MATERIALS COMPATIBILITY

The compatibility data shown on the following pages has been compiled to assist in evaluating the appropriate materials to use in handling various gases. Prepared for use with the dry (anhydrous) gases at normal operating temperature of 70° (21° C), information may vary if different operating conditions exist.

Directions:
Locate the gas you are using in the first column.

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 the compatibility.

KEY TO MATERIALS COMPATIBILITY

- • 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
- R1 Satisfactory with brass having a low copper content
- R2 Satisfactory with acetylene, however, cylinder gas is dissolved in a solvent (generally acetone) which may be incompatible with these elastomers
- R3 Satisfactory with brass, except where acetylene or acetylides are present
- R4 Generally unsatisfactory, except where specific use conditions have proven acceptable
- R5 Satisfactory below 3000 PSIG (206.9 bar) where gas velocities do not exceed 30 ft./sec.
- R6 Compatibility depends on condition of use

COMPATIBILITY GUIDE

COMMON NAME	CHEMICAL FORMULA	MATERIALS OF CONSTRUCTION										
		METALS					PLASTICS		ELASTOMERS			
		Brass	Stainless Steel	Aluminum	Zinc	Copper	PCTFE	Teflon®	Viton®	Buna-N	Neoprene	Polyurethane
Acetylene	C_2H_2	R1	•	I	U	U	•	•	R2	R2	R2	R2
Air	-	•	•	•	•	•	•	•	•	•	•	•
Allene	C_3H_4	•	•	•	I	U	•	•	•	•	•	I
Ammonia	NH_3	U	•	•	U	U	•	•	U	•	•	U
Argon	Ar	•	•	•	•	•	•	•	•	•	•	•
Arsine	AsH_3	•	•	R4	I	•	•	•	•	•	•	U
Boron Trichloride	BCl_3	U	•	U	I	•	•	•	I	I	I	I
Boron Trifluoride	BF_3	•	•	•	I	•	•	•	I	I	I	I
1,3-Butadiene	C_4H_6	•	•	•	•	•	•	•	•	U	•	U
Butane	C_4H_{10}	•	•	•	•	•	•	•	•	•	•	•
1-Butene	C_4H_8	•	•	•	•	•	•	•	•	•	•	•
cis-2-Butene	C_4H_8	•	•	•	•	•	•	•	•	•	•	•
trans-2-Butene	C_4H_8	•	•	•	•	•	•	•	•	•	•	•
Carbon Dioxide	CO_2	•	•	•	•	•	•	•	•	•	•	U
Carbon Monoxide	CO	•	•	•	•	•	•	•	I	•	•	•
Carbonyl Sulfide	COS	•	•	•	I	•	•	•	•	I	I	I
Chlorine	Cl_2	U	•	U	U	U	•	•	•	U	U	U
Deuterium	D_2	•	•	•	•	•	•	•	•	•	•	•
Diborane	B_2H_6	•	•	U	I	•	•	•	I	I	I	I
Dichlorosilane	H_2SiCl_2	I	•	I	I	I	•	•	I	I	I	I
Dimethyl Ether	C_2H_6O	•	•	•	•	•	•	•	•	•	•	I
Ethane	C_2H_6	•	•	•	•	•	•	•	•	•	•	•
Ethyl Acetylene	C_4H_6	I	•	•	I	U	•	•	•	I	•	I
Ethyl Chloride	C_2H_5Cl	•	•	U	I	•	•	•	•	•	•	U
Ethylene	C_2H_4	•	•	•	•	•	•	•	•	•	•	I
Ethylene Oxide*	C_2H_4O	R3	•	R4	I	U	•	•	U	U	U	U
Ethylene Oxide/Carbon Dioxide Mixtures*		R3	•	I	I	U	•	•	U	U	U	U
Ethylene Oxide/Halocarbon Mixtures*		R3	•	I	I	U	•	•	U	U	U	U
Ethylene Oxide/HCFC-124		R3	•	I	I	U	•	•	U	U	U	U
Halocarbon 11	CCl_3F	•	•	R4	I	•	•	•	•	•	U	U
Halocarbon 12	CCl_2F_2	•	•	R4	I	•	•	•	•	•	•	•
Halocarbon 13	$CClF_3$	•	•	R4	I	•	•	•	•	•	•	•
Halocarbon 13B1	CBF_3	•	•	R4	I	•	•	•	•	•	•	•
Halocarbon 14	CF_4	•	•	R4	I	•	•	•	•	•	•	•

MATERIALS COMPATIBILITY

COMPATIBILITY GUIDE CONT.

