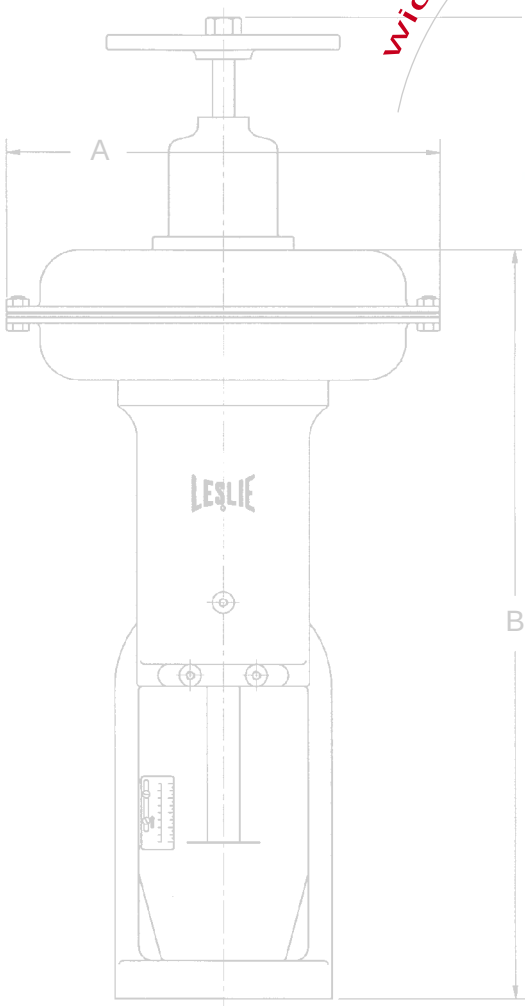
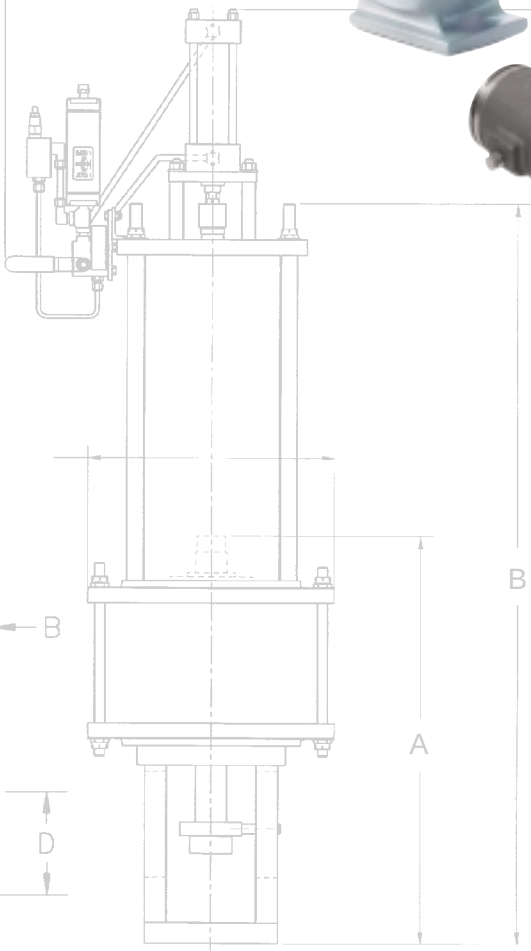
10/0.1.0
Rev. 0610

wide rangeability





CONTROL VALVE handbook

LESLIE CONTROLS, INC.
A division of CIRCOR International, Inc.

zero leakage guaranteed

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LINEAR

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ISOLATION VALVE

ON–OFF

NOISE REDUCTION

INSTRUMENTATION

REFERENCE

DKLO SERIES CONTROL VALVE

SIZES ½" – 4"
ANSI Class 125/250

DKLO CONTROL VALVE

- **Shutoff to 400 PSI without Positioner** for broad range of applications
- **Ultra Compact Multi Spring Pneumatic Actuator** installs in tight spaces
- **3–15 lb. Spring Ranges** in durable epoxy coated pneumatic actuators accommodate most standard input devices
- **V-ring Packing Assembly** is self adjusting
- **Stainless Steel Valve Plugs & Seat Rings** resist wear and corrosion

Application Data

- Process control systems for food, pulp and paper, chemical, petrochemical & other industries
- HVAC systems
- Feed water and fuel system controls in boiler rooms
- Packaged systems (OEM) such as heat exchangers, water purification systems & vaporizers, metal cleaning and plating

Models

- DKLO (D1) — Single Seat Bronze w/union ends & Pneumatic Actuator
- DKLO-C (D4) — Single Seat Flanged Cast Iron with Pneumatic Actuator

Options

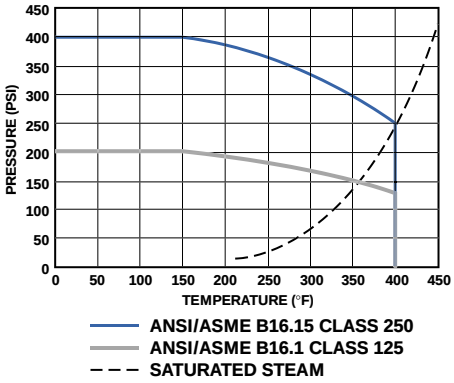
- 36 or 60 sq. in. Pneumatic Actuator

Applicable Codes *See Reference Section on page 195*

Plug Characteristics

Modified Equal Percent, 30:1 flow rangeability

PRESSURE/TEMPERATURE CHART



Cv TABLE

PERCENT OF TRAVEL			5	10	20	30	40	50	60	70	80	90	100
Valve Size	Travel	Orifice	Cv										
1/2	1/4	C	0.1	0.2	0.3	0.36	0.41	0.46	0.51	0.56	0.6	0.65	0.7
		E	0.3	0.5	0.7	0.9	1.1	1.3	1.5	1.7	1.9	2	2.1
		A	0.3	0.6	1.2	1.7	2.2	2.6	2.9	3.1	3.2	3.25	3.3
		B	0.15	0.25	0.65	1.5	2.7	3.3	3.7	3.9	4.1	4.2	4.3
		T	0.7	1.2	2.0	2.7	3.2	3.8	4.3	4.7	4.9	5.1	5.2
3/4	5/16	T	0.7	1.3	2.4	3.3	4.2	4.9	5.5	6.0	6.4	6.8	7.0
1	1/4	T	0.7	1.3	2.4	3.8	5.5	7.4	9.0	10.0	10.6	10.9	11.0
1-1/4	5/16	T	0.8	1.7	4.0	6.5	9.3	12.6	15.3	17.0	18.1	19.1	20.0
1-1/2	5/16	T	1.0	2.0	4.5	7.2	9.9	12.4	15.2	18.2	20.9	23.4	25.0
2	5/16	T	1.0	2.0	4.5	7.4	10.6	15.1	18.8	22.8	26.1	28.3	30.0
2-1/2	3/4	T	5	11	23	36	46	53	59	62.5	65.7	68	71
3	3/4	T	5	11	30	47	61	72	79	85	90	92	94
4	3/4	T	12	23	46	69	89	104	116	127	134	140	146

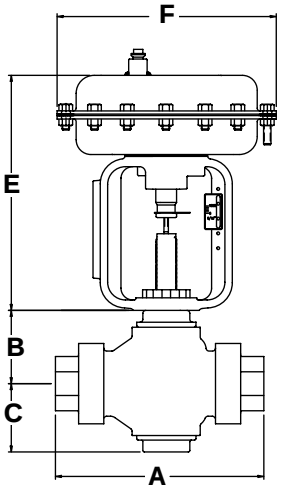
DKLO SERIES CONTROL VALVE

SPECIFICATION

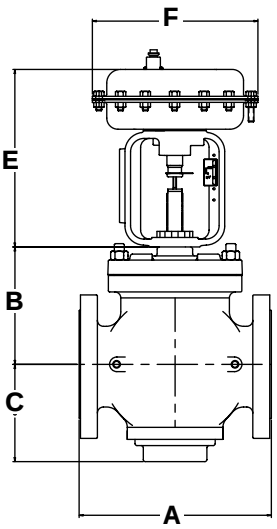
Valve shall be pneumatically actuated, have a bronze or cast iron body and meet ANSI B16.15 Class 250 or ANSI B16.1 Class 125 accommodating pressures to 400 PSIG. Guiding shall be low friction, utilizing spring loaded self adjusting chevron type Teflon® packing, teflon coated stem and double guided stainless steel monolithic disc assembly. Valve trim shall be erosion resistant stainless steel with a modified equal percent flow characteristic capable of exceeding ANSI/FCI 70-2 Class IV shutoff. Valve connections shall be female NPT with integral galvanized cast iron unions or flanged. Pneumatic actuator shall be 36 sq. in. or 60 sq. in and have a high-thrust multi-spring diaphragm. Actuator components shall be stainless steel and epoxy coated. Fixed 3-15 pound springs shall be utilized to accommodate standard controller outputs **without a positioner**.

MATERIALS OF CONSTRUCTION

Body DKLO .....Bronze ASTM B62
DKLO-C .....Cast Iron ASTM A126 CL B
Bonnet DKLO-C .....Ductile Iron ASTM A536 65-45-12
Seat DKLO .....303 SS ASTM A276
DKLO-C .....420 SS ASTM A743
Plug/Stem Assy DKLO .....303 SS ASTM A276
Plug DKLO-C .....420 SS ASTM A743
Stem .....303SS ASTM A582
Stem Guide - Body DKLO.....301 SS/Monel/Brass
Live Loaded Packing ...PTFE/302 SS Spring/Viton O-Ring
Actuator Casing DKLO, DKLO-C ...Steel SAE 1006 - 1008/Epoxy
Actuator Spring DKLO, DKLO-C...Music Wire ASTM A228
Diaphragm DKLO, DKLO-C .....Nitrile/Polyester
Yoke DKLO, DKLO-C .....Ductile Iron ASTM A536/Epoxy



DKLO ½" - 2"
D1



DKLO-C 2½" - 4"
D4

DIMENSIONS inches (mm) **AND WEIGHTS** pounds (kg)

Size	A	B	C	E		F		Weight	
				36 in²	60 in²	36 in²	60 in²	36 in²	60 in²
½-¾ (15)-(20)	5½ (140)	1 11/16 (43)	1 3/16 (30)	9⅞ (251)	— —	9¼ (235)	— —	21 (9.5)	— —
1 (25)	7 3/16 (183)	2⅞ (74)	2 5/16 (58)	9⅞ (251)	11¾ (298)	9¼ (235)	11¼ (286)	25½ (12)	39 (17)
1¼-1½ (32)-(40)	8⅞ (226)	3⅛ (79)	2⅞ (74)	9⅞ (251)	11¾ (298)	9¼ (235)	11¼ (286)	31½ (14)	45 (20)
2 (50)	8⅞ (226)	3⅛ (79)	2⅞ (74)	9⅞ (251)	11¾ (298)	9¼ (235)	11¼ (286)	33½ (15)	47 (21)
2½ (65)	9⅜ (238)	5¼ (133)	4⅝ (118)	— —	11⅞ (302)	— —	11¼ (286)	— —	72 (33)
3 (80)	10 (254)	6⅛ (155)	5⅜ (136)	— —	11⅞ (302)	— —	11¼ (286)	— —	84 (39)
4 (100)	11⅞ (302)	7⅛ (181)	7⅜ (187)	— —	11⅞ (302)	— —	11¼ (286)	— —	145 (66)

DKLO Saturated Steam Capacity Table

(Modified Equal Percent Contour Plug) (Lb/Hr)

Pressure (PSI)		Valve Size and Port												
P1	P2	1/2" C	1/2" E	1/2" A	1/2" B	1/2" T	3/4"	1"	1¼"	1½"	2"	2½"	3"	4"
10	5	22	65	102	133	161	217	341	620	775	930	2237	2962	4601
	0	27	81	128	166	201	270	425	773	966	1159	2846	3768	5853
15	10	24	72	114	148	179	241	379	689	861	1033	2477	3280	5094
	5	31	92	145	189	229	308	484	880	1099	1319	3216	4257	6613
	0	34	101	159	207	250	337	529	962	1202	1443	3586	4748	7374
20	15	26	79	124	161	195	262	412	750	937	1125	2692	3565	5537
	10	34	102	161	209	253	341	536	974	1217	1461	3543	4691	7286
	0	40	119	187	243	294	396	623	1132	1416	1699	4262	5643	8765
30	25	30	90	142	184	223	300	472	858	1072	1287	3072	4067	6316
	15	46	137	215	280	338	455	715	1301	1626	1951	4755	6295	9778
	0	51	152	239	312	377	507	797	1450	1812	2174	5525	7315	11362
40	25	52	156	245	319	385	519	815	1482	1852	2223	5384	7128	11071
	15	59	178	280	365	442	595	935	1699	2124	2549	6297	8337	12948
	0	62	185	290	378	457	615	967	1758	2198	2637	6724	8903	13827
50	35	57	172	271	353	427	575	903	1643	2053	2464	5943	7869	12222
	30	63	190	299	389	470	633	995	1809	2262	2714	6596	8732	13563
	25	67	202	318	414	501	674	1059	1925	2406	2888	7076	9368	14550
	2-0	72	217	341	444	537	723	1136	2066	2582	3099	7905	10466	16256
60	45	63	188	295	384	464	625	982	1786	2232	2679	6444	8531	13250
	40	69	208	327	426	515	693	1090	1981	2477	2972	7194	9524	14792
	35	74	223	351	457	552	744	1169	2125	2656	3187	7767	10282	15971
	4-0	83	249	391	509	616	829	1303	2370	2962	3555	9067	12005	18645
75	55	77	232	365	476	575	774	1216	2212	2765	3318	7996	10587	16443
	50	84	251	395	514	622	837	1315	2391	2989	3587	8690	11505	17870
	45	89	266	417	544	658	885	1391	2530	3162	3795	9246	12241	19013
	8-0	99	296	466	607	734	988	1552	2822	3527	4233	10797	14294	22202
100	75	97	291	457	596	721	970	1525	2773	3466	4159	10020	13266	20604
	60	113	340	534	696	841	1133	1780	3236	4045	4854	11845	15683	24358
	15-0	125	375	589	767	927	1249	1962	3567	4459	5351	13649	18071	28068
125	100	109	326	512	667	806	1086	1706	3102	3877	4652	11169	14787	22968
	75	138	413	649	845	1022	1376	2163	3933	4916	5899	14409	19077	29630
	21-0	151	452	710	925	1119	1507	2367	4304	5381	6457	16470	21806	33869
150	125	119	356	560	730	882	1188	1866	3394	4242	5090	12192	16142	25071
	100	153	460	723	943	1140	1535	2412	4385	5481	6577	15975	21150	32850
	28-0	176	529	831	1082	1309	1762	2769	5035	6293	7552	19264	25505	39614
175	150	128	384	604	787	951	1281	2013	3659	4574	5489	13124	17376	26988
	125	168	503	791	1030	1246	1677	2635	4791	5989	7187	17388	23021	35755
	100	189	567	891	1161	1403	1889	2969	5398	6747	8097	19859	26293	40838
	35-0	202	605	951	1239	1498	2016	3168	5761	7201	8641	22031	29168	45304
200	150	181	542	852	1110	1342	1806	2839	5161	6452	7742	18677	24728	38407
	125	206	618	971	1265	1529	2059	3235	5882	7353	8823	21533	28509	44279
	41-0	227	681	1069	1393	1685	2268	3565	6481	8101	9722	24799	32833	50996
225	175	193	578	908	1183	1430	1925	3025	5500	6875	8250	-	-	-
	150	221	664	1043	1359	1644	2213	3478	6323	7904	9485	-	-	-
	48-0	252	755	1187	1547	1870	2518	3956	7194	8992	10790	-	-	-
250	200	204	611	960	1251	1512	2036	3199	5817	7271	8725	-	-	-
	150	256	769	1208	1574	1904	2563	4027	7322	9153	10984	-	-	-
	100	275	825	1297	1690	2044	2752	4324	7862	9827	11792	-	-	-
	54-0	277	830	1304	1699	2055	2766	4346	7902	9878	11854	-	-	-

Note: It is recommended to keep valve outlet velocity below 30,000 ft./min. Capacities based on maximum Cv.

DKLO Saturated Steam Capacity Table

(Modified Equal Percent Contour Plug) (Kg/Hr)

Pressure (BARG)		Valve Size and Port												
P1	P2	1/2" C	1/2" E	1/2" A	1/2" B	1/2" T	3/4"	1"	1¼"	1½"	2"	2½"	3"	4"
0.7	0.3	10	31	49	64	78	104	164	298	373	447	1079	1429	2220
	0.2	11	34	53	69	84	113	177	322	402	483	1171	1551	2409
1	0.7	10	31	48	63	76	102	161	292	365	438	1049	1389	2157
	0.5	12	37	59	76	92	125	196	356	445	534	1289	1707	2651
	0.3	14	42	65	85	103	139	218	396	495	594	1448	1918	2978
1.5	1	14	43	67	87	106	142	224	407	508	610	1467	1942	3017
	0.7	17	50	79	103	124	167	263	479	598	718	1746	2312	3591
	0.5	18	53	84	109	132	178	280	508	635	762	1870	2476	3846
2	1.5	16	47	74	97	117	157	247	449	562	674	1616	2139	3323
	1.2	19	56	88	115	139	188	295	536	670	804	1945	2575	3999
	1	20	60	95	124	149	201	316	575	719	862	2100	2781	4319
3	2	24	73	114	149	180	242	381	692	865	1038	2508	3321	5158
	1.0	29	87	137	179	216	291	457	832	1040	1248	3098	4102	6371
	0	32	97	152	198	239	322	506	920	1149	1379	3264	4322	6713
3.5	3.0	20	59	92	120	145	195	307	558	698	838	2000	2647	4112
	2.0	30	89	140	182	221	297	466	848	1060	1272	3099	4103	6373
	1.0	33	99	155	202	245	329	518	941	1176	1412	3531	4675	7261
	.1-0	36	108	170	222	268	361	567	1031	1289	1547	3661	4847	7528
4	3.0	28	83	130	169	204	275	432	786	983	1179	2836	3755	5832
	2.0	34	103	162	211	255	344	540	982	1228	1473	3615	4786	7433
	1.0	37	110	172	224	271	365	574	1044	1305	1566	3942	5219	8105
	.3-0	39	118	186	242	293	394	620	1126	1408	1690	4000	5296	8225
5	4.0	30	91	144	187	226	305	479	870	1088	1306	3131	4145	6438
	3.0	39	117	184	239	290	390	612	1113	1392	1670	4069	5387	8367
	2.0	43	128	201	262	317	427	671	1220	1525	1830	4544	6016	9344
	.6-0	47	140	220	287	347	467	734	1334	1667	2001	4757	6299	9783
7	5.0	47	140	221	288	348	468	736	1338	1672	2007	4848	6419	9970
	3.0	56	169	265	346	418	563	884	1607	2009	2411	5987	7926	12311
	1.0-0	62	187	293	382	462	622	978	1778	2222	2667	6311	8356	12978
9	7.0	53	160	252	328	397	534	839	1526	1907	2289	5505	7289	11321
	5.0	67	200	314	410	496	667	1048	1906	2382	2859	7015	9288	14425
	1.6-0	77	230	361	470	569	765	1203	2187	2733	3280	7762	10277	15962
10	8.0	56	168	265	345	417	562	882	1605	2006	2407	5780	7652	11885
	5.0	75	224	353	459	556	748	1175	2137	2671	3205	7916	10480	16277
	1.8-0	84	251	395	515	623	838	1317	2395	2994	3592	8502	11256	17483
12	10.0	62	185	291	379	458	616	968	1761	2201	2641	6327	8376	13009
	7.0	85	254	399	520	629	846	1330	2418	3023	3627	8886	11764	18272
	5.0	90	270	425	553	669	900	1415	2573	3216	3859	9633	12753	19808
	2.4-0	98	294	462	602	728	979	1539	2798	3498	4197	9939	13158	20438
14	10.0	87	261	410	535	647	871	1368	2488	3110	3732	-	-	-
	5.0	104	312	491	640	774	1041	1636	2975	3719	4463	-	-	-
	2.9-0	112	337	530	691	835	1124	1767	3213	4016	4819	-	-	-
15	12.0	81	243	383	499	603	812	1275	2319	2898	3478	-	-	-
	5.0	111	332	521	679	821	1105	1737	3158	3948	4737	-	-	-
	3.1-0	120	359	564	734	888	1195	1878	3415	4269	5123	-	-	-
17	15.0	73	219	344	448	542	730	1147	2086	2607	3129	-	-	-
	10.0	115	346	544	709	858	1155	1815	3300	4125	4950	-	-	-
	5.0	127	380	597	778	941	1266	1990	3619	4523	5428	-	-	-
	3.7-0	133	400	629	819	990	1333	2095	3809	4762	5714	-	-	-

Note: It is recommended to keep valve outlet velocity below 30,000 ft./min. Capacities based on maximum Cv.

DKLO Water Capacity Table

(Modified Equal Percent Contour Plug) (G.P.M.)

Pressure (PSI)		Valve Size and Port												
P1	P2	1/2" C	1/2" E	1/2" A	1/2" B	1/2" T	3/4"	1"	1¼"	1½"	2"	2½"	3"	4"
10	5	2	5	7	10	12	16	25	45	56	67	159	210	326
	3	2	6	9	11	14	19	29	53	66	79	188	249	386
15	10	2	5	7	10	12	16	25	45	56	67	159	210	326
	7	2	6	9	12	15	20	31	57	71	85	201	266	413
	4	2	7	11	14	17	23	36	66	83	99	235	312	484
20	15	2	5	7	10	12	16	25	45	56	67	159	210	326
	10	2	7	10	14	16	22	35	63	79	95	225	297	462
	5	3	8	13	17	20	27	43	77	97	116	275	364	565
30	22	2	6	9	12	15	20	31	57	71	85	201	266	413
	17	3	8	12	16	19	25	40	72	90	108	256	339	526
	6	3	10	16	21	25	34	54	98	122	147	348	461	715
40	25	3	8	13	17	20	27	43	77	97	116	275	364	565
	20	3	9	15	19	23	31	49	89	112	134	318	420	653
	8	4	12	19	24	29	40	62	113	141	170	402	532	826
50	35	3	8	13	17	20	27	43	77	97	116	275	364	565
	30	3	9	15	19	23	31	49	89	112	134	318	420	653
	25	4	11	17	22	26	35	55	100	125	150	355	470	730
	10	4	13	21	27	33	44	70	126	158	190	449	595	923
60	50	2	7	10	14	16	22	35	63	79	95	225	297	462
	40	3	9	15	19	23	31	49	89	112	134	318	420	653
	25	4	12	20	25	31	41	65	118	148	177	420	556	864
	12	5	15	23	30	36	48	76	139	173	208	492	651	1012
75	70	2	5	7	10	12	16	25	45	56	67	159	210	326
	50	4	11	17	22	26	35	55	100	125	150	355	470	730
	25	5	15	23	30	37	49	78	141	177	212	502	665	1032
	15	5	16	26	33	40	54	85	155	194	232	550	728	1131
100	75	4	11	17	22	26	35	55	100	125	150	355	470	730
	60	4	13	21	27	33	44	70	126	158	190	449	595	923
	20	6	19	30	38	47	63	98	179	224	268	635	841	1306
125	100	4	11	17	22	26	35	55	100	125	150	355	470	730
	75	5	15	23	30	37	49	78	141	177	212	502	665	1032
	24	7	21	33	43	52	70	111	201	251	301	714	945	1467
150	125	4	11	17	22	26	35	55	100	125	150	355	470	730
	100	5	15	23	30	37	49	78	141	177	212	502	665	1032
	29	8	23	36	47	57	77	121	220	275	330	781	1034	1606
175	150	4	11	17	22	26	35	55	100	125	150	355	470	730
	125	5	15	23	30	37	49	78	141	177	212	502	665	1032
	100	6	18	29	37	45	61	95	173	217	260	615	814	1264
	34	8	25	39	51	62	83	131	237	297	356	843	1116	1734
200	150	5	15	23	30	37	49	78	141	177	212	502	665	1032
	100	7	21	33	43	52	70	110	200	250	300	710	940	1460
	39	9	27	42	55	66	89	140	254	317	381	901	1193	1853
225	175	5	15	23	30	37	49	78	141	177	212	-	-	-
	100	8	23	37	48	58	78	123	224	280	335	-	-	-
	43	9	28	45	58	70	94	148	270	337	405	-	-	-
250	200	5	15	23	30	37	49	78	141	177	212	-	-	-
	150	7	21	33	43	52	70	110	200	250	300	-	-	-
	100	9	26	40	53	64	86	135	245	306	367	-	-	-
300	48	10	30	47	61	74	99	156	284	355	426	-	-	-
	250	5	15	23	30	37	49	78	141	177	212	-	-	-
	150	9	26	40	53	64	86	135	245	306	367	-	-	-
	58	11	33	51	67	81	109	171	311	389	467	-	-	-
400	350	5	15	23	30	37	49	78	141	177	212	-	-	-
	200	10	30	47	61	74	99	156	283	354	424	-	-	-
	77	13	38	59	77	93	126	198	359	449	539	-	-	-

Note: It is recommended to keep valve outlet velocity below 30,000 ft./min. Capacities based on maximum Cv.

DKLO Water Capacity Table

(Modified Equal Percent Contour Plug) (M3/Hr.)

Pressure (BARG)		Valve Size and Port												
P1	P2	1/2" C	1/2" E	1/2" A	1/2" B	1/2" T	3/4"	1"	1¼"	1½"	2"	2½"	3"	4"
0.7	0.3	0.4	1.1	1.8	2.4	2.8	3.8	6.0	10.9	13.7	16.4	38.8	51.4	79.9
	0.2	0.4	1.3	2.0	2.6	3.2	4.3	6.7	12.2	15.3	18.3	43.4	57.5	89.3
1	0.7	0.3	1.0	1.6	2.0	2.5	3.3	5.2	9.5	11.8	14.2	33.6	44.5	69.2
	0.5	0.4	1.3	2.0	2.6	3.2	4.3	6.7	12.2	15.3	18.3	43.4	57.5	89.3
	0.25	0.5	1.6	2.5	3.2	3.9	5.2	8.2	15.0	18.7	22.5	53.2	70.4	109.3
1.5	1	0.4	1.3	2.0	2.6	3.2	4.3	6.7	12.2	15.3	18.3	43.4	57.5	89.3
	0.7	0.5	1.6	2.6	3.3	4.0	5.4	8.5	15.5	19.3	23.2	54.9	72.7	112.9
	0.3	0.7	2.0	3.1	4.1	4.9	6.6	10.4	18.9	23.7	28.4	67.3	89.0	138.3
2	1.5	0.4	1.3	2.0	2.6	3.2	4.3	6.7	12.2	15.3	18.3	43.4	57.5	89.3
	1	0.6	1.8	2.9	3.7	4.5	6.1	9.5	17.3	21.6	25.9	61.4	81.3	126.3
	0.4	0.8	2.3	3.6	4.7	5.7	7.7	12.0	21.9	27.3	32.8	77.7	102.8	159.7
3	2	0.6	1.8	2.9	3.7	4.5	6.1	9.5	17.3	21.6	25.9	61.4	81.3	126.3
	1.5	0.7	2.2	3.5	4.6	5.5	7.4	11.7	21.2	26.5	31.8	75.2	99.6	154.6
	0.6	0.9	2.8	4.4	5.8	7.0	9.4	14.7	26.8	33.5	40.2	95.1	125.9	195.6
3.5	3	0.4	1.3	2.0	2.6	3.2	4.3	6.7	12.2	15.3	18.3	43.4	57.5	89.3
	2	0.7	2.2	3.5	4.6	5.5	7.4	11.7	21.2	26.5	31.8	75.2	99.6	154.6
	1.5	0.9	2.6	4.0	5.3	6.4	8.6	13.5	24.5	30.6	36.7	86.8	115.0	178.6
	0.7	1.0	3.0	4.8	6.2	7.5	10.1	15.9	28.9	36.2	43.4	102.7	136.0	211.3
4	3.5	0.4	1.3	2.0	2.6	3.2	4.3	6.7	12.2	15.3	18.3	43.4	57.5	89.3
	3	0.6	1.8	2.9	3.7	4.5	6.1	9.5	17.3	21.6	25.9	61.4	81.3	126.3
	2	0.9	2.6	4.0	5.3	6.4	8.6	13.5	24.5	30.6	36.7	86.8	115.0	178.6
	0.8	1.1	3.2	5.1	6.7	8.0	10.8	17.0	30.9	38.7	46.4	109.8	145.4	225.9
5	4	0.6	1.8	2.9	3.7	4.5	6.1	9.5	17.3	21.6	25.9	61.4	81.3	126.3
	3	0.9	2.6	4.0	5.3	6.4	8.6	13.5	24.5	30.6	36.7	86.8	115.0	178.6
	2	1.0	3.1	4.9	6.4	7.8	10.5	16.5	30.0	37.4	44.9	106.3	140.8	218.7
	1	1.2	3.6	5.7	7.4	9.0	12.1	19.0	34.6	43.2	51.9	122.8	162.6	252.5
6	5	0.6	1.8	2.9	3.7	4.5	6.1	9.5	17.3	21.6	25.9	61.4	81.3	126.3
	3	1.0	3.1	4.9	6.4	7.8	10.5	16.5	30.0	37.4	44.9	106.3	140.8	218.7
	1.2	1.3	4.0	6.3	8.1	9.9	13.3	20.8	37.9	47.4	56.8	134.5	178.1	276.6
8	6	0.9	2.6	4.0	5.3	6.4	8.6	13.5	24.5	30.6	36.7	86.8	115.0	178.6
	5	1.0	3.1	4.9	6.4	7.8	10.5	16.5	30.0	37.4	44.9	106.3	140.8	218.7
	1.6	1.5	4.6	7.2	9.4	11.4	15.3	24.1	43.8	54.7	65.6	155.3	205.6	319.4
10	8	0.9	2.6	4.0	5.3	6.4	8.6	13.5	24.5	30.6	36.7	86.8	115.0	178.6
	5	1.4	4.1	6.4	8.3	10.1	13.5	21.3	38.7	48.3	58.0	137.3	181.8	282.3
	2	1.7	5.1	8.1	10.5	12.7	17.1	26.9	48.9	61.1	73.4	173.7	229.9	357.1
12	10	0.9	2.6	4.0	5.3	6.4	8.6	13.5	24.5	30.6	36.7	86.8	115.0	178.6
	8	1.2	3.6	5.7	7.4	9.0	12.1	19.0	34.6	43.2	51.9	122.8	162.6	252.5
	5	1.6	4.8	7.6	9.8	11.9	16.0	25.2	45.8	57.2	68.6	162.4	215.1	334.0
	2.3	1.9	5.7	8.9	11.6	14.0	18.9	29.6	53.9	67.3	80.8	191.2	253.2	393.2
14	10	1.2	3.6	5.7	7.4	9.0	12.1	19.0	34.6	43.2	51.9	-	-	-
	5	1.8	5.4	8.6	11.2	13.5	18.2	28.5	51.9	64.9	77.8	-	-	-
	2.7	2.0	6.1	9.6	12.5	15.1	20.3	32.0	58.1	72.7	87.2	-	-	-
15	12	1.0	3.1	4.9	6.4	7.8	10.5	16.5	30.0	37.4	44.9	-	-	-
	5	1.9	5.7	9.0	11.8	14.2	19.1	30.1	54.7	68.4	82.0	-	-	-
	2.9	2.1	6.3	9.9	12.9	15.6	21.1	33.1	60.2	75.2	90.2	-	-	-
17	14	1.0	3.1	4.9	6.4	7.8	10.5	16.5	30.0	37.4	44.9	-	-	-
	10	1.6	4.8	7.6	9.8	11.9	16.0	25.2	45.8	57.2	68.6	-	-	-
	5	2.1	6.3	9.9	12.9	15.6	21.0	33.0	59.9	74.9	89.9	-	-	-
	3.2	2.2	6.7	10.6	13.8	16.7	22.5	35.3	64.2	80.3	96.4	-	-	-
20	17	1.0	3.1	4.9	6.4	7.8	10.5	16.5	30.0	37.4	44.9	-	-	-
	14	1.5	4.4	7.0	9.1	11.0	14.8	23.3	42.4	53.0	63.5	-	-	-
	3.9	2.4	7.3	11.5	14.9	18.0	24.3	38.2	69.4	86.7	104.1	-	-	-
27	24	1.0	3.1	4.9	6.4	7.8	10.5	16.5	30.0	37.4	44.9	-	-	-
	20	1.6	4.8	7.6	9.8	11.9	16.0	25.2	45.8	57.2	68.6	-	-	-
	5.2	2.8	8.5	13.3	17.4	21.0	28.3	44.4	80.8	100.9	121.1	-	-	-

Note: It is recommended to keep valve outlet velocity below 30,000 ft./min. Capacities based on maximum Cv.

DKLO Shutoff & Cv Tables

ACTUATOR SHUTOFF TABLE

(Refer to Temperature Limits)

Size	Orifice	Act. Size	Bench Range	Reverse Shutoff, D1,D4[1]			Bench Range	Direct Shutoff, D1,D4[1]			Shutoff, D5,D6
				3-15 psi	0-20 psi[2]	0-30 psi[3]		3-15 psi	0-20 psi[2]	0-30 psi[3]	
1/2	A, C, E	36	6-15	0-400	0-400	—	3-12	0-400	0-400	—	0-400
	B	36	6-15	0-400	0-400	—	3-12	0-300	0-400	—	
			—	—	—	—	3-9	301-400	400	—	
	T	36	6-15	0-300	0-400	—	3-9	0-400	0-400	—	
3/4	T	36	6-15	0-100	0-300	—	3-9	0-250	0-400	—	0-400
			9-15	101-225	301-350	—	—	—	—	—	
			12-15	226-300	351-400	—	—	—	—	—	
		60	12-15	0-400	0-400	—	3-7	0-400	0-400	—	
1	T	36	9-15	0-150	0-250	—	3-9	0-100	0-200	—	0-330
			12-15	151-250	251-400	—	—	—	—	—	
			13-15	251-400	400	—	—	—	—	—	
		60	—	—	—	—	3-7	0-400	0-400	—	
1¼	T	36	9-15	0-150	0-175	—	3-9	0-150	0-250	—	0-210
			12-15	151-200	176-250	—	—	—	—	—	
			13-15	201-250	251-275	—	—	—	—	—	
		60	12-15	0-300	0-400	—	3-7	0-300	0-400	—	
			13-15	301-400	0-400	—	—	—	—	—	
1½	T	36	12-15	0-150	0-225	—	—	—	—-	—	0-161
			13-15	151-200	226-250	—	—	—	—	—	
		60	12-15	0-225	0-275	—	3-7	0-200	0-400	—	
			13-15	226-275	276-300	—	—	—	—	—	
2	T	36	12-15	0-50	0-75	—	—	—	—	—	0-121
			13-15	51-75	76-100	—	—	—	—	—	
		60	12-15	0-125	0-200	—	3-7	0-100	0-300	—	
			13-15	126-175	201-250	—	—	—	—	—	
2½	T	60	10-15	0-75	—	0-100	3-8	0-70	—	0-200	—
			12-15	76-125	—	101-125	3-8	0-70	—	0-200	
			22-30	—	—	125	3-8	0-70	—	0-200	
3	T	60	10-15	0-40	—	0-60	3-8	0-40	—	0-100	—
			12-15	41-60	—	0-80	3-8	0-40	—	0-100	
			22-30	—	—	81-110	3-8	0-40	—	0-100	
4	T	60	12-15	0-20	—	0-32	3-8	0-10	—	0-25	—
			22-30	—	—	33-50	3-8	0-10	—	0-25	

1. Shutoff pressures are in conformance with ANSI/FCI 70-2 Class IV
   Reverse Acting - Fail Closed/Air to Open (FC/ATO)
   Direct Acting - Fail Open/Air to Close (FO/ATC)
2. Based on 20 psi air supply.
3. Based on 30 psi air supply.

DKLO Series Order Code

Class		Orifice Size	Valve Size	Connections	Trim Material	Packing	Actuator		Bench Range	
D	1	T	E	8	1	1	3	6	R	B
1	2	3	4	5	6	7	8	9	10	11

Class -Position 1 & 2
- D1 = Bronze, Pneumatic
- D4 = Cast Iron, Pneumatic

Orifice Size[1] - Position 3
- A
- B
- C
- E
- T

Valve Size - Position 4
- C = 1/2
- D = 3/4
- E = 1
- F = 1¼
- G = 1½
- H = 2
- J = 2½
- K = 3
- M = 4

Connections - Position 5
- 2 = 125 Flg
- 8 = Unions

Trim Material - Position 6
- 1 = Metal

Packing - Position 7
- 1 = Teflon® V-Ring

Actuator - Position 8 & 9
- 01 = None
- 36 = 36 sq. in.
- 60 = 60 sq. in.

Bench Range - Position 10 & 11

DKLO only	**DKLO-C only**
DA = 3-12 Dir 36	DH = 3-8 Dir 60
DB = 3-9 Dir 36	RH = 10-15 Rev 60
DR = 3-9 Dir 36	RQ = 12-15 Rev 60
RA = 6-15 Rev 36	RT = 22-30 Rev 60
RB = 9-15 Rev 36	AA = None
RC = 12-15 Rev 36	
RE = 13-15 Rev 36	
DG = 3-7 Dir 60	
RG = 12-15 Rev 60	
RH = 13-15 Rev 60	
RR = 9-15 Rev 36	
AA = None	

Pressure drop for each valve purchased must be indicated on sales order.

1. A, B, C, E available in 1/2" only.

LIL' GATOR TYPE VLG CONTROL VALVE

SIZES 1/2" - 2"
ANSI CLASS 150, 250/300, 600

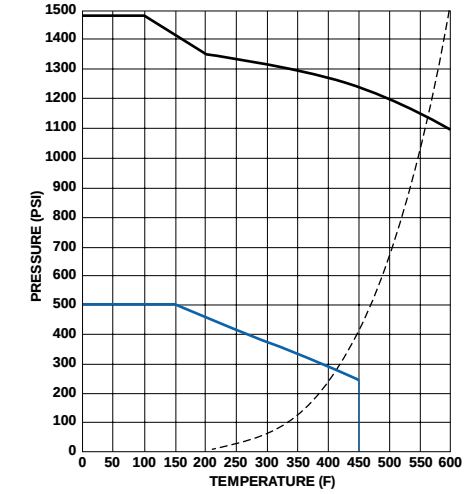
LIL' GATOR TYPE VLG CONTROL VALVE

- **High Capacity Streamlined Body** reduces velocity and pressure loss
- **Compact Design** for ease of installation
- **Multiple Port Sizes** allows flexibility in sizing
- **Stainless Steel Trim** for long life and corrosion resistance
- **Super Polished, Extra Thick Stem** provides low friction and precise control
- **Live Loaded V-ring Packing** is self adjusting
- **Slip-on Flanges** for flexibility in piping
- **NEMUR 4 Mounting Pad** for accessories

Application Data

- Process control systems for food, pulp and paper, chemical, petrochemical & other industries
- HVAC systems
- Feed water and fuel system controls in boiler rooms
- Packaged systems (OEM) such as heat exchangers, water purification systems & vaporizer, metal cleaning and plating

PRESSURE/TEMPERATURE CHART



- - - - SATURATED STEAM
LG1 ANSI/ASME B16.1 CLASS 250 CAST IRON
LG3 ANSI/ASME B16.34 CLASS 600 STAINLESS STEEL

MAXIMUM RATED FLOW COEFFICIENTS* (Cv)

VALVE SIZE				
1/2	3/4	1	1 1/2	2
5.1	10.3	18.2	37	67

Models

- LG1 — Cast Iron
- LG3 — Stainless Steel[1]

Options

- 36 or 60 sq. in. actuators
- Soft Seats
- Threaded or Flanged Connections
- Graphite or High Temperature Packing
- High Temperature 600ºF Construction (Extended Bonnet no longer available)

Accessories

- Positioners
- Solenoid Valves
- Limit Switches
- Air Filter Regulators

Applicable Codes *See Reference Section on page 195*

Plug Characteristics

- 1/8" to 1/4" Port Sizes - Equal Percent, 50:1 flow rangeability
- 5/8" to 2-1/4" Port Sizes - Modified Equal Percent, 100:1 flow rangeability

Canadian Registration # OC 0591.9C

1. Body is ANSI Class 600. Pressure rating may be limited by choice of flanges.

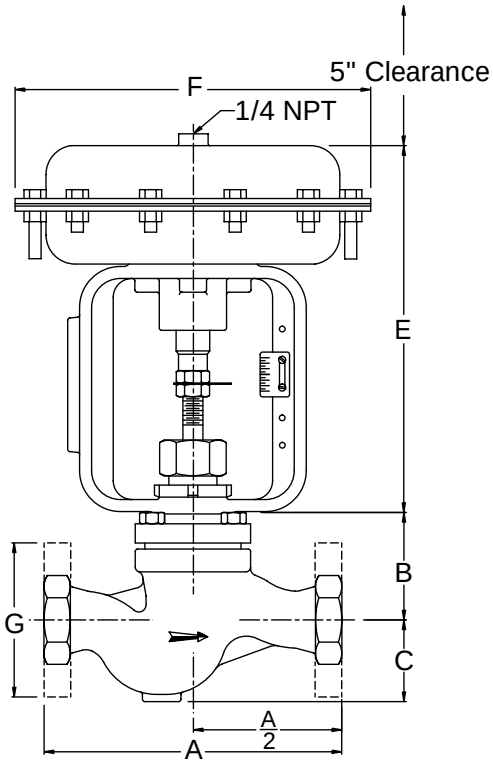
LIL' GATOR TYPE VLG CONTROL VALVE

SPECIFICATION

The valve shall be single seated, top guided compact pneumatic globe control valve with a streamlined body. The actuator shall have all SS hardware with a maximum deadband of .3 PSIG. The valve trim shall be all 316SS with replaceable threaded seats for easy maintenance. Standard packing shall be spring loaded Teflon® V-Rings. Optional graphite or high temperature packings available. The valve seat leakage shall conform to ANSI/ISA 70-2 Class IV for metal seats and Class VI for Teflon® soft seats. The valve shall conform to NEMUR 4 for mounting of accessories.

MATERIALS OF CONSTRUCTION

Body .....316 SS ASTM A351 CF8M
Cast Iron ASTM A126 CL B
Seat Ring .....316 SS ASTM A276 Cond A
Packing .....PTFE V-ring
PTFE/Graphite
Graphite
Plug & Stem Ass'y.....316 SS ASTM A276 Cond A
Yoke .....DI ASTM A536/Epoxy
Stem .....303 SS ASTM A582
Diaphragm.....Nitrile/Polyester
Piston.....316 SS ASTM A743 Grd CF8
Spring .....Music Wire ASTM A228
Actuator Housing .....Steel SAE 1006-1008/Epoxy



DIMENSIONS inches **AND WEIGHTS** pounds

Size	A		B	C	E		F		G (Flange Diameter)		Weights[1]			
											Screwed		Flanged	
	Scrd.	Flg.			36 in.²	60 in.²	36 in.²	60 in.²	150	300/600	36 in.²	60 in.²	36 in.²	60 in.²
½	7⅝	8	2 11/16	1⅞	9⅞	11⅞	9¼	11¼	3½	3¾	20½	36½	23½	39½
¾	7⅝	8⅛	2 11/16	1⅞	9⅞	11⅞	9¼	11¼	3⅞	4⅝	20½	36½	25¾	41¾
1	7¾	8¼	2¾	2⅛	9⅞	11⅞	9¼	11¼	4¼	4⅞	22½	38¾	29	45¼
1½	9¼	9⅞	33/8	2 11/16	9⅞	11⅞	9¼	11¼	5	6⅛	29¼	45½	40¼	57½
2	10½	11¼	3 9/32	3 5/16	9⅞	11⅞	9¼	11¼	6	6½	38¼	54¼	50¼	68¼

PRESSURE RECOVERY FACTORS

For Gas: X_T=0.7, For F_L: See Chart

½		¾			1				1½			2		
¼	⅝	¼	⅝	⅞	¼	⅝	⅞	1¼	⅞	1¼	1¾	1¼	1¾	2¼
.851	.79	.864	.82	.775	.869	.839	.805	.768	.843	.82	.782	.841	.811	.772

1. Weights are approximate.

LIL' GATOR SHUTOFF & CV TABLES

ACTUATOR SHUTOFF TABLE

PORT SIZE	ACTUATOR SIZE	BENCH RANGE	REVERSE SHUTOFF		BENCH RANGE	DIRECT SHUTOFF	
			3-15 PSI	0-20 PSI[1]		3-15 PSI	0-20 PSI
1/8	36	5 - 15	0 - 750	0 - 750	3 - 13	0 - 750	0 - 750
3/16, 1/4	36	5 - 15	0 - 250	0 - 750	3 - 13	0 - 250	0 - 750
5/8	36	5 - 15	—	0 - 50	3 - 10	0 - 300	0 - 750
		8 - 15	0 - 350	50 - 500	3 - 5	300 - 750	300 -750
		10 - 15	350 - 550	500 - 750	—	—	—
7/8	36	8 - 15	0 - 200	0 - 300	3 - 10	0 -150	0 - 350
		10 - 15	200 - 300	300 - 450	3 - 5	150 - 400	350 - 650
	60	8 - 15	0 - 500	0 - 700	3 - 11	0 - 300	0 - 600
		10 - 15	500 - 650	700 - 750	3 - 8	300 - 500	600 - 750
		12 - 15	650 - 750	—	—	—	—
1-1/4	36	—	—	—	3 - 10	0 - 150	0 - 300
		10 - 15	0 - 150	0 - 225	3 - 5	150 - 225	300 - 375
	60	8 - 15	0 - 200	0 - 300	3 - 11	0 - 150	0 - 350
		10 - 15	200 - 250	300 - 350	3 - 8	150 - 250	350 - 450
		12 - 15	250 - 300	350 - 400	—	—	—
		20 - 60[2]	—	0 - 750[2]	—	—	—
1-3/4	36	10 - 15	0 - 75	0 - 125	3 - 5	0 - 100	0 - 200
	60	8 - 15	0 - 75	0 - 125	3 - 11	0 - 100	0 - 200
		10 - 15	75 - 125	125 - 175	3 - 8	100 - 125	200 - 250
		12 - 15	125 - 175	175 - 225	—	—	—
		20 - 60[2]	—	0 - 375[2]	—	—	—
2-1/4	60	11 - 15	0 - 100	0 - 125	3 - 10	0 - 50	0 - 100
		20 - 60[2]	—	0 - 225[2]	—	—	—

NOTE: For direct configured actuators 60 psi air signal will achieve 750 psi shutoff except for 2.25 port which will achieve 650 psi shutoff. For pressures over 750 psi please consult factory. Do not exceed 60 psi air signal to actuator.

1. Based on 20 psi air supply w/PMC or Positioner
2. Based on 60 psi air supply w/PMC or Positioner

ACTUATOR SELECTION

Select Actuator size and bench range that will accommodate require shutoff with port size selected. Select reverse for air to open fail close applications, direct for air to close fail open applications.

Cv TABLE

SIZE	TRAVEL	PORT SIZE	PLUG CONTOUR	PERCENT OF TRAVEL										
				5	10	20	30	40	50	60	70	80	90	100
1/2	3/4	1/8	EP	0.002	0.003	0.006	0.011	0.021	0.032	0.042	0.052	0.062	0.072	0.08
		3/16	EP	0.004	0.008	0.014	0.021	0.03	0.045	0.063	0.095	0.145	0.25	0.5
		1/4	EP	0.03	0.04	0.07	0.12	0.18	0.25	0.36	0.49	0.7	1.1	1.5
		5/8	MEP	0.05	0.1	0.18	0.31	0.49	0.73	1.1	1.6	2.3	3.4	5.1
3/4	3/4	1/8	EP	0.002	0.003	0.006	0.011	0.021	0.032	0.042	0.052	0.062	0.072	0.08
		3/16	EP	0.004	0.008	0.014	0.021	0.03	0.045	0.063	0.095	0.145	0.25	0.5
		1/4	EP	0.03	0.04	0.07	0.12	0.18	0.25	0.36	0.49	0.7	1.1	1.5
		5/8	MEP	0.05	0.07	0.18	0.31	0.47	0.73	1.1	1.6	2.4	3.8	6
		7/8	MEP	0.07	0.19	0.58	1	1.3	1.9	2.5	3.8	5.7	8.7	10.3
1	3/4	5/8	MEP	0.04	0.07	0.16	0.31	0.54	0.79	1.1	1.8	2.2	4	6.2
		7/8	MEP	0.07	0.15	0.42	0.75	1.2	1.9	2.9	4.2	6.7	9.8	12.1
		1-1/4	MEP	0.09	0.27	0.63	1	1.4	3.2	5.3	7.5	11.5	15.6	18.2
1-1/2	3/4	7/8	MEP	0.11	0.21	0.54	0.89	1.4	1.9	2.7	3.9	6.4	10.1	13.2
		1-1/4	MEP	0.14	0.37	0.99	1.5	2.4	3.6	5.3	7.5	12.3	16.8	22
		1-3/4	MEP	0.41	0.85	2.4	4.3	6.4	9.9	15.7	22.7	29	34.2	37
2	3/4	1-1/4	MEP	0.14	0.37	0.99	1.5	2.4	3.6	5.3	7.5	12.3	17.3	23
		1-3/4	MEP	0.41	0.85	2.4	4.3	6.5	10	16	23	31	37	43
	1-1/16	2-1/4	MEP	0.75	1.5	3.5	6.5	10.5	15.5	26	39	50	60	67

LIL' GATOR SATURATED STEAM CAPACITY TABLE

(Lbs./Hr.)

Pressure (PSI)		Valve Size and Port																		
		1/2"				3/4"					1"			1½"			2"			
P1	P2	1/8	3/16	1/4	5/8	1/8	3/16	1/4	5/8	7/8	5/8	7/8	1¼	7/8	1¼	1¾	1¼	1¾	2¼
10	5	2	16	47	159	2	16	47	187	322	194	378	569	412	687	1156	719	1344	2094
	3	3	18	53	181	3	18	53	213	366	220	430	646	469	781	1314	817	1527	2380
15	10	3	17	52	177	3	17	52	208	357	215	419	630	457	762	1281	796	1489	2320
	7	3	21	62	212	3	21	62	250	429	258	503	757	549	915	1540	957	1789	2788
	5	4	22	67	229	4	22	67	269	463	278	543	817	593	988	1662	1033	1931	3009
20	15	3	19	56	192	3	19	56	226	387	233	455	685	497	828	1392	865	1617	2520
	10	4	25	74	253	4	25	74	297	510	307	599	902	654	1090	1833	1139	2130	3319
	7	4	27	81	275	4	27	81	324	555	334	652	981	712	1186	1995	1240	2319	3613
30	22	4	26	79	268	4	26	79	315	541	326	636	957	694	1156	1945	1209	2260	3522
	17	5	32	95	323	5	32	95	380	652	393	766	1153	836	1393	2343	1457	2723	4243
	10	6	36	108	369	6	36	108	434	744	448	874	1315	954	1590	2674	1662	3108	4842
40	25	6	38	113	384	6	38	113	452	775	467	911	1370	994	1656	2786	1732	3237	5044
	20	7	41	124	423	7	41	124	497	854	514	1003	1508	1094	1823	3067	1906	3564	5553
	3-0	8	47	141	480	8	47	141	564	969	583	1138	1711	1241	2069	3479	2163	4043	6300
50	35	7	42	125	424	7	42	125	498	855	515	1005	1511	1096	1827	3073	1910	3571	5564
	30	7	46	138	470	7	46	138	553	950	572	1116	1679	1217	2029	3413	2121	3966	6179
	25	8	49	148	505	8	49	148	594	1019	614	1198	1801	1307	2178	3662	2277	4256	6632
	6-0	9	55	166	564	9	55	166	663	1139	686	1338	2013	1460	2433	4091	2543	4755	7409
60	45	7	45	135	460	7	45	135	541	928	559	1090	1640	1189	1982	3334	2072	3874	6037
	40	8	50	151	513	8	50	151	604	1036	624	1217	1831	1328	2213	3722	2313	4325	6739
	35	9	54	163	554	9	54	163	652	1119	674	1315	1977	1434	2390	4020	2499	4672	7279
	9-0	10	64	191	648	10	64	191	763	1309	788	1538	2314	1678	2797	4704	2924	5466	8517
75	55	9	56	168	571	9	56	168	671	1153	694	1354	2036	1477	2462	4140	2574	4811	7497
	50	10	61	182	620	10	61	182	730	1253	754	1472	2214	1606	2677	4501	2798	5231	8151
	45	10	65	194	660	10	65	194	777	1334	803	1567	2356	1709	2848	4791	2978	5568	8675
	14-0	12	76	227	772	12	76	227	909	1560	939	1833	2757	1999	3332	5604	3484	6513	10148
100	75	11	70	210	715	11	70	210	841	1444	869	1697	2552	1851	3085	5188	3225	6029	9394
	60	13	83	249	847	13	83	249	996	1710	1029	2009	3021	2191	3652	6142	3818	7138	11122
	22-0	15	96	288	978	15	96	288	1151	1975	1189	2321	3491	2532	4219	7096	4411	8247	12850
125	100	13	78	234	797	13	78	234	938	1609	969	1891	2844	2063	3438	5782	3594	6719	10469
	75	16	101	303	1030	16	101	303	1212	2081	1252	2444	3676	2666	4444	7474	4646	8686	13534
	30-0	19	116	348	1182	19	116	348	1391	2388	1437	2805	4220	3060	5101	8578	5332	9969	15534
150	125	14	86	257	875	14	86	257	1029	1766	1063	2075	3121	2264	3773	6346	3945	7375	11491
	100	18	112	336	1142	18	112	336	1343	2306	1388	2709	4074	2955	4925	8283	5149	9626	14998
	38-0	22	136	407	1385	22	136	407	1629	2796	1683	3285	4941	3584	5973	10045	6244	11674	18190
175	150	15	92	275	936	15	92	275	1101	1890	1138	2221	3340	2422	4037	6790	4221	7891	12296
	125	20	122	367	1249	20	122	367	1469	2522	1518	2963	4457	3232	5387	9060	5632	10529	16406
	100	22	139	418	1421	22	139	418	1672	2870	1728	3372	5072	3678	6131	10311	6409	11983	18671
	46-0	25	155	466	1585	25	155	466	1865	3202	1927	3761	5657	4103	6838	11501	7149	13366	20826
200	150	21	131	392	1333	21	131	392	1569	2693	1621	3164	4759	3451	5752	9674	6014	11243	17518
	125	24	152	455	1549	24	152	455	1822	3127	1883	3674	5526	4008	6680	11235	6984	13056	20344
	54-0	28	175	525	1784	28	175	525	2098	3602	2168	4232	6365	4616	7694	12939	8043	15038	23431
225	175	22	139	417	1418	22	139	417	1669	2865	1724	3365	5062	3671	6119	10291	6397	11960	18635
	150	26	162	485	1649	26	162	485	1940	3331	2005	3913	5885	4268	7114	11964	7437	13904	21665
	63-0	31	194	583	1981	31	194	583	2330	4001	2408	4700	7069	5127	8545	14371	8933	16701	26023
250	200	23	147	441	1498	23	147	441	1762	3025	1821	3554	5345	3877	6461	10866	6755	12628	19676
	175	27	172	515	1751	27	172	515	2060	3536	2129	4154	6249	4532	7554	12704	7897	14764	23004
	150	30	189	566	1926	30	189	566	2266	3889	2341	4569	6872	4984	8307	13971	8685	16237	25300
	71-0	34	214	641	2179	34	214	641	2564	4401	2649	5170	7776	5640	9400	15808	9827	18372	28626

Note: It is recommended to keep valve outlet velocity below 30,000 ft./min. Capacities based on maximum Cv.

LIL' GATOR SATURATED STEAM CAPACITY TABLE

(Kg./Hr.)

Pressure (BARG)		Valve Size and Port																	
		1/2"				3/4"					1"			1½"			2"		
P1	P2	1/8	3/16	1/4	5/8	1/8	3/16	1/4	5/8	7/8	5/8	7/8	1¼	7/8	1¼	1¾	1¼	1¾	2¼
0.7	0.3	1	8	23	77	1	8	23	90	155	93	182	274	199	331	557	346	647	1008
	0.2	1	8	25	83	1	8	25	98	169	101	198	298	216	360	606	376	704	1097
1	0.7	1	7	22	75	1	7	22	88	151	91	178	267	194	323	543	337	631	983
	0.5	1	9	27	92	1	9	27	108	186	112	218	328	238	397	667	415	775	1208
	0.3	2	10	30	103	2	10	30	121	208	125	245	368	267	445	748	465	869	1354
1.5	1	2	10	31	104	2	10	31	123	211	127	247	372	270	450	756	470	879	1370
	0.7	2	12	37	124	2	12	37	146	251	151	295	444	322	536	902	561	1048	1633
	0.5	2	13	39	133	2	13	39	157	269	162	316	475	345	574	966	600	1122	1749
2	1.5	2	11	34	115	2	11	34	136	233	140	273	411	298	497	836	520	972	1514
	1.2	2	14	41	139	2	14	41	163	280	169	329	495	359	599	1007	626	1170	1823
	1	2	15	44	151	2	15	44	178	305	184	358	539	391	651	1095	681	1273	1983
3	2	3	18	53	179	3	18	53	211	362	218	425	639	464	773	1299	808	1510	2353
	1.5	3	20	60	205	3	20	60	241	414	249	487	732	531	885	1489	925	1730	2696
	.3-0	4	23	68	231	4	23	68	272	467	281	549	826	599	998	1679	1044	1951	3040
3.5	3.0	2	14	42	143	2	14	42	169	289	174	340	511	371	618	1040	646	1208	1883
	2.0	3	22	65	221	3	22	65	260	446	268	524	788	571	952	1601	996	1861	2900
	1.0	4	24	73	249	4	24	73	293	503	303	591	889	645	1075	1808	1124	2101	3273
	.4-0	4	25	76	259	4	25	76	304	523	315	614	923	670	1116	1877	1167	2181	3399
4	3.0	3	20	59	202	3	20	59	238	409	246	480	722	524	873	1468	912	1706	2657
	2.0	4	25	75	256	4	25	75	301	517	311	607	913	662	1104	1856	1154	2158	3362
	1.0	4	27	81	276	4	27	81	325	558	336	656	986	715	1192	2005	1246	2330	3631
	.6-0	4	28	84	286	4	28	84	337	578	348	679	1021	741	1234	2076	1290	2413	3759
5	4.0	4	22	66	224	4	22	66	264	453	272	532	800	580	967	1625	1010	1889	2943
	3.0	5	28	85	290	5	28	85	341	585	352	687	1034	750	1250	2101	1306	2442	3805
	2.0	5	31	94	321	5	31	94	378	649	391	762	1146	831	1386	2331	1449	2708	4220
	.9-0	5	33	100	341	5	33	100	401	688	414	808	1215	881	1469	2471	1536	2871	4474
7	5.0	5	34	102	345	5	34	102	406	698	420	820	1233	894	1490	2506	1558	2913	4538
	3.0	7	42	125	424	7	42	125	499	856	515	1006	1513	1097	1829	3075	1912	3574	5569
	1.6-0	7	44	132	449	7	44	132	529	908	546	1066	1604	1163	1939	3260	2027	3789	5904
9	7.0	6	38	115	392	6	38	115	462	793	477	931	1400	1016	1693	2847	1770	3309	5155
	5.0	8	49	147	500	8	49	147	589	1010	608	1187	1786	1295	2158	3630	2256	4219	6573
	2.1-0	9	55	164	557	9	55	164	656	1126	678	1322	1989	1442	2404	4043	2513	4699	7321
10	8.0	6	41	122	414	6	41	122	487	836	503	982	1478	1072	1786	3004	1867	3491	5439
	5.0	9	55	165	561	9	55	165	660	1132	682	1330	2001	1451	2419	4068	2529	4727	7366
	2.5-0	10	60	179	609	10	60	179	716	1230	740	1445	2173	1576	2627	4417	2746	5134	7999
12	10.0	7	44	133	451	7	44	133	530	910	548	1069	1608	1167	1944	3270	2033	3800	5921
	7.0	10	62	186	634	10	62	186	746	1280	771	1504	2262	1641	2735	4599	2859	5345	8328
	5.0	11	67	201	683	11	67	201	803	1379	830	1620	2437	1768	2946	4955	3080	5758	8972
	3.2-0	11	70	210	715	11	70	210	841	1444	869	1697	2552	1851	3085	5188	3225	6030	9395
14	10.0	10	63	189	644	10	63	189	757	1300	783	1527	2297	1666	2777	4670	2903	5427	8456
	7.0	12	75	225	766	12	75	225	901	1546	931	1817	2733	1982	3303	5555	3453	6456	10059
	3.8-0	13	80	241	820	13	80	241	965	1656	997	1946	2927	2123	3538	5950	3699	6915	10775
15	12.0	9	59	176	597	9	59	176	703	1207	726	1417	2132	1546	2577	4334	2694	5037	7849
	10.0	11	71	213	724	11	71	213	852	1462	880	1718	2584	1874	3123	5253	3265	6104	9511
	4.2-0	14	85	256	870	14	85	256	1024	1758	1058	2065	3106	2252	3754	6313	3925	7337	11432
17	15.0	8	53	158	536	8	53	158	630	1082	651	1271	1911	1386	2310	3885	2415	4515	7035
	12.0	12	76	229	778	12	76	229	915	1572	946	1846	2777	2014	3357	5645	3509	6561	10223
	10.0	14	85	255	868	14	85	255	1022	1754	1056	2060	3099	2248	3746	6300	3916	7322	11408
	4.8-0	15	96	287	975	15	96	287	1147	1969	1185	2314	3480	2524	4206	7075	4398	8222	12811

Note: It is recommended to keep valve outlet velocity below 30,000 ft./min. Capacities based on maximum Cv.

LIL' GATOR AIR CAPACITY TABLE

(SCFH)

Pressure (PSI)		Valve Size and Port																		
		1/2"				3/4"					1"			1½"			2"		
P1	P2	1/8	3/16	1/4	5/8	1/8	3/16	1/4	5/8	7/8	5/8	7/8	1¼	7/8	1¼	1¾	1¼	1¾	2¼
10	5	48	300	901	3064	48	300	901	3605	6189	3725	7270	10936	7931	13219	22232	13820	25837	40258
	3	55	341	1023	3477	55	341	1023	4091	7023	4227	8250	12409	9000	15000	25227	15682	29318	45682
	10	54	335	1005	3418	54	335	1005	4021	6904	4156	8110	12199	8847	14745	24799	15416	28821	44907
15	7	64	403	1208	4106	64	403	1208	4831	8293	4992	9743	14655	10629	17714	29792	18519	34623	53948
	5	69	434	1303	4429	69	434	1303	5211	8945	5385	10508	15806	11464	19106	32133	19975	37344	58188
	15	59	367	1100	3739	59	367	1100	4399	7552	4546	8872	13345	9678	16131	27129	16864	31528	49126
20	10	77	482	1445	4914	77	482	1445	5781	9924	5973	11658	17535	12718	21196	35648	22160	41429	64552
	7	84	524	1572	5346	84	524	1572	6290	10797	6499	12684	19078	13837	23062	38786	24110	45075	70234
	22	83	517	1552	5276	83	517	1552	6208	10656	6414	12519	18830	13657	22761	38280	23796	44488	69318
30	17	100	623	1868	6350	100	623	1868	7470	12824	7719	15065	22660	16435	27391	46067	28636	53537	83419
	10	113	708	2124	7222	113	708	2124	8497	14586	8780	17135	25774	18693	31155	52398	32572	60895	94882
	25	119	746	2239	7612	119	746	2239	8955	15373	9253	18059	27163	19701	32835	55222	34327	64177	99996
40	20	131	820	2461	8367	131	820	2461	9844	16898	10172	19851	29859	21656	36094	60703	37734	70547	109922
	3-0	148	924	2773	9429	148	924	2773	11093	19043	11463	22371	33649	24405	40674	68407	42523	79500	123871
	35	133	830	2489	8463	133	830	2489	9956	17091	10288	20078	30200	21903	36505	61395	38164	71351	111174
50	30	147	920	2760	9384	147	920	2760	11040	18951	11408	22263	33487	24287	40478	68077	42318	79117	123275
	25	158	986	2958	10057	158	986	2958	11832	20312	12227	23862	35891	26031	43385	72966	45357	84798	132127
	6-0	175	1094	3281	11156	175	1094	3281	13124	22530	13562	26467	39810	28873	48122	80933	50310	94057	146555
	45	145	906	2717	9238	145	906	2717	10868	18657	11231	21918	32967	23910	39850	67021	41662	77889	121362
60	40	162	1010	3031	10306	162	1010	3031	12125	20814	12529	24452	36778	26674	44457	74769	46478	86894	135393
	35	174	1090	3270	11119	174	1090	3270	13081	22455	13517	26380	39679	28778	47963	80665	50143	93746	146070
	9-0	202	1263	3789	12882	202	1263	3789	15155	26017	15661	30563	45971	33342	55570	93459	58096	108614	169236
	55	181	1133	3399	11558	181	1133	3399	13598	23343	14051	27422	41247	29915	49859	83853	52125	97451	151842
75	50	197	1231	3692	12554	197	1231	3692	14769	25354	15262	29785	44800	32493	54154	91078	56616	105847	164925
	45	209	1309	3926	13349	209	1309	3926	15704	26959	16228	31670	47636	34549	57582	96843	60199	112547	175364
	14-0	243	1516	4549	15466	243	1516	4549	18195	31236	18802	36694	55193	40030	66717	112206	69749	130401	203183
	75	230	1436	4309	14650	230	1436	4309	17235	29587	17810	34758	52281	37918	63196	106285	66069	123520	192462
100	60	271	1696	5087	17295	271	1696	5087	20347	34928	21025	41032	61718	44763	74604	125471	77995	145817	227204
	22-0	310	1939	5817	19777	310	1939	5817	23267	39941	24042	46921	70576	51187	85311	143478	89189	166745	259811
	100	259	1617	4850	16490	259	1617	4850	19400	33303	20046	39123	58846	42679	71132	119631	74365	139031	216630
125	75	333	2082	6245	21232	333	2082	6245	24979	42881	25812	50375	75770	54954	91591	154039	95754	179018	278935
	30-0	378	2361	7084	24087	378	2361	7084	28338	48647	29282	57148	85958	62343	103906	174750	108629	203088	316440
	125	285	1779	5338	18148	285	1779	5338	21350	36651	22062	43057	64763	46971	78285	131660	81843	153011	238412
150	100	372	2328	6983	23742	372	2328	6983	27932	47950	28863	56330	84727	61450	102417	172247	107073	200179	311907
	38-0	445	2784	8352	28398	445	2784	8352	33409	57352	34523	67375	101341	73500	122500	206023	128068	239432	373068
	150	309	1928	5785	19669	309	1928	5785	23140	39723	23911	46665	70191	50907	84846	142695	88702	165835	258394
175	125	408	2551	7654	26024	408	2551	7654	30617	52559	31637	61744	92871	67357	112262	188804	117365	219421	341889
	100	466	2910	8729	29679	466	2910	8729	34917	59940	36080	70415	105914	76816	128027	215319	133847	250235	389902
	46-0	513	3207	9620	32708	513	3207	9620	38480	66058	39763	77602	116723	84657	141094	237295	147508	275775	429696
	150	441	2758	8274	28130	441	2758	8274	33094	56812	34197	66740	100385	72807	121345	204080	126861	237174	369551
200	125	508	3175	9526	32390	508	3175	9526	38105	65414	39376	76846	115587	83832	139720	234984	146071	273089	425511
	54-0	581	3629	10888	37019	581	3629	10888	43551	74763	45003	87829	132106	95813	159689	268567	166947	312119	486325
	175	472	2950	8851	30094	472	2950	8851	35404	60778	36585	71399	107394	77890	129816	218328	135717	253732	395350
225	150	548	3422	10266	34905	548	3422	10266	41065	70495	42434	82815	124564	90343	150572	253235	157416	294300	458560
	63-0	648	4051	12152	41317	648	4051	12152	48608	83444	50229	98027	147445	106938	178230	299751	186332	348359	542792
	200	501	3131	9394	31941	501	3131	9394	37577	64507	38830	75781	113984	82670	137783	231726	144046	269303	419612
250	175	584	3653	10959	37262	584	3653	10959	43837	75254	45298	88405	132973	96442	160736	270329	168043	314167	489515
	150	641	4008	12024	40881	641	4008	12024	48096	82564	49699	96993	145890	105810	176350	296589	184366	344685	537067
	71-0	716	4473	13420	45628	716	4473	13420	53680	92150	55469	108254	162828	118095	196825	331024	205771	384703	599421

Note: It is recommended to keep valve outlet velocity below 30,000 ft./min. Capacities based on maximum Cv.

LIL' GATOR AIR CAPACITY TABLE

(M3/Hr.)

Pressure (BARG)		Valve Size and Port																	
		1/2"				3/4"					1"			1½"			2"		
P1	P2	1/8	3/16	1/4	5/8	1/8	3/16	1/4	5/8	7/8	5/8	7/8	1¼	7/8	1¼	1¾	1¼	1¾	2¼
0.7	0.3	1.4	9.0	27	92	1.4	9.0	27	109	186	112	219	329	239	398	669	416	778	1212
	0.2	1.6	10	29	100	1.6	10	29	118	202	122	237	357	259	432	726	451	844	1315
1	0.7	1.4	8.9	27	90	1.4	8.9	27	106	183	110	214	323	234	390	656	408	762	1187
	0.5	1.7	11	33	111	1.7	11	33	131	224	135	263	396	287	479	805	500	936	1458
	0.3	2.0	12	37	125	2.0	12	37	147	252	151	295	444	322	537	904	562	1050	1636
1.5	1	2.0	12	37	127	2.0	12	37	150	257	155	302	454	329	549	923	573	1072	1671
	0.7	2.4	15	44	151	2.4	15	44	178	305	184	359	539	391	652	1097	682	1274	1986
	0.5	2.5	16	48	162	2.5	16	48	190	327	197	384	577	419	698	1174	730	1364	2125
2	1.5	2.2	14	42	142	2.2	14	42	167	286	172	336	505	366	611	1027	638	1194	1860
	1.2	2.7	17	50	170	2.7	17	50	200	344	207	404	607	441	734	1235	768	1435	2236
	1	2.9	18	54	184	2.9	18	54	216	371	223	436	655	475	792	1333	828	1549	2413
3	2	3.5	22	65	221	3.5	22	65	261	447	269	525	790	573	955	1607	999	1867	2909
	1.5	4.0	25	75	254	4.0	25	75	299	512	308	602	905	657	1095	1841	1144	2139	3333
	.3-0	4.5	28	84	284	4.5	28	84	334	574	345	674	1014	735	1225	2060	1281	2395	3731
3.5	3.0	2.8	17	52	178	2.8	17	52	209	359	216	422	635	461	768	1291	803	1501	2338
	2.0	4.3	27	81	275	4.3	27	81	324	556	335	653	982	712	1187	1997	1241	2321	3616
	1.0	4.9	31	92	313	4.9	31	92	368	631	380	742	1116	809	1349	2268	1410	2636	4108
	4-0	5.0	31	94	320	5.0	31	94	376	646	389	758	1141	827	1379	2319	1442	2695	4200
4	3.0	4.0	25	75	254	4.0	25	75	299	513	309	602	906	657	1095	1842	1145	2141	3336
	2.0	5.1	32	95	323	5.1	32	95	380	652	393	766	1152	836	1393	2342	1456	2722	4242
	1.0	5.5	34	103	351	5.5	34	103	413	709	427	833	1253	909	1515	2547	1583	2960	4613
	.6-0	5.6	35	104	355	5.6	35	104	418	717	431	842	1267	919	1531	2575	1601	2992	4662
5	4.0	4.4	28	83	283	4.4	28	83	333	571	344	671	1009	732	1220	2051	1275	2384	3714
	3.0	5.8	36	108	367	5.8	36	108	432	741	446	870	1309	949	1582	2661	1654	3093	4819
	2.0	6.4	40	120	409	6.4	40	120	481	826	497	970	1459	1058	1763	2965	1843	3446	5370
	.9-0	6.7	42	125	426	6.7	42	125	501	860	518	1010	1520	1102	1837	3089	1920	3590	5594
7	5.0	6.9	43	130	442	6.9	43	130	521	894	538	1050	1579	1145	1909	3210	1995	3731	5813
	3.0	8.5	53	160	545	8.5	53	160	641	1100	662	1292	1944	1410	2350	3952	2457	4593	7157
	1.6-0	8.9	56	167	567	8.9	56	167	667	1145	689	1345	2024	1468	2446	4114	2557	4781	7450
9	7.0	8.0	50	149	507	8.0	50	149	597	1025	617	1204	1811	1313	2189	3681	2288	4278	6666
	5.0	10	63	190	645	10	63	190	759	1303	784	1531	2302	1670	2783	4680	2909	5439	8475
	2.1-0	11	70	209	709	11	70	209	834	1433	862	1683	2531	1836	3060	5146	3199	5981	9318
10	8.0	8.4	53	158	537	8.4	53	158	632	1085	653	1274	1916	1390	2316	3896	2422	4528	7055
	5.0	12	72	216	733	12	72	216	863	1481	891	1740	2617	1898	3163	5319	3307	6182	9632
	2.5-0	12	76	229	780	12	76	229	917	1575	948	1850	2783	2018	3364	5657	3517	6575	10244
12	10.0	9.3	58	174	592	9.3	58	174	696	1195	720	1404	2112	1532	2553	4294	2669	4990	7776
	7.0	13	81	244	829	13	81	244	976	1675	1008	1967	2959	2146	3577	6016	3740	6992	10894
	5.0	14	88	264	897	14	88	264	1055	1812	1091	2129	3202	2322	3870	6509	4046	7564	11786
	3.2-0	14	90	271	921	14	90	271	1084	1860	1120	2185	3287	2384	3973	6682	4154	7766	12100
14	10.0	13	83	250	849	13	83	250	999	1715	1032	2014	3030	2197	3662	6159	3829	7158	11153
	7.0	16	99	296	1006	16	99	296	1183	2031	1223	2386	3589	2603	4338	7296	4536	8480	13212
	3.8-0	17	104	313	1063	17	104	313	1250	2147	1292	2522	3793	2751	4585	7711	4793	8961	13963
15	12.0	12	78	233	791	12	78	233	930	1597	961	1876	2822	2047	3411	5737	3566	6667	10388
	10.0	15	94	281	957	15	94	281	1126	1932	1163	2270	3414	2476	4127	6942	4315	8067	12570
	4.2-0	18	111	333	1133	18	111	333	1333	2289	1378	2689	4044	2933	4888	8222	5111	9555	14888
17	15.0	11	70	209	711	11	70	209	837	1436	864	1687	2537	1840	3067	5158	3207	5995	9341
	12.0	16	101	304	1034	16	101	304	1216	2088	1257	2452	3689	2675	4459	7499	4662	8715	13579
	10.0	18	113	339	1152	18	113	339	1355	2326	1400	2732	4110	2981	4968	8355	5193	9709	15129
	4.8-0	20	125	375	1275	20	125	375	1500	2575	1550	3025	4550	3300	5500	9250	5750	10750	16751

Note: It is recommended to keep valve outlet velocity below 30,000 ft./min. Capacities based on maximum Cv.

LIL' GATOR WATER CAPACITY TABLE

(G.P.M.)

