

FLOW CAPACITIES
Spare valve cartridges P, Px and S meters

TABLE 1 - MFV™ VALVE FLOW CAPACITIES 10 psig (0.7 kPa gauge) INLET PRESSURE, ATMOSPHERIC EXHAUST						
SIZE	AIR		HELIUM		WATER	
	[mL/min]	[scfh]	[mL/min]	[scfh]	[mL/min]	[gph]
1	200	0.42	400	0.85	6	0.095
2	400	0.85	850	1.80	12	0.190
3	1020	2.15	2100	4.45	28	0.444
4	2600	5.50	6050	12.80	85	1.347
5	8900	18.85	20800	44.05	270	4.279
6	35000	74.15	84500	179.10	1070	16.960
7	63000	133.50	156000	330.50	1930	30.590



TABLE 2 - CV™ VALVE FLOW CAPACITIES 10 psig (0.7 kPa gauge) INLET PRESSURE, ATMOSPHERIC EXHAUST						
SIZE	AIR		HELIUM		WATER	
	[mL/min]	[scfh]	[mL/min]	[scfh]	[mL/min]	[gph]
L	5050	10.70	11500	24.35	360	5.70
M	30000	63.55	71500	151.50	1760	27.90
H	76000	161.05	180000	381.40	4500	71.33



FLOW CAPACITIES
Spare valve cartridges T and Tx meters

TABLE 1a - MVT™ VALVE FLOW CAPACITIES 10 psig (0.7 kPa gauge) INLET PRESSURE, ATMOSPHERIC EXHAUST						
SIZE	AIR		HELIUM		WATER	
	[mL/min]	[scfh]	[mL/min]	[scfh]	[mL/min]	[gph]
1	600	1.25	1250	2.65	36	0.57
3	3000	6.35	6900	14.60	180	2.85
6	30000	63.55	71500	151.50	1800	28.53



TABLE 2a - CVT™ VALVE FLOW CAPACITIES 10 psig (0.7 kPa gauge) INLET PRESSURE, ATMOSPHERIC EXHAUST						
SIZE	AIR		HELIUM		WATER	
	[mL/min]	[scfh]	[mL/min]	[scfh]	[mL/min]	[gph]
L	2400	5.10	5300	11.23	130	2.05
H	55000	116.55	135000	286.05	2800	44.40

METER SIZING FOR P, PX, T, TX AND S METERS

Flow capacity tables 6, 7, 8, 9 and 10 (pages 62 to 65) are based on calibrations at standard conditions, meaning 14.7 psia (1 atm) pressure and 70 °F (21.1 °C).

Tables list maximum flow rates of flow tubes. The usable range of meters is at least 10:1, often more. Thus, as a rule of thumb, to estimate the minimum metering limit divide the flow rates listed, by ten.

For gases or liquids with fluid properties not greatly different from the calibration media, tables apply directly, when working pressure and temperature are also approximately standard.

Where the above conditions do not apply the maximum flow rates of the metered fluids are converted to equivalent standard flow rates of air or water.

To do this calculate "K" as shown in charts, multiply the maximum flow rate with this factor, and select the appropriate flow tube size from the Flow Capacity tables 6, 7, 8, 9 and 10 (pages 62 to 65).

gas flow

$$Q_{air} = K_{gas} \times Q_{gas}$$

$$K_{gas} = \sqrt{G \times \frac{T_{act}}{T_o} \times \frac{P_o}{P_{act}}}$$

where:

Q_{air} = equivalent air flow capacity at Standard Conditions (SPT).
Q_{gas} = maximum flow of metered gas.
G = specific gravity of metered gas (from table 5).
T_{act} = absolute temperature at flow condition, deg R or deg K.
T_o = absolute temperature at Standard Conditions. (STP) deg R (530) or deg K (294).
P_{act} = pressure at flow conditions, psia.
P_o = pressure at Standard Conditions (STP), (14.7 psia).

liquid flow

$$Q_{water} = K_{liq} \times Q_{liq}$$

$$K_{liq} = \sqrt{\frac{(d_F - d_W)}{(d_F - d_L)} \times \frac{d_L}{d_W}}$$

where:

Q_{water} = equivalent water flow capacity at Standard Conditions (STP).
Q_{liq} = maximum flow of metered liquid.
d_F = density of float selected, (see table 3), (g/ml).
d_L = density of metered liquid, (g/ml).
d_W = density of water at Standard Conditions (STP) (1.0 g/ml).

CALCULATION VS. CALIBRATION FOR P, PX, S, T AND TX METERS

In case of liquid flows at each major point along the scale, sample volumes are collected in a buret of a volumetric flask during measured time intervals. Volumes are interpolated to a unit of time such as for example [mL/min] or [cu. ft/hr] etc. A table or a graph is then constructed to establish a complete set of calibration data. In case of gas flows, calibration data can be similarly developed, except that collection of sample volumes is accomplished by means of gas sampling devices, the simplest of which is a "soap bubble" meter.

It is very important that the correction factors as calculated from the accompanying equations are used for sizing only. These relationships are greatly simplified and will not provide precise predictable flow corrections. It is always best practice to calibrate meters for non-standard conditions on site, by using reliable means of calibration.

TABLE 3 - FLOAT DENSITIES

MATERIAL	DENSITY [g/ml]
GLASS	2.53
SAPPHIRE	3.98
STAINLESS STEEL	8.04
CARBOLOY	14.98
TANTALUM	16.58

TABLE 4 - CONVERSION FACTORS

MULTIPLY	BY	TO OBTAIN
atm	14.70	lbs/sq. in.
atm	1.0333	kg/sq. cm.
lbs/square inch	0.07031	kg/sq. cm.
ml/min	0.001	liters/min.
ml/min	3.531×10^{-5}	cu. ft/min.
ml/min	1.585×10^{-2}	gal/hr.
cubic ft/hr	472	ml/min.
gal/min	3785	ml/min.
g/ml	62.43	lbs/cu. ft.
g/ml	0.03613	lbs/cu. in.
cc/mn	1	mL/min.
cfm (ft^3/min)	28.31	L/min.
cfm (ft^3/min)	1.699	m^3/hr.
oz/min	29.57	mL/min.

