

**VALVE FLOW CAPACITIES**

TABLE 1 - MFV™ STYLE VALVE FLOW CAPACITIES 10 psig (0.7 kg/cm<sup>2</sup>) INLET PRESSURE, ATMOSPHERIC EXHAUST

ORIFICE NUMBER	AIR		HELIUM		WATER	
	smL/min	scfh	smL/min	scfh	mL/min	gph
1	200	0.42	400	0.85	6	1.363
2	400	0.85	850	1.80	12	2.725
3	1000	2.22	1800	3.81	26	5.905
4	2500	4.87	6000	12.71	80	18.168
5	6200	13.14	16000	33.90	200	45.420
6	21500	45.55	55000	116.53	650	147.615

TABLE 2 - CV™ STYLE VALVE FLOW CAPACITIES 10 psig (0.7 kg/cm<sup>2</sup>) INLET PRESSURE, ATMOSPHERIC EXHAUST

ORIFICE NUMBER	AIR		HELIUM		WATER	
	smL/min	scfh	smL/min	scfh	mL/min	gph
L	5000	10.6	10300	21.8	350	79.485
M	20000	42.4	41400	87.7	1200	272.520
H	60000	127	146000	309	3500	794.850

**METERING SIZING**

Flow capacity tables 6, 7, 8, 9 and 10 (pages 38 to 41) 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 38 to 41).

**gas flow**

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

$$K_{gas} = \sqrt{G \times \frac{T_{act}}{T_0} \times \frac{P_0}{P_{act}}}$$

**where**

- Q<sub>air</sub>** = equivalent air flow capacity at Standard Conditions (SPT).
- Q<sub>gas</sub>** = maximum flow of metered gas.
- G** = specific gravity of metered gas (from table 5).
- T<sub>act</sub>** = absolute temperature at flow condition, deg R or deg K.
- T<sub>0</sub>** = absolute temperature at Standard Conditions. (STP) deg R (530) or deg K (294).
- P<sub>act</sub>** = pressure at flow conditions, psia.
- P<sub>0</sub>** = 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<sub>water</sub>** = equivalent water flow capacity at Standard Conditions (STP).
- Q<sub>liq</sub>** = maximum flow of metered liquid.
- d<sub>f</sub>** = density of float selected, (see table 3), (g/ml).
- d<sub>L</sub>** = density of metered liquid, (g/ml).
- d<sub>w</sub>** = density of water at Standard Conditions (STP) (1.0 g/ml).

## CALCULATION VS. CALIBRATION

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.

**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	$3.531 \times 10^{-5}$	cu. ft/min.
ml/min	$1.585 \times 10^{-2}$	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 <sup>3</sup> /min)	28.31	L/min.
cfm (ft <sup>3</sup> /min)	1.699	m <sup>3</sup> /hr.
oz/min	29.57	mL/min.

  

PRESSURE		
MULTIPLY	BY	TO OBTAIN
PSI	27.71	in. H <sub>2</sub> O
PSI	2.036	in. Hg
PSI	703.1	mm/H <sub>2</sub> O
PSI	51.75	mm/Hg
PSI	.0703	kg/cm <sup>2</sup>
PSI	.0689	bar
PSI	68.95	mbar
PSI	6895	Pa
PSI	6.895	kPa

  

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

  