Pressure (PSI)		Valve Size and Port																	
		1/2"				3/4"					1"			1½"			2"		
P1	P2	1/8	3/16	1/4	5/8	1/8	3/16	1/4	5/8	7/8	5/8	7/8	1¼	7/8	1¼	1¾	1¼	1¾	2¼
10	5	0.18	1.1	3.4	11.4	0.18	1.1	3.4	13.4	23.0	13.9	27.1	40.7	29.5	49.2	82.7	51.4	96.2	150
	4	0.20	1.2	3.7	12.5	0.20	1.2	3.7	14.7	25.2	15.2	29.6	44.6	32.3	53.9	90.6	56.3	105	164
	10	0.18	1.1	3.4	11.4	0.18	1.1	3.4	13.4	23.0	13.9	27.1	40.7	29.5	49.2	82.7	51.4	96.2	150
15	7	0.23	1.4	4.2	14.4	0.23	1.4	4.2	17.0	29.1	17.5	34.2	51.5	37.3	62.2	105	65	122	190
	6	0.24	1.5	4.5	15.3	0.24	1.5	4.5	18.0	30.9	18.6	36.3	54.6	39.6	66.0	111	69	129	201
	15	0.18	1.1	3.4	11.4	0.18	1.1	3.4	13.4	23.0	13.9	27.1	40.7	29.5	49.2	82.7	51.4	96.2	150
20	10	0.25	1.6	4.7	16.1	0.25	1.6	4.7	19.0	32.6	19.6	38.3	57.6	41.7	69.6	117	72.7	136	212
	8	0.28	1.7	5.2	17.7	0.28	1.7	5.2	20.8	35.7	21.5	41.9	63.0	45.7	76.2	128	79.7	149	232
	25	0.18	1.1	3.4	11.4	0.18	1.1	3.4	13.4	23.0	13.9	27.1	40.7	29.5	49.2	83	51.4	96	150
30	20	0.25	1.6	4.7	16.1	0.25	1.6	4.7	19.0	32.6	19.6	38.3	57.6	41.7	69.6	117	72.7	136	212
	12	0.34	2.1	6.4	21.6	0.34	2.1	6.4	25.5	43.7	26.3	51.3	77.2	56.0	93.3	157	98	182	284
	25	0.31	1.9	5.8	19.8	0.31	1.9	5.8	23.2	39.9	24.0	46.9	70.5	51.1	85.2	143	89.1	167	259
40	20	0.36	2.2	6.7	22.8	0.36	2.2	6.7	26.8	46.1	27.7	54.1	81.4	59.0	98.4	165	103	192	300
	15	0.40	2.5	7.5	25.5	0.40	2.5	7.5	30.0	51.5	31.0	60.5	91.0	66.0	110	185	115	215	335
	35	0.31	1.9	5.8	19.8	0.31	1.9	5.8	23.2	39.9	24.0	46.9	70.5	51.1	85.2	143	89.1	167	259
50	30	0.36	2.2	6.7	22.8	0.36	2.2	6.7	26.8	46.1	27.7	54.1	81.4	59.0	98.4	165	103	192	300
	25	0.40	2.5	7.5	25.5	0.40	2.5	7.5	30.0	51.5	31.0	60.5	91.0	66.0	110	185	115	215	335
	15	0.47	3.0	8.9	30.2	0.47	3.0	8.9	35.5	60.9	36.7	71.6	107.7	78.1	130	219	136	254	396
	45	0.31	1.9	5.8	19.8	0.31	1.9	5.8	23.2	39.9	24.0	46.9	70.5	51.1	85.2	143	89.1	167	259
60	40	0.36	2.2	6.7	22.8	0.36	2.2	6.7	26.8	46.1	27.7	54.1	81.4	59.0	98.4	165	103	192	300
	35	0.40	2.5	7.5	25.5	0.40	2.5	7.5	30.0	51.5	31.0	60.5	91.0	66.0	110	185	115	215	335
	25	0.47	3.0	8.9	30.2	0.47	3.0	8.9	35.5	60.9	36.7	71.6	107.7	78.1	130	219	136	254	396
	55	0.36	2.2	6.7	22.8	0.36	2.2	6.7	26.8	46.1	27.7	54.1	81.4	59.0	98.4	165	103	192	300
75	50	0.40	2.5	7.5	25.5	0.40	2.5	7.5	30.0	51.5	31.0	60.5	91.0	66.0	110	185	115	215	335
	45	0.44	2.7	8.2	27.9	0.44	2.7	8.2	32.9	56.4	34.0	66.3	99.7	72.3	120	203	126	236	367
	31	0.53	3.3	9.9	33.8	0.53	3.3	9.9	39.8	68.3	41.1	80.3	121	88	146	245	153	285	444
	75	0.40	2.5	7.5	25.5	0.40	2.5	7.5	30.0	51.5	31.0	60.5	91.0	66.0	110	185	115	215	335
100	60	0.51	3.2	9.5	32.3	0.51	3.2	9.5	37.9	65.1	39.2	76.5	115	83.5	139	234	145	272	424
	50	0.57	3.5	10.6	36.1	0.57	3.5	10.6	42.4	72.8	43.8	86	129	93	156	262	163	304	474
	100	0.40	2.5	7.5	25.5	0.40	2.5	7.5	30.0	51.5	31.0	60.5	91.0	66.0	110	185	115	215	335
125	75	0.57	3.5	10.6	36.1	0.57	3.5	10.6	42.4	72.8	43.8	85.6	129	93.3	156	262	163	304	474
	55	0.67	4.2	12.5	42.7	0.67	4.2	12.5	50.2	86.2	51.9	101	152	110	184	310	192	360	561
	125	0.40	2.5	7.5	25.5	0.40	2.5	7.5	30.0	51.5	31.0	60.5	91.0	66.0	110	185	115	215	335
150	100	0.57	3.5	10.6	36.1	0.57	3.5	10.6	42.4	72.8	43.8	85.6	129	93.3	156	262	163	304	474
	75	0.69	4.3	13.0	44.2	0.69	4.3	13.0	52.0	89	53.7	105	158	114	191	320	199	372	580
	150	0.40	2.5	7.5	25.5	0.40	2.5	7.5	30.0	51.5	31.0	60.5	91.0	66.0	110	185	115	215	335
175	125	0.57	3.5	10.6	36.1	0.57	3.5	10.6	42.4	72.8	43.8	85.6	129	93.3	156	262	163	304	474
	100	0.69	4.3	13.0	44.2	0.69	4.3	13.0	52.0	89.2	53.7	105	158	114	191	320	199	372	580
	75	0.80	5.0	15.0	51.0	0.80	5.0	15.0	60.0	103	62.0	121	182	132	220	370	230	430	670
	150	0.57	3.5	10.6	36.1	0.57	3.5	10.6	42.4	72.8	43.8	85.6	129	93.3	156	262	163	304	474
200	125	0.69	4.3	13.0	44.2	0.69	4.3	13.0	52.0	89.2	53.7	105	158	114	191	320	199	372	580
	85	0.86	5.4	16.1	54.7	0.86	5.4	16.1	64.3	110	66.5	130	195	142	236	397	247	461	718
	175	0.57	3.5	10.6	36.1	0.57	3.5	10.6	42.4	72.8	43.8	85.6	129	93.3	156	262	163	304	474
225	150	0.69	4.3	13.0	44.2	0.69	4.3	13.0	52.0	89.2	53.7	105	158	114	191	320	199	372	580
	100	0.89	5.6	16.8	57.0	0.89	5.6	16.8	67.1	115	69.3	135	203	148	246	414	257	481	749
	200	0.57	3.5	10.6	36.1	0.57	3.5	10.6	42.4	72.8	43.8	85.6	129	93.3	156	262	163	304	474
250	175	0.69	4.3	13.0	44.2	0.69	4.3	13.0	52.0	89.2	53.7	105	158	114	191	320	199	372	580
	150	0.80	5.0	15.0	51.0	0.80	5.0	15.0	60.0	103	62.0	121	182	132	220	370	230	430	670
	125	0.89	5.6	16.8	57.0	0.89	5.6	16.8	67.1	115	69.3	135	203	148	246	414	257	481	749
	250	0.57	3.5	10.6	36.1	0.57	3.5	10.6	42.4	72.8	43.8	85.6	129	93.3	156	262	163	304	474
300	200	0.80	5.0	15.0	51.0	0.80	5.0	15.0	60.0	103	62.0	121	182	132	220	370	230	430	670
	125	1.1	6.6	19.8	67.5	1.1	6.6	19.8	79.4	136	82.0	160	241	175	291	489	304	569	886
	350	0.57	3.5	10.6	36.1	0.57	3.5	10.6	42.4	72.8	43.8	85.6	129	93.3	156	262	163	304	474
400	300	0.80	5.0	15.0	51.0	0.80	5.0	15.0	60.0	103	62.0	121	182	132	220	370	230	430	670
	175	1.2	7.5	22.5	76.5	1.2	7.5	22.5	90.0	155	93.0	182	273	198	330	555	345	645	1005

Note: It is recommended to keep valve outlet velocity below 30,000 ft./min. Capacities based on maximum Cv.

LIL' GATOR WATER CAPACITY TABLE

(M3/Hr.)

Pressure (BARG)		Valve Size and Port																	
		1/2"				3/4"					1"			1½"			2"		
P1	P2	1/8	3/16	1/4	5/8	1/8	3/16	1/4	5/8	7/8	5/8	7/8	1¼	7/8	1¼	1¾	1¼	1¾	2¼
0.7	0.5	0.03	0.2	0.6	2.0	0.03	0.2	0.6	2.3	4.0	2.4	4.7	7.0	5.1	8.5	14.3	8.9	16.6	25.9
	0.3	0.04	0.3	0.8	2.8	0.04	0.3	0.8	3.3	5.6	3.4	6.6	10.0	7.2	12.0	20.2	12.6	23.5	36.6
1	0.7	0.04	0.2	0.7	2.4	0.04	0.2	0.7	2.8	4.9	2.9	5.7	8.6	6.3	10.4	17.5	10.9	20.4	31.7
	0.5	0.05	0.3	0.9	3.1	0.05	0.3	0.9	3.7	6.3	3.8	7.4	11.1	8.1	13.5	22.6	14.1	26.3	41.0
	0.4	0.05	0.3	1.0	3.4	0.05	0.3	1.0	4.0	6.9	4.2	8.1	12.2	8.8	14.7	24.8	15.4	28.8	44.9
1.5	1	0.05	0.3	0.9	3.1	0.05	0.3	0.9	3.7	6.3	3.8	7.4	11.1	8.1	13.5	22.6	14.1	26.3	41.0
	0.7	0.06	0.4	1.2	3.9	0.06	0.4	1.2	4.6	8.0	4.8	9.4	14.1	10.2	17.0	28.6	17.8	33.3	51.8
	0.6	0.07	0.4	1.2	4.2	0.07	0.4	1.2	4.9	8.5	5.1	9.9	14.9	10.8	18.0	30.4	18.9	35.3	55.0
2	1.5	0.05	0.3	0.9	3.1	0.05	0.3	0.9	3.7	6.3	3.8	7.4	11.1	8.1	13.5	22.6	14.1	26.3	41.0
	1	0.07	0.4	1.3	4.4	0.07	0.4	1.3	5.2	8.9	5.4	10.5	15.7	11.4	19.0	32.0	19.9	37.2	57.9
	0.8	0.08	0.5	1.4	4.8	0.08	0.5	1.4	5.7	9.8	5.9	11.5	17.2	12.5	20.8	35.1	21.8	40.7	63.5
3	2	0.07	0.4	1.3	4.4	0.07	0.4	1.3	5.2	8.9	5.4	10.5	15.7	11.4	19.0	32.0	19.9	37.2	57.9
	1.5	0.08	0.5	1.6	5.4	0.08	0.5	1.6	6.4	10.9	6.6	12.8	19.3	14.0	23.3	39.2	24.4	45.5	71.0
	1.0	0.10	0.6	1.8	6.2	0.10	0.6	1.8	7.3	12.6	7.6	14.8	22.3	16.1	26.9	45.2	28.1	52.6	81.9
3.5	3	0.05	0.3	0.9	3.1	0.05	0.3	0.9	3.7	6.3	3.8	7.4	11.1	8.1	13.5	22.6	14.1	26.3	41.0
	2	0.08	0.5	1.6	5.4	0.08	0.5	1.6	6.4	10.9	6.6	12.8	19.3	14.0	23.3	39.2	24.4	45.5	71.0
	1.5	0.10	0.6	1.8	6.2	0.10	0.6	1.8	7.3	12.6	7.6	14.8	22.3	16.1	26.9	45.2	28.1	52.6	81.9
	1	0.11	0.7	2.1	7.0	0.11	0.7	2.1	8.2	14.1	8.5	16.5	24.9	18.0	30.1	50.6	31.4	58.8	91.6
4	3.5	0.05	0.3	0.9	3.1	0.05	0.3	0.9	3.7	6.3	3.8	7.4	11.1	8.1	13.5	22.6	14.1	26.3	41.0
	3	0.07	0.4	1.3	4.4	0.07	0.4	1.3	5.2	8.9	5.4	10.5	15.7	11.4	19.0	32.0	19.9	37.2	57.9
	2	0.10	0.6	1.8	6.2	0.10	0.6	1.8	7.3	12.6	7.6	14.8	22.3	16.1	26.9	45.2	28.1	52.6	81.9
	1.7	0.10	0.7	2.0	6.7	0.10	0.7	2.0	7.9	13.5	8.1	15.9	23.9	17.3	28.9	48.5	30.2	56.4	87.9
5	4	0.07	0.4	1.3	4.4	0.07	0.4	1.3	5.2	8.9	5.4	10.5	15.7	11.4	19.0	32.0	19.9	37.2	57.9
	3	0.10	0.6	1.8	6.2	0.10	0.6	1.8	7.3	12.6	7.6	14.8	22.3	16.1	26.9	45.2	28.1	52.6	81.9
	2.5	0.11	0.7	2.1	7.0	0.11	0.7	2.1	8.2	14.1	8.5	16.5	24.9	18.0	30.1	50.6	31.4	58.8	91.6
	2.2	0.12	0.7	2.2	7.4	0.12	0.7	2.2	8.7	14.9	9.0	17.5	26.3	19.1	31.8	53.5	33.3	62.2	97.0
6	5	0.07	0.4	1.3	4.4	0.07	0.4	1.3	5.2	8.9	5.4	10.5	15.7	11.4	19.0	32.0	19.9	37.2	57.9
	4	0.10	0.6	1.8	6.2	0.10	0.6	1.8	7.3	12.6	7.6	14.8	22.3	16.1	26.9	45.2	28.1	52.6	81.9
	3.5	0.11	0.7	2.1	7.0	0.11	0.7	2.1	8.2	14.1	8.5	16.5	24.9	18.0	30.1	50.6	31.4	58.8	91.6
8	6	0.10	0.6	1.8	6.2	0.10	0.6	1.8	7.3	12.6	7.6	14.8	22.3	16.1	26.9	45.2	28.1	52.6	81.9
	5	0.12	0.7	2.2	7.6	0.12	0.7	2.2	9.0	15.4	9.3	18.1	27.3	19.8	33.0	55.4	34.5	64.4	100
	4	0.14	0.9	2.6	8.8	0.14	0.9	2.6	10.4	17.8	10.7	20.9	31.5	22.8	38.0	64.0	39.8	74.4	116
10	8	0.10	0.6	1.8	6.2	0.10	0.6	1.8	7.3	12.6	7.6	14.8	22.3	16.1	26.9	45.2	28.1	52.6	81.9
	6	0.14	0.9	2.6	8.8	0.14	0.9	2.6	10.4	17.8	10.7	20.9	31.5	22.8	38.0	64.0	39.8	74.4	116
	5	0.15	1.0	2.9	9.9	0.15	1.0	2.9	11.6	19.9	12.0	23.4	35.2	25.5	42.5	71.5	44.5	83.1	130
12	10	0.10	0.6	1.8	6.2	0.10	0.6	1.8	7.3	12.6	7.6	14.8	22.3	16.1	26.9	45.2	28.1	52.6	81.9
	8	0.14	0.9	2.6	8.8	0.14	0.9	2.6	10.4	17.8	10.7	20.9	31.5	22.8	38.0	64.0	39.8	74.4	116
	6	0.17	1.1	3.2	10.8	0.17	1.1	3.2	12.7	21.8	13.1	25.6	38.6	28.0	46.6	78.4	48.7	91.1	142
	5	0.18	1.1	3.4	11.7	0.18	1.1	3.4	13.7	23.6	14.2	27.7	41.6	30.2	50.3	84.7	52.6	98.4	153
14	10	0.14	0.9	2.6	8.8	0.14	0.9	2.6	10.4	17.8	10.7	20.9	31.5	22.8	38.0	64.0	39.8	74.4	116
	8	0.17	1.1	3.2	10.8	0.17	1.1	3.2	12.7	21.8	13.1	25.6	38.6	28.0	46.6	78.4	48.7	91.1	142
	6	0.20	1.2	3.7	12.5	0.20	1.2	3.7	14.7	25.2	15.2	29.6	44.5	32.3	53.8	90.5	56.3	105	164
15	12	0.12	0.7	2.2	7.6	0.12	0.7	2.2	9.0	15.4	9.3	18.1	27.3	19.8	33.0	55.4	34.5	64.4	100
	10	0.15	1.0	2.9	9.9	0.15	1.0	2.9	11.6	19.9	12.0	23.4	35.2	25.5	42.5	71.5	44.5	83.1	130
	7	0.20	1.2	3.7	12.5	0.20	1.2	3.7	14.7	25.2	15.2	29.6	44.5	32.3	53.8	90.5	56.3	105	164
17	14	0.12	0.7	2.2	7.6	0.12	0.7	2.2	9.0	15.4	9.3	18.1	27.3	19.8	33.0	55.4	34.5	64.4	100
	12	0.15	1.0	2.9	9.9	0.15	1.0	2.9	11.6	19.9	12.0	23.4	35.2	25.5	42.5	71.5	44.5	83.1	130
	10	0.18	1.1	3.4	11.7	0.18	1.1	3.4	13.7	23.6	14.2	27.7	41.6	30.2	50.3	84.7	52.6	98.4	153
	9	0.20	1.2	3.7	12.5	0.20	1.2	3.7	14.7	25.2	15.2	29.6	44.5	32.3	53.8	90.5	56.3	105	164
20	17	0.12	0.7	2.2	7.6	0.12	0.7	2.2	9.0	15.4	9.3	18.1	27.3	19.8	33.0	55.4	34.5	64.4	100
	15	0.15	1.0	2.9	9.9	0.15	1.0	2.9	11.6	19.9	12.0	23.4	35.2	25.5	42.5	71.5	44.5	83.1	130
	9	0.23	1.4	4.3	14.6	0.23	1.4	4.3	17.2	29.5	17.8	34.7	52.2	37.9	63.1	106	66.0	123	192
27	20	0.18	1.1	3.4	11.7	0.18	1.1	3.4	13.7	23.6	14.2	27.7	41.6	30.2	50.3	84.7	52.6	98.4	153
	15	0.24	1.5	4.5	15.3	0.24	1.5	4.5	18.0	30.9	18.6	36.2	54.5	39.5	65.9	111	68.9	129	201
	12	0.27	1.7	5.0	17.1	0.27	1.7	5.0	20.1	34.5	20.8	40.5	61.0	44.2	73.7	124	77.0	144	224

Note: It is recommended to keep valve outlet velocity below 30,000 ft./min. Capacities based on maximum Cv.

LIL' GATOR ORDERING CODE

Class		Material	Orifice Size	Valve Size	Con-nections	Trim Material	Packing	Actuator		Bench Range	
L	G	1	F	C	1	1	1	3	6	D	C
1	2	3	4	5	6	7	8	9	10	11	12

Class - Position 1 & 2
LG

Material - Position 3
1 = Cast Iron
3 = Stainless Steel

Orifice Size - Position 4
F = 1/8
G = 3/16
H = 1/4
J = 5/8
K = 7/8
L = 1-1/4
M = 1-3/4
N = 2-1/4

Valve Size - Position 5
C = 1/2
D = 3/4
E = 1
G = 1-1/2
H = 2

Connections - Position 6
1 = 125/150 Flanged
3 = 250/300 Flanged
6 = 600 RF Flanged
9 = Threaded

Trim Material - Position 7
1 = Metal
2 = Soft

Packing - Position 8
1 = Teflon® V-Ring
2 = BTG
3 = LG

Actuator - Position 9 & 10
01 = None
36 = 36 sq. in.
60 = 60 sq. in.

Bench Range - Position 11 & 12
AA = None
DC - 3-13 Dir 36
DD - 3-10 Dir 36
DE - 3-5 Dir 36
DF - 3-10 Dir 60[1]
DG - 3-11 Dir 60
DH - 3-8 Dir 60
RC - 5-15 Rev 36
RD - 8-15 Rev 36
RE - 10-15 Rev 36
RG - 8-15 Rev 60
RH - 10-15 Rev 60
RJ - 11-15 Rev 60[1]
RK - 20-60 Rev 60
RL - 20-60 Rev 60[1]
RQ - 12-15 Rev 60

1. 2¼" port only.

DLO(S)-2 CONTROL VALVE

SIZES 1/2" – 4"
ANSI CLASS 125/250, 150/300

DLO CONTROL VALVE

- **Cage Retained Seat** eliminates threaded internal parts
- **Top Entry** permits easy in line maintenance
- **Highest Cv's** of any comparable single seated valve
- **Two Point Stem Guide** minimizes trim wear and seat leakage
- **Tight Shutoff** with choice of seat materials for Class IV, V or VI
- **Multiple Trim Selections** to suit a wide variety of applications
- **One Piece Plug and Stem** ensures proper alignment and will not separate
- **Bolted Actuator Yoke** guarantees easy disassembly
- **Ultra Compact Actuators** install in tight spaces

Application Data

- Process control systems for food, pulp and paper, chemical, petrochemical & other industries
- HVAC systems
- Feed water and fuel system controls in boiler rooms
- Packaged systems (OEM) such as heat exchangers, water purification systems & vaporizers, metal cleaning and plating

Options

- Soft Seats
- Threaded, Flanged, Buttweld or Socketweld Connections
- Reduced Port Trim

Models

- U851 — Cast Iron
- U853 — Cast Steel
- U854 — SST

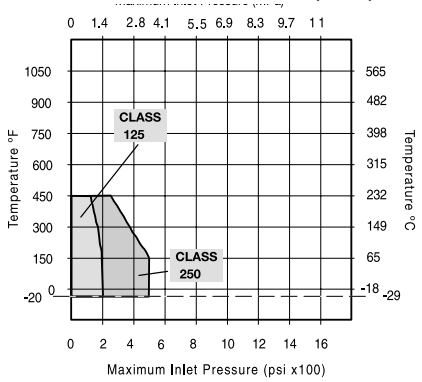
Applicable Codes *See Reference Section on page* 195

RANGEABILITIES

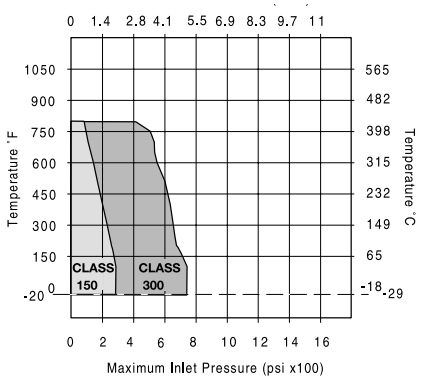
Trim Type	Ratio
¼" MT (Microtaper®)	55:1
¼-½"	25:1
¾-2"	35:1
2½-3"	40:1
4"	50:1

Valve Size	Full Port Cv	Cv's-Reduced Trim								
		¼"MT	¼"	½"	¾"	1"	1½"	2"	2½"	3"
½	4	.5	1.5	—	—	—	—	—	—	—
¾	9	.5	1.5	4.1	—	—	—	—	—	—
1	15	.5	1.5	4.1	9.1	—	—	—	—	—
1½	30	—	—	—	9.3	15.2	—	—	—	—
2	57	—	—	—	—	15.4	30.3	—	—	—
2½	83	—	—	—	—	—	30.9	57.4	—	—
3	120	—	—	—	—	—	30.9	58.0	83.0	—
4	201	—	—	—	—	—	—	58.9	83.0	120

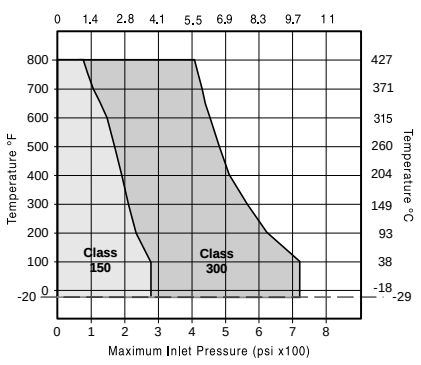
CAST IRON
A126 CLASS B
Maximum Inlet Pressure (MPa)



CARBON STEEL
A216 Gr. WCB - Standard Class
Maximum Inlet Pressure (MPa)



316 STAINLESS STEEL CF8M
CLASS A - Standard
Maximum Inlet Pressure (MPa)



DLO(S)-2 CONTROL VALVE

SPECIFICATION

BODY ASSEMBLY:
Style: Single seated, top entry bolted bonnet, globe style body, cage retained seat, unbalanced plug

ANSI Body Ratings:
Cast Iron: Class 125 & 250
(DIN ND16 & ND25)
Steel and alloys: Class 150 & 300
(DIN ND 16 & ND40)

BODY/BONNET MATERIALS:
Cast Iron, ASTM A126 Class B
Carbon Steel, ASTM A216 Gr WCB
316 stainless steel, ASTM A351 Gr CF8M

Note: See ANSI B16.1 (cast iron) or ANSI B16.34 (other materials) for pressure/temp. limits of body/bonnet assemblies.

SIZES: ½" - 4"

END CONNECTIONS:
ANSI Class 125/150 Integral Flanged, 1"- 4"
ANSI Class 250/300 Integral Flanged, 1"- 4"
Threaded, NPT -½"- 2":
Cast iron - ANSI Class 250 rated
Steel & alloys - ANSI Class 300 rated
Socketweld ends (Sch. 40) ½" - 2"
Buttweld ends (Sch. 40) 2½" - 4"
DIN Flanges: ND-16, ND-25,
ND-40

BONNET:
Through-bolted bonnet

BODY/BONNET BOLTING:
ASTM A-193 GRB7 Studs
ASTM A-194 GR2H Nuts

STEM PACKING:
PTFE V-Rings, -40 to 460˚F (-22 to 238˚C)
Braided PTFE/Graphite (Split-ring),
-40 to 500˚F (-22 to 260˚C)
Laminated Graphite,-320 to 800˚
(-195 to 426˚C)

PACKING STUDS, NUTS & FOLLOWER:
300 Series Stainless Steel

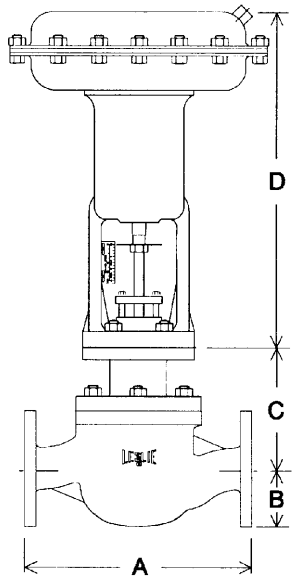
GASKETS:
Body gasket: Spiral wound AISI Type 316L
Seat/Body Gasket:
DLO-2 - Filled PTFE, 460ºF (238ºC)
DLOS-2 - Graphite filled Inconel* 600
750ºF (399ºC)

TRIM SIZES:
Full, reduced port, Microtaper®

TRIM MATERIAL:
316SS; 316SS/Stellited

FLOW CHARACTERISTICS:
Linear or equal percent - standard
Modified linear - optional

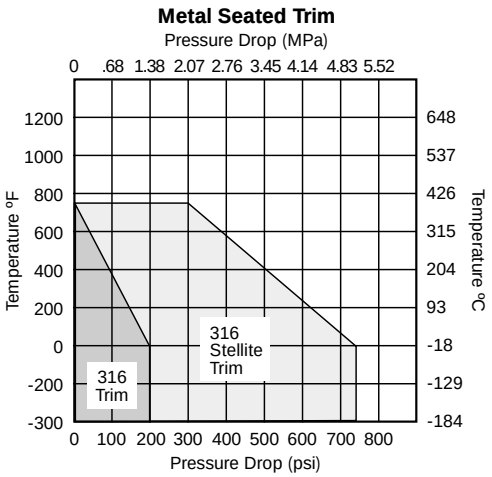
SHUT-OFF CLASS:
Metal/metal seats - ANSI/ISA 70-2 Class IV,
Class V optional to 750ºF (399ºC)
Metal/PTFE seats - ANSI/ISA 70-2 Class VI,
bubble-tight to 460ºF (238ºC)

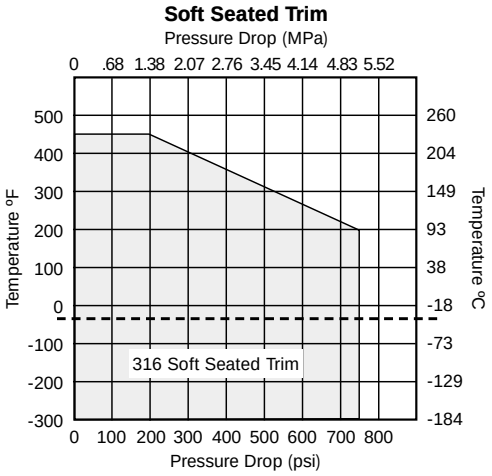


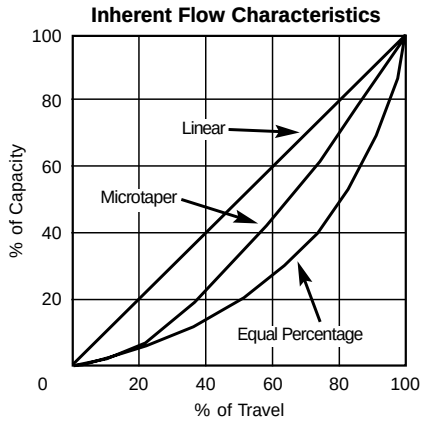
DIMENSIONS[1] inches (mm) **AND WEIGHTS** pounds (kg)

SIZE	A		B		C	D	WEIGHT				
	THD, 250,300[2] (ND25,40)	125,150 (ND16)	CI	CS			THD	125 (ND16)	150 (ND16)	250 (ND25)	300 (ND40)
½ (15)	7¾ (197)	— —	2⅜ (60)	— —	5^{1}⁄$_{16}$ (145)	12⅜ (314)	54 (23.6)	— —	— —	— —	— —
¾ (20)	7¾ (197)	— —	2⅜ (60)	— —	5^{1}⁄$_{16}$ (145)	12⅜ (314)	54 (23.6)	— —	— —	— —	— —
1 (25)	7¾ (197)	7¼ (184)	2¼ (57)	2¼ (57)	5^{1}⁄$_{16}$ (145)	12⅜ (314)	54 (23.6)	54 (28.6)	54 (28.6)	56 (25.4)	65 (25.4)
1½ (40)	9¼ (235)	8¾ (222)	2⅜ (60)	2⅜ (60)	7⅜ (187)	12⅜ (314)	63 (28.6)	70 (31.8)	70 (31.8)	70 (32.7)	72 (32.7)
2 (50)	10½ (267)	10 (254)	3 (76)	3 (76)	7⅝ (194)	15¼ (387)	70 (31.8)	91 (41.3)	91 (41.3)	95 (43.2)	95 (43.2)
2½ (65)	11½ (292)	10⅞ (276)	3⅝ (92)	3⅞ (98)	8 (203)	15¼ (387)	— —	108 (59)	107 (57.7)	114 (51.7)	115 (52.7)
3 (80)	12½ (318)	11¾ (298)	3⅞ (98)	3⅞ (98)	8⅜ (213)	15¼ (387)	— —	130	127	141 (64.1)	138 (62.7)
4 (100)	14½ (393)	13⅞ (385)	5 (127)	4¾ (123)	10^{7}⁄$_{16}$ (259)	19⅝ (499)	— —	231 (104.8)	271 (98.5)	248 (112.5)	236 (107.1)

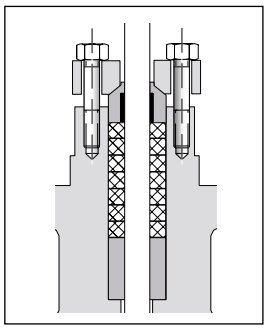
1. Threaded available in 1/2" to 2" only.
2. BWE same as 300# Flanged.





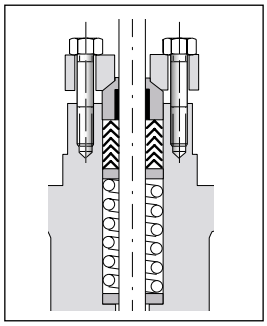


PACKING CONFIGURATIONS



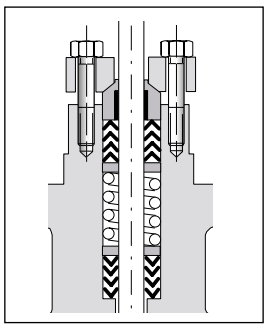
BRAIDED TEFLON GRAPHITE

Split rings allow packing replacement without removal of actuator. Graphite impregnated PTFE provides 500˚F (260˚C) service temperature, better memory and sealing than pure PTFE rings, lowered stem hysteresis, and is ideal for fluids that contain suspended particles.



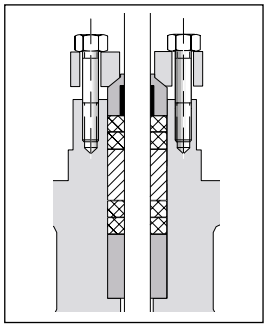
PTFE - V-RING

Live-loaded PTFE V-ring packing provides the most maintenance free stem seal. The V-ring packing is both pressure energized and live-loaded by a 304 stainless steel spring to automatically compensate for packing wear. Maximum service temperature is 460˚F (238˚C).



DOUBLE PTFE V-RING

Inverted sets of PTFE V-ring packing provide tight sealing in valves which may be controlling pressure or vacuum at different times. Maximum temperature 460˚F (238˚C).



HIGH TEMPERATURE LAMINATED GRAPHITE

Precision die-cut laminated graphite rings provide a reliable, tight stem seal to operating temperatures of 800˚F (426˚C).

DLO TRIM SELECTION

LINEAR CONTOURED

EQUAL PERCENTAGE

MICROTAPER®

Trim	Maximum Service Temp.	Plug[1]	Seat Ring	Stem	Cage	Guide Bushings	ANSI/ISA 70-2 Shutoff
Standard	450/750˚F[2] (232/398˚C)[2]	AISI Type 316 SS	AISI Type[3] 316 SS	AISI Type 316 SS	ASTM A351 CF8M SS	Nitronic 60	IV,V[4]
High Temperature	750˚F (398˚C)	AISI Type 316 SS Stellite	AISI Type 316 SS Stellite	AISI Type 316 SS	ASTM A351 CF8M SS	Nitronic 60	IV,V[4]
Soft Seated	460˚F (238˚C)	AISI Type 316 SS	AISI Type 316 SS w/PTFE Insert	AISI Type 316 SS	ASTM A351 CF8M SS	Nitronic 60	VI

1. Microtaper plugs are solid stellite alloy.
2. Maximum is 450ºF when used with Cast Iron bodies.
3. Stellite seat optional.
4. On application.

DLO(S)-2 ORDER CODE

Class	Material			Valve Size	End Conn.	Actuator	Bonnet Packing	Trim Size	Trim Type	Acces-sories
U	8	5	1	A	1	A	1	D	F	0
1	2	3	4	5	6	7	8	9	10	11

Class - Position 1
- U

Material - Position 2, 3 & 4
- 851 = Iron
- 853 = Carbon Steel
- 854 = SST

Valve Size - Position 5
- A = ½
- B = ¾
- C = 1
- E = 1½
- F = 2
- G = 2½
- H = 3
- J = 4

End Connection - Position 6
- 1 = Threaded
- 2 = Flanged 125/150
- 3 = Flanged 250/300
- 4 = SWE Sch. 40 (steel only)
- 5 = BWE Sch. 40 (steel only)
- 6 = ND16 (steel only)
- 7 = ND40
- 8 = SWE Sch. 80 (steel only)
- 9 = BWE Sch. 80 (steel only)
- 0 = Other (Specify)

Actuator - Position 7
- A = 35
- B = 35R
- C = 35 HOD
- D = 35R HOD
- E = 55
- F = 55R
- G[1] = 55A
- H[1] = 55AR
- I = 55 HOD
- J = 55R HOD
- K[1] = 55A HOD
- L[1] = 55AR HOD
- M = 85
- N = 85R
- P = 85 HOD
- Q = 85R HOD
- X = w/o Actuator

Bonnet & Packing - Position 8
- 1 = Std. Bonnet, BTG
- 2 = Std. Bonnet, Teflon® V-Ring
- 3 = Std. Bonnet, LG
- 4 = Std. Bonnet, Double Teflon®

Trim Size - Position 9
- B[2] = ¼
- D = ½
- G = ¾
- J = 1
- L = 1½
- M = 2
- N = 2½
- P = 3
- R = 4

Trim Type - Position 10
- B[2] = Micro-Taper
- F = Equal % 316 SS
- G[3] = Equal % 316 SS/TFE (RES)
- H = Equal % 316 SS/Stellite
- J = Linear 316 SS
- K[3] = Linear 316 SS/TFE (RES)
- L = Linear 316 SS/Stellite

Number of Accessories - Position 11
- 1 = 1 accessory
- 2 = 2 accessories
- 3 = 3 accessories
- 4 = 4 accessories
- 5 = 5 accessories
- 6 = 6 accessories
- 7 = 7 accessories
- 8 = 8 accessories
- 9 = 9 accessories
- 0 = 0 accessories

TRIM AVAILABILITY CHART

TRIM DIA	CV[4]	STROKE	BODY SIZE (IN) ½	¾	1	1½	2	2½	3	4	ACTUATOR[1] 35(R)	55 (R)	55A(R)	85(R)
¼MT	0.5	¾	●	●	●	—	—	—	—	—	●	●	—	—
¼	1.5	¾	●	●	●	—	—	—	—	—	●	●	—	—
½	4	¾	●	●	●	—	—	—	—	—	●	●	—	—
¾	9	¾	—	●	●	●	—	—	—	—	●	●	—	—
1	15	¾	—	—	●	*	●	—	—	—	●	●	—	—
1½	30	¾	—	—	—	●	*	●	●	—	●	●	—	—
2	57	1	—	—	—	—	●	*	*	●	—	—	●	●
2½	83	1¼	—	—	—	—	—	●	—	—	—	—	●	●
3	120	1½	—	—	—	—	—	—	●	—	—	—	●	●
4	201	2	—	—	—	—	—	—	—	●	—	—	●	●

1. 55A(R) used on trim sizes 2 through 4 only (Stem Connection 1/2").
2. Microtaper is available in 1/4" Stellite only Code BB.
3. Resilient seat DLOA, DLOAS available with full size trim only.
4. Minimum Cv controllable is Cv from table divided by rangeability.

* Consult factory.

DLO(S)-2 Linear Valve Specification Form

LESLIE CONTROLS, INC.
A division of CIRCOR International, Inc.
12501 Telecom Drive · Tampa, Florida 33637
(813) 978-1000 · FAX: (813)-978-0984

CONTROL VALVE SPEC SHEET

Project/Job _____
Unit/Customer _____
P.O./LCO File #_____
Item _____
Contract_____
MFR Serial# _____

Data Sheet _____ of _____
Spec _____
Tag_____
Dwg_____
Service _____

Fluid ❑ Steam ❑ Water ❑ Gas_____ ❑ Liquid_____ Crit Pres PC

Service Conditions

Flow ❑ #/hr ❑ gpm ❑ scfh ❑ _____
Inlet Pressure ❑ psig ❑ psia ❑ _____
Outlet Pressure ❑ psig ❑ psia ❑ _____
Temperature ❑ °C ❑ °F _____
Max Press/Temperature:_____ /_____
Density/MW/SG _____/_____/_____
Viscosity _____CP
Vapor Pressure ❑ psia ❑ _____
Required C_V _____

Max. Flow	Norm. Flow	Min. Flow	Shut-off Pressure

Noise (dBA) Allowable_____

Line Info Pipe Size In_____/Sch_____ Pipe Size Out_____/Sch_____

Valve, Body & Bonnet

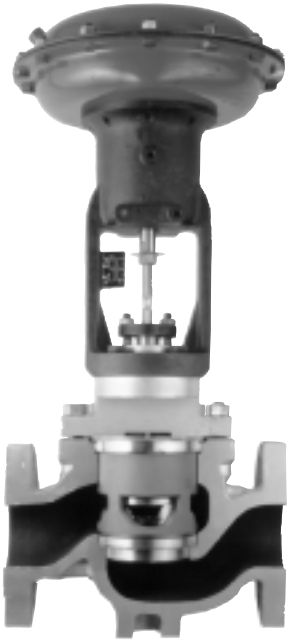
Body Size in. ❑ ½ ❑ ¾ ❑ 1 ❑ 1½ ❑ 2 ❑ 2½ ❑ 3 ❑ 4
ANSI Class ❑ 125 ❑ 150 ❑ 250 ❑ 300 ❑ Other_____
Body/Bonnet Material: ❑ Cast Iron ❑ Cast Steel ❑ SST ❑ Other_____
End Conn. Inlet/Outlet: ❑ NPT ❑ SWE ❑ BWE Sch._____ ❑ Int. Flanges ❑ Other_____
Packing Material: ❑ PTFE ❑ BTG ❑ Laminated Graphite ❑ DTFE ❑ Other_____

Trim Size
❑ MT ❑ ¼ ❑ ½ ❑ ¾ ❑ 1 ❑ 1½ ❑ 2 ❑ 3 ❑ 4
❑ MT ❑ =% ❑ Linear
❑ 316SS ❑ 316SS / Stellite ❑ 316SS / TFE

Actuator
Spring Action: ❑ Air to Open ❑ Air to Close ❑ Last Position ❑ Other_____ ❑ None
Available Air Supply Pressure: Max._____ Min._____
Manual Override: ❑ Yes ❑ No ❑ Type_____

Solenoid ❑ Yes ❑ No ❑ Type_____ ❑ Voltage_____
Positioner ❑ Yes ❑ No ❑ Type_____ ❑ Pneu ❑ E/P
Switch ❑ Yes ❑ No ❑ Type_____ ❑ Voltage_____
Air Set ❑ Yes ❑ No ❑ Type:_____ ❑ Range:_____
Other Accessories ❑ Yes ❑ No ❑ Type_____
Test ANSI/FCI Leakage Class: ❑ IV ❑ V ❑ VI

QUESTIONS? CALL LESLIE CONTROLS @ (813) 978-1000 PLEASE FAX COMPLETED FORM TO: (813) 977-0174



DBO(Y)(S)-3 CONTROL VALVE

SIZES 2" – 8"
ANSI CLASS 125/250, 150/300, 600

- **High Flow Capacities** provide larger flow area, reduced body velocity and pressure loss
- **Bolted Actuator Yoke** guarantees easy disassembly
- **Controlled Seat Loading** maintains constant seat gasket load
- **Hung Cage Design** allows thermal expansion without seat damage
- **Hardened/Stainless Steel Trim** provides twice the service life of 316 stainless trim
- **Rugged Plug Seal** with three times the wear surface of competitive valves for long lasting leak tight seal
- **Multiple Cage Options** for maximum versatility
- **Balanced Plug Design** provides smooth high pressure control
- **Ultra Compact Actuators** install in tight spaces
- **Tighter Shutoff** design provides exceptional performance up to Class VI

Application Data

- Control systems for food, pulp and paper, chemical, petrochemical, power & other industries
- HVAC systems
- Feed water and fuel system controls in boiler rooms
- Packaged systems (OEM) such as heat exchangers, water purification systems & vaporizers, metal cleaning and plating

Options

- 35, 55, 85 or 135 sq. in. Actuator, Reverse or Direct
- Soft Seats
- Threaded, Socketweld, Flanged and Buttweld End Connections
- Positioners
- Noise and Cavitation Reducing Trim
- Reduced Flow Cage
- Alternate Packings for Severe Service
- High Temperature Trim

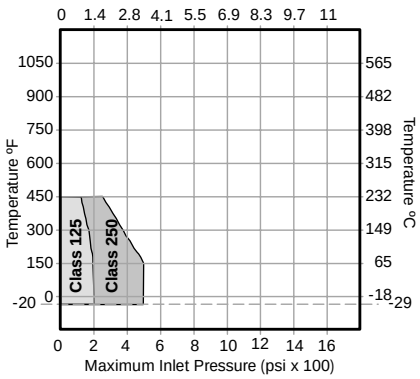
Models

- U841 — Cast Iron
- U843 — Carbon Steel
- U845 — Chrome Moly

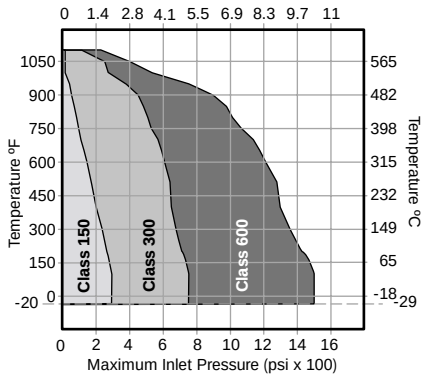
Applicable Industry Standards

See Reference Section on page 195

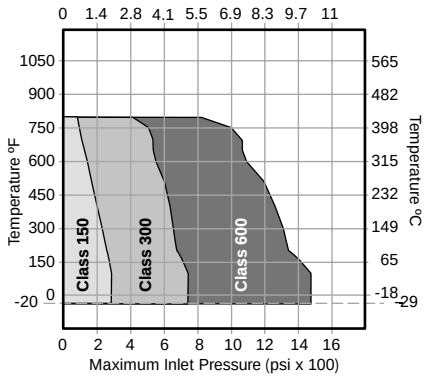
CAST IRON
A126 Class B



CHROME MOLY
A217WC9



CARBON STEEL
A216 Gr. WCB - Standard Class



DBO(Y)(S)-3 CONTROL VALVE
Dimensions & Weights

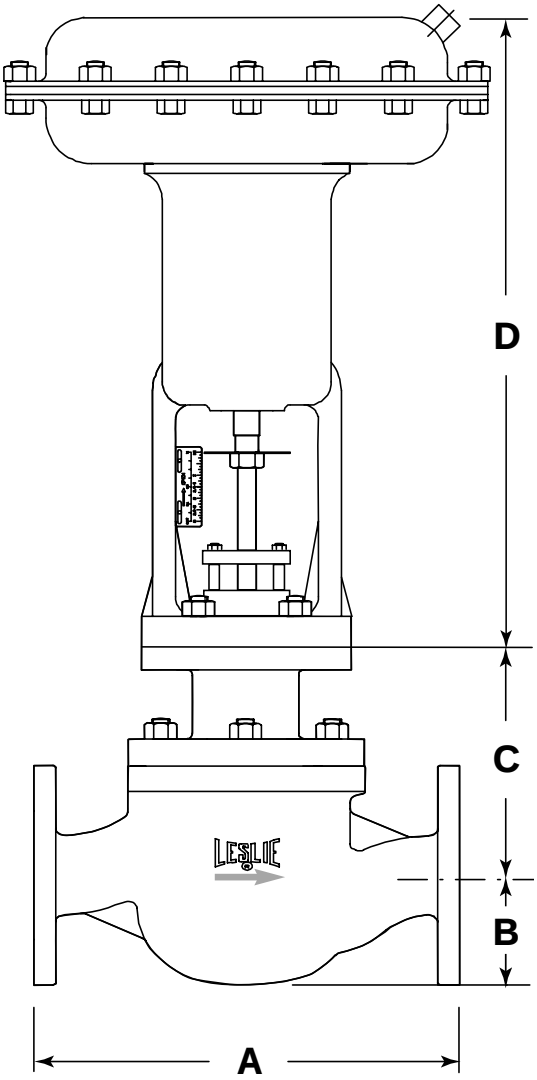
"A", "B" and "C" DIMENSIONS inches (mm)

Size	A				B				C	
	NPT	125, 150 (ND -16)	250, 300 (ND-25[2] ND-40)	600 (ND-100)	CI	CS NPT[1], 150 (ND-16)	CS 300 (ND-40)	CS 600 (ND-100)	CI	CS
2 (50)	9¼ (235)	10 (254)	10½ (267)	11¼ (286)	3¾ (95)	3 (76)	3¼ (83)	3¼ (83)	7¼ (184)	7⅛ (181)
2½ (65)	—	10⅞ (276)	11½ (292)	12¼ (311)	4⅜ (111)	3½ (89)	3¾ (95)	3¾ (95)	6⅝ (168)	6⅝ (168)
3 (80)	—	11¾ (299)	12½ (318)	13¼ (337)	4½ (114)	3¾ (95)	4⅛ (105)	4⅛ (105)	6⅞ (175)	6⅞ (175)
4 (100)	—	13⅞ (352)	14½ (368)	15½ (394)	5½ (140)	4½ (114)	5 (127)	5⅜ (137)	8⅛ (206)	8⅝ (219)
6 (150)	—	17¾ (451)	18⅝ (473)	20 (508)	5⅞ (149)	5½ (140)	6¼ (159)	7 (178)	9¾ (248)	9¾ (248)
8 (200)	—	21⅜ (543)	22⅜ (568)	24 (610)	7⅝ (194)	6¾ (172)	7½ (191)	8¼ (210)	12¼ (311)	12¼ (311)

"D" DIMENSIONS inches (mm)

Size	D											
	35	35R	55	55R	55(A)	55AR	85	85R	85A	85AR	135	135R
2 (50)	12⅜ (314)	12⅜ (314)	15¼ (387)	18 (457)	—	—	—	—	—	—	—	—
2½ (65)	—	—	—	—	15¼ (387)	18 (457)	19⅝ (499)	23¼ (591)	—	—	—	—
3 (80)	—	—	—	—	15¼ (387)	18 (457)	19⅝ (499)	23¼ (591)	—	—	—	—
4 (100)	—	—	—	—	15¼ (387)	18 (457)	19⅝ (499)	23¼ (591)	—	—	—	—
6 (160)	—	—	—	—	—	—	—	—	22¼ (565)	25⅞ (657)	27⅜ (695)	32¼ (819)
8 (200)	—	—	—	—	—	—	—	—	—	—	27⅜ (695)	32¼ (819)

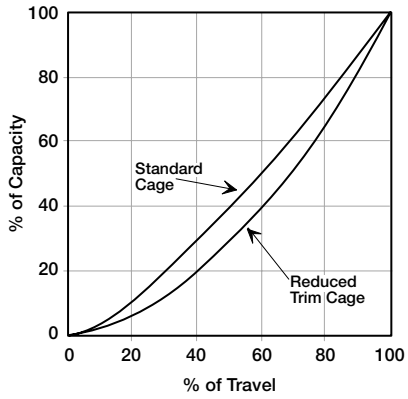
Note: Go to lesliecontrols.com web site for 10/0.4.3 and 10/0.4.4 for Actuator dimensions with HOD and Handjack



WEIGHTS[3] pounds (kg)

Size	CI			CS			
	NPT	125	250	NPT	150	300	600
2 (50)	80 (36.3)	85 (39)	88 (40)	45 (20.4)	85 (39)	88 (40)	90 (41)
2½ (65)	—	125 (57)	130 (59)	—	125 (57)	130 (59)	135 (61)
3 (80)	—	145 (66)	152 (69)	—	145 (66)	152 (69)	158 (72)
4 (100)	—	190 (86)	198 (90)	—	190 (86)	198 (90)	205 (93)
6 (150)	—	460 (209)	480 (218)	—	450 (204)	470 (213)	485 (220)
8 (200)	—	625 (284)	640 (290)	—	600 (272)	635 (288)	660 (299)

Inherent Flow Characteristics

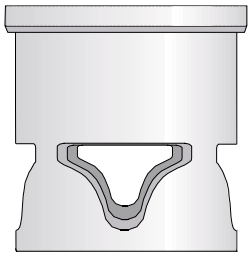


1. NPT available in 2" only.
2. BWE same as 300
3. Weights are approximate.

DBO(Y)(S)-3 HUNG CAGE DESIGN

Unlike competitor's valves (which use the cage to compress the seat ring into the body), Leslie's cage is suspended in the body from a machined shoulder. This eliminates bonnet gasket leakage, cage deformation, sticking plugs, seat gasket and body washout which can occur with cage retained seat designs. The Leslie hung cage design utilizes a 17-4 Ph stainless steel Belleville load ring to maintain a constant seat gasket load, even in temperature cycling service.

The Leslie DBO(Y)(S)-3 Control Valves are specifically designed for high pressure drop service. Pressure drop, high velocities and throttling occur between the cage window and the plug, thereby protecting the seat ring and tight shutoff capability of the valve.

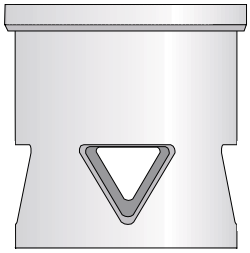


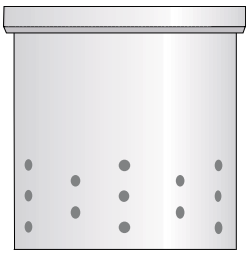
STANDARD CAGE

The full ported, standard cage, provides maximum flow with minimum pressure drop. The inherent modified linear flow characteristic provides excellent low flow control, high rangeability and maximum flow per given body size.

40% REDUCED TRIM CAGE

This optional cage reduces the maximum Cv and flow to 40% of the normal, full port valve. Used to provide body velocity control, future flow expandability, or to correct for oversized valve conditions.



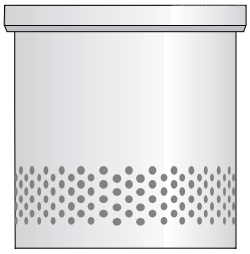


ANTI-CAVITATION CAGE

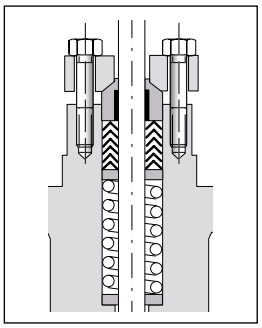
The Les-Cav cage controls the effects of valve cavitation providing a normal valve/trim life expectancy in cavitating conditions. Diametrically opposed holes, increase the valves cavitation index (Kc) and direct impinging flow to the center of the cage, preventing mechanical trim/body damage.

NOISE REDUCING CAGE

The Les-Sonic cage is designed to reduce fluid generated noise up to 10dBA in steam, gas or any compressible fluid service. When used in conjunction with a Les-Sonic silencing orifice, noise attenuations of 15-20dBA can be achieved.

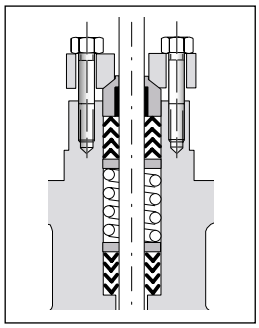


PACKING CONFIGURATIONS



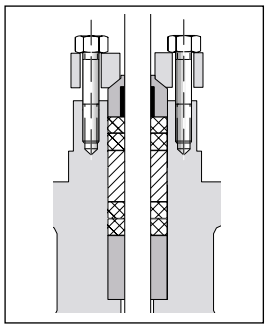
PTFE - V-RING

Live-loaded PTFE V-ring packing provides the most maintenance free stem seal. The V-ring packing is both pressure energized and live-loaded by a 304 stainless steel spring to automatically compensate for packing wear. Maximum service temperature is 460˚F (238˚C).



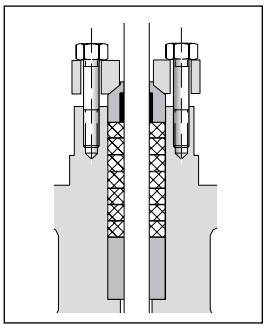
DOUBLE PTFE V-RING

Inverted sets of PTFE V-ring packing provide tight sealing in valves which may be controlling pressure or vacuum at different times. Maximum temperature 460˚F (238˚C).



HIGH TEMPERATURE LAMINATED GRAPHITE

Precision die-cut laminated graphite rings provide a reliable, tight stem seal to operating temperatures of 800˚F (426˚C).



BRAIDED TEFLON GRAPHITE

Split rings allow packing replacement without removal of actuator. Graphite impregnated PTFE provides 500˚F (260˚C) service temperature, better memory and sealing than pure PTFE rings, lowered stem hysteresis, and is ideal for fluids that contain suspended particles.

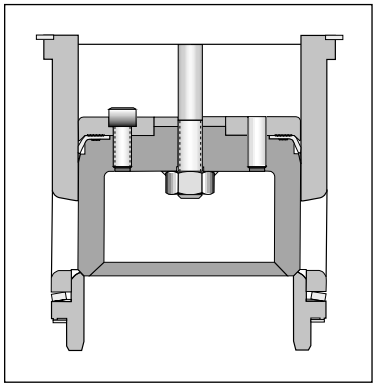
DBO(Y)(S)-3 TRIM MATERIAL SELECTION

Balanced Plug design allows line pressure under the plug to build up above the plug, effectively cancelling out any unbalanced stem force due to pressure. In addition to providing smooth, high pressure control, balanced plugs allow use of small, light, cost effective actuators. Class III, IV or VI shutoff can be provided.

The piston seal is critical to maintaining tight shutoff in any cage valve. The DBOY's heavy cupwasher style PTFE plug seal has three times the cross sectional area and wear surface of competitive valves. This provides tight shutoff longer than competitor's designs at both low and high pressures.

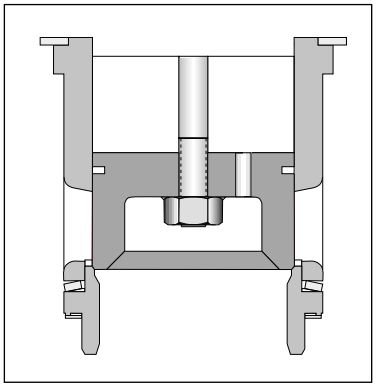
Trim	Maximum Service Temp.	Plug	Seat Ring	Stem	Gaskets	ANSI/ISA 70-2 Shutoff
Standard Balanced	500˚F (260˚C)	AISI 410 SS w/PTFE Seal	AISI Type 400 SS[1]	AISI Type 316 SS	Filled Type 304 SS	IV
High Temperature	800˚F (426˚C)	AISI 410 SS w/ Ni-Resist Seal	AISI Type 400 SS Stellite®	AISI Type 316 SS	Inconel Graphite	III
Soft-Seated	460˚F (238˚C)	AISI 410 SS w/PTFE Seal	AISI Type 400 SS w/PTFE Insert	AISI Type 316 SS	Filled Type 304 SS	VI

1. Stellite® seat optional. STELLITE® is a trademark of Stoody Deloro Stellite, Inc.



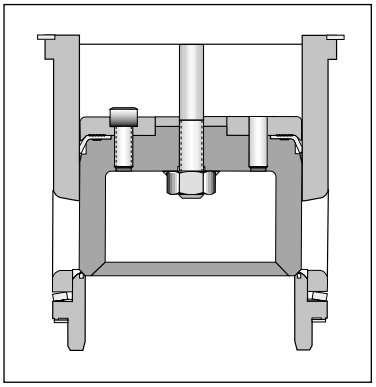
STANDARD BALANCED PLUG

Balanced plug design eliminates large stem forces allowing the use of small, cost-effective actuators. Provides smooth throttling control even at pressures to 1000 psi. Standard PTFE plug seal provides ANSI Class IV tight shutoff to temperatures of 500˚F. (Flow over seat only)



HIGH-TEMP BALANCED PLUG

Balanced plug with high-temp ni-resist or carbon plug seal provides ANSI Class III shutoff at temperatures up to 800˚F.

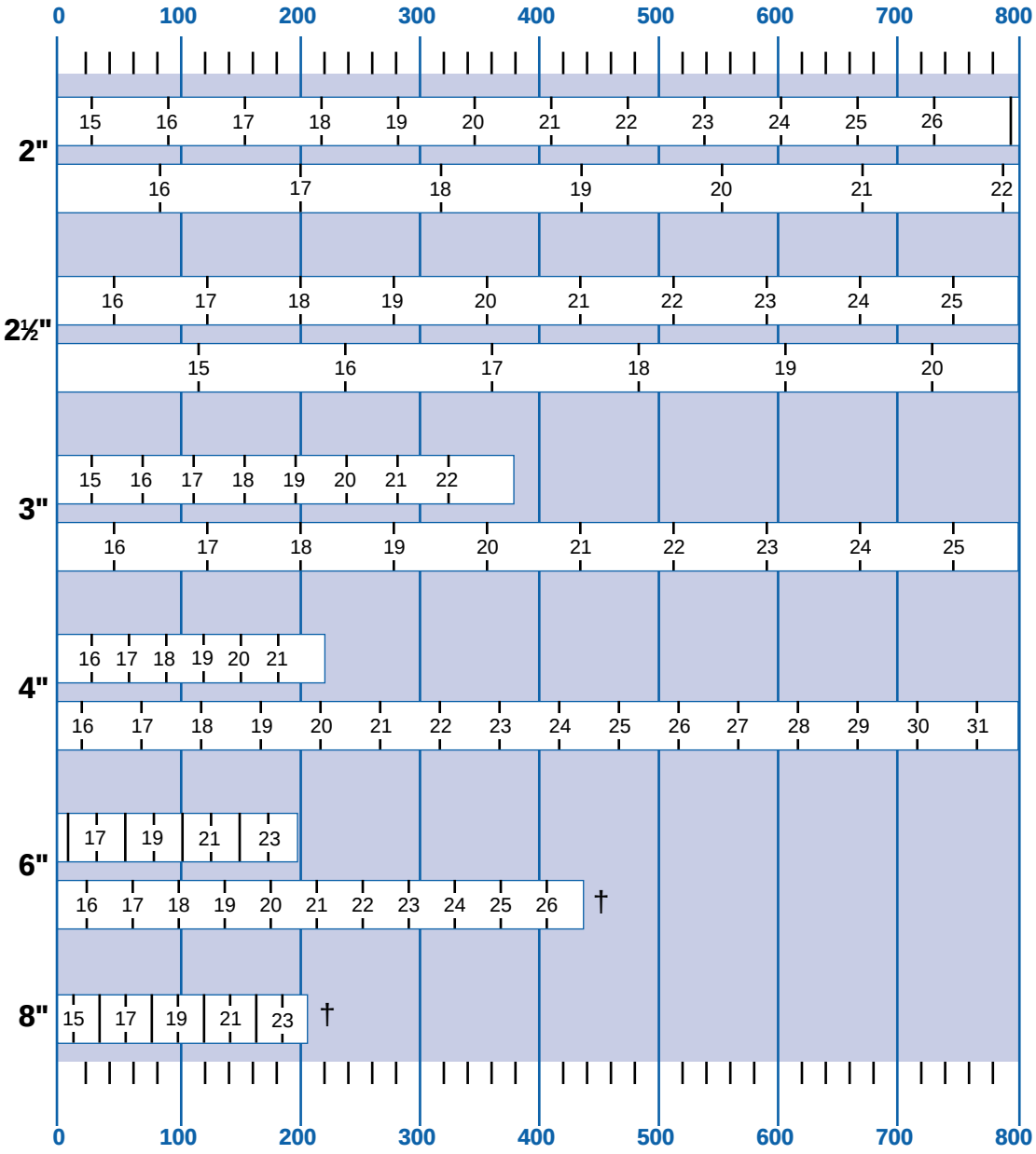


SOFT SEATED TRIM

Balanced plug with PTFE plug seal and an optional seat design with PTFE insert provide ANSI Class VI bubble tight shutoff at temperatures up to 460˚F. (Flow over seat only)

DBO(Y)(S)-3 SHUTOFF TABLE - REVERSE ACTING

ACTUATOR SHUTOFF TABLE



35R Spring 38422, Span 11.9

55R Spring 41968, Span 12.7

55AR Spring 23239, Span 12.6

85R Spring 35014, Span 11.3

55AR Spring 24296, Span 12.7

85R Spring 35014, Span 12.9

55AR Spring 24297, Span 12.6

85R Spring 24299, Span 12.8

85AR Spring 24301, Span 12.9

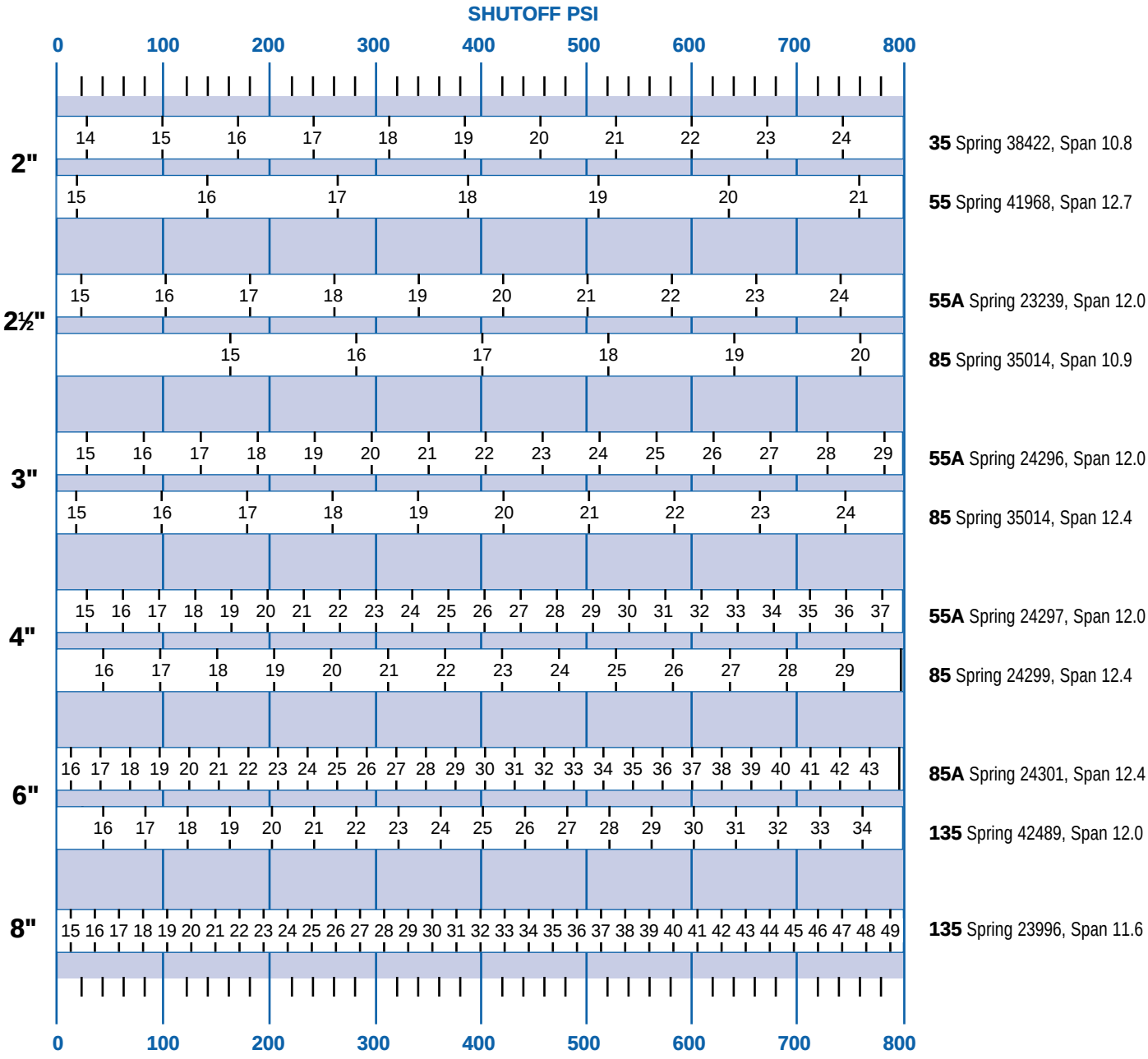
135R Spring 42489, Span 12.4

135R Spring 23996, Span 11.8

† For shutoff pressure above this value, consult factory.

DBO(Y)(S)-3 Shutoff Table - Direct Acting

ACTUATOR SHUTOFF TABLE



35 Spring 38422, Span 10.8

55 Spring 41968, Span 12.7

55A Spring 23239, Span 12.0

85 Spring 35014, Span 10.9

55A Spring 24296, Span 12.0

85 Spring 35014, Span 12.4

55A Spring 24297, Span 12.0

85 Spring 24299, Span 12.4

85A Spring 24301, Span 12.4

135 Spring 42489, Span 12.0

135 Spring 23996, Span 11.6

DBO(Y)(S)-3 SPECIFICATIONS

BODY ASSEMBLY:
Style: Single seated, top entry bolted bonnet, globe style body, cage guided balanced plug

ANSI Body Ratings:
Class 125 & 250 Cast Iron
Class 150, 300, & 600 Steel and Alloy Steel

BODY/BONNET MATERIALS:
Cast Iron, ASTM A126 Class B
Carbon Steel, ASTM A216 Gr WCB
Chrome Moly, ASTM A217 Gr WC9

SIZES:
2"-8" (50-200mm)

END CONNECTIONS:
ANSI Class all Integral Flanged, 2-8"
Threaded, NPT - 2" only, (ANSI 250 Cast Iron Bodies), (ANSI 600 Carbon Steel & Alloy Steel)
Socketweld - 2" only, (ANSI 600 Class)
Buttweld Ends
DIN Flanges: ND-16, ND-25, ND-40, ND-64, ND-100

BONNET:
Bolted Bonnet, Standard

BODY/BONNET BOLTING:
ASTM A-193 GRB7 Studs
ASTM A-194 GR2H Nuts

STEM PACKING:
PTFE V-Rings, -40 to 460˚F(-22 to 238˚C)
PTFE/Graphite, -40 to 500˚F(-22 to 260˚C)
Laminated Graphite,-320 to 800˚F (-195 to 426˚C)

PACKING STUDS, NUTS & FOLLOWER:
300 Series Stainless Steel

GASKETS:
Body/Bonnet and Seat Ring/Body:
Filled 304 stainless steel: 500˚F (260˚C) Max.
Inconel/Graphite: 800˚F (426˚C) Max.

TRIM SIZES:
Full Port
40% reduced
Custom, contact Leslie Application Engineering

PLUG (PISTON) SEAL MATERIALS:
Standard TFE/Graphite
max. temp. 500˚F (Class IV shutoff)
Ni-Resist
max. temp. 800˚F (Class III shutoff)

FLOW CHARACTERISTICS:
Modified Linear, Standard
Equal Percentage (w/ CAM Characterized Positioner)

SHUTOFF CLASS (ANSI / ISA 70-2):
Standard trim, 0-500˚F(-18 to 260˚C)
Max. Class IV (.01% Cv)
Metal/PTFE seats - Class VI, bubble tight to 460˚F (238˚C)
High-temp trim, 0-800˚F(-18 to 426˚C), Class III (.1% Cv)
For optional Class IV or V shutoff above 500˚F, contact factory

TRIM MATERIAL COMBINATIONS:
See chart above

ACTUATORS:
Standard:
Spring and Diaphragm
Optional:
Piston, Double Acting/Spring Return
Hydraulic
Electric
Electro-Hydraulic

DBO(Y)(S)-3 Cv TABLE

Valve Size	Full Port		40% Red.		Les-Sonic		Les-Cav		Stroke (in.)	Seat Dia.	Unbalanced Area (in²)
	C_V[1]	Range	C_V[1]	Range	C_V[1]	Range	C_V[1]	Range			
2	65	30:1	26	20:1	48	30:1	32	14:1	0.750	2.3	0.14
2½	90	40:1	36	25:1	70	40:1	40	17:1	0.875	2.9	0.18
3	125	40:1	50	25:1	97	40:1	63	20:1	1.00	3.5	0.21
4	205	50:1	82	30:1	156	50:1	103	25:1	1.25	4.6	0.28
6	435	50:1	174	30:1	349	50:1	217	25:1	2.00	6.9	0.42
8	760	50:1	304	30:1	579	50:1	304	25:1	2.75	9.2	0.56

1. Minimum Cv controllable is Cv from table divided by rangeability.

SIZING COEFFICIENTS

CASE TYPE	LIQUID		GAS
	F_L	K_C	X_T
Standard	.8	.65	.7
Les Cav	.9	.79	N/A
Les Sonic	N/A	N/A	.65

DBO(Y)(S)-3 ORDER CODE

Class	Material			Valve Size	End Conn.	Actuator	Bonnet Packing	Trim Form	Trim Mat'l.	Acces-sories
U	8	4	1	F	2	A	1	S	J	4
1	2	3	4	5	6	7	8	9	10	11

Class - Position 1
U

Material - Position 2, 3 & 4
841 = Iron
843 = Carbon Steel
845 = Chrome Moly, WC9
XXX = Other

Valve Size - Position 5
F = 2
G = 2½
H = 3
J = 4
K = 6
L = 8

End Connection - Position 6
1 = Threaded
2 = Flanged 150 Steels
Flanged 125 Iron
3 = Flanged 300 Steels
Flanged 250 Iron
4 = SWE Steels
5 = BWE 40 Steels
6 = ND 16 Steels & Iron)
7 = ND 40 Steels
ND 10 Iron (8" only)
8 = Flanged 600 Steels
9 = BWE 80 Steels
0 = ND 100 Steels
A = RTJ 300 Steels
B = RTJ 600 Steels
C = SWE Sch. 80 Steels
D = ND64 Steels

Actuator - Position 7
A = 35
B = 35R
C = 35 HOD
D = 35R HOD
E = 55[1]
F = 55R[1]
G = 55A
H = 55AR[1]
I = 55 HOD[1]
J = 55R HOD[1]
K = 55A HOD[1]
L = 55AR HOD[1]
M = 85/85A[2]
N = 85R/85AR[2]
P = 85/85A HOD[2]
Q = 85R/85AR HOD[2]
R = 135
S = 135R
T = 135 HOD
U = 135R HOD
V = 270
W = 270R
X = w/o Actuator
Y = 270 HOD
Z = 270R HOD

DIGIDBOY: Specify X for Actuator (Position 7) Specify Actuator, Mounting Kit and each option as a separate line item.
See page 39

Bonnet & Packing - Position 8
1 = Std. Bonnet, Braided Teflon® Graphite Pkg.
2 = Std. Bonnet, PTFE Pkg.
3 = Std. Bonnet, Laminated Graphite Pkg.
4 = Std. Bonnet, Double Teflon® Pkg.

Trim Form - Position 9
S = Full Capacity
T = Reduced 40% Capacity
V = Les-Cav
W = Les-Sonic

Trim Material - Position 10
J = Standard 400 SS
L = Stellite® Hard Faced
P = DBOS, Hi-Temp HF
V = TFE Soft Seat

Accessories - Position 11
1 = 1 accessory
2 = 2 accessory
3 = 3 accessory
4 = 4 accessory
5 = 5 accessory
6 = 6 accessory
7 = 7 accessory
8 = 8 accessory
9 = 9 accessory
0 = 0 accessory

1. 55/R used on 2" D(D)BOY(S)-3; 55A/AR used on 2½" - 4"valves.
2. 85A/AR used on 6" D(D)BOY(S)-3; 85/R used on 2½" - 4"valves.

Applications

FEEDWATER CONTROL regulates level of water in boiler drum. A 1 - 3 drum design is commonly based on HP, IP & LP applications. Valve receives water flow from pump and supplies water to drum to make up for that used to produce steam.

FEEDWATER RECIRCULATION valve insures that adequate flow is maintained through feedwater pump. The pump manufacturer calculates minimum flow required to prevent risk of premature pump failure due to bearings overheating or excessive thermal expansion of impeller blades.

AUXILIARY STEAM PRESSURE REDUCTION

1) Soot Blowers increase thermal efficiencies. Valve controls steam supplied to header from super heated source. PRV sees high pressure drop, intermittent operation and rapid load swings.

2) Building Heat, extraction steam control.

3) Pegging, Deaerators use super heated steam to heat and remove air from condensate normally closed against high differential pressure.

DRAIN VALVES, the presence of condensate in the turbine at startup or shutdown can be extremely damaging. As the steam temperature and pressure increase, the drain valves gradually throttle closed. These valves see a wide range of conditions, cool condensate followed by increasing temperature and pressure.

GLAND SEAL STEAM, valves are used to maintain constant steam pressure in gland to seal air from turbine. Application requires HP steam, throttling a low flow at high DP. Typically these valves operate in a split range mode. One pressure signal either loads or vents the gland.

ATTEMPERATOR SPRAY, SUPERHEAT, REHEAT - Spray Control valve, is used for controlling steam temperature to turbine. The purpose of valve is to maintain a tight temperature band resulting in maximum efficiency.

1) Superheat spray, low DP, turndown and accuracy are important.

2) Reheat spray, high DP, with Cavitation and seat leakage concerns as the valve operates close to the seat.

DBO(Y)(S)-3 Linear Valve Specification Form

LESLIE CONTROLS, INC.
A division of CIRCOR International, Inc.
12501 Telecom Drive · Tampa, Florida 33637
(813) 978-1000 · FAX: (813)-978-0984

CONTROL VALVE SPEC SHEET

Project/Job _____ Data Sheet _____ of _____
Unit/Customer _____ Spec _____
P.O./LCO File #_____ Tag_____
Item _____ Dwg_____
Contract_____ Service _____
MFR Serial# _____

Fluid ❑ Steam ❑ Water ❑ Gas_____ ❑ Liquid_____ Crit Pres PC

Service Conditions

	Max. Flow	Norm. Flow	Min. Flow	Shut-off Pressure
Flow ❑ #/hr ❑ gpm ❑ scfh ❑ _____				
Inlet Pressure ❑ psig ❑ psia ❑ _____				
Outlet Pressure ❑ psig ❑ psia ❑ _____				
Temperature ❑ °C ❑ °F _____				
Max Press/Temperature:_____ /_____				
Density/MW/SG _____/_____/_____				
Viscosity _____CP				
Vapor Pressure ❑ psia ❑ _____				

Required C_V _____ Noise (dBA) Allowable_____

Line Info Pipe Size In_____/Sch_____ Pipe Size Out_____/Sch_____

Valve, Body & Bonnet

Body Size in. ❑ 2 ❑ 2½ ❑ 3 ❑ 4 ❑ 6 ❑ 8

ANSI Class ❑ 125 ❑ 150 ❑ 250 ❑ 300 ❑ 600 ❑ Other_____

Body/Bonnet Material: ❑ Cast Iron ❑ Cast Steel ❑ Cr Mo ❑ Other_____

End Conn. Inlet/Outlet: ❑ NPT ❑ SWE ❑ BWE Sch._____ ❑ Int. Flanges ❑ Other_____

Packing Material: ❑ PTFE ❑ BTG ❑ Laminated Graphite ❑ DTFE ❑ Other_____

Trim Size ❑ 100% ❑ 40% ❑ Les-Cav ❑ Les-sonic ❑ Other_____

Actuator

Spring Action: ❑ Air to Open ❑ Air to Close ❑ Last Position ❑ Other_____ ❑ None

Available Air Supply Pressure: Max._____ Min._____

Manual Override: ❑ Yes ❑ No ❑ Type_____

Solenoid ❑ Yes ❑ No ❑ Type_____ ❑ Voltage_____

Positioner ❑ Yes ❑ No ❑ Type_____ ❑ Pneu ❑ E/P

Switch ❑ Yes ❑ No ❑ Type_____ ❑ Voltage_____

Air Set ❑ Yes ❑ No ❑ Type:_____ ❑ Range:_____

Other Accessories ❑ Yes ❑ No ❑ Type_____

Test ANSI/FCI Leakage Class: ❑ III ❑ IV ❑ V ❑ VI

QUESTIONS? CALL LESLIE CONTROLS @ (813) 978-1000 PLEASE FAX COMPLETED FORM TO: (813) 977-0174

DIGI ELECTRIC ACTUATORS

Currently used on DLO, DBOY & GTW

- **Electric Motor Voltages** available 24 VAC, 115 VAC, 230 VAC, 400 VAC 3 phase or 24 VDC
- **Controller Accepts Analog Signals** 4-20 mA, 0-10 VDC (Profibus optional)
- **IP 65 or IP 55 Rated Enclosure** protects electric components in dirty environments
- **Manual Handwheel** permits easy operation if electric power is lost
- **High Thrust Motor** permits shutoff to 750 psi
- **Digital Actuator Control** assures precise control, fast setup and high level of safety
- **Stall Proof Precision Motor** provides accurate positioning without burnout
- **Pushbutton Setup at Actuator** facilitates setting and maintenance
- **Thrust** up to 2248 lb3/f
- **Stroke** up to 3.15 inches
- **Speeds** from 15 s/inch to 100 s/inch

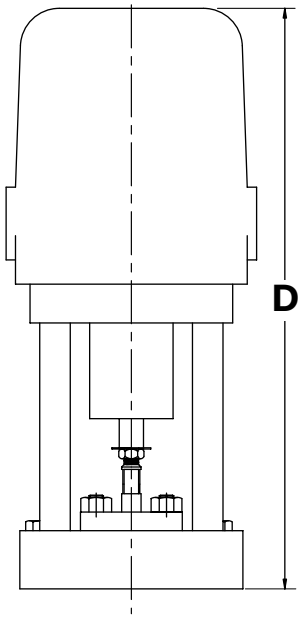
APPLICATION DATA

- Modulating control and On/Off applications for light industrial and institutional liquid and steam systems.