PRESSURE

MULTIPLY	BY	TO OBTAIN
PSI	27.71	in. H_2O
PSI	2.036	in. Hg
PSI	703.1	mm/H_2O
PSI	51.75	mm/Hg
PSI	.0703	kg/cm^2
PSI	.0689	bar
PSI	68.95	mbar
PSI	6895	Pa
PSI	6.895	kPa

TEMPERATURE

$^{\circ}F = (1.8 \times {}^{\circ}C) + 32$
$^{\circ}C = ({}^{\circ}F - 32) \times 0.555$
$^{\circ}Kelvin = {}^{\circ}C + 273.2$

LENGTH

MULTIPLY	BY	TO OBTAIN
Multiply	2.54	cm
Inch	12	inch
Ft.	0.305	meter
Yard	1.094	meter
Angstrom	10^{10}	meter

TABLE 5- DENSITY, VISCOSITY & SPECIFIC GRAVITY OF GASES

GAS	DENSITY [g/ml]	VISCOSITY [centipols]	SPECIFIC GRAVITY G [air=1.0]
Acetylene	0.001090	0.00988	0.9073
Air	0.001200	0.01812	1.0000
Ammonia	0.000716	0.00994	0.5963
Argon	0.001660	0.02220	1.3796
Butane	0.002484	0.00848	2.0854
Carbon Dioxide	0.001835	0.01470	1.5290
Carbon Monoxide	0.001163	0.01750	0.9671
Chlorine	0.002983	0.01330	2.4860
Ethane	0.001260	0.00901	1.0493
Ethylene	0.001170	0.00994	0.9749
Helium	0.0001656	0.01980	0.13804
Hydrogen	0.0000834	0.00885	0.06952
Hydrogen Chloride	0.001512	0.01560	1.2678
Methane	0.0006653	0.01099	0.5544
Nitrogen	0.001160	0.01756	0.96724
Nitrous Oxide	0.001833	0.01453	1.5297
Oxygen	0.001326	0.02030	1.10527
Propane	0.001874	0.00805	1.5620
Sulfur Dioxide	0.002717	0.01270	2.2638

TABLES OF STANDARD FLOW CAPACITIES P, PX, T, TX AND S METERS

TABLE 6
150mm Flow tubes (See Table 8 for Gas Flow Capacities)

FLOW TUBE MAXIMUM FLOW RATES				
FLOW TUBE NUMBER	AIR		WATER	
	[smL/min]	[scfh]	[smL/min]	[gph]
042-29-GL	11.6	0.024	-	-
042-29-SA	18.3	0.038	-	-
042-29-ST	34	0.07	-	-
042-29-CA	62.8	0.13	-	-
032-41-GL	46.6	0.098	0.50	0.007
032-41-SA	73.1	0.154	0.99	0.015
032-41-ST	138.3	0.293	2.36	0.037
032-41-CA	239.1	0.506	4.60	0.072
032-41-TA	258.7	0.548	5.10	0.080
062-01-GL	91.6	0.194	1.13	0.020
062-01-SA	144.3	0.306	2.19	0.035
062-01-ST	262.2	0.556	4.97	0.079
062-01-CA	431.7	0.915	9.23	0.146
062-01-TA	467.1	0.990	10.15	0.161
112-02-GL	370.6	0.784	5.71	0.090
112-02-SA	513.3	1.087	10.00	0.158
112-02-ST	816.0	1.729	19.2	0.301
112-02-CA	1216.9	2.579	31.6	0.500
112-02-TA	1291.7	2.738	34.1	0.540
082-03-GL	817	1.731	15.2	0.240
082-03-SA	1093	2.316	24.9	0.394
082-03-ST	1665	3.528	44.3	0.702
082-03-CA	2405	5.096	69.0	1.094
082-03-TA	2558	5.420	74.1	1.175
092-04-GL	2214	4.690	49.9	0.792
092-04-SA	2975	6.300	77.7	1.234
092-04-ST	4494	9.520	132.5	2.092
092-04-CA	6467	13.70	203.2	3.218
092-04-TA	6979	14.79	219	3.471
102-05-GL	3780	8.00	89	1.411
102-05-SA	4942	10.47	134	2.124
102-05-ST	7720	16.35	234	3.70
102-05-CA	10780	22.84	343	5.437
102-05-TA	11287	23.92	361	5.722
034-39-GL	8555	18.12	200	3.170
034-39-SA	11140	23.60	301	4.771
034-39-ST	16493	34.94	498	7.893
034-39-CA	23001	48.73	736	11.67
034-39-TA	24540	51.99	784	12.43
044-40-GL	23105	48.95	579	9.177
044-40-SA	29410	62.30	833	13.2
044-40-ST	42860	90.80	1339	21.22
044-40-CA	60212	127.5	1972	31.26
044-40-TA	65625	139.0	2144	33.98

*SUFFIX REFERS TO FLOAT MATERIALS;

GL = Black Glass
SA = Sapphire (red)
ST = 316 Stainless Steel
CA = Carboloy®
TA = Tantalum

TABLE 7
65mm Flow tubes (See Table 9 for Gas Flow Capacities)

