	S	S	I	U	S	S	S	I	S	I	I	S	S	I	S	I
Ethyl Chloride	C ₂ H ₅ Cl	S	S	S	U	I	S	S	S	S	S	S	U	U	S	S	S	S	U
Ethylene	C ₂ H ₄	S	S	S	S	S	S	S	S	S	S	S	I	I	S	S	S	S	I
Ethylene Oxide**	C ₂ H ₄ O	C4	S	S	C5	I	U	I	S	S	I	I	U	U	C3	U	U	U	U

** Satisfactory for use with EPR (Ethylene Propylene Rubber) and EPDM.

Gas Compatibility Data



CONTROLLING
PRESSURE & VACUUM

Gas Compatibility Chart (continued)

		Materials of Construction																	
		Metals						Plastics					Elastomers						
		Brass	303 Stainless Steel	316 Stainless Steel	Aluminum	Zinc	Copper	Monel	PCTFE	Teflon	Tefzel	Kynar	PVC	Polycarbonate	Kalrez	Viton	Buna-N	Neoprene	Polyurethane
Common Name	Chemical Formula																		
Ethylene Oxide/Carbon Dioxide Mixtures**		C4	S	S	I	I	U	I	S	S	I	I	U	U	C3	U	U	U	U
Ethylene Oxide/Halocarbon Mixtures**		C4	S	S	I	I	U	I	S	S	I	I	U	U	C3	U	U	U	U
Ethylene Oxide/HCFC-124		C4	S	S	I	I	U	I	S	S	I	I	U	U	C3	U	U	U	U
Halocarbon 11	CCl ₃ F	S	S	S	C5	I	S	S	S	S	S	S	U	U	C3	S	S	U	U
Halocarbon 12	CCl ₂ F ₂	S	S	S	C5	I	S	S	S	S	S	S	U	U	C3	S	S	S	S
Halocarbon 13	CClF ₃	S	S	S	C5	I	S	S	S	S	S	S	U	U	C3	S	S	S	S
Halocarbon 13B1	CBF ₃	S	S	S	C5	I	S	S	S	S	S	S	U	U	C3	S	S	S	S
Halocarbon 14	CF ₄	S	S	S	C5	I	S	S	S	S	S	S	U	U	C3	S	S	S	S
Halocarbon 21	CHCl ₂ F	S	S	S	C5	I	S	S	S	S	S	S	U	U	C3	U	U	S	S
Halocarbon 22	CHClF ₂	S	S	S	C5	I	S	S	S	S	S	S	U	U	C3	U	U	S	U
Halocarbon 23	CHF ₃	S	S	S	C5	I	S	S	S	S	S	S	U	U	C3	I	I	I	S
Halocarbon 113	CCl ₂ FCClF ₂	S	S	S	C5	U	S	S	S	S	S	S	U	U	C3	S	S	S	S
Halocarbon 114	C ₂ Cl ₂ F ₄	S	S	S	C5	I	S	S	S	S	S	S	U	U	C3	S	S	S	S
Halocarbon 115	C ₂ ClF ₅	S	S	S	C5	I	S	S	S	S	S	S	U	U	C3	S	S	S	S
Halocarbon 116	C ₂ F ₆	S	S	S	C5	I	S	S	S	S	S	S	U	U	C3	I	I	I	S
Halocarbon 142B	C ₂ H ₃ ClF ₂	S	S	S	C5	I	S	S	S	S	S	S	U	U	C3	U	S	S	S
Halocarbon 152A	C ₂ H ₄ F ₂	S	S	S	C5	I	S	S	S	S	S	S	U	U	C3	U	S	S	S
Halocarbon C-318	C ₄ F ₈	S	S	S	C5	I	I	S	S	S	S	S	U	U	C3	S	S	S	S
Halocarbon 502	CHClF ₂ /CClF ₂ -CF ₃	I	S	S	C5	I	I	S	S	S	I	S	U	U	C3	S	S	S	S
Halocarbon 1132A	C ₂ H ₂ F ₂	S	S	S	C5	I	S	S	I	S	S	S	U	U	C3	I	I	I	S
Helium	He	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Hydrogen	H ₂	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Hydrogen Chloride	HCl	U	S	S	I	U	U	S	S	S	S	S	S	U	S	S	U	U	U
Hydrogen Sulfide	H ₂ S	U	S	S	S	I	I	S	S	S	S	S	S	S	S	U	S	S	S
Isobutane	C ₄ H ₁₀	S	S	S	S	S	S	S	S	S	S	S	S	U	S	S	S	S	S
Isobutylene	C ₄ H ₈	S	S	S	S	I	S	S	S	S	S	S	S	I	S	S	S	S	I

** Satisfactory for use with EPR (Ethylene Propylene Rubber) and EPDM.

Gas Compatibility Data



CONTROLLING
PRESSURE & VACUUM

Gas Compatibility Chart (continued)