COMMON NAME	CHEMICAL FORMULA	MATERIALS OF CONSTRUCTION										
		METALS					PLASTICS		ELASTOMERS			
		Brass	Stainless Steel	Aluminum	Zinc	Copper	PCTFE	Teflon®	Viton®	Buna-N	Neoprene	Polyurethane
Halocarbon 21	$CHCl_2F$	•	•	R4	I	•	•	•	U	U	•	•
Halocarbon 22	$CHClF_2$	•	•	R4	I	•	•	•	U	U	•	U
Halocarbon 23	CHF_3	•	•	R4	I	•	•	•	I	I	I	•
Halocarbon 113	CCl_2FCClF_2	•	•	R4	U	•	•	•	•	•	•	•
Halocarbon 114	$C_2Cl_2F_4$	•	•	R4	I	•	•	•	•	•	•	•
Halocarbon 115	C_2ClF_5	•	•	R4	I	•	•	•	•	•	•	•
Halocarbon 116	C_2F_6	•	•	R4	I	•	•	•	I	I	I	•
Halocarbon 142B	$C_2H_3ClF_2$	•	•	R4	I	•	•	•	U	•	•	•
Halocarbon 152A	$C_2H_4F_2$	•	•	R4	I	•	•	•	U	•	•	•
Halocarbon C-318	C_2F_8	•	•	R4	I	I	•	•	•	•	•	•
Halocarbon 502	$CHClF_2/CClF_2$-CF_3	I	•	R4	I	I	•	•	•	•	•	•
Halocarbon 1132A	$C_2H_2F_2$	•	•	R4	I	•	I	•	I	I	I	•
Helium	He	•	•	•	•	•	•	•	•	•	•	•
Hydrogen	H_2	•	•	•	•	•	•	•	•	•	•	•
Hydrogen Chloride	HCl	U	•	U	U	U	•	•	•	U	U	U
Hydrogen Sulfide	H_2S	U	•	•	I	I	•	•	U	•	•	•
Isobutane	C_4H_{10}	•	•	•	•	•	•	•	•	•	•	•
Isobutylene	C_4H_8	•	•	•	I	•	•	•	•	•	•	I
Isopentane	C_5H_{12}	•	•	•	•	•	•	•	•	•	•	•
Krypton	Kr	•	•	•	•	•	•	•	•	•	•	•
Methane	CH4	•	•	•	•	•	•	•	•	•	•	•
Methyl Chloride	CH_3Cl	•	•	U	U	•	•	•	•	U	U	U
Methyl Mercaptan	CH_3SH	•	•	U	I	U	•	•	I	I	•	I
Neon	Ne	•	•	•	•	•	•	•	•	•	•	•
Nitric Oxide	NO	U	•	•	I	•	•	•	I	I	•	I
Nitrogen	N_2	•	•	•	•	•	•	•	•	•	•	•
Nitrogen Dioxide	NO_2	I	•	•	I	I	•	•	U	U	U	U
Nitrous Oxide	N_2O	•	•	•	•	•	•	•	•	•	•	•
Oxygen	O_2	•	R5	R4	•	•	•	•	R6	R6	R6	•
Perfluoropropane	C_3F_8	•	•	•	I	•	•	•	I	•	•	I
Phosphine	PH_3	I	•	•	I	I	•	•	I	I	I	I
Phosphorous Pentafluoride	PF_5	I	•	I	I	I	•	•	I	I	I	I
Propane	C_3H_8	•	•	•	•	•	•	•	•	•	•	•
Propylene	C_3H_6	•	•	•	•	•	•	•	•	U	U	U
Propylene Oxide	C_3H_6O	I	•	I	I	I	•	•	U	U	U	U
Refrigerant Gases	See Halocarbons											
Silane	SiH_4	•	•	•	I	•	•	•	•	•	•	•
Silicon Tetrachloride	$SiCl_4$	I	•	U	I	I	•	•	I	I	I	I
Silicon Tetrafluoride	SiF_4	•	•	•	I	•	•	•	•	•	•	•
Sulfur Dioxide	SO_2	U	•	•	U	U	•	•	•	U	U	•
Sulfur Hexafluoride	SF_6	•	•	•	I	•	•	•	•	•	•	•
Trichlorosilane	$HSiCl_3$	I	•	U	I	I	•	•	I	I	I	I
Vinyl Methyl Ether	C_3H_6O	•	•	•	I	U	•	•	I	I	I	I
Xenon	Xe	•	•	•	•	•	•	•	•	•	•	•