FLOW TUBE MAXIMUM FLOW RATES				
FLOW TUBE NUMBER	AIR		WATER	
	[smL/min]	[scfh]	[smL/min]	[gph]
042-07-GL	5.8	0.013	-	-
042-07-SA	9	0.017	-	-
042-07-ST	19	0.036	-	-
042-07-CA	33	0.070	-	-
042-07-TA	36	0.072	-	-
032-15-GL	49	0.104	0.55	0.009
032-15-SA	74	0.153	0.98	0.016
032-15-ST	145	0.307	2.38	0.038
032-15-CA	246	0.528	4.60	0.073
032-15-TA	271	0.578	5.25	0.084
022-13-GL	107	0.22	1.28	0.020
022-13-SA	167	0.35	2.60	0.041
022-13-ST	314	0.66	6.15	0.098
022-13-CA	517	1.09	11.21	0.179
022-13-TA	563	1.19	12.67	0.202
012-10-GL	216	0.46	3.0	0.048
012-10-SA	320	0.68	5.7	0.091
012-10-ST	538	1.14	11.7	0.187
012-10-CA	826	1.75	20.0	0.320
012-10-TA	898	1.90	22.1	0.353
052-01-GL	1036	2.42	20	0.320
052-01-SA	1383	2.93	33	0.527
052-01-ST	2088	4.42	57	0.912
052-01-CA	3007	6.37	89	1.42
052-01-TA	3196	6.77	95	1.52
023-92-GL	1249	2.65	25	0.396
023-92-SA	1623	3.44	36.7	0.581
023-92-ST	2520	5.34	70.7	1.121
023-92-CA	3680	7.80	103.5	1.641
013-88-GL	2030	4.3	40.01	0.641
013-88-SA	2655	5.62	63.1	1.0
013-88-ST	4041	8.56	111.2	1.76
013-88-CA	5769	12.22	169.9	2.69
365-02-GL	2522	5.35	54.7	0.86
365-02-ST	4917	10.42	143	2.26
014-96-GL	6318	13.4	147	2.33
014-96-SA	8145	17.3	217	3.44
014-96-ST	12058	25.5	364	5.77
014-96-CA	16943	35.8	540	8.56
014-96-TA	18213	38.6	568	9.00
054-17-GL	12860	27.2	307	4.86
054-17-SA	16617	35.2	449	7.11
054-17-ST	24452	51.8	723	11.46
054-17-CA	34507	73.1	1049	16.63
054-17-TA	36466	77.2	1111	17.61
064-63-GL	21969	46.5	550	8.71
064-63-SA	28518	60.4	811	12.85
064-63-ST	41289	87.4	1297	20.56
064-63-CA	58348	123.6	1895	30.04
064-63-TA	61299	129.9	2000	31.70

TABLE OF STANDARD FLOW CAPACITIES P, PX, T, TX AND S METERS

TABLE 8 - 150mm FLOW TUBES, GAS FLOW CAPACITIES OF ROUTINE GASES

FLOW TUBE MAXIMUM FLOW RATES

FLOW TUBE NUMBER	ARGON		CARBON DIOXIDE		HELIUM		HYDROGEN		NITROGEN		OXYGEN	
	[smL/min]	[scfh]	[smL/min]	[scfh]	[smL/min]	[scfh]	[smL/min]	[scfh]	[smL/min]	[scfh]	[smL/min]	[scfh]
042-29-GL	10.1	0.021	14.9	0.031	10.7	0.023	22.7	0.048	12	0.025	11	0.023
042-29-SA	14.3	0.030	22	0.046	16	0.033	35.8	0.075	18	0.038	16	0.034
042-29-ST	28	0.059	42	0.089	33	0.070	67	0.14	35	0.074	31	0.066
042-29-CA	55	0.116	79	0.167	66	0.14	126	0.26	69	0.146	61	0.129
032-41-GL	38.1	0.080	55.1	0.116	41.1	0.087	95	0.201	48	0.101	42	0.088
032-41-SA	59.1	0.125	83	0.175	66	0.139	151	0.319	74	0.156	65	0.137
032-41-ST	114	0.241	153	0.324	136	0.288	304	0.644	142	0.300	125	0.264
032-41-CA	197	0.417	255	0.540	254	0.538	553	1.171	246	0.521	217	0.459
032-41-TA	215	0.455	276	0.584	281	0.595	609	1.29	268	0.567	237	0.502
062-01-GL	79.2	0.168	112.8	0.239	94	0.200	211	0.447	93	0.197	87	0.185
062-01-SA	119	0.253	156	0.331	149	0.316	327	0.693	148	0.314	131	0.278
062-01-ST	217	0.460	272	0.577	288	0.611	632	1.339	269	0.570	239	0.507
062-01-CA	368	0.780	431	0.914	518	1.098	1100	2.331	443	0.939	396	0.839
062-01-TA	388.3	0.823	464.1	0.983	571.9	1.212	1200.3	2.543	478.8	1.015	429	0.909
112-02-GL	307	0.650	358.3	0.758	453	0.959	981	2.079	378	0.800	340	0.012
112-02-SA	429	0.909	485	1.028	708	1.500	1420	3.009	525	1.112	478	1.013
112-02-ST	682	1.445	740	1.568	1352	2.865	2366	5.013	832	1.763	756	1.621
112-02-CA	1022	2.165	1080	2.288	2228	4.721	3688	7.814	1243	2.634	1141	2.418
112-02-TA	1090	2.310	1140.9	2.418	2404.6	5.096	4257	9.020	1321.4	2.799	1211	2.566
082-03-GL	685	1.451	705	1.494	1488	3.153	2459	5.210	834	1.767	761	1.612
082-03-SA	919	1.947	950	2.013	2105	4.460	3546	7.514	1117	2.367	1022	2.165
082-03-ST	1403	2.973	1362	2.886	3443	7.295	5359	11.36	1699	3.600	1573	3.333
082-03-CA	2029	4.299	2076	4.399	5197	11.01	7967	16.88	2452	5.195	2275	4.820
082-03-TA	2159	4.575	2182	4.623	5530	11.72	8511	18.03	2608	5.526	2406	5.098
092-04-GL	1896	4.01	1976	4.18	4727	10.02	7557	16.01	2288	4.84	2113	4.47
092-04-SA	2516	5.33	2610	5.53	6310	13.37	10202	21.62	3032	6.42	2806	5.94
092-04-ST	3805	8.06	3887	8.23	9728	20.61	15754	33.38	4578	9.70	4247	8.99
092-04-CA	5525	11.71	5599	11.86	14158	30.00	23232	49.23	6640	14.07	6170	13.07
092-04-TA	5914	12.53	5954	12.62	15227	32.26	24927	52.82	7103	15.05	6604	13.99
102-05-GL	3148	6.67	3334	6.92	8526	18.07	13164	27.89	3824	8.10	3549	7.52
102-05-SA	4185	8.86	4314	9.14	10384	22.00	17434	36.94	5033	10.66	4672	9.89
102-05-ST	6641	14.06	6520	13.80	16163	34.24	27705	58.69	7992	16.93	7475	15.83
102-05-CA	9082	19.24	8976	19.02	23416	49.62	39080	82.81	10974	23.25	10185	21.58
102-05-TA	9573	20.28	9351	19.81	24794	52.54	40968	86.81	11490	24.35	10697	22.67
034-39-GL	7266	15.39	7304	15.47	19040	40.33	29795	63.12	8695	18.42	8091	17.14
034-39-SA	9373	19.85	9406	19.92	24810	52.56	39101	82.84	11270	23.87	10535	22.31
034-39-ST	13977	29.61	13728	29.08	39280	83.22	58968	124.9	16794	35.58	15610	33.07
034-39-CA	19580	41.48	19296	40.88	54965	116.4	84023	178.0	23444	49.66	22000	46.61
034-39-TA	20938	44.36	20543	43.52	60207	127.5	89109	188.7	25084	53.14	23500	49.78
044-40-GL	19472	41.25	19220	40.72	53552	113.4	83730	177.3	23432	49.64	21832	46.25
044-40-SA	24878	52.70	24263	51.40	71100	150.6	106992	226.6	29798	63.13	27937	59.26
044-40-ST	36564	77.46	35541	75.29	106151	224.8	157719	334.1	43607	92.38	41076	87.02
044-40-CA	51689	109.5	50243	106.4	161232	341.5	224353	475.3	61653	130.6	57480	121.7
044-40-TA	55248	117.0	53771	113.9	171090	362.4	243016	514.8	66954	141.8	61892	131.1