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

**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 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

**TABLE OF STANDARD FLOW CAPACITIES**

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

FLOW TUBE NUMBER	FLOW TUBE MAXIMUM FLOW RATE			
	AIR		WATER	
	[sml/min]	[scfh]	[ml/min]	[gph]
042-15-GL	19	0.040	0.19	0.003
042-15-SA	30	0.064	0.39	0.006
042-15-ST	61	0.128	0.94	0.015
042-15-CA	110	0.234	1.91	0.030
042-15-TA	121	0.257	2.13	0.033
032-41-GL	49	0.104	0.49	0.008
032-41-SA	73	0.155	0.98	0.016
032-41-ST	143	0.290	2.34	0.039
032-41-CA	246	0.521	4.7	0.078
032-41-TA	264	0.559	5.1	0.087
062-01-GL	92	0.195	0.9	0.013
062-01-SA	141	0.297	1.9	0.030
062-01-ST	264	0.559	4.7	0.075
062-01-CA	444	0.962	8.5	0.135
062-01-TA	484	1.025	9.2	0.146
112-02-GL	374	0.792	5.5	0.087
112-02-SA	513	1.087	10.0	0.159
112-02-ST	814	1.725	20.4	0.323
112-02-CA	1222	2.589	33.7	0.534
112-02-TA	1331	2.820	36.1	0.572
082-03-GL	844	1.748	16.5	0.262
082-03-SA	1093	2.316	26.1	0.414
082-03-ST	1682	3.564	44.6	0.729
082-03-CA	2423	5.133	70.5	1.117
082-03-TA	2576	5.458	75.6	1.198
092-04-GL	2313	4.900	54	0.848
092-04-SA	3079	6.523	78	1.233
092-04-ST	4562	9.665	133	2.067
092-04-CA	6621	14.02	201	3.180
092-04-TA	6932	14.68	212	3.357
102-05-GL	3922	8.07	84	1.336
102-05-SA	5188	10.60	126	2.002
102-05-ST	7825	16.08	217	3.433
102-05-CA	11371	22.94	329	5.219
102-05-TA	11965	24.10	353	5.589
034-39-GL	8505	18.38	210	3.32
034-39-SA	11357	24.05	306	4.84
034-39-ST	16737	35.46	506	8.02
034-39-CA	23752	50.32	747	11.84
034-39-TA	25252	53.50	790	12.52
044-40-GL	23742	47.7	541	8.58
044-40-SA	30711	62.6	806	12.77
044-40-ST	45227	87.9	1288	20.41
044-40-CA	66346	126.0	1881	29.81
044-40-TA	69940	132.6	2001	31.72

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

FLOW TUBE NUMBER	FLOW TUBE MAXIMUM FLOW RATE			
	AIR		WATER	
	[sml/min]	[scfh]	[mL/min]	[gph]
042-07-GL	6	0.013	0.07	0.001
042-07-SA	9	0.017	0.08	0.001
042-07-ST	19	0.036	0.28	0.004
042-07-CA	33	0.070	0.62	0.009
042-07-TA	36	0.072	0.66	0.010
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	104	0.220	1.8	0.028
022-13-SA	159	0.337	3.4	0.054
022-13-ST	299	0.633	5.8	0.122
022-13-CA	516	1.093	14.1	0.223
022-13-TA	530	1.123	15.5	0.246
012-10-GL	202	0.43	2.6	0.041
012-10-SA	300	0.64	4.7	0.074
012-10-ST	522	1.11	12.0	0.190
012-10-CA	818	1.73	20.8	0.330
012-10-TA	859	1.82	23.5	0.372
052-01-GL	986	2.09	20.5	0.325
052-01-SA	1299	2.75	34.0	0.539
052-01-ST	1946	4.12	55.6	0.881
052-01-CA	2827	5.99	88.5	1.403
052-01-TA	3020	6.40	94.0	1.490
023-92-GL	1249	2.65	25	0.428
023-92-SA	1623	3.44	37	0.586
023-92-ST	2520	5.34	71	1.125
023-92-CA	3680	7.80	104	1.648
013-88-GL	2040	4.32	40	0.63
013-88-SA	2704	5.73	61	0.97
013-88-ST	3990	8.45	108	1.71
013-88-CA	5739	12.16	170	2.69
365-02-GL	2678	5.67	52	0.82
365-02-ST	4922	10.40	150	2.38
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	17153	36.3	540	8.56
014-96-TA	18213	38.6	568	9.00
054-17-GL	13153	27.9	309	4.90
054-17-SA	16980	36.0	456	7.23
054-17-ST	24680	52.3	745	11.8
054-17-CA	35320	74.8	1110	17.59
054-17-TA	37589	79.6	1182	18.73
064-63-GL	23169	49.1	522	8.27
064-63-SA	29218	61.9	798	12.65
064-63-ST	42094	89.2	1261	19.97
064-63-CA	58500	123.9	1866	29.58
064-63-TA	62100	131.6	2027	32.13