		Materials of Construction																	
		Metals							Plastics					Elastomers					
		Brass	303 Stainless Steel	316 Stainless Steel	Aluminum	Zinc	Copper	Monel	PCTFE	Teflon	Tefzel	Kynar	PVC	Polycarbonate	Kalrez	Viton	Buna-N	Neoprene	Polyurethane
Common Name	Chemical Formula																		
Isopentane	C ₅ H ₁₂	S	S	S	S	S	S	S	S	S	S	S	S	U	S	S	S	S	S
Krypton	Kr	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Methane	CH ₄	S	S	S	S	S	S	S	S	S	S	S	S	I	S	S	S	S	S
Methyl Chloride	CH ₃ Cl	S	S	S	U	U	S	S	S	S	S	S	I	I	S	S	U	U	U
Methyl Mercaptan	CH ₃ SH	S	S	S	U	I	U	U	S	S	S	I	I	I	S	I	I	S	I
Neon	Ne	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Nitric Oxide	NO	U	S	S	S	I	S	S	S	S	S	I	S	I	S	I	I	S	I
Nitrogen	N ₂	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Nitrogen Dioxide	NO ₂	I	S	S	S	I	I	S	S	S	S	I	U	I	S	U	U	U	U
Nitrous Oxide	N ₂ O	S	C6	C6	C5	S	S	S	S	C5	S	S	S	I	C3	S	S	S	S
Oxygen	O ₂	S	C7	C7	C7	S	S	S	S	C5	S	S	S	S	C3	C8	C8	C8	S
Perfluoropropane	C ₃ F ₈	S	S	S	S	I	S	S	S	S	S	I	I	I	I	I	S	S	I
Phosphine	PH ₃	I	S	S	S	I	I	S	S	S	S	I	I	I	S	I	I	I	I
Phosphorous Pentafluoride	PF ₅	I	S	S	I	I	I	S	S	S	S	I	I	I	I	I	I	I	I
Propane	C ₃ H ₈	S	S	S	S	S	S	S	S	S	S	S	S	U	S	S	S	S	S
Propylene	C ₃ H ₆	S	S	S	S	S	S	S	S	S	S	S	S	U	S	S	U	U	U
Propylene Oxide	C ₃ H ₆ O	I	S	S	I	I	I	I	S	S	S	I	U	S	C3	U	U	U	U
Refrigerant Gases	—	See Halocarbons																	
Silane	SiH ₄	S	S	S	S	I	S	S	S	S	S	S	S	I	S	S	S	S	S
Silicon Tetrachloride	SiCl ₄	I	S	S	U	I	I	S	S	S	I	I	U	I	C3	I	I	I	I
Silicon Tetrafluoride	SiF ₄	S	S	S	S	I	S	S	S	S	S	S	S	I	C3	S	S	S	S
Sulfur Dioxide	SO ₂	U	S	S	S	U	U	S	S	S	S	S	S	U	S	S	U	U	S
Sulfur Hexafluoride	SF ₆	S	S	S	S	I	S	S	S	S	S	S	S	I	C3	S	S	S	S
Trichlorosilane	HSiCl ₃	I	S	S	U	I	I	S	S	S	I	I	U	I	C3	I	I	I	I
Vinyl Methyl Ether	C ₃ H ₆ O	S	S	S	S	I	U	S	S	S	S	I	I	U	C3	I	I	I	I
Xenon	Xe	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S



CONTROLLING
PRESSURE & VACUUM

Semiconductor Gases & Properties

TYPE	GAS	SYNONYM	FORMULA	CLASS	VP@20 C	HEAT TRACING	WEIGH SCALES	VENTURI
Silicon Precursor	Dichlorosilane	DCS	SiH ₂ Cl ₂	F+, T, C	1.6	R	R	R
	Disilane	Silicon Hexahydride	Si ₂ H ₆	F+	2.3	R	R	
	Germane	Germanium Hydride	GeH ₄	F+, T+	n/a			R
	Germanium Tetrafluoride	Tetrafluorogermane	GeF ₄	T, C	4.04		R	R
	Methyl Silane	Monomethylsilane	CH ₃ SiH ₃	F+	13		R	
	Silane	Silicon Hydride	SiH ₄	F+, P	n/a			R
	Silicon Tetrachloride	Tetrachlorosilane	SiCl ₄	C	0.2	R	R	R
	Silicon Tetrafluoride	Tetrafluorosilane	SiF ₄	T, C	n/a			R
	Trichlorosilane	TCS	SiHCl ₃	F, T, C	0.6	R	R	R
Dopant	Arsine		AsH ₃	F+, T+	15		R	R
	Boron Trifluoride	Trifluoroborane	BF ₃	T, C	2.2	R	R	R
	Boron-11 Trifluoride		¹¹ BF ₃	T, C	2.2	R	R	R
	Diborane	Diboron Hexahydride	B ₂ H ₆	F+, T+	n/a			R
	Phosphine	Phosphorus Hydride	PH ₃	F+, T+	34.6		R	R
	Trimethylboron	TMB	B(CH ₃) ₃	T, F	4.1		R	R
Etchant	Boron Trichloride		BCl ₃	T, C	1.6	R	R	R
	Chlorine		Cl ₂	O, T, C	6.8		R	R
	Chlorine Trifluoride		ClF ₃	O, T, C	1.5	R	R	R
	Halocarbon 14	Tetrafluoromethane Carbon Tetrafluoride	CF ₄	NONE	n/a			
	Halocarbon 23	Trifluoromethane	CHF ₃	NONE	41.6		R	
	Halocarbon 32	Difluoromethane	CH ₂ F ₂	F	14.2		R	
	Halocarbon 41	Methyl Fluoride	CH ₃ F	F	3.81		R	
	Halocarbon 116	Hexafluoroethane	C ₂ F ₆	NONE	30		R	
	Halocarbon 125	Pentafluoroethane	C ₂ HF ₅	NONE	10.5		R	
	Halocarbon 218	Perfluoropropane	C ₃ F ₈	NONE	7.7		R	
	Halocarbon C318	Octafluorocyclobutane	C ₄ F ₈	NONE	2.7	R		
	Hydrogen Bromide		HBr	T, C	21		R	R
	Hydrogen Chloride		HCl	T, C	21		R	R
	Hydrogen Fluoride		HF	T+, C	1	R	R	R
	Nitrogen Trifluoride		NF ₃	O, Xn	n/a			R
	Sulphur Hexafluoride		SF ₆	NONE	21		R	
	Etchant (Laser)	1% Fluoride, 1.25% Krypton bal Neon	1% F ₂ , 1.25% Kr, Bal Ne	O, T, C	n/a			R
		1.2% Krypton, bal Neon	1.2% Kr, Bal Ne	NONE	n/a			R
Atmospherics	Argon		Ar	NONE	n/a			
	Helium		He	NONE	n/a			
	Hydrogen		H ₂	F+	n/a			
	Nitrogen		N ₂	NONE	n/a			
	Oxygen		O ₂	O	n/a			
	Xenon		Xe	NONE	n/a			
Reactants	Ammonia		NH ₃	T, C	8.6		R	R
	Carbon Dioxide		CO ₂	NONE	57.3		R	
	Carbon Monoxide		CO	F+, T	n/a			
	Nitrous Oxide		N ₂ O	O	50.8		R	
	Sulphur Dioxide		SO ₂	T, C	3.3		R	R
	Tungsten Hexafluoride		WF ₆	T+, C	1.1	R	R	R