OPTIONS

- Positioner
- Additional Position Feedback
- Heater
- Additional Limit Switches

DIGI
ELECTRIC ACTUATORS
SPECIFICATIONS



DIMENSIONS inches **AND WEIGHTS** pounds

Model	Max Stroke (in.)	Max Thrust (lb/ft)	Sec/ Inch	Rating	Power Supply	Power Consumption	Ambient Temp Limits	D	Wgt.
ST5112	1.57 (40)	674	25-100	IP-65	24VAC. 115 VAC. 230 VAC. 1 phase 400 VAC. 3 phase or 24 VDC	18VA	-4ºF to 158ºF	16 1/16 (424)	12 (5.5)
ST5113	2.36 (60)	1348	15-181	IP-55		72VA	-4ºF to 140ºF	21 5/8 (541)	23 (10.5)
ST5114	3.14 (80)	2248	15-91	IP-55		66VA		21 15/16 (558)	

DBOY **CLASS IV SHUTOFF**

VALVE SIZE	VALVE STROKE (IN)	MAXIMUM DELTA P (PSI)		
		ST5112	ST5113	ST5114
2	3/4	750	—	—
2 1/2	7/8	600	—	—
3	1	600	750	—
4	1 1/4	—	750	—
6	2	—	350	500
8	2 3/4	—	—	300

DLO **CLASS IV SHUTOFF**

TRIM SIZE	VALVE STROKE (IN)	MAXIMUM DELTA P (PSI)		
		ST5112	ST5113	ST5114
1/4	3/4	700	—	—
1/2	3/4	700	—	—
3/4	3/4	700	—	—
1	3/4	500	700	—
1 1/2	3/4	250	450	700
2	1	200	250	550
2 1/2	1 1/4	139	150	300
3	1 1/2	—	100	200
4	2	—	75	125

GTW **CLASS IV SHUTOFF**

VALVE SIZE	VALVE STROKE (IN)	MAXIMUM DELTA P (PSI)		
		ST5112	ST5113	ST5114
1/2	15/32	3280	1200	686
3/4	15/32	1458	1000	305
1	11/16	699	900	172
1 1/2	15/16	212	600	65
2	3/4	—	400	50
2 1/2	7/8	—	301	40
3	1	—	202	30
4	1 1/4	—	123	20
6	2	—	55	—
8	2 3/4	—	31	—
10	3	—	20	—
12	3 1/2	—	14	—

DIGI ACTUATOR ORDER CODE

Product ID	Basic Actuator								Motor Voltage	Posi-tioner	Valve Stroke	Heater Option	Add'l Switches	Extra Feedback Pots	Valve Type	Valve Size/ Trim Size
S	T	5	1	1	2	-	3	2	B	2	A	C	A	N	2	F
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

Product ID - Position 1 & 2
ST = Digi Actuator

Basic Actuator - Position 3-9

5112-32 =
100 Sec/in 1 Phase 24V, 115V (120V), 230V 50/60 Hz AC, 24V DC

5112-33 =
50 Sec/in 1 Phase 24V, 115V (120V), 230V 50/60 Hz AC, 24V DC

5112-34 =
25 Sec/in 1 Phase 24V, 115V (120V), 230V 50/60 Hz AC, 24V DC

5113-06 =
15 Sec/in 3 Phase 400V, 50/60 Hz AC

5113-07 =
15 Sec/in 1 Phase 115 & 230V, 50/60 Hz AC

5113-14 =
29 Sec/in 3 Phase 400V, 50/60 Hz AC

5113-34 =
58 Sec/in 3 Phase 400V, 50/60 Hz AC

5113-51 =
181 Sec/in 1 Phase 24V, 115V, 230V, 50/60 Hz AC, 24V DC

5113-15 =
29 Sec/in 1 Phase 24V, 115V, 230V, 50/60 Hz AC, 24V DC

5113-35 =
58 Sec/in 1 Phase 24V, 115V, 230V, 50/60 Hz AC, 24V DC

5113-53 =
91 Sec/in 1 Phase 24V, 115V, 230V, 50/60 Hz AC, 24V DC

5114-17 =
29 Sec/in 1 Phase 24V, 115V, 230V, 50/60 Hz AC

5114-36 =
58 Sec/in 3 Phase 400V, 50/60 Hz AC

5114-54 =
91 Sec/in 3 Phase 400V, 50/60 Hz AC

5114-37 =
58 Sec/in 1 Phase 24V, 115V, 230V, 50/60 Hz AC, 24V DC

5114-55 =
91 Sec/in 1 Phase 24V, 115V, 230V, 50/60 Hz AC, 24V DC

5114-06 =
15.38 Sec/in 3 Phase 400V, 50/60 Hz AC

XXXX-XX = Other

Motor Voltage - Position 10
A = 24 VDC
B = 115 VAC
C = 230 VAC
D = 24 VAC
E = 400 VAC
X = Other

Positioner - Position 11
N = None (On-Off)
1 = RE3446 (4-20mA) Analog type
2 = RE3446 (0-10 VDC) Analog type
X = Other

Valve Stroke - Position 12
A = .75" to 1"
B = 1.25"
C = 1.5"
D = 2" to 3"
X = Other

Heater Option - Position 13
N = None
A = 24 VDC (E68717)
B = 115 VAC (E68718)
C = 230 VAC (E68719)
X = Other

Add'l Switches - Position 14
N = None
A = 250 Volt 10 Amp (Qty 2) (E68720)
X = Other

Extra Feedback Pots - Position 15
N = None
1 = 1000 Ohm
X = Other

Valve Type - Position 16
N = None
1 = DLO
2 = DBOY
3 = GTW
X = Other

Valve Size (DBOY)
Valve Trim (DLO) - Position 17
N = None
A = .5"
B = .75"
C = 1"
D = 1.5"
E = 2"
F = 2.5"
G = 3"
H = 4"
J = 6"
K = 8"
X = Other

DOS UNBALANCED CONTROL VALVE

SIZES 1" – 2"
ANSI CLASS 150, 300, 600

DOS CONTROL VALVE

- **Reliable** control characteristics and tight shut-off over a long service life
- **Cage Guided Trim** increases valve stability and trim life
- **Easy In Line Maintenance** and trim changes reduce labor costs
- **Hardened/Stainless Steel Trim** provides twice the service life of 316 stainless trim
- **Unbalanced Plug** provides precise control
- **Ultra Compact Actuators** install in tight spaces
- **Multiple Trim Options** to match your control application requirements

Application Data

- Process control systems for food, pulp and paper, chemical, petrochemical & other industries
- Feed water and fuel system controls in boiler rooms
- Packaged systems (OEM) such as heat exchangers, water purification systems & vaporizer, metal cleaning and plating

Models

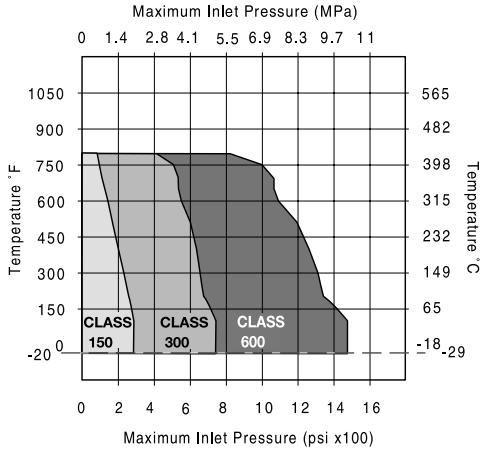
- UDOS3 — Carbon Steel
- UDOS5 — SST
- UDOS7 — Chrome Moly

Options

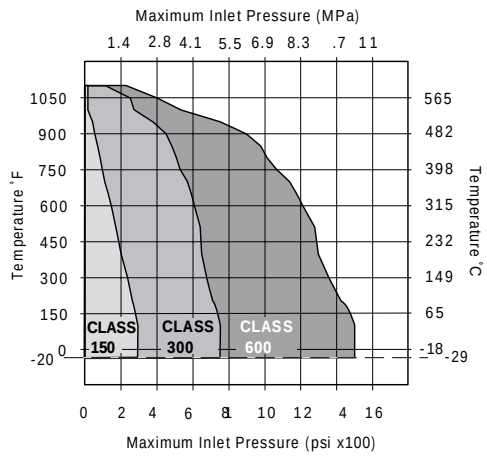
- 35, 55 or 85 sq. in. Actuator, Reverse or Direct
- Threaded, Flanged or Socketweld Connections
- Positioners
- Alternate Packings for High Temperatures
- High Temperature Trim
- Reduced Trim

Applicable Codes *See Reference Section on page* 195

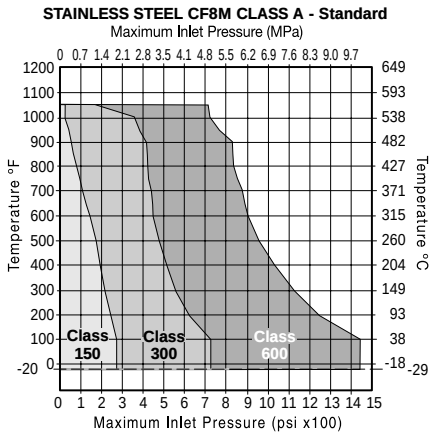
CARBON STEEL A216WCB



CHROME MOLY A217WC9



STAINLESS STEEL CF8M CLASS A - Standard



DOS UNBALANCED CONTROL VALVE

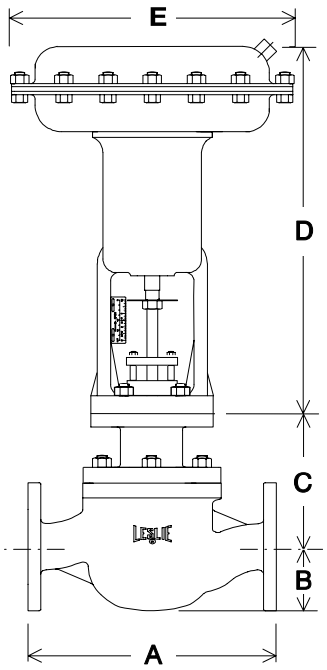
BODY DIMENSIONS inches **AND WEIGHTS** pounds

Size	A				B	C	Weight[1]		
	THD/SWE	FLANGED							
	600	150	300	600			150	300	600
1	7¾	7¼	7¾	8¼	3¼	6⅛	54	56	59
1¼	9⅛	8⅝	9⅛	9¾	4	7	86	91	96
1½	9¼	8¾	9¼	9⅞	4	7	90	93	98
2	10½	10	10½	11¼	4⅞	7½	95	108	127

ACTUATOR DIMENSIONS inches **AND WEIGHTS** pounds

Size	D	E	WT.
35, 35R	12⅜	9¼	35
55	15¼	12	50
55R	17⅝	12	50
85	19 9/16	14¾	110
85R	23 3/16	14¾	110

Valve Size	Standard Actuator
1"	35 (R)
1¼"	35 (R)
1½"	35 (R)
2"	55 (R)



DOS SPECIFICATIONS

BODY ASSEMBLY:
Style: Single seated, top entry bolted bonnet, globe style body, cage guided unbalanced plug

ANSI Body Ratings:
Class 150, 300, & 600 Steel & Alloy Steel

BODY/BONNET MATERIALS:
Carbon Steel, ASTM A216 Gr WCB
SST, ASTM A351 GR CF8M
Chrome Moly, ASTM A217 GR WC9

SIZES: 1"-2" (25-50mm)

END CONNECTIONS:
ANSI Class 150 Integral Flanged, 1-2"
ANSI Class 300 Integral Flanged, 1-2"
ANSI Class 600 Integral Flanged, 1-2"
Threaded, NPT - 1-2" ANSI 600
Socketweld - 1-2" ANSI 600

BONNET:
Bolted Bonnet, Standard

BODY/BONNET BOLTING:
ASTM A-193 GRB7 Studs
ASTM A-194 GR2H Nuts

STEM PACKING:
PTFE/Graphite, -40 to 500˚F(-22 to 260˚C)
Laminated Graphite,-320 to 800˚F
(-195 to 426˚C)

PACKING STUDS, NUTS & FOLLOWER:
Carbon Steel & 300 Series Stainless Steel

GASKETS:
Flexible Metallic

TRIM SIZES:
Full Port
Reduced Port

FLOW CHARACTERISTICS:
Linear
Equal Percentage
Microtaper
Quick Opening
Modified Linear
Percentage Contoured

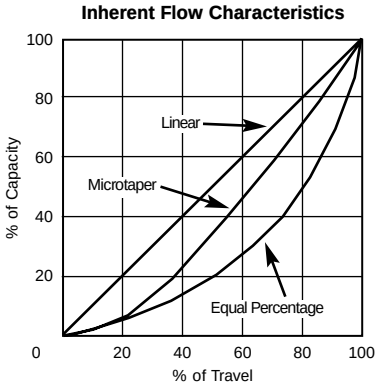
SHUT-OFF CLASS (ANSI/ISA 70-2):
Metal/Metal Seats-ANSI/ISA 70-2 Class IV

TRIM MATERIAL COMBINATIONS:
316/Stellited®

ACTUATOR:
Spring and Diaphragm

1. Weights are approximate with standard actuator.

DOS Cv and Pressure Drop Tables



MAXIMUM RATED FLOW COEFFICIENTS (Cv) and ACTUATOR AVAILABILITY

Valve Plug (Size & Shape)		Body Size - Inches				Representative Rangeability	Actuator		
		1	1¼	1½	2		35, 35R	55, 55R	85, 85R
Micro-Taper[1]	1/4 3 Flat 2.5º	0.6	—	—	—	67:1	X	X	—
	3/8 4 Flat 4º	1.2	—	—	—	89:1	X	X	—
Linear & Percentage Needle	1/4 Needle Plug	1.5	—	—	—	25:1	X	X	—
	3/8 Needle Plug	3.0	—	—	—	25:1	X	X	—
	1/2 Needle Plug	5.0	—	—	—	25:1	X	X	—
	5/8 Needle Plug	7.5	—	—	—	30:1	X	X	X
	3/4 Needle Plug	10.4	—	—	—	35:1	X	X	X
	7/8 Needle Plug	12.0	—	—	—	35:1	X	X	X
Modified Linear Ported[4]		11.5	17	23	40[4]	30:1	X	X	X
Percentage Contoured		11.5	17	23	40	30:1	X	X	X

MAXIMUM ALLOWABLE PRESSURE DROP[2] – PSI

Valve Action	Actuator Size	Diaphragm Pressure[3]	Linear and Percentage Needle-Plug and Micro-Taper (1/4 and 3/8)						Modified Linear Ported & Percentage Contoured			
			1/4	3/8	1/2	5/8	3/4	7/8	1	1¼	1½	2
Normally Open (DOS)	35[4]	17	1440	1440	1000	700	503	385	360	220	170	110
		22	1440	1440	1440	1020	755	573	540	330	260	160
		30	1440	1440	1440	1440	1160	880	800	500	400	245
		60	1440	1440	1440	1440	1440	1440	1440	1140	900	400
	55	17	1440	1440	1440	1440	812	617	600	360	280	170
		22	1440	1440	1440	1440	1230	935	860	540	420	250
		30	1440	1440	1440	1440	1440	1440	1300	840	620	390
		60	1440	1440	1440	1440	1440	1440	1440	1440	1160	920
	85	17	1440	1440	1440	1440	1440	1270	960	640	440	300
		22	1440	1440	1440	1440	1440	1440	1400	920	660	440
		30	1440	1440	1440	1440	1440	1440	1400	1360	1000	660
		60	1440	1440	1440	1440	1440	1440	1440	1440	1440	1440
Normally Closed (DDOS)	35R[4]	17	1440	820	530	370	263	200	185	120	90	58
		22	1440	895	575	400	300	252	260	130	100	62
		30	1440	895	575	400	300	252	260	130	100	62
		60	1440	895	575	400	300	252	270	130	100	62
	55R	17	1440	1440	1440	1440	755	573	540	320	250	145
		22	1440	1440	1440	1140	765	582	620	360	285	145
		30	1440	1440	1440	1440	1160	882	840	510	400	205
		60	1440	1440	1440	1440	1440	1140	1000	640	500	260
	85R	17	1440	1440	1440	1440	1210	920	900	520	400	195
		22	1440	1440	1440	1440	1440	1250	1180	720	540	320
		30	1440	1440	1440	1440	1440	1440	1440	870	735	415
		60	1440	1440	1440	1440	1440	1440	1440	1030	980	560

NOTE: Complete pressure drop and diaphragm pressure data for alternate springs available on request.

1. Micro-Taper Cv ratings based on 1" travel. When used with 35 sq. in. actuators having 3/4" maximum travel, Cv is reduced to 67%.

2. Maximum allowable pressure drop values shown are subject to body pressure/temperature limitations.

3. 17 psi available from flapper nozzle type pilots. 22 and 30 psi available from Leslie Pilots. 60 psi available from positioners and manual loaders.

4. 35 and 35R actuators provide maximum travel of 3/4". Cv is 35 when mounted on 2" valves fitted with ported valve plugs.

DOS Order Code

Class				Material	Valve Size	Connections	Actuator	Bonnet & Packing	Trim Size	Trim Type
U	D	O	S	3	F	1	B	1	K	H
1	2	3	4	5	6	7	8	9	10	11

Class -Position 1 ,2, 3 & 4
- UDOS = (D)DOS

Material - Position 5
- 3 = Carbon Steel
- 5 = Stainless Steel
- 7 = Chrome Moly, Wcg

Valve Size[1] - Position 6
- E = 1
- F = 1¼
- G = 1½
- H = 2

Connections -Position 7
- 1 = Threaded, 600# NPT
- 2 = Flanged, 150# ANSI
- 3 = Flanged, 300# ANSI
- 4 = SWE, 600# ANSI
- 8 = Flanged, 600# ANSI

Actuator - Position 8
- A = 35
- B = 35R
- C = 35 HOD
- D = 35R HOD
- E = 55
- F = 55R
- G[1] = 55A
- H[1] = 55AR
- I = 55 HOD
- J = 55R HOD
- K[1] = 55A HOD
- L[1] = 55AR HOD
- M = 85
- N = 85R
- P = 85 HOD
- Q = 85R HOD

Bonnet & Packing - Position 9
- 1 = Std. Bonnet, BTG
- 2 = Teflon® V-Ring
- 3 = Std. Bonnet, LG

Trim Size - Position 10
- B = 1/4
- C = 3/8
- D = 1/2
- F = 5/8
- G = 3/4
- H = 7/8
- J = 1
- K = 1¼
- L = 1½
- M = 2

Trim Type - Position 11
- B = Stellited, Microtaper[2]
- H =Stellited, Equal %
- L = Stellited, Linear

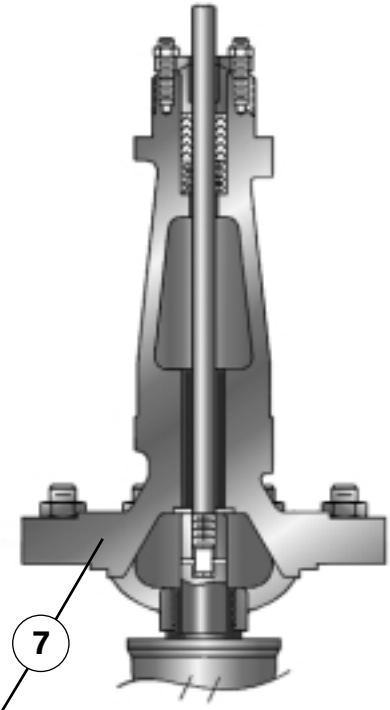
1. Reduced trim in 1" valve only.
2. Available in 1/4" and 3/8" Stellite only.

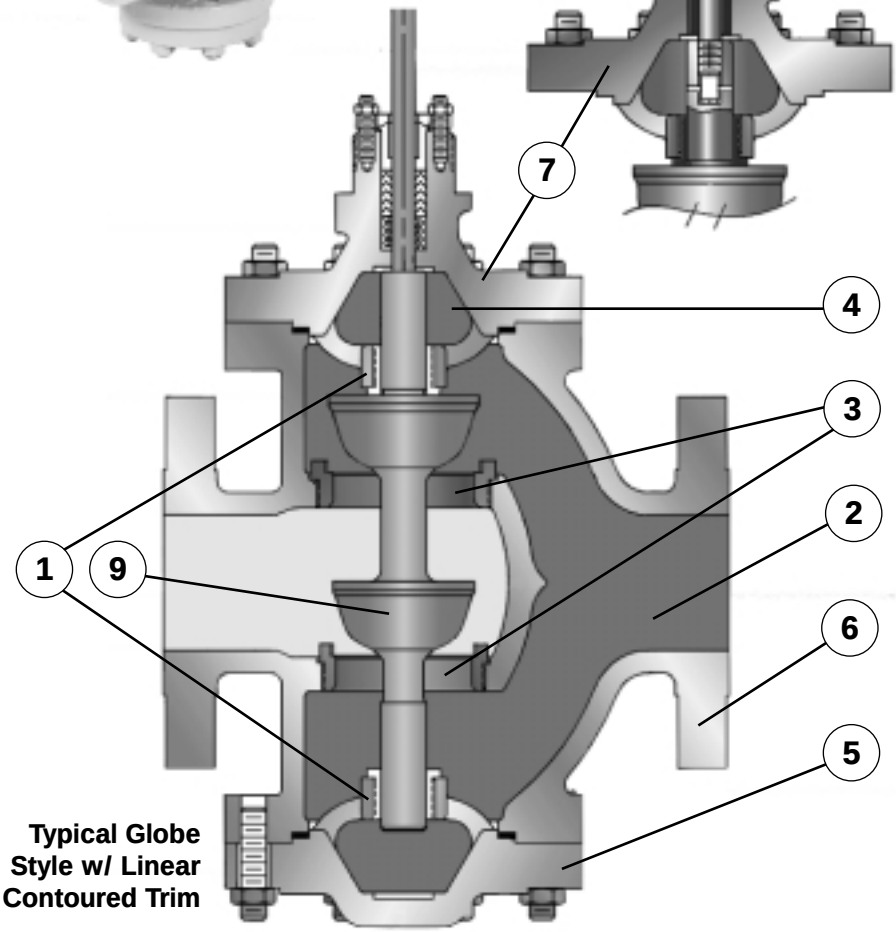
GTB CONTROL VALVE

Reliable and Proven Technology for the 21st Century

The Top & Bottom Guided Control Valve design has been successfully applied for over 50 years in chemical, refining, power, paper, and H.V.A.C. industries worldwide. Typical applications include clean and dirty liquids, gases and steam.

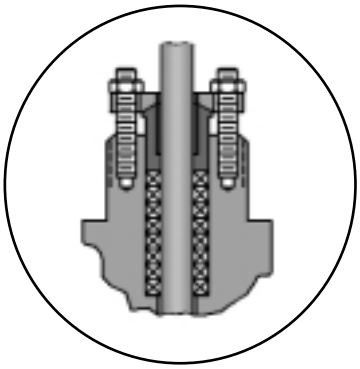
Typical Extended Bonnet



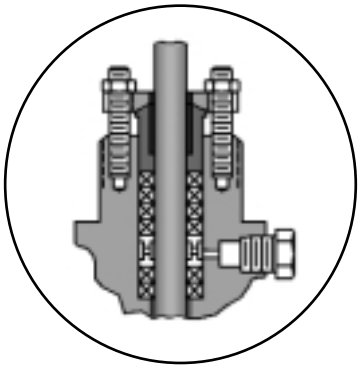


Typical Globe Style w/ Linear Contoured Trim

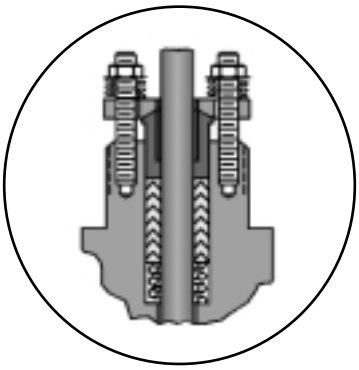
8 **Packing**



TC/BTG



LG w/ Lubricator



Environmental

GTB CONTROL VALVE

Solution-Engineered Features for Demanding Applications

1. Top & Bottom Stem Guiding
The valve plug is supported and rigidly guided by upper and lower guide bushings. This two-point guiding provides for exceptional stability and minimal valve plug deflection even under high pressure drop conditions, and allows for precise control and characterization of fluid.

2. High Capacity Body Designs
The body configuration incorporates large flow areas which maximize the flow capacity of each size. This enlarged flow area maintains acceptable fluid velocities in the valve body, which increases trim life and provides for quieter operation.

3. Balanced Double Port Design
Since inlet pressure exerts force on the upper and lower plugs, the forces are balanced. This balancing effect reduces the net thrust of the actuator, allowing for smaller actuators to be used in higher pressure drop applications. The result is a lower overall installation cost and dimensional envelope.

4. Plug Throttling Design
Plug characterization, stem guiding, and balancing effect give this design the combination best suited for handling dirty, sticky, and erosive applications in refinery plants where cage guided valves have consistently failed.

5. Field Reversible Trim
EQ% V-Port/ EQ%, Linear and Quick Opening Contoured plugs are easily reversed in the field so that either a fail open or closed action can be obtained using the same actuator. This reduces the need for parts inventory, and adds flexibility.

6. Sizes and End Connections
The GTB valve is available in sizes 1” through 16” (25-400 mm). End connections include raised face, ring type joint flanges and threaded ends.

7. Bonnet Options
Bonnet options include the standard bolted configuration and extension bonnet for temperatures below 32°F (0°C) and above 450°F (232°C). The standard and extension bonnets are available with lubricator and oversized construction.

8. Packing
Teflon® Chevron/Braided Teflon® Graphite (TC/BTG)
Split rings allow packing replacement without removal of actuator. Graphite impregnated PTFE provides 500°F (260°C) service temperature, lowered stem hysteresis, better “memory” and sealing than pure teflon rings, and is ideal for fluids that contain suspended solids.

Laminated Braided Graphite (LBG)
Precision die-cut laminated graphite rings in combination with braided graphite rings provide a reliable, tight stem seal up to operating temperatures of 1050°F (565°C).

9. Trim Options
The GTB design is available in double seat direct action (push-to close) and reverse action (push-to-open) construction and is designed to meet the widest variety of applications.

Quick Opening Plug Contoured
Generally utilized for open and shut (on/off) service, or for applications requiring rapid flow change for small load demand changes. As this type of inner valve trim leaves the seating surfaces, the open port area increases rapidly; maximum capacity is obtained at a relatively short valve lift.

Linear Plug Contoured
Primarily used for throttling applications where relatively quick changes in opening are required with small load demand changes. In linear contoured inner valves, the flow is directly proportional to travel.

Equal Percentage V-Port or Plug Contoured
Used for relatively long time lags and large load changes with a linear controller output. The equal percentage trim provides an equal percentage of flow change per unit of lift at a constant pressure drop. The solid contoured trim is more desirable for applications involving suspended solids, viscous fluids, and corrosive or scale-forming fluids. The V-Port trim provides additional guiding for high pressure drop applications, where noise and vibration are present.

Reduced Trim
For applications requiring accurate control of smaller flow rates, all valve sizes have two sizes of trim reductions available for all trim characteristics.

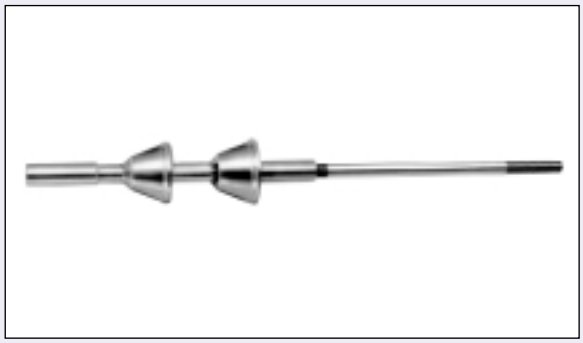
Hardened Trim
For applications requiring trim with superior wear resistance. the The complete size range is offered in three levels of hardened trims that utilize Alloy 6®.

- **Partial Stellite® A** is an overlay on the plug and seat ring surfaces.
- **Partial Stellite® B** is an overlay on the guide bushings, plug posts and seating surfaces of the plug and seat ring.
- **Full Stellite®** is an overlay on the complete plug contour, plug posts, seat ring and plug seating surfaces, seat ring bore and guide bushings.

GTB Trim Configurations

GTB trim designs allow you to choose the ideal construction/characteristic for each application. All trim modules are 100% field interchangeable providing extraordinary flexibility and value.

DOUBLE SEATED LINEAR CONTOURED

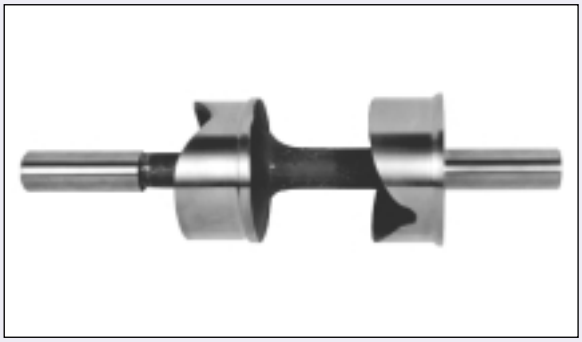


-20°F - 1050°F
-29°C - 565°C
SHUTOFF CLASS III

DOUBLE SEATED EQ% CONTOURED

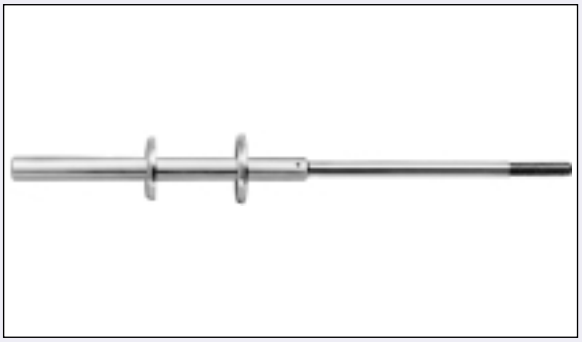
-20°F - 1050°F
-29°C - 565°C
SHUTOFF CLASS III

DOUBLE SEATED EQ% V-PORT



-20°F - 1050°F
-29°C - 565°C
SHUTOFF CLASS III

DOUBLE SEATED QUICK OPENING CONTOURED



-20°F - 1050°F
-29°C - 565°C
SHUTOFF CLASS III

GTB End Connections

Valve Size in/mm	ANSI CLASS 150	ANSI CLASS 300	ANSI CLASS 600
1 / 25	RF RTJ T	RF T RTJ	RF T RTJ
1.5 / 40	RF RTJ T	RF T RTJ	RF T RTJ
2 / 50	RF RTJ	RF RTJ	RF T RTJ
3 / 75	RF RTJ	RF RTJ	RF RTJ
4 / 100	RF RTJ	RF RTJ	RF RTJ
6 / 150	RF RTJ	RF RTJ	RF RTJ
8 / 200	RF RTJ	RF RTJ	RF RTJ
10 / 250	RF RTJ	RF RTJ	RF RTJ
12 / 300	RF RTJ	RF RTJ	RF RTJ
14 / 350	RF RTJ	RF RTJ	RF RTJ
16 / 400	RF RTJ	RF RTJ	RF RTJ

T = Threaded
RF = Raised Face
RTJ = Ring Type Joint

GTB Cv Table - Linear

Valve Size in/DN	Stroke in/mm	Large Seat Dia. in/mm	Small Seat Dia. in/mm	Min Cv STD	RATED Cv @ PERCENT OF STROKE									
					10	20	30	40	50	60	70	80	90	100
1 / 25	0.49/12	0.88/22	0.75/19	0.08	0.64	1.28	1.92	2.56	3.2	3.84	4.48	5.12	5.76	6.4
	0.49/12	0.88/22	0.75/19	0.18	0.91	1.82	2.73	3.64	4.55	5.46	6.37	7.28	8.19	9.1
	0.69/17	1.12/28	1.00/25	0.38	1.92	3.84	5.76	7.68	9.6	11.5	13.4	15.4	17.3	19.2
1.5 / 40	0.69/17	1.12/28	1.00/25	0.38	1.92	3.84	5.76	7.68	9.6	11.5	13.4	15.4	17.3	19.2
	0.69/17	1.31/33	1.19/30	0.64	3.18	6.36	9.54	12.7	15.9	19.1	22.3	25.4	28.6	31.8
	0.94/23	1.62/41	1.50/38	0.95	4.75	9.5	14.3	19	23.8	28.5	33.3	38	42.8	47.5
2 / 50	0.69/17	1.31/33	1.19/30	0.64	3.18	6.36	9.54	12.7	15.9	19.1	22.3	25.44	28.62	31.8
	0.94/23	1.62/41	1.50/38	0.95	4.75	9.5	14.3	19	23.8	28.5	33.3	38	42.8	47.5
	1.06/27	2.00/51	1.88/48	1.30	6.5	13	19.5	26	32.5	39	45.5	52	58.5	65
3 / 80	1.06/27	2.00/51	1.88/48	1.30	6.5	13	19.5	26	32.5	39	45.5	52	58.5	65
	1.19/30	2.56/65	2.44/62	2.40	11.8	23.6	35.4	47.2	59	70.8	82.6	94.4	106	118
	1.38/35	3.12/79	3.00/76	3.60	17.9	35.8	53.7	71.6	89.5	107	125	143	161	179
4 / 100	1.19/30	2.56/65	2.44/62	2.40	11.8	23.6	35.4	47.2	59	70.8	82.6	94.4	106	118
	1.38/35	3.12/79	3.00/76	3.60	17.9	35.8	53.7	71.6	89.5	107	125	143	161	179
	1.75/44	4.00/102	3.88/99	5.80	28.8	57.6	86.4	115	144	173	202	230	259	288
6 / 150	1.75/44	4.00/102	3.88/99	5.80	28.8	57.6	86.4	115	144	173	202	230	259	288
	1.88/48	5.00/127	4.88/124	7.30	36.5	73	110	146	183	219	256	292	329	365
	2.38/60	6.00/152	5.88/149	11.0	56.5	113	169.5	226	282.5	339	395.5	452	508.5	565
8 / 200	1.88/48	5.00/127	4.88/124	7.30	36.5	73	110	146	182	219	256	292	329	365
	2.38/60	6.00/152	5.88/149	11.0	56.5	113	170	226	282	339	396	452	509	656
	2.50/64	8.00/203	7.88/200	19.0	95	190	285	380	475	570	665	760	855	950
10 / 250	2.38/60	6.00/152	5.88/149	11.0	56.5	113	170	226	283	339	396	452	509	565
	2.50/64	8.00/203	7.88/200	19.0	95	190	285	380	475	570	665	760	855	950
	3.00/76	10.0/254	9.88/251	29.0	144	288	432	576	720	864	1008	1152	1296	1440
12 / 300	2.50/64	8.00/203	7.88/200	19.0	95	190	285	380	475	570	665	760	855	950
	3.00/76	10.0/254	9.88/251	29.0	144	288	432	576	720	864	1008	1152	1296	1440
	3.50/89	12.0/305	11.88/302	44.0	218	436	654	872	1090	1308	1526	1744	1962	2180
16 / 400	3.00/76	10.0/254	9.88/251	29.0	144	288	432	576	720	864	1008	1152	1296	1440
	3.50/89	12.0/305	11.88/302	44.0	218	436	654	872	1090	1308	1526	1744	1962	2180
	3.50/89	14.6/371	14.12/359	61.0	304.5	609	913.5	1218	1532	1827	2132	2436	2741	3045

Note: Minimum, Intermediate, and Maximum CV's are shown for reference

GTB Cv Table - Equal Percentage

Valve Size in/DN	Stroke in/mm	Large Seat Dia. in/mm	Small Seat Dia. in/mm	Min Cv STD	RATED Cv @ PERCENT OF STROKE									
					10	20	30	40	50	60	70	80	90	100
1 / 25	0.49/12	0.88/22	0.75/19	0.10	0.17	0.23	0.46	0.7	0.92	1.33	1.8	2.61	3.89	5.8
	0.49/12	0.88/22	0.75/19	0.18	0.23	0.30	0.61	0.91	1.22	1.75	2.36	3.42	5.09	7.6
	0.69/17	1.12/28	1.00/25	0.36	0.54	0.72	1.45	2.17	2.9	4.16	5.61	8.14	12.1	18.1
1.5 / 40	0.69/17	1.12/28	1.00/25	0.36	0.54	0.72	1.45	2.17	2.9	4.16	5.61	8.14	12.1	18.1
	0.69/17	1.31/33	1.19/30	0.53	0.79	1.06	2.11	3.17	4.22	6.07	8.18	11.9	17.7	26.4
	0.94/23	1.62/41	1.50/38	0.83	1.22	1.62	3.24	4.86	6.48	9.32	12.6	18.2	27.1	40.5
2 / 50	0.69/17	1.31/33	1.19/30	0.53	0.79	1.06	2.11	3.17	4.22	6.07	8.18	11.9	17.7	26.4
	0.94/23	1.62/41	1.50/38	0.83	1.22	1.62	3.24	4.86	6.48	9.32	12.6	18.2	27.1	40.5
	1.06/27	2.00/51	1.88/48	1.20	1.8	2.4	4.8	7.2	9.6	13.8	18.6	27	40.2	60
3 / 80	1.06/27	2.00/51	1.88/48	1.20	1.8	2.4	4.8	7.2	9.6	13.8	18.6	27	40.2	60
	1.19/30	2.56/65	2.44/62	2.20	3.15	4.2	8.4	12.6	16.8	24.2	32.6	47.3	70.4	105
	1.38/35	3.12/79	3.00/76	3.30	4.8	6.4	12.8	19.2	25.6	36.8	49.6	72	107	160
4 / 100	1.19/30	2.56/65	2.44/62	2.20	3.15	4.2	8.4	12.6	16.8	24.2	32.6	47.3	70.4	105
	1.38/35	3.12/79	3.00/76	3.30	4.8	6.4	12.8	19.2	25.6	36.8	49.6	72	107	160
	1.75/44	4.00/102	3.88/99	4.50	6.93	9.24	18.5	27.7	37	53.1	71.6	104	155	231
6 / 150	1.75/44	4.00/102	3.88/99	4.50	6.93	9.24	18.5	27.7	37	53.1	71.6	104	155	231
	1.88/48	5.00/127	4.88/124	6.70	10.1	13.4	26.8	40.2	53.6	77.1	104	151	225	335
	2.38/60	6.00/152	5.88/149	10.7	16	21.3	42.6	64	85.3	123	165	240	357	533
8 / 200	1.88/48	5.00/127	4.88/124	6.70	10.1	13.4	26.8	40.2	53.6	77.1	104	151	225	335
	2.38/60	6.00/152	5.88/149	10.7	16	21.3	42.6	64	85.3	123	165	240	357	533
	2.50/64	8.00/203	7.88/200	17.0	26.1	34.9	69.8	105	140	201	270	392	584	872
10 / 250	2.38/60	6.00/152	5.88/149	10.7	16	21.3	42.6	64	85.3	123	165	240	357	533
	2.50/64	8.00/203	7.88/200	17.0	26.2	34.9	69.8	105	140	201	270	392	584	872
	3.00/76	10.0/254	9.88/251	26.0	39.3	52.4	105	157	210	301	406	590	878	1310
12 / 300	2.50/64	8.00/203	7.88/200	17.0	26.2	34.9	69.8	105	140	201	270	392	584	872
	3.00/76	10.0/254	9.88/251	26.0	39.3	52.4	105	157	210	301	406	590	878	1310
	3.50/89	12.0/305	11.88/302	40.0	59.4	79.2	158	238	317	455	614	891	1327	1980
16 / 400	3.00/76	10.0/254	9.88/251	26.0	39.3	52.4	105	157	210	301	406	590	878	1310
	3.50/89	12.0/305	11.88/302	40.0	59.4	79.2	158	238	317	455	614	891	1327	1980
	3.50/89	14.6/371	14.12/359	55.0	82.8	110.4	221	331	442	635	856	1242	1849	2760

GTB Cv Table - Quick Opening

Valve Size in/DN	Stroke in/mm	Large Seat Dia. in/mm	Small Seat Dia. in/mm	Min Cv STD	RATED Cv @ PERCENT OF STROKE									
					10	20	30	40	50	60	70	80	90	100
1/ 25	0.4/10	1.12/28	1.00/25	0.38	6.65	14.3	17.5	18.4	18.6	18.7	18.8	18.9	19	19
1.5 / 40	0.5/13	1.62/41	1.5/40	1.10	18.5	39.8	48.8	51.4	51.9	52.2	52.5	52.7	52.9	53
2 / 50	0.6/15	2.00/51	1.88/48	1.20	20.3	43.5	53.4	56.3	56.8	57.1	57.4	57.7	57.9	58
3 / 80	0.9/23	3.12/79	3.00/76	3.70	64.1	137	168	178	179	180	181	182	183	183
4 / 100	1.1/28	4.00/102	3.88/99	6.40	112	240	294	310	314	315	317	318	319	320
6 / 150	1.6/41	6.00/152	5.88/149	12.0	217	465	570	601	608	611	614	617	619	620
8 / 200	1.8/46	8.00/203	7.88/200	22.0	382	818	1003	1057	1068	1074	1079	1085	1087	1090
10 / 250	2.4/61	10.00/254	9.88/251	33.0	578	1238	1518	1601	1617	1625	1634	1642	1646	1650
12 / 300	2.5/61	12.00/3.5	11.88/302	50.0	872	1868	2291	2415	2440	2453	2465	2478	2464	2490
16 / 400	3.5/89	14.62/371	14.12/359	70.0	1218	2610	3202	3376	3410	3428	3445	3463	3471	3480

GTB Cv Table - Equal Percentage V-Port

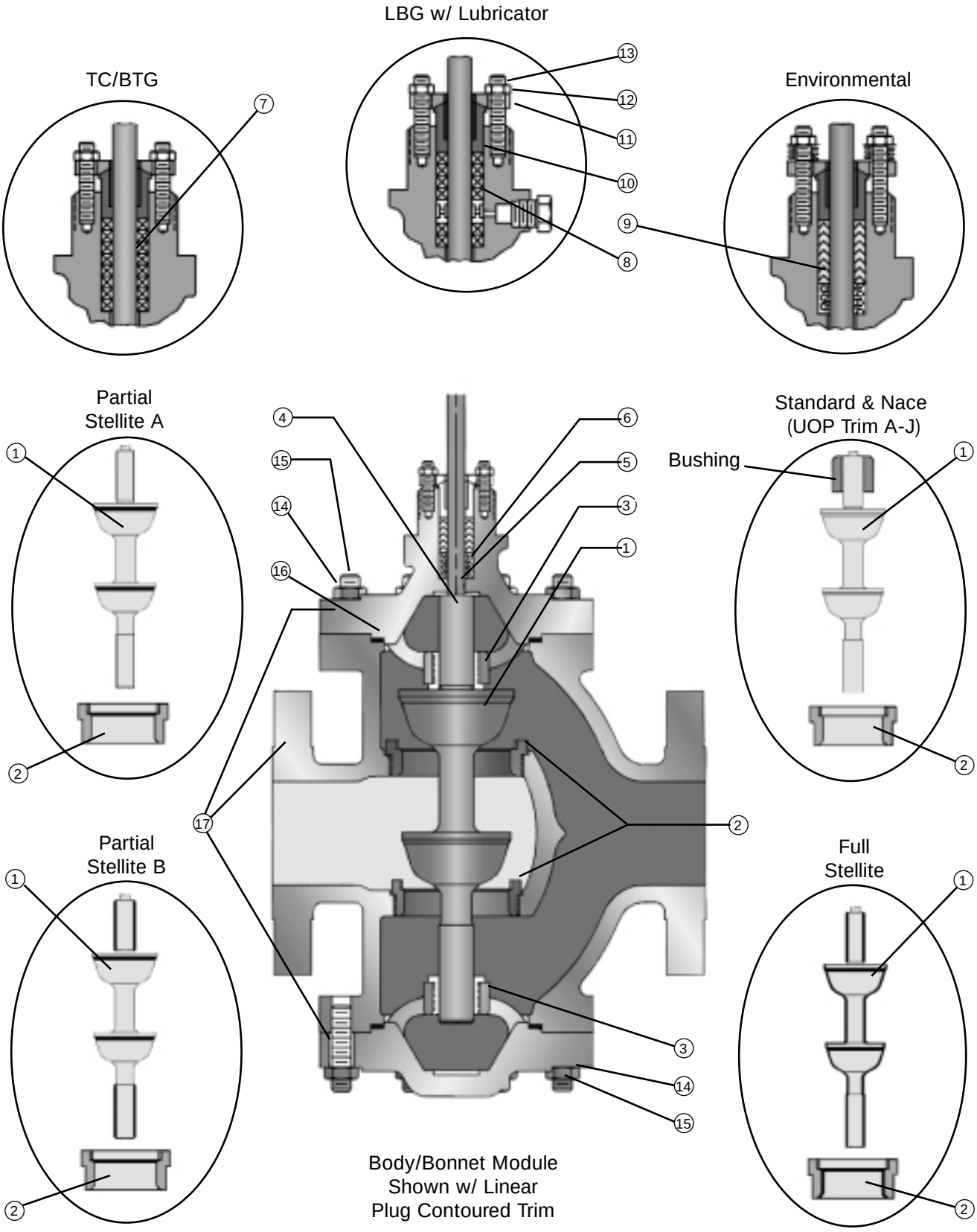
Valve Size in/DN	Stroke in/mm	Large Seat Dia. in/mm	Small Seat Dia. in/mm	Min Cv STD	RATED Cv @ PERCENT OF STROKE									
					10	20	30	40	50	60	70	80	90	100
1 / 25	0.49/12	0.88/22	0.75/19	0.10	0.2	0.3	0.52	0.78	1.04	1.5	2.02	2.93	4.36	6.5
	0.49/12	0.88/22	0.75/19	0.18	0.25	0.33	0.66	1	1.33	1.91	2.57	3.74	5.56	8.3
	0.69/18	1.12/28	1.00/25	0.36	0.54	0.72	1.45	2.17	2.9	4.16	5.61	8.15	12.1	18.1
1.5 / 40	0.69/18	1.12/28	1.00/25	0.36	0.54	0.72	1.5	2.17	2.9	4.16	5.61	8.15	12.1	18.1
	0.69/18	1.31/33	1.19/30	0.53	0.79	1.05	2.1	3.16	4.21	6.05	8.15	11.8	17.6	26.3
	0.94/24	1.62/41	1.50/38	0.83	1.25	1.66	3.3	5	6.66	9.57	12.9	18.7	27.9	41.6
2 / 50	0.69/18	1.31/33	1.19/30	0.53	0.79	1.05	2.1	3.16	4.21	6.05	8.15	11.8	17.6	26.3
	0.94/24	1.62/41	1.50/38	0.83	1.25	1.66	3.33	4.99	6.66	9.57	12.9	18.7	27.9	41.6
	1.06/27	2.00/51	1.88/48	1.20	1.77	2.36	4.72	7.08	9.44	13.6	18.3	26.6	39.5	59
3 / 80	1.06/27	2.00/51	1.88/48	1.20	1.77	2.36	4.72	7.08	9.44	13.6	18.3	26.6	39.5	59
	1.19/30	2.56/65	2.44/62	2.20	3.33	4.44	8.88	13.3	17.8	25.5	34.4	50	74.4	111
	1.38/35	3.12/79	3.00/76	3.30	4.95	6.6	13.2	19.8	26.4	38	51.2	74.3	111	165
4 / 100	1.19/30	2.56/65	2.44/62	2.20	3.33	4.44	8.88	13.3	17.8	25.5	34.4	50	74.4	111
	1.38/35	3.12/79	3.00/76	3.30	4.95	6.6	13.2	19.8	26.4	38	51.2	74.3	111	165
	1.75/44	4.00/102	3.88/99	4.50	6.72	8.96	17.9	26.9	35.8	51.5	69.4	101	150	224
6 / 150	1.75/44	4.00/102	3.88/99	4.50	6.72	8.96	17.9	26.9	35.8	51.5	69.4	101	150	224
	1.88/48	5.00/127	4.88/124	6.70	10.1	13.4	26.8	40.2	53.6	77.1	104	151	225	335
	2.38/60	6.00/152	5.88/149	10.7	16	21.3	42.6	64	85.3	123	165	240	357	533
8 / 200	1.88/48	5.00/127	4.88/124	6.70	10.1	13.4	26.8	40.2	53.6	77.1	104	151	225	335
	2.38/60	6.00/152	5.88/149	10.7	16	21.3	42.6	64	85.3	123	165	240	357	533
	2.50/64	8.00/203	7.88/200	17	26.2	34.9	69.8	105	140	201	270	392	584	872
10 / 250	2.38/60	6.00/152	5.88/149	10.7	16	21.3	42.6	64	85.3	123	165	240	357	533
	2.50/64	8.00/203	7.88/200	17	26.2	34.9	69.8	105	140	201	270	392	584	872
	3.00/76	10.0/254	9.88/251	26	39.3	52.4	105	157	210	301	406	590	878	1310
12 / 300	2.50/64	8.00/203	7.88/200	17	26.2	34.9	69.8	105	140	201	270	392	584	872
	3.00/76	10.0/254	9.88/251	26	39.3	52.4	105	157	210	301	406	590	878	1310
	3.50/89	12.0/304	11.88/302	40	59.4	79.2	158	238	317	455	614	891	1327	1980
16 / 400	3.00/76	10.0/254	9.88/251	26	39.3	52.4	105	157	210	301	406	590	878	1310
	3.50/89	12.0/304	11.88/302	40	59.4	79.2	158	238	317	455	614	891	1327	1980
	3.50/89	14.6/371	14.12/359	55	82.8	110	221	331	442	635	856	1242	1849	2760

Note: Minimum, Intermediate, and Maximum CVs are shown for reference

GTB Flow Coefficients

Flow Coefficients for GTB Trim Configurations	Direct		Reverse	
	F_L	X_T	F_L	X_T
Dbl. Seated Linear Contoured	0.9	0.78	0.91	0.79
Dbl. Seated Equal % Contoured	0.95	0.78	0.96	0.79
Dbl. Seated Equal % V-Port Contoured	0.95	0.78	0.96	0.79
Dbl. Seated Quick Opening Contoured	0.88	0.74	0.89	0.75

GTB Parts


LBG w/ Lubricator
TC/BTG
Environmental
Partial
Stellite A
Standard & Nace
(UOP Trim A-J)
Bushing
Partial
Stellite B
Full
Stellite
Body/Bonnet Module
Shown w/ Linear
Plug Contoured Trim

GTB MATERIAL/TEMPERATURE SPECIFICATIONS

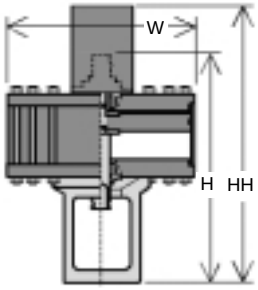
Balanced, Double Ported Trim Modules

	Operational Description	Material Specification	Temp. Range
	Trim Modules (Standard & Nace)		
1	Plug	316 Stainless Steel ASTM A351 Grade CF8M	-20—1050°F (29°C—565°C)
2	Seat Rings	316 Stainless Steel ASTM A351 Grade CF8M	-20—1050°F (29°C—565°C)
3	Bushing[1]	17-4PH® SST ASTM A654 Type 630[2]	-20—1050°F (-29°C—565°C)
4	Pin[1]	302 Stainless Steel[2]	-20—1050°F (29°C—565°C)
5	Stem[1]	316 Stainless Steel[2]	-20—1050°F (29°C—565°C)
	Trim Module (Partial Stellite® A & B) (Full Stellite®)		
1	Plug	316 Stainless Steel w/ Stellite®	-20—1050°F (29°C—565°C)
2	Seat Rings	316 Stainless Steel w/ Stellite®	-20—1050°F (29°C—565°C)
	Trim Module (UOP Trim A)		
3	Bushings	440C Stainless Steel	-20—1050°F (29°C—565°C)
	Trim Module (UOP Trim B)		
1	Plug	17-4PH® Stainless Steel	-20—1050°F (29°C—565°C)
2	Seat Ring	416 Stainless Steel	-20—1050°F (29°C—565°C)
3	Bushings	440C Stainless Steel	-20—1050°F (29°C—565°C)
	Trim Module (UOP Trim C)		
1	Plug	316 Stainless Steel w/ Stellite® on guides	-20—1050°F (29°C—565°C)
	Trim Module (UOP Trim D & G)		
1	Plug	316 Stainless Steel	-20—1050°F (29°C—565°C)
2	Seat Rings	316 Stainless Steel	-20—1050°F (29°C—565°C)
3	Bushings	Solid Stellite®	-20—1050°F (29°C—565°C)
	Trim Module (UOP Trim H & J)		
1	Plug	Monel®	-20—800°F (29°C—426°C)
2	Seat Ring	Monel®	-20—800°F (29°C—426°C)
3	Bushings	Monel®	-20—800°F (29°C—426°C)
4	Pin	Monel®	-20—800°F (29°C—426°C)
5	Stem	Monel®	-20—800°F (29°C—426°C)
	Packing Module (Standard Materials & Nace)		
6	Spring (V-Ring Packing)	316 Stainless Steel	-20—1050°F (-29°C—565°C)
7	Packing Set	TC/BTG	-40—450°F (-40°C—232°C)
7	Packing Set	TC/BTG w/ Extension Bonnet	-40—800°F (-40°C—426°C)
8	Packing Set	LBG	-20—1050°F (29°C—565°C)
9	Packing Set	Environmental	-20—500°F (29°C—260°C)
9	Packing Set	Environmental w/ Extension Bonnet	-20—800°F (29°C—426°C)
10	Packing Follower	316 Stainless Steel	-20—1050°F (29°C—565°C)
11	Packing Flange	Cadmium Plated Steel	-20—1050°F (29°C—565°C)
12	Hex Nut	316 Stainless Steel	-20—1050°F (29°C—565°C)
13	Studs	316 Stainless Steel	-20—1050°F (29°C—565°C)
	Body/Bonnet Materials (Standard & Nace)		
14	Nut	ASTM A-194 Gr.2H	-20—800°F (-29°C—427°C)
14	Nut	ASTM A-194 Gr.7	-20—1050°F (-29°C—565°C)
15	Stud	ASTM A-193 Gr.B7	-20—800°F (-29°C—427°C)
15	Stud	ASTM A-193 B 16	-20—1050°F (-29°C—565°C)
16	Gasket	Grafoil®	-120—1000°F (-195°C—538°C)
17	Body/Bonnet/Cover	Iron ASTM A-126 Class B	-20—450°F (-29°C—232°C)
17	Body/Bonnet/Cover	*ASTM A-216 Steel Gr.WCB	-20—800°F (-29°C— 427°C)
17	Body/Bonnet/Cover	ASTM A-217 Gr.WC9	-20—1050°F (-29°C—565°C)
17	Body/Bonnet/Cover	*ASTM A-351 Gr.CF8M	-20—1050°F (-29°C—565°C)

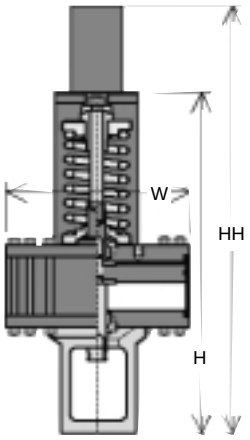
NOTE:
STELLITE® is a trademark of Stoody Deloro Stellite, Inc.
MONEL® and INCONEL® are trademarks of The Inco Family of Co's.
18-8® and 17-4-PH® are trademarks of Armco Steel, Inc.
Grafoil® is a trademark of Union Carbide.

1. Included in other trim modules unless otherwise listed.
2. Nace Rc < 22 Hardness

GTB Actuator Dimensions



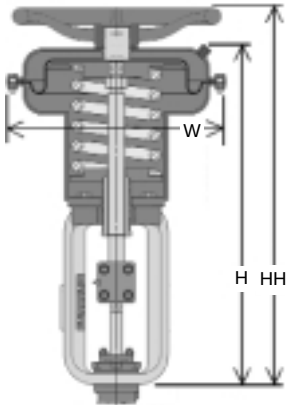
Double Acting



Spring Return

DOUBLE ACTING & SPRING RETURN ACTUATORS
DIMENSIONS inches (mm)**, WEIGHTS** pounds (kg) **AND VOLUME** cu.ft. (m^3)

MODEL	DOUBLE ACTING		SPRING RETURN		W[2]	NOM. DIA.	NOM. AREA $in^2(cm^2)$	WGT.[1]		SHPG. VOL.[1]	
	H	HH	H	HH				DOUBLE ACTING	SPRING RETURN	DOUBLE ACTING	SPRING RETURN
P28	16¾ (343)	25 15/16 (659)	27¼ (692)	36 7/16 (926)	7 (178)	6 (152)	28 (181)	82 (37)	122 (55)	2.1 (0.06)	2.8 (0.08)
P80	17½ (457)	26 1/16 (678)	28 (787)	37 3/16 (945)	10½ (267)	10 (254)	78 (503)	132 (60)	172 (78)	3.7 (0.11)	5 (0.14)
P130	28 (711)	39 (991)	48 (1219)	59 (1499)	14 (356)	13 (330)	130 (839)	232 (105)	352 (160)	8.1 (0.23)	11.8 (0.33)
P200	24¾ (610)	35¾ (908)	42⅛ (1003)	53⅛ (1349)	16½ (419)	16 (406)	201 (1297)	295 (134)	425 (188)	9.7 (0.27)	14 (0.39)
P300	24¾ (610)	35¾ (908)	42⅛ (1003)	53⅛ (1349)	20½ (521)	20 (508)	314 (2026)	415 (188)	535 (243)	13.8 (0.39)	20 (0.56)



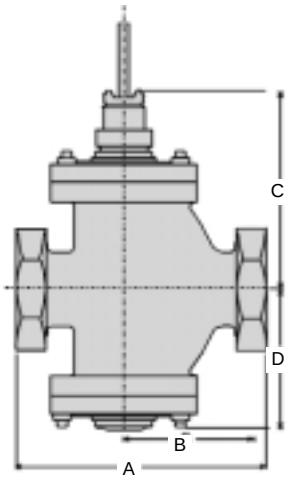
Direct Acting

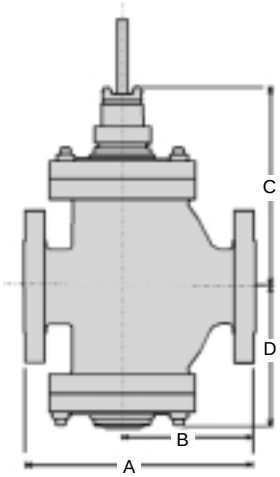
DIRECT ACTING ACTUATOR
DIMENSIONS inches (mm)**,**
WEIGHTS pounds (kg) **AND VOLUME** cu.ft. (m^3)

MODEL	DIRECT ACTING		W	NOM. DIA.	NOM. AREA $in^2(cm^2)$	WGT.[3]	SHPG. VOL.
	H	HH					
DL-40	19.5 (493)	22.7 (577)	10.1 (257)	12.1 (310)	40 (258)	37 (17)	3.1 (0.1)
DL-85	21 (530)	22.8 (579)	14.8 (375)	16.8 (426)	85 (548)	84 (38)	5.5 (0.2)

1. Values are approximate; includes manual override.
2. Corner to corner dimension not shown.
3. Values are approximate; includes manual override.

GTB Body Dimensions





BODY DIMENSIONS inches (mm)**, WEIGHTS** pounds (kg) **AND VOLUME** cu.ft. (m^3)

SIZE	A				B			C[1]	D	WGT.[2]			VOL.[2]		
	NPT	FLG 150	FLG 300	FLG 600	NPT, 150 FLG	FLG 300	FLG 600			NPT, 150 FLG	FLG 300	FLG 600	NPT, 150 FLG	FLG 300	FLG 600
1 (25)	6.19 (25)	7.25 (184)	7.75 (197)	8.25 (210)	3.75 (95)	4.00 (102)	4.25 (108)	5.44 (138)	4.47 (114)	55 (25)	60 (27)	65 (29)	1 (.03)	1 (.03)	1 (.03)
1 1/2 (40)	7.75 (197)	8.75 (222)	9.25 (235)	9.88 (251)	4.44 (113)	4.69 (119)	5.00 (127)	6.25 (159)	5.22 (133)	65 (29)	70 (32)	75 (34)	2 (.04)	2 (.04)	2 (.05)
2 (50)	9.19 (51)	10.00 (254)	10.50 (267)	11.25 (286)	5.44 (138)	5.69 (145)	6.06 (154)	6.88 (175)	5.78 (147)	85 (39)	92 (42)	99 (45)	2 (.05)	2 (.06)	2 (.06)
3 (80)	— —	11.75 (298)	12.50 (318)	13.25 (337)	6.81 (173)	7.19 (183)	7.56 (192)	8.72 (221)	7.66 (195)	145 (66)	155 (70)	165 (75)	3 (.08)	3 (.09)	4 (0.1)
4 (100)	— —	13.88 (353)	14.50 (368)	15.50 (394)	8.12 (206)	8.44 (214)	8.94 (227)	9.88 (251)	8.88 (226)	175 (79)	185 (84)	195 (88)	4 (0.1)	5 (0.1)	5 (0.2)
6 (150)	— —	17.75 (451)	18.62 (473)	20.00 (508)	10.44 (265)	10.88 (276)	11.56 (294)	14.31 (363)	12.28 (312)	415 (188)	430 (195)	445 (202)	8 (0.2)	9 (0.3)	10 (0.3)
8 (200)	— —	21.38 (543)	22.38 (568)	24.00 (610)	12.69 (322)	13.19 (335)	14.00 (356)	17.19 (437)	13.91 (353)	580 (263)	600 (272)	620 (281)	13 (0.4)	14 (0.4)	16 (0.5)
10 (250)	— —	25.50 (648)	26.88 (683)	28.62 (727)	15.50 (394)	16.19 (411)	17.06 (433)	19.19 (487)	16.03 (407)	960 (435)	990 (449)	1020 (463)	20 (0.6)	22 (0.6)	24 (0.7)
12 (300)	— —	29.75 (756)	31.25 (817)	33.00 (838)	18.00 (457)	18.75 (476)	19.62 (498)	21.88 (556)	18.88 (480)	1535 (696)	1575 (714)	1615 (733)	30 (0.8)	32 (0.9)	36 (1)
16 (400)	— —	37.38 (949)	39.00 (991)	41.00 (1041)	23.38 (574)	24.19 (614)	25.19 (640)	26.69 (678)	23.94 (608)	2150 (975)	2200 (898)	2250 (1021)	51 (2)	59 (1.7)	64 (2)

NOTE: Dimensions are subject to change without notice. Request certified drawings for piping layout and construction purposes.

1. Consult factory for C dimension when an extension bonnet is to be used.
2. Approximate weight and volume

GTB ORDERING CODE

Class	Valve Size	End Connection/ Bonnet Style	Body Mat'l	Packing	Gasket	Flow Char.	Trim Mat'l	Trim Mat'l Available 1 or 2 Size Reduced	Actuator Size/ Action	Actuator Yoke	Actuator Spring		# of Manual Override	Acces-sories	European Approval	
K	**B**	**H**	**A**	**4**	**L**	**3**	**E**	**F**	**M**	**5**	**F**	**B**	**1**	**M**	**2**	**C**	**F**
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

Class - Position 1
KB

Valve Size - Position 3
C = 1"
E = 1.5"
F = 2"
H = 3"
J = 4"
K = 6"
L = 8"
M = 10"
N = 12"
X = Other

End Connection/Bonnet Style - Position 4
A = Flg'd 125/150 Std. Bonnet
B = Flg'd 250/300 Std. Bonnet
C = NPT Std. Bonnet
D = Flg'd 125/150 Ext. Bonnet
E = Flg'd 250/300 Ext. Bonnet
F = NPT Ext. Bonnet
G = Flanged 600 Std. Bonnet
H = Flanged 600 Ext. Bonnet
X = Other

Body Material - Position 5
1 = Cast Iron
2 = Carbon Steel
3 = Stainless Steel
4 = Chrome Moly (C-5)

Packing Material - Position 6
T = Teflon®
B = Braided Teflon® Graphite (BTG)
L = Laminated Graphite (LG)
X = Other

Gasket Material - Position 7
1 = Non-Asbestos
2 = PTFE
3 = Grafoil
4 = Metal
X = Other

Flow Characteristic - Position 8
L = Linear
E = Equal Percent
Q = Quick Opening

Trim Material - Position 9
N = No Stellite on Seat & Plug
A = Partial Stellite Overlay on seating surface of Plug & Seat
B = Stellite Overlay on guide bushings and seating surfaces of plug, seat ring & upper and lower plug post
F = Stellite Overlay on full plug contour, full seat ring bore, post and guide bushing
X = Other

Trim Material - Position 10
(Available 1 or 2 Size Reduced)
B = 3/4"
C = 1"
D = 1 1/4"
E = 1 1/2"
F = 2"
G = 2 1/2"
H = 3"
J = 4"
Y = 5"
D = 6"
L = 8"
M = 10"
N = 12"
X = Other

Actuator Size/Action - Position 11
4 = 40 Direct sq. in.
5 = 40 Reverse sq. in.
8 = 85 Direct sq. in.
9 = 85 Reverse sq. in.
N = No actuator
X = Other

Actuator Yoke - Position 12
C = 2.31" Dia hub (40 act)
E = 2.31" Dia hub (85, 145)
F = 3" Dia hub (145, 250)
H = 3" Dia bolted hub (145, 250)
N = No actuator

Actuator Spring - Position 13

CODE		SPRING RATE	MAX COMP
(Used with 40 Actuator)			
B1	=	435	1.95
B2	=	590	4.52
B3	=	875	1.95
B4	=	1180	1.52
B5	=	1850	0.92
B6	=	300	2.75
B7*	=	533	4.25
(Used with 85 Actuator)			
C1	=	900	2.04
C2	=	1250	1.52
C3	=	1850	2.04
C4	=	2500	1.52
C5	=	3867	0.92
C6	=	600	2.75
C7	=	485	8.25
NN	=	No actuator	
XX	=	Other	

Manual Override - Position 14
N = None
M = Manual Override

# of Accessories - Position 16
1 = 1 accessory
2 = 2 accessories
3 = 3 accessories
4 = 4 accessories
5 = 5 accessories
6 = 6 accessories
7 = 7 accessories
8 = 8 accessories
9 = 9 accessories
0 = No accessories

European Approval - Position 17 & 18
CF

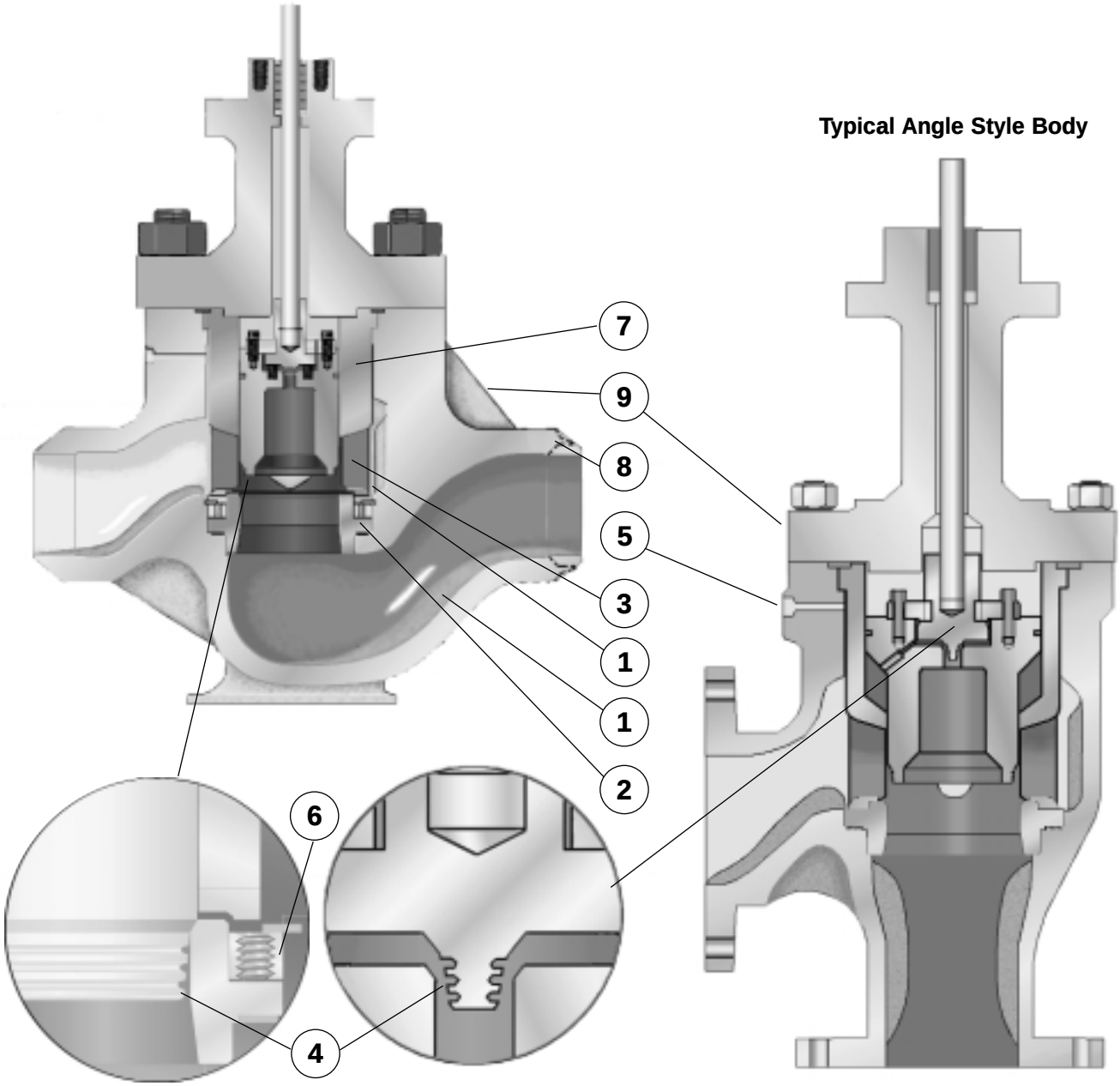
AEROFLOW CONTROL VALVE

Innovative Technology for the 21st Century

The Aeroflow control valve family represents an integrated valve solution for the 21st Century ... and beyond. Not a compromise or re-packaging of old valve technologies. The Aeroflow valve concept integrates proven state-of-the-art design in aerodynamic/ hydrodynamic flow, field proven materials, digital positioning, and “smart” valve technology, with a modular design concept. The sum benefit of Aeroflow’s technological advances is simply the most accurate, reliable control valve product line available in the world today.

CLASS 150 - 4500#

Typical Globe Style Body w/Pilot Balanced Trim



Typical Angle Style Body

AEROFLOW CONTROL VALVE

Solution-Engineered Features for Demanding Applications

1. Aerodynamic Flow Control Vanes

- Integrally cast into the inlet and 0utlet
- Profiles flow to reduce turbulence
- Evenly distributes flow around the cage
- Reduces noise generated in the valve

2. Zero Leakage Tight Shut-off

- Exceeds ANSI Class VI shutoff
- Metal to metal seat and pilot balanced plug design
- Zero cc/min without oversized actuators

3. Custom Characterized Trim Options

- C3 Combination Characterized Cage – Combines high rangeability, cavitation protection and low noise in one valve
- Mini P Multi Stage Trim – Designed for low-flow, high ΔP, cavitating service with tight shutoff
- Les-Sonic Cage – Provide up to a 25 dBA noise reduction
- Les-CAV Multi Stage Cage – Up to five stages control for pressure drops to 4000 PSI (276 BAR)
- Micro Taper Trim – Specially designed trim for very fine control in low-flow/ high ΔP applications

4. Tri-Sheer Protected Seat Design

- Prevents high velocity erosion at opening and closing
- Provides a five-stage pressure drop near the seating position
- Prevents particle impingement on the seating surfaces since they are withdrawn from the direct flow path before flow commences
- For LES-CAV cages only

5. “Smart Valve” Capability

- Optional inlet and outlet pressure taps provide accurate, stable pressure measurements required by today’s “smart” instrument action

6. Quick Change Trim Design (ANSI 900 and above)

- Seat retention and gasket loading are designed for reliability and ease of maintenance

7. Hung Cage Design (ANSI 900 and above)

- Suspended Trim Cage eliminates damaging effects of thermal expansion
- Cage is free to expand and contract with temperature changes

8. Oversized Outlet Connection

- Aeroflow Valves can be supplied with a larger outlet connection than the valve body size

9. Parts Interchangeability

- All parts interchangeable between globe and angle style bodies
- Reduces parts inventory
- Reduces maintenance training

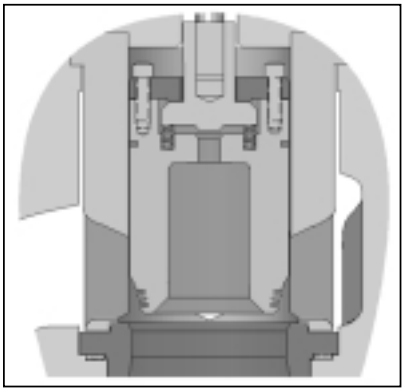
AEROFLOW TRIM OPTIONS

MODULAR TRIM

Aeroflow trim design allows you to choose the ideal cost/performance combination for each application. All trim modules are 100% field interchangeable providing extraordinary flexibility and value. Any of the cage throttling designs shown below can be combined with any of the characterized cages shown in this section to give you the best possible solution to your specific flow control application. In addition, as shown at the bottom of this page, we can also offer customized trim sets for specific severe service applications where fine control of low flows and high differential pressures is a critical part to your operation.