\* SUFFIX REFERS TO FLOAT MATERIALS;

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

## TABLE OF STANDARD FLOW CAPACITIES

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]
042-15-GL	15	0.033	23	0.050	16	0.034	37	0.078	20	0.041	17	0.036
042-15-SA	24	0.052	37	0.078	26	0.054	59	0.126	31	0.066	27	0.057
042-15-ST	49	0.104	72	0.153	53	0.112	123	0.260	62	0.132	54	0.115
042-15-CA	90	0.192	127	0.269	101	0.214	232	0.491	114	0.241	99	0.210
042-15-TA	99	0.211	139	0.294	112	0.238	256	0.543	125	0.265	109	0.231
032-41-GL	44	0.093	56	0.121	46	0.100	94	0.212	48	0.119	42	0.104
032-41-SA	60	0.127	84	0.178	69	0.148	149	0.318	76	0.161	70.4	0.149
032-41-ST	113	0.239	150	0.318	133	0.282	301	0.646	143	0.303	131	0.278
032-41-CA	202	0.428	251	0.532	260	0.551	567	1.258	255	0.540	228	0.483
032-41-TA	222	0.470	263	0.557	288	0.610	602	1.390	274	0.581	244	0.517
062-01-GL	76	0.161	103	0.218	90	0.191	208	0.441	92	0.195	81	0.172
062-01-SA	111	0.235	157	0.333	142	0.301	322	0.682	139	0.294	121	0.256
062-01-ST	218	0.462	281	0.595	283	0.600	627	1.328	271	0.574	233	0.494
062-01-CA	373	0.790	445	0.943	519	1.100	1120	2.373	462	0.979	407	0.862
062-01-TA	393	0.833	470	0.996	555	1.176	1225	2.595	495	1.049	433	0.917
112-02-GL	305	0.646	355	0.752	450	0.953	1021	2.163	382	0.809	340	0.720
112-02-SA	429	0.909	472	1.000	681	1.443	1497	3.172	520	1.102	472	1.000
112-02-ST	676	1.432	728	1.542	1290	2.733	2496	5.288	824	1.746	753	1.595
112-02-CA	1020	2.161	1072	2.271	2221	4.706	3876	8.212	1220	2.585	1131	2.396
112-02-TA	1085	2.299	1134	2.403	2356	4.992	4257	9.019	1310	2.775	1206	2.555
082-03-GL	687	1.46	725	1.54	1490	3.16	2620	5.55	827	1.75	772	1.64
082-03-SA	910	1.93	944	2.00	2059	4.36	3546	7.51	1110	2.35	1024	2.18
082-03-ST	1380	2.92	1420	3.01	3397	7.20	5547	11.75	1662	3.52	1545	3.27
082-03-CA	1996	4.23	2039	4.32	5120	10.85	8170	17.31	2405	5.10	2246	4.76
082-03-TA	2131	4.51	2163	4.58	5437	11.52	8717	18.47	2575	5.46	2364	5.01
092-04-GL	1949	4.13	2048	4.34	4880	10.34	7817	16.56	2395	5.07	2169	4.60
092-04-SA	2605	5.52	2620	5.55	6458	13.68	10455	22.15	3142	6.66	2860	6.06
092-04-ST	3903	8.27	3990	8.45	9770	20.70	15855	33.59	4685	9.93	4341	9.20
092-04-CA	5665	12.00	5743	12.17	14500	30.72	22790	48.28	6845	14.50	6307	13.36
092-04-TA	6040	12.80	6018	12.75	15420	32.67	24252	51.38	7080	15.00	6690	14.17
102-05-GL	3151	6.68	3374	7.15	7803	16.53	13105	27.76	3868	8.19	3485	7.38
102-05-SA	4175	8.85	4388	9.30	10336	21.89	16108	34.13	5090	10.78	4652	9.86
102-05-ST	6384	13.54	6308	13.36	15960	33.82	27804	58.91	7722	16.36	6992	14.81
102-05-CA	9069	19.21	9069	19.21	23509	49.81	37553	79.57	10973	23.25	10082	21.36
102-05-TA	9627	20.40	9475	20.07	25131	53.24	39998	84.74	11628	24.64	10741	22.76
034-39-GL	7366	15.61	7485	15.86	19426	41.16	29840	63.22	8916	18.89	8269	17.52
034-39-SA	9539	20.21	9557	20.25	25400	53.81	40006	84.76	11524	24.42	10706	22.68
034-39-ST	14131	29.94	14051	29.77	38576	81.73	59996	127.1	17021	36.06	15710	33.28
034-39-CA	20166	42.72	19854	42.06	56220	119.1	83052	175.9	24071	51.00	22432	47.53
034-39-TA	21414	45.37	21115	44.74	60596	128.3	90410	191.5	25709	54.47	23790	50.40
044-40-GL	19761	41.9	18989	40.2	53100	112.5	85812	181.8	23512	49.8	21350	45.2
044-40-SA	24563	52.0	23855	50.6	70100	148.5	110100	233.2	29930	63.4	27181	57.5
044-40-ST	35300	74.8	34287	72.6	103647	219.6	159699	338.3	43000	91.1	39567	83.8
044-40-CA	47890	101.4	46311	98.1	146500	310.4	221872	470.0	59580	126.2	54902	116.3
044-40-TA	51997	110.2	49009	103.8	189826	402.2	234423	496.6	63826	135.2	57960	122.8