Cylinder Connectors



Cylinder connectors are used for connecting various items of gas handling apparatus (such as pressure regulators or pigtails) directly to a high pressure gas cylinder. The actual connection varies depending on the gas in the cylinder and is designated by a code (BS, DIN, or CGA Connection Number) as set forth in BS341, DIN 477, or CGA V-1.

Cylinder connectors consist of a nut and nipple and in some cases require a washer for sealing purposes. Refer to technical information section for connection type details.

FTI offers cylinder connections in a variety of configurations and materials.

- Full range of products - cylinder connectors, cap nuts, gaskets adaptors
- Upstream connection fits all standards - CGA, DIN, BS
- Downstream connection - butt weld, NPT, face seal glands
- Materials of construction - 316L, brass, chrome-plated brass
- Customised solutions on request

Cylinder Connectors



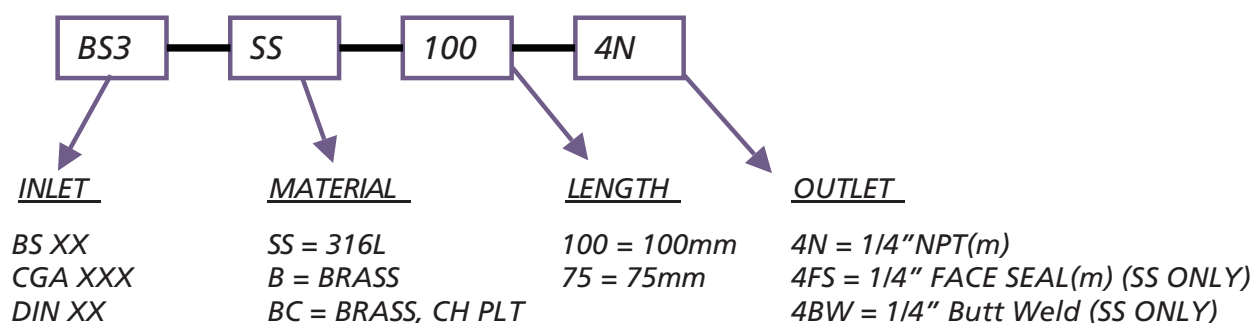
CONTROLLING
PRESSURE & VACUUM

GAS	BS	DIN	CGA
Acetylene	4	-	510
Air	3	6	590
Allene	-	1	510
Ammonia, Anhydrous	10	8	240, 660
Argon	3	10	580
Arsine	4	5	350
1,3 –Butadiene	4	1	510
Butane	4	1	510
Butenes	4	1	510
Carbon Dioxide	8	6	320
Carbon Monoxide	4	5	350
Carbonyl Fluoride	-	8	660
Carbonyl Sulphide	-	5	330
Chlorine	6	8	660
Cyanogen	-	8	660
Deuterium	4	1	350
Dimethylamine	11	5	240
Dimethyl Ether	-	1	510
Ethane	4	1	350
Ethyl Acetylene	-	1	510
Ethyl Chloride	7	1	510
Ethylene	4	1	350
Ethylene Oxide	7	1	510
Halocarbon-14	6	6	580
Halocarbon-22	6	6	660
Helium	3	10	580
Hydrogen	4	1	350
Hydrogen Bromide	-	8	330
Hydrogen Chloride	6	8	330
Hydrogen Sulphide	15	5	330

GAS	BS	DIN	CGA
Iso-Butane	4	1	510
Iso-Butylene	4	1	510
Krypton	3	10	580
Methane	4	1	350
Methyl Chloride	7	5	660
Methyl Mercaptan	-	5	330
Monoethylamine	11	5	240
Monomethylamine	11	5	240
Natural Gas	4	1	350
Neon	3	10	580
Nitric Oxide	14	8	660
Nitrogen	3	10	580
Nitrogen Dioxide	14	8	660
Nitrous Oxide	13	6	326
Oxygen	3	-	540
Phosgene	6	8	660
Phosphine	4	5	350
Propane	4	1	510
Propylene	4	1	510
Silane	-	5	350
Silicon Tetrafluoride	-	8	330
Sulphur Dioxide	12	8	660
Sulphur Hexafluoride	6	6	240
Trimethylamine	11	5	240
Vinyl Chloride	7	5	510
Xenon	3	10	580