*Suffix refers to float materials: G = black glass, S = sapphire (red), ST = 316 stainless steel, C = Carboloy® , T = tantalum.

Flow capacities shown in Tables 4, 5, 6 and 7 are based on calibrations at standard (STP) conditions (70 °F /21.1 °C and 14.7psia/1 atm abs). For fluids other than air or water at STP conditions see paragraph on METER SIZING on page 60. For special OEM requirements call toll free 1-800-866-3837.

for direct reading (engineering units) scale flow tubes contact the company or visit us at www.aalborg.com

TABLE OF STANDARD FLOW CAPACITIES P, PX, T, TX AND S METERS

TABLE 9 - 65mm FLOW TUBES, GAS FLOW CAPACITIES OF ROUTINE GASES

FLOW TUBE MAXIMUM FLOW RATES

FLOW TUBE NUMBER	ARGON		CARBON DIOXIDE		HELIUM		HYDROGEN		NITROGEN		OXYGEN	
	[smL/min]	[scfh]	[smL/min]	[scfh]	[smL/min]	[scfh]	[smL/min]	[scfh]	[smL/min]	[scfh]	[smL/min]	[scfh]
042-07-GL	4	0.01	6.5	0.01	5.5	0.01	9.6	0.02	6	0.01	5	0.01
042-07-SA	7.7	0.02	10	0.02	8	0.02	15.3	0.03	9	0.02	7	0.01
042-07-ST	14	0.03	20	0.04	16	0.03	32.3	0.07	18	0.04	15	0.03
042-07-CA	28	0.06	39	0.08	30	0.06	53.6	0.11	34	0.07	29	0.06
042-07-TA	29	0.06	40	0.08	32	0.07	64.8	0.14	34	0.07	30	0.06
032-15-GL	38	0.08	59	0.13	47	0.10	100	0.21	51	0.11	46	0.10
032-15-SA	63	0.13	90	0.19	71	0.15	150	0.32	78	0.17	72	0.15
032-15-ST	122	0.26	160	0.34	146	0.31	314	0.67	149	0.32	132	0.28
032-15-CA	214	0.45	263	0.56	274	0.58	593	1.26	264	0.56	239	0.51
032-15-TA	224	0.47	279	0.59	294	0.62	654	1.39	276	0.58	248	0.53
022-13-GL	87	0.18	126	0.26	101	0.21	237	0.50	109	0.23	96	0.20
022-13-SA	137	0.29	189	0.40	161	0.34	386	0.81	173	0.36	151	0.31
022-13-ST	265	0.56	330	0.69	335	0.70	777	1.64	332	0.70	295	0.62
022-13-CA	432	0.91	499	1.05	600	1.27	1352	2.86	535	1.13	482	1.02
022-13-TA	472	1.00	539	1.14	675	1.43	1492	3.16	581	1.23	525	1.11
012-10-GL	170	0.36	223	0.48	208	0.44	527	1.12	214	0.46	189	0.4
012-10-SA	255	0.54	311	0.66	329	0.7	818	1.74	318	0.68	285	0.61
012-10-ST	448	0.95	503	1.07	672	1.43	1459	3.1	541	1.15	499	1.06
012-10-CA	687	1.46	738	1.57	1196	2.54	2346	4.97	838	1.78	769	1.63
012-10-TA	732	1.55	786	1.67	1325	2.81	2575	5.46	890	1.89	817	1.73
052-01-GL	886	1.87	939	1.98	2070	4.38	3294	6.98	1086	2.30	1003	2.12
052-01-SA	1185	2.51	1227	2.59	2852	6.04	4477	9.49	1419	3.00	1344	2.84
052-01-ST	1794	3.80	1838	3.89	4573	9.68	7061	14.96	2164	4.58	2022	4.28
052-01-CA	2573	5.45	2629	5.56	6762	14.32	10394	21.93	3105	6.57	2912	6.16
052-01-TA	2742	5.80	2774	5.87	7190	15.23	11056	23.43	3293	6.97	3094	6.55
023-92-GL	1030	2.19	1114	2.36	1934	4.10	3590	7.61	1251	2.65	1150	2.44
023-92-SA	1399	2.97	1494	3.17	2878	6.10	5022	10.64	1702	3.61	1568	3.33
023-92-ST	2141	4.54	2224	4.72	4886	10.36	8251	17.48	2576	5.46	2381	5.05
023-92-CA	3103	6.58	3194	6.77	7580	16.06	12517	26.52	3767	7.98	3480	7.38
013-88-GL	1729	3.66	1795	3.8	3371	7.14	6335	13.42	2077	4.40	1927	4.08
013-88-SA	2286	4.84	2347	4.97	4882	10.34	8482	17.97	2762	5.85	2560	5.42
013-88-ST	3426	7.33	3498	7.41	8541	18.09	13362	28.3	4124	8.73	3867	8.19
013-88-CA	4928	10.50	4999	10.59	12885	27.29	19542	41.4	5869	12.43	5529	11.71
365-02-GL	2106	4.47	2188	4.64	4748	10.06	7770	16.47	2563	5.43	2373	5.03