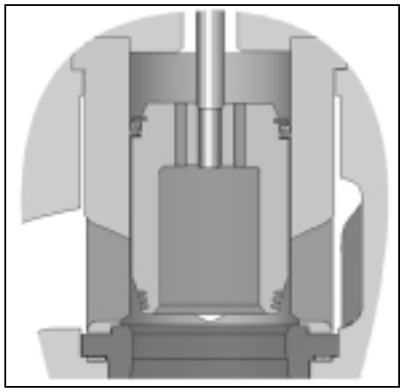
CAGE THROTTLING DESIGNS

PILOT BALANCED (PB)



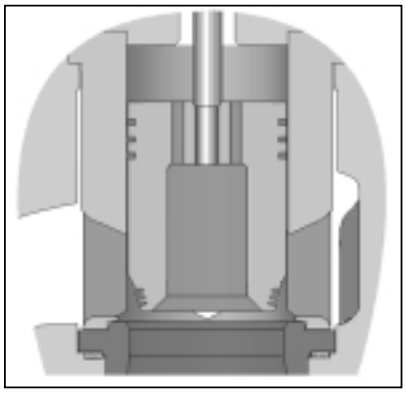
-20ºF — 1050ºF
-29ºC — 565ºC
Class IV/V/Zero

BAL. LOW-TEMP (BL)



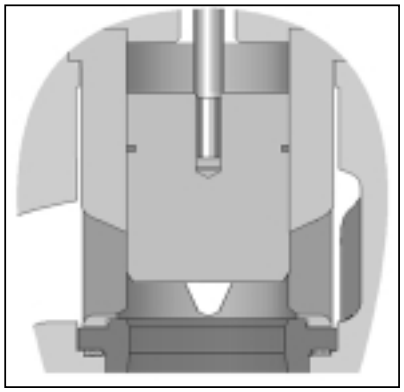
-20ºF — 500ºF
-29ºC — 260ºC
Class IV/V

BAL. HIGH-TEMP (BH)



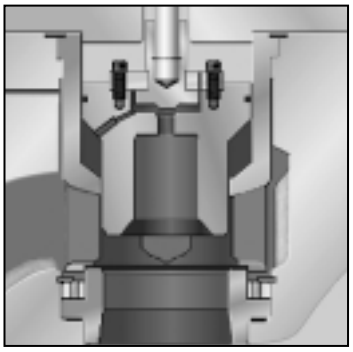
-20ºF — 1050ºF
-29ºC — 565ºC
Class III

UNBALANCED (UBC)



-20ºF — 1050ºF
-29ºC — 565ºC
Class IV/V/Zero

T^2

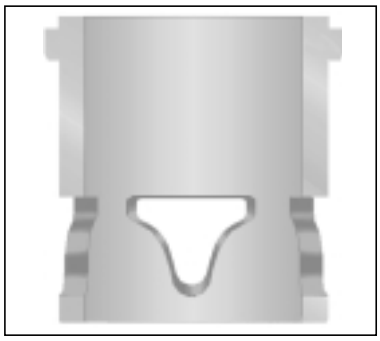


-20ºF — 1050ºF
-29ºC — 565ºC
Class IV/V/Zero

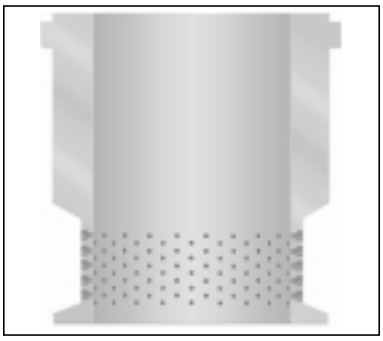
AEROFLOW TRIM OPTIONS

CUSTOM CHARACTERIZED CONTROL

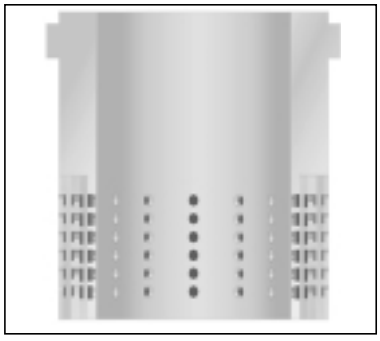
Standard Cage



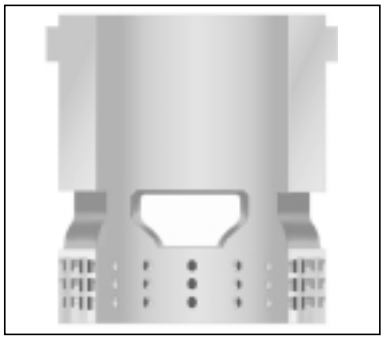
LesSonic Cage (Noise Control)



LesCav Cage (Cavitation Control)

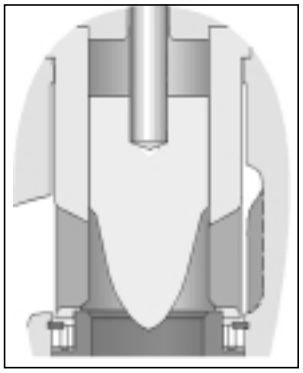


C³ Cage (Range Control)



CUSTOM TRIM SET OPTIONS

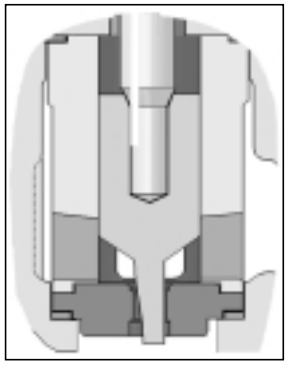
UNBALANCED (UBP)



-20ºF — 1050ºF
-29ºC — 565ºC
Class IV/V/Zero

MICROTAPER® (MT)

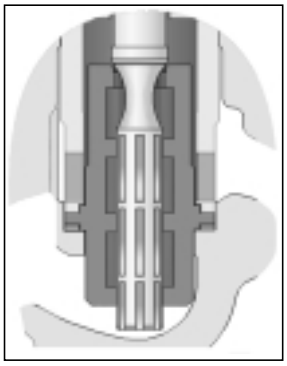
For Fine Control on Low Flow/ High ΔP Service



-20ºF — 1050ºF
-29ºC — 565ºC
Class IV/V/Zero

MINI-P

For Staged Low Flow/ High ΔP Cavitating Service



-20ºF — 800ºF
-29ºC — 427ºC
Class IV/V/Zero

AEROFLOW Cv TABLES

UNBALANCED PLUG THROTTLING (UBP) Cv Table
ANSI Class 150 – 2500

Linear and Equal %					
Valve Size in (DN)	**Stroke** in (mm)	**Stem Dia.** in (mm)	**Seat Dia.** in (mm)	**Min. Cv Controllable**	**Max. Cv**
1 (25)	1 (25)	0.75 (20)	1.00 (25)	0.2	16
1.5 (40)	1 (25)	0.75 (20)	1.50 (40)	0.2	30
2 (50)	1.5 (40)	0.75 (20)	2.25 (57)	0.3	57
3 (80)	2 (50)	0.75 (20)	3.00 (80)	0.4	120

CAGE THROTTLING (UBC, BL, BH, PB, T[2]) Cv Table
ANSI Class 150 – 2500

Flow Characteristic										
							LINEAR		**EQUAL %**	
							Max. Cv		**Max. Cv**	
Valve Size	**Stroke**	**Stem Dia.[1]**		**Seat Dia.**						
		150-600	**900-2500**	**150-600**	**900-2500**	**Min Cv**	**ANSI**	**ANSI**	**ANSI**	**ANSI**
in. (DN)	in. (mm)	in. (mm)	in. (mm)	in. (mm)	in. (mm)	**Controllable**	150-600	900-2500	150-600	900-2500
2 (50)	1.5 (40)	0.75 (20)	0.75 (20)	2.21 (56)	2.21 (56)	0.6	65	60	55	50
3 (80)	2 (50)	0.75 (20)	0.75 (20)	2.96 (75)	2.96 (75)	0.8	140	130	125	120
4 (100)	2 (50)	0.75 (20)	0.75 (20)	3.80 (97)	3.80 (97)	0.9	210	200	190	180
6 (150)	3 (80)	1.00 (25)	1.00 (25)	5.31 (135)	5.31 (135)	1.4	470	450	420	400
8 (200)	3 (80) 4 (100)	1.25 (32)	1.25 (32)	7.06 (179)	7.06 (179)	1.8	725 830	700 800	650 750	580 720
10 (250)	3 (80) 4 (100)	1.25 (32)	1.5 (40)	10 (250)	8.5 (216)	5.0	1375 1550	1020 1160	1230 1390	850 1040
12 (300)	3 (80) 4 (100)	1.25 (32)	1.5 (40)	11.9 (301)	10 (250)	6.0	1740 2020	1300 1470	1560 1790	1080 1320
14 (350)	3 (80) 4 (100)	1.25 (32)	1.5 (40)	12.5 (318)	11.86 (301)	7.5	— —	1650 1950	— —	1370 1750
16 (400)	3 (80) 4 (100)	1.25 (32)	1.5 (40)	14.7 (373)	12.5 (318)	7.5	2500 3100	1850 2200	2250 2750	1530 1980

1. Stem diameter for T2 trim is 1/2" for 2-4" sizes and 3/4" for 6" & 8" sizes.

AEROFLOW Cv TABLES

LES-SONIC CAGE THROTTLING Cv Table

Flow Characteristic - LINEAR

Valve Size in (DN)	Stroke in (mm)	Stem Dia.[1] 150-600 in (mm)	Stem Dia.[1] 900-2500 in (mm)	Seat Dia. 150-600 in (mm)	Seat Dia. 900-2500 in (mm)	Min. Cv Controllable	ΔP/P1 ≤ 0.6 150-600	ΔP/P1 ≤ 0.6 900-2500	ΔP/P1 >0.6 ≤ 0.8 150-600	ΔP/P1 >0.6 ≤ 0.8 900-2500	ΔP/P1 >0.8 ≤ 0.99[2] 150-600	ΔP/P1 >0.8 ≤ 0.99[2] 900-2500
2 (50)	1.5 (40) 2 (50)	0.75 (20)	0.75 (20)	2.21 (56)	2.21 (56)	0.60	45 60	45 60	30 40	30 40	15 23	15 23
3 (80)	2 (50) 3 (80)	0.75 (20)	0.75 (20)	2.96 (75)	2.96 (75)	0.80	100 150	100 150	55 82	55 82	30 45	30 45
4 (100)	2 (50) 3 (80)	0.75 (20)	0.75 (20)	3.80 (97)	3.80 (97)	0.90	150 225	150 225	75 110	75 110	40 60	40 60
6 (150)	3 (80) 4 (100)	1.00 (25)	1.00 (25)	5.31 (135)	5.31 (135)	1.40	330 440	330 440	150 200	150 200	85 115	85 115
8 (200)	3 (80) 4 (100) 5 (125)	1.25 (32)	1.25 (32)	7.06 (179)	7.06 (179)	1.80	430 530 720	430 530 720	200 265 330	200 265 330	110 150 180	110 150 180
10 (250)	3 (80) 4 (100) 5 (125)	1.25 (32)	1.5 (40)	10 (250)	8.5 (216)	5.02	620 830 1030	535 720 890	280 375 470	240 320 400	160 210 270	135 180 225
12 (300)	3 (80) 4 (100) 5 (125)	1.25 (32)	1.5 (40)	11.9 (301)	10 (250)	6.00	760 1010 1270	620 830 1030	340 450 570	280 375 470	190 250 315	160 210 270
14 (350)	3 (80) 4 (100) 5 (125)	1.25 (32)	1.5 (40)	12.5 (318)	11.86 (301)	7.50	— — —	760 1010 1270	— — —	340 450 570	— — —	190 250 315
16 (400)	3 (80) 4 (100) 5 (125)	1.25 (32)	1.5 (40)	14.7 (373)	12.5 (318)	7.50	920 1230 1540	790 1060 1320	410 550 690	350 465 585	230 310 390	200 270 335

1. Stem diameter for T2 trim is 1/2" for 2-4" sizes and 3/4" for 6" size.

2. For ratios above .9 consult Leslie Controls.

LES-CAV CAGE THROTTLING (Single/Multi - Stage) Cv Table

Flow Characteristic - LINEAR

Valve Size in (DN)	Stroke in (mm)	Stem Dia.[1] 150-600 in (mm)	Stem Dia.[1] 900-2500 in (mm)	Seat Dia. 150-600 in (mm)	Seat Dia. 900-2500 in (mm)	Min.Cv Contr.	ANSI 150-600 CAV I	CAV II	CAV III	CAV IV	CAV V	ANSI 900-2500 CAV I	CAV II	CAV III	CAV IV	CAV V
2 (50)	1.5 (40) 2 (50)	.75 (20)	.75 (20)	2.2 (56)	2.2 (56)	0.6	40 52	15 20	9 12	6 7	4 6	40 52	15 20	9 12	6 7	4 6
3 (80)	2 (50) 3 (80)	.75 (20)	.75 (20)	2.96 (75)	2.96 (75)	0.8	75 110	28 48	18 28	10 14	8 12	75 110	28 48	18 28	10 14	8 12
4 (100)	2 (50) 3 (80)	.75 (20)	.75 (20)	3.80 (97)	3.80 (97)	0.9	95 140	45 68	27 41	18 26	13 22	95 140	45 68	27 41	18 26	13 22
6 (150)	3 (80) 4 (100)	1 (25)	1 (25)	5.31 (135)	5.31 (135)	1.4	200 265	110 145	58 80	38 50	28 38	200 265	110 145	58 80	38 50	28 38
8 (200)	3 (80) 4 (100) 5 (125)	1.25 (32)	1.25 (32)	7.06 (179)	7.06 (179)	1.8	270 340 430	150 225 300	106 140 180	58 87 116	50 75 100	270 340 430	150 225 300	106 140 180	58 87 116	50 75 100
10 (250)	3 (80) 4 (100) 5 (125)	1.25 (32)	1.5 (40)	10 (250)	8.5 (216)	5.0	370 490 620	210 280 350	150 195 250	81 122 162	70 106 140	320 425 530	185 250 310	127 168 215	70 104 140	60 90 120
12 (300)	3 (80) 4 (100) 5 (125)	1.25 (32)	1.5 (40)	11.9 (301)	10 (250)	5.6	450 600 750	250 330 415	178 235 300	97 146 195	84 126 168	370 490 620	210 280 350	150 195 250	81 122 162	70 106 140
14 (350)	3 (80) 4 (100) 5 (125)	1.25 (32)	1.5 (40)	12.5 (318)	11.86 (301)	6.6	345 580 730	250 330 415	178 235 300	97 146 195	84 126 168	345 580 730	250 330 415	178 235 300	97 146 195	84 126 168
16 (400)	3 (80) 4 (100) 5 (125)	1.25 (32)	1.5 (40)	14.7 (373)	12.5 (318)	6.9	550 730 910	310 410 515	220 290 370	120 180 240	104 150 200	470 630 780	260 345 430	187 248 320	103 154 205	88 133 177

AEROFLOW Cv & FLOW COEFFICIENT TABLES

Mini-P (3-STAGE) PLUG THROTTLING Cv Table

Good for Cavitation but not for Flashing

Flow Characteristic - LINEAR					
Valve Size in/DN	**Stroke** in/mm	**Stem Dia.** in/mm	**Seat Dia.** in/mm	**Min Cv**	**Max Cv**
1/25 or 1.5/40	0.75/20	0.75/20	0.875/22	0.08	1.2 3 5

MICROTAPER® PLUG THROTTLING Cv Table

Good for Flashing but not for Cavitation

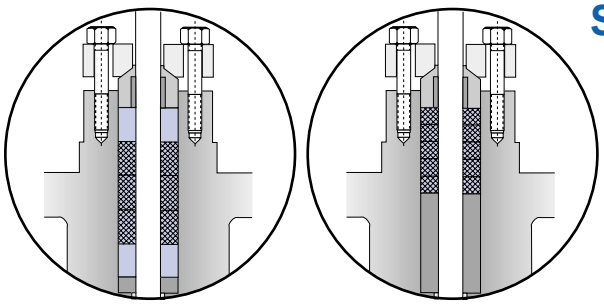
Flow Characteristic - LINEAR					
Valve Size in/DN	**Stroke** in/mm	**Stem Dia.** in/mm	**Seat Dia.** in/mm	**Min Cv**	**Max Cv**
1/25 or 1.5/40	1/25	0.75/20	0.375/9.5 0.375/9.5 0.375/9.5 0.50/13 .75/19 1.0/25	0.01 0.01 0.01 0.013 0.02 0.03	0.3 0.6 1.2 2.1 4.8 8.5

Flow Coefficients Globe vs. Angle

Flow Coefficients/Allowable ΔP for Aeroflow Anti-Cav Trim Configurations					
	Globe		**Angle**		**Maximum Pressure**
	FL	**XT**	**FL**	**XT**	**Differential psi (bar)[1]**
Unbalanced Plug Throttling (Flow under seat)	0.92	0.80	0.90	0.76	N/A
Unbalanced Plug Throttling (Flow over seat)[2]	0.75	0.50	0.65	0.40	N/A
Cage (UBC/LT/HT) Throttling (Flow under seat)	0.88	0.76	0.85	0.72	N/A
Cage (LT/HT/PB/T2) Throttling (Flow over seat)	0.85	0.72	0.83	0.70	N/A
Les-Sonic (Flow under seat)	N/A	0.68	N/A	0.64	N/A
Les-Sonic (Flow over seat)	N/A	0.66	N/A	0.62	N/A
Les-Cav I (Flow over seat)	0.94	N/A	0.92	N/A	400 (27.6)
Les-Cav II (Flow over seat)	0.96	N/A	0.94	N/A	750 (51.7)
Les-Cav III (Flow over seat)	0.98	N/A	0.96	N/A	2000 (138)
Les-Cav IV (Flow over seat)	0.99	N/A	0.97	N/A	3000 (207)
Les-Cav V (Flow over seat)	0.99	N/A	0.98	N/A	4000 (276)
MicroTaper® (Flow under seat)	0.92	0.80	0.90	0.78	N/A
MicroTaper® (Flow over seat)	0.70	0.45	0.60	0.35	N/A
Mini-P (Flow under seat)	0.98	N/A	0.96	N/A	2000 (138)

1. Other trim Configurations Maximum Pressure Differential will be limited on Allowable Liquid Velocities. These values are rules of thumb and may vary with specific customer conditions.

2. Consult factory for limitations of using unbalanced trim to flow over seat.



LG BTG

STANDARD PACKING CONFIGURATIONS

LAMINATED GRAPHITE (LG)
Precision die-cut laminated graphite rings provide a reliable, tight stem seal up to operating temperatures of 1050ºF (565ºC).

BRAIDED TEFLON GRAPHITE (BTG)
Split rings allow packing replacement without removal of actuator. Graphite impregnated PTFE provides 500ºF (260ºC) service temperature, better "memory" and sealing than pure PTFE rings, lowered stem hysteresis, and is ideal for fluids that contain suspended particles.

DOUBLE PTFE V-RING
Also available.

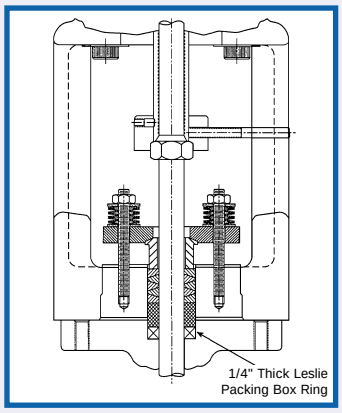
NEW No More Tightening

Leslie Controls PROTECTS YOUR VALVE INVESTMENT

with a leak free WedgeSeal packing system

from CHESTERTON

WedgeSeal™ Packing System



The WedgeSeal packing system reduces stem friction and gland loads. The WedgeSeal arrangement transfers gland force with predictable precision. Patented, WedgeSeal sealing rings are available in low friction, PTFE mesh over graphite construction or pure graphite. Both meet API 589 Fire Test requirements.

CHESTERTON WedgeSeal™ SOLUTIONS

MAXIMUM SEALABILITY
- Transfers gland force efficiently to enhance sealing
- Packing volume loss and relaxation is minimized with low PTFE content

VALVE RESPONSIVENESS
- Combines the friction characteristics of PTFE with the physical characteristics of graphite for unmatched performance. Step response below 1% is typical to maximize process control
- Minimizes valve hunting and improves process quality and production yields

CONSISTENT PERFORMANCE
- Engineered sets ensure valve performance and repeatablility
- Wiper rings are available for abrasive service

MAINTENANCE FREE
- Valve live loading stores 800% more elastic energy to maintain optimized gland load
- Frequent valve adjustments are eliminated

COMMON AIR OPERATED VALVE CONCERNS

VALVE LEAKAGE
- Frequent stem actuation can cause loss of packing gland load that leads to stem leakage.
- PTFE v-rings will relax and wear in service. Braided packing will consolidate in-service and lose gland load.

POOR VALVE RESPONSIVENESS
- Control valve responsiveness is critical to process quality and control. High packing friction from graphite rings causes poor step response and process control, especially in lower temperature valves.
- Friction causes valves to constantly hunt for the correct position resulting in continuous stem actuation.

VARIATIONS IN VALVE PERFORMANCE
- Variations in packing friction can cause unit start-up problems. Inconsistent gland loading and sealing system designs can be factors.

FREQUENT VALVE ADJUSTMENTS
- Tightening packing glands in the field to reduce valve leakage can be all too common. Once tightened, uncontrolled packing friction can limit operability.

POOR VALVE RELIABILITY
- Poor control valve reliability can have a dramatic affect on production costs, even before it is removed from service. Removing control valves from service can be expensive.

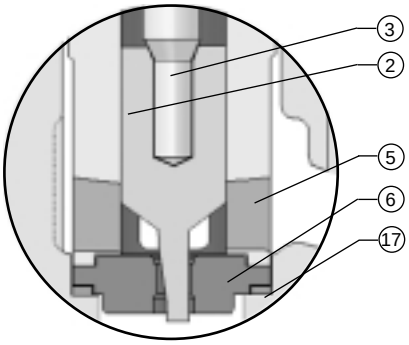
WedgeSeal Packing System for temperatures greater than 230ºC (450ºF)

Low overall PTFE content increases thermal stability

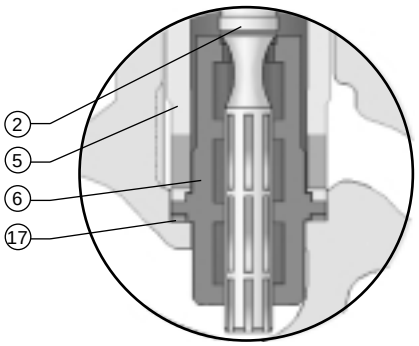
1724E PTFE Sealing System for maximum chemical compatability

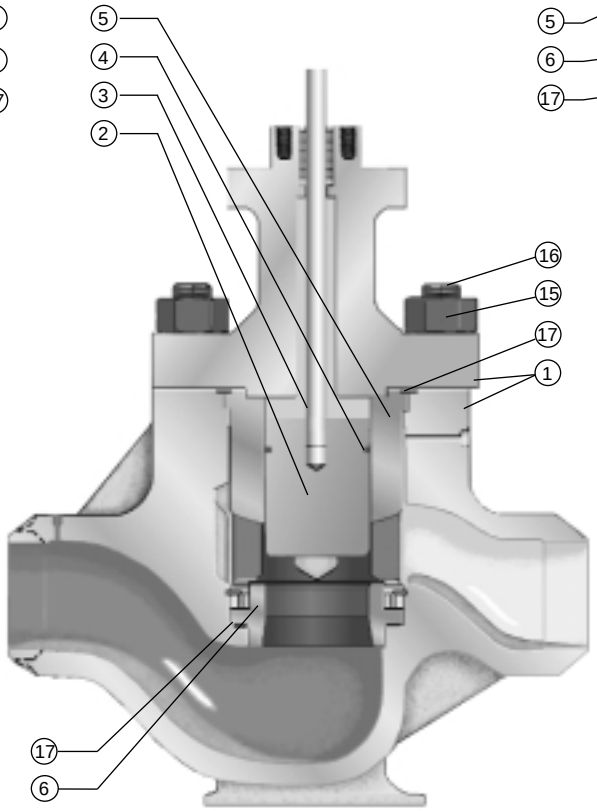
AEROFLOW PARTS - UNBALANCED

MicroTaper® Trim



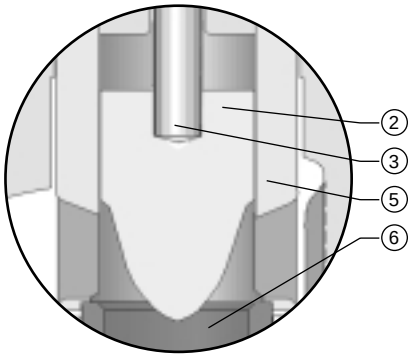
Mini-P Multi-Stage Plug ThrottlingTrim





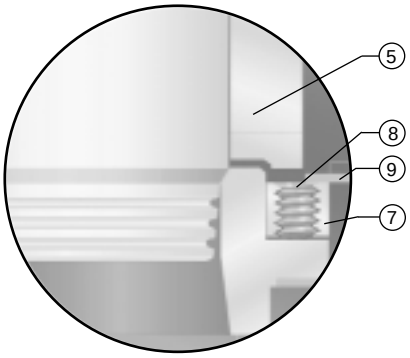
Body/bonnet Module
shown with
Unbalanced Cage Throttling Trim

Unbalanced Plug Throttling Trim



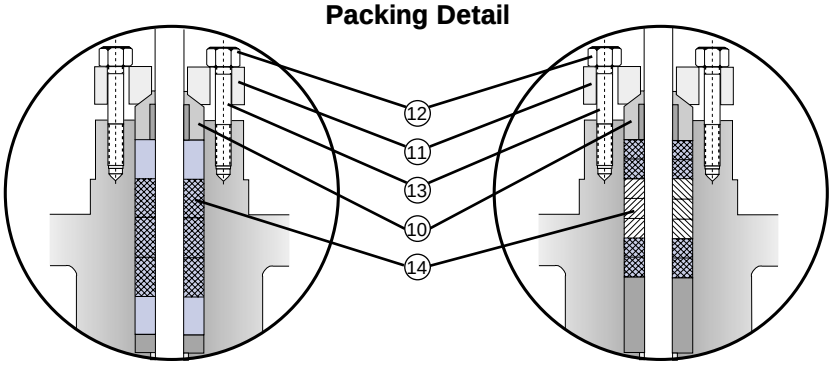
Load Ring Detail & VP 900-2500

(Cage Throttling 4" Valve Size and Up) 900-2500 Class



Packing Detail

Packing Detail w/BTG Packing



Packing Detail w/Laminated Graphite Packing

AEROFLOW MATERIAL SPECIFICATION - UNBALANCED

Item	Description	Material	Material Specification
1	Body/Bonnet	Carbon Steel Stainless Steel Chrome-moly Steel	ASTM A-216 GR WCB ASTM A-351 GR CF8M ASTM A-217 GR WC9
2	Valve Plug Mini P Trim only Microtaper Trim only	Stainless Steel 1 3-8 MO Stainless Steel	AISI SST 420 ASTM A-564 AISI SST 431
3	Valve Stem	Nitronic 60	ASTM A-276
4	Piston Ring	Stellite	Stellite #25
5	Cage[1]	Stainless Steel	AISI SST 440
6	Seat Ring	Stainless Steel	AISI SST 440C
7	Load Ring	Stainless Steel	400 Series
8	Load Screws	Stainless Steel	ASTM F880
9	Retaining Ring	Stainless Steel	AISI SST 302
10	Packing Follower	Stainless Steel	AISI SST 303
11	Packing Flange	Stainless Steel	AISI 1144CF
12	Hex Nut	Stainless Steel	ASTM A-194 GR4
13	Studs	Alloy Steel	ASTM A-193 B16
14	Packing	BTG or Laminated Graphite	
15	Hex Nut	Alloy Steel Alloy Steel (WCB body)	ASTM A-194 GR7 ASTM A-194 GR2
16	Stud	Alloy Steel Alloy Steel (WCB body)	ASTM A-193 B16 ASTM A-193 GR7
17	Gasket	Graphite	Inconel 600

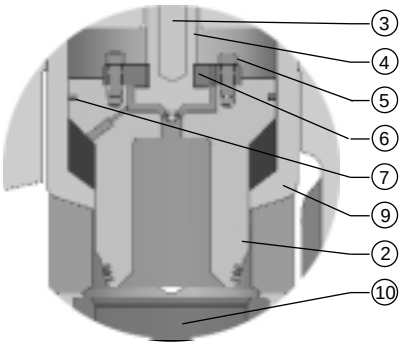
NOTE:
INCONEL® is a trademark of the Inco Family of Companies
MICROTAPER® is a registered trademark of Leslie Controls, Inc.
STELLITE® is a trademark of Stoody Deloro Stellite, Inc.
NITRONIC 60® is a trademark of Armco, Inc.

NACE Material available upon request

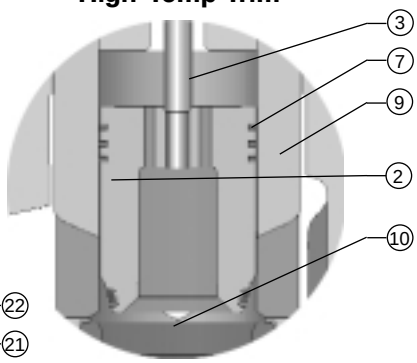
1. Included in all other trim modules unless otherwise listed

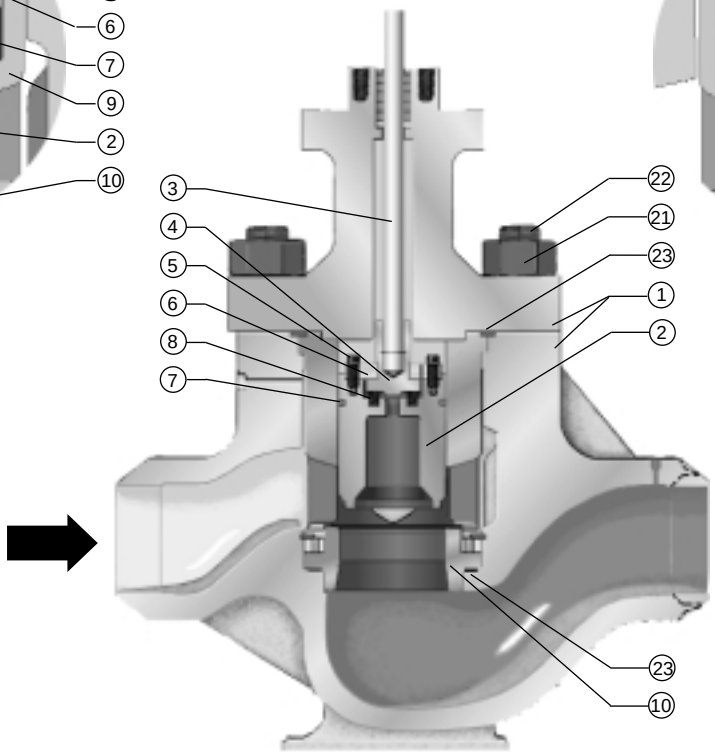
AEROFLOW PARTS - BALANCED

T² Trim



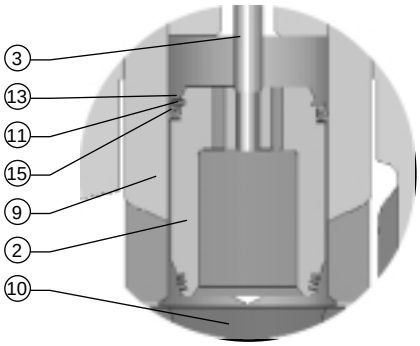
Balanced High-Temp Trim





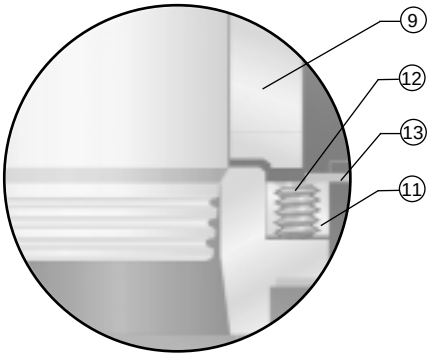
Body/bonnet Module
shown with
Pilot Balanced Trim

Balanced Low-Temp Trim



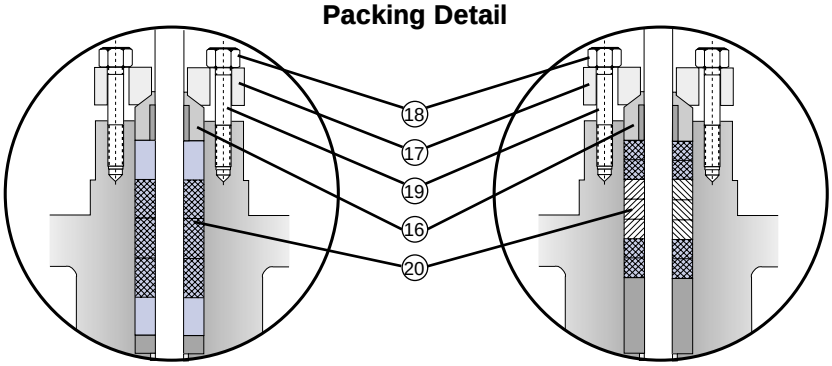
Load Ring Detail & VP 900-2500

(Cage Throttling 4" Valve Size and Up) 900-2500 Class



Packing Detail

Packing Detail w/BTG Packing



Packing Detail w/Laminated Graphite Packing

AEROFLOW MATERIAL SPECIFICATION - BALANCED

Item	Description	Material	Material Specification
1	Body/Bonnet	Carbon Steel Stainless Steel Chrome-moly	ASTM A-216 GR WCB ASTM A-351 GR CF8M ASTM A-217 GR WC9
2	Valve Plug	Stainless Steel	AISI 420
3	Valve Stem	Nitronic 60	ASTM A-276
4	Pilot Plug	Stainless Steel	AISI SST 431
5	Socket Head Cap Screw	18-8 Stainless Steel	AISI SST 300
6	Pilot Plate	Stainless Steel	ASTM A-582
7	Piston Ring	Stellite	Stellite #25
8	Spring	Inconel	INCO: x 750
9	Cage[1]	Stainless Steel	AISI SST 440
10	Seat Ring	Stainless Steel	AISI SST 440 C
11	Load Ring[2]	Stainless Steel	400 Series
12	Load Screws[2]	Stainless Steel	ASTM F880
13	Retaining Ring	Stainless Steel	AISI SST 302
14	Seal Retainer	Stainless Steel	ASTM A-240
15	Seal	PTFE	Fluo 36
16	Packing Follower	Stainless Steel	AISI SST 303
17	Packing Flange	Stainless Steel	AISI 1144 CF
18	Hex Nut	Stainless Steel	ASTM A-194 GR4
19	Studs	Alloy Steel	A-193 B16
20	Packing	BTG or Laminated Graphite	
21	Hex Nut	Alloy Steel Alloy Steel (WCB only)	ASTM 194 GR7 ASTM 194 GR2H
22	Stud	Alloy Steel Alloy Steel (WCB only)	ASTM 193 B16 ASTM 193 GR7
23	Gasket	Graphite	Inconel 600

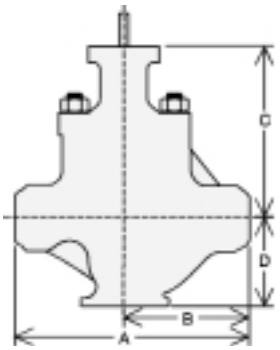
NOTE: Common to all trim modules including Les-Cav/Les-Sonic unless otherwise listed

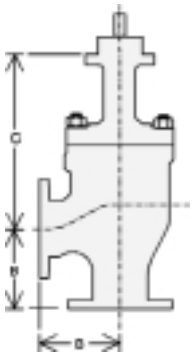
INCONEL® is a trademark of the Inco Family of Companies
NITRONIC 60® is a trademark of Armco, Inc.
STELLITE® is a trademark of Stoody Deloro Stellite, Inc.

NACE Material available upon request

1. Cage Guided 4" valve size and up (900-2500 Class)
2. Malcolmized® 150-600 Class above 700ºF and 900-4500 Class above 650ºF.

AEROFLOW BODY DIMENSIONS[3] - CLASS 150-600





DIMENSIONS IN INCHES					Shpg. Info.[1]		DIMENSIONS IN MILLIMETERS					Shpg. Info.[1]	
SIZE	A	B	C[2]	D	WGT.	VOL.	SIZE	A	B	C[2]	D	WGT.	VOL.
ANSI 150/300/600# PN16-100 BWE/SWE							**ANSI 150/300/600# PN16-100 BWE/SWE**						
1	8¼	4⅛	8	3	53 lb.	2 ft^3	25	210	105	203	76	24 kg	0.1 m^3
1½	9⅞	4 15/16	8	3 1/16	63 lb.	2 ft^3	40	251	125	203	78	29 kg	0.1 m^3
2	11¼	5⅝	12¾	3 11/16	94 lb.	3 ft^3	50	286	143	324	94	43 kg	0.1 m^3
3	13¾	6⅞	14½	4¾	160 lb.	4 ft^3	75	337	168	368	121	73 kg	0.2 m^3
4	15½	7¾	16½	5 5/16	215 lb.	6 ft^3	100	394	197	419	141	98 kg	0.2 m^3
6	20	10	21 3/16	6 13/16	450 lb.	11 ft^3	150	508	254	548	173	204 kg	0.4 m^3
8	24	12	24	8⅜	860 lb.	17 ft^3	200	610	305	610	225	390 kg	0.5 m^3
10	29⅝	14 13/16	18¾	9¾	1100 lb.	22 ft^3	250	752	376	476	248	499 kg	0.6 m^3
12	32¼	16⅛	20½	10¾	1700 lb.	27 ft^3	300	819	410	521	273	771 kg	0.8 m^3
16	43⅝	21 13/16	23½	12¾	3200 lb.	53 ft^3	400	1108	552	597	324	1451 kg	1.5 m^3
ANSI 150# PN16 Flanged							**ANSI 150# PN16 Flanged**						
1	7¼	3⅝	8	3	56 lb.	2 ft^3	25	184	92	203	76	25 kg	0.1 m^3
1½	8¾	4⅜	8	3 1/16	65 lb.	2 ft^3	40	222	111	203	78	29 kg	0.1 m^3
2	10	5	12¾	3 11/16	95 lb.	3 ft^3	50	284	127	324	94	43 kg	0.1 m^3
3	11¾	5⅞	14½	4¾	155 lb.	4 ft^3	75	298	149	368	121	70 kg	0.1 m^3
4	13⅞	6 15/16	16½	5 5/16	230 lb.	5 ft^3	100	352	176	419	141	105 kg	0.3 m^3
6	17¾	8⅞	21 3/16	6 13/16	505 lb.	9 ft^3	150	451	225	548	173	230 kg	0.3 m^3
8	21⅞	10⅝	24	8⅜	930 lb.	14 ft^3	200	543	270	610	225	423 kg	0.4 m^3
10	26½	14 13/16	18¾	9¾	1120 lb.	18 ft^3	250	673	376	476	248	508 kg	0.5 m^3
12	29	16⅛	20½	10¾	1730 lb.	23 ft^3	300	737	410	521	273	785 kg	0.7 m^3
16	40	21 13/16	23½	12¾	3250 lb.	46 ft^3	400	1016	554	597	324	1474 kg	1.3 m^3
ANSI 300# PN40-64 Flanged							**ANSI 300# PN40-64 Flanged**						
1	7¾	3⅜	8	3	58 lb.	2 ft^3	25	197	98	203	76	26 kg	0.1 m^3
1½	9¼	4⅝	8	3 1/16	67 lb.	2 ft^3	40	235	117	203	78	30 kg	0.1 m^3
2	10½	5¼	12¾	3 11/16	97 lb.	3 ft^3	50	267	133	324	94	44 kg	0.1 m^3
3	12½	6¼	14½	4¾	160 lb.	4 ft^3	75	311	159	368	121	73 kg	0.1 m^3
4	14½	7¼	16½	5 5/16	240 lb.	6 ft^3	100	368	184	419	141	109 kg	0.2 m^3
6	18⅝	9 5/16	21 3/16	6 13/16	525 lb.	10 ft^3	150	473	237	548	173	239 kg	0.3 m^3
8	22⅝	11 3/16	24	8⅜	950 lb.	15 ft^3	200	568	284	610	225	432 kg	0.5 m^3
10	27⅛	13 5/16	18¾	9¾	1140 lb.	20 ft^3	250	708	354	476	248	517 kg	0.6 m^3
12	30½	15¼	20½	10¾	1760 lb.	25 ft^3	300	775	387	521	273	798 kg	0.7 m^3
16	41⅝	20 13/16	23½	12¾	3300 lb.	49 ft^3	400	1057	529	597	324	1497 kg	1.4 m^3
ANSI 600# PN40-64 Flanged							**ANSI 600# PN40-64 Flanged**						
1	8¼	4⅛	8	3	59 lb.	2 ft^3	25	210	105	203	76	27 kg	0.1 m^3
1½	9⅞	4 15/16	8	3 1/16	69 lb.	2 ft^3	40	251	125	203	78	31 kg	0.1 m^3
2	11¼	5⅝	12¾	3 11/16	100 lb.	3 ft^3	50	286	143	324	100	45 kg	0.1 m^3
3	13¾	6⅞	14½	4¾	170 lb.	4 ft^3	75	337	168	368	121	77 kg	0.2 m^3
4	15½	7¾	15⅞	5 5/16	260 lb.	6 ft^3	100	394	197	419	141	118kg	0.2 m^3
6	20	10	21 3/16	6 13/16	450 lb.	11 ft^3	150	508	254	548	173	204 kg	0.3 m^3
8	24	12	24	8⅜	1000 lb.	17 ft^3	200	610	305	610	225	390 kg	0.5 m^3
10	29⅝	14 13/16	18¾	9¾	1160 lb.	22 ft^3	250	752	376	476	248	526 kg	0.6 m^3
12	32¼	16⅛	20½	10¾	1740 lb.	28 ft^3	300	819	410	521	273	812 kg	0.8 m^3
16	43⅝	21 13/16	23½	12¾	3350 lb.	53 ft^3	400	1108	554	597	324	1520 kg	1.5 m^3

NOTE: DIMENSIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.
Request certified drawings for piping layout and construction purposes.

1. Approximate weight and volume (actuator not included)
2. Consult factory for extended travel (C dimension)
3. ISA - 575.15 - 1986
4. Consult Factory for installation dimensions for 150-600 Angle Valves

AEROFLOW BODY DIMENSIONS[3] - CLASS 900-2500

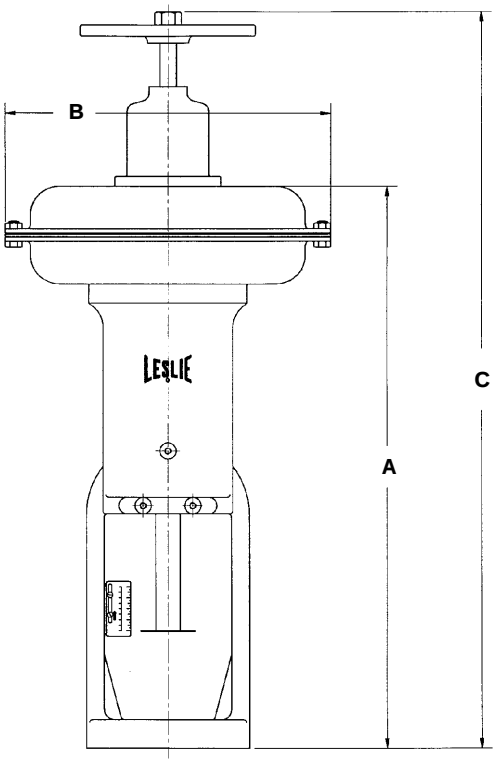
DIMENSIONS IN INCHES					Shpg. Info.[1]		DIMENSIONS IN MILLIMETERS					Shpg. Info.[1]	
SIZE	A	B	C[2]	D	WGT.	VOL.	SIZE	A	B	C[2]	D	WGT.	VOL.
ANSI CLASS 900/1500 PN160-250 BWE/SWE							**ANSI CLASS 900/1500 PN160-250 BWE/SWE**						
1	11	5½	9½	3⅜	87 lb.	2 ft^3	25	279	140	241	79	39 kg	0.1 m^3
1½	13	6½	9⅞	3½	125 lb.	3 ft^3	40	330	165	251	89	57 kg	0.1 m^3
2	14¾	7⅜	12¾	4 15/16	230 lb.	4 ft^3	50	400	200	323	379	104 kg	0.1 m^3
3	18⅜	9 1/16	14½	6⅛	346 lb.	7 ft^3	75	460	251	368	156	157 kg	0.2 m^3
4 Glb	20⅞	11 3/16	15¾	7¾	484 lb.	10 ft^3	100	574	308	400	197	220 kg	0.3 m^3
4 Angl	N/A	11 3/16	15¾	7¾	484 lb.	10 ft^3	100	574	308	400	197	220 kg	0.3 m^3
6	30¼	15⅛	20¾	10 5/16	1311 lb.	24 ft^3	150	819	384	527	259	595 kg	0.7 m^3
8	32¾	16⅜	23 9/16	13¼	3069 lb.	34 ft^3	200	1022	416	598	337	1392 kg	1.0 m^3
10	39	19½	28½	16½	3800 lb.	52 ft^3	250	991	495	724	419	1723 kg	1.5 m^3
12	44½	22¼	30½	19¾	5700 lb.	74 ft^3	300	1130	565	775	502	2585 kg	2.1 m^3
16	56	28	34½	26	8100 lb.	134 ft^3	400	1422	711	876	660	3674 kg	3.8 m^3
ANSI CLASS 2500 PN400 BWE/SWE							**ANSI CLASS 2500 PN400 BWE/SWE**						
1	12½	6¼	9½	3⅜	90 lb.	3 ft^3	25	318	159	241	79	41 kg	0.1 m^3
1½	14⅛	7½	9⅞	3½	130 lb.	3 ft^3	40	359	191	251	89	59 kg	0.1 m^3
2	15¾	7⅞	12¾	4-4 5/16	250 lb.	5 ft^3	50	375	187	323	379	113 kg	0.1 m^3
3	19⅝	9 13/16	14½	6⅛	511 lb.	8 ft^3	75	460	230	368	156	232 kg	0.2 m^3
4 Glb	22⅝	12 1/16	15¾	8	625 lb.	11 ft^3	100	530	301	400	203	283 kg	0.3 m^3
4 Angl	N/A	11 5/16	15¾	8	625 lb.	11 ft^3	100	530	301	400	203	283 kg	0.3 m^3
6	32¼	16⅛	20¾	11	1590 lb.	27 ft^3	150	768	409	527	280	721 kg	0.8 m^3
8	40¼	20⅛	23 9/16	14¼	4059 lb.	51 ft^3	200	832	511	598	362	1841 kg	1.4 m^3
10	50	25	28½	17½	4900 lb.	84 ft^3	250	1270	635	724	419	2223 kg	2.4 m^3
12	56	28	30½	20¾	7100 lb.	115 ft^3	300	1422	711	775	502	3221 kg	3.3 m^3
16	Call	Call	34½	27	10600 lb.	Call ft^3	400	Call	Call	876	660	4808 kg	Call
ANSI CLASS 900 PN160 Flanged (RF and RTJ)							**ANSI CLASS 900 PN160 Flanged (RF and RTJ)**						
1	17¼	8⅝	9½	3⅜	105 lb.	4 ft^3	25	438	219	241	79	48 kg	0.1 m^3
1½	20	10	9⅞	3½	150 lb.	6 ft^3	40	508	254	251	89	68 kg	0.2 m^3
2	23¼	11⅝	12¾	4 15/16	280 lb.	9 ft^3	50	591	295	323	379	113 kg	0.3 m^3
3	26⅝	13 5/16	14½	6⅛	551 lb.	13 ft^3	75	676	338	368	156	232 kg	0.4 m^3
4 Glb	30⅜	15⅞	15¾	8	680 lb.	18 ft^3	100	770	379	400	203	283 kg	0.5 m^3
4 Angl	N/A	15 3/16	15¾	8	680 lb.	Call ft^3	100	N/A	386	400	203	283 kg	Call
6	41¾	20⅞	20¾	11	1680 lb.	43 ft^3	150	1060	530	527	280	721 kg	1.2 m^3
8	46⅞	23 1/16	23 9/16	14¼	4189 lb.	78 ft^3	200	1172	586	598	362	1841 kg	1.9 m^3
10	54	27	28½	17½	5070 lb.	106 ft^3	250	1372	686	724	419	2300 kg	2.8 m^3
12	60¾	30⅜	30½	20¾	7300 lb.	147 ft^3	300	1543	772	775	502	3311 kg	3.8 m^3
16	73½	36¾	34½	27	10840 lb.	225 ft^3	400	1867	933	876	660	4917 kg	6.5 m^3
ANSI CLASS 1500 PN250 Flanged (RF and RTJ)							**ANSI CLASS 1500 PN250 Flanged (RF and RTJ)**						
1	17¼	8⅝	9½	3⅜	105 lb.	4 ft^3	25	438	219	241	79	48 kg	0.1 m^3
1½	20	10	9⅞	3½	150 lb.	6 ft^3	40	508	254	251	89	68 kg	0.2 m^3
2	23¼	11⅝	12¾	4 15/16	280 lb.	9 ft^3	50	591	295	323	379	113 kg	0.3 m^3
3	26⅝	13 5/16	14½	6⅛	561 lb.	14 ft^3	75	708	354	368	156	254 kg	0.4 m^3
4 Glb	31⅛	16 1/16	15¾	8	690 lb.	19 ft^3	100	791	389	400	203	313 kg	0.5 m^3
4 Angl	N/A	15 9/16	15¾	8	690 lb.	Call	100	N/A	395	400	203	313 kg	Call
6	44¼	22⅛	20¾	11	1685 lb.	47 ft^3	150	1124	562	527	280	764 kg	1.4 m^3
8	50⅛	25 1/16	23 9/16	14¼	4199 lb.	90 ft^3	200	1273	637	598	362	1905 kg	2.2 m^3
10	59½	29¾	28½	17½	5100 lb.	126 ft^3	250	1511	756	724	419	2313 kg	3.3 m^3
12	67¼	33⅝	30½	20¾	7360 lb.	176 ft^3	300	1708	854	775	502	3338 kg	4.6 m^3
16	81	40½	34½	27	10980 lb.	271 ft^3	400	2057	1029	876	660	4980 kg	7.7 m^3
ANSI CLASS 2500 PN400 Flanged (RF and RTJ)							**ANSI CLASS 2500 PN400 Flanged (RF and RTJ)**						
1	20	10	9½	3⅜	110 lb.	6 ft^3	25	508	254	241	79	50 kg	0.2 m^3
1½	23⅜	11 1/16	9⅞	3½	160 lb.	8 ft^3	40	594	297	251	89	73 kg	0.2 m^3
2	26¼	13⅛	12¾	4 15/16	290 lb.	12 ft^3	50	667	333	323	379	113 kg	0.3 m^3
3	33⅜	16 1/16	14½	6⅛	576 lb.	27 ft^3	75	848	424	368	156	232 kg	0.6 m^3
4 Glb	38⅛	19 1/16	15¾	8	710 lb.	37 ft^3	100	968	562	400	203	283 kg	0.8 m^3
4 Angl	N/A	19 1/16	15¾	8	710 lb.	Call	100	N/A	484	400	203	283 kg	Call
6	54¼	27⅛	20¾	11	1745 lb.	73 ft^3	150	1378	689	527	280	721 kg	2.0 m^3
8	65¾	32⅝	23 9/16	14¼	4249 lb.	124 ft^3	200	1670	829	598	362	1841 kg	3.6 m^3
10	83½	41¾	28½	17½	5180 lb.	240 ft^3	250	2121	1060	724	419	2350 kg	6.2 m^3
12	93	46½	30½	20¾	7460 lb.	336 ft^3	300	2362	1181	775	502	3384 kg	8.5 m^3
16	C/F	C/F	34½	27	11120 lb.	C/F	400	C/F	C/F	876	660	5044 kg	C/F

NOTE: DIMENSIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.
Request certified drawings for piping layout and construction purposes.

1. Approximate weight and volume (actuator not included)
2. Consult factory for extended travel (C dimension)
3. ISA - 575.15 - 1986
4. Consult Factory for installation dimensions for 150-600 Angle Valves

AEROFLOW ACTUATOR DIMENSIONS

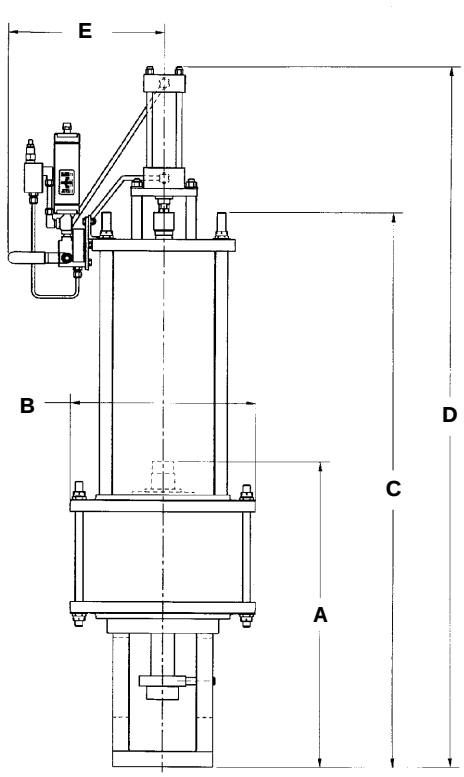
Diaphragm Actuator



DIAPHRAGM ACTUATOR

SIZE	STANDARD A	STANDARD B	w/Handwheel C	WEIGHT w/o	WEIGHT w/Hndwl
55AFR	16¼	11 15/16	25 9/16	60	65
55AF	18⅝	11 15/16	26 9/16	50	55
85AFR	22 15/32	14¾	31 13/16	120	122
85AF	25 11/16	14¾	33⅝	96	101

Piston Actuator



PISTON ACTUATOR

SIZE	NOM. AREA in²	DA A	DA & DASR B†	DASR C	DASR w/ HOD D	DASR w/ HOD E	WEIGHT DA	WEIGHT DASR	SHPG. VOL. ft.³ DA	SHPG. VOL. ft.³ DASR
6"	28	16½	7⅞	25 15/16	35⅜	11½	82	122	2.1	2.8
10"	78	17 11/16	10½	33⅞	45¾	12 13/16	132	172	3.7	5
13"	130	26	15¾	47 5/16	59 13/16	13 3/16	232	352	8.1	11.8
16"	201	24¾	19	42 1/16	51 13/16	14 11/16	295	425	9.7	14
20"	314	24¾	23	42 1/16	51 13/16	14 11/16	415	535	13.8	20

DA - Double Acting
DASR - Double Acting w/Spring Return
† Corner to corner dimension not shown.

Leslie's unique optional Manual Hydraulic Override System (HOD), shown above, assures easy, accurate manual valve positioning using a hydraulic hand pump to position the valve plug in 1/8" increments per pump stroke.

AEROFLOW SPECIFICATION

Valve Body

1.1.1 Body should have integrally cast flow control vanes in the inlet, outlet and body gallery to reduce turbulence and allow maximum Cv/Size ratios.

1.1.2 Body should be designed with pressure taps on the inlet and outlet side so that adjacent piping penetration points are not needed.

1.1.3 Globe and angle body configurations should be designed so that trim modules are fully interchangeable.

1.1.4 High pressure body designs (900-2500#) should allow for machining to accept an outlet pipe nominally one size larger than the valve body size.

Valve Trim

1.2.1 Pilot balanced trim to have capability to shutoff to ANSI Class VI or Zero (cc/min) Leakage utilizing metal-to-metal seats.

1.2.2 Valve plug should be designed with a three stage labyrinth style plug tip.

1.2.3 Trim design should allow for reduction down to a 0.2 factor of full Cv, without changing the original plug or seat ring

1.2.4 Cage design should allow for modification of flow win dow for a desired flow characteristic without changing plug assembly.

1.2.5 Unbalanced designs should allow for reduction of Cv without reducing seat ring diameter.

Actuators

2.1.1 Actuator should be designed in a steel or composite construction that is rated for 150 psig working pressure.

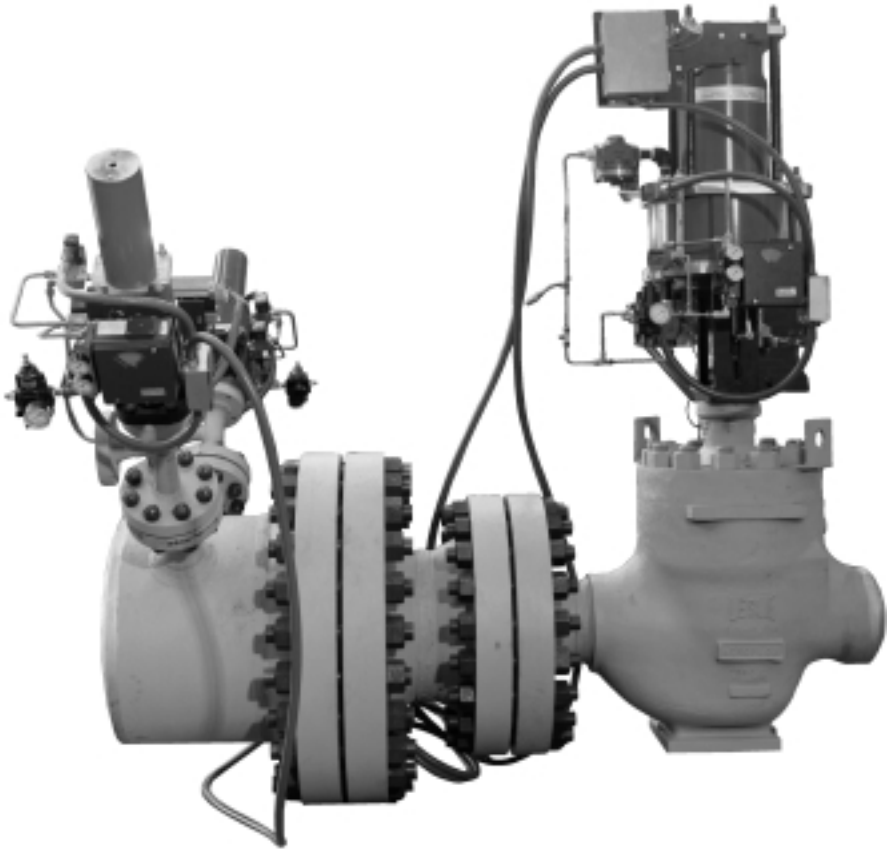
2.1.2 Air failure spring should be mounted outside air cylinder to minimize residual air volume.

2.1.3 Spring cartridge should be mounted so that accessibility for reversing failure modes is easily accomplished.

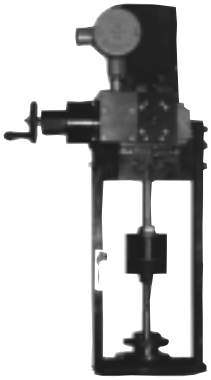
2.1.4 Actuator/spring assembly shall be designed to provide a low center of gravity for vibration and seismic resistance.

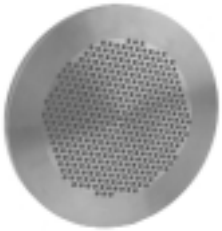
Steam Conditioning Station

Leslie offers it's unique Aeroflow pressure reducing valve in combination with a state of the art, variable area, mechanically atomized desuperheating system. This combination system meets today's stringent requirements for control and turndown without the temperature stress problems associated with combination units. We offer complete fabricated systems that include either Globe or Angle body PRV designs with noise attenuation plates (as required), customized trim selection and desuperheating equipment.



AEROFLOW ACCESSORIES





Siemen's Series 760 Positioners
- Pneumatic: Model 760P
- Electropneumatic: Model 760E
- Optional internal limit switches
- Optional valve position transmission

Other Positioners
- PMV Series 1200, 2000 and P5
- ABB TZID-C
- SMAR FY302 Fieldbus
- Siemens PS2
- Bailey AV Series

Process Controllers
- Electropneumatic: PMC-1
- Pneumatic: PDAP/PRAP

Solenoid Valves
- ASCO 8320G174 is standard
- Other Asco models, Versa, Skinner, as required

Electric Actuators
- Jordan

Electrohydraulic Actuators
- Rexa L & T Series

Limit Switches
- Westlock
- National Acme (NAMCO)
- Honeywell (Micro)
- GO Proximity Switches

Noise Reduction Devices
- Noise Suppressor
- Les-Sonic Silencing Orifice

Air Regulators
- ASG-1
- AFG-2
- Bellofram Type 50
- Control Air Type 300

Instruments
- Lockup Valves
- S-Transfer Valve

Other Options
- Handwheels
- Hydraulic Manual Override System
- Limit Stops
- Special Connections
  - Socketweld
  - Buttweld
  - Stub Ends
  - Pipe Reducers
  - Smooth Flange Faces
  - Ring Type Joints

AEROFLOW Linear Valve Specification Form

LESLIE CONTROLS, INC.
A division of CIRCOR International, Inc.
12501 Telecom Drive · Tampa, Florida 33637
(813) 978-1000 · FAX: (813)-978-0984

CONTROL VALVE SPEC SHEET

Project/Job _____ Data Sheet _____ of _____
Unit/Customer _____ Spec _____
P.O./LCO File # _____ Tag _____
Item _____ Dwg _____
Contract _____ Service _____
MFR Serial# _____

LINEAR

Fluid ❑ Steam ❑ Water ❑ Gas_____ ❑ Liquid_____ Crit Pres PC

Service Conditions

Flow ❑ #/hr ❑ gpm ❑ scfh ❑ _____
Inlet Pressure ❑ psig ❑ psia ❑ _____
Outlet Pressure ❑ psig ❑ psia ❑ _____
Temperature ❑ °C ❑ °F _____
Max Press/Temperature:_____ /_____
Density/MW/SG _____/_____/_____
Viscosity _____CP
Vapor Pressure ❑ psia ❑ _____
Required C_V _____ Noise (dBA) Allowable_____

Max. Flow	Norm. Flow	Min. Flow	Shut-off Pressure

Line

Pipe Size/Sch.In _____ /Sch _____
Pipe Size/Sch. Out _____ /Sch _____
Pipe Line Insulation _____ in. _____

Valve Body and Bonnet

Type ❑ Globe ❑ Angle
*Body Size inches ❑ 1 ❑ 1½ ❑ 2 ❑ 3 ❑ 4 ❑ 6 ❑ 8 ❑ 10 ❑ 12 ❑ 16
ANSI Class ❑ 150 ❑ 300 ❑ 600 ❑ 900 ❑ 1500 ❑ 2500 ❑ 4500
Design.Press.Temp_____ /_____
Mfr./Model: Leslie/Aeroflow
Body/Bonnet Mat'l ❑ WCB ❑ WC9 ❑ CF8M ❑ C12A ❑ _____
End Conn Inlet/Outlet
❑ Flg RF ❑ Thd ❑ RTJ
❑ SWE ❑ BWE/Sch _____
❑ In BWE/Sch _____ ❑ In SWE _____
❑ Out BWE/Sch _____ ❑ Out SWE _____
❑ In Stubs/Sch _____ Length (in.) _____
❑ Out Stub/Sch _____ Length (in.) _____
❑ Exp _____ x _____ In/Sch _____
❑ Exp _____ x _____ Out/Sch _____
Flg. Face Finish _____RMS ❑ Std. (125-500)
End Ext/Mat'l. _____
*Flow ❑ Over Seat ❑ Under Seat
*Type Bonnet ❑ Std
*Packing Mat'l ❑ LG ❑ BTG ❑ DTFE ❑ Live Loaded ❑ Other

Trim

*Type ❑ UBP ❑ MT ❑ Mini-P ❑ UBC ❑ BH ❑ BL ❑ PB ❑ T2
Les-Sonic Cage ❑ Yes
Les-Cav ❑ I ❑ II ❑ III ❑ IV ❑ V
C3 ❑ Yes
*Characteristic ❑ Linear ❑ =% ❑ QO ❑ Custom
Travel ❑ Std. ❑ Ext ❑ Max
*Rated Cv _____% Max._____ Cv = _____
❑ Malcomizing (150-600 CL > 700ºF, 900-4500 CL > 650ºF)

Special ACC NEC Class Group Div.

Actuator

*Type ❑ DA ❑ SR ❑ DASR ❑ Diaph ❑ EHA ❑ Electr. ❑ Other
*Mfr/Model _____/_____
*Size/Eff Area ❑ 6"/28 in² ❑ 10"/80 in² ❑ 13"/130 in² ❑ 16"/200 in² ❑ 20"/300 in² ❑ Other
❑ On/Off ❑ Modulating
Spring Action/Air Failure ❑ Open ❑ Closed ❑ None
Spring #_____
*Max. Allowable Press. _____
*Min. Required Press. _____ psig
Available Air Supply Press. _____
Max. _____ Min. _____
*Bench Range _____ psig ❑ N/A
Act.Orientation ❑ Horiz. ❑ Vert. (Std.)
Override Type ❑ Hyd. Overide ❑ None
Air Failure Valve ❑ Opens ❑ Closes ❑ Last
Tubing ❑ SST ❑ Copper ❑ 3/8" ❑ 1/2" ❑ _____
Data Tag: ❑ Brass ❑ SST

Solenoid ❑ Asco/8320G174 ❑ None ❑ Other Mfgr/Model _____ /_____

Positioner

Input Signal ❑ 3-15 psi ❑ 4-20 mA ❑ _____
*Type ❑ Pneu. ❑ I/P ❑ None
*Mfr./Model_____ /_____
*On Incr. Signal Output ❑ Incr. ❑ Decr.
Gauges ❑ Yes ❑ No, By-Pass ❑ Yes ❑ No
*Cam Charact. ❑ Linear ❑ =% ❑ Sq.Root

Switch

*Type ❑ Mech ❑ Prox ❑ Other
*Mfr./Model_____ /_____
Contacts/Rating ❑ SPDT ❑ DPDT
Actuation points: ❑ Both ❑ Open ❑ Closed
NEMA Class 1,4, & 13

Airset

*Mfr./Model: Leslie/ ❑ AFG-2 ❑ ASG-1 ❑ None
*Set Press. _____PSIG _____ /_____
Filter ❑ Yes ❑ No Gauge ❑ Yes ❑ No
Range: Max ❑ 30psi ❑ 60 psi ❑ 100psi ❑ 150psi

Test *Hydro Pressure
ANSI/FCI Leakage Class ❑ III ❑ IV ❑ V ❑ VI ❑ Zero CC/min

QUESTIONS? CALL LESLIE CONTROLS @ (813) 978-1000 PLEASE FAX COMPLETED FORM TO: (813) 977-0174

LESLIE DESUPERHEATERS

SIZES 1/2" – 16"
ANSI Class 150 to 2500

- **Fabricated and forged constructions**
- **High quality stuffing box**
- **Variable nozzle type**
- **Wide range of Cv (Kv) capacities available**
- **Special nozzle combinations available**

Application Data

- Boiler superheaters
- Boiler reheaters
- Turbine bleed steam
- Pressure reducing valve outlet steam
- Process steam
- Process gases

TABLE 1 Cv (Kv) CAPACITY RANGES

Size	Standard capacity ranges for Models 13, 18, 23, 24, 28, 33, 34, 38 and 48					
1/2" (16mm)	6A	Cv = 0.0752	Kv = 0.0648	9A	Cv = 0.1128	Kv = 0.0972
	6B	Cv = 0.1587	Kv = 0.1368	9B	Cv = 0.2380	Kv = 0.2052
	6C	Cv = 0.3007	Kv = 0.2592	9C	Cv = 0.4510	Kv = 0.3888
	6D	Cv = 0.5860	Kv = 0.5052	9D	Cv = 0.8790	Kv = 0.7578
	6Dx	Cv = 1.1602	Kv = 1.0002	9Dx	Cv = 1.7403	Kv = 1.5003
1" (25mm)	6E	Cv = 1.9022	Kv = 1.6398	9E	Cv = 2.8533	Kv = 2.4597
	6F	Cv = 2.8397	Kv = 2.4480	9F	Cv = 4.2595	Kv = 3.6720
	6G	Cv = 6.0322	Kv = 5.2002	9G	Cv = 9.0483	Kv = 7.8003
	6H	Cv = 9.3960	Kv = 8.1000	9H	Cv =14.0940	Kv = 12.1500
	6K	Cv = 13.4885	Kv =11.6280	9K	Cv =20.2327	Kv = 17.4420

Flow capacity limitations are:

- Model 18, 24 and 38 with a maximum water flow capacity of 883 ft^3/hr. (25 m^3/hr.) in continuous service.
- Model 13, 33, 34 and 48 with a maximum water flow capacity of 1766 ft^3/hr. (50 m^3/hr.) in continuous service.
- Model 23 with a maximum water flow capacity of 3531 ft^3/hr. (100 m^3/hr.). in continuous service.

LESLIE DESUPERHEATERS

Definition

$$Kv = Q\sqrt{\frac{S.G.}{\Delta P}}$$

Q = ft³/hr. (m³/hr.)
Δp = psi (bar)

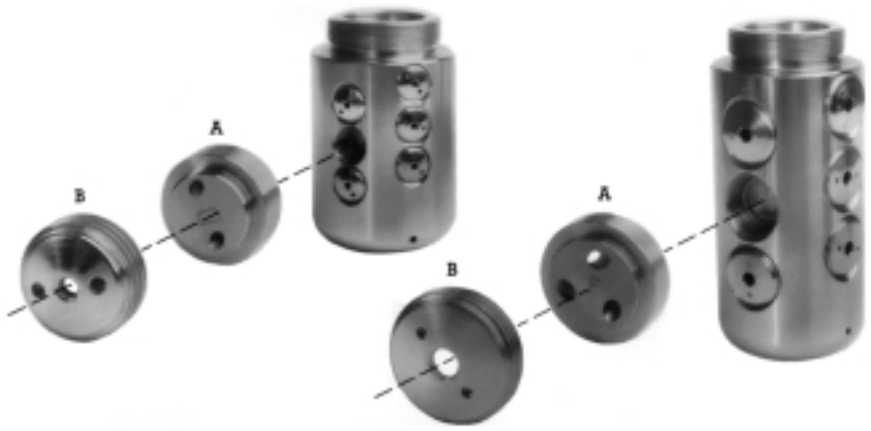
$$\frac{C_V}{1.156} = K_V$$

Multiple nozzle heads

The A.T. - Temp Desuperheater may be equipped with a variety of spray heads. The uniform body threading accepts spray cylinder heads with a wide range of Cv (Kv) values.

Standard configurations are with either 6 or 9 equally sized spray nozzles but combinations are available.

This feature enables the A.T. - Temp Desuperheater to be customized to specific system requirements.
Consult Leslie Controls or your local representative for details.



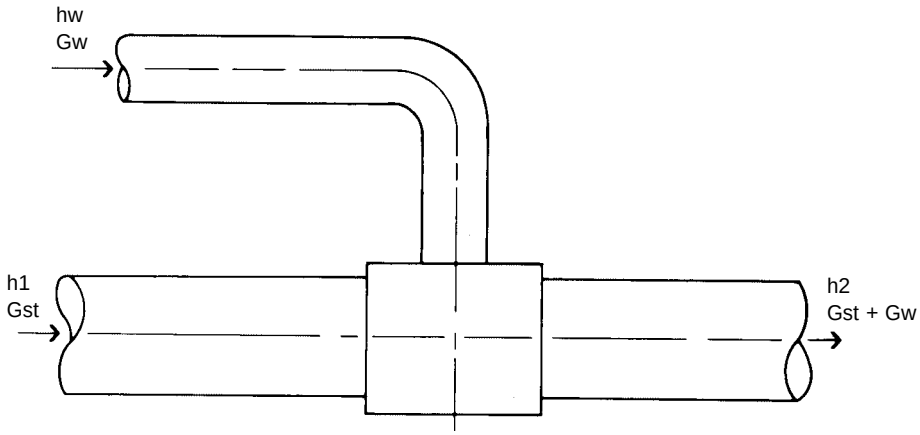
Sizing formula

Every desuperheating station is a mixing point where there is a heat and mass balance.
The universal formula is:

Gw = Gst (h1-h2) : (h2-hw)

In which:
Gw = Injection water mass
Gst = Inlet steam mass
h1 = Enthalpy of the inlet steam
h2 = Enthalpy of the outlet steam
hw = Enthalpy of the injection water

This formula enables calculation of the quantity of water required to lower the inlet steam temperature to the set - point temperature of the outlet steam.



Important system parameters

Apart from the spray quality of the atomizer (primary atomization) there are other system parameters which influence the Desuperheater stations performance. These are:

Inlet steam velocity
At high steam velocities, water droplets are easily disintegrated. This factor contributes to the overall atomization quality (secondary atomization). The minimum acceptable steam velocity varies as a function of the nozzle size and pipe diameter. In case of doubt, consult Leslie controls.

Water to Steam Ratio
This ratio is determined by dividing Gw by Gst. For system steam pressures below 15 bar, this ratio should not exceed 10% for the normal operating conditions. Systems operating between 218 and 363 psi (15 and 25 bar) can have a ratio of up to 15%. For higher pressure duties, consult Leslie controls.

Distance to Sensor
The distance from the injection point to the temperature sensor should be 40 to 50 feet (12 to 15 meters). Systems operating at pressures above 363 psi (25 bar) can have significantly less run to the sensor, consult Leslie controls.

Required Straight Pipe Run
The distance from injection point to the first pipe bend is also a function of steam pressure, temperature and nozzle size. Experience has shown that in systems up to 363 psi (25 bar), 13 to 20 feet (4 to 6 meters), is an acceptable distance.

LESLIE DESUPERHEATERS

Actuator Sizing Formula

Units:

D seat	inch	(cm)
d stem	inch	(cm)
D bal	inch	(cm)
P water	psi	(bar)

F1 = p / 4 (**D** seat² - **d** stem²) x **P** water
F2 = p / 4 (**D** bal² - **d** stem²) x **P** water
F3 = **P** water x **F** friction (+ or -).

Actuator stem forces

The stem forces for the Standard Duty A.T. - Temp Desuperheater are determined by the following formula:

Model 24/38: P water x 62 + 1000 = Newton [P Water in psi (bar)] The maximum stem force must be limited to 3372 lb/f (15kN).

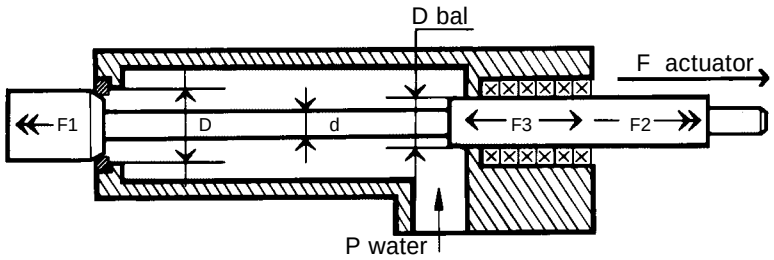
Model 34/48: P water x 68 + 1250 = Newton [P Water in psi (bar)] The maximum stem force must be limited to 11,240 lb/f (50kN).

The stem forces for the Heavy Duty A.T. - Temp Desuperheater are determined by the following formula:

Model 18: P water x 36 + 1000 = Newton [P Water in psi (bar)] The maximum stem force must be limited to 3372 lb/f (15kN).

Model 28: P water x 68 + 1250 = Newton [P Water in psi (bar)] The maximum stem force must be limited to 11,240 lb/f (50kN).

Special care should be taken when electric actuators are used. By their momentum of inertia these actuators can generate stem forces exceeding the specified nominal stem force during short intervals. Leslie controls supplies special spring loaded couplings for such applications.



Ordering / sizing data

Steam Desuperheaters are selected specifically against application data. For optimal sizing, the following comprehensive data should always be supplied.

Steam Data

Inlet pressure	psi	bar
Inlet temperature	ºF	°C
Outlet temperature	ºF setpoint	°C setpoint
Steam flow max.	lbs/hr	t / hr
Steam flow normal	lbs/hr	t / hr
Steam flow min.	lbs/hr	t / hr

Water Data

Water pressure	psi	bar
Water temperature	ºF	°C

General

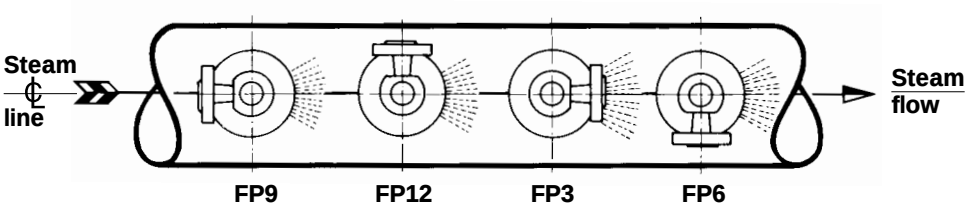
Pipe size	inch	mm
Pipe schedule		
Required water flange position (9) (12) (3) (6)		

It is essential not to over specify the required turndown ratio i.e.:

Steam flow max.
Steam flow min.

Otherwise this will necessitate selection of special nozzle heads which are non - stock items. Standard stock consists of nozzles with 6 or 9 equally sized atomizers giving turndown ratios of 18:1 and 27:1 respectively, on the water flow control. Experience shows that the majority of applications fall within this range.

Water flange positions



Spray water must be injected in the direction of the steam flow. To facilitate installation of the water supply line, 4 different spray head positions are available in relation to the water connecting flange. Specification of this spray head orientation is required with the ordering data.

Leslie Controls always recommends a strainer with a mesh size of approx. 100 µ (400 µ upon request) in the water supply line to protect the A.T. - Temp Desuperheater from clogging.

STANDARD DUTY A.T. - TEMP DESUPERHEATER
MODEL: 38 / 48

TECHNICAL DATA

- Size: Steam 3" (DN 80)
  Water 1"-1½" (DN 25-40)
  Steam 4" (DN 100)
  Water 1½"-2"-3" (DN 40-50-80)
- Fabricated construction
- Non / Semi balanced internals for economic actuator selection

TABLE 1 - C_V (K_V) CAPACITY RANGES *see page 76*

TABLE 2 DIMENSIONS inches (mm)

		Model 38 Qmax = 883 ft³/hr (25 m³/hr.)	Model 48 Qmax = 1766 ft³/hr (50 m³/hr.)
Standard length for steam line sizes up to 12" (DN300)			
A	A through Dx	15.0 (380)	15.7 (399)
	E through K	15.7 (399)	—
B	A through Dx	17.2 (436)	18.7 (476)
	E through K	18.7 (476)	—
Option: standard length for steam line sizes 14" (DN350) and higher			
A	A through Dx	22.8 (580)	23.6 (599)
	E through K	23.6 (599)	—
B	A through Dx	25.0 (636)	26.6 (676)
	E through K	26.6 (676)	—
C		7.9 (200)	7.9 (200)
D		12.0 (305)	15.6 (395)
E		8.3 (210)	9.3 (236)
F		1.3 (32)	1.3 (32)
G		M12 x 1.75	M16 x 2.00
H		M70 x 2.00	M90 x 2.00
K		2.8 (71) + 0 (0) /.008 (-0.2)	3.6 (91) + 0 (0) /.008 (-0.2)
L	Depending on size and class	min. 5.9 (150)	min. 7.9 (200)
M	**minimum**	2.6 (66.0)	3.2 (80.0)
N		2.4 (60.3) x 0.4 (11.17)	2.9 (73) x 0.6 (14.0)
P		2.5 (64.0)	3.1 (78.0)

Note: Dimensions may be subject to change without prior notification.
Leslie Controls will provide a certified dimensional drawing upon request.

TABLE 3 FLANGE CONNECTIONS

FLANGE	Model 38 Qmax = 883 ft³/hr (25 m³/hr.)	Model 48 Qmax = 1766 ft³/hr (50 m³/hr.)
Steam flange	3" class 150	4" class 150
	class 300	class 300
	class 600	class 600
	class 900	class 900
	class 1500	class 1500
	DN80 - PN 25/40	DN100 - PN 25/40
	PN 64	PN 64
	PN 100	PN 100
	PN 160	PN 160
	PN 250	PN 250
Water flange	**1" - 1½"**	**1½" - 2" - 3"**
	DN 25 - 40 *Pressure classes as per water data requirements*	DN 40 - 50 - 80 *Pressure classes as per water data requirements*

STROKE

- For nozzles A - B - C - D - Dx: 2.2" (55mm) Pipeline diameter min. 6"
- For nozzles E - F - G - H - K: 3.5" (90mm) Pipeline diameter min. 8"

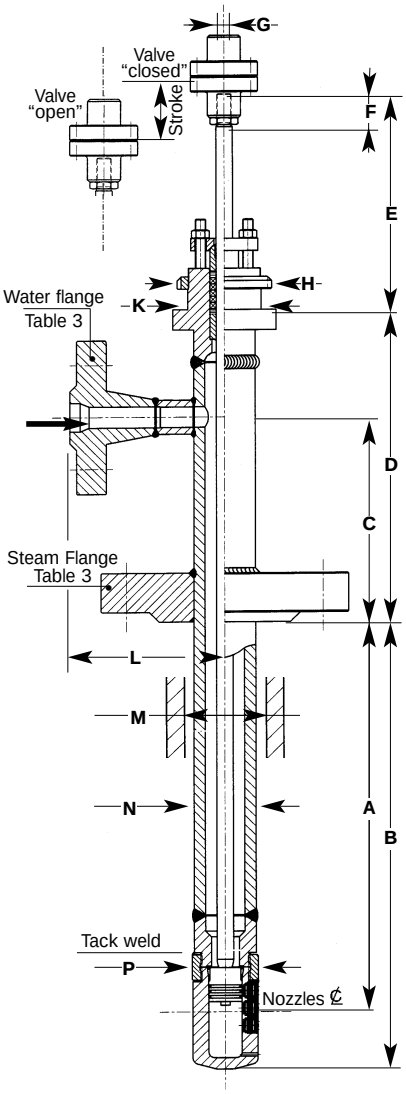
In case of deviating line size, consult Leslie Controls.

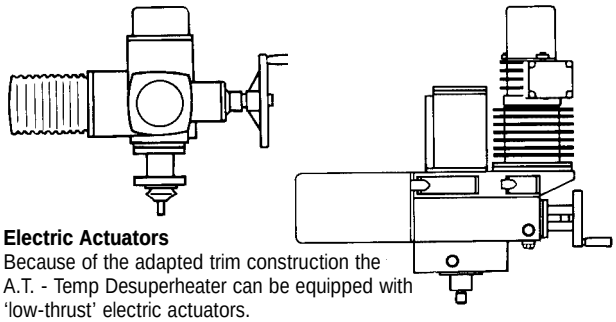
MATERIALS OF CONSTRUCTION

- ASTM SA 105 / SA 106 Gr.B or SA 182 F11 / SA 335 P11
- DIN C22.8 / St 35.8.III or DIN 1.7335
- Other materials upon request

APPLICABLE CODES

- ASME/ ANSI B16.34 class 150 to 1500
- DIN 2401 class PN 25 to 250
- Buttweld connections to ANSI B16.25 or DIN 2559





Electric Actuators
Because of the adapted trim construction the A.T. - Temp Desuperheater can be equipped with 'low-thrust' electric actuators.

Each actuator-valve assembly is fully function tested at the Leslie Controls factory. A functional test certificate is issued for all valves supplied.