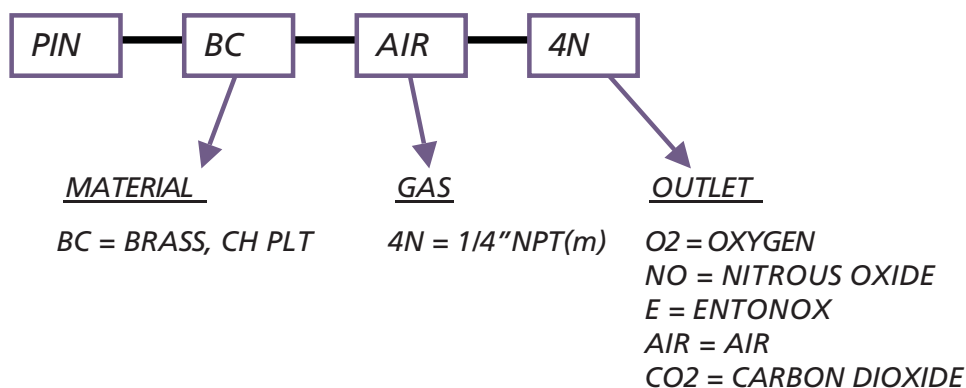
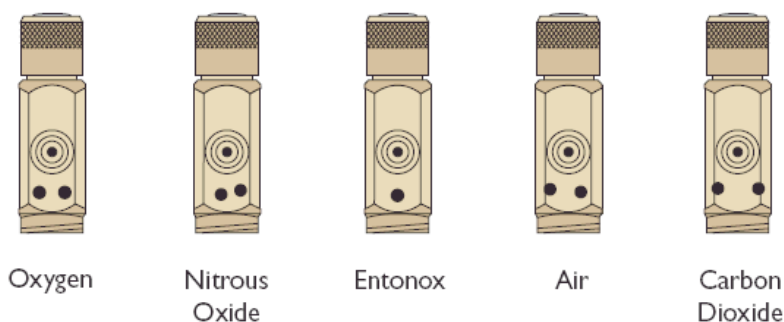
Cylinder Connectors - Part Numbers

Cylinder Connectors – Part Numbers



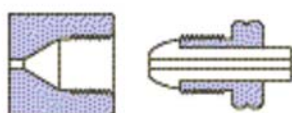
Cylinder Connectors – For Medical Gases

Pin Indexed Yolk connections available, in chrome-plated brass:



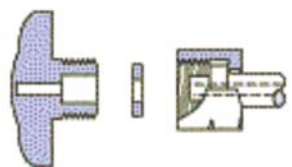
BS341 British Standard Cylinder Valve Outlets & Connections

BS 341 British Standard Cylinder Valve Outlets and Connections



BS No. 3

5/8" BSP RH INT.



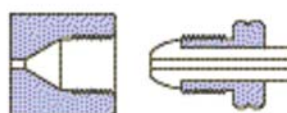
BS No. 6

5/8" BSP RH EXT.
Flat Seal with Gasket



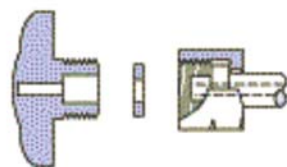
BS No. 14

3/8" BSP RH EXT.
Flat Seal with Gasket



BS No. 4

5/8" BSP LH INT.



BS No. 8

0.860 BSW RH EXT.
Flat Seal with Gasket

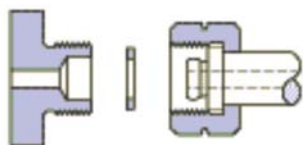


BS No. 15

3/8" BSP LH EXT.
Flat Seal with Gasket

DIN477 Cylinder Valve Outlets & Connections

DIN 477 German Standard Cylinder Valve Outlets and Connections



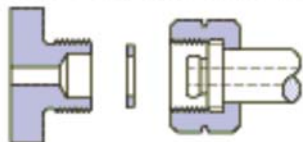
DIN 1

21,80 mm x 1/14" - LH EXT.
Flat Seal with Gasket



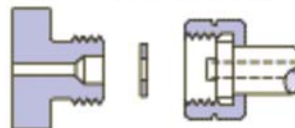
DIN 5

1" - LH EXT.
Flat Seal with Gasket



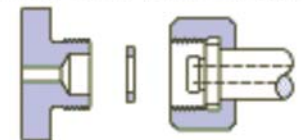
DIN 6

21,80 mm x 1/14" - RH EXT.
Flat Seal with Gasket



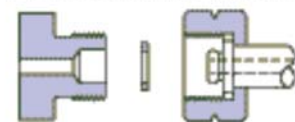
DIN 8

1" - RH EXT.
Flat Seal with Gasket



DIN 10

24,32 mm x 1/14" - RH EXT.
Flat Seal with Gasket

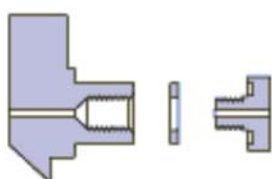


DIN 14

M 19 x 1,5 mm - LH EXT.
Flat Seal with Gasket

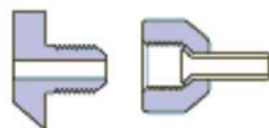
CGA Cylinder Valve Outlets & Connections

CGA Cylinder Valve Outlets and Connections



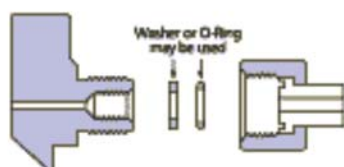
Connection 110

5/16" - 32 RH INT. with Gasket



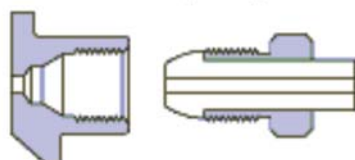
Connection 165

0.4375" - 20 UNF 2A RH EXT.



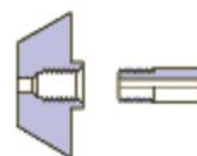
Connection 180

0.625" - 18 UNF 2A RH EXT. with Gasket
(washer or O-ring may be used)



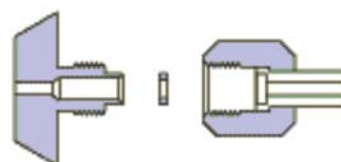
Connection 296

0.803" - 14 RH INT.



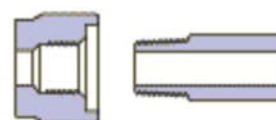
Connection 160

1/8" - 27 NGT RH INT.