365-02-ST	4141	8.78	4106	8.70	10903	23.10	16980	35.98	5034	10.67	4657	9.87
014-96-GL	5290	11.21	5379	11.4	13639	28.9	21327	45.2	6380	13.52	5880	12.45
014-96-SA	6900	14.62	6980	14.79	18280	39.19	28211	59.77	8280	17.54	7690	16.29
014-96-ST	10175	21.56	10150	21.50	27300	57.84	41889	88.76	12058	25.55	11250	23.83
014-96-CA	14293	30.28	14200	30.08	40036	84.84	58498	123.9	17253	36.55	16031	33.97
014-96-TA	15168	32.14	15088	36.55	42396	89.84	63885	135.4	18250	38.67	16939	35.89
054-17-GL	10895	23.09	10811	22.91	29355	62.20	47100	99.8	13096	27.75	12166	25.78
054-17-SA	14085	29.85	14000	29.67	38325	81.20	61715	130.7	16919	35.85	15733	33.34
054-17-ST	20740	43.94	20307	43.03	57120	121.0	90323	191.3	24891	52.74	23174	49.10
054-17-CA	29280	62.04	28420	60.22	81800	173.3	130805	277.1	35122	74.42	32724	69.33
054-17-TA	30944	65.56	30570	64.77	87573	185.5	139224	294.9	37115	78.64	34585	73.28
064-63-GL	18625	39.46	18159	38.48	50441	106.87	79680	168.82	22501	47.68	20812	44.10
064-63-SA	24193	51.26	23513	49.82	66312	140.50	104110	220.58	29027	61.50	27038	57.29
064-63-ST	35263	74.71	34151	72.36	104993	222.45	152772	323.67	41985	88.96	39416	83.51
064-63-CA	49534	104.95	47860	101.40	143606	304.25	215595	456.77	59377	125.80	55375	117.32
064-63-TA	52041	110.26	50268	106.50	156768	332.14	226636	480.17	62380	132.17	57772	122.40

TABLE OF FLOW CAPACITIES AT 50 PSIG FOR GAS PROPORTIONERS

TABLE 10 - 150mm FLOW TUBES, GAS FLOW CAPACITIES FOR GAS PROPORTIONERS at 50 PSIG

	FLOW TUBE MAXIMUM FLOW RATES						
FLOW TUBE NUMBER	**AIR [smL/min]**	**ARGON [smL/min]**	**CARBON DIOXIDE [smL/min]**	**HELIUM [smL/min]**	**HYDROGEN [smL/min]**	**NITROGEN [smL/min]**	**OXYGEN [smL/min]**
032-41-GL	191	161	203	195	399	197	166
032-41-SA	270	229	279	302	662	283	246
032-41-ST	460	383	478	573	1185	471	442
032-41-CA	743	625	702	1094	2013	771	719
062-01-GL	324	270	346	333	844	331	294
062-01-SA	505	412	494	569	1209	467	460
062-01-ST	825	687	771	1089	2432	833	764
062-01-CA	1275	1062	1132	1972	3732	1303	1175
112-02-GL	1086	855	934	1779	3110	1016	930
112-02-SA	1324	1115	1168	2468	4289	1340	1228
112-02-ST	2024	1717	1724	4083	6740	2034	1905
112-02-CA	2912	2472	2521	6927	9979	2997	2703
082-03-GL	2008	1697	1747	4214	6711	2039	1865
082-03-SA	2590	2186	2264	5656	8995	2643	2503
082-03-ST	3903	3274	3343	8669	14490	3731	3685
082-03-CA	5547	4697	4691	12717	19993	6169	5210
092-04-GL	5528	4794	4954	12540	18862	5801	5381
092-04-SA	7240	6163	6217	15703	25235	7415	6826
092-04-ST	10813	9077	9178	24629	38556	11044	10335
092-04-CA	15322	12904	12879	34709	55936	15433	14451
102-05-GL	9294	7705	7888	19830	30900	9419	8749
102-05-SA	11647	9969	10042	26008	45263	11955	11137
102-05-ST	17311	14489	14420	40831	60300	17525	16353
102-05-CA	24065	20744	20099	59702	86369	24549	22905
034-39-GL	19767	17978	17936	48193	73500	21676	19931
034-39-SA	27514	23001	54010	63240	97000	27449	25800
034-39-ST	38995	33778	33087	98676	142000	40086	36821
034-39-CA	55293	47151	45745	139847	200500	55930	52494
044-40-GL	49374	41899	40520	125617	182239	50258	46851
044-40-SA	62480	53038	51220	159976	231239	63595	59304
044-40-ST	89880	76322	73584	231946	333775	91478	85341
044-40-CA	123846	105182	101303	321265	460942	126041	117615