\*Suffix refers to float materials: G = black glass, S = sapphire (red), ST = 316 stainless steel, C = Carboly®, 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 36. 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](http://www.aalborg.com)

**TABLE OF STANDARD FLOW CAPACITIES**

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	5.6	0.01	5	0.01
042-07-SA	7.7	0.02	10	0.02	8	0.02	15.3	0.03	8.5	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	86	0.18	122	0.26	99	0.21	284	0.60	113	0.24	94	0.20
022-13-SA	131	0.28	181	0.38	157	0.33	435	0.92	167	0.35	147	0.31
022-13-ST	246	0.52	310	0.66	313	0.66	700	1.75	312	0.66	268	0.57
022-13-CA	420	0.89	494	1.05	604	1.28	1500	3.18	524	1.11	456	0.97
022-13-TA	446	0.94	519	1.10	632	1.34	1553	3.29	563	1.19	486	1.03
012-10-GL	174	0.37	221	0.47	211	0.45	502	1.06	215	0.46	189	0.40
012-10-SA	257	0.54	307	0.65	327	0.69	788	1.67	312	0.66	279	0.59
012-10-ST	429	0.91	489	1.04	636	1.35	1488	3.15	530	1.12	480	1.02
012-10-CA	685	1.45	735	1.56	1185	2.51	2455	5.20	838	1.78	761	1.61
012-10-TA	724	1.53	775	1.64	1300	2.75	2728	5.78	877	1.86	800	1.69
052-01-GL	829	1.76	883	1.87	1903	4.03	3212	6.82	1015	2.15	970	2.06
052-01-SA	1095	2.32	1143	2.42	2606	5.52	4215	8.93	1321	2.80	1217	2.58
052-01-ST	1645	3.49	1699	3.60	4128	8.75	6598	13.98	1983	4.20	1842	3.90
052-01-CA	2415	5.12	2438	5.17	6175	13.08	9450	20.02	2900	6.14	2676	5.67
052-01-TA	2559	5.42	2587	5.48	6588	13.96	10332	21.89	3063	6.49	2837	6.01
023-92-GL	1065	2.26	1110	2.35	1990	4.22	3923	8.31	1293	2.74	1165	2.47
023-92-SA	1395	2.96	1500	3.18	2950	6.25	5258	11.14	1710	3.62	1575	3.34
023-92-ST	2124	4.50	2190	4.64	4970	10.53	8602	18.22	2610	5.53	2360	5.00
023-92-CA	3125	6.62	3210	6.80	7675	16.26	12850	27.22	3820	8.09	3485	7.38
013-88-GL	1784	3.78	1794	3.80	3470	7.35	6359	13.47	2091	4.43	1928	4.08
013-88-SA	2279	4.83	2314	4.90	4932	10.45	9130	19.34	2859	6.06	2522	5.34
013-88-ST	3388	7.18	3449	7.31	8699	18.43	13600	28.81	4097	8.68	3761	7.97