HEAVY DUTY A.T. - TEMP DESUPERHEATER

MODEL: 18 / 54 and 28 / 64

TECHNICAL DATA

- Size: Steam 3" (DN80)
  Water 1"-1½" (DN25-40)
  Steam 4" (DN100)
  Water 1½"-2"-3" (DN40-50-80)
- Forged construction
- Semi balanced internals for economic actuator selection

MATERIALS OF CONSTRUCTION

- ASTM SA 182 F22 or DIN 1.7380
- ASTM SA 182 F347H or DIN 1.4550
- ASTM SA 182 F91 or DIN 1.4903
- Other materials upon request

APPLICABLE CODES

- ASME/ ANSI B16.34 class 900 to 2500

TABLE 1 - Cv (Kv) CAPACITY RANGES *see page 76*

TABLE 2 DIMENSIONS inches (mm)

		Model 18 Qmax = 883 ft³/hr (25 m³/hr.)	Model 28 Qmax = 1766 ft³/hr (50 m³/hr.)
Standard length for steam line sizes up to 12" (DN300)			
A	A through Dx	15.0 (380)	15.7 (399)
	E through K	15.7 (399)	
B	A through Dx	17.2 (436)	18.7 (476)
	E through K	18.7 (476)	
C		7.9 (200) 9.5 (240) for model 54	9.8 (250)
D		12.0 (305)	14.0 (355)
E		8.3 (210)	9.8 (250)
F		1.3 (32)	1.3 (32)
G		M12 x 1.75	M16 x 2.00
H		M80 x 2.00	M90 x 2.00
K		3.2 (81) + 0 (0) /.008 (-0.2)	3.6 (91) + 0 (0) /.008 (-0.2)
L	Depending on size and class	5.9 (150) 9.8 (250) for model 54	7.9 (200) 9.8 (250)/11.8 (300) for model 64
M	**minimum**	2.6 (66.0)	3.2 (80.0)
N		2.4 (60.3) x 0.5 (12.6)	2.9 (73.0) x 0.6 (14.0)
P		2.5 (64.0)	3.1 (78.0)

Note: Dimensions may be subject to change without prior notification.
Leslie Controls will provide a certified dimensional drawing upon request.

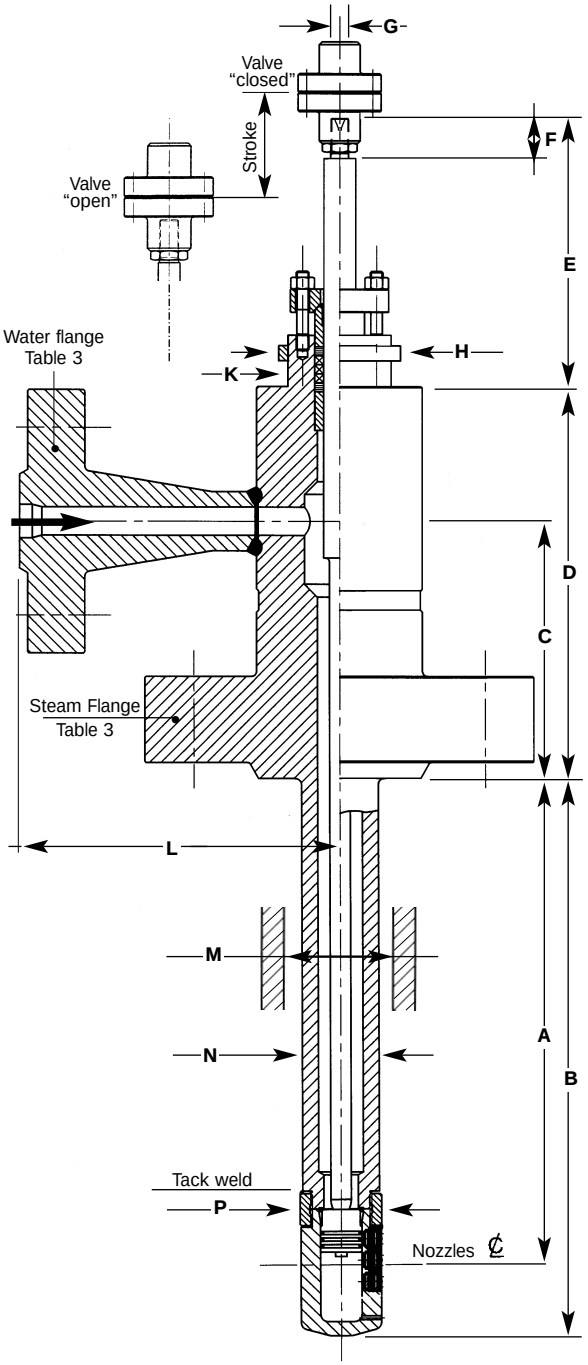
TABLE 3 FLANGE CONNECTIONS

FLANGE	Model 18 Qmax = 883 ft³/hr (25 m³/hr.)	Model 28 Qmax = 1766 ft³/hr (50 m³/hr.)
Steam flange	3" class 900	4" class 900
	class 1500	class 1500
	class 2500	class 2500
	DN80 - PN 160	DN100 - PN 160
	PN 250	PN 250
	PN 320	PN 320
	PN 400	PN 400
Water flange	**1" - 1½"**	**1½" - 2" - 3"**
	DN 25 - 40 *Pressure classes as per water data requirements*	DN 40 - 50 - 80 *Pressure classes as per water data requirements*

Note: Other pressure classes upon request.

STROKE

- For nozzles A - B - C - D - Dx: 2.2" (55mm)
  minimum steam line size: 6" (DN150)
- For nozzles E - F - G - H - K: 3.5" (90mm)
  minimum steam line size: 8" (DN200)



STANDARD DUTY A.T.S.A. - TEMP DESUPERHEATER
MODEL: 24 / 34

TECHNICAL DATA

- Size: Steam 6"- 8" (DN150-200)
  Water 1"- 3" (DN25-80)
  Steam assist 1½"- 4" (DN40-100)
- Fabricated construction

MATERIALS OF CONSTRUCTION

- ASTM SA 105 / SA 106 Gr.B or DIN C22.8 / St 35.8.III
- ASTM SA 182 F11 / SA 335 P 11 or DIN 1.7335
- Other materials upon request

APPLICABLE CODES

- ASME/ ANSI B16.34 class 150 to 1500
- DIN 2401 class PN25 to 250
- Buttweld connections to ANSI B16.25 or DIN 2559

TABLE 1 - Cv (Kv) CAPACITY RANGES *see page 76*

TABLE 2 DIMENSIONS inches (mm)

		Model 24 Qmax = 883 ft³/hr (25 m³/hr.)	Model 34 Qmax = 1766 ft³/hr (50 m³/hr.)
Standard length for steam line sizes 14" (DN350) and higher			
A	A through Dx	22.8 (580)	—
	E through K	23.6 (599)	23.6 (599)
B	A through Dx	25.0 (636)	—
	E through K	26.6 (676)	26.6 (676)
C		11.4 (290)	17.7 (450)
D		15.6 (395)	24.6 (625)
E		8.3 (210)	9.2 (236)
F		1.3 (32)	1.3 (32)
G		M12 x 1.75	M16 x 1.75
H		M70 x 2.00	M90 x 2.00
K		2.8 (71) + 0 (0) /.008 (-0.2)	3.6 (91) + 0 (0) /.008 (-0.2)
L	Depending on size and class	min. 5.9 (150)	min. 7.87 (200)
M	**minimum**	4.1 (105)	6.89 (175)
N		3.9 (100)	6.63 (168.3)
P		2.5 (64.0)	3.1 (78.0)
S		5.9 (150)	5.9 (150)
T		9.8 (250)	9.8 (250)

Note: Dimensions may be subject to change without prior notification.
Leslie Controls will provide a certified dimensional drawing upon request.

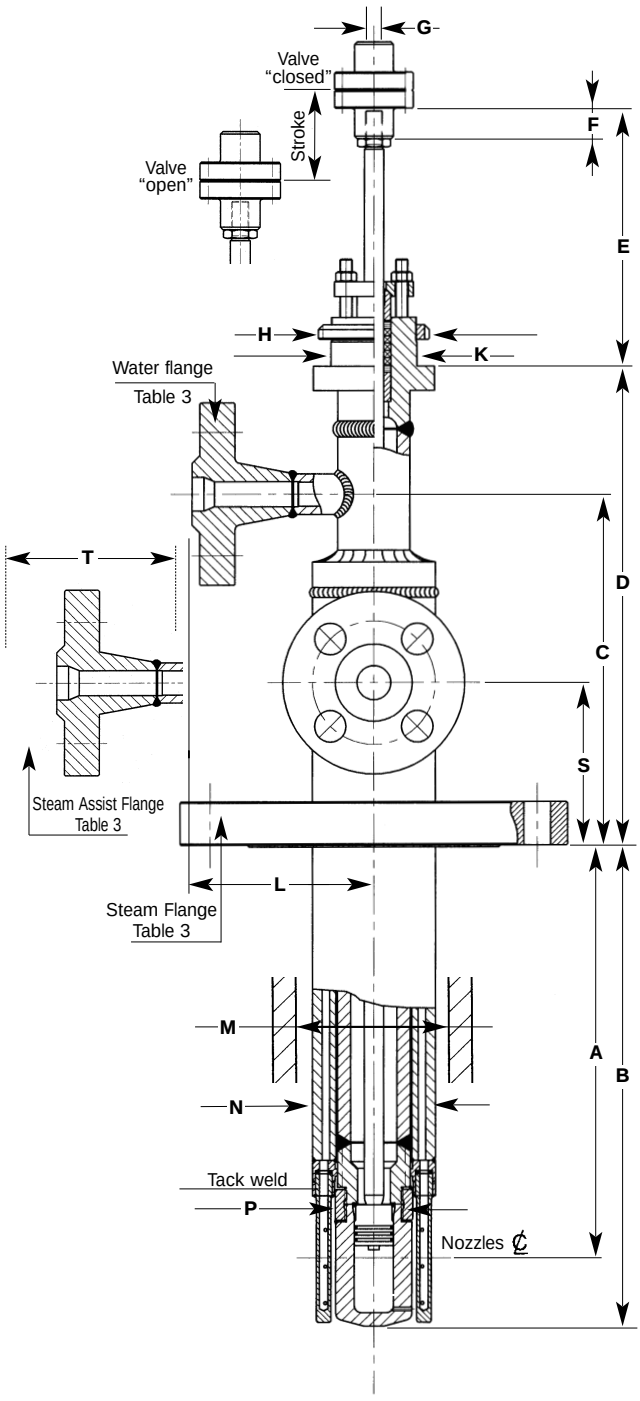


TABLE 3 FLANGE CONNECTIONS

FLANGE	Model 24 Qmax = 883 ft³/hr (25 m³/hr.)	Model 34 Qmax = 1766 ft³/hr (50 m³/hr.)
Steam flange*	6" class 150	8" class 150
	class 300	class 300
	class 600	class 600
	DN150 - PN 25/40	DN200 - PN 25/40
	PN 64	PN 64
	PN 100	PN 100
Water flange	**1" - 1½"**	**1½" - 3"**
	DN 25 - 40 *Pressure classes as per requirements up to 1500#*	DN 40 - 80 *Pressure classes as per requirements up to 1500#*
Steam assist flange	**1½" - 2"**	**2" - 4"**
	DN 40 - 50 *Pressure classes as per requirements up to 1500#*	DN 50 - 100 *Pressure classes as per requirements up to 1500#*

* Other pressure classes upon request.

STROKE

- For nozzles A - B - C - D - Dx: 2.2" (55mm)
- For nozzles E - F - G - H - K: 3.5" (90mm)
  minimum steam line size: 8" (DN200)

HEAVY DUTY QUE - TEMP DESUPERHEATER
MODEL: 33 / 43

TECHNICAL DATA

- Size: Steam 3" (DN 80)
  Water 1"-1½" (DN 25-40)
  Steam 4" (DN 100)
  Water 1½"-2"-3" (DN 40-50-80)
- Fabricated construction

TABLE 1 - Cv (Kv) CAPACITY RANGES *see page 76*

MATERIALS OF CONSTRUCTION

- ASTM SA 105 / SA 106 Gr.B or DIN C22.8 / St. 35.8.III
- ASTM SA 182 F11 / SA 335 P11 or DIN 1.7335
- Other materials upon request

APPLICABLE CODES

- ASME/ ANSI B16.34 class 150 to 1500
- DIN 2401 class PN 25 to 250
- Buttweld connections to ANSI B16.25 or DIN 2559

TABLE 2 DIMENSIONS inches (mm)

		Model 33 Qmax = 1766 ft³/hr (50 m³/hr.)	Model 43 Qmax = 3532 ft³/hr (100 m³/hr.)
Standard length for steam line sizes up to 12" (DN300)			
A	A through Dx	15.0 (380)	15.7 (399)
	E through K	15.7 (399)	—
B	A through Dx	17.2 (436)	18.7 (476)
	E through K	18.7 (476)	—
Option: standard length for steam line sizes 14" (DN350) and higher			
A	A through Dx	22.8 (580)	23.6 (599)
	E through K	23.6 (599)	
B	A through Dx	25.0 (636)	26.6 (676)
	E through K	26.6 (676)	
C		7.9 (200)	7.9 (200)
L	Depending on size and pressure class	min. 5.9 (150)	min. 7.9 (200)
M	**minimum**	2.6 (66.0)	3.2 (80.0)
N		2.4 (60.3) x 0.4 (11.1)	2.9 (73.3) x 0.6 (14.0)
P		2.5 (64.0)	3.1 (78.0)

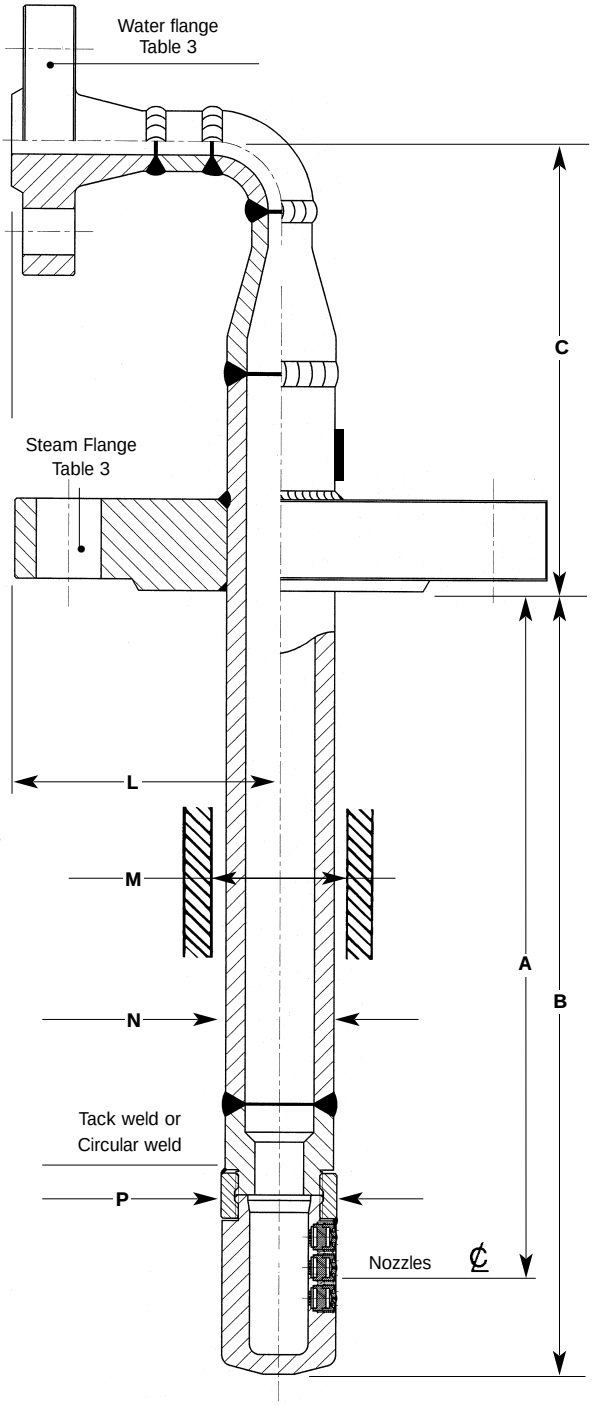
Note: Dimensions may be subject to change without prior notification.
Leslie Controls will provide a certified dimensional drawing upon request.

TABLE 3 FLANGE CONNECTIONS

FLANGE	Model 33 Qmax = 1766 ft³/hr (50 m³/hr.)	Model 43 Qmax = 3532 ft³/hr (100 m³/hr.)
Steam flange	3" class 150	4" class 150
	class 300	class 300
	class 600	class 600
	class 900	class 900
	class 1500	class 1500
	DN80 - PN 25/40	DN100 - PN 25/40
	PN 64	PN 64
	PN 100	PN 100
	PN 160	PN 160
	PN 250	PN 250
Water flange	**1" - 1½"**	**1½" - 2" - 3"**
	DN 25 - 40 *Pressure classes as per water data requirements*	DN 40 - 50 - 80 *Pressure classes as per water data requirements*

MINIMUM STEAM PIPE SIZE

- For nozzles A - B - C - D - Dx: 6" (152.4mm) (DN150)
- For nozzles E - F - G - H - K: 8" (203.2mm) (DN200)



HEAVY DUTY A.T. - TEMP DESUPERHEATER
MODELS 13 / 23

Technical Data

- Size: Steam 3" (DN80)
  Water 1"-1½" (DN25-40)
  Steam 4" (DN100)
  Water 1½"-2"-3" (DN40-50-80)
- Forged construction

TABLE 1 - Cv (Kv) CAPACITY RANGES *see page 76*

Materials of Construction

- ASTM SA 182 F22 or DIN 1.7380
- ASTM SA 182 F347H or DIN 1.4550
- ASTM SA 182 F91 or DIN 1.4903
- Other materials upon request

Applicable Codes

- ASME/ ANSI B16.34 class 900 to 2500
- DIN 2401 class PN 160 to 400
- Butt weld connections to ANSI B16.25 or DIN 2559

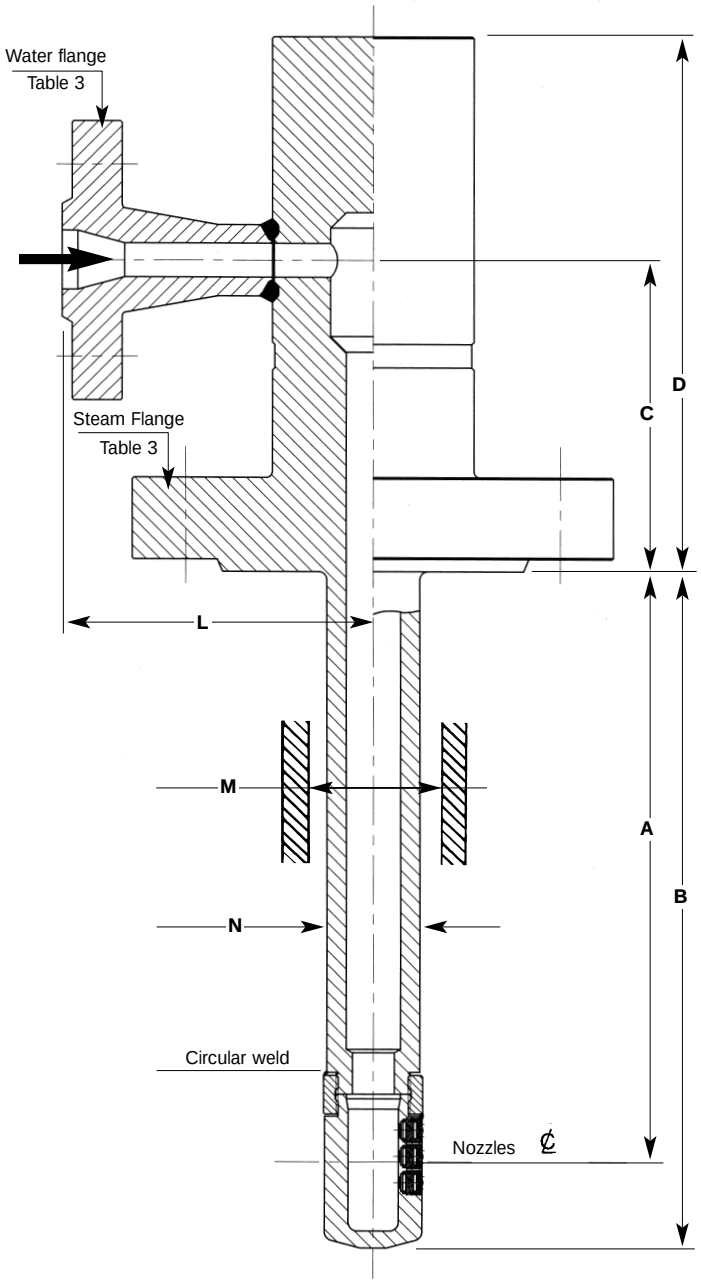
TABLE 2 DIMENSIONS inches (mm)

		Model 13 Qmax = 1766 ft³/hr (50 m³/hr.)	Model 23 Qmax = 3532 ft³/hr (100 m³/hr.)
Standard length for steam line sizes up to 12" (DN300)			
A	A through Dx	15.0 (380)	15.7 (399)
	E through K	15.7 (399)	—
B	A through Dx	17.2 (436)	18.7 (476)
	E through K	18.7 (476)	—
C		7.9 (200)	7.9 (200)
D		12.0 (305)	14.0 (355)
L	Depending on size and pressure class	5.9 (150)	7.9 (200)
M	**minimum**	2.6 (66.0)	3.2 (80.0)
N		2.4 (60.3) x 0.5 (12.6)	2.9 (73.3) x 0.6 (14.0)

Note: Dimensions may be subject to change without prior notification.
Leslie Controls will provide a certified dimensional drawing upon request.

TABLE 3 FLANGE CONNECTIONS

FLANGE	Model 13 Qmax = 1766 ft³/hr (50 m³/hr.)	Model 23 Qmax = 3532 ft³/hr (100 m³/hr.)
Steam flange	3" class 900	4" class 900
	class 1500	class 1500
	class 2500	class 2500
	DN80 - PN 160	DN100 - PN 160
	PN 250	PN 250
	PN 320	PN 320
	PN 400	PN 400
Water flange	**1" - 1½"**	**1½" - 2" - 3"**
	DN 25 - 40 *Pressure classes as per water data requirements*	DN 40 - 50 - 80 *Pressure classes as per water data requirements*



Minimum Steam Pipe Size

- For nozzles A - B - C - D - Dx: 6" (152.4mm) (DN150)
- For nozzles E - F - G - H - K: 8" (203.2mm) (DN200)

In case of smaller pipe size, please consult Leslie Controls.

SMALL PIPE INLINE DESUPERHEATER (SPID)

MODEL: 88

- **Fabricated construction**
- **Special design for small steam lines with minimal steam pressure losses**
- **Steam control within 43ºF (6°C) of saturation temperature and ± 1% of controller range**
- **Venturi type vena contracta**
- **Wide range of Cv (Dv) capacities**

Applications

- Turbine gland sealing,
- Air ejectors,
- Nox steam for gas turbines,
- House steam,
- Drum dryers,
- Tire molds,
- Vulcanizing equipment and cooking kettles

Technical Data

- Size: Steam 1½" - 4" (DN40 - DN100)
  Water 1/2" - 1" (DN15 - DN25)

Materials of Construction

- ASTM SA 182 F11 / SA 335 P11 or DIN 1.7335
- Other materials upon request

Applicable Codes

- ASME/ ANSI B16.34 class 150 to 600
- DIN 2401 class PN16 to PN100
- Butt weld connections to ANSI B16.25 or DIN 2559

Small Pipe Inline Desuperheater Ordering Code

Class	Standard	Body Rating			End Connection				Body Size	Cv Connection	Water Flange Rating			Water Connection	Approvals	
8	A	1	5	0	F	0	0	0	B	1	1	5	0	F	C	E
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

Class - Position 1
8 = Series 80000

Standard - Position 2
A = ANSI

Body Rating - Position 3 - 5
150 = Class 150
300 = Class 300
600 = Class 600

End Connections - Position 6 - 9
F000 = Flanged
W040 = Butt Weld End Sch 40
W080 = Butt Weld End Sch 80
W100 = Butt Weld End Sch 100
W120 = Butt Weld End Sch 120
W160 = Butt Weld End Sch 160

Body Size - Position 10
B = 1½" (15mm)
C = 2" (50mm)
D = 3" (80mm)
E = 4" (100mm)

Cv Connections - Position 11
1 = Cv from Capacity Table
2 = Cv from Capacity Table
3 = Cv from Capacity Table
4 = Cv from Capacity Table
5 = Cv from Capacity Table
6 = Cv from Capacity Table
7 = Cv from Capacity Table
8 = Cv from Capacity Table

Water Flange Rating* - Position 12 - 14
150 = Class 150
300 = Class 300
600 = Class 600

Water Connection - Position 15
F = Raised face flange Wafer Connection
X = Other

Approvals - Position 16 & 17
CE = European Approvals

* Wafer flanged ends to be equal to or greater then body rating.

SMALL PIPE INLINE DESUPERHEATER (SPID)
MODEL: 88

Important system parameters

Apart from the spray quality of the atomizer (primary atomization) there are other system parameters which influence the Desuperheater stations performance. These are:

Water to Steam Ratio
This ratio is determined by dividing Gw by Gst = 6 : 1.
Above this ratio, proper evaporation of the injection water cannot always be guaranteed.
In case of doubt, consult Leslie Controls.

Distance to Sensor
The distance from the SPID Desuperheater to the temperature sensor should be 40 to 50 feet (12 to 15 meters), although the distance specific to the application is advised by Narvik at the enquiry stage. Longer distances will ensure that full evaporation of the water will take place at lower velocities.

Required Straight Pipe Run
The minimum pipe run, required downstream, varies with each individual application and is specified by Narvik at the enquiry stage. This straight run is needed to prevent erosion due to impingement of water droplets against pipe walls, valves and fittings.
Upstream straight run is normally 6 x D and the downstream straight run 20 x D, as a minimum.

For applications outside these limitations, consult Leslie Controls or your local representative.

Ordering / sizing data

Steam Desuperheaters are selected specifically against application data. For optimal sizing, the following comprehensive data should always be supplied.

Water Data

Water pressure	psi	bar
Water temperature	ºF	ºC

Steam Data

Inlet pressure	psi	bar
Inlet temperature	ºF	ºC
Outlet temperature	ºF set point	ºC set point
Steam flow max.	lb / hr	t / hr
Steam flow normal	lb / hr	t / hr
Steam flow min.	lb / hr	t / hr

General

Pipe size	inch	mm
Pipe schedule		
Application		

Narvik does recommend a strainer with a mesh size of approx. 100 µ in the water supply line to protect the SPID Desuperheater from clogging.

SPID Cv (Kv) STANDARD CAPACITY RANGES

Body	Size	Ports	1	2	3	4	5	6	7	8
B	1 1/2"	Cv =	0.015	0.030	0.045	0.060	0.075	0.090		
	DN40	Kv =	0.013	0.026	0.039	0.052	0.065	0.078		
C	2”	Cv =	0.030	0.060	0.090	0.120	0.150	0.180		
	DN50	Kv =	0.026	0.052	0.078	0.104	0.130	0.156		
D	3”	Cv =	0.050	0.100	0.150	0.200	0.250	0.300	0.350	0.400
	DN80	Kv =	0.043	0.086	0.129	0.172	0.215	0.258	0.302	0.345
E	4”	Cv =	0.100	0.200	0.300	0.400	0.500	0.600	0.700	0.800
	DN100	Kv =	0.086	0.172	0.258	0.344	0.430	0.516	0.602	0.688

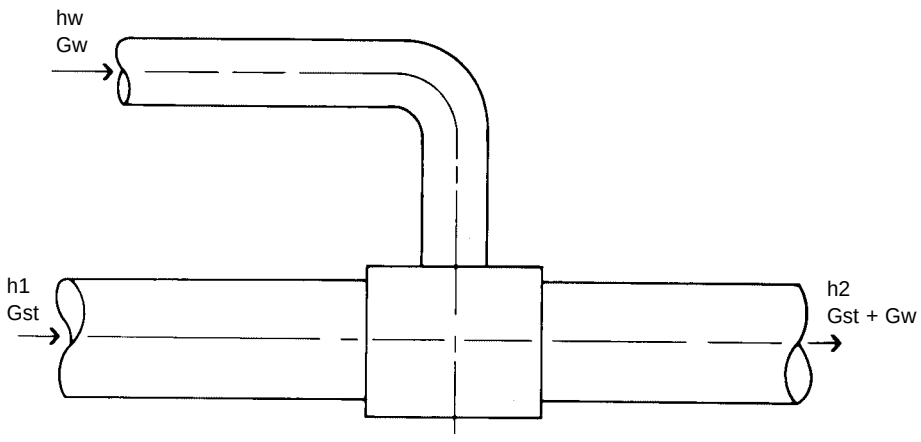
Sizing formula

Every desuperheating station is a mixing point where there is a heat and mass balance.
The universal formula is:

Gw = Gst (h1-h2) : (h2-hw)

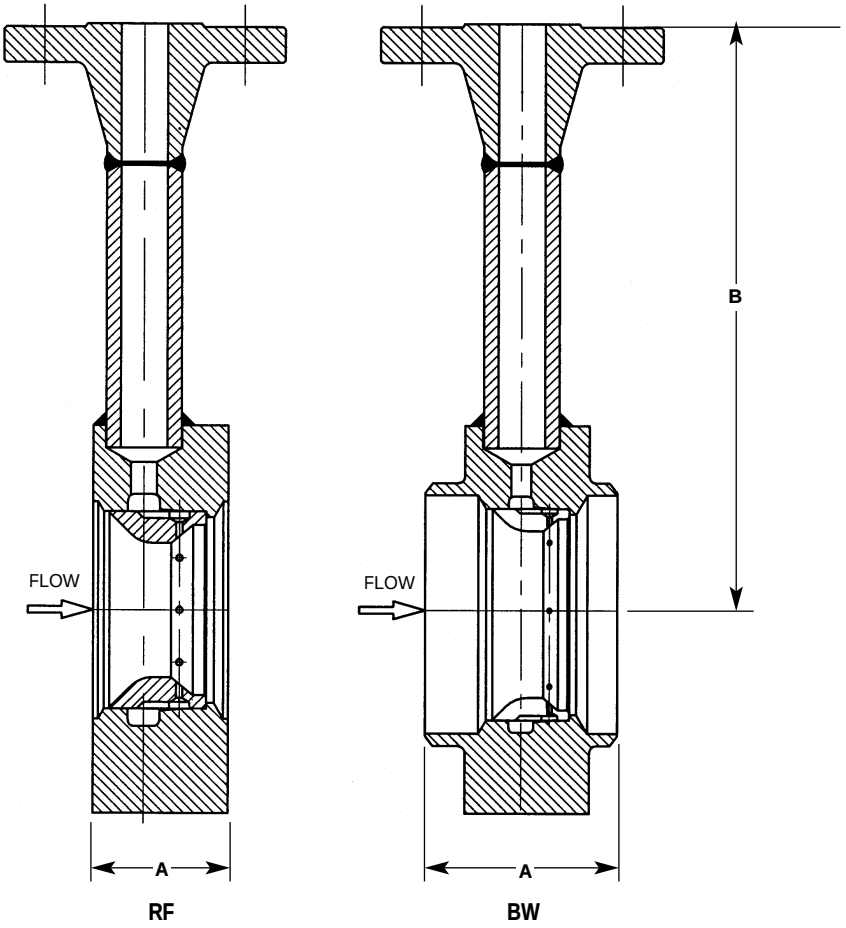
In which:
Gw = Injection water mass
Gst = Inlet steam mass
h1 = Enthalpy of the inlet steam
h2 = Enthalpy of the outlet steam
hw = Enthalpy of the injection water

This formula enables calculation of the quantity of water required to lower the inlet steam temperature to the set - point temperature of the outlet steam.



SMALL PIPE INLINE DESUPERHEATER (SPID)

MODEL: 88



DIMENSIONS inches (mm) **and WEIGHTS** pounds (kg)

Size	Weight	Body		Steam Connections	A	B	Water Connections		
							Size	Rating	
		ANSI	DIN					ANSI	DIN
1½ (40)	6.0 (2.7)	Class 150, 300, 600	PN 6, 40, 64, 100	RF (wafer)	1 9/16 (40)	7 7/8 (200)	1/2 (15)	Class 150, 300 or 600	PN 16, 40, 64, 100
				BW sched. 40	2 3/8 (60)	8 3/32	flanged		
				BW sched. 80	2 3/8 (60)	8 9/16	RF		
2 (50)	8.2 (3.7)	Class 150, 300, 600	PN 16, 40, 64, 100	RF (wafer)	1 9/16 (40)	8 55/64 (202)	1/2 (15)	Class 150, 300 or 600	PN 16, 40, 64, 100
				BW sched. 40	2 9/16 (65)	9 3/32	flanged		
				BW sched. 80	2 9/16 (65)	9 3/32	RF		
3 (80)	15.2 (6.9)	Class 150, 300, 600	PN 16, 40, 64, 100	RF (wafer)	1 31/32 (50)	9 29/64 (227)	1/2 (15)	Class 150, 300 or 600	PN 16, 40, 64, 100
				BW sched. 40	2 31/32 (75)	9 45/64	flanged		
				BW sched. 80	2 31/32 (75)	9 57/64	RF		
4 (100)	26.0 (11.8)	Class 150, 300, 600	PN 16, 40, 64, 100	RF (wafer)	2 3/8 (60)	10 3/64 (260)	1 (25)	Class 150, 300 or 600	PN 16, 40, 64, 100
				BW sched. 40	2 9/16 (90)	10 19/64	flanged		
				BW sched. 80	2 9/16 (90)	10 34/64	RF		

VEN-TEMP DESUPERHEATER
MODEL: 25

Materials of Construction

- ASTM SA 105, SA 182 F11 or SA 182 F22
- DIN C22.8, 1.7335 or 1.7380
- Other materials upon request

Applicable Codes

- ASME / ANSI B16.34 class 150 to 2500
- DIN 2401 class PN 25 to 400
- Buttweld connections to ANSI B16.25 or DIN 2559

Technical Data

- Size: Steam 1½" to 16" (DN40 to DN400)
  Water 1½" to 2" (DN15 to DN50)
- Forged construction
- Venturi nozzle type
- Low pressure loss over the desuperheater station
- Water pressures marginally above steam pressure

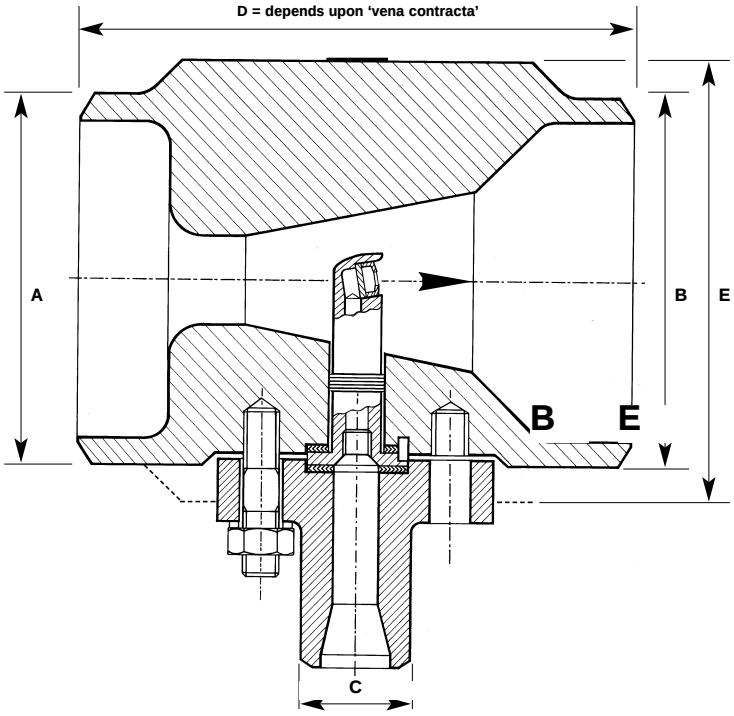


TABLE 2 **DIMENSIONS** inches (mm)

Connections		Class 150	PN 25/40	Class 300	PN 64	Class 600	PN 100	Class 900	PN 160	Class 1500	PN 250	Class 2500	PN 320
A - B / C	A - B / C	Ø E		Ø E		Ø E		Ø E		Ø E		Ø E	
1½"/½"	DN 40 / 15	127	150	156	170	156	170	178	170	178	185	203	195
2"/½"	DN 50 / 15	152	165	165	180	165	195	216	195	216	200	235	210
3"/1"	DN 80 / 25	190	200	210	215	210	230	241	230	267	255	305	275
4"/1"	DN 100 / 25	229	235	254	250	273	265	292	265	311	300	356	335
6"/1½"	DN 150 / 40	279	300	318	345	356	355	381	355	394	390	483	425
8"/1½"	DN 200 / 40	343	375	381	415	419	430	470	430	483	485	552	525
10"/2"	DN 250 / 50	406	450	445	470	508	505	546	515	584	585	673	640
12"/2"	DN 300 / 50	483	515	521	530	559	585	610	585	673	-	762	-
14"/2"	DN 350 / 50	533	580	584	600	603	655	641	-	749	-	-	-
16"/2"	DN 400 / 50	597	660	648	670	686	-	705	-	829	-	-	-

Notes

- Dimensions may be subject to change without prior notification and depending to the standards (flanged - butt weld, etc.)
- Other pressure classes upon request.
- Narvik will provide an order related certified dimensional drawing upon request.

Definition

$$Kv = Q\sqrt{\frac{S.G.}{\Delta P}}$$

Cv (Kv) CAPACITY RANGES

Size	Standard capacity ranges		
1/2" (16mm)	A	Cv =0,0125	Kv =0,0108
	B	Cv = 0,0263	Kv = 0,0227
	C	Cv = 0,0507	Kv = 0,0437
	D	Cv = 0,0973	Kv = 0,0839
	Dx	Cv = 0,1927	Kv = 0,1661
1" (25mm)	E	Cv = 0,3158	Kv = 0,2722
	F	Cv = 0,4720	Kv = 0,4069
	G	Cv = 1,0000	Kv = 0,8621
	H	Cv = 1,5567	Kv = 1,3420
	K	Cv = 2,2233	Kv =1,9164

Other Cv/Kv values upon request

Important system parameters

Apart from the spray quality of the atomizer (primary atomization) there are other system parameters which influence the Desuperheater stations performance. These are:

Distance to sensor

The distance from the Ven-Temp Desuperheater to the temperature sensor should be 39 to 50 feet (12 to 15 meters), although the distance specific to the application is advised by Narvik at the enquiry stage. Longer distances will ensure that full evaporation of the water will take place at lower steam velocities.

Required straight pipe run

The minimum pipe run, required downstream, varies with each individual application and is specified by Narvik at the enquiry stage. This straight run is needed to prevent erosion due to impingement of water droplets against pipewalls, valves and fittings. Upstream straight run is normally 5 x D and the outlet straight run 13 feet (4 meters), as a minimum.

For applications outside these limitations, consult Narvik or your local representative.

Spray water must be injected in the direction of the steam flow.
Narvik always recommends a strainer with a mesh size of approx. 100 µ in the water supply line to protect the injection nozzle from clogging.

Ordering / sizing data

The Ven-Temp Desuperheater works optimally under their design conditions. A minimum differential in static pressure is required to maintain the velocity at such a level that proper mixing of water and steam is achieved.

Steam Data		
Inlet pressure	psi	(bar)
Inlet temperature	ºF	(°C)
Outlet temperature	ºF	(°C setpoint)
Steam flow max.	t/hr	
Steam flow normal	t/hr	
Steam flow min.	t/hr	
Water Data		
Water pressure	psi	(bar)
Water temperature	ºF	(°C)
General		
Pipe size	inch	(mm)
Pipe schedule		

Turndown ratio
Gst max. : Gst min. = 4 : 1
It is essential not to over-specify the maximum quantity of steam and this rule applies generally to any Desuperheater selection.

Water / Steam ratio
Gst : Gw = 5 : 1
Above this ratio, proper evaporation of the injection water cannot always be guaranteed.

LESLIE MODEL SPID

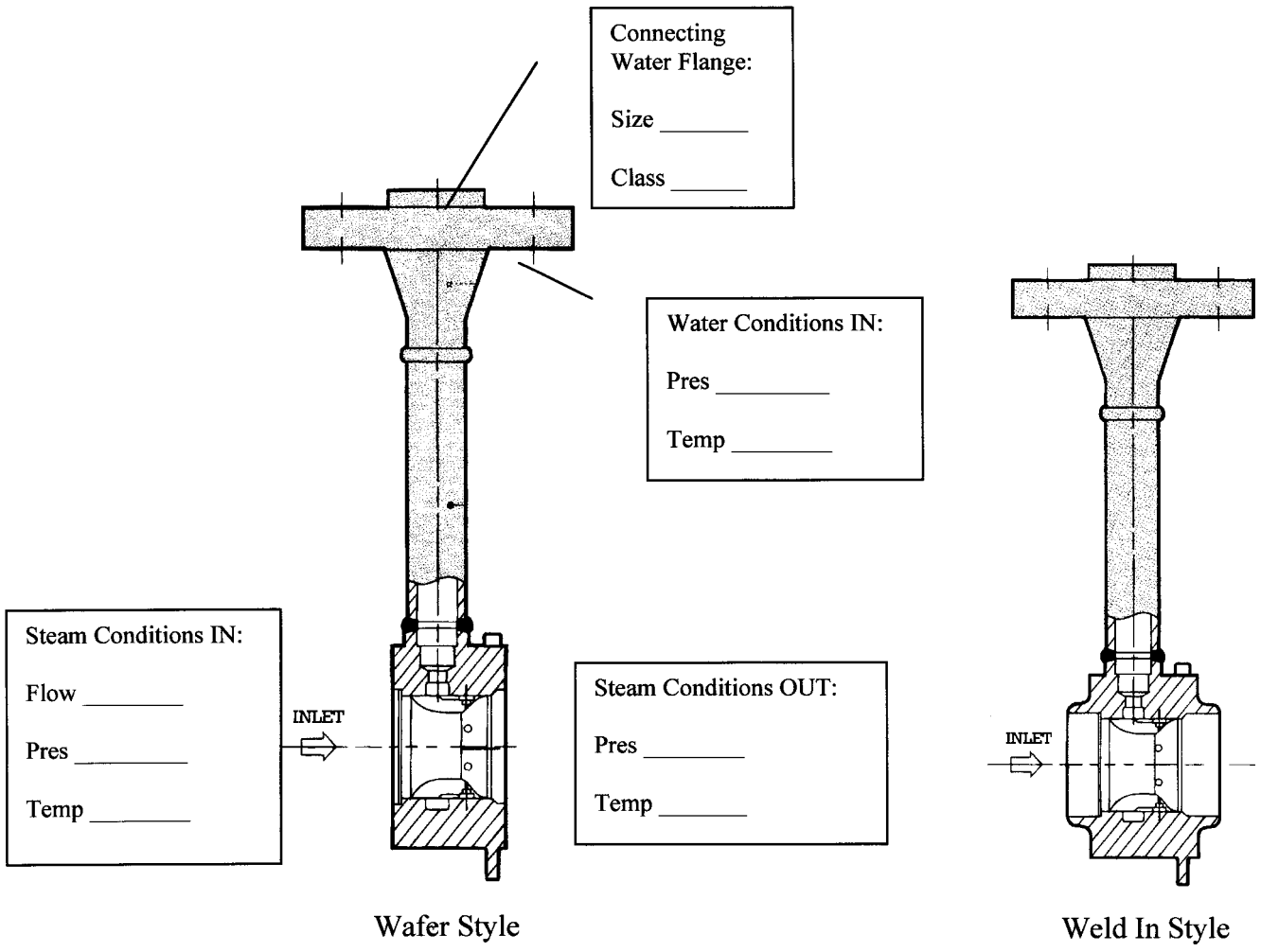
Desuperheater Specification Form

LESLIE CONTROLS, INC.
A division of CIRCOR International, Inc.
12501 Telecom Drive · Tampa, Florida 33637
(813) 978-1000 · FAX: (813)-978-0984

CONTROL VALVE SPEC SHEET

Project/Job _____
Unit/Customer _____
P.O./LCO File # _____
Item _____
Contract _____
MFR Serial# _____

Data Sheet _____ of _____
Spec _____
Tag _____
Dwg _____
Service _____



For use in small steam lines with minimal steam pressure losses. Steam control within 43ºF of saturation temp and +/- 1% of controller range. Water flange connection available 1/2"-1" size. Steam connection available in wafer or butt weld in 1½" – 4" size.

Distance to Sensor: distance from injection point to temp sensor should be 40-50 ft. Systems operating at pressures above 362psi can have significantly less run to the sensor (consult factory).
Required Straight Pipe Run: upstream straight pipe run is normally 6xD and the downstream straight pipe run 20xD, as a minimum. For other distance applications consult factory.
Turndown ratio: normally 1:40. Ratio is determined by dividing "steam flow max" x "steam flow min".

QUESTIONS? CALL LESLIE CONTROLS @ (813) 978-1000 PLEASE FAX COMPLETED FORM TO: (813) 977-0174

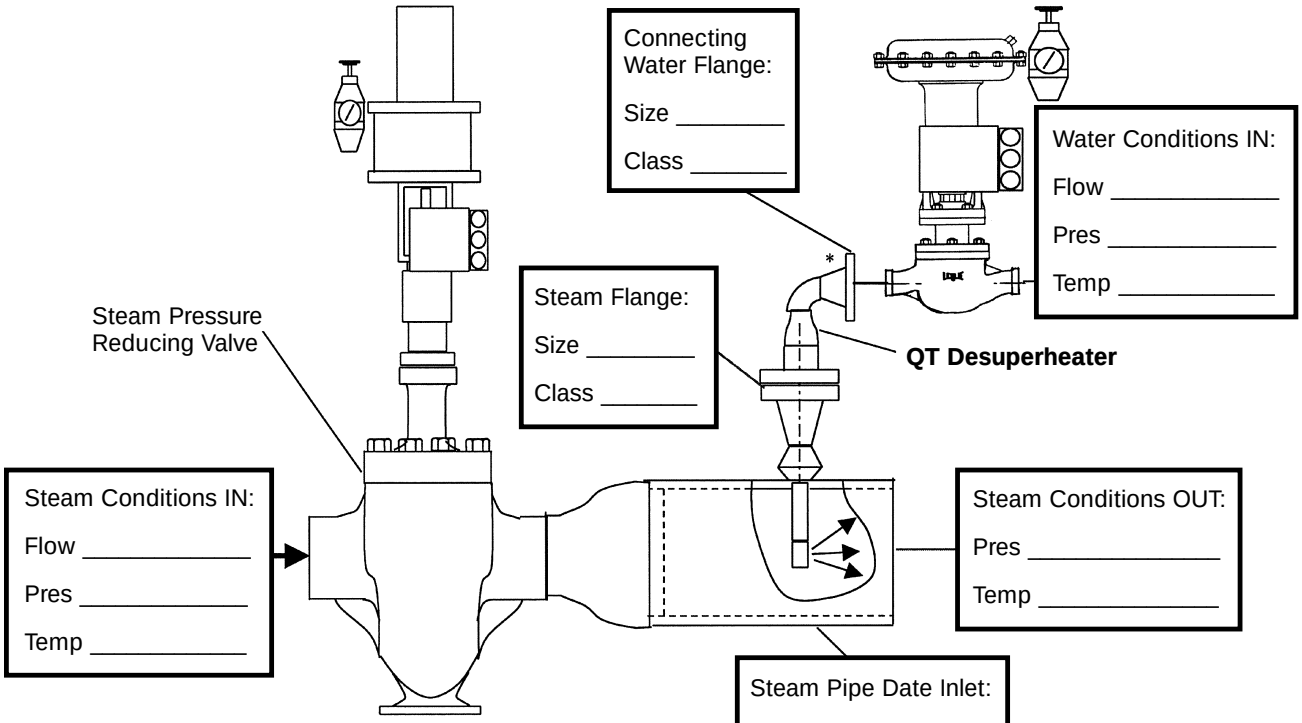
LESLIE MODEL QT

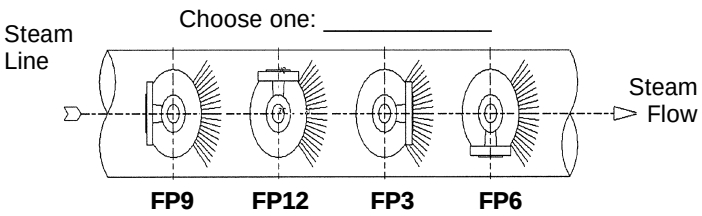
Steam Conditioning System Specification Form

LESLIE CONTROLS, INC.
A division of CIRCOR International, Inc.
12501 Telecom Drive · Tampa, Florida 33637
(813) 978-1000 · FAX: (813)-978-0984

CONTROL VALVE SPEC SHEET

Project/Job _____ Data Sheet _____ of _____
Unit/Customer _____ Spec _____
P.O./LCO File # _____ Tag _____
Item _____ Dwg _____
Contract _____ Service _____
MFR Serial# _____





Note: Spraywater must be injected in the direction of the steam flow. Select appropriate spray head flange position.

Distance Sensor:

distance from injection point to temp sensor should be 40-50 ft. Systems operating at pressures above 362 psi can have significantly less run to the sensor (consult factory).

Required Straight Pipe Run:

distance from injection point to first pipe bend is also a function of steam pressure, temp and nozzle size. Based on experience systems up to 362 psi, 13-20 ft., is an acceptable distance.

Turndown ratio:

normally 18:1 and 27:1. Ratio is determined by dividing "steam flow max" x "Steam flow min".

QUESTIONS? CALL LESLIE CONTROLS @ (813) 978-1000 PLEASE FAX COMPLETED FORM TO: (813) 977-0174

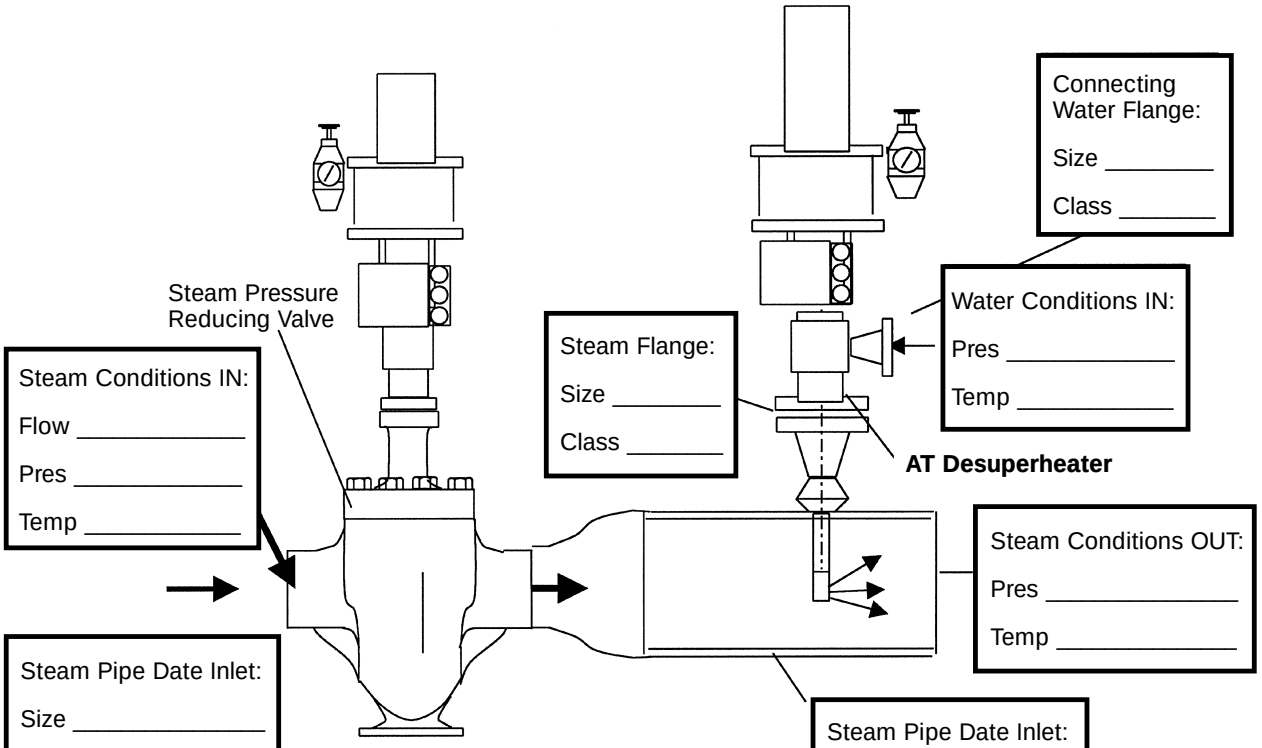
LESLIE MODEL AT

Steam Conditioning System Specification Form

LESLIE CONTROLS, INC.
A division of CIRCOR International, Inc.
12501 Telecom Drive · Tampa, Florida 33637
(813) 978-1000 · FAX: (813)-978-0984

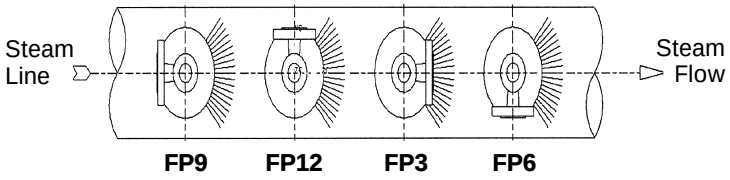
CONTROL VALVE SPEC SHEET

Project/Job _____ Data Sheet _____ of _____
Unit/Customer _____ Spec _____
P.O./LCO File # _____ Tag _____
Item _____ Dwg _____
Contract _____ Service _____
MFR Serial# _____



* Water flange positions

Choose one: _____



Note: Spraywater must be injected in the direction of the steam flow. Select appropriate spray head flange position.

Use on medium/low pressure steam applications. there is no water control valve.The AT desuperheater valve regulates the amount of injection water by varying the number of injection nozzles. This enables the water pressure to remain constant, independent of the number of injection nozzles in operation.

Distance Sensor:

distance from injection point to temp sensor should be 40-50 ft. Systems operating at pressures above 362 psi can have significantly less run to the sensor (consult factory).

Required Straight Pipe Run:

distance from injection point to first pipe bend is also a function of steam pressure, temp and nozzle size. Based on experience systems up to 362 psi, 13-20 ft., is an acceptable distance.

Turndown ratio:

normally 18:1 and 27:1. Ratio is determined by dividing "steam flow max" x "Steam flow min".

QUESTIONS? CALL LESLIE CONTROLS @ (813) 978-1000 PLEASE FAX COMPLETED FORM TO: (813) 977-0174

GTW THREE WAY CONTROL VALVE

GTW 3-WAY CONTROL VALVE

SIZES 1/2" – 12"
ANSI CLASS 125/250, 150/300

- **Rigid Port Guiding** dampens vibration and ensures proper seating
- **High Capacity Body Designs** means valve body flow areas are 140% of normal valve, reducing velocities and pressure loss
- **Balanced Plug Design** of DV provides gradual, stable transition
- **316 SS Valve Plugs & Seat Rings** for corrosion resistance
- **Mixing or Diverting** in Cast Iron, Carbon Steel or Stainless Steel to suit your application
- **Spring Loaded V-ring Packing** is self adjusting

Application Data

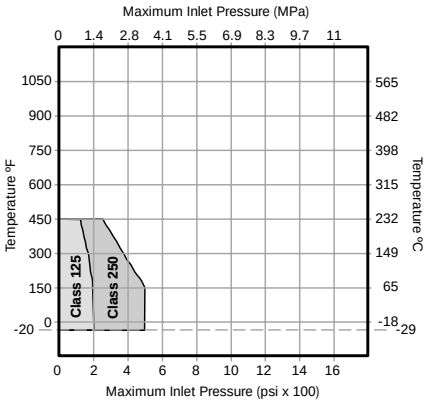
- Process control systems for food, pulp and paper, chemical, petrochemical & other industries
- HVAC systems
- Feed water and fuel system controls in boiler rooms
- Packaged systems (OEM) such as heat exchangers, water purification systems & vaporizer, metal cleaning and plating
- Especially designed for mix or diverting of clean, dirty, viscous and corrosive liquids, gasses and steam

Options

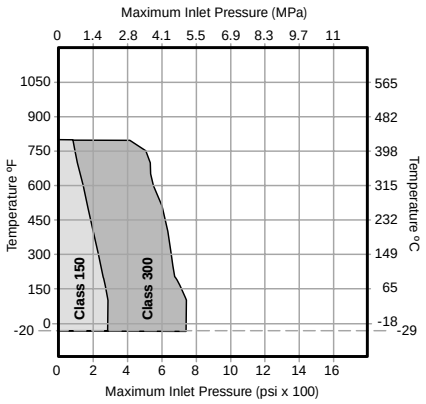
- 40 and 85 sq. in. Reverse and Direct Actuators
- Soft Seat
- Positioners and Other Accessories
- Alternate Packing for Severe Service
- Graphite or High Temperature Packing

Applicable Codes *See Reference Section on page 195*

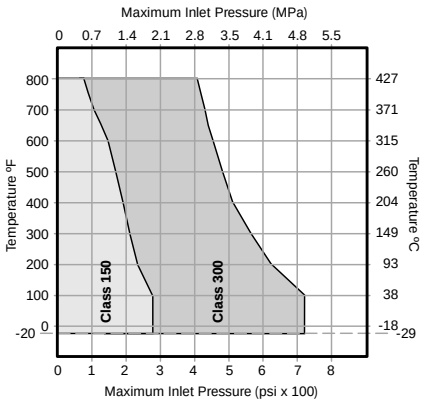
CAST IRON
A126 Class B



CARBON STEEL
A216 Gr. WCB - Standard Class



316 STAINLESS STEEL CF8M
Class A - Standard



MAXIMUM RATED FLOW COEFFICIENTS Cv **AND STROKE** inches (mm)

	VALVE SIZE											
	1/2 (15)	3/4 (20)	1 (25)	1 1/2 (40)	2 (50)	2 1/2 (65)	3 (80)	4 (100)	6 (150)	8 (200)	10 (250)	12 (300)
MX	5	7	12	28	50	70	116	158	352	475	739	1070
DV	5	7	12	28	52	76	108	160	365	475	795	1078
Stroke	15/32 (12)	15/32 (12)	11/16 (17.5)	15/16 (23.8)	1 1/16 (26.6)	1 3/16 (29.8)	1 3/8 (34.5)	1 3/4 (44.1)	2 3/8 (59.5)	2 1/2 (62.7)	3 (80)	3 1/2 (87.7)

GTW Principle of Operation

The Three Way Globe Valve design has been successfully applied for over 50 years in chemical, refining, power, paper, and H.V.A.C. industries worldwide. They are designed for mixing or diverting of clean, dirty, viscous and corrosive liquids, high and low pressure steam, and clean, dirty and corrosive gases.

MIXING SERVICE (Type MX)

The inner valves in type MX seat inside the two seat rings (see illustration A). When these valves are used for mixing service, the forces developed by the two inlet flows oppose each other, creating little, if any, unbalance. Thus, the actuator can control the flow efficiently, with very little power lost in overcoming dynamic unbalance.

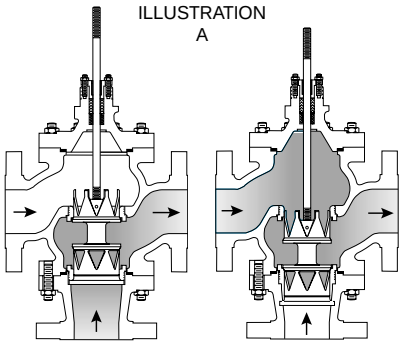
The Type MX valve is also used for diverting service, generally restricted to the smaller sizes (see illustration B).

DIVERTING SERVICE (Type DV)

In contrast to the MX control valve, the inner valve in the type DV seats outside the two seat rings (see illustration C). The flow enters between the two seats and the pressure tends to move the inner valve away from the seats, adding to the stability of operation. Therefore, the Type DV is preferred for diverting service in larger valve sizes and at higher pressure.

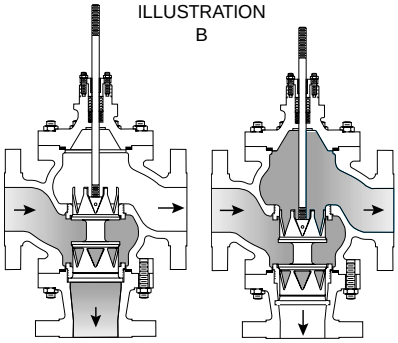
FLOW CONFIGURATIONS

ILLUSTRATION A



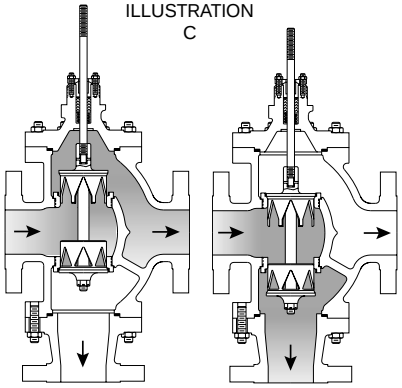
Used for Mixing Service

ILLUSTRATION B



Used for Diverting Service
½"-1½" sizes only

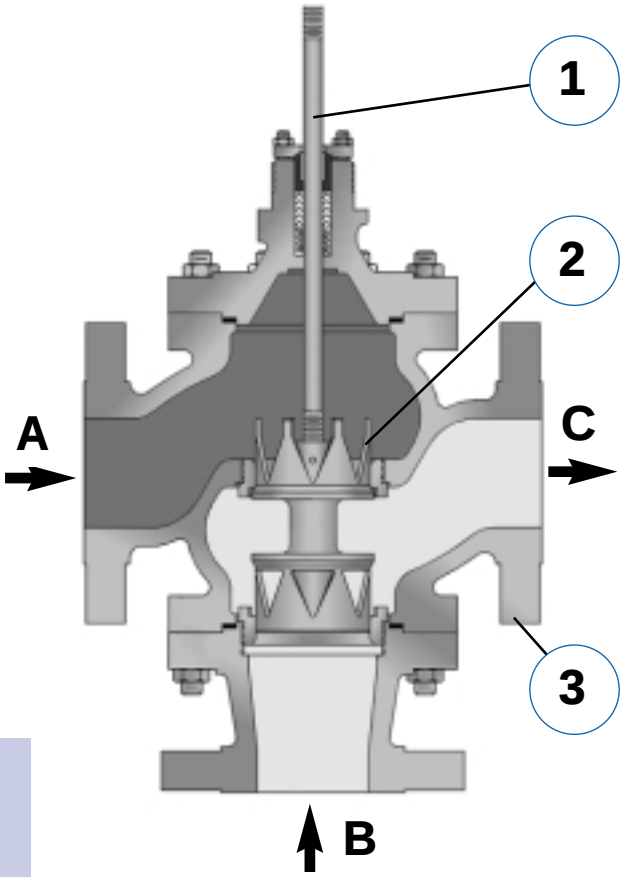
ILLUSTRATION C



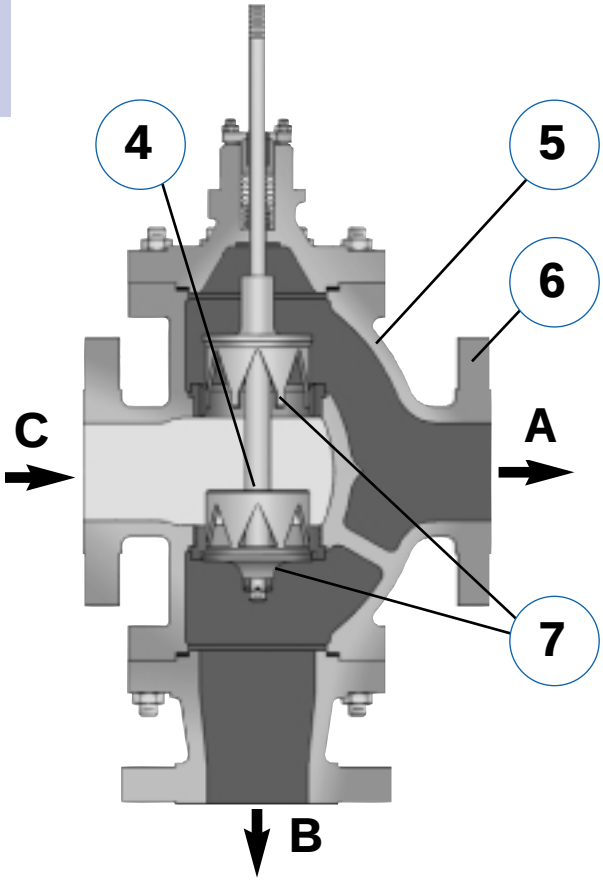
Used for Diverting Service
2"-12" sizes only

Note: When selecting a direct acting actuator, plug is up on air loss. When selecting a reverse acting actuator, plug is down on air loss.

MIXING



DIVERTING



Solution-Engineered Features for Demanding Applications

1. Stem Packing

Teflon® V-Ring Packing-Standard (T)

Live-loaded and pressure-assisted v-rings provide a tight self-adjusting stem seal for process applications from 32-450°F (0-232°C).

Braided Teflon®/Graphite (B)

Graphite impregnated PTFE split rings provide 500°F service temperatures, less stem hysteresis, more "dirt-tolerance", better "memory" and stem sealing than pure PTFE rings.

Laminated Graphite (L)

Precision-cut, laminated graphite rings suitable for process temperatures to 800°F (427°C).

2. Corrosion-Resistant Trim

Valve plugs and seat rings are manufactured from 316 stainless steel providing corrosion resistance and ease of long term maintenance.

3. Size & End Connections

Mixing (Type MX)

The GTW, Type MX is available in ½" - 12" (15-300mm) size, in cast iron and carbon steel bodies (other materials on application). NPT screwed end connections are available in ½" - 2" size. Ring type joint flanges available on request.

Diverting (Type DV)

The GTW, Type DV is available in the same materials as the Type MX in sizes ½" - 12" (15-300mm) sizes.

4. Balanced Plug Design-Diverting

V-notch flow ports and balanced plug design provide stable port switching by preventing valve slamming and pipeline water hammer. Flow entering the valve between the flow ports acts to push both plugs away from the seats providing a stable transition when switching ports.

5. Rigid Port Guiding

Port Guiding provides rigid support and guiding of the plug directly at the point of maximum fluid velocity and pressure drop. This type of plug guiding provides maximum resistance against plug vibration and eliminates plug mis-alignment for proper seating.

6. High Capacity Body Designs

Body configurations incorporate flow areas 140% of normal valve size. These enlarged flow areas minimize fluid velocities and turbulence, maximizing body/trim life and valve efficiency.

7. Stable and True Linear Proportioning

Engineered V-notch flow ports provide true linear proportioning in mixing applications and gradual flow reduction in diverting applications.

GTW 3 Way Valve Actuator Sizing Information

Based on your valve size and service please complete the appropriate questionnaire section below. We require this information to size the smallest actuator possible for your application. We have requested the data this way because the ports may be at different pressures when one or the other port is closed. It is very important that you advise the correct outlet pressures so the actuator is not grossly oversized. If the customer does not have any down stream pressure when the valve is closed the actuator will be extremely large as the valve becomes an unbalanced design.

1/2" through 2" Diverting Service

Upon air failure close Port A_____(direct) or Port B_____(reverse)

Valve Size _____

Type of packing _____

Shutoff Class _____

P1C - Inlet valve pressure _____

Port A closed

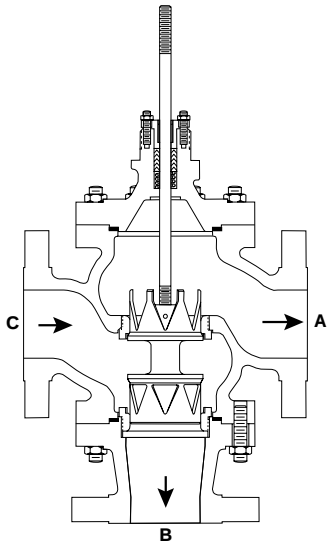
P2A - Outlet valve pressure on Port A _____

P2B - Outlet valve pressure on Port B _____

Port B closed

P2A - Outlet valve pressure on Port A _____

P2B - Outlet valve pressure on Port B _____



2½" through 12" Diverting Service

Upon air failure close Port A_____(reverse) or Port B_____(direct)

Valve Size _____

Type of packing _____

Shutoff Class _____

P1C - Inlet valve pressure _____

Port A closed

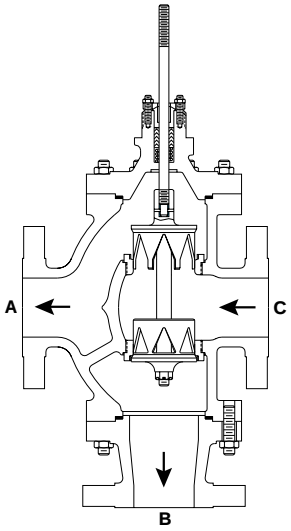
P2A - Outlet valve pressure on Port A _____

P2B - Outlet valve pressure on Port B _____

Port B closed

P2A - Outlet valve pressure on Port A _____

P2B - Outlet valve pressure on Port B _____



1/2" through 12" Mixing Service

Upon air failure close Port A_____(direct) or Port B_____(reverse)

Valve Size _____

Type of packing _____

Shutoff Class _____

P2C - Outlet valve pressure _____

Port A closed

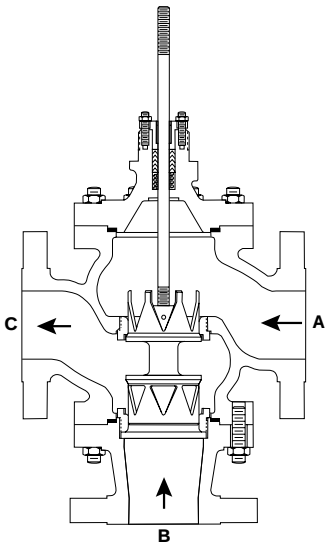
P1A - Inlet valve pressure on Port A _____

P1B - Inlet valve pressure on Port B _____

Port B closed

P1A - Inlet valve pressure on Port A _____

P1B - Inlet valve pressure on Port B _____



GTW Actuator Charts

Actuator	Yoke Used	Valve Size	Valve Stroke	Spring Part Number	Max Comp	Max Spring Force	Up Seating Spring Force (0 psig Air)	Max Upper Bench	Max Lower Bench	Down Seating Force (60 psig Air)
ACT,DL-40-D-C-B1	C	0.5/0.75	0.469	KM1183819	1.95	848.25	644.2	21.2	16.1	1551.7
		1	0.688				549.0		13.7	
		1.5	0.938				440.2		11.0	
		2	1.06				387.2		9.7	
		2.5	1.19				330.6		8.3	
		3	1.38				248.0		6.2	
		4	1.75				87.0		2.2	
ACT,DL-85-D-E-C1	E	0.5/0.75	0.469	KM1193668	2.03	1835	1413.9	21.6	16.6	564.0
		1	0.688				1216.8		14.3	
		1.5	0.938				991.8		11.7	
		2	1.06				882.0		10.4	
		2.5	1.19				765.0		9.0	
		3	1.38				594.0		7.0	
		4	1.75				261.0		3.1	
ACT,DL-85-D-E-C6	E	0.5/0.75	0.469	KM1193673	2.75	1650	1368.6	19.4	16.1	750.0
		1	0.688				1237.2		14.6	
		1.5	0.938				1087.2		12.8	
		2	1.06				1014.0		11.9	
		2.5	1.19				936.0		11.0	
		3	1.38				822.0		9.7	
		4	1.75				600.0		7.1	
ACT,DL-85-D-E-C7[1]	E	0.5/0.75	0.469	KM1193674	8.25	4001.3	3773.8	47.1	44.4	1098.8
		1	0.688				3667.6		43.1	
		1.5	0.938				3546.3		41.7	
		2	1.06				3487.2		41.0	
		2.5	1.19				3424.1		40.3	
		3	1.38				3332.0		39.2	
		4	1.75				3152.5		37.1	
ACT,DL-40-R-C-B1	C	0.5/0.75	0.469	KM1183819	1.95	848.25	644.2	21.2	16.1	1551.7
		1	0.688				549.0		13.7	
		1.5	0.938				440.2		11.0	
		2	1.06				387.2		9.7	
		2.5	1.19				330.6		8.3	
		3	1.38				248.0		6.2	
		4	1.75				87.0		2.2	
ACT,DL-40-R-C-B7[1]	C	0.5/0.75	0.469	KM1179418	4.25	2265.25	2015.3	56.6	50.4	134.8
		1	0.688				1898.5		47.5	
		1.5	0.938				1765.3		44.1	
		2	1.06				1700.3		42.5	
		2.5	1.19				1631.0		40.8	
		3	1.38				1529.7		38.2	
		4	1.75				1332.5		33.3	
ACT,DL-85-R-E-C2	E	0.5/0.75	0.469	KM1193669	1.51	1900.0	1313.7	22.4	15.5	3200.0
		1	0.688				1040.0		12.2	
		1.5	0.938				727.5		8.6	
		2	1.06				575.0		6.8	
		2.5	1.19				412.5		4.9	
		3	1.38				175.0		2.1	
		4	1.75				-287.5		-3.4	
ACT,DL-85-R-E-C7[1]	E	0.5/0.75	0.469	KM1193674	8.25	4001.3	3773.8	47.1	44.4	1098.8
		1	0.688				3667.6		43.1	
		1.5	0.938				3546.3		41.7	
		2	1.06				3487.2		41.0	
		2.5	1.19				3424.1		40.3	
		3	1.38				3332.0		39.2	
		4	1.75				3152.5		37.1	

1. Spring B7, C7, D4 and F7 are not available in direct

GTW Water Capacity Table

(Modified Equal Percent Contour Plug) (G.P.M.)

Pressure (PSI)		Valve Size and Type																		
						2		2.5		3		4		6		8	10		12	
P1	P2	1/2	3/4	1	1.5	MX	DV	MX	DV	MX	DV	MX	DV	MX	DV		MX	DV	MX	DV
10	5	11	16	27	63	112	116	157	170	259	241	353	358	787	816	1062	1652	1778	2393	2410
	2	14	20	34	79	141	147	198	215	328	305	447	453	996	1032	1344	2090	2249	3026	3049
15	10	11	16	27	63	112	116	157	170	259	241	353	358	787	816	1062	1652	1778	2393	2410
	7	14	20	34	79	141	147	198	215	328	305	447	453	996	1032	1344	2090	2249	3026	3049
	3	17	24	42	97	173	180	242	263	402	374	547	554	1219	1264	1645	2560	2754	3707	3734
20	15	11	16	27	63	112	116	157	170	259	241	353	358	787	816	1062	1652	1778	2393	2410
	10	16	22	38	89	158	164	221	240	367	342	500	506	1113	1154	1502	2337	2514	3384	3409
	3	21	29	49	115	206	214	289	313	478	445	651	660	1451	1505	1958	3047	3278	4412	4445
30	25	11	16	27	63	112	116	157	170	259	241	353	358	787	816	1062	1652	1778	2393	2410
	20	16	22	38	89	158	164	221	240	367	342	500	506	1113	1154	1502	2337	2514	3384	3409
	5	25	35	60	140	250	260	350	380	580	540	790	800	1760	1825	2375	3695	3975	5350	5390
40	25	19	27	46	108	194	201	271	294	449	418	612	620	1363	1414	1840	2862	3079	4144	4175
	15	25	35	60	140	250	260	350	380	580	540	790	800	1760	1825	2375	3695	3975	5350	5390
	6	29	41	70	163	292	303	408	443	676	630	921	933	2052	2128	2770	4309	4636	6239	6286
50	35	19	27	46	108	194	201	271	294	449	418	612	620	1363	1414	1840	2862	3079	4144	4175
	30	22	31	54	125	224	233	313	340	519	483	707	716	1574	1632	2124	3305	3555	4785	4821
	25	25	35	60	140	250	260	350	380	580	540	790	800	1760	1825	2375	3695	3975	5350	5390
	7	33	46	79	184	328	341	459	498	761	708	1036	1049	2308	2393	3115	4846	5213	7016	7069
60	45	19	27	46	108	194	201	271	294	449	418	612	620	1363	1414	1840	2862	3079	4144	4175
	40	22	31	54	125	224	233	313	340	519	483	707	716	1574	1632	2124	3305	3555	4785	4821
	25	30	41	71	166	296	308	414	450	686	639	935	947	2082	2159	2810	4372	4703	6330	6378
	9	36	50	86	200	357	371	500	543	828	771	1128	1143	2514	2607	3392	5278	5677	7641	7698
75	55	22	31	54	125	224	233	313	340	519	483	707	716	1574	1632	2124	3305	3555	4785	4821
	50	25	35	60	140	250	260	350	380	580	540	790	800	1760	1825	2375	3695	3975	5350	5390
	25	35	49	85	198	354	368	495	537	820	764	1117	1131	2489	2581	3359	5226	5621	7566	7623
	11	40	56	96	224	400	416	560	608	928	864	1264	1280	2816	2920	3800	5912	6360	8560	8624
100	75	25	35	60	140	250	260	350	380	580	540	790	800	1760	1825	2375	3695	3975	5350	5390
	50	35	49	85	198	354	368	495	537	820	764	1117	1131	2489	2581	3359	5226	5621	7566	7623
	14	46	65	111	260	464	482	649	705	1076	1002	1465	1484	3264	3385	4405	6853	7373	9923	9997
125	100	25	35	60	140	250	260	350	380	580	540	790	800	1760	1825	2375	3695	3975	5350	5390
	50	43	61	104	242	433	450	606	658	1005	935	1368	1386	3048	3161	4114	6400	6885	9266	9336
	18	52	72	124	290	517	538	724	786	1200	1117	1634	1655	3641	3776	4913	7644	8224	11068	11151
150	125	25	35	60	140	250	260	350	380	580	540	790	800	1760	1825	2375	3695	3975	5350	5390
	75	43	61	104	242	433	450	606	658	1005	935	1368	1386	3048	3161	4114	6400	6885	9266	9336
	20	57	80	137	319	570	593	798	867	1323	1231	1801	1824	4013	4162	5416	8426	9064	12200	12291
175	150	25	35	60	140	250	260	350	380	580	540	790	800	1760	1825	2375	3695	3975	5350	5390
	100	43	61	104	242	433	450	606	658	1005	935	1368	1386	3048	3161	4114	6400	6885	9266	9336
	50	56	78	134	313	559	581	783	850	1297	1207	1766	1789	3935	4081	5311	8262	8888	11963	12052
	24	61	86	147	344	614	639	860	934	1425	1327	1942	1966	4325	4485	5837	9081	9769	13148	13247
200	150	35	49	85	198	354	368	495	537	820	764	1117	1131	2489	2581	3359	5226	5621	7566	7623
	100	50	70	120	280	500	520	700	760	1160	1080	1580	1600	3520	3650	4750	7390	7950	10700	10780
	27	66	92	158	368	658	684	921	1000	1526	1421	2078	2104	4630	4801	6248	9720	10457	14074	14179
225	175	35	49	85	198	354	368	495	537	820	764	1117	1131	2489	2581	3359	5226	5621	7566	7623
	100	56	78	134	313	559	581	783	850	1297	1207	1766	1789	3935	4081	5311	8262	8888	11963	12052
	30	70	98	168	391	698	726	977	1061	1620	1508	2206	2234	4915	5097	6633	10320	11102	14942	15053
250	200	35	49	85	198	354	368	495	537	820	764	1117	1131	2489	2581	3359	5226	5621	7566	7623
	175	43	61	104	242	433	450	606	658	1005	935	1368	1386	3048	3161	4114	6400	6885	9266	9336
	100	61	86	147	343	612	637	857	931	1421	1323	1935	1960	4311	4470	5818	9051	9737	13105	13203
	34	73	103	176	412	735	764	1029	1117	1705	1587	2322	2352	5173	5364	6981	10861	11684	15726	15843
300	250	35	49	85	198	354	368	495	537	820	764	1117	1131	2489	2581	3359	5226	5621	7566	7623
	100	71	99	170	396	707	735	990	1075	1640	1527	2234	2263	4978	5162	6718	10451	11243	15132	15245
	40	81	113	193	451	806	838	1129	1225	1870	1741	2548	2580	5676	5885	7659	11916	12819	17253	17382
400	350	35	49	85	198	354	368	495	537	820	764	1117	1131	2489	2581	3359	5226	5621	7566	7623
	200	71	99	170	396	707	735	990	1075	1640	1527	2234	2263	4978	5162	6718	10451	11243	15132	15245
	50	94	131	224	524	935	973	1310	1422	2170	2020	2956	2993	6585	6829	8886	13825	14873	20018	20168

- It is recommended to keep valve outlet velocity below 30,000 ft./min.
- Capacities based on maximum Cv.