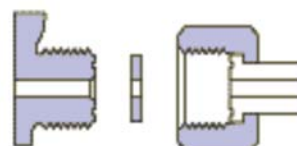
Connection 170

9/16" - 18RH EXT. and
5/16" - 32 RH INT., with Gasket



Connection 240

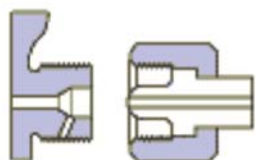
3/8" - 18 NGT RH INT.



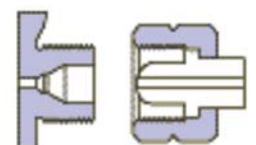
Connection 320

0.825" - 14 RH EXT. with Gasket

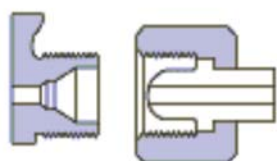
CGA Cylinder Valve Outlets & Connections



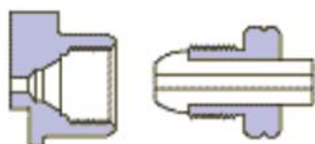
Connection 326
0.825" - 14 RH EXT.



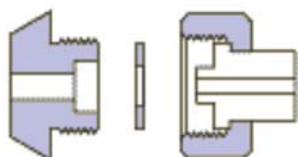
Connection 350
0.825" - 14 LH EXT.



Connection 540
0.903" - 14 RH EXT.



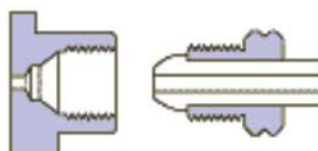
Connection 590
0.965" - 14 LH INT.



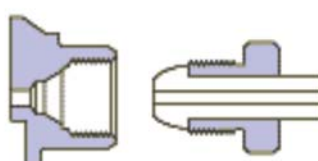
Connection 660
1.030" - 14 RH EXT. with Gasket



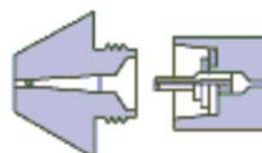
Connection 330
0.825" - 14 LH EXT. with Gasket



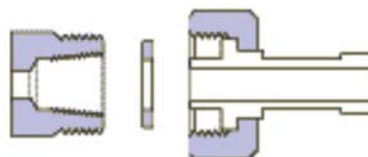
Connection 510
0.885" - 14 LH INT.



Connection 580
0.965" - 14 RH INT.



Connection 600
1.000" - 20 UNEF RH EXT. with Gasket



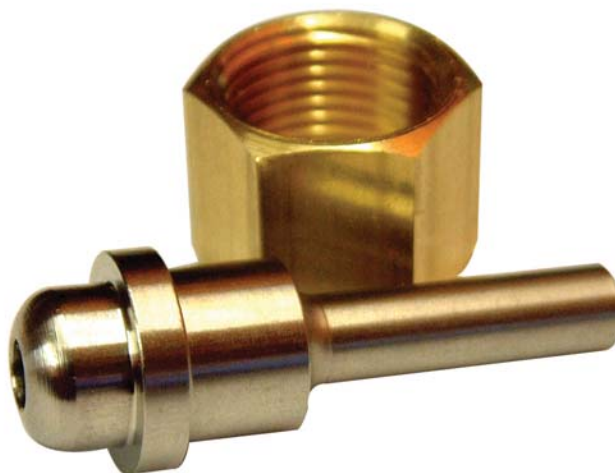
Connection 705
1.125" - 14 UNS 2A RH EXT. with Gasket



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Special Cylinder Connector

Special Connector converts 3/8 BSP male to 1/4" stainless tube. For connection to Let-Lok fitting.



Abbreviations & Symbols



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Abbreviations & Symbols

Symbol	Definition
Å	angstrom(s)
ACGIH	American Conference of Governmental Industrial Hygienists
ASTM	American Society for Testing Materials
atm	atmosphere(s)
avg	average
Btu	British thermal unit(s)
cal	calorie(s)
CAS	Chemical Abstract Services
cc	cubic centimeters
ccm	cubic centimeters per minute
CGA	Compressed Gas Association
cm	centimeter
cm ²	square centimeter
cm ³	cubic centimeter
CP	Chemically Pure
Cp	specific heat at constant pressure
CSA	Canadian Standards Association
Cv	coefficient of flow
°C	degree(s) Centigrade
°F	degree(s) Fahrenheit
°K	degree(s) Kelvin
°R	degree(s) Rankin
ea	each
EPA	Environmental Protection Agency
EPDM	Ethylene-Propylene Terpolymer
EPR	Ethylene Propylene Rubber
ft	foot, feet
ft ³	cubic foot (feet)
gal	gallon(s)
gms	gram(s)
HCFC-124	Hydrochlorofluorocarbon
hr	hour
Hz	hertz

Symbol	Definition
ID	identification or inside diameter
in, ins	inch(es)
in ³	cubic inch
kg	kilogram(s)
kpa	kilopascal(s)
lb, lbs	pound(s)
L	liter(s)
Lpm	liters per minute
m	meter(s)
m ³	cubic meter(s)
mA	milliampere
max	maximum
mg	milligram(s)
min	minute(s)
ml	milliliter(s)
mm	millimeter(s)
mol. wt.	molecular weight
MOS	Metal Oxide Semiconductor
NA	not applicable
nbp	normal boiling point
NER	normal evaporation rate
NF	National Formulary
NIST	National Institute of Standards and Technology
No	number
nom	nominal
NOS	not otherwise specified
NPT	national pipe thread
NTP	normal temperature and pressure
OD	outside diameter
OSHA	Occupational Safety and Health Administration
oz	ounce(s)
PCTFE	PolyChloroTrifluoroEthylene
ppb	part(s) per billion
ppm	part(s) per million
psi	pound(s) – force per square inch