013-88-CA	4904	10.39	4937	10.46	13227	28.02	19682	41.70	5928	12.56	5380	11.40
365-02-GL	2171	4.60	2237	4.74	4853	10.28	9410	19.94	2624	5.56	2323	4.92
365-02-ST	4172	8.84	4225	8.95	10947	23.19	16857	38.06	5026	10.65	4733	10.03
014-96-GL	5290	11.21	5470	11.59	13750	29.13	21712	46.00	6380	13.52	5880	124.5
014-96-SA	6900	14.62	6980	14.79	18500	39.19	28211	59.77	8280	17.54	7640	16.19
014-96-ST	10175	21.56	10150	21.50	27300	57.84	42040	89.07	12200	25.85	11250	23.83
014-96-CA	14150	29.98	14200	30.08	39500	83.69	58498	123.9	17050	36.12	15875	33.63
014-96-TA	15300	32.42	15050	31.89	41400	87.71	63804	135.1	18250	38.67	16700	35.38
054-17-GL	11125	23.57	11156	23.64	29762	63.1	47100	99.8	13412	28.42	12341	26.15
054-17-SA	14389	30.49	14256	30.20	38731	82.1	61715	130.7	17351	36.76	16047	34.00
054-17-ST	21116	44.74	20798	44.06	58472	123.8	90323	191.3	25311	53.63	23322	49.41
054-17-CA	30126	63.83	29156	61.77	84632	179.3	130805	277.1	35830	75.91	33287	70.52
054-17-TA	31622	67.00	31126	65.94	88862	188.2	139224	294.9	37724	79.92	35738	75.72
064-63-GL	19817	42.0	19379	41.1	51380	108.8	80752	171.0	23506	49.80	21686	45.9
064-63-SA	24597	52.1	24630	52.2	67754	143.5	106000	224.5	30337	64.27	27901	59.1
064-63-ST	37441	79.3	35100	74.4	104600	221.6	154750	327.8	43487	92.13	40053	84.9
064-63-CA	50200	106.3	47950	101.5	148114	313.8	220500	467.1	60618	128.4	55539	117.6
064-63-TA	52850	111.9	53200	112.7	156500	331.5	222300	470.9	64051	135.7	58300	123.5

**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]
042-15-GL	83	67	97	73	169	85	74
042-15-SA	127	104	146	117	267	131	114
042-15-ST	242	200	265	241	535	249	218
042-15-CA	415	343	437	450	967	426	376
032-41-GL	191	161	195	203	399	197	166
032-41-SA	270	229	302	279	662	283	246
032-41-ST	460	383	574	478	1185	471	442
032-41-CA	743	625	1094	702	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	32001	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