DIRECT READING SCALES FOR P, PX, T, TX AND S METERS

TABLE 11 - FLOW TUBES FOR AIR

65mm				150mm			
FLOW TUBE	**QMAX**	**[UNITS]**	**PRESSURE**	**FLOW TUBE**	**QMAX**	**[UNITS]**	**PRESSURE**
042-10-GL	7.00	mL/min	14.70 psia	042-12-SA	25.00	mL/min	14.70 psia
032-01-ST	50.00	mL/min	14.70 psia	032-06-SA	52.00	mL/min	14.70 psia
062-04-ST	75.00	mL/min	14.70 psia	042-06-CA	75.00	mL/min	14.70 psia
022-14-GL	100.00	mL/min	14.70 psia	032-10-ST	100.00	mL/min	14.70 psia
032-11-ST	130.00	mL/min	14.70 psia	032-21-ST	150.00	mL/min	14.70 psia
032-03-CA	250.00	mL/min	14.70 psia	062-03-ST	200.00	mL/min	14.70 psia
022-05-CA	500.00	mL/min	14.70 psia	112-10-GL	300.00	mL/min	14.70 psia
052-12-GL	1000.00	mL/min	14.70 psia	112-08-SA	500.00	mL/min	14.70 psia
052-04-GL	1.00	L/min	14.70 psia	082-02-GL	800.00	mL/min	14.70 psia
023-03-GL	1.15	L/min	14.70 psia	112-19-CA	1.25	L/min	14.70 psia
052-07-ST	2.00	L/min	14.70 psia	082-12-ST	1.80	L/min	14.70 psia
013-89-ST	4.00	L/min	14.70 psia	092-25-GL	2.50	L/min	14.70 psia
014-03-GL	5.00	L/min	14.70 psia	102-07-GL	4.00	L/min	14.70 psia
014-02-ST	10.00	L/min	14.70 psia	102-03-SA	4.50	L/min	14.70 psia
044-11-ST	16.00	L/min	14.70 psia	092-14-ST	4.80	L/min	14.70 psia
054-01-ST	25.00	L/min	14.70 psia	102-01-SA	5.00	L/min	14.70 psia
064-03-ST	40.00	L/min	14.70 psia	102-16-CA	10.00	L/min	14.70 psia
052-05-GL	2.20	scfh	14.70 psia	034-13-ST	17.00	L/min	14.70 psia
365-18-GL	6.00	scfh	14.70 psia	044-14-GL	23.00	L/min	14.70 psia
365-19-ST	10.00	scfh	14.70 psia	044-41-ST	42.00	L/min	14.70 psia
034-61-ST	18.00	scfh	14.70 psia	044-16-CA	60.00	L/min	14.70 psia
014-17-ST	25.00	scfh	14.70 psia	112-01-CA	2.50	scfh	14.70 psia
054-02-ST	50.00	scfh	14.70 psia	092-09-GL	5.00	scfh	14.70 psia
064-62-ST	90.00	scfh	14.70 psia	102-06-GL	8.25	scfh	14.70 psia
074-02-CA	150.00	scfh	14.70 psia	092-10-ST	10.00	scfh	14.70 psia
014-01-CA	0.60	scfm	14.70 psia	102-08-ST	16.50	scfh	14.70 psia
				102-09-CA	23.00	scfh	14.70 psia
				044-05-GL	55.00	scfh	14.70 psia
				044-18-ST	90.00	scfh	14.70 psia
				044-07-ST	94.00	scfh	14.70 psia
				044-23-SA	1.00	scfm	14.70 psia
				044-43-ST	1.50	scfm	14.70 psia

TABLE 12 - FLOW TUBES FOR WATER

65mm				150mm			
FLOW TUBE	**QMAX**	**[UNITS]**	**PRESSURE**	**FLOW TUBE**	**QMAX**	**[UNITS]**	**PRESSURE**
032-04-GL	0.50	mL/min	14.70 psia	032-05-SA	1.00	mL/min	14.70 psia
022-08-ST	6.00	mL/min	14.70 psia	112-12-SA	10.00	mL/min	14.70 psia
052-08-ST	60.00	mL/min	14.70 psia	112-05-ST	20.00	mL/min	14.70 psia
013-02-ST	115.00	mL/min	14.70 psia	092-02-GL	50.00	mL/min	14.70 psia
365-01-ST	150.00	mL/min	14.70 psia	092-08-GL	60.00	mL/min	14.70 psia
044-09-GL	250.00	mL/min	14.70 psia	102-11-GL	100.00	mL/min	14.70 psia
064-05-GL	500.00	mL/min	14.70 psia	092-06-CA	200.00	mL/min	14.70 psia
054-03-ST	750.00	mL/min	14.70 psia	044-15-ST	1.20	L/min	14.70 psia
064-04-SA	1.00	L/min	14.70 psia	044-01-TA	2.00	L/min	14.70 psia
064-06-ST	1.20	L/min	14.70 psia	044-12-SA	0.22	gpm	14.70 psia
052-16-ST	3.00	L/hr	14.70 psia	044-42-CA	0.45	gpm	14.70 psia
064-12-GL	10.00	gph	14.70 psia	044-10-CA	29.00	gph	14.70 psia
064-09-CA	24.00	gph	14.70 psia				
064-11-TA	32.00	gph	14.70 psia				