Symbol	Definition
psia	pound(s)–force per square inch absolute
psig	pound(s)–force per square inch gauge
scc	standard cubic centimeters
sccm	standard cubic centimeters per minute
sccs	standard cubic centimeters per second
scfh	standard cubic feet per hour
scfm	standard cubic feet per minute
scfs	standard cubic feet per second
sec	second(s)
slpm	standard liters per minute
sp. gr.	specific gravity
sp. vol.	specific volume
SS, Stn. Stl.	Stainless Steel
STEL	Short Term Exposure Limit
STP	Standard Temperature and Pressure
Temp.	Temperature
THC	Total Hydrocarbon Content
TLV	Threshold Limit Value
tp	triple point
TWA	Time Weighted Average
UHP	Ultra High Purity
UN	United Nations
USP	United States Pharmacopoeia
VAC	volts alternating current
VDC	volts direct current
wt%	weight percent (percent by weight)
wt. ppm	weight parts per million
yd	yard(s)
>	greater than
<	less than
≥	greater than or equal to
≤	less than or equal to



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Glossary of Gas Terminology

Å	<i>Angstrom, a unit of measure equal to 1 X 10⁻¹⁰ meters in length.</i>
AA	<i>Abbreviation commonly used for atomic absorption spectroscopy.</i>
ACGIH	<i>American Conference of Governmental Industrial Hygienists, a group which makes recommendations on the exposure levels of hazardous materials in the workplace.</i>
ASTM	<i>American Society of Testing Materials, an organization which sponsors committees which develop standards for Industrial Manufacturers and Consumers.</i>
Absolute Pressure	<i>A measurement of pressure which sets a total vacuum as having a value of zero. For example the commonly used term psia stands for pounds per square inch of absolute pressure.</i>
Absolute Zero	<i>The lowest point in the Kelvin temperature scale. 0°K = - 459.67°F or -273.15°C in the Fahrenheit or Celsius temperature scales, respectively.</i>
Absorption	<i>The physical penetration of a substance into the structure of another substance, such as the dissolution of a gas into a liquid.</i>
Accuracy Expresses	<i>The degree of agreement of a measured value when compared to the true or expected value of the quantity of concern. This term is often confused with precision, which is the range of the confidence level within which a measured value can be considered valid.</i>
Adsorption	<i>The adherence of molecules, ions or atoms of a gas or liquid to the surface of another substance. The adsorbed species is thought to be adhered to the surface by weak physical or chemical forces.</i>
Aerobic	<i>Describes gases that contain oxygen and which are commonly used as atmospheres for biological culture growth.</i>
Alphagaz™	<i>A registered trademark for Specialty Gas Products offered by Air Liquide Group S.A. worldwide.</i>
Anaerobic	<i>Describes gases that do not contain oxygen which are used for biological culture growth.</i>
Anhydrous	<i>Literally means without water. The term is often used with those gases that are particularly corrosive in the presence of moisture, such as ammonia.</i>
Annealing Gas	<i>A gas blend used as a reducing atmosphere in the metals industry during heating to render them less brittle. A commonly used furnace gas consists of a blend of hydrogen and nitrogen.</i>
Asphyxiant Gas	<i>A gas which displaces air in an enclosed space and which can cause unconsciousness or death due to lack of oxygen.</i>
Avogadro's Law	<i>One of the gas laws which states that equal volumes of gases at the same temperature and pressure contain the same number of molecules.</i>
Avogadro's Number	<i>The number of molecules in one mole or gram-molecular weight of a substance (6.0221367X10²³ molecules/gm-mole).</i>
Azeotrope	<i>A mixture of two substances that typically cannot be separated easily by simple distillation. A commonly used term to describe a liquid mixture that has a constant boiling point.</i>
BTU	<i>An abbreviation for British Thermal Unit, a unit of energy defined as the quantity of heat needed to raise the temperature of one pound of water 1°F.</i>



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Glossary of Gas Terminology

Boiling Point (BP)	The temperature of a liquid at which the vapor pressure is equal to the pressure of the atmosphere above it.
Bourdon Tube	A curved metal tube commonly used in pressure gauges. The tube flexes a known degree as pressure is applied, and that movement is translated as the physical movement of a gauge needle across a scale.
Boyle's Law	A gas law which states that for an Ideal Gas at constant temperature the volume of the gas is inversely proportional to the pressure applied.
Burst Pressure	The designed test pressure at which a gas-containment device such as a cylinder, piping or pressure adjusting device will begin leaking but not violently rupture. For most gas handling equipment, the industrial standard is that the burst pressure is four times (400%) of the normal operating pressure.
Calibration Gas Standard	A gas mixture that has been accurately analyzed against a known reference standard. This mixture can be used as a comparative standard for determinations on analytical instruments.
Calorie	The amount of heat required to raise the temperature of one gram of water at 15°C by one degree Celsius.
Carrier Gas	The gas which flows through a separation column of a gas chromatograph and propels a sample to a detector.
Catalyst	A substance which initiates or accelerates a chemical reaction. CAS Number A Chemical Abstract Services numbering system assigned to each new chemical as it is reported in the world's literature. Virtually every commercially manufactured chemical has been assigned a CAS number which allows it to be easily identified.
Celsius	A temperature scale that has been set up so that ice melts at 0° and water boils at 100°C.
Certificate of Analysis (COA)	A printed guarantee by a gas producer that a particular gas has been analyzed to the levels of purity or impurity stated.
Certificate of Conformance (COC)	A printed guarantee by a gas producer that a particular gas meets a recognized standard.
Chemiluminescence	Absorption and emission of light by a chemical compound. Chemiluminescence detectors function by monitoring this absorption and emission of light by a substance at certain wavelengths.
Chromatography	An analytical method where a mixture is physically separated into its individual components.
Coefficient of Flow (CV)	Rate of flow through a regulator or other gas handling device measured in U.S. gallons per minute at 60°F with a pressure differential of 1 psig.
Compressed Gas	A gas in a container which meets one of the following criteria: • Contained at pressures exceeding 40 psia at 70°F • Contained at pressures exceeding 104 psia at 130°F • A flammable liquid having a vapor pressure exceeding 40 psia at 100°F as determined by ASTM D-323-72
Compressed Gas Association (CGA)	A nonprofit technical organization which develops and promotes industry standards for the safe handling, transport and storage of compressed gases.