TABLE 11 - 65mm FLOW TUBES FOR AIR

FLOW TUBE	QMAX	[UNITS]	PRESSURE
052-05G	2.20	scfh	14.70 psia
365-18G	6.00	scfh	14.70 psia
365-19ST	10.00	scfh	14.70 psia
034-61ST	18.00	scfh	14.70 psia
014-17ST	25.00	scfh	14.70 psia
054-02ST	50.00	scfh	14.70 psia
064-62ST	90.00	scfh	14.70 psia
074-02-C	150.00	scfh	14.70 psia
014-01C	0.60	scfm	14.70 psia
052-04G	1.00	L/min	14.70 psia
023-03G	1.15	L/min	14.70 psia
052-07ST	2.00	L/min	14.70 psia
013-89ST	4.00	L/min	14.70 psia
014-03G	5.00	L/min	14.70 psia
014-02ST	10.00	L/min	14.70 psia
044-11ST	16.00	L/min	14.70 psia
054-01ST	25.00	L/min	14.70 psia
064-03ST	40.00	L/min	14.70 psia
042-10G	7.00	mL/min	14.70 psia
032-01ST	50.00	mL/min	14.70 psia
062-04ST	75.00	mL/min	14.70 psia
022-14G	100.00	mL/min	14.70 psia
032-11ST	130.00	mL/min	14.70 psia
032-03C	250.00	mL/min	14.70 psia
022-05C	500.00	mL/min	14.70 psia
052-12GL	1000.00	mL/min	14.70 psia
150mm FLOW TUBES FOR AIR			
112-01C	2.50	scfh	14.70 psia
092-09G	5.00	scfh	14.70 psia
102-06G	8.25	scfh	14.70 psia
092-10ST	10.00	scfh	14.70 psia
102-08ST	16.50	scfh	14.70 psia
102-09C	23.00	scfh	14.70 psia
044-05G	55.00	scfh	14.70 psia
044-18ST	90.00	scfh	14.70 psia
044-07ST	94.00	scfm	14.70 psia
044-23S	1.00	scfm	14.70 psia
044-43ST	1.50	scfm	14.70 psia
112-19C	1.25	L/min	14.70 psia
082-12ST	1.80	L/min	14.70 psia
092-25G	2.50	L/min	14.70 psia
102-07G	4.00	L/min	14.70 psia
102-03S	4.50	L/min	14.70 psia
092-14ST	4.80	L/min	14.70 psia
102-01S	5.00	L/min	14.70 psia
034-62G	10.00	L/min	14.70 psia
102-16C	10.00	L/min	14.70 psia
034-13ST	17.00	L/min	14.70 psia
044-14G	23.00	L/min	14.70 psia
044-41ST	42.00	L/min	14.70 psia
044-16C	60.00	L/min	14.70 psia
042-12S	25.00	mL/min	14.70 psia
032-06S	52.00	mL/min	14.70 psia
042-06C	75.00	mL/min	14.70 psia
032-10ST	100.00	mL/min	14.70 psia
042-75C	100.00	mL/min	14.70 psia
032-21ST	150.00	mL/min	14.70 psia
062-03ST	200.00	mL/min	14.70 psia
112-10G	300.00	mL/min	14.70 psia
112-08S	500.00	mL/min	14.70 psia
082-02G	800.00	mL/min	14.70 psia