DIRECT READING SCALES FOR P, PX, T, TX AND S METERS

TABLE 13 -FLOW TUBES FOR ARGON

65mm				150mm			
FLOW TUBE	**QMAX**	**[UNITS]**	**PRESSURE**	**FLOW TUBE**	**QMAX**	**[UNITS]**	**PRESSURE**
052-15-SA	1000.00	mL/min	14.70 psia	062-10-CA	325.00	mL/min	14.70 psia
013-09-CA	4.5	L/min	14.70 psia	032-18-GL	33.00	mL/min	14.70 psia
064-14-SA	26.00	L/min	14.70 psia	082-11-CA	2.00	L/min	14.70 psia
023-05-GL	2.50	scfh	14.70 psia	034-07-ST	15.00	L/min	14.70 psia
365-17-ST	10.00	scfh	14.70 psia	044-22-SA	25.00	L/min	14.70 psia
014-14-ST	22.00	scfh	14.70 psia				
064-01-GL	50.00	scfh	14.70 psia				

TABLE 14 - FLOW TUBES FOR CARBON DIOXIDE

65mm				150mm			
FLOW TUBE	**QMAX**	**[UNITS]**	**PRESSURE**	**FLOW TUBE**	**QMAX**	**[UNITS]**	**PRESSURE**
042-20-SA	10.00	mL/min	14.70 psia	062-09-GL	100.00	mL/min	14.70 psia
042-09-ST	20.00	mL/min	14.70 psia	032-32-ST	150.00	mL/min	14.70 psia
032-20-GL	55.00	mL/min	14.70 psia	062-14-ST	300.00	mL/min	14.70 psia
022-24-SA	220.00	mL/min	14.70 psia	092-18-SA	2.5	L/min	14.70 psia
052-14-GL	1.00	L/min	14.70 psia	034-18-SA	10.00	L/min	14.70 psia
023-07-ST	2.00	L/min	14.70 psia				
014-18-GL	6.00	L/min	14.70 psia				
014-19-ST	10.00	L/min	14.70 psia				
064-08-ST	35.00	L/min	14.70 psia				

TABLE 15 - DIRECT READING FLOW TUBES FOR FUEL OIL

150mm			
FLOW TUBE	**QMAX**	**[UNITS]**	**PRESSURE**
034-60-GL	3.00	gph	14.70 psia

TABLE 16 - DIRECT READING FLOW TUBES FOR HELIUM

65mm				150mm			
FLOW TUBE	**QMAX**	**[UNITS]**	**PRESSURE**	**FLOW TUBE**	**QMAX**	**[UNITS]**	**PRESSURE**
032-07-SA	65.00	mL/min	14.70 psia	062-13-GL	100.00	mL/min	14.70 psia
022-02-GL	120.00	mL/min	14.70 psia	062-07-CA	500.00	mL/min	14.70 psia
014-04-GL	30.00	scfh	14.70 psia	082-05-GL	1500.00	mL/min	14.70 psia
				082-07-CA	5.00	L/min	14.70 psia
				034-09-ST	40.00	L/min	14.70 psia

TABLE 17 - DIRECT READING FLOW TUBES FOR HYDROGEN

65mm				150mm			
FLOW TUBE	**QMAX**	**[UNITS]**	**PRESSURE**	**FLOW TUBE**	**QMAX**	**[UNITS]**	**PRESSURE**
032-13-GL	35.00	mL/min	14.70 psia	032-12-GL	100.00	mL/min	14.70 psia
042-01-CA	100.00	mL/min	14.70 psia	092-15-SA	20.00	scfh	14.70 psia
032-02-SA	150.00	mL/min	14.70 psia	044-20-SA	225.00	scfh	14.70 psia
012-01-GL	600.00	mL/min	14.70 psia				
022-01-CA	1.50	L/min	14.70 psia				
023-01-GL	3.50	L/min	14.70 psia				
013-01-GL	6.00	L/min	14.70 psia				
014-15-ST	42.00	L/min	14.70 psia				
013-08-ST	30.00	scfh	14.70 psia				

DIRECT READING SCALES FOR P, PX, T, TX AND S METERS

TABLE 18- DIRECT READING FLOW TUBES FOR METHANE

65mm			
FLOW TUBE	**QMAX**	**[UNITS]**	**PRESSURE**
042-03-ST	40.00	mL/min	14.70 psia

TABLE 19- DIRECT READING FLOW TUBES FOR NITROUS OXIDE

150mm			
FLOW TUBE	**QMAX**	**[UNITS]**	**PRESSURE**
112-11-SA	500.00	mL/min	14.70 psia

TABLE 20 - DIRECT READING FLOW TUBES FOR NITROGEN

65mm			
FLOW TUBE	**QMAX**	**[UNITS]**	**PRESSURE**
042-08-GL	6.00	mL/min	14.70 psia
032-16-ST	50.00	mL/min	14.70 psia
032-08-SA	60.00	mL/min	14.70 psia
022-15-GL	120.00	mL/min	14.70 psia
022-06-SA	200.00	mL/min	14.70 psia
014-16-ST	12.00	L/min	14.70 psia
064-13-GL	20.00	L/min	14.70 psia

150mm			
FLOW TUBE	**QMAX**	**[UNITS]**	**PRESSURE**
062-12-GL	100.00	mL/min	14.70 psia
032-22-CA	200.00	mL/min	14.70 psia
062-30-CA	300.00	mL/min	14.70 psia
112-06-SA	500.00	mL/min	14.70 psia
032-31-GL	50.00	mL/min	14.70 psia
092-05-GL	2.00	L/min	14.70 psia
102-21-ST	7.00	L/min	14.70 psia
034-24-ST	14.00	L/min	14.70 psia
044-25-CA	50.00	L/min	14.70 psia
044-24-TA	66.00	L/min	14.70 psia
044-06-ST	1.60	scfm	14.70 psia