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Glossary of Gas Terminology

Corrosive	<i>The ability of a chemical to attack another substance, causing irreversible damage. The term applies to substances which attack human tissue and other materials it may come in contact.</i>
Cracking Pressure	<i>The inlet pressure at which a gas begins to flow through a regulator, valve or other pressure-control device.</i>
Creep	<i>The slow increase in the outlet pressure of a regulator which may be caused by changes in inlet pressure or failure of the regulator seat.</i>
Critical Density	<i>The density of a pure substance at its critical point.</i>
Critical Point	<i>The point of a temperature vs. pressure curve of a pure substance above which a gas cannot exist in both gas and liquid phases.</i>
Critical Pressure	<i>The pressure at the critical point above which a pure gas cannot be liquefied.</i>
Critical Temperature	<i>The temperature above which a gas cannot be liquefied by pressure alone.</i>
Cryogenic Liquid	<i>A liquid having a normal boiling point below -240°F. (-151.1°C).</i>
Cryogenic Vessel	<i>An insulated container for the storage, transport and dispensing of liquids having a boiling point below -130°F.</i>
Cylinder	<i>A container designed to safely hold compressed gases and which is designed and tested to meet government specified standards of construction.</i>
Dalton's Law of Partial Pressure	<i>One of the gas laws which states that for ideal gases the pressure of a gas blend is equal to the sum of the pressures of each of its components.</i>
Density	<i>The mass of a substance divided by its volume.</i>
Department of Transportation (DOT)	<i>Federal agency that regulates the transport of hazardous materials per Title 49, Code of Federal Regulations.</i>
Dewar	<i>A vessel that is usually portable and is used to contain cryogenic liquids.</i>
Dew Point	<i>The temperature at which a gas vapor begins to condense as a liquid.</i>
Diameter Index Safety System (DISS)	<i>Type of valve designed with metal to metal seals for high leak integrity, generally used for high purity, corrosive or toxic gases.</i>
Discharge Ionization Detector (DID)	<i>A universal detector used in gas chromatography where the species detected is ionized by electrical discharges between plates.</i>
Dopant	<i>An impurity added to a pure substance in small amounts to alter its properties.</i>
DOT Numbers	<i>Product identification numbers assigned to chemicals for shipping purposes that helps in the rapid identification by emergency response teams. The prefix used, UN, designates the United Nations, meaning that these numbers are recognized worldwide.</i>
Eductor Tube	<i>A tube inside a cylinder which allows for liquid withdrawal from the bottom of the cylinder when the valve is opened.</i>
Effluent Splitter	<i>The part of an analytical instrument which divides the effluent stream into smaller segments and diverts them to different detectors.</i>
Electron Capture Detector	<i>Chromatographic detector used commonly for halogenated compounds. Electrons are generated by a radioactive source and are captured by the species being monitored. The current drop across two plates is measured.</i>



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Glossary of Gas Terminology

Environmental Protection Agency (EPA)	The governmental agency responsible for environmental standards in the United States.
EPA Protocol Mixture	Standard gas mixture prepared and analyzed following EPA-600/R-97/121 guidelines. These standards are required for calibration purposes when EPA analytical methods must be followed.
Exposure Limits	Concentration of substances under which it is believed that nearly all workers can be repeatedly exposed on a daily basis without adverse effects.
Fahrenheit	A temperature scale that has been set up so that ice melts at 32° and water boils at 212°.
Flame Ionization Detector (FID)	One of the most commonly used detectors for measuring organic compounds in a gas stream. Organic species are decomposed by a hydrogen flame and measured by electrodes near the flame.
Flammable Gas	DOT definition of any gas which either will form a flammable mixture with air at concentrations of 13% or less by volume or have a flammable range wider than 12% regardless of the lower explosive limit (LEL).
Flammability Limits	The extremes of the range at which a gas mixed with air can be ignited with a source of ignition. The lower number is referred to as the lower explosive limit (LEL), and the upper number is called the upper explosive limit (UEL).
Flash Point	The lowest temperature at which a flammable liquid will give off enough fumes to form an ignitable mixture with air directly above the liquid surface.
Gas	A state of matter in which the individual molecules are almost totally unrestricted by cohesive forces. An ideal gas is one which obeys the gas laws under standard conditions.
Gas Processing Association (GPA)	Organization consisting of both member companies and suppliers to the Gas Processing Industry. This organization was established to exchange technology related to the industry and to develop standards applying to the processing of gas products.
Gay-Lussac's Law	One of the gas laws which states that for an ideal gas under constant pressure, the volume increase is proportional to the increase in temperature.
Gross Weight	The total weight of both the container and the contents therein.
Halocarbons	A family of compounds made up of a hydrocarbon combined with one or more halogens from the group VIIA elements in the Periodic Table. This name is commonly attributed to those compounds in the family which are used for refrigeration systems.
Heat of Adsorption	The total heat generated from the initial adsorption of a compound on an adsorbate to the point at which equilibrium conditions are met and no more adsorption can take place.
Heat of Fusion	The heat energy required to convert one mole of substance from the solid phase to the liquid phase at one atmosphere of pressure.
Heat of Vaporization	The heat energy needed to transform one mole of substance from the liquid phase to the gas phase at one atmosphere of pressure.
Hydrocarbon	An organic compound which contains both carbon and hydrogen in its molecular structure.