CONVERSION FACTORS

Pressure

TO OBTAIN

	atm	bar	ft of H_2O	in of hg	in of H_2O	kg/cm^2	kPa	mm of Hg	PSI
MULTIPLY				**BY**					
atm	....	1.01325	33.932	29.921	407.1827	1.0332	101.3171	760	14.696
bar	0.98692	....	33.4883	29.530	401.8596	1.019716	100	750.062	14.50368
Ft. of H_2O	0.02947	0.029891	....	0.882646	12	0.03048	2.9890	22.4198	0.433107
in of Hg	0.03342	0.033864	1.1340	....	13.6	0.034532	3.376895	25.4	0.49115
in of H_2O	0.00246	0.002499	0.083333	0.073556	....	0.00254	0.0249089	1.86832	0.03609
kg/cm^2	0.9678	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	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	51.175	....

Flow

TO OBTAIN

	cm^3/min	cm^3/sec	ft^3/hr	ft^3/min	m^3/hr	m^3/min	L/hr	Lpm
MULTIPLY				**BY**				
cm^3/min	....	0.0166667	0.0021189	0.0000353	0.00006	0.000001	0.06	0.001
cm^3/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	28.31686
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	....

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	3.61273×10^{-5}	0.0083454
lbs/ft^3	0.0160185	16.018463	....	5.78704×10^{-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	....

MOISTURE CONVERSION

Dew Point °C	Dew Point °F	Vapor Pressure (Water/Ice in Equilibrium) mm of Mercury	PPM on Volume Basis at 760 mm of Hg Pressure	Relative Humidity at 70 F%	PPM on Weight Basis in Air
-90	-130	0.00007	0.0921	0.00037	0.057
-88	-126	0.0001	0.132	0.00054	0.082
-86	-123	0.00014	0.184	0.00075	0.11
-84	-119	0.0002	0.263	0.00107	0.16
-82	-116	0.00029	0.382	0.00155	0.24
-80	-112	0.0004	0.562	0.00214	0.33
-78	-108	0.00056	0.737	0.003	0.46
-76	-105	0.00077	1.01	0.0041	0.63
-74	-101	0.00105	1.38	0.00559	0.86
-72	-98	0.00143	1.88	0.00762	1.17
-70	-94	0.00194	2.55	0.0104	1.58
-68	-90	0.00261	3.43	0.014	2.13
-66	-87	0.00349	4.59	0.0187	2.84
-64	-83	0.00464	6.11	0.0248	3.79
-62	-80	0.00614	8.08	0.0328	5.01
-60	-76	0.00808	10.6	0.043	6.59
-58	-72	0.0106	13.9	0.0565	8.63
-56	-69	0.0138	18.2	0.0735	11.3
-54	-65	0.0178	23.4	0.0948	14.5
-52	-62	0.023	30.3	0.123	18.8
-50	-58	0.0295	38.8	0.157	24.1
-48	-54	0.0378	49.7	0.202	30.9
-46	-51	0.0481	63.3	0.257	39.3
-44	-47	0.0609	80	0.325	49.7
-42	-44	0.0768	101	0.41	62.7
-40	-40	0.0966	127	0.516	78.9
-38	-36	0.1209	159	0.644	98.6
-36	-33	0.1507	198	0.804	122.9
-34	-29	0.1873	246	1	152
-32	-26	0.2318	305	1.24	189
-30	-22	0.2859	376	1.52	234
-28	-18	0.351	462	1.88	287
-26	-15	0.43	566	2.3	351
-24	-11	0.526	692	2.81	430
-22	-8	0.64	842	3.41	523
-20	-4	0.776	1020	4.13	633
-18	0	0.939	1240	5	770
-16	3	1.132	1490	6.03	925
-14	7	1.361	1790	7.25	1110
-12	10	1.632	2150	8.69	1335
-10	14	1.95	2570	10.4	1596
-8	18	2.326	3060	12.4	1900
-6	21	2.765	3640	14.7	2260
-4	25	3.28	4320	17.5	2680
-2	28	3.88	5100	20.7	3170
0	32	4.579	6020	24.4	3640
2	36	5.294	6970	28.2	4330
4	39	6.101	8030	32.5	4990
6	43	7.013	9230	37.4	5730
8	46	8.045	10590	42.9	6580
10	50	9.029	12120	49.1	7530
12	54	10.52	13840	56.1	8600
14	57	11.99	15780	63.9	9800
16	61	13.63	17930	72.6	11140
18	64	15.48	20370	82.5	12650
20	68	17.54	23080	93.5	14330