TABLE 21 - DIRECT READING FLOW TUBES FOR OXYGEN

65mm			
FLOW TUBE	**QMAX**	**[UNITS]**	**PRESSURE**
042-21-ST	10.00	mL/min	14.70 psia
032-09-GL	35.00	mL/min	14.70 psia
032-19-GL	50.00	mL/min	14.70 psia
022-07-ST	300.00	mL/min	14.70 psia
012-02-ST	500.00	mL/min	14.70 psia
052-02-GL	1.00	L/min	14.70 psia
013-25-ST	4.00	L/min	14.70 psia
034-08-ST	8.00	L/min	14.70 psia
044-04-ST	15.00	L/min	14.70 psia

150mm			
FLOW TUBE	**QMAX**	**[UNITS]**	**PRESSURE**
032-33-ST	150.00	mL/min	14.70 psia
062-02-ST	250.00	mL/min	14.70 psia
112-04-SA	400.00	mL/min	14.70 psia
062-16-CA	600.00	mL/min	14.70 psia
082-08-SA	1.00	L/min	14.70 psia
102-12-SA	5.00	L/min	14.70 psia
034-77-SA	10.00	L/min	14.70 psia
034-15-ST	16.50	L/min	14.70 psia

TABLE 22 - DIRECT READING FLOW TUBES FOR PROPANE

150mm			
FLOW TUBE	**QMAX**	**[UNITS]**	**PRESSURE**
092-01-ST	4.20	L/min	14.70 psia
102-02-CA	10.00	L/min	14.70 psia
044-02-ST	38.00	L/min	14.70 psia

COMMON EQUIVALENTS AND CONVERSIONS

Approximate Common Equivalents

1 inch	= 25 millimeter
1 foot	= 0.3 meter
1 yard	= 0.9 meter
1 mile	= 1.6 kilometers
1 square inch	= 6.5 sq centimeters
1 square foot	= 0.09 square meter
1 square yard	= 0.8 square meter
1 acre	= 0.4 hectare +
1 cubic inch	= 16 cu centimeters
1 cubic foot	= 0.03 cubic meter
1 cubic yard	= 0.8 cubic meter
1 quart (lq)	= 1 liter +
1 gallon	= 0.004 cubic meter
1 ounce (avdp)	= 28 grams
1 pound (avdp)	= 0.45 kilogram
1 horsepower	= 0.75 kilowatt
1 millimeter	= 0.04 inch
1 meter	= 3.3 feet
1 meter	= 1.1 yards
1 kilometer	= 0.6 mile
1 square centimeter	= 0.16 square inch
1 square meter	= 11 square feet
1 square meter	= 1.2 square yards
1 hectare +	= 2.5 acres
1 cubic centimeter	= 0.06 cubic feet
1 cubic meter	= 35 cubic feet
1 cubic meter	= 1.3 cubic yards
1 liter +	= 1 quart
1 cubic meter	= 250 gallons
1 gram	= 0.035 ounces (avdp)
1 kilogram	= 2.2 pounds (avdp)
1 kilowatt	= 1.3 horsepower

Conversions Accurate to Parts Per Million

inches X 25.4*	= millimeters
feet X 0.3048*	= meters
yards X 0.9144*	= meters
miles X 1.603 34	= kilometers
square inches X 6.4516*	= square centimeters
square feet X 0.92 903 0	= square meters
square yards X 0.836 127	= square meters
acres X 0.404 686	= hectares
cubic inches X 16.3871	= cubic centimeters
cubic feet X 0.028 316.8	= cubic meters
cubic yards X 0.764 555	= cubic meters
quarts (lq) X 0.946 353	= liters
gallons X 0.003 785 41	= cubic meters
ounces (avdp) X 28.3495	= grams
pounds (avdp) X 0.453 592	= kilograms
horsepower X 0.745 700	= kilowatts
millimeters X 0.039 370 1	= inchs
meters X 3.280 84	= feet
meters X 1.093 61	= yards
kilometers X 0.621 371	= miles
sq centimeters X 0.155 000	= square inchs
square meters X 10.7639	= square feet
square meters X 1.195 99	= square yards
hectares X 2.471 05	= acres
cu centimeters X 0.061 623 7	= cubic inches
cubic meters X 35.3147	= cubic feet
cubic meters X 1.307 95	= cubic yards
liters X 1.056 69	= quarts (lq)
cubic meters X 264.172	= gallons
grams 0.035 274 0	= ounces (avdp)
kilograms X 2.204 62	= pounds (avdp)
kilowatts 1.341 02	= horsepower

THESE PREFIXES MAY BE APPLIED TO ALL SI UNITS
Multiples and Submultiples

1 000 000 000 000	= 10^{12}
1 000 000 000	= 10^{9}
1 000 000	= 10^{6}
1000	= 10^{3}
100	= 10^{2}
10	= 10
0.1	= 10^{-1}
0.01	= 10^{-2}
0.001	= 10^{-3}
0.000 001	= 10^{-6}
0.000 000 001	= 10^{-9}
0.000 000 000 001	= 10^{-12}
0.000 000 000 000 001	= 10^{-15}
0.000 000 000 000 000 0001	= 10^{-18}

Prefixes	Symbols
tara (ter'a)	T
giga (ji ga)	G
mega (meg'a)	Ma
kilo (kil o)	k*
hecto (hek'to)	h
deka (dek'a)	da
deci (des'i)	d
centi (sen'ti)	c*
milli (mil'i)	m*
micro (mi' kro)	*u**
nano (nan'o)	n
pico (pe'ko)	p
femto (fem'to)	f
atto (at'to)	a

+ common term not used in S1
* exact

Source: NBS Special Pub. 304.