TABLE 12 - 65mm FLOW TUBES FOR WATER

FLOW TUBE	QMAX	[UNITS]	PRESSURE
064-04S	1.00	L/min	14.70 psia
064-06ST	1.20	L/min	14.70 psia
052-16ST	3.00	L/hr	14.70 psia
032-04G	0.50	mL/min	14.70 psia
022-08ST	6.00	mL/min	14.70 psia
052-09G	25.00	mL/min	14.70 psia
052-08ST	60.00	mL/min	14.70 psia
013-02ST	115.00	mL/min	14.70 psia
365-01ST	150.00	mL/min	14.70 psia
044-09G	250.00	mL/min	14.70 psia
064-05G	500.00	mL/min	14.70 psia
054-03ST	750.00	mL/min	14.70 psia
150mm FLOW TUBES FOR WATER			
044-10C	29.00	gph	14.70 psia
044-12S	0.22	gpm	14.70 psia
044-42C	0.45	gpm	14.70 psia
044-15ST	1.20	L/min	14.70 psia
044-01T	2.00	L/min	14.70 psia
032-05S	1.00	mL/min	14.70 psia
112-12S	10.00	mL/min	14.70 psia
112-05ST	20.00	mL/min	14.70 psia
092-02G	50.00	mL/min	14.70 psia
092-08G	60.00	mL/min	14.70 psia
102-11G	100.00	mL/min	14.70 psia
092-06C	200.00	mL/min	14.70 psia
034-10ST	500.00	mL/min	14.70 psia

TABLE 13 - 65mm FLOW TUBES FOR ARGON

FLOW TUBE	QMAX	[UNITS]	PRESSURE
023-05G	2.50	scfh	14.70 psia
365-17ST	10.00	scfh	14.70 psia
014-14ST	22.00	scfh	14.70 psia
064-01G	50.00	scfh	14.70 psia
052-15S	1000.00	mL/min	14.70 psia
150mm FLOW TUBES FOR ARGON			
082-11C	2.00	L/min	14.70 psia
034-07ST	15.00	L/min	14.70 psia
044-22S	25.00	L/min	14.70 psia
062-10C	325.00	mL/min	14.70 psia
032-18GL	33.00	mL/min	14.70 psia

TABLE 14 - 65mm FLOW TUBES FOR CARBON DIOXIDE

FLOW TUBE	QMAX	[UNITS]	PRESSURE
052-14G	1.00	L/min	14.70 psia
014-18G	6.00	L/min	14.70 psia
014-19ST	10.00	L/min	14.70 psia
064-08ST	35.00	L/min	14.70 psia
042-09ST	20.00	mL/min	14.70 psia
032-20G	55.00	mL/min	14.70 psia
022-24S	220.00	mL/min	14.70 psia
150mm FLOW TUBES FOR CARBON DIOXIDE			
062-09G	100.00	mL/min	14.70 psia
062-14ST	300.00	mL/min	14.70 psia
034-18S	10.00	L/min	14.70 psia

TABLE 15 - DIRECT READING FLOW TUBES FOR FUEL OIL  
150mm FLOW TUBES

FLOW TUBE	QMAX	[UNITS]	PRESSURE
034-60G	3.00	gph	14.70 psia

# TECHNICAL INFORMATION

**TABLE 16 - DIRECT READING FLOW TUBES FOR HELIUM  
65mm FLOW TUBES**

FLOW TUBE	QMAX	[UNITS]	PRESSURE
032-07S	65.00	mL/min	14.70 psia
022-02G	120.00	mL/min	14.70 psia
150mm FLOW TUBES			
112-03S	1.25	scfh	14.70 psia
082-07C	5.00	L/min	14.70 psia
034-09ST	40.00	L/min	14.70 psia
062-13G	100.00	mL/min	14.70 psia
062-07C	500.00	mL/min	14.70 psia
082-05G	1500.00	mL/min	14.70 psia

**TABLE 17 - DIRECT READING FLOW TUBES FOR HYDROGEN  
65mm FLOW TUBES**

FLOW TUBE	QMAX	[UNITS]	PRESSURE
022-01C	1.50	L/min	14.70 psia
023-01G	3.50	L/min	14.70 psia
013-01G	6.00	L/min	14.70 psia
014-15ST	42.00	L/min	14.70 psia
032-13G	35.00	mL/min	14.70 psia
042-01ST	100.00	mL/min	14.70 psia
032-02S	150.00	mL/min	14.70 psia
012-01G	600.00	mL/min	14.70 psia
150mm FLOW TUBES			
044-20S	225.00	scfh	14.70 psia
032-12G	100.00	mL/min	14.70 psia