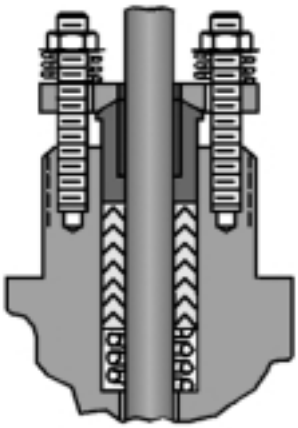
GTW Water Capacity Table

(Modified Equal Percent Contour Plug) (M3/Hr.)

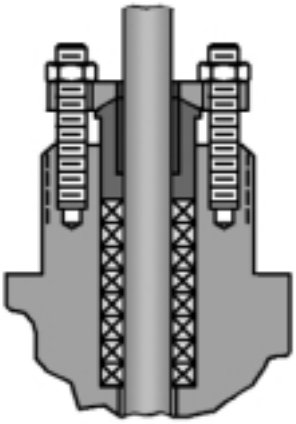
Pressure (M_3/hr)		Valve Size and Type																		
						2		2.5		3		4		6		8	10		12	
P1	P2	1/2	3/4	1	1.5	MX	DV	MX	DV	MX	DV	MX	DV	MX	DV		MX	DV	MX	DV
0.7	0.5	2	3	5	11	19	20	27	29	45	42	61	62	136	141	184	286	307	414	417
	0.2	3	4	7	17	31	32	43	46	71	66	97	98	215	223	290	452	486	654	659
1	0.7	2	3	6	13	24	25	33	36	55	51	75	76	167	173	225	350	377	507	511
	0.5	3	4	7	17	31	32	43	46	71	66	97	98	215	223	290	452	486	654	659
	.2	4	5	9	22	39	40	54	59	90	84	122	124	272	282	367	572	615	828	834
1.5	1	3	4	7	17	31	32	43	46	71	66	97	98	215	223	290	452	486	654	659
	0.7	4	5	9	22	39	40	54	59	90	84	122	124	272	282	367	572	615	828	834
	.2	5	7	12	28	49	51	69	75	114	106	156	158	347	360	468	729	784	1055	1063
2	1.5	3	4	7	17	31	32	43	46	71	66	97	98	215	223	290	452	486	654	659
	1	4	6	10	24	43	45	61	66	100	93	137	138	304	316	411	639	687	925	932
	.3	6	8	14	32	56	59	79	86	131	122	178	180	397	412	536	833	896	1206	1215
3	2	4	6	10	24	43	45	61	66	100	93	137	138	304	316	411	639	687	925	932
	1	6	9	15	34	61	64	86	93	142	132	193	196	430	446	581	904	972	1309	1318
	.5	7	10	16	38	68	71	96	104	159	148	216	219	481	499	649	1010	1087	1463	1474
3.5	3	3	4	7	17	31	32	43	46	71	66	97	98	215	223	290	452	486	654	659
	2	5	7	13	30	53	55	74	80	123	114	167	169	373	387	503	783	842	1133	1142
	1	7	10	16	38	68	71	96	104	159	148	216	219	481	499	649	1010	1087	1463	1474
	.5	7	10	18	42	75	78	105	114	174	162	237	240	527	547	711	1107	1191	1603	1615
4	3	4	6	10	24	43	45	61	66	100	93	137	138	304	316	411	639	687	925	932
	2	6	9	15	34	61	64	86	93	142	132	193	196	430	446	581	904	972	1309	1318
	1	7	10	18	42	75	78	105	114	174	162	237	240	527	547	711	1107	1191	1603	1615
	.6	8	11	19	45	80	83	112	121	185	172	252	255	561	582	757	1178	1268	1706	1719
5	4	4	6	10	24	43	45	61	66	100	93	137	138	304	316	411	639	687	925	932
	3	6	9	15	34	61	64	86	93	142	132	193	196	430	446	581	904	972	1309	1318
	2	7	10	18	42	75	78	105	114	174	162	237	240	527	547	711	1107	1191	1603	1615
	.8	9	12	21	50	89	92	124	135	206	191	280	284	624	647	842	1310	1409	1896	1910
6	5	4	6	10	24	43	45	61	66	100	93	137	138	304	316	411	639	687	925	932
	3	7	10	18	42	75	78	105	114	174	162	237	240	527	547	711	1107	1191	1603	1615
	1	10	14	23	54	97	101	135	147	224	209	306	309	681	706	919	1429	1537	2069	2085
8	6	6	9	15	34	61	64	86	93	142	132	193	196	430	446	581	904	972	1309	1318
	3	10	14	23	54	97	101	135	147	224	209	306	309	681	706	919	1429	1537	2069	2085
	1.1	11	16	27	64	114	118	159	173	264	245	359	363	800	829	1079	1679	1806	2431	2449
10	8	6	9	15	34	61	64	86	93	142	132	193	196	430	446	581	904	972	1309	1318
	5	10	14	23	54	97	101	135	147	224	209	306	309	681	706	919	1429	1537	2069	2085
	1.4	13	18	30	71	127	132	178	193	294	274	401	406	893	926	1205	1874	2016	2714	2734
12	10	6	9	15	34	61	64	86	93	142	132	193	196	430	446	581	904	972	1309	1318
	7	10	14	23	54	97	101	135	147	224	209	306	309	681	706	919	1429	1537	2069	2085
	5	11	16	27	64	114	119	160	174	265	247	361	366	805	835	1087	1691	1819	2448	2466
	1.7	14	19	33	78	139	144	194	211	322	300	439	444	977	1013	1318	2051	2206	2970	2992
14	10	9	12	21	48	86	90	121	131	201	187	273	277	609	631	822	1278	1375	1851	1864
	7	11	16	27	64	114	119	160	174	265	247	361	366	805	835	1087	1691	1819	2448	2466
	2	15	21	36	84	150	156	210	228	347	324	473	479	1054	1093	1423	2214	2382	3205	3229
15	12	7	10	18	42	75	78	105	114	174	162	237	240	527	547	711	1107	1191	1603	1615
	7	12	17	29	68	122	127	171	186	284	264	386	391	861	893	1162	1808	1945	2617	2637
	2	16	22	37	87	156	162	218	237	362	337	493	499	1098	1138	1481	2304	2479	3336	3361
17	14	7	10	18	42	75	78	105	114	174	162	237	240	527	547	711	1107	1191	1603	1615
	10	11	16	27	64	114	119	160	174	265	247	361	366	805	835	1087	1691	1819	2448	2466
	5	15	21	36	84	150	156	210	228	347	324	473	479	1054	1093	1423	2214	2382	3205	3229
	2.4	17	23	40	93	165	172	231	251	383	357	522	529	1163	1206	1570	2442	2627	3536	3562
20	15	10	14	23	54	97	101	135	147	224	209	306	309	681	706	919	1429	1537	2069	2085
	10	14	19	33	77	137	142	191	208	317	295	432	438	963	998	1299	2021	2174	2926	2948
	2.7	18	25	43	101	180	187	252	273	417	388	568	575	1266	1313	1709	2658	2860	3849	3877
27	20	11	16	27	64	114	119	160	174	265	247	361	366	805	835	1087	1691	1819	2448	2466
	15	15	21	36	84	150	156	210	228	347	324	473	479	1054	1093	1423	2214	2382	3205	3229
	3.5	21	29	50	117	210	218	293	319	486	453	662	671	1476	1530	1991	3098	3333	4486	4519

- It is recommended to keep valve outlet velocity below 30,000 ft./min.
- Capacities based on maximum Cv.

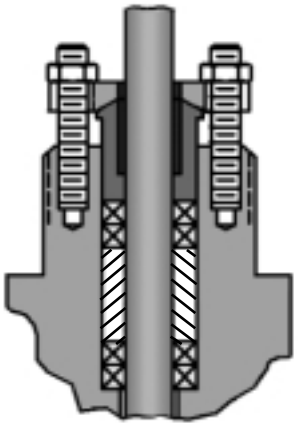
GTW
Three Way Valves



(T) Teflon Chevron



(B) BTG

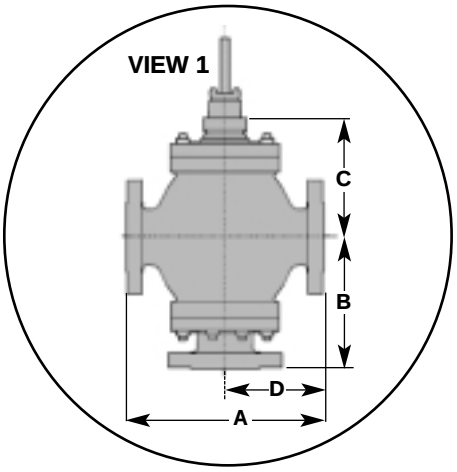


(L) Laminated Graphite

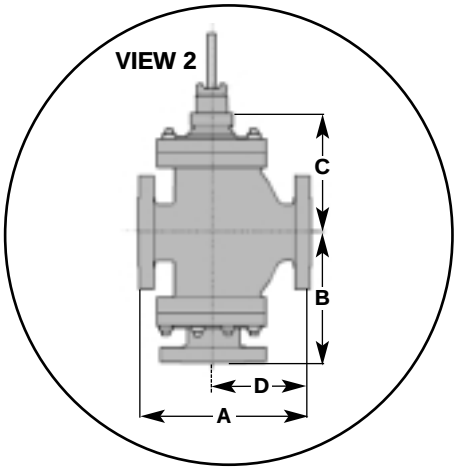
Sizing Coefficients

TYPE	F_L	K_c	X_T
Mixing - MX	.95	.75	.76
Diverting - DV	.93	.71	.73

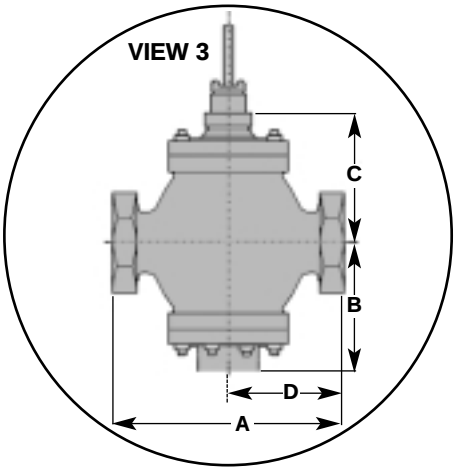
GTW Body Dimensions



Valve Sizes - Flanged Ends
Diverting ½" - 1½"
Mixing ½" - 12"



Valve Sizes - Flanged Ends
Diverting 2" - 12"



Valve Sizes - Threaded Ends
Diverting ½" - 1½"
Mixing ½" - 2"

BODY DIMENSIONS inches (mm)**,**
WEIGHTS pounds (kg) **AND VOLUME** cu.ft. (m^3)

THREE WAY

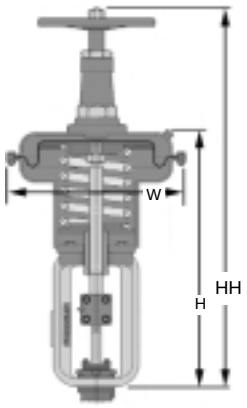
VALVE SIZE	Threaded 250 / 300														WEIGHT	VOLUME
	A				B				C				D			
	Diverting	Diagram View #	Mixing	Diagram View #	Diverting	Diagram View #	Mixing	Diagram View #	Diverting	Diagram View #	Mixing	Diagram View #	Diverting	Diagram View #	Mixing	Diagram View #		
0.5 (15)	5 11/16 (144.5)	3	5 11/16 (144.5)	3	3 5/8 (92.1)	3	3 5/8 (92.1)	3	4 5/8 (117.5)	3	4 5/8 (117.5)	3	*	3	*	3	45 (20)	1 (.03)
.75 (20)	5 11/16 (144.5)	3	5 11/16 (144.5)	3	3 5/8 (92.1)	3	3 5/8 (92.1)	3	4 5/8 (117.5)	3	4 5/8 (117.5)	3	3 1/16 (77.8)	3	3 1/16 (77.8)	3	45 (20)	1 (.03)
1 (25)	6 3/16 (157.2)	3	6 3/16 (157.2)	3	4 7/16 (112.7)	3	44 7/16 (112.7)	3	54 7/16 (138.1)	3	54 7/16 (138.1)	3	3 1/4 (82.6)	3	3 1/4 (82.6)	3	6 (28)	1 (.03)
1.5 (40)	7 3/4 (196.9)	3	7 3/4 (196.9)	3	5 1/2 (139.7)	3	5 1/2 (139.7)	3	6 1/4 (158.8)	3	6 1/4 (158.8)	3	4 3/8 (111.1)	3	4 3/8 (111.1)	3	72 (33)	2 (.06)
2 (50)	—-		9 3/16 (233.4)	3	—-		6 1/4 (158.8)	3	—-		6 7/8 (174.6)		—-		5 (127)	3	94 (43)	2 (.06)

*Consult Factory
NOTE 1. 0.5" CI 250 Class is 3 1/16" and Steel 300 Class is 4".

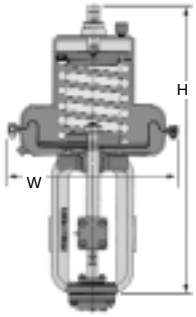
Numbers after dimensions refer to diagram view above.

VALVE SIZE	ANSI Flange 125 / 150														ANSI Flange 250 300														WEIGHT	VOLUME
	A				B				C				D		A				B				C				D					
	Diverting	Diagram View #	Mixing	Diagram View #	Diverting	Diagram View #	Mixing	Diagram View #	Diverting	Diagram View #	Mixing	Diagram View #	Diverting	Diagram View #	Mixing	Diagram View #	Diverting	Diagram View #	Mixing	Diagram View #	Diverting	Diagram View #	Mixing	Diagram View #	Diverting	Diagram View #	Mixing	Diagram View #		
0.5 (15)	7½ (190.5)	1	7½ (190.5)	1	5 5/16 (141.3)	1	5 5/16 (141.3)	1	4 5/8 (117.5)	1	4 5/8 (117.5)	1	3 7/8 (98.4)	1	3 7/8 (98.4)	1	7¼ (184.2)	1	7¼ (184.2)	1	5 11/16 (144.5)	1	5 11/16 (144.5)	1	4 5/8 (117.5)	1	4 5/8 (117.5)	1	Note 1		Note 1		45 (20)	1 (.03)
.75 (20)	7¼ (184.2)	1	7¼ (184.2)	1	5 5/16 (141.3)	1	5 5/16 (141.3)	1	4 5/8 (117.5)	1	4 5/8 (117.5)	1	3 7/8 (98.4)	1	3 7/8 (98.4)	1	7 7/8 (193.7)	1	7 7/8 (193.7)	1	5¾ (146.1)	1	5¾ (146.1)	1	4 5/8 (117.5)	1	4 5/8 (117.5)	1	4 1/16 (103.2)	1	4 1/16 (103.2)	1	45 (20)	1 (.03)
1 (25)	7¼ (184.2)	1	7¼ (184.2)	1	6 3/16 (157.2)	1	6 3/16 (157.2)	1	5 5/16 (138.1)	1	5 5/16 (138.1)	1	3¾ (95.3)	1	3¾ (95.3)	1	7¾ (196.9)	1	7¾ (196.9)	1	6 7/16 (163.5)	1	6 7/16 (163.5)	1	5 5/16 (138.1)	1	5 5/16 (138.1)	1	4 (101.6)	1	4 (101.6)	1	6 (28)	1 (.03)
1.5 (40)	8¾ (222.3)	1	8¾ (222.3)	1	7 7/16 (188.9)	1	7 7/16 (188.9)	1	6¼ (158.8)	1	6¼ (158.8)	1	4 7/16 (112.7)	1	4 7/16 (112.7)	1	9¼ (235)	1	9¼ (235)	1	7 11/16 (195.3)	1	7 11/16 (195.3)	1	6¼ (158.8)	1	6¼ (158.8)	1	4 11/16 (119.1)	1	4 11/16 (119.1)	1	72 (33)	2 (.06)
2 (50)	10 (254.0)	2	10 (254.0)	1	7 13/16 (198.4)	2	7 13/16 (198.4)	1	6 7/8 (174.6)	2	6 7/8 (174.6)	1	5 7/16 (138.1)	2	5 7/16 (138.1)	1	10½ (266.7)	2	10½ (266.7)	1	8 1/16 (204.8)	2	8 1/16 (204.8)	1	6 7/8 (174.6)	2	6 7/8 (174.6)	1	5 11/16 (144.5)	2	5 11/16 (144.5)	1	94 (43)	2 (.06)
2.5 (65)	10 7/8 (276.2)	2	10 7/8 (276.2)	1	8¾ (222.3)	2	8¾ (222.3)	1	7 21/32 (194.5)	2	7 21/32 (194.5)	1	6 1/8 (155.6)	2	6 1/8 (155.6)	1	11½ (292.1)	2	11½ (292.1)	1	9 1/16 (230.2)	2	9 1/16 (230.2)	1	7 21/32 (194.5)	2	7 21/32 (194.5)	1	6 7/16 (163.5)	2	6 7/16 (163.5)	1	105 (48)	3 (.08)
3 (80)	11¾ (298.5)	2	11¾ (298.5)	1	9 19/32 (243.7)	2	8 1/16 (208.0)	1	8 23/32 (221.5)	2	7 5/16 (185.7)	1	6 13/16 (173.0)	2	5⅞ (149.2)	1	12½ (317.5)	2	12½ (317.5)	1	9 31/32 (253.2)	2	8 1/16 (217.5)	1	8 23/32 (221.5)	2	7 5/16 (185.7)	1	7 3/16 (182.6)	2	6¼ (158.8)	1	160 (73)	3 (.08)
4 (100)	13⅞ (352.4)	2	13⅞ (352.4)	1	11⅛ (282.6)	2	10 3/16 (258.8)	1	9⅞ (250.8)	2	8 15/16 (227.0)	1	8⅛ (206.4)	2	6 15/16 (176.2)	1	14½ (368.3)	2	14½ (368.3)	1	11 7/16 (290.5)	2	10½ (266.7)	1	9⅞ (250.8)	2	8 15/16 (227.0)	1	8 1/16 (214.3)	2	7¼ (184.2)	1	193 (88)	5 (.14)
6 (150)	17¾ (450.9)	2	17¾ (450.9)	1	14⅝ (371.5)	2	12⅛ (308.0)	1	14 5/16 (363.5)	2	11 13/16 (300.0)	1	10 7/16 (265.1)	2	8⅞ (225.4)	1	18⅝ (473.1)	2	18⅝ (473.1)	1	15 1/16 (382.6)	2	12 9/16 (319.1)	1	14 5/16 (363.5)	2	11 13/16 (300.0)	1	10⅞ (276.2)	2	9 5/16 (236.5)	1	455 (206)	8 (.23)
8 (200)	21⅜ (542.9)	2	21⅜ (542.9)	1	16 29/32 (429.4)	2	14 23/32 (373.9)	1	17 3/16 (436.6)	2	15 (381.0)	1	12 11/16 (322.2)	2	10 11/16 (271.5)	1	22⅜ (568.3)	2	22⅜ (568.3)	1	17 13/32 (442.1)	2	15 5/32 (386.6)	1	17 3/16 (436.6)	2	15 (381.0)	1	13 3/16 (335.0)	2	11 3/16 (284.2)	1	635 (288)	13 (.37)
10 (250)	25½ (647.7)	2	26 (660.4)	1	19 23/32 (500.9)	2	17 17/32 (445.3)	1	19 3/16 (487.4)	2	17 (431.8)	1	15½ (393.7)	2	13 (330.2)	1	26⅞ (682.6)	2	27⅜ (695.3)	1	20⅜ (517.5)	2	18 5/32 (462.8)	1	19 3/16 (487.4)	2	17 (431.8)	1	16 5/16 (411.2)	2	13 11/16 (347.7)	1	1050 (476)	21 (.59)
12 (300)	*	2	29¾ (755.7)	1	*	2	19 13/16 (503.2)	1	*	2	18⅜ (466.7)	1	*	2	14⅞ (377.8)	1	*	2	31¼ (793.8)	1	*	2	20 9/16 (522.3)	1	*	2	18⅜ (466.7)	1	*	2	15⅝ (396.9)	1	1690 (767)	30 (.85)

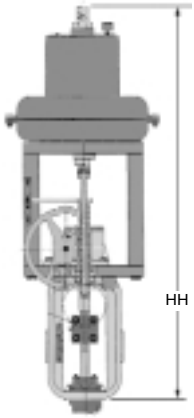
GTW Actuator



Direct
Fig. 1



Reverse
Fig. 2



Reverse
Fig. 2A

ACTUATOR DIMENSIONS inches (mm)
AND WEIGHTS pounds (kg)

MODEL	DIRECT		REVERSE			WGT.	
	H	HH	H	HH[1]	W	DIRECT	REVERSE
40	19.5 (495)	32.7 (831)	25.8 (655)	39.8 (1011)	10.1 (257)	37 (817)	54 (25)
85	20.9 (531)	41.7 (1059)	38.4 (975)	57.4 (1458)	14.8 (375)	84 (38)	125 (57)

1. See Fig. 2A

GTW Specifications

Description		Material Specification	Temp. Range
Trim Modules			
1	Plug	316 Stainless Steel ASTM A351 Grade CF8M	-20 — 800°F (29°C—427°C)
2	Seat Rings	316 Stainless Steel ASTM A351 Grade CF8M	-20 — 800°F (29°C—427°C)
3	Pin	302 Stainless Steel	-20 — 800°F (29°C—427°C)
4	Stem	316 Stainless Steel	-20 — 800°F (29°C—427°C)
Packing Module			
5	Spring (V-Ring Packing)	316 Stainless Steel	-20 — 800°F (29°C—427°C)
6	Packing Set (B)	Braided Teflon Graphite	-40 — 500°F (-40°C—232°C)
6	Packing Set (T)	Teflon-Chevron	-40 — 450°F (-40°C—232°C)
7	Packing Set (L)	Laminated Graphite	-425 — 800°F (-29°C—427°C)
9	Packing Follower	316 Stainless Steel	-20 — 800°F (-29°C—427°C)
10	Packing Flange	Cadmium Plated Steel	-20 — 800°F (-29°C—427°C)
11	Hex Nut	316 Stainless Steel	-20 — 800°F (-29°C—427°C)
12	Studs	316 Stainless Steel	-20 — 800°F (-29°C—427°C)
Body/Bonnet Materials			
13	Nut	ASTM A-194 Gr.2H	-20 — 800°F (29°C—427°C)
13	Nut	ASTM A-194 Gr.7	-20 — 800°F (29°C—427°C)
14	Stud	ASTM A-193 Gr.B7	-20 — 800°F (29°C—427°C)
14	Stud	ASTM A-193 B 16	-20 — 800°F (-29°C—427°C)
15	Gasket	Nitrile Rubber Bonded	32 — 450°F (0ºC—230°C)
15	Gasket	PTFE	-32 — 450°F (-35ºC—230°C)
15	Gasket	Grafoil®	-120 — 800°F (-195°C—427°C)
16	Body/Bonnet/Lower Adapter	Cast Iron ASTM A-126 Class B	-20 — 450°F (-29°C—232°C)
16	Body/Bonnet/Lower Adapter	*Steel ASTM A-216 Gr.WCB	-20 — 800°F (-29°C—427°C)
16	Body/Bonnet/Lower Adapter	*316 Stainless Steel ASTM A-351 Gr.CF8M	-20 — 800°F (-29°C—427°C)

* Consult ANSI B16.1 (cast iron) or ANSI B16.34 (other body materials) for pressure/temperature limits of body/bonnet assembly.

GTW Ordering Code

Class	Size	Ends	Body Material	Packing Bonnet Type	Gasket	Valve Function	Actuator Size & Action	Actuator Yoke	Actuator Spring	Manual Override	Number of Accessories	European Approval	
K	W	H	B	2	T	1	M	8	E	C	2	N	0	C	E
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Class - Position 1 & 2
KW = Globe 3-way

Size - Position 3
A = ½"
B = ¾"
C = 1"
E = 1½"
F = 2"
G = 2½"
H = 3"
J = 4"
K = 6"
L = 8"
M = 10"
N = 12"

Ends - Position 4
A = Flg.125/150
B = Flg. 250/300
C = NPT

Body Mat'l - Position 5
1 = Cast Iron
2 = Carbon Steel
3 = Stainless Steel

Packing/Std. Bonnet - Position 6
T = Teflon Chevron
B = Braided Teflon Graphite
L = Laminated Graphite

Gasket - Position 7
1 = Nitrile rubber bonded
2 = PTFE
3 = Grafoil
X = Other

Valve Function - Position 8
M = Mixing
D = Diverting

Actuator Size & Action - Position 9
4 = 40 Direct
5 = 40 Reverse
8 = 85 Direct
9 = 85 Reverse
N = No Actuator
X = Other

Actuator Yoke - Position 10
C = 2.31 Dia Hub (40 Act)
E = 2.31 Dia Hub (85 Act)
N = No Actuator

Actuator Spring - Position 11&12

Order Code	Spring Rate	Max. Comp.
Used w/size 40 actuator		
B1 =	435	1.95
B2 =	590	1.52
B3 =	875	1.95
B4 =	1180	1.52
B5 =	1850	0.92
B6 =	300	2.75
B7[1]=	533	4.25
Used w/size 85 actuator		
C1 =	900	2.04
C2 =	1250	1.52
C3 =	1850	2.04
C4 =	2500	1.52
C5 =	3867	0.92
C6 =	600	2.75
C7[1]=	485	8.25

NN = No Actuator/Bare Stem
XX = Other

Manual Override - Position 13
N = None
M = Manual Override (Handwheel)

Accessories - Position 14
0 = No Accessories Mounted
1-8 = Actual Number of Accessories Mounted[2]

European Approval
- Position 15 & 16
CE

THREE WAY

1. Reverse acting actuators only.
2. Does not include spring or mounting kit.

GTW SPECIFICATION FORM

LESLIE CONTROLS, INC.
A division of CIRCOR International, Inc.
12501 Telecom Drive · Tampa, Florida 33637
(813) 978-1000 · FAX: (813)-978-0984

CONTROL VALVE SPEC SHEET

Project/Job _____
Unit/Customer _____
P.O./LCO File # _____
Item _____
Contract _____
MFR Serial# _____

Data Sheet_____of_____
Spec _____
Tag _____
Dwg _____
Service _____

Fluid ❑ Steam ❑ Other

Crit Pres PC

Service Conditions

Flow ❑ #/hr ❑ gpm ❑ scfh ❑ _____
Inlet Pressure ❑ psig ❑ psia ❑ _____
Outlet Pressure ❑ psig ❑ psia ❑ _____
Temperature ❑ °C ❑ °F _____
Max Press/Temperature:_____ /_____
Density/MW/SG _____ / _____ / _____
Viscosity _____ CP
Vapor Pressure ❑ psia ❑ _____
Required C_V _____
Noise (dBA) Allowable_____

Max. Flow	Norm. Flow	Min. Flow

Line Info Pipe Size In_____/Sch_____ Pipe Size Out_____/Sch_____

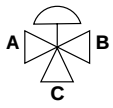
Valve, Body & Bonnet

Body Size in. ❑ ½ ❑ ¾ ❑ 1 ❑ 1½ ❑ 2 ❑ 2½ ❑ 3 ❑ 4 ❑ 6 ❑ 8 ❑ 10 ❑ 12
ANSI Class ❑ 125 ❑ 150 ❑ 250 ❑ 300
Body/Bonnet Material: ❑ Cast Iron ❑ Cast Steel ❑ 316SS ❑ Other_____
End Conn. Inlet/Outlet: ❑ NPT ❑ Int. Flanges ❑ Other_____
Packing Material: ❑ Teflon Chevron ❑ BTG ❑ Laminated Graphite

Trim Size ❑ 100%

Flow Path

❑ Mixing (Converging) (choose one outlet port)
❑ Diverting (Diverging) (choose two outlet ports)



	A	B	C
Outlet Port	❑	❑	❑
Close Port on Air Loss	❑	❑	❑

Actuator

Spring Action: ❑ Air to Open ❑ Air to Close ❑ Last Position
Available Air Supply Pressure: Max._____ Min._____
Manual Override: ❑ Yes ❑ No ❑ Type_____

Solenoid ❑ Yes ❑ No ❑ Type_____ ❑ Voltage_____

Positioner ❑ Yes ❑ No ❑ Type_____ ❑ Pneu ❑ I/P

Switch ❑ Yes ❑ No ❑ Type_____

Air Set ❑ Yes ❑ No ❑ Type:_____ ❑ Range:_____

Other Accessories ❑ Yes ❑ No ❑ Type_____

Test ANSI/FCI Leakage Class: ❑ IV

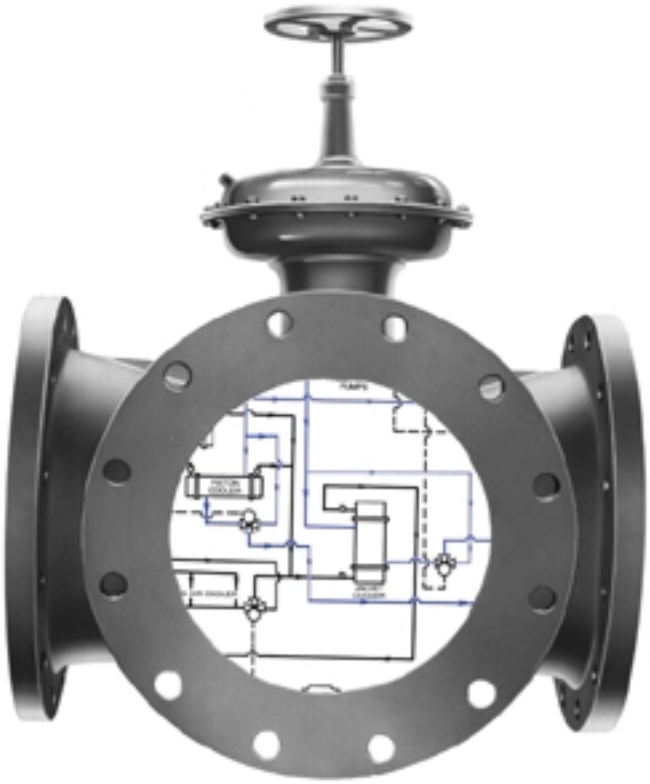
THREE WAY

QUESTIONS? CALL LESLIE CONTROLS @ (813) 978-1000 PLEASE FAX COMPLETED FORM TO: (813) 977-0174

RVK, RVB, RVD THREE WAY ROTARY VALVE

Compact, Efficient Mixing and Diverting Valve

Precisely designed and built, the valve requires very low operating forces. Consequently, smaller valve actuators may be used. In addition, the RV Series 3-way rotary valve boasts higher overall flow capacities—nearly double the Cv of same size globe types—resulting in extremely low pressure losses or reduced valve size. As a result of these two factors, systems using the RV Series 3-way rotary valve usually show lower initial cost than those using globe-type 3-way valves.



Additional features further enhance the RV Series 3-way valve's cost-effectiveness, operational reliability, and maintainability:

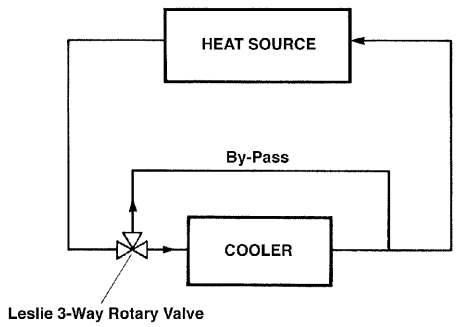
- *Smoother Throttling*
- *Greater Accuracy*
- *Pneumatic/Electronic Instrument Control*
- *Non-Fouling, Non-Sticking Design*
- *Low Profile, Compact Size*
- *Converging or Diverging Flow Capability*
- *Reversible Valve Action*

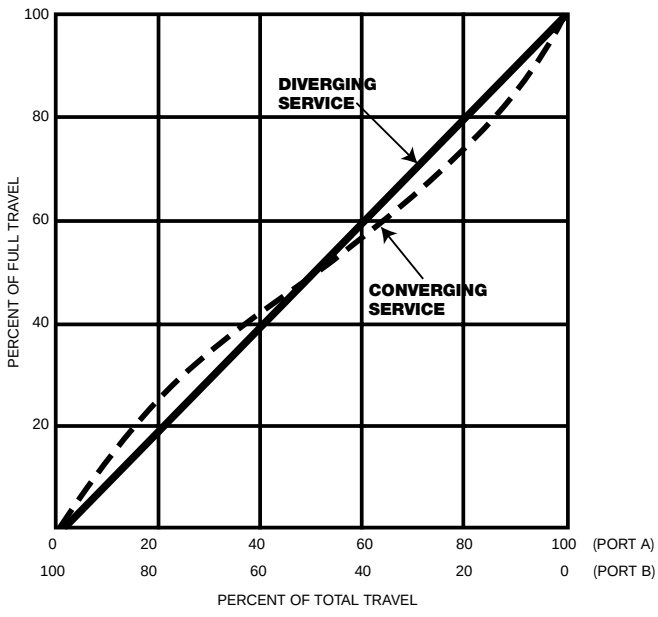
Lower cost plus reliable, long-life operation makes the RV Series 3-way rotary valve your best choice for almost all by-pass temperature control applications. Leslie Controls, Inc. can supply a full line of electronic and pneumatic control instrumentation, too.

THREE WAY

BY-PASS TEMPERATURE CONTROL

By-pass temperature control describes a simple method for controlling the temperature of one fluid with another fluid. A typical system consists basically of a heat source, a cooler, connecting piping and a means of controlling fluid direction: the Leslie 3-way rotary valve.





RVK, RVB, RVD THREE WAY ROTARY VALVE

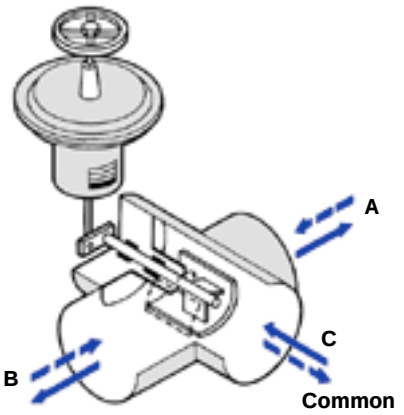
PRINCIPLES OF OPERATION

Operation of the 3-way rotary valve is simple and straightforward.

In diverging service, flow enters the common port and flows out of port A and/or B depending upon the position of the rotor.

In converging service, flow enters from A and/or B depending upon position of rotor and leaves through the common port.

All sizes have an external position indicator. Valve action can be reversed without removing the valve from the line and without additional parts.



---- **Converging Service**

—— **Diverging Service**

S P E C I F I C A T I O N S

Class:			
w/Pneumatic Actuator **w/Electric Actuator**	RVB/RVBR ERVB/ERVBR	RVK/RVKR ERVK/ERVKR	RVD/RVDR ERVD/ERVDR
Body Material:	Cast Bronze	Cast Iron	Ductile Iron
Rotor Material:	Cast Bronze	Cast Bronze	Cast Bronze
Shaft Material:	Monel	Stainless Steel	Stainless Steel
Sizes:	150# ANSI Flanges: 4" - 16" ND10 DIN Flanges: 100 mm - 400 mm	125# ANSI Flanges: 4" - 16" ND10/16 DIN Flanges: 100 mm - 150 mm ND10 DIN Flanges: 200 mm - 400 mm ND16 DIN Flanges: 200 mm - 400 mm JIS 5K: 100 mm - 400 mm	150# ANSI Flanges: 4" - 16" ND10/16 DIN Flanges: 100 mm - 150 mm ND10 DIN Flanges: 200 mm - 400 mm ND16 DIN Flanges: 200 mm - 400 mm JIS 5K: 100 mm - 450 mm
Temperature Range:	32°F - 220°F (0°C - 105°C)	32°F - 220°F (0°C - 105°C)	32°F - 220°F (0°C - 105°C)
Maximum Inlet Pressure:	150 PSIG (10.34 Bar)	125 PSIG (8.62 Bar)	150(PSIG (10.34 Bar)
Fluids:	Fresh Water Sea Water Non-Sulphur Containing Oils	Fresh Water Lube Oil Other Non-Corrosive Fluids	

Actuators:	Pneumatic	4" - 6" Sizes: Leslie 55	8" - 16" Sizes: Leslie 85
	Electrical	Wide range of RTK, Jordan, Rexa, Auma and other models available. Please specify your requirements.	
Maximum Through Valve ΔP:	Full Port: 4" & 5": 25 PSI 6" - 10": 15 PSI 12" - 16": 10 PSI	25 PSI Reduced Port: 4" & 5": 40 PSI 6" - 10": 25 PSI 12" - 16": 15 PSI	
Maximum Leakage Rate:	All Sizes: 1.5% Of Capacity for Diverging Service. 1.8% Of Capacity for Converging Service.		

ACCESSORIES & OPTIONS:

Hand Operating Devices (HOD's) are available on Pneumatic and Electric Actuators.
Pneumatic Actuators are available with aluminum yokes. Add "M" to valve class (RVB becomes RVMB; RVDR becomes RVMDR).
A Positioner or Limit Switches or a Pneumatic Position Transmitter is available on Pneumatic Actuators.
Electric Actuators are available with:

- Feedback Potentiometers
- SPDT or DPDT Limit Switches
- Weatherproof and/or explosion proof enclosures
- Different operating times for both modulating and on-off units.

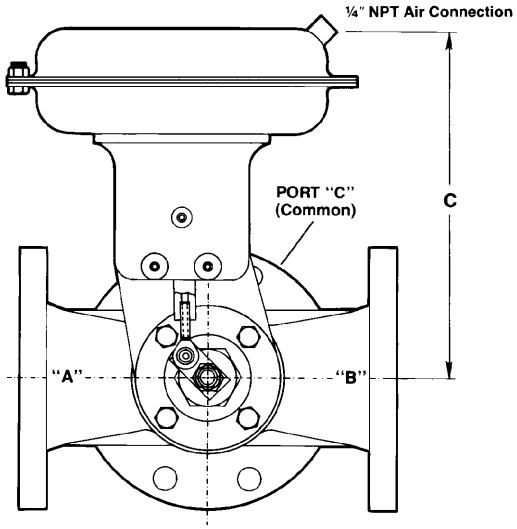
FLOW COEFFICIENTS:

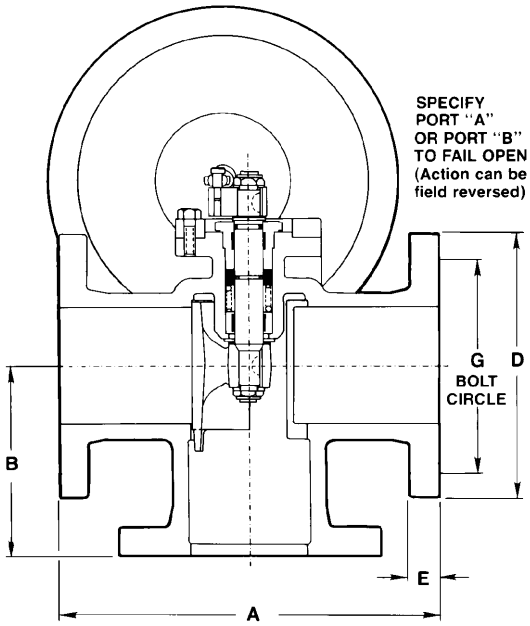
Size	Full Port Cv	Reduced Port Cv
4"/100 mm	290	145
5"/125 mm	290	145
6"/150 mm	645	325
8"/200 mm	1150	575

FLOW COEFFICIENTS:

Size	Full Port Cv	Reduced Port Cv
10"/250 mm	1800	900
12"/250 mm	2590	1295
14"/350 mm	3500	1750
16"/400 mm	3500	1750

RVK, RVB, RVD Dimensions





THREE WAY

150 Lb. ANSI Bronze (in.)

SIZE (in.)	A	B	C	D	E	G	NO. OF HOLES	HOLE SIZE
4	13	6½	14¼	9	11/16	7½	8	3/4
5	15	7½	14¼	10	3/4	8 1/2	8	7/8
6	16	8	14¼	11	13/16	9 1/2	8	7/8
8	18	9	18¼	13½	15/16	11 3/4	8	7/8
10	22	11	18¼	16	1	14 1/4	12	1
12	24	12	18¼	19	1 1/16	17	12	1 1/16
14	28	14	18¼	21	1 5/16	18 3/4	12	1 1/8
16	30	15	18¼	23½	1 3/8	21 1/4	16	1 1/8

125 Lb. ANSI Cast Iron (in.)

SIZE (in.)	A	B	C	D	E	G	NO. OF HOLES	HOLE SIZE
4	13	6 1/2	14 1/4	9	15/16	7 1/2	8	3/4
5	15	7 1/2	14 1/4	10	15/16	8 1/2	8	7/8
6	16	8	14 1/4	11	1	9 1/2	8	7/8
8	18	9	18 1/4	13 1/2	1 1/8	11 3/4	8	7/8
10	22	11	18 1/4	16	1 3/16	14 1/4	12	1
12	24	12	18 1/4	19	1 1/4	17	12	1
14	28	14	18 1/4	21	1 3/8	18 3/4	12	1 1/8
16	30	15	18 1/4	23 1/2	1 7/16	21 1/4	16	1 1/8

150 Lb. ANSI Ductile Iron (in.)

SIZE (in.)	A	B	C	D	E	G	NO. OF HOLES	HOLE SIZE
4	13	6 1/2	14 1/4	9	15/16	7 1/2	8	3/4
5	15	7 1/2	14 1/4	10	15/16	8 1/2	8	7/8
6	15 5/8	7 13/16	14 1/4	11	1	9 1/2	8	7/8
8	18	9	18 1/4	13 1/2	1 1/8	11 3/4	8	7/8
10	22	11	18 1/4	16	1 3/16	14 1/4	12	1
12	24	12	18 1/4	19	1 1/4	17	12	1
14	28	14	18 1/4	21	1 3/8	18 3/4	12	1 1/8
16	30	15	18 1/4	23 1/2	1 7/16	21 1/4	16	1 1/8

ND10/16 DIN Cast Iron/Ductile Iron (mm)

SIZE (in.)	A	B	C	D	E	G	NO. OF HOLES	HOLE SIZE
100	330.2	165.1	362	219.9	24	180	8	18
125	385.8	192.9	362	250.0	26	210	8	18
150	408.0	204.0	362	285.0	26	240	8	23

ND10 DIN Cast Iron/Ductile Iron (mm)

SIZE (in.)	A	B	C	D	E	G	NO. OF HOLES	HOLE SIZE
200	452.4	226.2	463	340.1	26	295	8	23
250	554.8	277.4	463	395.3	28	350	12	23
300	602.5	301.2	463	444.9	28	400	12	23
350	701.7	350.8	463	504.8	30	460	16	23
400	753.3	376.6	463	565.1	32	515	16	27

ND16 DIN Cast Iron/Ductile Iron Dimensions (mm)

SIZE (in.)	A	B	C	D	E	G	NO. OF HOLES	HOLE SIZE
200	460.4	230.2	463	340.1	30	295	12	23
250	562.8	281.4	463	404.8	32	355	12	27
300	610.4	305.2	463	460.0	32	410	12	27
350	713.6	356.8	463	519.9	36	470	16	27
400	765.2	382.6	463	580.2	38	525	16	30

ND10 DIN Cast Bronze Dimensions (mm)

SIZE (in.)	A	B	C	D	E	G	NO. OF HOLES	HOLE SIZE
100	322.6	161.3	362	219.9	20	180	8	18
125	382.9	191.5	362	250.0	20	210	8	18
150	409.6	204.8	362	285.0	22	240	8	23
200	454.0	227.0	463	340.1	22	295	8	23
250	555.6	277.8	463	395.3	24	350	12	23
300	603.3	301.7	463	444.9	24	400	12	23
350	704.9	352.5	463	504.8	27	460	16	23
400	755.6	377.8	463	565.1	32	515	16	27

RV Three Way Valve Specification Form

LESLIE CONTROLS, INC.
A division of CIRCOR International, Inc.
12501 Telecom Drive · Tampa, Florida 33637
(813) 978-1000 · FAX: (813)-978-0984

CONTROL VALVE SPEC SHEET

Project/Job _____ Data Sheet_____of_____
Unit/Customer _____ Spec _____
P.O./LCO File # _____ Tag _____
Item _____ Dwg _____
Contract _____ Service _____
MFR Serial# _____

Fluid ❑ Liquid_____ ❑ Other_____ Crit Pres PC

Service Conditions

Flow ❑ #/hr ❑ gpm ❑ scfh ❑ _____
Inlet Pressure ❑ psig ❑ psia ❑ _____
Pressure Drop ❑ psi ❑ _____
Temperature ❑ °C ❑ °F _____
Max Press/Temperature:_____ /_____
Density/MW/SG
Viscosity
Vapor Pressure ❑ psia ❑ _____
Required C_V _____ ΔP = _____
Noise (dBA) Allowable_____

Max. Flow*	Norm. Flow	Min. Flow*

* NOTE: 3-Way Rotary Valves are normally used in cooling system with fixed speed pumps

Line Info Pipe Size In_____/Sch_____ Pipe Size Out_____/Sch_____

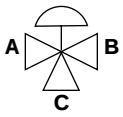
Valve, Body & Bonnet

Body Size in. ❑ 4 ❑ 6 ❑ 8 ❑ 10 ❑ 12 ❑ 16
ANSI Class ❑ 125 ❑ 150 ❑ ND_____ ❑ JIS 5K
Body/Bonnet Material: ❑ Cast Iron ❑ Bronze ❑ Ductile Iron ❑ Other_____
End Conn. Inlet/Outlet: ❑ Int. Flanges ❑ Other_____
Packing Material: ❑ O-Ring/Buna-N ❑ Other_____

Trim Size ❑ 100% ❑ Reduced (Rotary 3-way only)

Flow Path

❑ Mixing (Converging) (choose one outlet port)
❑ Diverting (Diverging) (choose two outlet ports)



	A	B	C
Outlet Port	❑	❑	❑
Close Port on Air Loss	❑	❑	❑

Actuator

❑ 55 ❑ 85 ❑ Converging ❑ Diverting ❑ None
Available Air Supply Pressure: Max._____ Min._____
Manual Override: ❑ Yes ❑ No ❑ Type_____

Solenoid ❑ Yes ❑ No ❑ Type_____ ❑ Voltage_____

Positioner ❑ Yes ❑ No ❑ Type_____ ❑ Pneu ❑ I/P

Switch ❑ Yes ❑ No ❑ Type_____

Air Set ❑ Yes ❑ No ❑ Type:_____ ❑ Range:_____

Other Accessories ❑ Yes ❑ No ❑ Type_____

Test ANSI/FCI Leakage Class: ❑ 1.5% of Capacity for Diverting ❑ 1.8% of capacity for Converging

QUESTIONS? CALL LESLIE CONTROLS @ (813) 978-1000 PLEASE FAX COMPLETED FORM TO: (813) 977-0174

THREE WAY

DOT THREE WAY CONTROL VALVE

SIZES 1" - 3"
ANSI CLASS 125, 150

DOT THREE WAY CONTROL VALVE WITH OPTIONAL HAND OPERATING DEVICE

NEW

- **EPDM O-Rings** for temperatures to 450ºF
- **Cage Trim** provides easy maintenance. All trim parts can be removed from the top of the valve
- **Cage-Guided Trim** for increased valve stability and trim life
- **One-Piece Body** eliminates the conventional tailpiece and extra gasketed joint
- **Spring Loaded Teflon® Chevron Stem Packing** eliminates the need for periodic adjustment
- **In-Line Maintenance** reduces labor costs
- **Lower Stem Friction** provides increased stability
- **Single Body Style** performs either mixing or diverting functions

APPLICATION DATA

- Mixing or diverting water, oil, sea water or other liquids
- Heating or cooling applications involving heat exchanger bypass control
- Blending Systems
- On-off Selector Systems

OPTIONS

- Hand Operating Device
- Valve Positioner
- Position Transmitter
- Limit Switches
- Electric Actuator

FLOW COEFFICIENTS (C_V)

Stroke	Valve Size		Diverging Service	Converging Service
	Inches	mm		
1/4"	1	25	11	12
3/8"	1¼	32	17	19
3/8"	1½	40	24	26
1/2"	2	50	40	45
9/16"	2½	65	60	63
11/16"	3	80	87	91

DOT THREE WAY CONTROL VALVE

SPECIFICATIONS

TRIM MATERIALS

Part	Iron Valves	Bronze Valves
Main Valve	316 Stainless	Monel
Cage	Bronze	Bronze
Lower Seat	17-4 PH SST	Monel
Packing	Teflon Chevron	Teflon Chevron
Packing Spring	Monel	Monel

MAXIMUM OPERATING TEMPERATURE[1]

Bronze 150#	365º F	185º C
Cast Iron 125#	365º F	185º C

MAXIMUM INLET PRESSURE

Bronze	225 PSIG @ 100ºF
Iron	200 PSIG @ 100ºF

YOKES

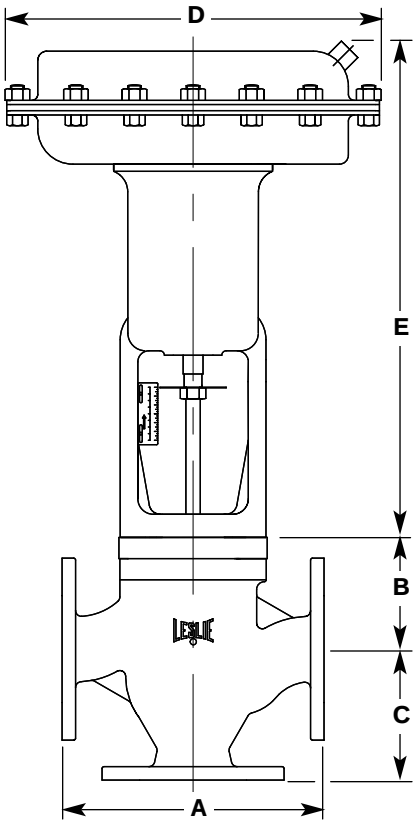
Cast Iron or Aluminum

CHARACTERISTICS

On/Off and Throttling

LEAKAGE

Maximum 0.1% of Rated Capacity



VALVE DIMENSIONS inches (mm) **AND WEIGHTS** pounds (kg)

Size	A			B	C			Weight		
	NPT	125	150		NPT	125	150	NPT	125	150
1 (25)	8⅜ (212.7)	7¼ (184.2)	7⅛ (181)	2⅝ (66.7)	4³⁄₁₆ (106.4)	3⅜ (42.1)	3⁹⁄₁₆ (90.5)	62 (28.1)	66 (29.9)	66 (29.9)
1¼ (32)	9⅝ (244.5)	8⅝ (219.1)	8⁷⁄₁₆ (214.3)	2¹⁵⁄₁₆ (74.6)	4¹³⁄₁₆ (122.2)	4⅜ (109.5)	4³⁄₃₂ (107.2)	69 (31.3)	73 (33.1)	73 (33.1)
1½ (40)	9⅞ (250.8)	8¾ (222.3)	8½ (215.9)	2¹⁵⁄₁₆ (74.6)	4¹⁵⁄₁₆ (125.4)	4⅜ (111.1)	4¼ (108)	72 (32.7)	78 (35.4)	78 (35.4)
2 (50)	11 (279.4)	10 (250)	9¾ (247.7)	3⁵⁄₁₆ (84.1)	5½ (139.7)	5 (125)	4⅞ (123.8)	80 (36.3)	85 (38.6)	85 (38.6)
2½ (65)	— —	10⅞ (276.2)	10⅝ (269.9)	4¼ (108)	— —	5⁷⁄₁₆ (138.1)	5⁵⁄₁₆ (134.9)	— —	145 (65.8)	143 (64.9)
3 (80)	— —	11¾ (298.5)	11½ (292.1)	4½ (114.3)	— —	5⅞ (149.2)	5¾ (146.1)	— —	175 (79.4)	173 (78.5)

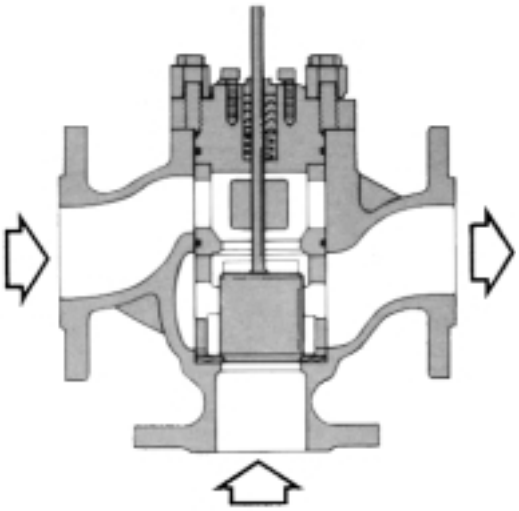
ACTUATOR DIMENSIONS inches **AND WEIGHTS** pounds

Size	D	E	WT.
35	91/4 (235)	121/4 (311.2)	35 (15.9)
35R	91/4 (235)	123/8 (314.3)	35 (15.9)
55,55A	12 (304.8)	151/4 (387.4	50 (10.4)
55R, 55AR	12 (304.8)	18 (457.2)	60 (13.6)
85	143/4 (374.7)	195/8 (498.5)	96 (43.5)
85R	143/4 (374.7)	231/4 (590.6)	117 (53.1)

1. With EPDM O-Rings, 220ºF / 104ºC with Buna-N O-Rings

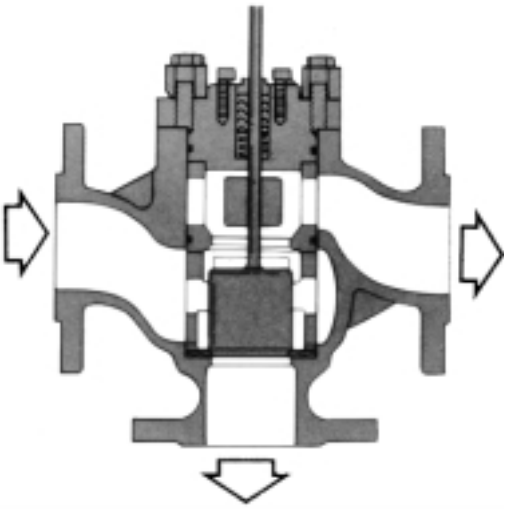
DOT THREE WAY CONTROL VALVE

CONVERGING SERVICE



Typical D(D)OT Class, single plug valve with flanged ends, indicating converging or mixing flow with a single outlet port.

DIVERGING SERVICE



Typical D(D)OT Class, single plug valve with flanged ends, showing throttling diverging service with two outlet ports.

MAXIMUM PRESSURE DROP with STANDARD and ALTERNATE ACTUATORS

Valve Size (Inches)	Actuator Size	Air Pressure PSIG	Converging Service PSID	Diverging Service PSID
1"	35	18 25 60	125 185 225	60 60 60
	55	18 25 60	225 225 225	100 100 100
1¼" 1½"	35	18 25 60	70 120 225	25 40 40
	55	18 25 60	100 187 225	35 65 65
2"	35	18 25 60	43 80 130	— 25 40
	55	18 25 60	57 120 225	20 35 65
2½"	55A	18 25 60	30 70 225	— 25 40
	85	18 25 60	35 95 225	30 43 43
3"	55A	18 25 60	12 40 155	— 20 35
	85	18 25 60	27 72 225	8 27 40

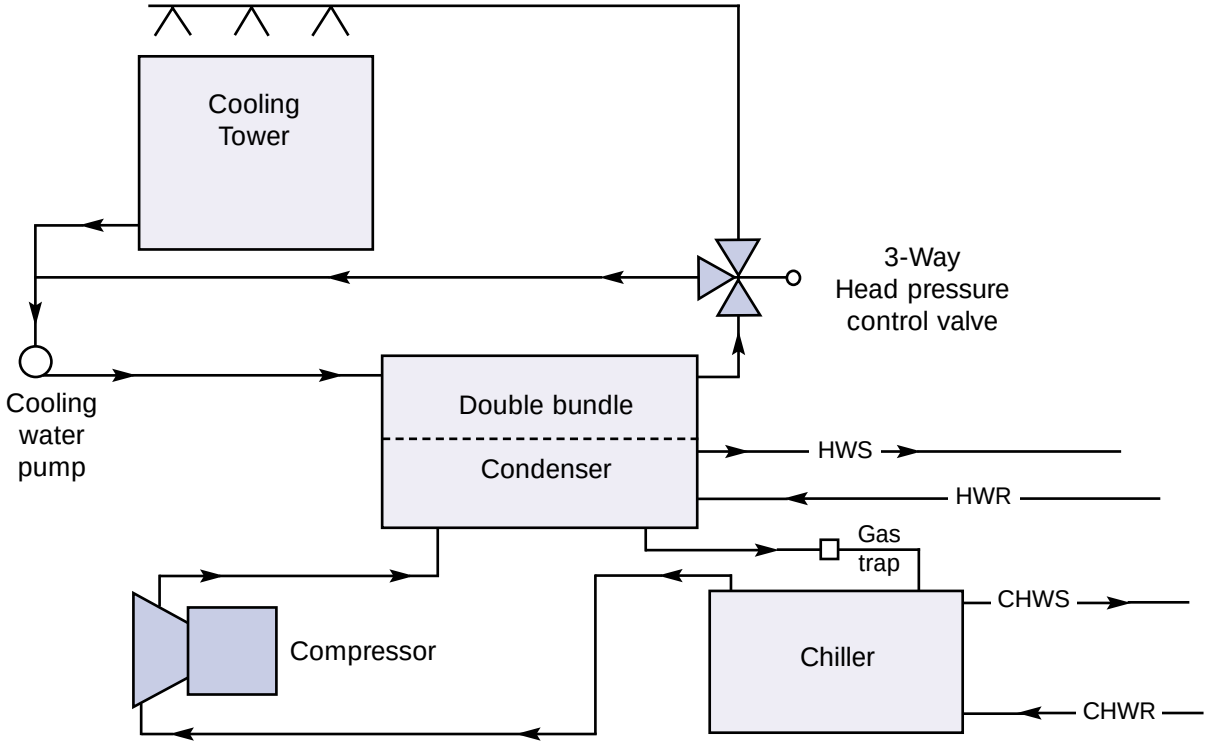
NOTE:

Actuators 35 and 55 are mutually interchangeable; however please note actuator travels are different.

Actuators indicated are all direct-acting (top seat normally closed). For reverse-acting actuators, suffix “R” is added to actuator number. Maximum allowable pressure drop values shown are identical for either type. Maximum allowable pressure drop figures shown above are subject to body pressure/temperature limitations.

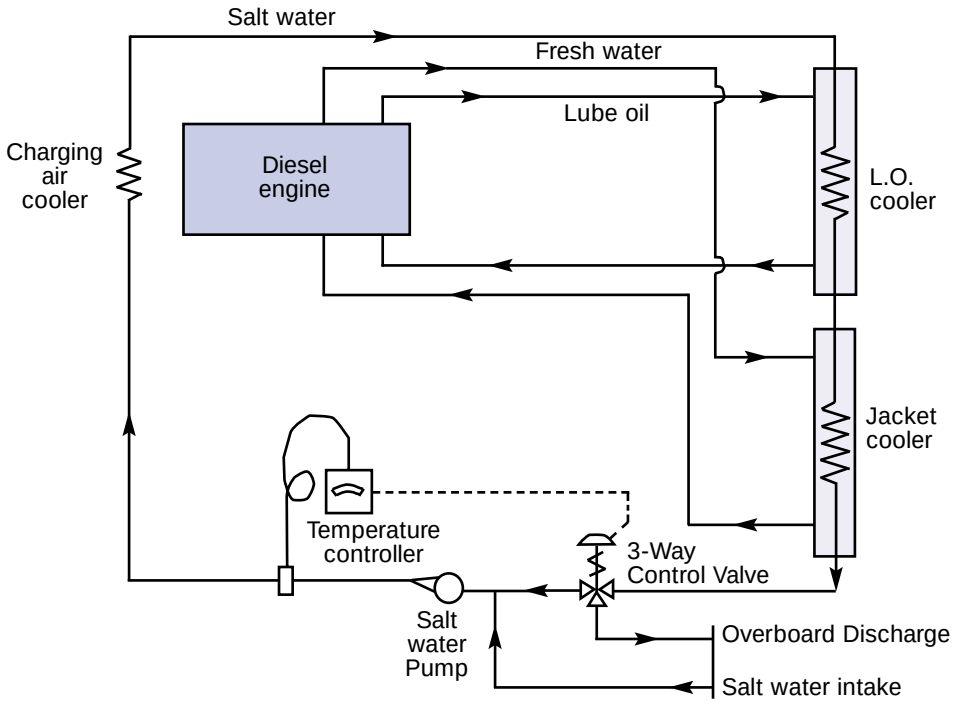
DOT Typical Applications

TYPICAL APPLICATION — INDUSTRIAL/COMMERCIAL

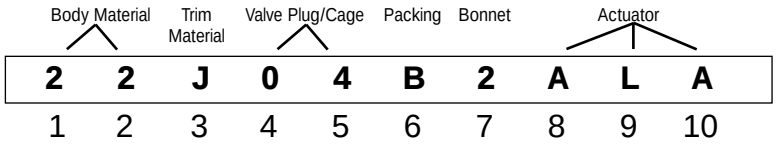


A basic hydronic system.

TYPICAL APPLICATION — MARINE



DOT ORDER CODE



Body Material - Position 1 & 2
- 02 = Cast Iron
- 22 = Bronze

Trim Material - Position 3
- A = Stainless Steel, Renewable Seat
- J = Monel

Valve Plug/Cage - Position 4 & 5
- 04 = Quick Opening – Q.O.

Packing - Position 6
- B = Teflon Chevron

Bonnet - Position 7
- 2 = Regular (up to 450°F)

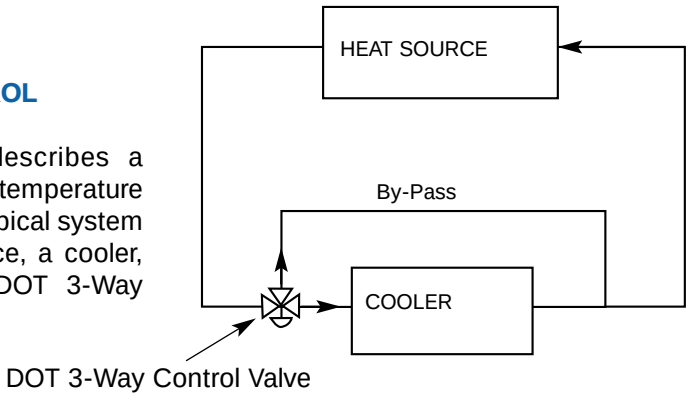
Actuator - Position 8, 9 & 10
- U = 35 Iron
- Y = 35R Iron
- AL = 55 Iron
- ALA = 55A Iron
- GLA = 55AR Iron
- GL = 55R Iron
- BL = 85 Iron
- HL = 85R Iron

VALVE AVAILABILITY CHART

Body Material	ANSI Class	Size Inches	Size mm	Actuator Standard	Threaded Ends	Flanged Ends ANSI	Flanged Ends DIN
CAST IRON	125	1	25	35(R)	X	Class 125 All Sizes	ND-10 ND-16 All Sizes
		1¼	32	35(R)	X		
		1½	40	35(R)	X		
		2	50	35(R)	X		
		2½	65	55A(R)	—		
		3	80	55A(R)	—		
BRONZE	150	1	25	35(R)	—	Class 150 All Sizes	ND-10 ND-16 All Sizes
		1¼	32	35(R)	—		
		1½	40	35(R)	—		
		2	50	35(R)	—		
		2½	65	55A(R)	—		
		3	80	55A(R)	—		

BY-PASS TEMPERATURE CONTROL

By-pass temperature control describes a simple method for controlling the temperature of one fluid with another fluid. A typical system consists basically of a heat source, a cooler, connecting fluid direction: the DOT 3-Way Control Valve.



DOT 3-Way Valve Specification Form

LESLIE CONTROLS, INC.
A division of CIRCOR International, Inc.
12501 Telecom Drive · Tampa, Florida 33637
(813) 978-1000 · FAX: (813)-978-0984

CONTROL VALVE SPEC SHEET

Project/Job _____ Data Sheet _____ of _____
Unit/Customer _____ Spec _____
P.O./LCO File #_____ Tag_____
Item _____ Dwg_____
Contract_____ Service _____
MFR Serial# _____

Fluid ❑ Steam ❑ Liquid_____ ❑ Other_____ Crit Pres PC

Service Conditions

Flow ❑ #/hr ❑ gpm ❑ scfh ❑ _____
Inlet Pressure ❑ psig ❑ psia ❑ _____
Outlet Pressure ❑ psig ❑ psia ❑ _____
Temperature ❑ °C ❑ °F _____
Max Press/Temperature:_____ /_____
Density/MW/SG _____/_____/_____
Viscosity _____CP
Vapor Pressure ❑ psia ❑ _____
Required C_V _____ Noise (dBA) Allowable_____

Max. Flow	Norm. Flow	Min. Flow

Line Info Pipe Size In_____/Sch_____ Pipe Size Out_____/Sch_____

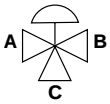
Valve, Body & Bonnet

Body Size in. ❑ 1 ❑ 1¼ ❑ 1½ ❑ 2 ❑ 2½ ❑ 3
ANSI Class ❑ 125 ❑ 150 ❑ Other _____
Body/Bonnet Material: ❑ Cast Iron ❑ Bronze
End Conn. Inlet/Outlet: ❑ Threaded ❑ Int. Flange ❑ Other_____
Packing Material: ❑ Teflon Chevron ❑ *Special EPDM Seals for 365ºF

Trim Size ❑ 100% - Quick Opening ❑ SST ❑ Monel

Flow Path

❑ Mixing (Converging) (choose one outlet port)
❑ Diverting (Diverging) (choose two outlet ports)



	A	B	C
Outlet Port	❑	❑	❑
Close Port on Air Loss	❑	❑	❑

Actuator

❑ 35 ❑ 55 ❑ 85 ❑ Converging ❑ Diverting ❑ None
Available Air Supply Pressure: Max._____ Min._____
Manual Override: ❑ Yes ❑ No ❑ Type_____

Solenoid ❑ Yes ❑ No ❑ Type_____ ❑ Voltage_____

Positioner ❑ Yes ❑ No ❑ Type_____ ❑ Pneu ❑ I/P

Switch ❑ Yes ❑ No ❑ Type_____

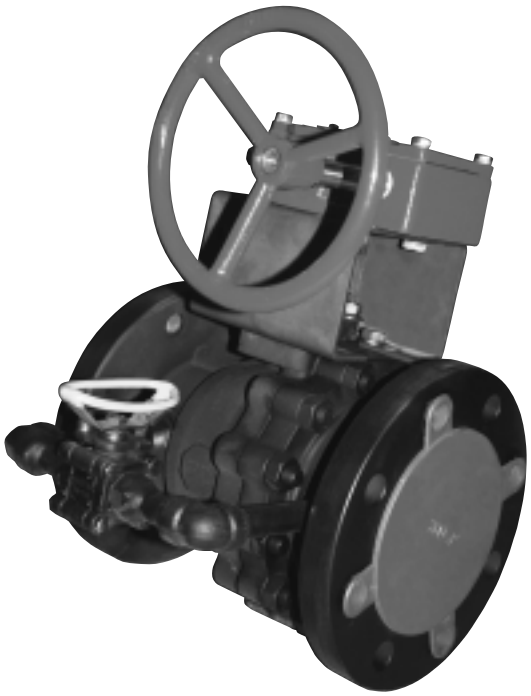
Air Set ❑ Yes ❑ No ❑ Type:_____ ❑ Range:_____

Other Accessories ❑ Yes ❑ No ❑ Type_____

Test ANSI/FCI Leakage Class: ❑ .1% of capacity (std)

THREE WAY

QUESTIONS? CALL LESLIE CONTROLS @ (813) 978-1000 PLEASE FAX COMPLETED FORM TO: (813) 977-0174



ISOLATION BALL VALVE

APPLICATION DATA

- District Steam Central Heating Systems
- Low Temperature Steam Distribution and Isolation Service

STEAM ISOLATION BALL VALVE

SIZES 1½" - 12"
ANSI CLASS 300

- **Positive Shutoff** for isolation
- **Face to Face Dimensions** same as Gate Valve
- **End Flanges Dimensions** same as Gate Valve
- **Low Center of Gravity** close to the pipeline center
- **Quarter Turn Operation**
- **Does Not Require large valve vaults**
- **Corrosion Resistant** internal parts
- **Compact Design** less weight than Gate Valve
- **Ease of maintenance and rebuild**
- **Backup Metal Seats**
- **Ball Support** on the larger sizes
- **Optional By-Pass**
- **By-Pass includes** Triad 3-piece valve
- **Extended Warranty** available when valves provided with optional By-Pass

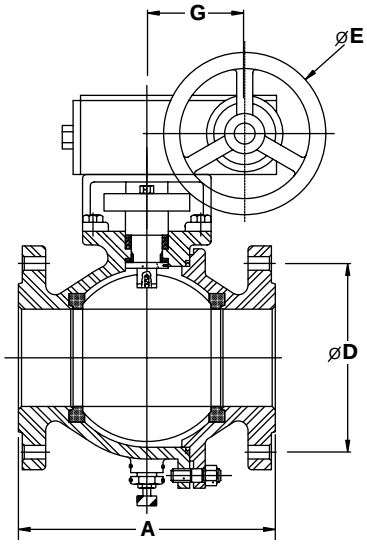
STEAM ISOLATION BALL VALVE

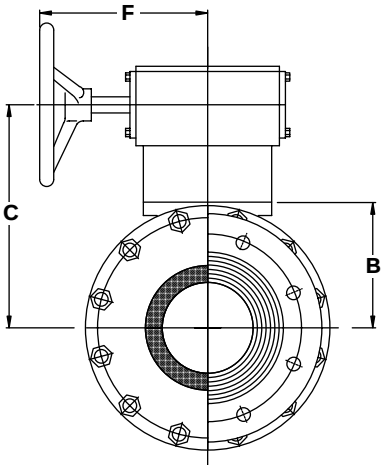
Specifications

Steam distribution and isolation valves must be 2-piece flanged full port ball valves. Valves must have ASTM A216-WCB carbon steel body and end cap with 316 stainless steel ball and stem. The stem packing must be graphite and live loaded to compensate for changes in temperature and wear on all size valves. Seats must be made of PEEK. Valves must have a blowout proof stem design and integrally cast actuator mounting pad. Valves must offer bubble tight shutoff.

Materials of Contruction

Body .....ASTM A216 Gr WCB
End Cap .....ASTM A216 Gr WCB
Ball .....ASTM A351 Gr CF8M
Seat .....PEEK
Stem .....ASTM A479 Type 316
Body Seal .....Spiral Wound (316 Graphite)
Body Nut.....ASTM A194 2H
Body Stud .....ASTM A193 B7
Anti-Static Device SS304
Packing Protector .....PEEK
Thrust Washer Protector .....PEEK
Thrust Washer .....50% SS316 + 50% PTFE
Stem Bearing .....15% RPTFE
Stem Packing .....RPTFE/Graphite
Packing Gland .....ASTM A167 Type 304
Packing follower .....ASTM A216 Gr WCB
Gland Bolt SS304
Belleville Washer SS301
Tab Lock Washer SS300
Travel Stop Housing .....WCB
Housing Bolt SS300
Travel Stop .....Zinc Plated Carbon Steel
Travel Stop Sleeve .....ASTM A167 Type 304
Travel Stop Bolt.....SS300
Handle .....SS304/Ductile Iron
Lock Nut .....ASTM A167 Type 304
Handle Bolt.....Carbon Steel
Handle Sleeve .....Vinyl through 2"
Locking Device SS304
Snap Ring .....Nickel Plated Carbon Steel





DIMENSIONS inches (mm) and WEIGHTS pounds (kg)

Size	A	B	C	D	E	F	G	Wgt.
1½ (38)	7.5 (190.2)	2.6 (66.0)	5.95 (151.1)	4.5 (114.3)	7.8 (198.1)	5.75 (146.1)	1.67 (42.4)	19 (9)
2 (50)	8.5 (215.9)	2.95 (74.9)	6.3 (160.0)	5.0 (127.0)	7.8 (198.1)	5.75 (146.1)	1.67 (42.4)	33 (15)
2½ (64)	9.5 (241.3)	3.39 (86.1)	9.02 (229.1)	5.88 (149.4)	11.81 (300.0)	10 (254.0)	2.48 (63.0)	50 (23)
3 (76)	11.12 (282.4)	3.72 (94.5)	9.35 (237.5)	6.62 (168.2)	11.81 (300.0)	10 (254.0)	2.48 (63.0)	68 (31)
4 (102)	12.0 (304.8)	4.35 (110.5)	9.98 (253.5)	7.88 (200.2)	11.81 (300.0)	10 (254.0)	2.48 (63.0)	96 (44)
6 (152)	15.88 (403.4)	7.19 (182.6)	14.97 (380.2)	10.62 (269.8)	11.81 (300.0)	10 (254.0)	3.15 (80.0)	230 (104)
8 (203)	19.75 (501.7)	8.64 (219.5)	16.42 (417.1)	13.0 (330.2)	11.81 (300.0)	10 (254.0)	3.15 (80.0)	430 (195)
10 (254)	22.38 (568.5)	9.69 (246.1)	17.89 (454.4)	15.25 (387.4)	15.75 (400.1)	13.5 (342.9)	4.72 (119.9)	610() (277)
12 (305)	25.5 (647.7)	11.26 (286.1)	19.46 (494.3)	17.75 (450.9)	15.75 (400.1)	13.5 (342.9)	4.72 (119.9)	950 (431)

2500 SERIES ELECTRICALLY ACTUATED SHUTOFF VALVE

ROTARY SHAFT

Series 2500 valves are 2-way, globe-type, piston valves. They are operated by an external lever connecting the lifting action of the linear actuator to the valve piston/plug through a rotary shaft. The Rotary Shaft principle creates a mechanical advantage enabling more force in operating the valve. It also allows stronger return spring action to ensure reliable, fail-safe return.

Isolated actuator: In the Rotary Shaft valve, the fluid is contained in the lower valve body assembly, completely away from the electrical portion of the valve. Therefore, there is no possibility of explosive gas or corrosive liquid leaking into the electrical enclosure, as there is in any packless type solenoid valve.

High temperature capability: Because the magnetic plunger and the solenoid are mounted outside and away from the valve body, up to 425°F fluid temperature, including steam, can be safely handled without coil insulation breakdown which is often associated with packless type solenoid valves.

Quick acting, two position: Speed of operation is less than one second and is independent of line-media conditions.

Manual operation provision: In case of an emergency or for trial operation, the valve may be operated by hand using the external lever.

Visual position indication: The external lever also serves as a visual position indicator.

Corrosion resistant materials: All internal parts are made from 316 stainless steel.

High pressure capability: The mechanical advantage provided by the external lever of the rotary shaft type enables the valve to be fitted with a much stronger closure spring than is possible with any direct lift packless type solenoid valve. This allows a much higher opening pressure and/or a greater factor of safety for opening and closing the valve.

Much longer maintenance-free life: The slight arc (15-30°) of the rotary shaft offers superior seal life expectancy compared to reciprocating-stem packing glands.

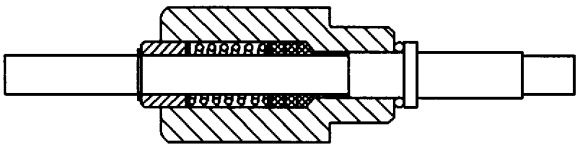
Dependable shutoff: Pressure and flow (above the seat) tending to close the valve achieves shutoff reliability not possible with ball, gate, or butterfly type valves.

Zero pressure operation: Valve is not dependent on pressure or flow to open or close fully.

No tiny orifices: These valves contain no diaphragms, needle-sized orifices or piston rings typical of packless type solenoid valves which are prone to clogging.

Heavy walled valve bodies: All valves have heavy walled cast bodies which meet the ANSI ratings of class 150 & 300 for steel.

A Doubled Seal System: Ensures an absolute minimum of fugitive emissions. The primary seal is Teflon® with a spring loaded, secondary seal (see drawing below).



SPECIAL FEATURES

FAST DELIVERY - This modular design provides the capability to stock valve components that can be assembled and shipped quickly.

FIELD REVERSIBILITY - The 2500 series is designed with versatility in mind. In order to adapt to changing process conditions, the valve action can be reversed while it remains in the pipeline. The operation may be changed from normally closed to normally opened with a kit or vice versa.

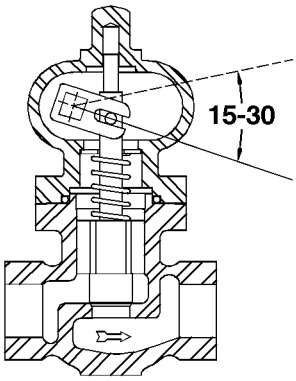
SWITCH KITS - The 2500 series valves can be fitted with add on valve position indication switch kits in the field. Heavy duty position switches in NEMA 4 and explosion proof enclosures are featured.