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Glossary of Gas Terminology

Inductively Coupled Plasma (ICP)	An instrument used in atomic emission spectroscopy primarily for the quantitative analysis of trace metals in solids or liquids.
Inert Gas	A gas which is considered stable and does not react with other materials at normal temperatures and pressures.
Inorganic Compounds	Substances which do not contain carbon in their molecular structure.
Irritant	A substance which causes inflammation of living tissue but does not cause irreversible damage.
Isotopes	Forms of an element that have the same structure but differ from each other only in atomic mass. These slight changes in atomic mass often lead to instability and radioactivity.
Kelvin	A temperature scale related to the triple point of water.
Level of Detection	In chromatography, the amount of sample in a stream necessary to produce a peak height two to three times the baseline noise height.
Liquefied Compressed Gas	A gas which under charged pressure is partially liquid at 70°F (21.1°C).
Liquified Petroleum Gas (LPG)	A term generally used to describe those hydrocarbon gases which exist as liquids at normal temperature and pressure.
Lower Explosive Limit (LEL)	The minimum percent by volume of a gas in air which forms a flammable mixture at normal temperatures and pressures.
Manifold	A device having a single outlet but several inlets to which cylinders can be connected for multiple usage at the same time.
Material Safety Data Sheet (MSDS)	A data sheet for a particular substance describing the characteristics and hazards associated with the handling and use of this product.
Melting Point	The temperature at which the solid and liquid phase of a substance are at equilibrium (normally given for 1 atmosphere of pressure).
Micron	A unit of length equivalent to 1×10^{-6} meters.
Mole	Mass equivalent to the molecular weight of a substance. It is commonly expressed as gram-mole, the molecular weight in grams.
Molecular Weight	The sum of all the atomic weights of the atoms which make up a single molecule of a substance.
Nanogram (ng)	Mass equivalent to 1×10^{-9} grams.
Nanometer (nm)	Length equivalent to 1×10^{-9} meters.
National Formulary (NF)	A supplement to the United States Pharmacopoeia (USP).
Normal Temperature and Pressure	A reference base for the gas industry of 70°F temperature and 14.696 psia pressure.
Nuclear Magnetic Resonance Spectrometer (NMR)	An analytical instrument normally used for the qualitative identification of compounds containing hydrogen. The device measures the absorption of radio frequency waves by hydrogen molecules as they are electromagnetically excited.



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Glossary of Gas Terminology

Occupational Safety and Health Administration (OSHA)	Organization within the Department of Labor which sets standards for employers to ensure a safe working environment for its employees.
Oxidizing Agent	A substance that supports or causes combustion of other materials.
Parts per Million (PPM)	A method of expressing low concentrations of impurities in a mixture. The unit can be expressed in moles, volume or weight per million of the same units. Lower concentration may be expressed in parts per billion (ppb) or parts per trillion (ppt).
Permissible Exposure Limit (PEL)	Maximum routine exposure levels for different substances in the work environment as set by OSHA.
Poison	A substance that in small dosages can cause death or serious impairment to organs when entering a living organism by either ingestion, injection, absorption or inhalation.
Pyrophoric	A substance that can spontaneously ignite when exposed to air at temperatures of 130°F or below.
Rare Gas	Those constituents of air that make up less than 1% of air and are generally considered inert. Examples include the gases in the far right column of the Periodic Table.
Restrictive Flow Orifice (RFO)	A safety device placed in the outlet of a valve that limits the release rate of a hazardous gas to a maximum specified range in the event of accidental opening of the valve or failure of the gas containment system downstream.
Safety Relief Device	A device usually incorporated into the valve of a cylinder, actuated by either pressure or temperature at predetermined limit to prevent rupture of the vessel.
Self Venting Device	A device on certain types of regulators that relieves the outlet pressure as the regulator pressure is reduced.
Span Gas	A calibration gas that is used to set the maximum reading on the scale of an analyzer.
Specific Gravity	The ratio of the mass of one substance to that of a standard substance. For gases the reference is air (air = 1).
Specific Heat	The amount of heat required to raise that temperature of a unit mass of a substance one degree at either constant temperature or volume.
Standard Temperature and Pressure (STP)	An internationally recognized reference of a standard temperature of 0°C and standard pressure of 14.6960 psia.
Sublimation	The direct passage of some substances from the solid state to the gaseous state without going through the liquid state first.
Tare Weight	The weight of an empty cylinder without a valve or cap.
Thermoconductivity Detector (TCD)	One of the earliest detectors used in gas chromatography. This detector operates as one leg of a Wheatstone bridge that detects slight changes in conductivity as the exposed wire changes temperature. Also, sometimes this type of detector is referred to as a hot wire detector.
Threshold Limit Value (TLV)	Maximum standards set by ACGIH for airborne hazardous substances below which workers can be routinely exposed without adverse effects.
Threshold Limit Value-Ceiling (TLV-C)	Airborne concentration of a substance which should not be exceeded.



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Glossary of Gas Terminology

Threshold Limit Value/Short Term Exposure Limit (TLV/STEL)	<i>Refers to a 15 minute time weighted average exposure for substances which should not be exceeded at any time during a workday.</i>
Threshold Limit Value/Time Weighted Average (TLV/TWA)	<i>Refers to the time weighted average over a normal 8 hour workday and a 40 hour week to which all workers may be repeatedly exposed without adverse effect.</i>
Toxic	<i>A substance which has the ability to produce injurious or lethal effects through its chemical interaction with the body.</i>
Triple Point	<i>The defined pressure and temperature for a pure substance at which the three phases all exist in equilibrium.</i>
Vapor Pressure	<i>The pressure exerted by the vapor above a liquid when the two phases are in equilibrium.</i>
Zero Gas	<i>Calibration gas used to set the minimum reference point on the scale of an analyzer.</i>



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