**TABLE 18-DIRECT READING FLOW TUBES FOR HYDROGEN CHLORIDE  
150mm FLOW TUBES**

FLOW TUBE	QMAX	[UNITS]	PRESSURE
052-05G	2.20	scfh	14.70 psia

**TABLE 19-DIRECT READING FLOW TUBES FOR METHANE  
65mm FLOW TUBES**

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

**TABLE 20 - DIRECT READING FLOW TUBES FOR NITROUS OXIDE  
150mm FLOW TUBES**

FLOW TUBE	QMAX	[UNITS]	PRESSURE
112-11S	500.00	mL/min	14.70 psia

**TABLE 21 - DIRECT READING FLOW TUBES FOR NITROGEN  
65mm FLOW TUBES**

FLOW TUBE	QMAX	[UNITS]	PRESSURE
014-16ST	12.00	L/min	14.70 psia
042-08G	6.00	mL/min	14.70 psia
032-16ST	50.00	mL/min	14.70 psia
032-08S	60.00	mL/min	14.70 psia
022-15G	120.00	mL/min	14.70 psia
022-06S	200.00	mL/min	14.70 psia
150mm FLOW TUBES			
044-06ST	1.60	scfm	14.70 psia
092-05G	2.00	L/min	14.70 psia
062-12G	100.00	mL/min	14.70 psia
032-22C	200.00	mL/min	14.70 psia
062-30C	300.00	mL/min	14.70 psia
112-06S	500.00	mL/min	14.70 psia

**TABLE 22 - DIRECT READING FLOW TUBES FOR OXYGEN  
65mm FLOW TUBES**

FLOW TUBE	QMAX	[UNITS]	PRESSURE
052-02G	1.00	L/min	14.70 psia
013-25ST	4.00	L/min	14.70 psia
034-08ST	8.00	L/min	14.70 psia
044-04ST	15.00	L/min	14.70 psia
032-19G	50.00	mL/min	14.70 psia
022-07ST	300.00	mL/min	14.70 psia
012-02ST	500.00	mL/min	14.70 psia
150mm FLOW TUBES			
082-08S	1.00	L/min	14.70 psia
102-12S	5.00	L/min	14.70 psia
102-17C	10.00	L/min	14.70 psia
034-15ST	16.50	L/min	14.70 psia
044-19C	58.00	L/min	14.70 psia
062-02ST	250.00	mL/min	14.70 psia
112-04S	400.00	mL/min	14.70 psia

**TABLE 23 - DIRECT READING FLOW TUBES FOR PROPANE  
150mm FLOW TUBES**

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

## COMMON EQUIVALENTS and CONVERSIONS

### THESE PREFIXES MAY BE APPLIED TO ALL SI UNITS

#### Multiples and Submultiples

1 000 000 000 000	= 10 <sup>12</sup>
1 000 000 000	= 10 <sup>9</sup>
1 000 000	= 10 <sup>6</sup>
1000	= 10 <sup>3</sup>
100	= 10 <sup>2</sup>
10	= 10 <sup>1</sup>
0.1	= 10 <sup>-1</sup>
0.01	= 10 <sup>-2</sup>
0.001	= 10 <sup>-3</sup>
0.000 001	= 10 <sup>-4</sup>
0.000 000 001	= 10 <sup>-9</sup>
0.000 000 000 001	= 10 <sup>-12</sup>
0.000 000 000 000 001	= 10 <sup>-15</sup>
0.000 000 000 000 000 001	= 10 <sup>-18</sup>

### Prefixes Symbols

tara (ter'a)	T
giga (ji ga)	G
mega (meg'a)	M <sup>a</sup>
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 SI  
\* exact  
Source: NBS Special Pub. 304.

### 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	= inches
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 inches
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