FACTORY MUTUAL SYSTEMS APPROVED EXPLOSION-PROOF - This series features fully electrical valves that are FM approved for safety shut-off of fuel oils and gases. In addition, this series features FM approved actuators where explosion-proof approval is required: Class I, Groups B, C, & D, Division 1, and Class II Groups E, F, & G, Division 1 explosion proof; and NEMA 4 watertight actuator enclosure with 1/2" NPT conduit connection.

Teflon® is a registered trademark of E.I. Dupont de Nemours Co.,Inc.

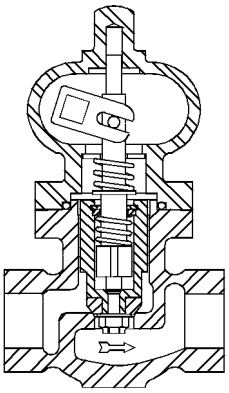
2500 Series Valve Piston Options

OPTION D - Direct Operated for Low Pressures



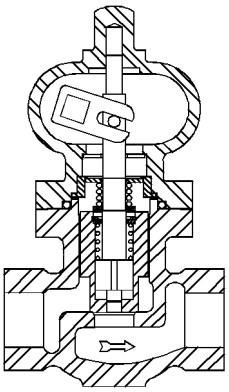
This series can be used for viscous or dirty fluids as well as light liquids and gases. These are “Direct Operated” valves; referring to the inner valve construction where the full area valve disc is lifted off the seat against the full inlet shutoff pressure. This is done without the aid of a pressure assist from the media or by an internal pilot or minimum flow requirement. These valves open and close, quickly and fully, down to zero psi. Closing speed is essentially independent of fluid viscosity, line pressure or pressure drop across valve.

OPTION P - Pilot Operated for Clean Gases or Light Liquids



Use this series for light liquids (less than 200 SSU) and clean gases in higher pressure applications than the “D” series. These are “Semi Direct Operated” valves. The actuator lifts the first stage port relieving the static line pressure on top of the main piston. This relief creates a pressure imbalance due to inlet and outlet area size differences which assist in lifting the piston off the seat, opening the valve fully. The first stage is connected to the piston with an auxiliary spring. Therefore, it is essentially the actuator that provides a lifting action and not the pressure imbalance. Consequently, there is no dependence on pressure or flow to operate the valve. This allows the valve to act as “Direct Operated” down to zero psi compared to that of most pilot operated or diaphragm valves with needle sized orifices. Moreover, this allows the valve operation to be positive and quick.

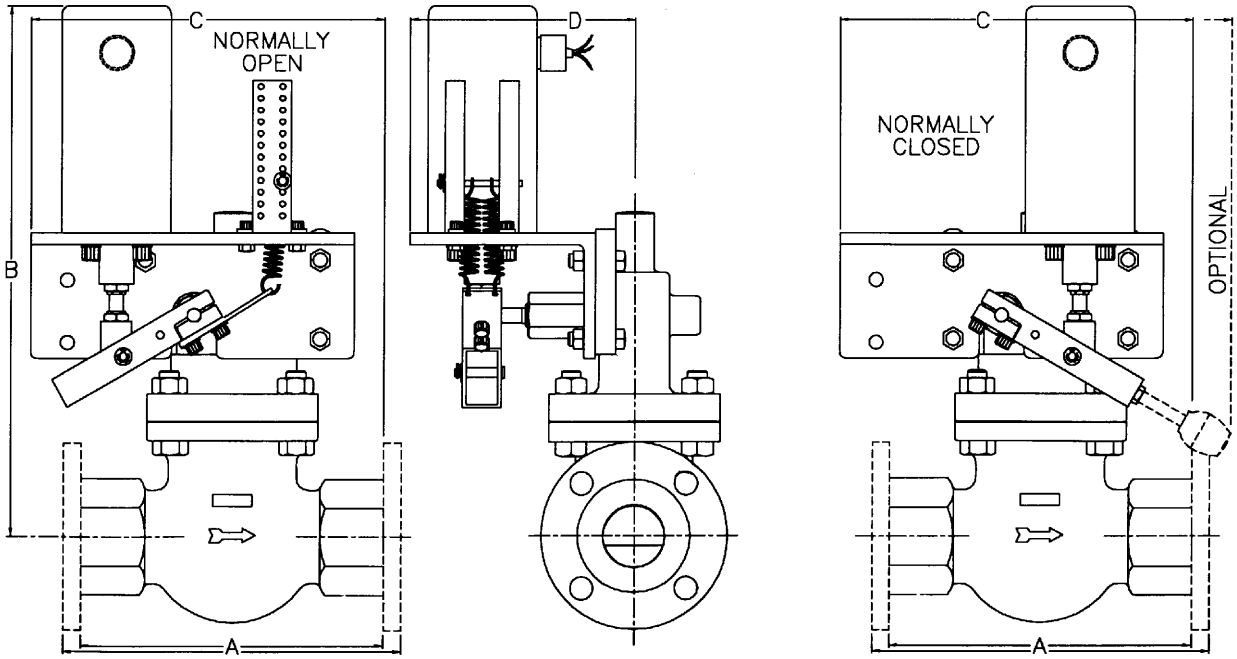
OPTION S - Semi-Direct Operated for Dirty/Viscous Liquids



Use this series for viscous or dirty liquids in higher pressure applications than the “D” series. These are “Semi Direct Operated” valves. The actuator lifts the full area disc off the seat with the assistance of the pressure of the media. Because the piston is connected to the actuator and not floating, the valve operation is positive and quick. This also allows the valve to act as “Direct Operated” at low pressures down to zero psig. Viscous or unclean liquids can be handled reliably because the first stage valve port is 25 to 50% of the main port diameter; as compared to needle sized orifices of most pilot operated valves.

Note: This option is for use with liquids only.

2500 Series Dimensions



Size & Connections				Max. Opening Diff. Press. (psi)						Dimensions				
				Direct (D)		Pilot (P)		Semi-Direct (S)		Net				
Suffix	Pipe/ Port (in.)	Ends	CV	Metal	Teflon	Metal	Teflon	Metal	Teflon	Wgt. (lbs.)	A (in.)	B (in.)	C (in.)	D (in.)
05	1/2	FNPT	3	300	300	720	300	N/A	N/A	13	4	10-3/4	10	5-1/2
05	1/2	150FL	3	275	275	275	275	N/A	N/A	15	4-1/4	10-3/4	10	5-1/2
05	1/2	300FL	3	300	300	720	300	N/A	N/A	17	5-1/2	10-3/4	10	5-1/2
08	3/4	FNPT	6.8	135	135	720	270	600	270	13	3-1/2	10-3/4	10	5-1/2
08	3/4	150FL	6.8	135	135	275	270	275	270	15	4-7/8	10-3/4	10	5-1/2
08	3/4	300FL	6.8	135	135	720	270	600	270	17	7	10-3/4	10	5-1/2
10	1	FNPT	10	75	75	720	240	250	240	17-1/2	4	11-1/2	10	5-1/2
10	1	150FL	10	75	75	275	240	250	240	17-1/2	5-1/8	11-1/2	10	5-1/2
10	1	300FL	10	75	75	720	240	250	240	19	5-1/2	11-1/2	10	5-1/2
15	1-1/2	FNPT	22.5	25	25	400	285	125	125	25	7	12	10	5-3/4
15	1-1/2	150FL	22.5	25	25	275	275	125	125	26	6-1/2	12	10	5-3/4
15	1-1/2	300FL	22.5	25	25	295	285	125	125	47	7-1/2	12	10	5-3/4
20	2	FNPT	40	30	30	600	220	375	220	45	10-3/4	15	7	7
20	2	150FL	40	30	30	275	220	275	220	45	10	15	7	7
20	2	300FL	46	30	30	600	220	375	220	90	10-1/2	15	9	7
30	3	150FL	90	10	10	275	150	165	150	108	9-7/8	17-1/2	10	7
30	3	300FL	96	10	10	440	150	165	150	120	11-3/4	19-1/2	12	7
40	4	150FL	160	5	5	275	115	110	110	138	11-3/4	18-1/2	11-3/4	7
40	4	300FL	160	5	5	330	115	110	110	174	14	18-1/2	12-1/2	7

Dimensions do not show optional features such as position switch kits or manual reset (“C” dimension increases up to 2-1/2 inches). Pressures are based on ANSI ratings at 100°F.

MOUNTING NOTE: All 2500 Series valves must be mounted with the solenoid in a vertical, upright position. Valve bodies are to be mounted in a horizontal pipeline. For mounting in vertical pipeline or any other pipeline orientation, please consult the factory.

2500 SERIES ACTUATORS

SOLI-CON® SOLENOID ACTUATORS

The Soli-Con® solenoid actuator is a solid-state-controlled electric actuator, which effectively eliminates coil burn-out due to mechanical overload. The solid-state-controller acts as both a timer and electrical signal conditioner. Upon energizing (applying an electrical signal), the timing circuit delivers an "inrush" current spike to the coil to "pull-in" the plunger (armature) and operate the valve. After approximately a half second (~500 ms), the circuit drops the current to the coil to a small fraction of an amp "holding" the plunger magnetically in its new position. Actual current depends upon voltage and actuator size (model); see table below. The conditioning circuit regulates the voltage and current delivered to the coil allowing for greater voltage ranges and eliminating AC hum and chatter. This lowers the coil temperature rise, resulting in longer coil life, while also saving energy and maintenance costs. Additionally, should the valve be operated in excess pressure or blocked, the coil will not be damaged.

SOLI-CON® ELECTROMAGNET ACTUATORS

The Soli-Con® electromagnet actuator is a solid-state-controlled electric actuator, which holds the plunger in the "latched" position. The solid-state-controller acts as electrical signal conditioner. Upon energizing (applying an electrical signal), the circuit only allows "holding" current to the coil, disabling the "inrush" current draw and "pull-in" event. This actuator is used on the Manual Reset – No Voltage Release (NV) valve type. In all other aspects, it is the same as the solenoid actuators.

NOTE: All Soli-Con® actuators feature continuous duty operation, Class H coils, function up to a maximum ambient temperature of 185ºF (85ºC), and contain a 1/2" FNPT conduit connection.

ELECTRICAL REQUIREMENTS
Solid-State-Controlled Actuators

Model[1]	Holding (amps)	Inrush[2] (amps)	Cycles[3] per minute	Voltage (volts/hertz)
SCB	0.2	14.2	3	120/60 (Z)
SCB	0.17	7.5	3	220/60 (X)
SCE	0.04	13.5	3	125/DC (Y)
SCE	0.04	6.4	3	250/DC (W)
SCG	0.8	14.0	2	24/DC (V)
SCH	Covers the following:			
SCH	0.7	10.0	2	48/60 (U)
SCH	0.5	7.0	2	120/60 (U)
SCH	0.35	6.0	2	220/60 (U)
SCH	0.5	10.0	2	48/DC (U)
SCH	0.3	6.0	2	125/DC (U)
SCH	0.25	5.0	2	250/DC (U)

1. For solenoid actuators, models SCG and SCH are used on ½- 1½ valves, and models SCB and SCE are used on 2" - 4" valves. For electromagnet actuators, models SCG and SCH are used on all valve sizes.
2. Inrush amps do not apply for manual reset - no voltage release valve type.
3. Maximum cycles per minute (on/off) rated with a valve having a fluid temperature of 425°F.

2500 Series Valve Types

FULLY AUTOMATIC (FA)
This fully electric valve automatically changes its position based on electrical signal. When the Soli-Con® solenoid actuator is de-energized (on loss of electrical signal), the valve will "fail" to its "normal" or fail-safe position. Upon applying or restoring the electrical signal, the solenoid actuator will automatically energize and change the valve position.

FM SAFETY SHUT-OFF (FM)
This version of the fully electric valve is FM approved for safety shut-off of fuel oils and gases. The valve features an explosion proof Soli-Con® solenoid actuator and is only supplied in the normally closed fail-safe position.

MANUAL RESET – ELECTRICALLY TRIPPED (ET)
This manual reset valve must be manually actuated to move from its "normal" or fail-safe position to its "latched" position. When the Soli-Con® solenoid actuator is in the de-energized state (no electrical signal), the valve is held mechanically in its "latched" position. Upon applying an electrical signal (energizing), the solenoid actuator will "trip" the valve to revert back to its "normal" position. Momentary energizing is all that is required to "trip" this valve.

NEW MANUAL RESET – NO VOLTAGE RELEASE (NV)
This manual reset valve must be manually actuated to move from its "normal" or fail-safe position to its "latched" position. When the Soli-Con® electromagnet actuator is energized (with an electrical signal), the valve is held magnetically in its "latched" position. Upon de-energizing (loss of electrical signal), the electromagnet actuator will "release" the valve to revert back to its "normal" position. Since the electromagnet actuator is used for holding only, it avoids the higher "inrush" current of the solenoid actuator.

OPTIONS:

LIMIT SWITCH
Limit switches may be supplied to indicate "valve open/not open", "valve closed/not closed" or both. Choices are SPDT or DPDT switches. All switches supplied will be both watertight and explosion proof.

TERMINAL BLOCK
A terminal block can be furnished in a separate external enclosure for making electrical connections to the electric actuator.

LOCKING DEVICE
A locking device may be supplied with a manual operator knob to hold valve in the override position.

PRESSURE DROP CALCULATIONS

FOR LIQUIDS:

$$\text{Pressure drop (PSID)} = \left[\frac{\text{GPM}}{C_V}\right]^2 \times (\text{Specific gravity})$$

FOR GASES:

$$\text{Pressure drop (PSID)} = \left[\frac{460° + °F}{\text{Inlet Psig} + 15}\right] \times \left[\frac{\text{SCFH}}{1360 \times C_V}\right]^2$$

FOR STEAM:

$$\text{Pressure drop (PSID)} = \left[\text{Specific Volume (ft}^3\text{/lb)}\right] \times \left[\frac{\text{lb/hr}}{63 \times C_V}\right]^2$$

SUITABLE FOR 0 TO 300PSI SATURATED STEAM

2500 Series Ordering Code

Series	Size	Type	Trip/Fail Position	Disc	Piston	Material	ANSI CL	Shaft Seal Mat'l	Enclosure	Voltage	Options		
2	5	2	0	F	A	C	M	P	S	1	F	T	E	Y	C	S	L
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

Series - Position 1 & 2
- 25

Valve Size - Position 3 & 4
- 05 = ½
- 08 = ¾
- 10 = 1
- 15 = 1½
- 20 = 2
- 30 = 3
- 40 = 4

Valve Type - Position 5 & 6
- FA = Fully Electric
- FM = FM Shut Off Valve[1]
- ET = Electrically Tripped
- NV = No Voltage Release

Trip/Fail Position - Position 7
- O = Normally Open[1]
- C = Normally Closed

Disc - Position 8
- M = Metal
- T = Teflon®

Piston - Position 9
- P = Pilot Operated
- D = Direct Operated
- S = Semi-direct[2] Operated

Body/Bonnet Material - Position 10
- S = Stainless Steel CF8M (316)
- C = Carbon Steel WCB

ANSI CL - Position 11 & 12
- 1F = 150 Flanged
- 3F = 300 Flanged
- 3T = 300 FNPT[3]

Shaft Seal Mat'l - Position 13
- T = Teflon®
- A = Ammonia Service

Enclosure[5] - Position 14
- E = Explosion Proof
- W = Watertight (NEMA 4)

Voltage - Position 15
- U = Universal[4]
- V = 24 DC[4]
- W = 250 DC[6]
- X = 220 (50 or 60 Hz)[6]
- Y = 125 DC
- Z = 120 (50 or 60 Hz)

Options - Position 16, 17 & 18

Switches
- CS = SPDT Show Closed
- CD = DPDT Show Closed
- OS = SPDT Show Open
- OD = DPDT Show Open
- 2S = SPDT Show Both
- 2D = DPDT Show Both

Other
- T = Terminal Box
- L = Lock Device w/Handle

EXAMPLE: 2520FACMPS1FTEYL

2520	FAC	MP	S	1F	T	E	Y	L
1,2,3,4	5,6,7	8,9	10	11,12	13	14	15	16,17 and/or 18

2520: 2-Way fully automatic rotary shaft type **Soli-Con®** valve with solid-state-controlled electric actuator
Horizontal pipe mounting; upright actuator
Continuous duty class H molded coil With 1/2" NPT conduit connection
2" pipe size, 2" port; Cv = approx. 40
FAC: Normally closed, energize to open, fail closed
M: Metal (Regrinding) valve disc
P: Pilot assisted operation
S: Stainless steel valve body and inner parts
1F: ANSI Class 150 RF flanged ends
T: Teflon® rotary shaft seal
E: "FM" Approved explosion proof and NEMA 4 watertight actuator enclosure
Y: 125 Volts, DC
L: With locking device to hold valve in the (manually override or 'energized') position

1. FMO is not available.
2. Liquid only
3. 1/2" to 2" valve size only
4. 1/2" to 1½" valve size only; Universal Voltage is 48-240 VAC (50 or 60 Hz) and 48-250 VDC.
5. Explosion Proof (E) required with FMC valve type. FM approved for CL.I, Div. I, Groups B, C & D and CL.II, Div. I, Groups E, F & G.
6. Not offered as explosion proof

2500 SERIES Valve Specification Form

Laurence Products, Electric On / Off

LESLIE CONTROLS, INC.
A division of CIRCOR International, Inc.
12501 Telecom Drive · Tampa, Florida 33637
(813) 978-1000 · FAX: (813)-978-0984

CONTROL VALVE SPEC SHEET

Project/Job _____
Unit/Customer _____
P.O./LCO File # _____
Item _____
Contract _____
MFR Serial# _____

Data Sheet _____ of _____
Spec _____
Tag _____
Dwg _____
Service _____

I have (or anticipate) a requirement for an electrically actuated valve as follows:

Quantity _____Pipe Size _____

❑ 2-way
- ❑ Fully Electrical
  - ❑ Energize to Open (Normally Closed)
  - ❑ Energize to close (Normally Open)
- ❑ Manually Reset
  - ❑ Latch to Open (Normally Closed)
  - ❑ Latch to Close (Normally Open)
  - ❑ Trip on Current Failure
  - ❑ Trip on Energization

Summary of Application _____

Fluid Handled _____Viscosity_____@_____Clean?_____Conc._____ Spec. Grav. _____

Max Opening Differential Pressure _____ Fluid Temp _____ Ambient Temp _____

Flow Rate _____ Max Allowable Pressure Drop_____ Req'd C_v _____

Body Mat'l _____ Inner Parts_____ Valve Disc _____

❑ Screwed Ends ❑ Flanged150 ❑ Flanged 300 ❑ Socketweld ❑ Buttweld ❑ Other_____

❑ Horizontal Pipe Mounting ❑ Vertical Pipe Mounting- ❑ Up Flow ❑ Down Flow

Actuator Enclosure: ❑ NEMA4 Watertight/Dusttight ❑ Explosion Proof Class I,

Group_____ Div_____ ❑ Other_____

❑ AC ❑ DC Volts_____ Hz_____ Duty_____ Frequency of Operation _____

Coil Insulation ❑ Class H (std) ❑ Other_____ ❑ Position Switch(es)_____

Other Options_____

Other Description _____

Please send ❑ _____copies of dimension drawing ❑ _____copies of Laurence On-Off Valves Handbook.

QUESTIONS? CALL LESLIE CONTROLS @ (813) 978-1000 PLEASE FAX COMPLETED FORM TO: (813) 977-0174

ON-OFF

FIRE-CIDE® SERIES
HEAT ACTUATED SHUTOFF VALVE

ROTARY SHAFT DESIGN

FIRE-CIDE® series valves are globe-type valves, operated by a manual external lever. Lifting action is transmitted from the lever directly to the valve stem and piston through the "rotary shaft". This mechanical advantage allows the valve to operate at higher pressures and allows for a stronger return spring to assure reliable, fail-safe operation compared to "direct lift" or "direct acting" valves. Closing speed, for fail closed valves, is not significantly affected by fluid viscosity, line pressure or pressure drop across valve. The slight arc of motion (15-30°) of the valve rotary shaft provides much longer maintenance-free life of the rotary shaft seal compared to reciprocating-stem packing glands.

BUILT FOR SAFETY

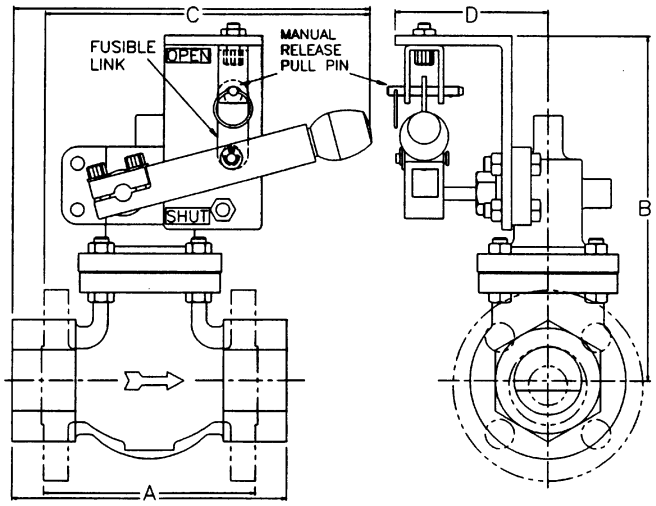
OSHA requires a heat actuated valve on each withdrawal line from indoor tanks containing flammable or combustible fluids. The **FIRE-CIDE**® series valves conform to and exceed the requirements of OSHA para. 1910.1016 (b) (4) (iv) (c). These valves can also be placed on outdoor flammable liquid lines as a sensible safety precaution. They can be tripped manually and instantly by pulling a release pin for periodic testing or manual operation.

ALL VALVES ***FACTORY MUTUAL SYSTEM*** APPROVED FOR EMERGENCY SHUT-OFF

FIRE-CIDE® SERIES HIGHLIGHTS

- Fire safe rated
- Steel heavy-walled body for high pressure
- Corrosion resistant, stainless steel inner parts
- Manual operation provision for periodic testing
- Full diameter internal valve port for high C_V's
- ANSI Class threaded or RF flanged ends
- Zero pressure and flow required for closing
- No diaphragms or needle sized orifices to clog
- Viscous and dirty fluids can be handled efficiently
- Standard fluid temperature range: -50° to 550°F
- MSS SP-61 seat leakage rated
- Quick acting, two position; fails closed @ link rating
- All fusible links are UL Listed
- Inherently safe

FIRE-CIDE® 2800 SERIES DIMENSIONS



All dimensions (inches), weights (pounds) and C_V's listed are approximate and are for estimating purposes only. All flanges are drilled to ANSI B16.5. Valve is shown in the mechanically latched open position; it trips closed upon melting of the link or removal of pin. Valve bodies can be rotated 90°, 180° or 270° to accommodate flow direction. Larger sizes and alternate end connections are available. Please consult factory for further details.

SIZE CONNECTIONS				MAX. OPENING DIFF. PRESS. (psi)						DIMENSIONS				
Suffix	Pipe/ Port (in.)	Ends	C_V	Direct (D)		Pilot (P)		Semi-Direct (S)		Net Wt. (lbs.)	A (in.)	B (in.)	C (in.)	D (in.)
				Metal	Teflon	Metal	Teflon	Metal	Teflon					
05	½	FNPT	3	300	300	720	300	N/A	N/A	12	4	5	7	4⅜
05	½	150FL	3	275	275	275	275	N/A	N/A	13	4¼	5	7	4⅜
05	½	300FL	3	300	300	720	300	N/A	N/A	15	5½	5	7	4⅜
08	¾	FNPT	6.8	250	250	720	270	720	270	14	3½	6	7	4⅜
08	¾	150FL	6.8	250	250	275	270	275	270	16	4⅞	6	7	4⅜
08	¾	300FL	6.8	250	250	720	270	720	270	20	7	6	7	4⅜
10	1	FNPT	10	200	200	720	240	720	240	16	4	7	7	4⅜
10	1	150FL	10	200	200	275	240	275	240	20	5⅛	7	7	4⅜
10	1	300FL	10	200	200	720	240	720	240	25	5½	7	7	4⅜
15	1½	FNPT	22.5	150	150	720	170	720	170	21	7	8	8	4 3/16
15	1½	150FL	22.5	150	150	275	170	275	170	26	6½	9	8	4 3/16
15	1½	300FL	22.5	150	150	720	170	720	170	40	7½	12	12	4 3/16
20	2	FNPT	40	150	150	400	220	400	220	34	10¾	8	10	4½
20	2	150FL	40	150	150	275	220	275	220	39	10	9	10	4½
20	2	300FL	46	150	150	720	220	720	220	50	10½	10	12	4½
30	3	150FL	90	100	100	275	150	275	150	97	9⅞	9	11	4½
30	3	300FL	96	100	100	720	150	300	150	112	11¾	11	12	4½
40	4	150FL	160	60	60	275	115	275	115	115	11¾	10	11	4½
40	4	300FL	160	60	60	720	115	300	115	125	14	13	14	4½

***PRESSURES** - The above suffixes represent the maximum inlet differential pressure (psi) the valves can be opened against. Because the line pressure and flow are above the seat, tending to close the valve, all valves will shut and hold closed at emergency pressures greatly exceeding those figures shown. The maximum pressures are limited by ANSI B16.5/B16.34.

MOUNTING NOTE: All 2800 Series valves must be mounted in an upright position (as shown above). Valve bodies are to be mounted in a horizontal pipeline. For mounting in vertical pipeline or any other pipeline orientation, please consult the factory.

EXPANDED OFFERING/ADDITIONAL OPTIONS

The 2800 series is a basic offering of the FM approved FIRE-CIDE® valves. In addition to all the features of the 2800 series, the 1700/1800 series is an expanded offering of our heat actuated fusible link shutoff valves including sizes from 1/4" to 8" will full port construction. The 1700/1800 series also offers additional options such as linkage covers, position indication switches, and buttweld or socketweld end connections. Materials for this series include Bronze, Naval Bronze, Alloy 20, Monel, and Hastelloy. For additional information and a catalog bulletin, please contact the factory.

FIRE-CIDE® 2800 SERIES ORDERING CODE

Class		Size		Link		Fail Position	Disc	Piston	Material	ANSI CL		Shaft Seal Mat'l
2	8	2	0	H	2	C	M	P	S	1	F	T
1	2	3	4	5	6	7	8	9	10	11	12	13

Class - Position 1 & 2
28

Valve Size - Position 3 & 4
05 = ½
08 = ¾
10 = 1
15 = 1½
20 = 2
30 = 3
40 = 4

NOTE: Fusible links are UL approved. Threaded ends are available in ½" to 2" only.

Link - Position 5 & 6
H1 = 135°F
H2 = 165°F
H3 = 212°F
H4 = 286°F
H5 = 386°F

Fail Position - Position 7
C = Normally Closed

Disc - Position 8
M = Metal[1]
T = Teflon®

Piston - Position 9
P = Pilot Operated
D = Direct Operated
S = Semi-direct[2]

Material - Position 10
S = Stainless Steel 316 CF8M
C = Carbon Steel WCB

ANSI CL - Position 11 & 12
1F = 150 Flanged
3F = 300 Flanged
3T = 300 FNPT[3]

Shaft Seal Mat'l - Position 13
T = Teflon®
M = Metal

1. Valve standard offering
2. Liquid only
3. ½" to 2" only

EXAMPLE: 2820H2CMPS1FT

2820	H2	C	MP	S	1F	T
1,2,3,4	5,6	7	8,9	10	11,12	13

2820: 2-Way "FM" Approved safety shutoff, rotary shaft type Fire-Cide® Valve
Horizontal pipe mounting; upright actuator
2" pipe size, 2" port; Cv = approx. 40
H2: 165ºF fusible link
C: Fail Close, held openwith the link
M: Metal (Regrinding) valve disc
P: Pilot assisted operation
S: Stainless steel valve body and inner parts
1F: ANSI Class 150 RF flanged ends
T: Teflon® rotary shaft seal

ON-OFF

1. Valve standard offering
2. Liquid only
3. 1/2" to 2" valve size only
4. Valve standard offering up to 425ºF

2800 Series Fire-Cide® Valve Specification Form

Laurence Product, Fusible Link

LESLIE CONTROLS, INC.
A division of CIRCOR International, Inc.
12501 Telecom Drive · Tampa, Florida 33637
(813) 978-1000 · FAX: (813)-978-0984

CONTROL VALVE SPEC SHEET

Project/Job _____
Unit/Customer _____
P.O./LCO File # _____
Item _____
Contract _____
MFR Serial# _____

Data Sheet _____ of _____
Spec _____
Tag _____
Dwg _____
Service _____

I have (or anticipate) a requirement for a Fire Safety Shut Off valve as follows:

Quantity _____ Pipe Size _____ ❑ FM Approved

❑ 2-way ❑ Fail Closed / ❑ Fail Open

Summary of Application _____

Fluid Handled _____ Spec. Grav. _____

Viscosity _____ Concentration _____ Free of Solids? _____

Max Inlet Pressure _____ Min/Max Fluid Temp _____

Flow Rate _____ Max Allowable Pressure Drop _____

Temperature Rating of Fusible Link Desired _____

Body Mat'l _____ Inner Parts _____ Valve Disc _____

❑ Screwed Ends ❑ Flanged 150 ❑ Flanged 300 ❑ Other _____

❑ Horizontal Pipe Mounting ❑ Vertical Pipe Mounting- ❑ Up Flow ❑ Down Flow

❑ Position Switch to Indicate- ❑ Valve Open ❑ Valve Closed ❑ SPDT ❑ DPDT

Other Description _____

❑ Please send _____ copies of an applicable dimension drawing.

❑ Please send _____ additional copies of Laurence On-Off Valves Handbook.

QUESTIONS? CALL LESLIE CONTROLS @ (813) 978-1000 PLEASE FAX COMPLETED FORM TO: (813) 977-0174

NOISE SUPPRESSOR

for SERVICE to 500°F
Sizes 3/8" to 8"

- **Effective over a broad frequency band** (up to 12,000 Hz)
- **Noise attenuation** up to 20 dBA
- **Additional noise reduction** available with multiple Suppressors and/or Silencing Orifice Plates
- **Expansion fittings not required**
- **Straight through design** minimizes pressure drop, permitting normal valve sizing

OPTIONS

- Sizes larger than 8"

NOISE SUPPRESSORS

APPLICATION DATA

- Steam Pressure Reduction Stations where Noise Reduction is Desired

SUPPRESSOR ENDS

INLET ANSI	OUTLET ANSI
NPT	NPT
NPT	150#
NPT	300#
150#	150#
300#	150#
300#	300#

NOTE: ANSI 150# Flanges are flat faced.
It is recommended that the Noise Suppressor be insulated to reduce condensation formation in the acoustic material.

DIMENSIONS inches (mm) **AND WEIGHTS** pounds (kg)
INLET SIZE 2½" TO 8"

NOMINAL PIPE SIZE			D[1] — INSTALLED LENGTH			APPROX. WEIGHT			Average Attenuation dBa[2]
A INLET	B OUTLET	C SHELL	150# X 150#	300# X 150#	300# X 300#	150# X 150#	300# X 150#	300# X 300#	
2½ (65)	4 (100)	5 (125)	39¾ (1010)	40 (1016)	40⅜ (1025)	73 (33)	75 (34)	85 (39)	12
2½ (65)	5 (125)	6 (150)	47¼ (1200)	47½ (1207)	47⅞ (1216)	105 (48)	108 (49)	123 (56)	16
3 (80)	4 (100)	5 (125)	39¾ (1009)	40⅛ (1019)	40½ (1028)	76 (35)	82 (37)	91 (41)	10
3 (80)	5 (125)	6 (150)	47¼ (1200)	47⅝ (1210)	48 (1219)	108 (49)	114 (52)	129 (59)	14
3 (80)	6 (150)	8 (200)	58¼ (1480)	58⅝ (1489)	59 (1499)	174 (798)	180 (82)	199 (90)	19
4 (100)	5 (125)	6 (150)	47½ (1206)	47⅞ (1216)	48¼ (1225)	113 (51)	123 (56)	138 (63)	12
4 (100)	6 (150)	8 (200)	54½ (1384)	54⅞ (1393)	55¼ (1403)	175 (80)	185 (84)	204 (93)	15
4 (100)	8 (200)	10 (250)	66 (1676)	66⅜ (1686)	66¾ (1695)	284 (129)	294 (134)	321 (146)	21
5 (125)	6 (150)	8 (200)	55 (1397)	55⅜ (1406)	55¾ (1416)	180 (82)	195 (87)	214 (97)	14
5 (125)	8 (200)	10 (250)	66½ (1689)	66⅞ (1698)	67¼ (1708)	289 (131)	304 (138)	331 (150)	19
5 (125)	10 (250)	12 (300)	89 (2261)	89⅜ (2280)	90 (2286)	455 (207)	470 (214)	516 (235)	26
6 (150)	8 (200)	10 (350)	66½ (1689)	66⅞ (1698)	67¼ (1708)	295 (134)	314 (143)	341 (155)	17
6 (150)	10 (250)	12 (300)	83½ (2121)	83⅞ (2130)	84½ (2146)	451 (205)	470 (214)	516 (235)	24
8 (200)	10 (250)	12 (300)	84 (2134)	84⅜ (2143)	85 (2159)	468 (213)	495 (225)	541 (246)	21

1. ±1/4" for 8" Shell and under, otherwise ± 3/8".
2. Consult factory for specifics.

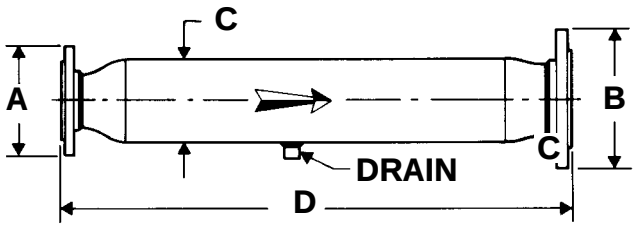
NOISE SUPPRESSOR

Specification

Noise Suppression equipment shall be of the dissipative reactive type. It shall have expanded outlet flange for attachment to downstream piping. Equipment shall provide a minimum of 10 dBA reduction in noise. Installation must be insulated.

MATERIALS OF CONSTRUCTION

Pressure Shell .....Welded Steel Components
Acoustic Material .....Stainless Steel



MAXIMUM VELOCITY feet per minute (meters per minute)

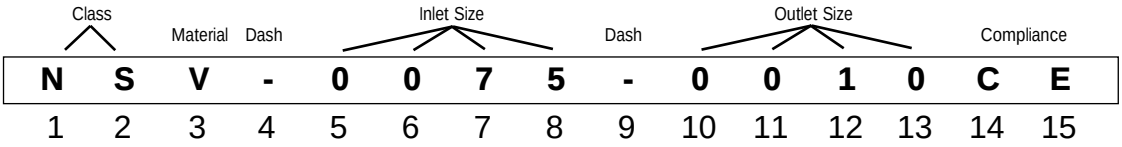
NOMINAL PIPE SIZE	MAXIMUM VELOCITY
0 - 2 (0 - 51)	17,000 (5182)
21/2 - 8 (64 - 203)	11,000 (3353)
>8 (>203)	9,000 (2734)

DIMENSIONS inches (mm) **AND WEIGHTS** pounds (kg)
INLET SIZES 3/8" TO 2"

NOMINAL PIPE SIZE			D[1] — INSTALLED LENGTH			APPROX. WEIGHT						
A INLET	B OUTLET	C SHELL	NPTxNPT NPTx300# 300#x300#	NPTx150# 300#x150#	150#x150#	NPT x NPT	NPT x 150#	NPT x 300#	150# x 150#	300# x 150#	300# x 300#	Average Attenuation dBa[2]
3/8 (10)	3/4 (20)	2 (50)	19 13/16 (502)	19 5/8 (498)	— —	8 (3.6)	9 (4.1)	10 (4.5)	— —	— —	— —	16
3/8 (10)	1 (25)	2 (50)	20 (508)	19 3/4 (502)	— —	8 (3.6)	10 (4.5)	11 (5)	— —	— —	— —	16
3/8 (10)	1 1/2 (40)	2 1/2 (65)	22 3/4 (578)	22 1/2 (572)	— —	12 (5.4)	15 (6.8)	18 (8.2)	— —	— —	— —	19
1/2 (15)	1 (25)	2 (50)	20 (508)	19 3/4 (502)	19 9/16 (140)	8 (3.6)	10 (4.5)	11 (5)	12 (5.4)	12 (5.4)	13 (5.9)	13
1/2 (15)	1 1/4 (32)	2 1/2 (65)	22 5/8 (574)	22 5/16 (565)	22 1/8 (562)	12 (5.4)	13 (5.9)	16 (7.3)	15 (6.8)	15 (6.8)	17 (7.7)	16
1/2 (15)	1 1/2 (40)	2 1/2 (65)	22 3/4 (578)	22 1/2 (572)	22 5/16 (565)	12 (5.45)	15 (6.8)	18 (8.2)	16 (7.3)	16 (7.3)	19 (8.6)	16
3/4 (20)	1 1/4 (32)	2 1/2 (65)	23 5/16 (591)	23 (584)	22 13/16 (578)	12 (5.4)	14 (6.4)	16 (7.3)	15 (6.8)	16 (7.3)	18 (8.2)	12
3/4 (20)	2 (50)	3 (80)	26 1/2 (673)	26 1/4 (667)	26 1/16 (664)	16 (7.3)	21 (9.5)	23 (10.4)	22 (10)	23 (10.4)	25 (11.4)	16
1 (25)	1 1/2 (40)	2 1/2 (65)	21 1/8 (537)	20 7/8 (530)	20 5/8 (524)	13 (5.9)	16 (7.3)	19 (8.6)	18 (8.2)	19 (8.6)	22 (10	9
1 (25)	2 (50)	3 (80)	23 11/16 (603)	26 7/16 (683)	26 3/16 (666)	16 (7.3)	21 (9.5)	23 (10.4)	23 (10.4)	24 (10.9)	26 (11.8)	12
1 1/4 (32)	2 (50)	3 (80)	24 5/16 (616)	24 1/16 (613)	23 3/4 (603)	16 (7.3)	21 (9.5)	23 (10.4)	23 (10.4)	25 (11.4)	27 (12.3)	9
1 1/4 (32)	3 (80)	4 (100)	34 11/16 (882)	34 5/16 (879)	34 (864)	— —	40 (18)	47 (21.4)	42 (19)	45 (20.5)	51 (23)	15
1 1/2 (40)	3 (80)	4 (100)	31 13/16 (807)	31 7/16 (800)	31 3/16 (791)	— —	39 (17.7)	44 (20)	43 (19.5)	46 (21)	52 (23.6)	13
2 (50)	3 (80)	4 (100)	31 7/8 (810)	31 1/2 (800)	31 1/4 (794)	— —	40 (18)	46 (21)	45 (20.5)	47 (21.4)	53 (24)	10
2 (50)	4 (100)	5 (125)	40 1/8 (1019)	39 3/4 (1010)	39 1/2 (1003)	— —	66 (30)	76 (34.5)	72 (32.7)	74 (33.6)	84 (38.2)	14

1. ±1/4" for 8" Shell and under, otherwise ± 3/8".
2. Consult factory for specifics.

NOISE SUPPRESSOR ORDER CODE



CLASS - Position 1 & 2
NS = Noise Suppressor

Material - Position 3
C = Carbon Steel
L = Low Temp Carbon Steel
V = 304 SST
T = 316 SST
R = Chrome Moly

Dash - Position 4

Inlet Size* - Position 5 - 8
0038 = 0.375"
0050 = 0.5"
0075 = 0.75"
0100 = 1"
0125 = 1.25"
0150 = 1.5"
0200 = 2"
0250 = 2.5"
0300 = 3"
0400 = 4"
0500 = 5"
0600 = 6"
0800 = 8"

Dash - Position 9

Outlet Size* - Position 10 - 13
0075 = 0.75"
0100 = 1"
0125 = 1.25"
0150 = 1.5"
0200 = 2"
0250 = 2.5"
0300 = 3"
0400 = 4"
0500 = 5"
0600 = 6"
0800 = 8"
1000 = 10"

Compliance - Position 14 & 15
CE = European Compliance

* Refer to sales literature for the standard inlet vs outlet configuration available.

NOTES:

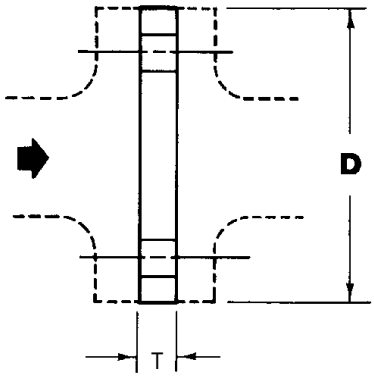
LES-SONIC SILENCING ORIFICE

SILENCING ORIFICE

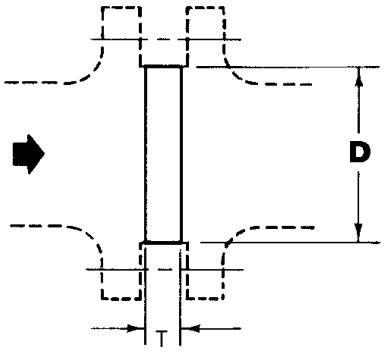
- **Economical** noise reduction
- **Single plate** reduces noise by 6 to 12 dBA
- **Additional noise reduction** available with multiple plates and/or Noise Suppressors
- **Engineered** for each application
- **Designed** to fit between ANSI flanges (DIN upon request)
- **For noise reduction estimates,** consult your Representative

Application Data

- Pressure Regulators or Control Valves where noise reduction or velocity control is desired.



ANSI 125 FLANGED



ANSI 150, 250, 300 & 600 FLANGED

Materials of Construction

Plate .....300 Series Stainless Steel

Specification

A Silencing Orifice Plate to be constructed of materials suitable for the installation and compatible with the piping. Generally, it is to be of stainless steel construction. The silencing orifice plate shall be of one piece construction with drilled holes. The holes shall be stepped in diameter for optimum d/I ratio and spaced for noise cancellation considering the specific parameters of the application. Orifice plates are to be designed for installation between two ANSI flanges in the enlarged piping downstream of the regulator or control valve. Silencing Orifice Plates are to be designed to provide between 6 to 12 dBA of noise reduction.

DIMENSIONS inches (mm)

NOMINAL PIPE SIZE	DIMEN-SION T	DIMENSION D			
		ANSI 125	ANSI 150	ANSI 300	ANSI 600
2	*	6	3⅞	4⅛	4⅛
2½	*	7	4⅝	4⅞	4⅞
3	*	7½	5⅛	5⅝	5⅝
4	*	9	6⅝	6⅞	7⅜
5	*	10	7½	8¼	9¼
6	*	11	8½	9⅝	10¼
8	*	13½	10¾	11⅞	12⅜
10	*	16	13⅛	14	15½
12	*	19	15⅞	16⅜	17¾
14	*	21	17½	18⅛	19¼
16	*	23½	20	21	22

* Consult factory.

SILENCING PLATES ORDERING CODE

Product Type	Pipe Size	ANSI Class			Plate Thickness	Plate Mat'l	Plate Type	Pressure Drop Ratio	Cv[1]				Other	
S	O	K	0	6	0	0	A	1	W	B	1	0	0	0	C	E
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

Product Type - Positions 1 & 2
- SO = Silencing Orifice

Pipe Size - Position 3
- C = 1"
- E = 1½"
- F = 2"
- H = 3"
- J = 4"
- K = 6"
- L = 8"
- M = 10"
- N = 12"
- P = 14"
- Q = 16"
- R = 18"
- T = 20"
- U = 22"
- W = 24"
- X = Other

ANSI Class - Positions 4 - 7
- 0125 = ANSI Class 125
- 0150 = ANSI Class 150
- 0300 = ANSI Class 300
- 0600 = ANSI Class 600
- 0900 = ANSI Class 900
- 1500 = ANSI Class 1500
- 2500 = ANSI Class 2500
- XXXX = Other

Plate Thickness - Position 8
- A = 3/8" thick
- B = 1/2" thick
- C = 3/4" thick
- D = 1" thick
- E = 1¼" thick
- F = 1½" thick
- G = 1¾" thick
- H = 2" thick
- X = Other

Plate Material - Position 9
- 1 = 300 Series
- X = Other

Plate Type - Position 10
- W = Wafer
- F = Flanged
- X = Other

Pressure Drop Ratio - Position 11
(See Note 2)
- A = 0 and .65
- B = Between .66 and .75
- C = Between .76 and .85
- D = Over .85

Cv[1] - Positions 12 - 15
- 0010 = Cv 10
- 0100 = Cv 100
- 1000 = Cv 1000

Other - Positions 16 & 17
- CE = CE marking for PED
- XX = None

1. Actual Cv will be ±5%.
2. Pressure drop ratio is ΔP/P1 of the plate only.

SIEMENS POSITIONER

- **Pneumatic or Electro-Pneumatic**
- **Modular Design**
- **Cam Characterized for Added Turndown**
- **Gauges Included**
- **Proportional Control**
- **Easy to Calibrate**
- **Non-Interacting Zero and Span**
- **Mounts Compactly on Valve**
- **Provides Precise Control**

Options

- Mechanical Limit Switch (2) SPDT
- 4-20 mA Position Transmitter Feedback
- Potentiometer 1K Feedback

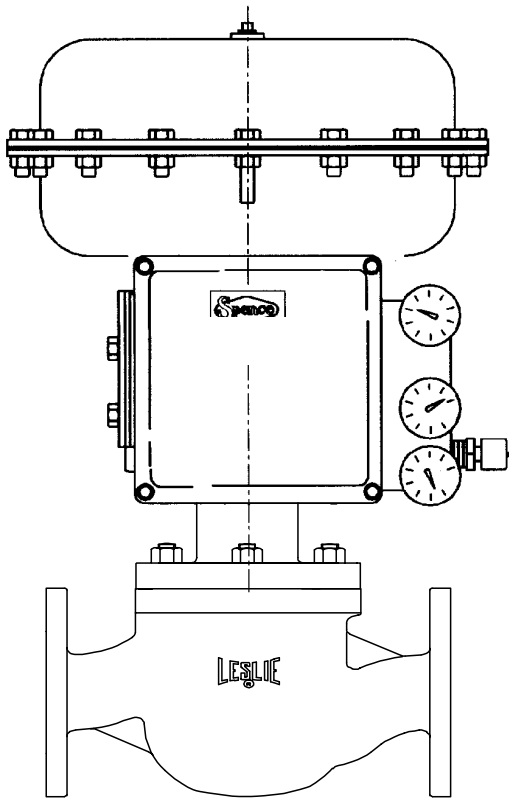
Models

760P Pneumatic Positioner

760E Electro-pneumatic Positioner w/Integral I/P Transducer

Specification

The Positioner shall be modular and cam characterized with NEMA 4X, FM, CSA, CENELEC and Sirs certifications and shall be mounted directly onto the valve. Feedback, I/P Transducer and/or Limit Switch options shall be available. The Positioner shall include gages,have non-interacting zero and span and consume 0.5 to 0.6 scfm.



SIEMENS 760P POSITIONER ON CONTROL VALVE

SIEMENS 760P PNEUMATIC POSITIONER

Application Data

- Split Range for Parallel Stations
- Fine Tune Control
- Where Required Air Pressure is Greater than Controller Output
- Where Change of Actuator Action is Desired (Reverse to Direct & vice versa)

Ratings

Temperature Range	-40 to 185°F (-40 to 85°C)
Pneumatic Connections	1/4" NPT
Gauge Connections	1/8' NPT
Electrical Connections	3/4" NPT
Exhaust Connections	1/4" NPT
Action	Direct or Reverse
Supply Pressure	60 psig
Air Consumption, Typical	0.5 scfm
Input Signal	3-15 psig, 50%, 4-20 mA[1], Split Range
Span	Adjustable, -60% to +25% of normal
Zero	Adjustable, -10% to +60% of normal
Linearity, Typical	0.5% of normal span 0.75% of normal span[1]
Hysteresis, Typical	0.75% of normal span 1.0% of normal span[1]
Deadband	≤0.25% of span
Standard Flow Capacity	Cv=0.3

Applicable Codes

NEMA 4X, IP 65

FM, CSA, CENELEC, Sira Approved

1. Applies to 760E only

PMC-1 ELECTRO-PNEUMATIC CONTROLLER

PMC-1 ELECTRO-PNEUMATIC CONTROLLER

- **Simplified Installation eliminates need for Positioner, I/P, External Power Supply & Instrument Quality Air**
- **No Air Consumption at Steady State**
- **Air Output 0 to Maximum Supply Pressure**
- **Loss of Power Reset**
- **Accuracy to ±0.5% of Span**
- **Easy to Read Digital Display**
- **Internal Power Supply for Transmitter**

Application Data

- Process Control Systems Pressure/Temperature Control
- HVAC Systems
- Packaged Systems such as Water Purification, Vaporizers, Metal Cleaning, Plating, etc.
- Feed Water and Fuel System Controls in Boiler Rooms
- Ideal for Pressure Control

Applicable Codes

NEMA 4 Enclosure

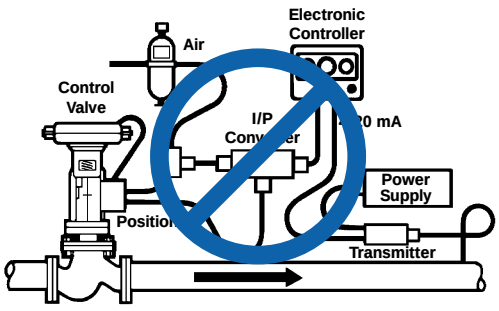
Options

- Pressure Transmitter
- RTD, Thermocouple and Transmitting Thermocouple
- Differential Pressure Transmitter
- Thermowell

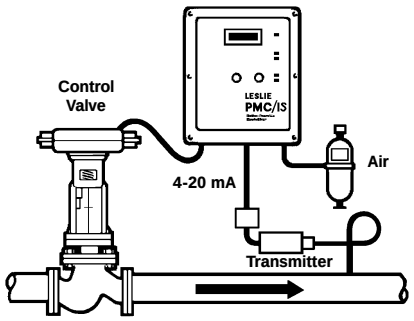
Models

PMC-1—Electro-Pneumatic Controller
PMC-1DA—Used for double acting Actuator
PMC-1M—For size 85 Actuator only

PMC Simplifies your Pressure Control System



Conventional Electronic Control System



Leslie PMC System

PMC-1 ELECTRO-PNEUMATIC CONTROLLER

SPECIFICATION

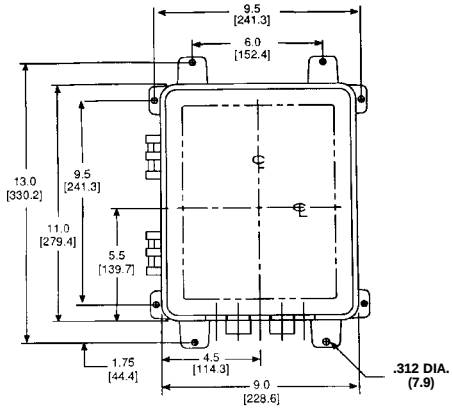
PMC-1 SERIES

Controllers shall be electro-pneumatic, accepting an input signal of 4 to 20 mA or RTD input and providing an output of 0-100 psig capable of modulating diaphragm or cylinder actuators without the use of valve positioners or I/P transducers. Controllers shall be capable of operating on 115/230 VAC, 50/60 Hz or 24 VDC supply and provided with a minimum 3½ inch digital display indicating set point, process variable, deviation from set point and high/low calibration values.

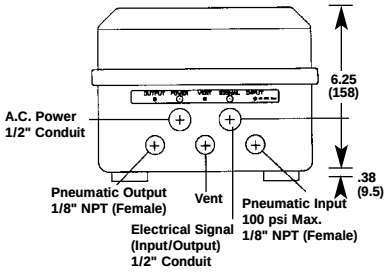
Controllers shall be capable of direct or reverse action and provided with external AUTO/MANUAL switch. Controllers shall have no steady-state air consumption and be capable of accepting a 100 psig input without the use of regulators. Accuracy shall be ±0.5% of span, gain shall be adjustable, dead band shall be adjustable 0–5% of span and controllers shall be provided with an adjustable derivative function.

Enclosures shall be NEMA 1, 2, 3, 3S, 4 and 4X rated and provided with a hinged cover.

Controllers shall be Leslie Controls or approved equivalent.



PMC-1



RATINGS

Supply Voltage	115 Volts 50/60 Hz 230 Volts 50/60 Hz 24 Volts DC
Operating Voltage Range	90 to 110%
Power Consumption	10 Watts (max) 0.7 Watts (steady state)
Input	4-20 mA
Air Supply	100 psig maximum
Output	0 to max supply pressure
Air Consumption	0 at steady state
Accuracy	±0.5% Span
Response Speed Range	200:1
Amplifier Gain	Normal = 6 High = 12
Dead Band	Adjustable, 0 to 5% Span
Input Resistance	150 Ohms
Enclosure Material	Noryl[1]
Enclosure Cover	Polycarbonate
Pneumatic Fittings	1/8" FNPT
Air Delivery	0.45 scfm at 30 psi 0.55 scfm at 60 psi 0.63 scfm at 90 psi
Weight	9 lbs (4.1 kg)

1. Noryl is a registered trademark of General Electric.

LESLIE PNEUMATICS III INDICATING PNEUMATIC CONTROLLERS

Pressure & Temperature

The Indicating Pneumatic Pressure Controller is designed for performance and durability under rigorous operating conditions.

FEATURES

- Compact Size
- High accuracy sensing element
- Easily adjusted control modes
- Easily changed control action
- High Capacity Pilot valve
- Low air consumption
- Push button restriction cleaner (optional)
- No plastic tubing
  (except direct set differential gap controller)

Fast response and highly stable control action are key features of this controller.

The controller has been engineered for compactness, and is constructed of materials that have been carefully selected to give dependable service with a minimum of maintenance. Because of these features, the controller is especially suitable for field-mounting and other types of installations where a control record is not required.

GENERAL SPECIFICATIONS

- Dimensions: 7 23/32" W x 7 15/16" H x 4 15/16" D (196 x 202 x 125mm)
- Case: Weatherproof, diecast aluminum case and gasketed door with plastic window, gray epoxy finish standard
- Materials: All working parts - Stainless Steel, Diaphragms - neoprene, Feedback - Ni-Span-C
- Panel cutout: 7 3/16"W x 7 3/16"H (183x192mm) for controller without M/A station. 2" (51mm) horizontal and 5" (127mm) vertical clearance required between adjacent panel mounted units.
- Mounting: Case is basically interchangeable for wall or flush-panel mounting. If required, can be furnished with bracket and U-bolts for mounting on 2" (51mm) pipe.
- Scale: Segmental with a 3½" (83mm) calibrated length. Black figures on white background. Setpoint and measured variable pointers are painted in fluorescent colors.
- Case connections: Pneumatic supply and output through 1/4" (6.35mm) NPT female connections at bottom of case. Process variable through a 1/2" (12.7mm) NPT female fitting also at the bottom of the case.
- Weight: approximately 8 pounds (3.63kg)

OPTIONS (consult Factory for further information)

- **Remote Setpoint -** Pneumatically operated setpoint consists of a 3-15 psi capsular and a linkage that mechanically shifts the setpoint. Also included are adjustable high and low scale stops.
- **External 2-Position Manual-Automatic Station -** Used for transferring the pneumatic control of a process from either manual operation to automatic or automatic to manual.
- **2330 Pneumatic Controller -** Provides adjustable differential gap pneumatic control of pressure, liquid level, flow or differential pressure.
- **Differential-Pressure Element for level, flow and Pressure Drop -** Accurate, reliable sensor for Controllers and Transmitters under severe operating conditions and environments, easy installation and minimal maintenance

LESLIE PNEUMATICS III
INDICATING PNEUMATIC CONTROLLERS

OPERATING & PERFORMANCE SPECS

- **Calibrated Accuracy:** ±0.5% of span at a gain of 1
- **Measuring Elements - pressure and vacuum:**
  Capsular elements, in a choice of materials, are available for ranges from a minimum span of 0-4 inches of water (0.99kPa) to a maximum range of 0-200 psig (0.1.38 mPa). *Helical elements*, in various materials, are used from a minimum range of 0-31 psig (0-213.75 kPa) up to pressures of 10,000 psig (69mPa).
- **Air Supply:**
  18-20 psig (124.1-137.9 kPa) for 3-15 psig (20.69-103.43 kPa) output range

  30-35 psig (206.9-241.3 kPa for 3-27 psig (20.69-186.17 kPa) output range

  31-35 psig (213.75-241.3 kPa) for 6-30 psig (41.37-206.9 kPa) output range.
- **Air Output:**
  3-15 psig (20.69-103.43 kPa) standard
  3-27 psig (20.69-186.17 kPa)
  6-30 psig (41.37-206.9 kPa).
- **Control Modes Available:**
  a. Standard gain (proportional)
  b. Standard gain + integral (reset)
  c. Standard gain + integral + derivative (3-15 psig output only)
  d. Direct set differential gap, adjustable from 5-95% of the instrument range, low bleed
- **Mode Adjustment Range:**
  a. Standard gain: 50-.25
  b. Integral: 01-30 repeats/minute
  c. Derivative Time: 0-30 minutes
  d. Direct set differential gap: 0.5-100.0%
- **Frequency Response:**
  Standard gain unit: Response curve flat to 400 cpm
- **Standard Gain + Integral Unit:**
  Standard gain unit: Response curve flat to 300cpm
- **Pilot Valve Capacity:** 3 SCFM (exhaust or delivery) for a 1 psig change in output pressure
- **Air Consumption:** Less than 0.05 SCFM at balance with a 20 psig air supply
- **Temperature Stability:** Maximum of ±1% change in output pressure span per 100ºF (37.8ºC) change in ambient temperature
- **Ambient Temperature Limits:**
  -40ºF (-40ºC) to +180ºF (82ºC)

Pneumatics III
Controllers, One, Two, or Three Mode

			1 2 3	4	5	6	7	8	9
BASIC MODEL (NOTE 4)		U	2 3 1						
Process Input Type	Pressure			1					
	Differential Pressure/Flow/Level-Merriam 1050			4					
	Temperature			6					
	Differential Pressure/Flow/Level-Barton 199			8					
Input Range	Listed Range - Scale same as Range (Note 1)				–	–			
	Unlisted Range - Any Listed Scale (Note 2)				9	8			
	Unlisted Range - New Scale (Note 3)				9	9			
Output and Modes	3-15 psig	Proportional (Gain)					1		
		Proportional (Gain), + Integral (Reset)					2		
		Proportional (Gain), + Integral (Reset), + Derivative (3-5 psi only)					3		
	3-27 psig	Proportional (Gain)					5		
		Proportional (Gain), + Integral (Reset)					6		
Accessories	No Auto/Manual Station + No Remote Setpoint							0	
	With Auto/Manual Station + No Remote Setpoint							1	
	No Auto/Manual Station + With Remote Setpoint							2	
	With Auto/Manual Station + With Remote Setpoint							3	
Mounting	Surface or Flush (N/A for units with Barton 199 Body)								1
	Yoke Mounted to Leslie Actuator (N/A for units with Barton 199 Body)								2
	Pipe Mounted (For 2" Diameter Pipe)								3

Notes: 1. Select from Table 1 in Leslie Price Book
2. Determine Range and Scale from data in Leslie Price Book
3. Determine Range using data from Leslie Price Book and specify New Scale Calibration
4. Unit is easily field reversible

INDICATING PNEUMATICS III TRANSMITTERS

Pneumatics III Transmitter

Measurement and transmission of temperature, pressure, vacuum, absolute pressure, differential pressure, flow, liquid level and humidity.

FEATURES

- Outstanding frequency response characteristics enable the transmitter to pick up process changes which would pass through slower-acting units.
- Non-bleed pilot valve design provides low air consumption (0.1 scfm at balance) plus high exhaust and delivery capacity (over 2.5 scfm).
- Transmitter output pressure varies less than 1% of span per 100°F change in ambient temperature, and less than 0.1% per 1 psi change in supply pressure.

CONTINUOUS INDICATION

Since Pneumatics III indicating pointers are directly linked to their measuring elements, local indication is not affected by air supply failure.

OPTIONS (consult Factory for further information)

- **Remote Setpoint -** Pneumatically operated setpoint consists of a 3-15 psi capsular and a linkage that mechanically shifts the setpoint. Also included are adjustable high and low scale stops.
- **External 2-Position Manual-Automatic Station -** Used for transferring the pneumatic control of a process from either manual operation to automatic or automatic to manual.
- **2330 Pneumatic Controller -** Provides adjustable differential gap pneumatic control of pressure, liquid level, flow or differential pressure.
- **Differential-Pressure Element for level, flow and Pressure Drop -** Accurate, reliable sensor for Controllers and Transmitters under severe operating conditions and environments, easy installation and minimal maintenance

GENERAL SPECIFICATIONS

- Case Dimensions: 7 23/32" W x 7 15/16" H x 4 15/16" D (196 x 202 x 125mm
- Case: Weatherproof, die-cast aluminum case with gasketed aluminum door, blue epoxy finish standard.
- Materials: All working parts - Stainless Steel, Diaphragms - neoprene, Feedback - Ni-Span-C
- Panel cutout: 7 3/16"W x 7 9/16"H (183x192mm). 2" (51mm) horizontal and 5" (127mm) vertical clearance required between adjacent panel mounted units.
- Mounting: Brackets and U-clamps furnished for 2" pipe mounting. Brackets for flush or surface mounting are optional.
- Scales: Segmental, 3¼" calibrated length. Black numerals on white background. Fluorescent pointers.

Connections: Supply & output, ¼" NPT female at bottom of case.

- Weight: Approximately 8 pounds with pressure measuring element.

Internal view showing Pneumatics III control unit and indicating pointer linked directly to helical element

Transmitters are indicating instruments that transmit the universal 3-15 psig pneumatic signal.

Transmitter pipe-mounted

INDICATING PNEUMATICS III TRANSMITTERS

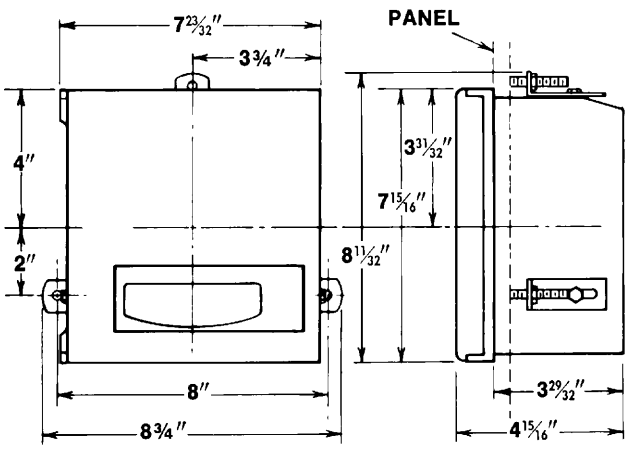
OPERATING & PERFORMANCE SPECS

- **Calibrated Accuracy:**
  Temperature: ±½% of span.
  Pressure and Vacuum: ±½% of span.
  Flow: ±½% of span (from 20% to 100% of range).
  Absolute and Differential Pressure: ±½% of span
- **Air Supply:** 20 psig or 35 psig, depending upon output range.
- **Output:** 3-15 psig or 3-27 standard. Partial spans available. Convertible in field for direct or reverse action.
- **Frequency Response:** Response curve flat to 400 cycles per minute.
- **Response Level:** 0.006% of span.
- **Pilot Capacity:** 3 scfm, exhaust or delivery, for 1 psi change in out-put pressure.
- **Air Consumption:** 0.1 scfm at balance with 20 psig air supply.
- **Temperature Stability:** ±1% of span change in output pressure per 100°F change in ambient temperature.

MEASURING ELEMENTS

- **Temperature:** Class 1A, 3B and 5A thermal systems available for ranges between -350° and +1200°F.
- **Pressure & Vacuum:** Capsular elements available for ranges from 0-3 inches of water to 0-200 psig. Helical elements used for pressures up to 15,000 psig.
- **Absolute Pressure:** Ranges: 0-100 inches of water to 0-400 psig
- **Flow & Liquid Level:** Pneumatics III and Barton meter body (Model 224) available for differential pressure ranges from 0-10 inches of water to 0-400 psi.
- **Relative Humidity:** Hygroscopic measuring elements. Range 0-100% R.H

OVERALL DIMENSIONS



INSTRUMENTATION

Pneumatics III
Controllers, One, Two, or Three Mode

			1 2 3	4	5	6	7	8	9
BASIC MODEL (NOTE 4)			2 3 1						
Process Input Type	Pressure			1					
	Differential Pressure/Flow/Level-Merriam 1050			4					
	Temperature			6					
	Differential Pressure/Flow/Level-Barton 199			8					
Input Range	Listed Range - Scale same as Range (Note 1)				–	–			
	Unlisted Range - Any Listed Scale (Note 2)				9	8			
	Unlisted Range - New Scale (Note 3)				9	9			
Output and Modes	3-15 psig	Proportional (Gain)					1		
		Proportional (Gain), + Integral (Reset)					2		
		Proportional (Gain), + Integral (Reset), + Derivative (3-5 psi only					3		
	3-27 psig	Proportional (Gain)					5		
		Proportional (Gain), + Integral (Reset)					6		
Accessories	No Auto/Manual Station + No Remote Setpoint							0	
	With Auto/Manual Station + No Remote Setpoint							1	
	No Auto/Manual Station + With Remote Setpoint							2	
	With Auto/Manual Station + With Remote Setpoint							3	
Mounting	Surface or Flush (N/A for units with Barton 199 Body)								1
	Yoke Mounted to Leslie Actuator (N/A for units with Barton 199 Body)								2
	Pipe Mounted (For 2" Diameter Pipe)								3

Notes: 1. Select from Table 1 in Leslie Price Book
2. Determine Range and Scale from data in Leslie Price Book
3. Determine Range using data from Leslie Price Book and specify New Scale Calibration
4. Unit is easily field reversible

ABB TZID-C INTELLIGENT POSITIONER

ABB TZID-C POSITIONER

Application Data

- Split range parallel stations
- Where precise positioning is required
- Building management or PLC input

Options

- EX-Protection EEx ib II C T6
- Plug In Modules
  - Analog Position Feedback Signal
  - Digital Position Feedback Signal for Min/Max Position
  - Safety Shutdown Module
- Kit for:
  - Mechanical Position Indicator
  - Digital Posiition Feedback for Min/Max position for 2-slot type indicators or micro-switch

- **Input Signal** 4-20mA, 2 wire fieldbus connection
- **Supply Air** 20-90 psi (1.4-6 bar)
- **Control Accuracy** ≤ 0.5%
- **Ambient Temp** - 22ºF to 185ºF
  - 30ºC to 85ºC
- **Housing** Aluminum coated IP65
- **Vibration Immunity** 10g to 20...80Hz
- **Burden Voltage** 8, 7 V DC (Non Exhaust)

ABB TZID-C INTELLIGENT POSITIONER

SPECIFICATION

Overview
The positioner shall be an electronically-configurable positioner with Hart communication. Positioner shall be suitable for mounting to pneumatic linear or rotary actuators. Positioner shall feature a small and compact design, a modular construction, loop-powered CPU, and an excellent cost/performance ratio.

Operation
The positioner shall utilize a built-in operating panel providing a 2-line LCD and 4 pushbuttons for local configuration, commissioning and operational monitoring.

Operating Modes
The positioner shall provide three different operating modes: fixed control; adaptive control; and manual.

Adaptive Mode
The positioner shall incorporate a unique “Adaptive Control” mode that will “self-tune” positioner control parameters for any valve-actuator combination while controlling the process.

Pneumatics
Positioner shall utlitlize an I/P module with subsequent pneumatic amplifier that is used to control the pneumatic actuator. Positioner shall have steady-state air consumption < 0.015 scfm (< 0.03 kg/hr), independent of supply pressure.

Choice of Fail function
Positioner shall provide either “fail-safe” or “fail-freeze” function via i/p construction.

Inputs and outputs
The positioner shall have as standard a digital input and a digital output, both of which are in addition to its 4-20 mA input for the analog position set point.

Modular design
The positioner shall have available optional modules for analog position feedback, digital position feedback, an emergency shutdown module, proximity switches, or 24 V microswitches.

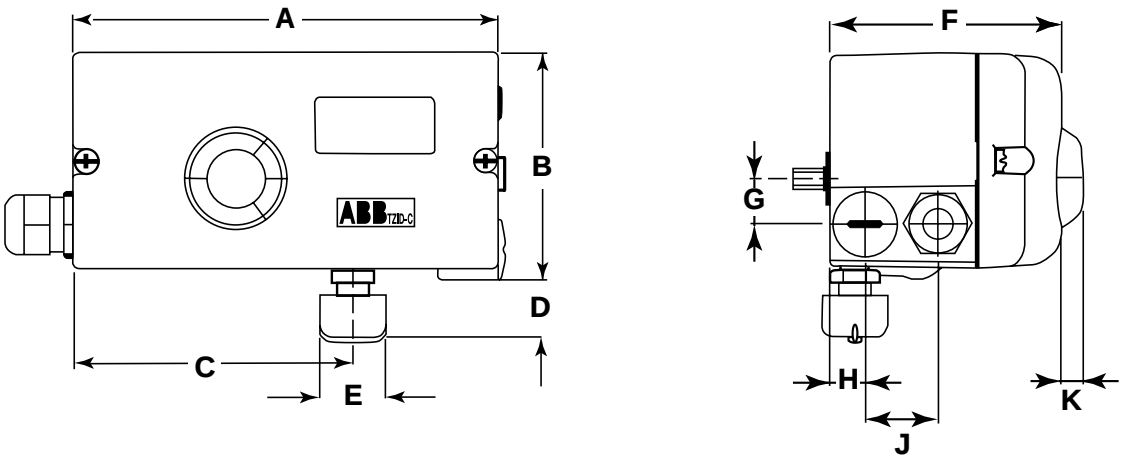
Single-button commissioning
The positioner shall utilize a commissioning function called Autoadjust which quickly establishes zero, span, and optimum positioning control parameters. Autoadjust function shall start with single pushbutton.

Display
The positioner shall utilize a 2-line LCD to show % position during operation and also displays via pushbutton operation the following positioner data:
Up arrow button: Current setpoint (mA)
Down arrow button: Internal device temperature
Up + Down arrow buttons: % difference between position and signal

Mounting
The positioner case shall have one mounting footprint and the positioner design shall utilize one type feedback shaft. The positioner shall easily mount to any linear or rotary valve.

Positioner shall have the following performance specifications:
Accuracy:
≤ 0.5 % of span
Tolerance band:
0.3...10 %, adjustable
Resolution (A/D conversion):
> 4000 steps
Sample rate:
20 msec

Positioner shall have the following environmental specifications:
Influence of ambient temperature:
≤ 0.5 % for every 10°C change in temperature
Influence of vibration:
≤ ± 1 % up to 10 g and 20…80 Hz
Seismic requirements:
Meets requirements of DIN/IEC 68-3-3 Class III for strong and strongest earthquakes
Influence of mounting orientation:
Can be mounted in any position
Meets requirements of following directives:
EMC Directive 89/336/EEC as of May 1989
EC Directive for CE conformity marking
Ambient temperature:
-40 °F to +185 °F (-40 °C to +85 °C) for operation, storage and transport;
Relative humidity:
Operational (with closed housing and air supply switched on): < 95 %(annual average), condensation permissible
Transport and storage:
75 % (annual average), non-condensing



DIMENSIONS[1] inches (mm) **AND WEIGHTS** pounds (kg)

A	B	C	D	E	F	G	H	J	K	WEIGHT
6⅝ (168.5)	3½ (89.5)	4⅜ (110.75)	1 (25)	1 (ø26)	3.62 (92)	3/4 (18)	1/2 (14)	1⅛ (29)	3/8 (9)	5 (796)

ABB AV SERIES POSITIONER

ABB AV SERIES POSITIONER

Application Data

- Split range parallel stations
- Where precise positioning is required
- Building management or PLC input

- **Input Signal** 4-20mA, 2 wire fieldbus connection
- **Control Accuracy** ≤ 0.5% of span
- **Supply & Exhaust Air Capacity** up to 23 scfm at 70psi supply pressure
- **Ambient Temp** - 40ºF (- 40ºC) to 185ºF (85ºC)
- **Housing** is epoxy coated cast aluminum for long life and environmental protection
- **Vibration Immunity** 15 to 120 Hz at accelerations to 2 G
- **Burden Voltage** 8, 7 V DC (Non Exhaust)
- **Mounting** in any position to any linear or rotary valve
- **Autoadjusts** to control parameters with single pushbutton
- **Adaptive Mode** will self-tune positioner control parameters for any valve-actuator combination while controlling process
- **Cam provides application flexibility** between input signal and actuator position and includes direct and reverse acting
- **Threaded Exhaust Vent** allows use of natural gas

ABB AV SERIES POSITIONER

SPECIFICATION

Overview
The positioner shall be an electronically-configurable positioner with Hart communication. Positioner shall be suitable for mounting to pneumatic linear or rotary actuators. Positioner shall feature a small and compact design, a modular construction, loop-powered CPU, and an excellent cost/performance ratio.

Operation
The positioner shall utilize a built-in operating panel providing a 2-line LCD and 4 pushbuttons for local configuration, commissioning and operational monitoring.

Operating Modes
The positioner shall provide three different operating modes: fixed control; adaptive control; and manual.

Adaptive Mode
The positioner shall incorporate a unique "Adaptive Control" mode that will "self-tune" positioner control parameters for any valve-actuator combination while controlling the process.

Pneumatics
Positioner shall utlitlize an I/P module with subsequent pneumatic amplifier that is used to control the pneumatic actuator. Positioner shall have steady-state air consumption < 0.015 scfm (< 0.03 kg/hr), independent of supply pressure.

Choice of Fail function
Positioner shall provide either "fail-safe" or "fail-freeze" function via i/p construction.

Inputs and outputs
The positioner shall have as standard a digital input and a digital output, both of which are in addition to its 4-20 mA input for the analog position set point.

Modular design
The positioner shall have available optional modules for analog position feedback, digital position feedback, an emergency shutdown module, proximity switches, or 24 V microswitches.

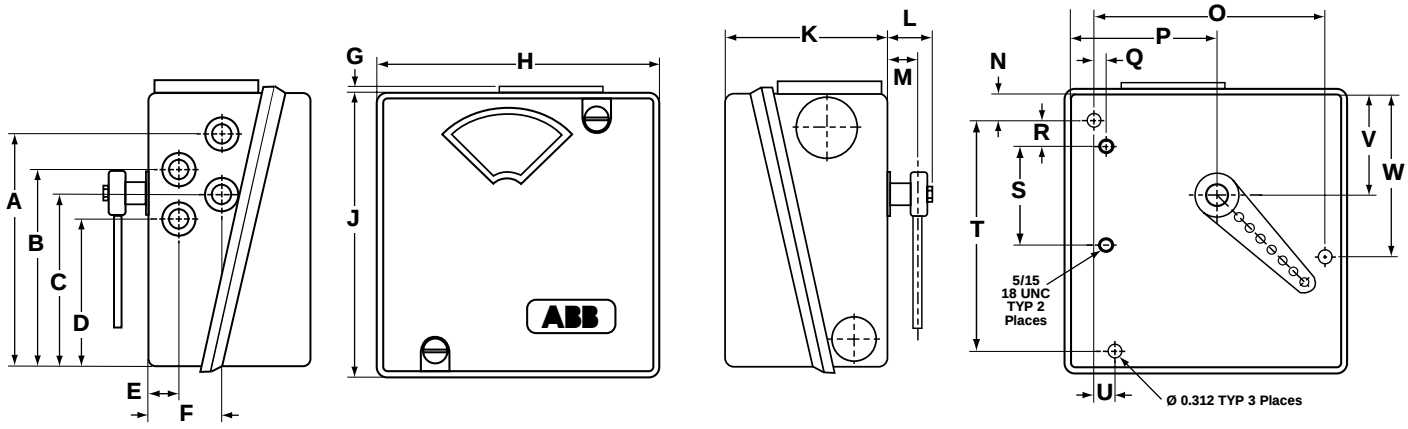
Single-button commissioning
The positioner shall utilize a commissioning function called Autoadjust which quickly establishes zero, span, and optimum positioning control parameters. Autoadjust function shall start with single pushbutton.

Display
The positioner shall utilize a 2-line LCD to show % position during operation and also displays via pushbutton operation the following positioner data:
Up arrow button: Current setpoint (mA)
Down arrow button: Internal device temperature
Up + Down arrow buttons: % difference between position and signal

Mounting
The positioner case shall have one mounting footprint and the positioner design shall utilize one type feedback shaft. The positioner shall easily mount to any linear or rotary valve.

Positioner shall have the following performance specifications:
Accuracy: ≤ 0.5 % of span
Tolerance band: 0.3...10 %, adjustable
Resolution (A/D conversion): > 4000 steps
Sample rate: 20 msec

Positioner shall have the following environmental specifications:
Influence of ambient temperature: ≤ 0.5 % for every 10 °C change in temperature
Influence of vibration: ≤ ± 1 % up to 10 g and 20…80 Hz
Seismic requirements: Meets requirements of DIN/IEC 68-3-3 Class III for strong and strongest earthquakes
Influence of mounting orientation: Can be mounted in any position
Meets the requirements of the following directives: EMC Directive 89/336/EEC as of May 1989
EC Directive for CE conformity marking
Ambient temperature: -40 °F to +185 °F (-40 °C to +85 °C) for operation, storage and transport;
Relative humidity:
Operational (with closed housing and air supply switched on): < 95 %(annual average), condensation permissible
Transport and storage: 75 % (annual average), non-condensing



DIMENSIONS inches (mm) **and WEIGHT** pounds (kg)

A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	Wgt.
1¼ (134.0)	4½ (113.4)	3⅞ (98.9)	3⅝ (84.7)	11/16 (17.5)	1 11/16 (42.4)	5/32 (3.6)	6 7/16 (163.3)	6½ (164.8)	3 11/16 (93.7)	1 1/32 (26.2)	11/16 (17.5)	19/32 (15.2)	5¼ (133.6)	3 5/16 (84.8)	¼ (7.1)	19/32 (15.0)	2¼ (57.2)	5¼ (133.4)	½ (12.2)	2 9/32 (58.2)	3 23/32 (94.0)	10 (4.54)

LESLIE THERMOCOUPLE

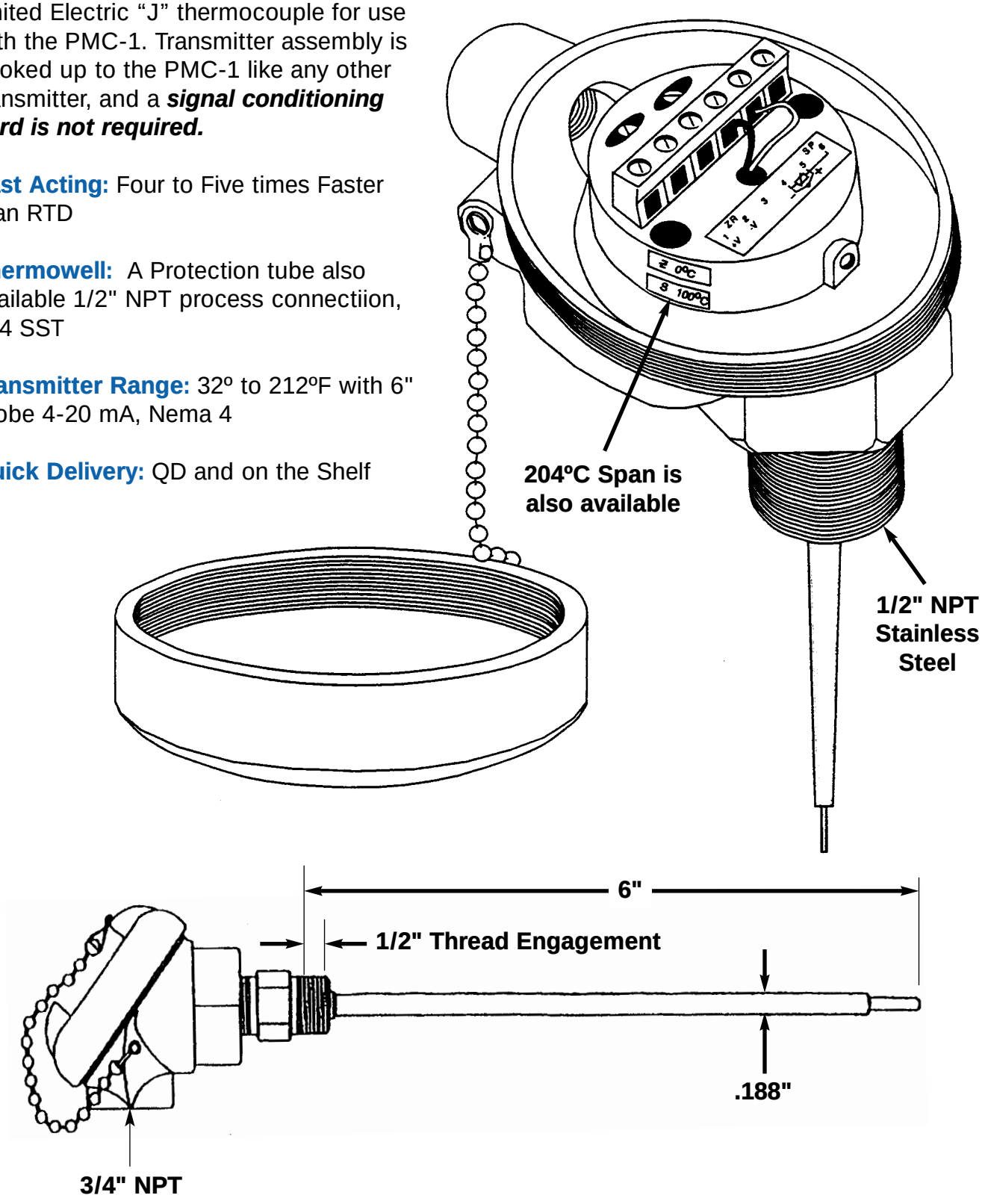
For fast response in temperature control loops, Leslie offers a custom made United Electric “J” thermocouple for use with the PMC-1. Transmitter assembly is hooked up to the PMC-1 like any other transmitter, and a ***signal conditioning card is not required.***

Fast Acting: Four to Five times Faster than RTD

Thermowell: A Protection tube also available 1/2" NPT process connectiion, 304 SST

Transmitter Range: 32º to 212ºF with 6" probe 4-20 mA, Nema 4

Quick Delivery: QD and on the Shelf



RTD RESISTANCE PROBE THERMOMETER

- **304 SS Closed End Probe** measures temperature
- **Varies Electrical Resistance** in proportion to temperature changes
- **Communicates Change** in resistance to automated systems

Options

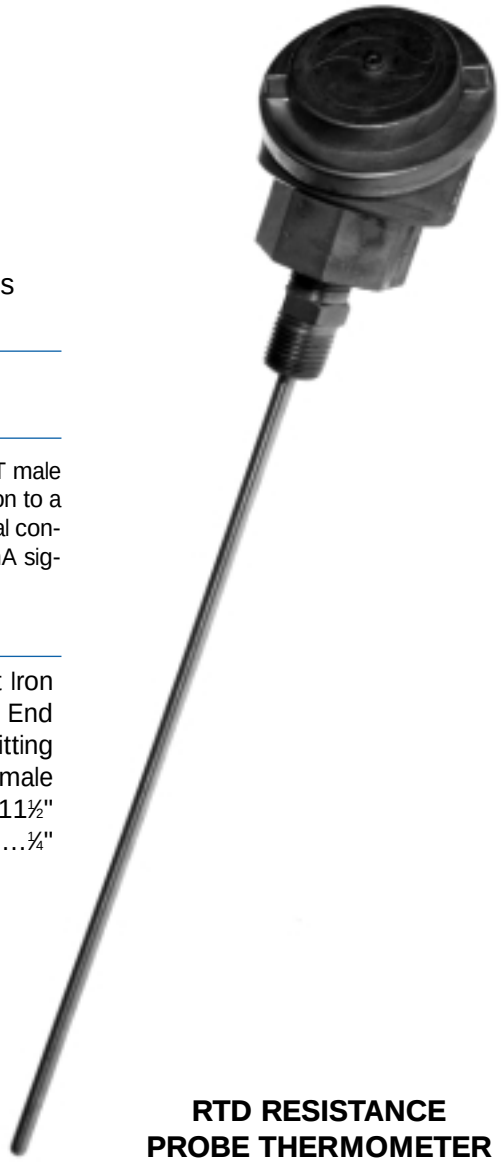
- 304 SST Thermowell

Specification

The RTD shall have a 304 stainless steel closed end probe with a 1/2 inch NPT male with hex fitting process connection. The RTD shall change resistance in proportion to a change in temperature and be capable of connecting to a device (such as a signal conditioning card) which can convert that resistance change to a standard 4-20 mA signal.

Materials of Construction

Connector Head:.....NB 1 Cast Iron
Probe: .....304 SS Closed End
Process Connection: .....1/2" NPT Male w/Hex fitting
Electrical Connection: .....1/2" NPT Female
Sheath Length .....5½" or 11½"
Sheath Diameter .....¼"



RTD RESISTANCE PROBE THERMOMETER

Application Data

- Building control systems
- Process control systems
- Systems utilizing the PMC Electro-Pneumatic Controller

ELECTRONIC PRESSURE TRANSMITTER

ELECTRONIC PRESSURE TRANSMITTER

Application Data

- Building control systems
- Process control systems
- Systems utilizing the PMC Electro-Pneumatic Controller

- **Solid State, Calibrated Transmitter** measures pressure to ±0.5% accuracy
- **Outputs 4-20 mA Signal;** 10-30 VDC unregulated; 100 ohms output impedance
- **Integral Metal Diaphragm and Polysilicon Bridge** are virtually unaffected by shock, vibration or mounting
- **Various Ranges** available from 0-30 to 0-5000 psig, overpressure protected
- **NEMA 4 Compliant** with cable or waterproof connector
- **Operates in 40-200°F**
- **1/8 NPT male or female process connection**

Specification

The Electronic Pressure Transmitter shall have a 1/8 NPT male or female 316 stainless steel process connection. The Electronic Pressure Transmitter shall measure pressure to ±0.5% accuracy and output a standard 4-20 mA signal with 100 ohms output impedance. The Electronic Pressure Transmitter shall be shock and vibration resistant, overpressure protected, operate within 40-200°F and be NEMA 4 compliant.

Materials of Construction

Case: .....304 SS
Diaphragm: .....17-4 PH SS
Process Connection: .....316 SS

TYPE PDA/PRA CONSTANT PRESSURE CONTROL PILOT

Type PDA
Direct acting, Air operated
Type PRA
Reverse acting, Air operated

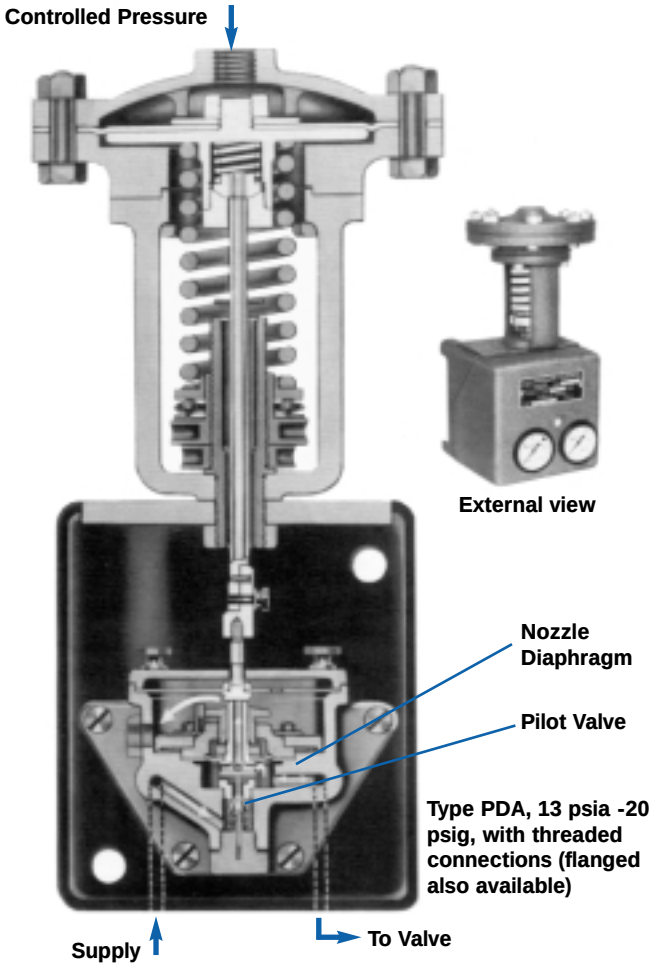
The PDA/PRA Constant Pressure Control Pilot is a force balance, pneumatic relay combining the fast response of the on-off relay and stability of the wide proportional band controller. It does not require continuous bleed of operating medium for most services. Flat characteristic, stable throttling action and speed of response proportional to the momentary deviation from set point make it ideal for systems with short lag factors.

FEATURES:

FAST RESPONSE WITH STABILITY - high capacity, independent supply valve out performs other pilots. Highest air output per second without separate booster or positioner.
FEW MOVING PARTS - simple design eliminates flappers, linkages, lost motion, tight fitting glands and plungers. No delicate adjustments.
ECONOMICAL - non-continuous bleed operation handles most services.
UNAFFECTED BY MOISTURE OR OIL in operating air supply.
SHOCK-PROOF, DEPENDABLE - force-balance design is not affected by vibration, shock or roll of a ship.
DIAPHRAGM PRESSURE ELEMENTS give positive transmission of force from the operating medium. Neoprene-nylon diaphragm standard for most applications; Teflon facing is available for corrosive service.
CORROSION-RESISTANT MATERIALS give long trouble-free life. Aluminum diaphragm chambers are standard: Steel or stainless steel are available for corrosive fluids.

OPERATION:

DIRECT ACTING PILOT - Process pressure on the upper diaphragm is balanced by the adjusting spring. Pressure increase causes instant downward stem movement, opening the pilot valve and increasing output pressure to control valve.
The output pressure also acts upward on the lower nozzle diaphragm opposing the change in controlled pressure on the upper diaphragm. This force-balance action stabilizes the change in output pressure in proportion to the change in process pressure and moves the nozzle diaphragm against its upper stop, allowing pilot valve to close. Hunting or over-regulation is eliminated by sealing in the operating pressure until another force-balance change occurs.
Although a further increase in controlled pressure will cause the pilot valve to immediately increase operating pressure to the control valve, a slight momentary drop won't bleed off operating pressure.
This difference in response in the loading and unloading cycle results from having the upward force on the nozzle diaphragm absorbed by the nozzle stop when the pilot valve seats. A further drop in controlled pressure is necessary before the nozzle disc can lift and reduce the operating pressure to the control valve.



Type PDA, 13 psia -20 psig, with threaded connections (flanged also available)

TYPE PDA/PRA CONSTANT PRESSURE CONTROL PILOT

S P E C I F I C A T I O N S

PILOT CHARACTERISTICS				CONTROLLER CHARACTERISTICS (Pilot with Valve)					
ADJUSTABLE RANGE PSIG	NORMAL** OPERATING FLUID PRESSURE PSI	MAXIMUM ALLOWABLE STATIC PRESSURE ON DIAPHRAGM PSI	RESOLUTION SENSITIVITY (Pressure deviation to create response) PSI	ADJUSTABLE RANGE PSIG	Controller ACCURACY OF REGULA-TION* PSI	MOMENTARY DEVIATION † FROM SET POINT TO OBTAIN MAX RATE OF STROKE PSI	TIME IN SECONDS ‡ for 1" valve stroke (3-15 psi operating range)		
							ACTUATOR SIZE		
							55 Sq. in.	85 Sq. in.	135 Sq. in.
13 PSIA-20 15-75	20-22 20-22	300 400	.025 .05	-1.7, 20 15-75	.25 .5	1.0 2.5	7.5	12.0	19.5
50-125 100-200 175-300	20-22 20-22 20-22	500 700 700	.1 .2 .3	50-125 100-200 175-300	1.0 2.0 3.0	3.75 7.0 10.0	7.5	12.0	19.5
275-450 400-600 550-800	20-22 20-22 20-22	700 800 900	.4 .5 .8	275-450 400-600 550-800	4.0 5.0 8.0	14.75 15.25 26.0	7.5	12.0	19.5

* Maximum deviation from control point when slowly increasing flow through control valve from zero to rated capacity (3-15 psi operating range).

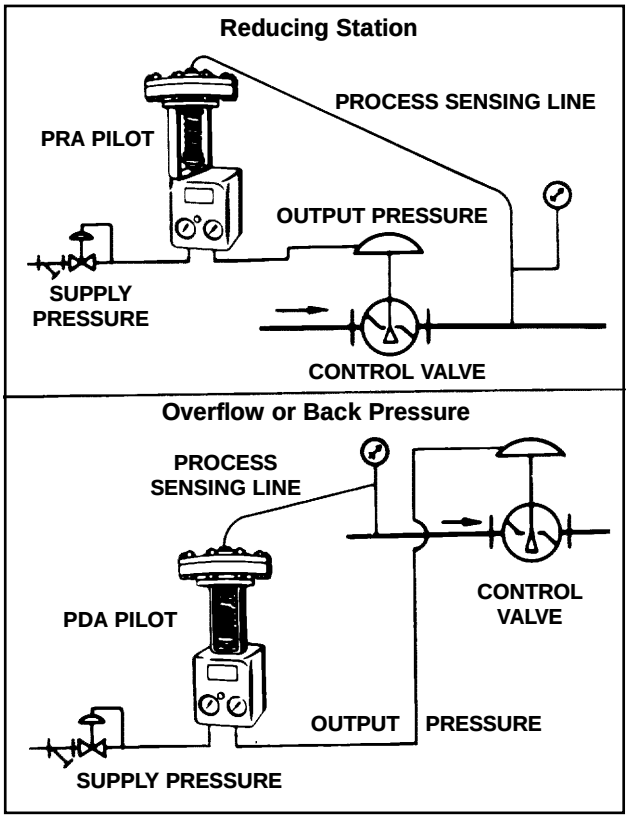
† Caused by abrupt load changes with fast return to values indicated under "Controller ACCURACY OF REGULATION"

‡ Based on momentary deviation to give maximum rate of stroke using air For control valves with other diaphragm displacements, time is directly proportional to the displaced volume.

**** Maximum output PRA-1 24 psi and PDA-1 30 psi with suitable inlet pressure.**

OTHER PILOTS

PDA	Direct, proportional pressure control
PRA	Reverse, proportional pressure control
PDAP	PDA with adjustable proportional band
PRAP	PRA with adjustable proportional band
UDDV	PDA with differential head
UDRV	PRA with differential head
UDDVP	UDDV with adjustable proportional band
UDDRP	UDRV with adjustable proportional band
DDD	Pressure ratio control pilot
LA	Level controller
LAP	Level control with adjustable proportional band
BP	Filled temperature controller, adjustable proportional band
BPC	BP with calibrated dial
DQ	Bimetal temperature control, direct
DTP	Bimetal temperature control, direct adjustable proportional band
DTHP	Hi-temperature DTP
RQ	Bimetal temperature control, reverse
RTP	Bimetal, reverse, adjustable proportional band
RTHP	Hi-temperature RTP



TYPE PDAP/PRAP CONSTANT PRESSURE CONTROL PILOT WITH ADJUSTABLE PROPORTIONAL BAND

Types PDAP and PRAP

Type PDAP and PRAP Pressure Pilots have been developed to meet the need for adjustable proportional bands in pressure control systems requiring a rugged controller that is not susceptible to wear, shock and minor system disturbances.

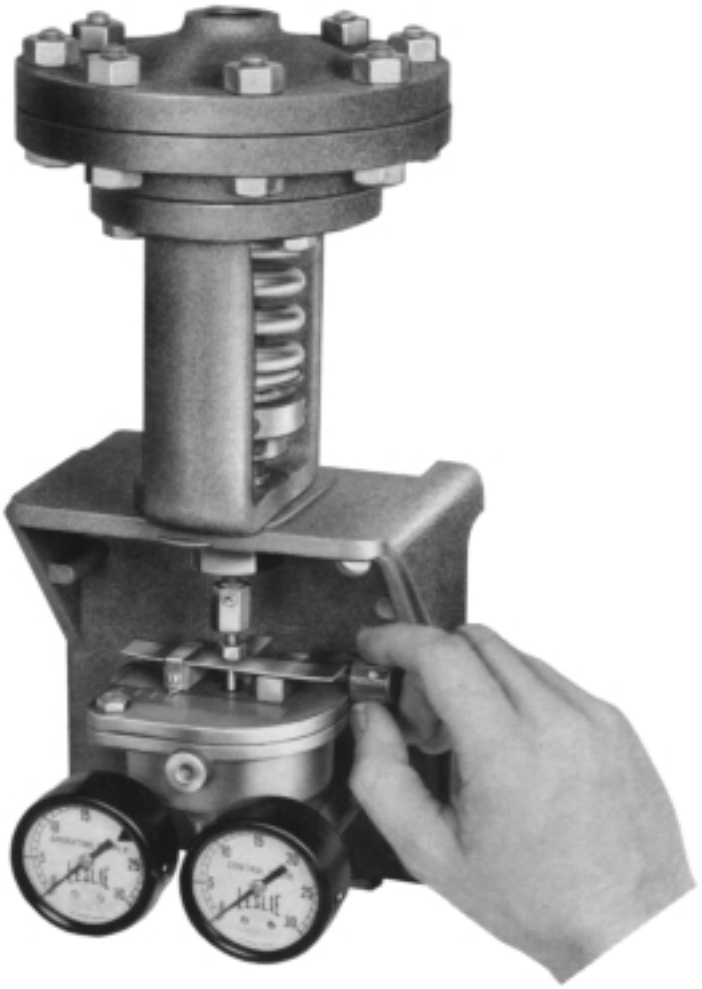
HOW IT OPERATES

Controlled pressure is applied to the top side of a spring opposed diaphragm. Variations in controlled pressure produce stem motion and nozzle disc positions which are proportionate to the pressure change. The nozzle disc position controls the bleed rate of operating air to atmosphere. Since a fixed metering orifice is used in the air supply and in series with the variable bleed orifice, the intermediate or output pressure is a function of the nozzle disc position. The pneumatic portion of the PRAP Pilot operates with a reverse acting nozzle valve to produce reverse action.

The amount of stem movement per psi of controlled pressure change (adjusting spring and blade spring) and upper diaphragm area. The diaphragm area and adjusting spring rate are fixed. The stem assembly is fitted with a blade spring which has an adjustable spring rate. The adjustment of the blade spring rate provides the means of manually setting the proportional band.

Pressure controlling stations having time lags in response to load changes because of system inertia, long distances between elements in the control loop, long impulse lines or other reasons, tend to cycle or are unstable.

Stable control is obtained in these installations by using a controller with proportional band which can be adjusted until stability is achieved. Types PDA or PRA Pressure Pilots or narrow proportional band controllers usually are unsuitable for this type of application.



PDAP and PRAP Pressure Pilots are also available for applications requiring valve positioners, volume boosting or other relays or receiver controllers with various modes of control. Both types may be used as controllers or transmitters.

TYPE PDAP/PRAP CONSTANT PRESSURE CONTROL PILOT WITH ADJUSTABLE PROPORTIONAL BAND

SPECIFICATIONS

Adjustable Proportional Band:

	Approximate PSI Control Panel Change Required to Produce Change in Output Pressure from 3 PSI to 15 PSI							
	5-70 PSI Range				50-800 PSI Range			
	Min.	Band	Max.	Band	Max.	Band	Max.	Band
Set Point PSI	5	70	5	70	50	800	50	800
Air Supply Pressure PSIG								
17	.5	.9	4	5	6	8	20	27
20	.4	.75	4	5	5	8	17	26
30	.3	.6	3.5	4.5	3.8	7	14	24
	Approximate PSI Control Point Change Required to Produce Change in Output Pressure from 3 PSI to 27 PSI							
30	.5	1	6	7.5	6.25	11	23	40

ADJUSTABLE RANGE
5 – 70 psi 50 – 800 psi

NORMAL AIR SUPPLY PRESSURE 20 psi

MAXIMUM AIR SUPPLY PRESSURE 30 psi

MAXIMUM ALLOWABLE PRESSURE ON DIAPHRAGM
5 – 70 psi range – 400 psi
50 – 800 psi range – 900 psi

MAXIMUM AIR CONSUMPTION

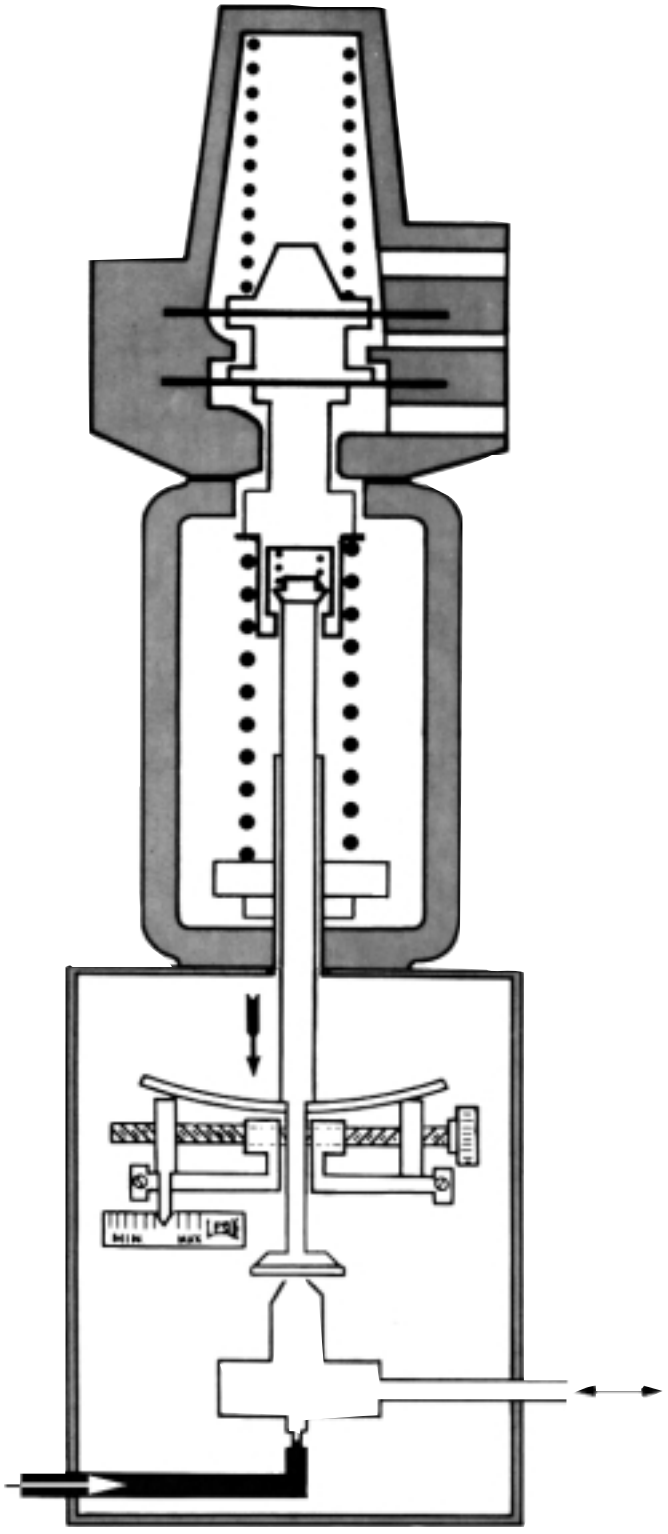
Supply Pressure PSI	SCFM
17	.23 – .29
20	.25 – .32
30	.32 – .41

Valve Operating Speed – Average time in seconds required to provide full valve travel of a 1½" Class DL control valve with 35 Actuator (32.2 cu. in. displacement), with controlled pressure change equal to proportional band setting.

Without Positioner	With Positioner
18	5

Linearity – Since this Pilot incorporates a fixed orifice and a variable orifice, it produces an output pressure vs. measured pressure relationship similar to a conventional flapper-nozzle controller. This curve has a reasonably straight line (linear) center section and flattens out at both ends.

TYPE UDDV/UDDVP/UDRVP DIFFERENTIAL PRESSURE AND VACUUM PILOT CONTROLLERS



Types UDDV, UDDVP, and UDRVP

These Pilot Controllers consist of a differential superstructure mounted on a standard force balance or adjustable proportional band pilot body.

They can be used for:
1. Differential pressure control
2. Vacuum control
3. Pressure control with remote set point adjustment

One of the advantages of this type design is the use of two separate sensing diaphragms. This feature prevents contamination of either fluid in case of diaphragm failure.

PILOT ACTION	FORCE BALANCE TYPE	ADJUSTABLE PROPORTIONAL BAND TYPE
Direct	UDDV (Uses PDA Body Assembly)	UDDVP (Uses PDAP Body Assembly)
Reverse	UDRV (Uses PRA Body Assembly)	UDRVP (Uses PRAP Body Assembly)

HOW THEY OPERATE:

The diaphragm cover arrangement includes a spring in the upper diaphragm chamber. This upper spring permits the high pressure impulse to be applied to either the upper or lower diaphragm. The adjustable differential pressure range depends on which chamber the high pressure impulse is connected to. (See Specifications)

TYPE UDDV/UDDVP/UDRVP DIFFERENTIAL PRESSURE AND VACUUM PILOT CONTROLLERS

S P E C I F I C A T I O N S

ADJUSTABLE PROPORTIONAL BAND TYPES: (UDDVP & UDRVP)

ADJUSTABLE DIFFERENTIAL
High Pressure on Upper Chamber 0-100 PSI
High Pressure on Lower Chamber 0-35 PSI
Vacuum control: 0-30 in. Hg.
(vacuum on upper chamber only)

RATIO: 1:1

Resolution Sensitivity: 20 PSI static .05 PSI
300 PSI static .07 PSI

Max. Air Consumption: .41 SCFM

		STATIC PRESSURE	
Adjustable		20 PSI	300 PSI
Proportional	Min.	1 PSI	2 PSI
Band	Max.	8	10

Max. Static Pressure on Diaphragm: 600 PSI

FORCE BALANCE TYPES: (UDDV & UDRV)

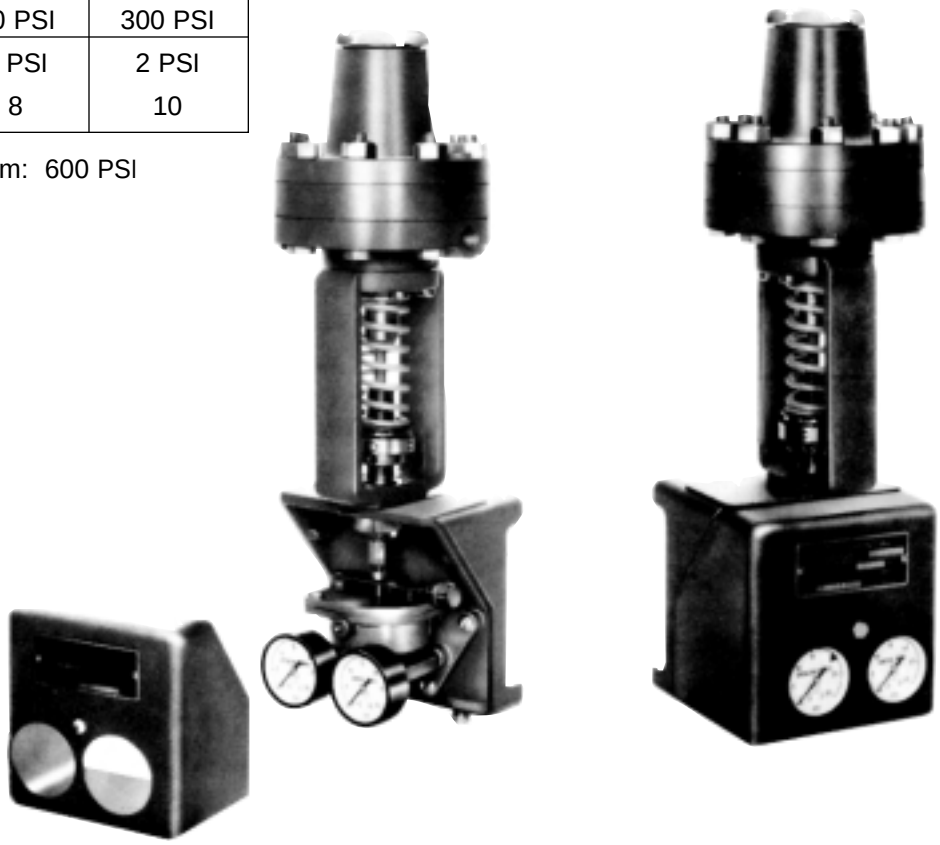
ADJUSTABLE DIFFERENTIAL:
High Pressure on Upper Chamber 0-100 PSI
High Pressure on Lower Chamber 0-35 PSI
Vacuum control: 0-30 in. Hg.
(vacuum on upper chamber only)

RATIO: 1:1

Resolution Sensitivity: 20 PSI static .05 PSI
300 PSI static .07 PSI

Max. Air Loading Capacity: 3.9 SCFM

Max. Static Pressure on Diaphragm: 600 PSI



INSTRUMENTATION

LEVELMATIC LIQUID LEVEL PILOT CONTROLLER

Differential Pressure Sensing Type — No Floats, No Linkages

Inexpensive to Install — No More Than 2 Vessel Connections

Low Cost Operation — No Wearing Parts

Stable, Reliable Control — No Need for Continuous Adjustments

THE INSTRUMENT FOR STABLE, ACCURATE LIQUID LEVEL CONTROL

Levelmatic responds instantly to changes in the differential pressure across the sensing diaphragm. The “friction-less”, low inertia, sensing method provides smooth modulation, stable accurate control and proportional response which is completely unaffected by surface turbulence, or vibration in the system equipment.

The Levelmatic floatless liquid level pilot controller is differential pressure sensing device that delivers a controlled pneumatic signal in response to a change in liquid level. The output air signal from the Levelmatic is applied to the control valve or other control element which adjusts the liquid flow into of the vessel to maintain the level within the proportional band.

LEVELMATICS ARE VERSATILE

Levelmatics are universally used to control level of most liquids–water, oil, gasoline, solvents, chemical solutions, acids, slurries and viscous fluids. The standard, basic Levelmatic unit is suitable for either open or closed vessels – including, boilers, feedwater heaters, evaporators, deaerators, hot wells, storage vessels, distillation columns, open or closed process vessels, etc.

They are used for control of either supply to the vessel or in unloading (or overflow) control of the vessel discharge line. Pilot controller action, (i.e., direct or reverse acting) can be changed by simply reversing the impulse connections.

By turning one single adjusting nut, the level set point can be fixed at any point over the instrument’s range, 0-36" W.C. 0-200" W.C., etc.

Levelmatics are also widely used as transmitters with other instrumentation – receiver controllers, characterized relays, alarm systems, etc.

HOW LEVELMATIC OPERATES

The Levelmatic Pilot Controller uses a fixed metering orifice to restrict the air supply. The output pressure is controlled by a simple, foolproof, nozzle and disc arrangement operated by the diaphragm-stem movement. The diaphragm-stem movement assembly is actuated by variations in head pressure as small as .1" W.C. which are directly related to the level deviation from the set point. Changing the leads permits optional direct or reverse action without any change in internal parts or mounting position.

LEVELMATIC LIQUID LEVEL PILOT CONTROLLER

HOW LEVELMATICS SAVE MONEY

Levelmatics use a single impulse connection to an open vessel, two connections to a closed vessel. Because only one or two small connections to the vessel are required. Levelmatics are fast, easy and economical to install. You can mount them in any convenient location – on the wall, on the control valve, on the vessel or at a remote point. They are also suitable for outdoor installations in most climates.

Maintenance costs are next to nothing! The simple, one-moving-part design leaves virtually nothing to get out of order. There are no pivots, pins or linkages; no torque tubes, or torque tube seals; no stuffing boxes, packed stems or float cages; no flapper nozzles; no thermo-hydraulic or electric probe sensing systems to adjust, wear, maintain or malfunction.

Levelmatics are available with a fixed proportional band, or adjustable proportional band.

PILOT CONTROLLER TYPE	MODE OF CONTROL	INSTALLATION		ADJUSTABLE LEVEL RANGE (inches W.C.)	MOUNTING POSITION	RESOLUTION SENSITIVITY INCHES W.C.	PROPOR. TIONAL BAND[2] (inches W.C.)	AVERAGE STROKING TIME (sec)		AIR CONSUMPTION SCFM
		TYPE OF VESSEL	PILOT ACTION					WITHOUT POSITIONER	WITH POSITIONS OR RELAY	
LA	Fixed Proportional Band	Open	Reverse	0 - 36	Upright Mount	.1	2	18 seconds Based on Average time to fully stroke a 1-1/2" Diaphragm Control Valve with a 35 Actuator, 3/4" Travel. (3-15 psi, Operating Range).	5 seconds Based on Average time to fully stroke a 1-1/2" Diaphragm Control Valve with a 35 Actuator, 3/4" Travel. (3-15 psi, Operating Range).	**Max. Consumption in steady state** 3 psi output pressure .31 SCFM 9psi output pressure .29 SCFM 15 psi output pressure .23 SCFM **Max. Average Lead Capacity** with signal change greater than Prop. band width & output change 3-15 psi. .29 SCFM **Max. Leading capacity –** fully stroked at 3 psi output. .32 SCFM
		Closed	Direct							
		Open	Direct	0 - 66						
		Closed	Reverse							
LAU		Open or Closed	Direct or Reverse	0 - 200		.35	7			
LAB		Open	Reverse	0 - 32	Inverted Mount	.1	2			
		Closed	Direct							
		Open	Direct	0 - 70						
		Closed	Reverse							
LAUB		Open or Closed	Direct or Closed	0 - 200		.35	7			
LAP	Adjustable Proportional Band	Open	Reverse	0 - 40	Upright Mount	.1[1]	2-20			
		Closed	Direct							
		Open	Direct	0 - 75						
		Closed	Reverse							
LAUP		Open or Closed	Direct or Reverse	0 - 200		.35[1]	7-25			
LAPB		Open	Reverse	0 - 36	Inverted Mount	.1[1]	2-20			
		Closed	Direct							
		Open	Direct	0 - 76						
		Closed	Reverse							
LAUPB		Open or Closed	Direct or Reverse	0 - 200		.35[1]	7-25			

1. Minimum proportional band setting.
2. Maximum deviation from control point when slowly increasing flow through control valve from zero to rated capacity (3 - 15 psi operating range). Momentary deviation for maximum speed of response of fixed proportional band units is 200% of the band.

OPERATING SUPPLY PRESSURE - Fixed Band and Adjustable Band Types

For 3-15 psig output range 20 - 22 psig
For 6-30 psig output range 32 psig

ALLOWABLE STATIC PRESSURE ON DIAPHRAGM 0 psig to 300 psig.

LEVELMATIC LIQUID LEVEL PILOT CONTROLLER

FIXED PROPORTIONAL BAND TYPES

The basic Levelmatic pilot controller with fixed proportional band is suitable for a wide variety of level control applications. Most relatively stable, level control systems without significant system lags can be controlled by Type LA Pilot Controller with fixed proportional band.

The simple design incorporated a fixed metering orifice in series with a variable bleed orifice to control the operating air to a diaphragm control valve. Changes in differential pressure across the sensing diaphragm (proportional to changes in liquid level) produce stem motion, nozzle disc positioning and changes in the bleed rate through the nozzle. The changes in bleed rate result in changes in operating air to the control valve.

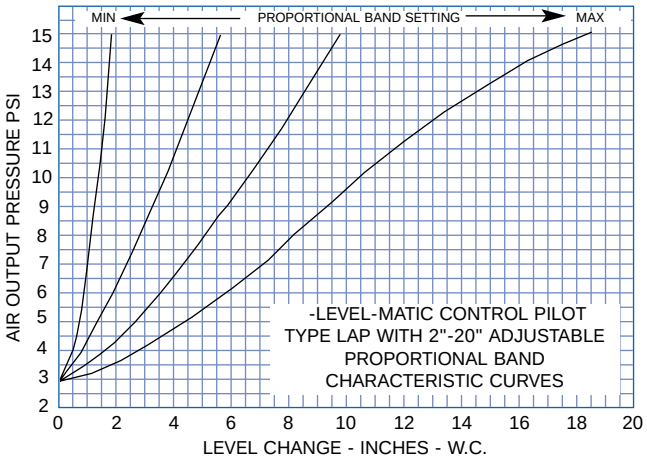
FIXED PROPORTIONAL BAND TYPES

Throttling type automatic level control systems operate on either a fixed or variable amount of change in controlled level. Since the control response or controller output is fundamentally proportional to the amount of change, the terms “throttling range” and proportional band’ are used here to refer to the amount of controlled variable level change required to provide sufficient controller output change to fully stroke the final control element.

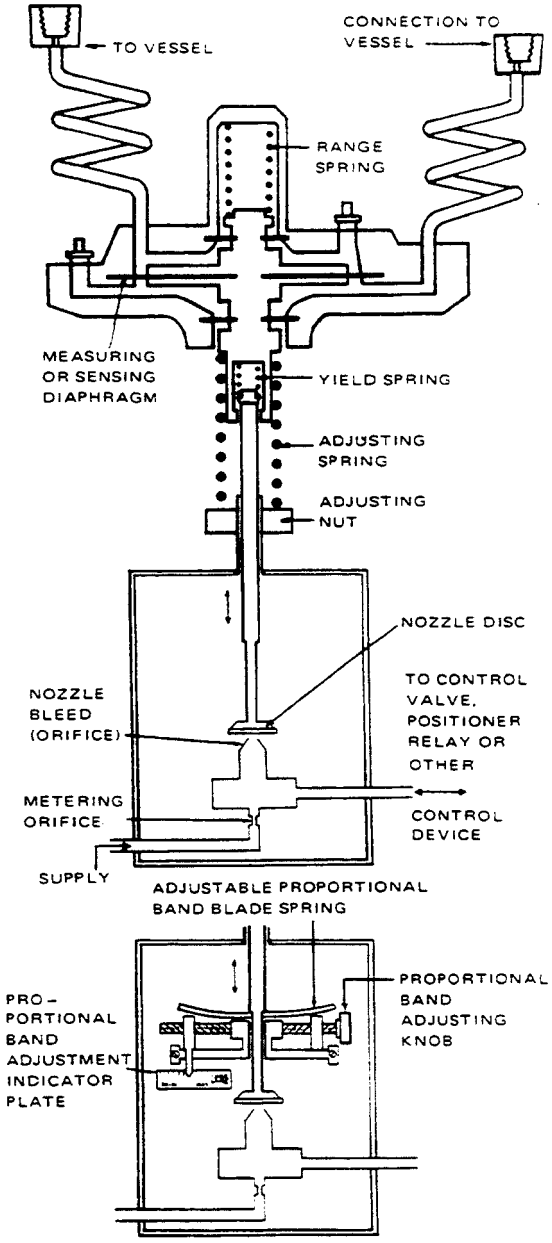
The Levelmatic pilot controller with adjustable proportional band provides for field adjustment of the pilot response characteristic by varying amount of valve stroke or travel per increment of controlled variable change to match the needs of the system and to achieve stability.

The Levelmatic pilot controller can therefore be used where the required band is unknown or does not coincide with any of the fixed band pilots available to the user.

Levelmatic PILOT CONTROLLER TYPE LAP WITH 2" - 20" W.C. ADJUSTABLE PROPORTIONAL BAND CHARACTERISTIC CURVES



SCHEMATIC VIEW OF TYPE LA Levelmatic PILOT CONTROLLER WITH ADJUSTABLE PROPORTIONAL BAND AND RESET SHOWN IN TOP VIEW, TYPE LAP SHOWN BELOW



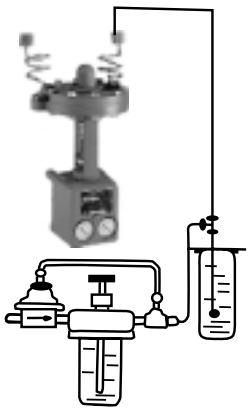
ADJUSTABLE PROPORTIONAL BAND MECHANISM

Adjustable proportional band, a means for providing added stability in sensitive systems, has been simplified in a single knob and indicator-type adjustment. Turning the knob clockwise widens the band, turning the knob counterclockwise narrows the band.

LEVELMATIC LIQUID LEVEL PILOT CONTROLLER

CONSTRUCTION FOR CORROSIVE SERVICES

Aluminum construction for wetted parts with a neoprene diaphragm is standard for general services. Teflon diaphragm facings are available at nominal cost for handling fluids where neoprene is unsuitable. Bronze, steel and stainless steel constructions are available for services compatible with these materials. Air, gas or liquid purges may be used for those services where direct head measurement is not permissible.



Exterior view Type LA. Diagrammatic sketch shows use of air purge set to protect diaphragm form highly corrosive fluids.

SPACE SAVER INVERTED MOUNTING

Where space will not permit the Levelmatic to be mounted with the sensing diaphragm at or below the liquid level an inverted mount is employed. Levelmatics equipped for inverted mounting are identified by a "B" in the type designation, i.e., LAPB, LAUPB, etc.

Levelmatic Type LAPB with space saver inverted mount

HOW TO ORDER LEVELMATICS

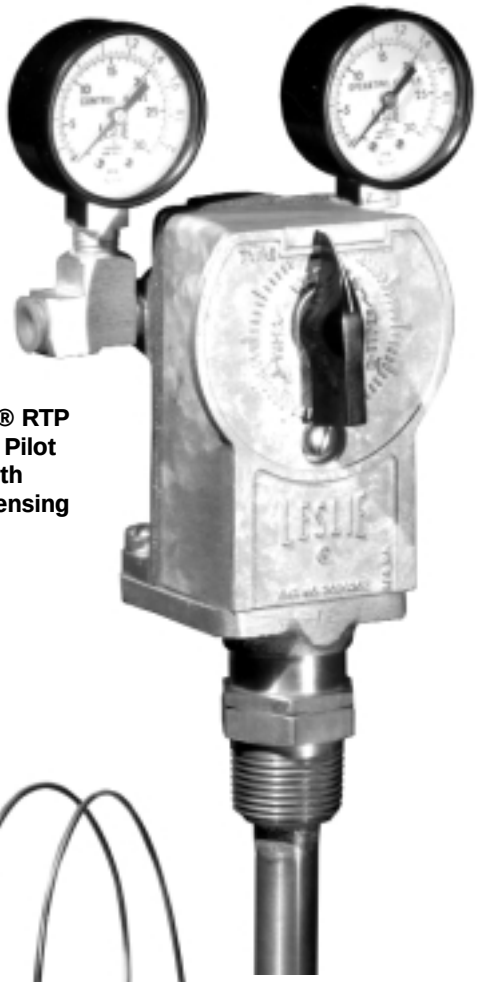
The following information is all that is required on orders for Levelmatics:

1. Service: Open or closed vessel.
2. Range of adjustment
   (See operating characteristics table.)
3. Minimum and maximum pressure on pilot diaphragm.
4. Operating air pressure available.
5. Distance between valve and pilot.
6. Accessories required: Airmate air filter-regulators; length of 5/16" O.D. copper tubing and compression fittings; purge sets, volume booster relays or characterized receiver controllers or relays.
7. Pilot connections, screwed (standard) or flanged for special applications.
8. Materials for corrosive service.
   If special materials for corrosive service are required, please submit details.

HOW TO SPECIFY LEVELMATIC

"Level Control" shall be of the floatless, differential diaphragm-stem assembly to control the bleed of a restricted air supply glands, plungers, torque tubes, or connecting linkages. It shall also have a simple adjusting means with sleeve and thrust bearing to permit easy change of the level set point. Adjustable proportional band units shall be equipped with a single knob adjustment for changing the proportional band.

PROPO-MATIC® TEMPERATURE PILOT CONTROLLER



Propo-Matic® RTP Temperature Pilot Controller with bi-metallic sensing element.

Propo-Matic® BP Temperature Pilot Controller with liquid filled thermo-element and calibrated dial.

- **Inexpensive to Install**
- **Low Cost Operation**
- **Stable Reliable Control**
- **Tough, Durable Instruments**

Propo-Matic® Temperature pilot controllers are thermomechanical devices that precisely sense changes in temperature and translate the changes into air or hydraulic outputs for operating a control valve or other system equipment.

A Propo-Matic® pilot controller, together with a Lifetime control valve is ideally applied to systems where pneumatic or hydraulic control is required to obtain maximum reliability and economy.

Propo-Matic® PILOT CONTROLLER FUNCTIONS

Propo-Matic® Temperature pilot controllers perform three basic functions:

1. SENSING OR MEASUREMENT

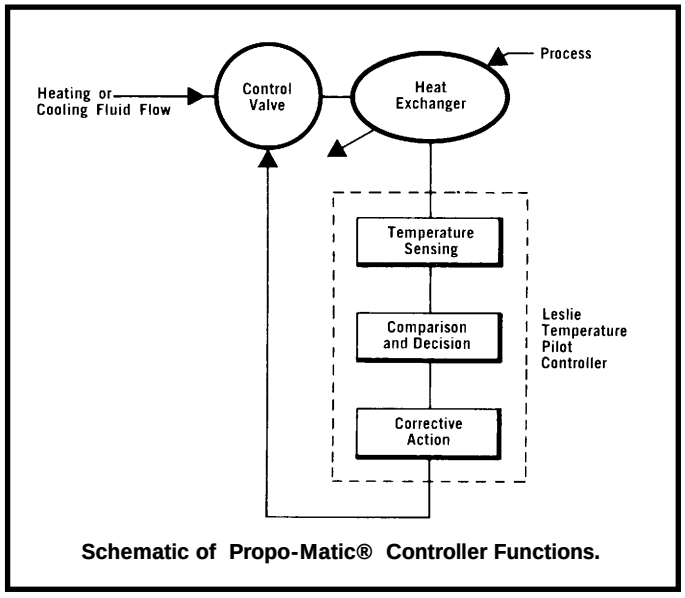
The temperature to be controlled is precisely measured by either a bi-metallic or a liquid filled thermo-element.

2. COMPARISON AND DECISION

The controller mechanically compares the sensed temperature with the required set point and“decides” what corrective action is required.

3. CORRECTIVE ACTION

The controller transmits a corrective pneumatic or hydraulic signal to a secondary system, control valve or other final control element. This adjusts the flow of the heating or cooling fluid medium to maintain the controlled variable within the desired control band.



Schematic of Propo-Matic® Controller Functions.

PROPO-MATIC® TEMPERATURE PILOT CONTROLLER

SAVE ON INSTALLATION

Propo-Matic® temperature pilot controllers are quick, easy and economical to install. No special costly or complicated piping is required. They are also suitable for outdoor installations without the need for enclosure or special weather protection.

SAVE ON MAINTENANCE

The simple designs leave virtually nothing to get out of order. There are no delicate linkages, packed stems, flapper nozzles, bourdon tubes or electric probes to adjust or maintain. Reliability is assured.

MOISTURE-PROOF DUST-PROOF WEATHER-PROOF SPARK-PROOF DESIGN

Because of the simple design of Propo-Matic® temperature pilot controllers, hardly anything can go wrong with them. Most outdoor temperature pilot controller installations do not require an enclosure or special weather protection. Propo-Matic® temperature pilot controllers work under a wide variety of adverse ambient conditions. These “non-sparking” instruments will keep on working — even in hazardous environments.

CHOICE OF LIQUID-FILLED OR BI-METALLIC SENSING ELEMENT TYPES

Bi-metallic type temperature pilot controller, Type RTP-2.

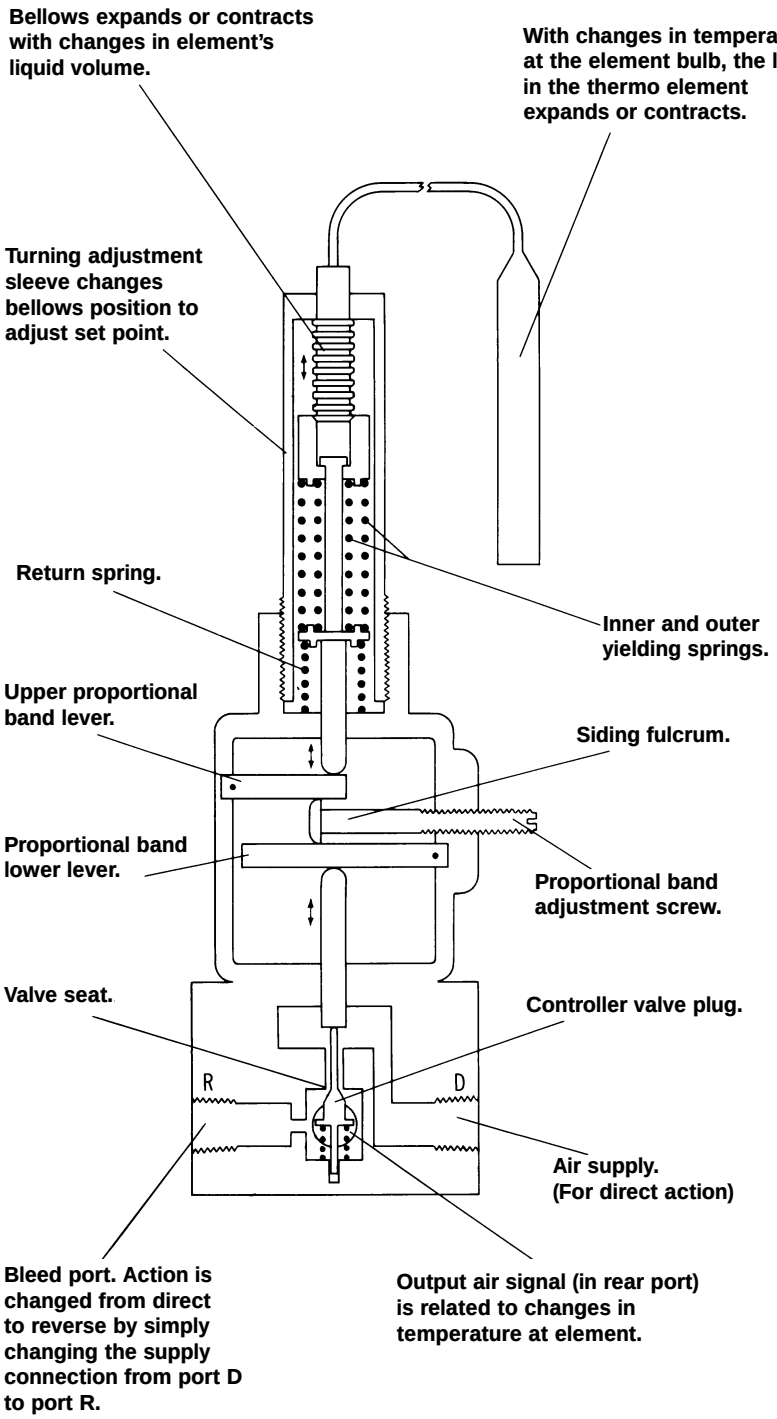
Propo-Matic® temperature pilot controllers can be classified into two general types: Those with bi-metallic thermo-elements and those with liquid-filled thermo elements. The bi-metallic element types (designated Types R or D) are of sturdy bronze and stainless steel construction and mount directly at the point of thermal measurement. The liquid-filled thermal element designs (designated Types B or BP) are light weight aluminum and can be mounted remotely in any convenient location. Both types provide precise, accurate, stable control; high dependability and low maintenance. The comparison chart below shows major selection considerations.

Liquid-filled temperature pilot controller, Type BP-2.

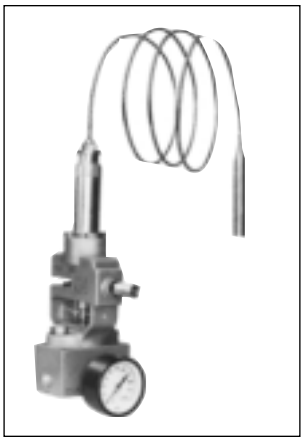
Temperature Pilot Controller Comparison Chart

CONSIDERATION	BI-METALLIC ELEMENT BASIC TYPES R - D	LIQUID-FILLED ELEMENT TYPES B - BP
Controller Construction	All bronze and stainless steel construction, they last for decades.	Husky light weight aluminum body. Optional calibrated dial available.
Element Construction	Invar and brass, monel or stainless steel element offers maximum protection against thermal element damage.	Compact liquid-filled bulb flexible bellows in the pilot are connected by capillary tubing. Optional armor is available where extra protection is required.
Operating Medium	Air or noncorrosive gas. Water or other noncorrosive liquid of low viscosity may be used on RQ and DQ types.	Air or noncorrosive gas.
Initial Cost	Initial cost of bi-metallic type is slightly higher than liquid-filled element types.	
Thermo Element Selection (ºF)	32-400 300-600	70-120 170-220 220-320 100-150 220-270 270-370 120-170 20-120 50-250 150-200 70-170 50-400
Representative Characteristics Adjustable Proportional Band Types	ºF change for 3-15 psi output. with 20 psi supply pressure	pressure ºF change for 3-15 psi output with 20 psi supply pressure
	Values shown are for Brass Tubes. Add 30% for S ST Tubes.	50ºF Span: Min. Band 4.1, Max. Band 16.4; 100ºF Span: Min. Band 8.2, Max. Band 32.8; 200ºF Span: Min. Band 16.4, Max. Band 65.6
	14" Bulb: Min. Band 8, Max. Band 30; 7" Bulb: Min. Band 15, Max. Band 50	
Element Changeability	Not changeable	Easily changed in field. All elements are interchangeable.
Maximum Loading Pressure	60 psi.	90 psi.
Mounting and ease of adjustment	Mounting contiguous to process; must be adjusted at point of thermal insertion.	Remote mounting permits adjustment in convenient location.
Space Requirements	Clearance dimensions usually exceed those of BP Types.	Smaller bulb length simplifies installation in close quarters.
Allowable Override	Limited only by materials of construction.	25% to 100% of Span, depending on range.

PROPO-MATIC® WITH LIQUID FILLED THERMO-ELEMENTS



Type BP-2 Adjustable Proportional Band Temperature Pilot Controller

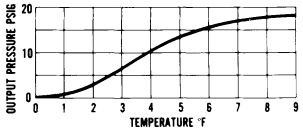


Adjustable Proportional Band Type BP-2

Propo-Matic® temperature pilot controllers with liquid-filled thermo-elements have been designed to convert temperature to a proportional pneumatic signal in temperature control systems. The output signal can be used to operate a control valve, or the unit can be used as a temperature transmitter.
The controller is a simple, accurate, reliable and rugged device. You select from a wide choice of element ranges and spans, each with a simple means of set point adjustment.

HOW IT OPERATES

Liquid fill in the thermo-element expands and contracts with changes in temperature, producing a corresponding expansion and contraction of the element bellows.
The motion produced is proportional to the measured temperature and operates the pilot valve through an adjustable lever (BP-2). Since the input air is metered through a fixed orifice, the pressure of the output air is a function of the opening of the pilot valve. Action of these pilots is reversible by simply switching supply and exhaust connections.



Typical response curve B or BP type pilot controllers

PROPO-MATIC® WITH LIQUID FILLED THERMO-ELEMENTS

ADJUSTABLE PROPORTIONAL BAND

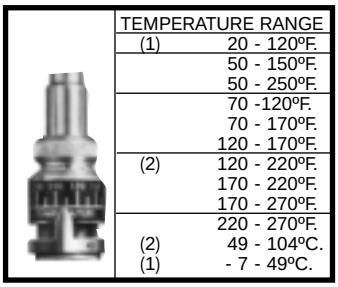
Throttling-type automatic temperature control systems operate on either a fixed or variable amount of change in the controlled temperature. Since the control response or controller output is proportional to the amount of change, the terms “throttling range” and “proportional band” are used here to refer to the amount of controlled variable temperature change required to provide sufficient controller output change to fully stroke the final control element.

The temperature pilot controllers with adjustable proportional band provide for field adjustment of the pilot controller response characteristic by varying amount of output signal change per degree of controlled temperature change to match the needs of the system and to achieve stability.

Type BP-2 pilot controllers can, therefore, be used where the required band is unknown or does not coincide with any of the fixed bands.

CALIBRATED DIALS

Propo-Matic® temperature pilot controllers with liquid filled thermo-elements are available with optional calibrated dials (Fahrenheit or centigrade) for quick, easy and dependable temperature readjustments are necessary and for process work, it replaces the standard adjusting sleeve. Pilot controllers fitted with calibrated dials have “C” added to the class designation e.g. BPC-2.



	TEMPERATURE RANGE
(1)	20 - 120ºF.
	50 - 150ºF.
	50 - 250ºF.
	70 -120ºF.
	70 - 170ºF.
	120 - 170ºF.
(2)	120 - 220ºF.
	170 - 220ºF.
	170 - 270ºF.
	220 - 270ºF.
(2)	49 - 104ºC.
(1)	- 7 - 49ºC.

(1) & (2) EQUIVALENT

Available Calibrated Dial Ranges

LIQUID FILLED THERMO-ELEMENTS

Robust, low cost liquid filled temperature sensing elements unscrew in moments for change of range or bulb material. No calibration is required. No messy gas or vapor pressure system to fill; no costly factory returns.

These powerful, incompressible liquid-filled thermo-elements provide positive repeatable positioning unobtainable with compressible vapor pressure or gas-filled types. Stem movement is truly proportional to temperature change at the bulb.

ELEMENT SPECIFICATIONS

Maximum Working Pressure of Thermo-Element Bulb	
With Stuffing Box Installation	200 psi
With Bulb Casing	400 psi or 2000 psi

Standard Ranges[1] (Maintained in Stock)		
50[1] Spans	100[1] Spans	200[1]Spans
20-70	20-120	50-250
70-120	50-150	
120-170	70-170	
170-220	120-220	
220-270	170-270	

STANDARD TUBING

Heavy gauge copper flexible tubing, nickel plated is standard .316 stainless steel is furnished in lengths of 5' or 10' and longer as an optional extra.

SPECIAL TUBING

Armored brass or stainless steel tubing for extra protection is available in standard ranges and lengths.

BULBS

Brass bulbs, nickel plated or 18-8 stainless steel bulbs are 4" long for 100º spans. (The 100º span element is standard.) Other ranges and various lengths of capillary tubing are available in 10 foot increments. Armored capillary tubing and or coated elements are available where required.

STANDARD BULB CASINGS

Standard bulb casings are available in two sizes: 4-13/16" long (No. 2) and 93/4" long (No. 30). Both casings have 5/8" outside diameter and 1/2" pipe thread. They are furnished in brass, carbon steel, monel and 316 stainless steel for maximum working pressure of 400 psi.

HIGH PRESSURE CASINGS

High pressure carbon steel or 316 stainless steel casings are available for maximum working pressures to 2000 psi. Extension neck casings that permit full exterior insulation of the tank or oven are also available.

STUFFING BOXES

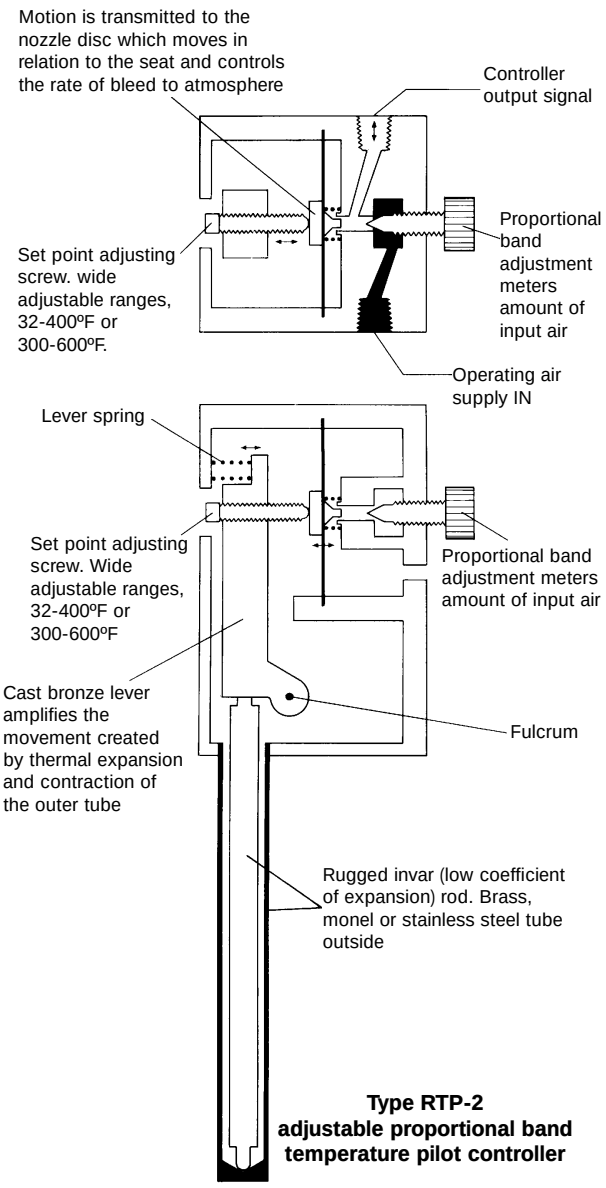
Stuffing boxes are available in brass or 316 stainless steel.

OPERATING CHARACTERISTICS

BP TYPES				
	REVERSE ACTING		DIRECT ACTING	
Maximum Air Consumption CFM	Minimum[2] Band ºF to Reduce Output to 2 PSI	Maximum[3] Band ºF to Reduce Output to 2 PSI	Min. Band ºF to Increase Output to Maximum PSI	Max. Band ºF to Increase Output to Maximum PSI
.23-.28	7	28	7.2	28.8
.25-.32	9	35	8.2	32.8
.32-.41	11	44	9.5	38.
.39-.50	14	56	11.	44.
.54-.68	16	64	14.1	56.4
.75-.96	18	72	16.4	65.6

1. Other spans up to 200ºF and other ranges are also available on order.
2. In narrowest band position with 100º span element.
3. In widest band position with 100º span element.
   For 50º span element divide proportional band figures shown above by 2.
   For 200º span element multiply proportional band figures shown above by 2.

PROPO-MATIC® WITH BI-METALLIC THERMO-ELEMENTS



Type RTP-2 adjustable proportional band temperature pilot controller

Adjustable Proportional Band Types
Types DTP and DTHP, Direct Acting
Types RTP and RTHP, Reverse Acting

Propo-Matic® temperature pilot controllers with bi-metallic sensing elements are simple pneumatic devices with either fixed or adjustable proportional band. These extremely sturdy controllers sense temperature variations and produce pneumatic output signals used to operate control valves for either heating or cooling service. They will respond to minute, definite temperature deviations and give accurate, stable control. They are unaffected by moisture or oil in the air supply that fouls ordinary instruments.

Because bi-metallic temperature pilot controllers combine accuracy, speed of response and dependability, they make "control-station" operation practical in a wide variety of applications.

HOW IT OPERATES
(Adjustable Proportional Band Type)

Temperature changes are sensed by the bi-metal element (tube and Invar steel rod) which is immersed in the fluid to be controlled. The tube (fixed at one end) expands and contracts with temperature changes. Since there is a difference in the coefficient of expansion between the tube and the invar rod, temperature changes at the tube create movement of the rod. The movement is transmitted and amplified by a lever which contacts the diaphragm assembly. The movement repositions the nozzle disc, increasing or decreasing the air flow exhausted to atmosphere. Since the exhaust orifice is in series with a fixed (manually adjusted) orifice, the intermediate air pressure is a function of (and proportional to) the nozzle disc position and measured temperature. The proportional band or the temperature change required for the output pressure of the pilot to go from minimum to maximum is determined by the manual adjustment of the proportional band screw. Set point (temperature at which pilot controls) is determined by the setting of the adjustment screw.

HEATING OR COOLING ACTION

PILOT TYPE	CONTROL VALVE ACTION	
	Heating Service	Cooling Service
Direct Acting DT, DTHP, etc.	Normally Open	Normally Closed
Reverse Acting RTP, RTHP, etc.	Normally Closed	Normally Open

OPERATING CHARACTERISTICS

Characteristic	TYPE RQ		TYPE DTP, RTP, DTHP[1], RTHP[1]			
			7" Tube		14" Tube	
	7"Tube	14" Tube	Min. Band[2]	Max. Band[2]	Min. Band[2]	Max. Band[2]
Proportional Band 20 psi supply 3-15 psi output	13.3ºF	8.0ºF	15ºF	50ºF	8ºF	30ºF
Proportional Band 60 psi supply 3-57 psi output	—	—	13ºF	59ºF	6.5ºF	29.5ºF
Averaging Loading Capacity 20 psi supply 3-15 psi output	1.26 cfm air .336 gpm water	1.26 cfm air .336 gpm water	.06 cfm air	.72 cfm air	.06 cfm air	.72 cfm air
Adjustable Range	Types DQ, DTP, RQ, RTP 32-400ºF		Types DTHP, RTHP 300-600ºF			
Supply Pressure	20-30 psi		20-60 psi			
Maximum Static Pressure	Brass Tube 500 psi, Monel Tube 550 psi, SS Tube 600 psi					
Resolution Sensitivity	½ºF					

1. DTHP and RTHP available with 7" tube only.
2. Values shown are for Brass Tubes. Add approx. 30% for SS Tubes.

PROPO-MATIC® WITH BI-METALLIC THERMO-ELEMENTS

STURDY CONSTRUCTION

Propo-Matic® temperature pilot controllers far surpass all other makes and types of controllers in resistance to damage, wear, or malfunction. They have passed the most severe shock tests with flying colors and are approved for use in a variety of vital and demanding services on both naval and commercial ships.

ADJUSTABLE PROPORTIONAL BAND

Throttling type automatic temperature control systems operate on either a fixed or variable amount of change in the controlled temperature. Since the control response or controller output is fundamentally proportional to the amount of change, the terms “throttling range” and “proportional band” are used here to refer to the amount of controlled variable temperature change required to provide sufficient controller output change to fully stroke the final control element.

The basic fixed band temperature pilot controller is suitable for a wide variety of temperature control applications. Most relatively stable large volume temperature control systems without significant system lags can be controlled by this basic fixed band design.

The temperature pilot controllers with adjustable proportional band provide for field adjustment of the pilot response characteristic by varying amount of output signal change per degree of controlled temperature change to match the needs of the system and achieve stability.

The bi-metallic type pilot controllers with adjustable proportional band is unknown or does not coincide with any of the fixed band pilots.

EASY ADJUSTMENT OF THE PROPORTIONAL BAND

Adjustable proportional band, a means for providing added stability in sensitive systems, has been simplified in RTP and DTP type Propo-Matic® temperature pilot controllers to a single knob adjustment. Turning the knob clockwise narrows the band; turning the knob counter-clockwise widens the band.

SET POINT REFERENCE DIAL

Propo-Matic® temperature pilot controllers with bi-metallic thermo-elements have a reference dial for fast temperature resetting without waiting for the equipment to heat up. A helpful feature where two or more temperatures are frequently set.

PROPO-MATIC® ORDERING INFORMATION

HOW TO SPECIFY TEMPERATURE PILOT CONTROLLERS

BI-METALLIC ELEMENT TYPES

Temperature controller shall be a positive, double-acting, pneumatic (or liquid) relay actuated by a bi-metallic element capable of fast response to temperature change without the use of fins. It shall be designed to permit installation in any position.

When adjustable proportional band is required the controller shall have a single knob adjustment for changing the proportional band.

LIQUID-FILLED THERMO-ELEMENT TYPES

Temperature controller shall be a self-contained non-sparking design directly operated by a completely filled liquid thermo-element consisting of a small bulb and a bellows unit. A yield spring shall prevent overstressing of the bellows for over-range protection of 25% to 100% of span. Body shall be machined from aluminum bar stock. Pilot stem shall be sealed with a low friction self-sealing single ring which requires no adjustment. Easy replacement of thermo elements shall be possible without removing the controller from the line.

HOW TO ORDER

When ordering temperature controllers, include the following data:

1. Type of pilot controller.
2. Service: Heating or cooling.
3. Range of adjustment.
4. Minimum and maximum temperature and pressure on tube or bulb.
5. Operating medium to be used and pressure available (clean air, gas, water or light oil).
6. Accessories available — air loader or air loading panel; length of 5/16" O.D. copper tubing and compression fittings.
7. Pilot controller action required (direct) or (reverse).
8. Materials for corrosive services.

TYPE S TRANSFER VALVE

- **Changeover** automatic, demand-controlled for optimum performance, expanded rangeability
- **Protection** against high pressure/low flow erosion of valve parts
- **Reduction** of overall maintenance and operating cost

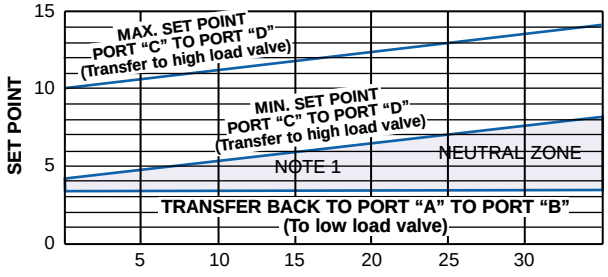
The Class S Transfer Valve is a pneumatic switch used to select which of two parallel control circuits will be active. It prevents oscillation from one circuit to another. It is usable in many types of control loops and has been used primarily to provide a two-controller pressure reducing station for handling extremely wide load variations (beyond the rangeability of a single controller) and to minimize the extreme throttling and erosive effect on a single control valve.

How S-Transfer Systems Work

The minimum adjustment of the piston spring positions the spool so that communication exists between port “A” and port “B”. A reference signal from port “B” is fed to the top of the small piston (port “F”). The low flow circuit (small control valve) for low load operation is now in control.

Low Flow Circuit to High Flow Circuit

As the demand increases to the load point at which the low flow valve cannot handle the load, the controlled pressure begins to drop. When the controlled pressure drops to the setpoint of the high load circuit control pilot, the output pressure from this pilot increases and is supplied to ports “C” and “E”. The signal supply pressure to port “E” acts on the large piston and produces an upward force which must exceed the downward force produced by the piston spring and the reference signal on the small piston. When this occurs, the spool moves upward so that port “A” is sealed, port “B” is vented (low flow valve closes) and communication exists between ports “C” and “D”. The high flow valve (large valve for high load operation) is now in control. Note that the reference signal to port “F” is vented. The point at which this transfer occurs (transfer valve setpoint) may be varied over a range as indicated on the graph below.



Note 1: Transfer dead band. This band width remains the same for all set points between min. and max.

High Flow Circuit to Low Flow Circuit

As the load begins to decrease and the controlled pressure begins to rise, the output of the high flow circuit pilot to ports “C” and “E” begins to drop. When it drops by some predetermined amount (transfer deadband), the spool will transfer back to its original position. The point at which the spool will transfer back will be somewhat lower in pressure than the setpoint because of the loss of the reference signal on the small piston. This transfer deadband is designed to prevent oscillation from one circuit to another. It is predetermined by the value of the reference signal at the time of transfer from the primary to the secondary circuit and is illustrated by the shaded area on the graph.

NOTE 1: Transfer deadband is the same for all set points between minimum and maximum.
NOTE 2: In the installations shown, the valves are normally closed and the pilots reverse acting. In these installations, normally open valves and direct acting pilots cannot be used. Selection of valves and pilots to be used with the transfer valve must be made carefully and the operation of the complete cycle in both directions considered.

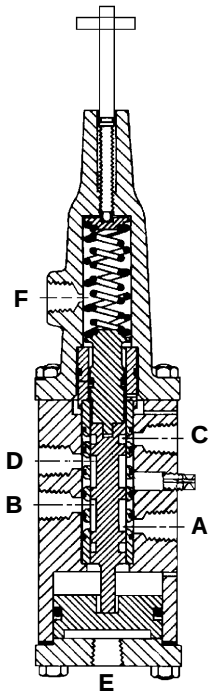
TYPE S TRANSFER VALVE

SPECIFICATIONS

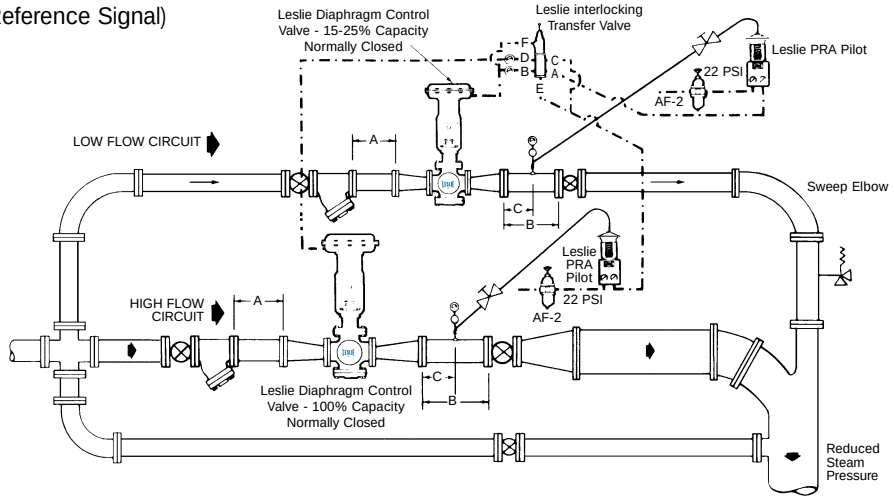
All Threaded Connections: 1/4" pipe thread except vent
Vent: 1/8" N.P.T. (vent hole in plug)
Maximum Height: 1111/16"
Width/Depth: 21/2

MATERIALS OF CONSTRUCTION

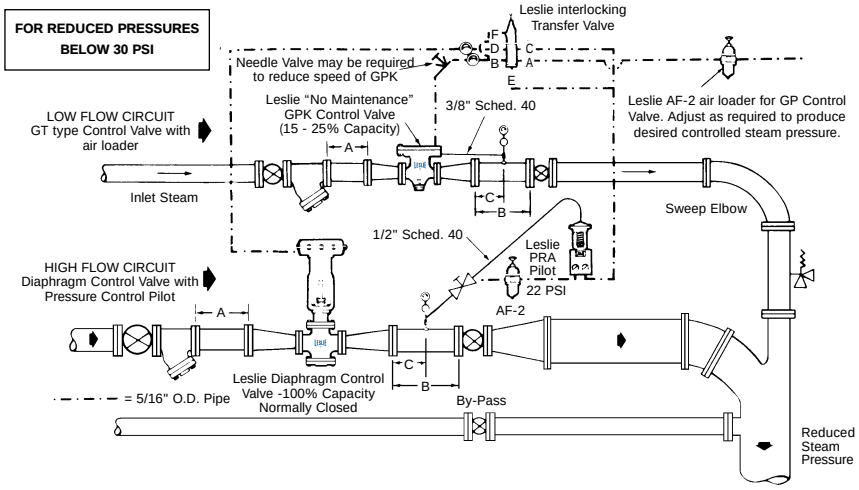
Spring Case .....Cast Aluminum
Valve Body .....Aluminum
Small Piston.....Aluminum
Sleeve and Spool Assembly .....Stainless Steel
Large Piston .....Aluminum
Bottom Flange .....Aluminum
O-Rings and Gaskets .....Synthetic rubber



CONN. A Primary Pilot Output Pressure Connection
CONN. B Transfer Valve Primary Output Pressure Connection
CONN. C Secondary Pilot Output Pressure Connection
CONN. D Transfer Valve Secondary Output Pressure Connection
CONN. E Connection for Large Piston Loading Pressure from Secondary Pilot Output (Transfer Valve Set Point)
CONN. F Connection for Small Piston Loading Pressure from Transfer Valve Primary Output (Reference Signal)



Parallel Pressure Control System using two pressure controllers and two control valves.



Parallel Pressure Control System using one diaphragm control valve and one air loaded GT Type Regulator.

AIRSET TYPE AS-1 SERIES
ADJUSTABLE AIR REGULATOR

AIRSET TYPE ASG-1

- **Superior Regulation Characteristics**
- **Adjusting Knobs Included**
- **Rugged, Corrosion-Resistant Construction**
- **Excellent Stability and Repeatability**
- **Self-Relieving**
- **Low Droop at High Flow**
- **Several Mounting Options**
- **Low Cost**

DESCRIPTION

Leslie Airset AS-1 pressure regulators are reliable precision units for instrumentation and general purpose.

Test data for these regulators shows excellent performance characteristics. The regulators are generally superior in regulated pressure vs. flow, forward-to-reverse flow offset, supply pressure sensitivity, repeatability and stability.

They are sturdily designed and constructed with housings of die cast aluminum. Every regulator is pressure and leak tested prior to shipment from the factory.

Careful design and quality materials throughout assure long, trouble free operation in the most difficult industrial environments. A rubberized, soft seat valve stem provides positive shutoff and “forgives” dirt or other foreign matter. An aspirator maintains downstream pressure and compensates for droop when high flow occurs. The full flow gauge port is convenient for gauge installation and also can be used as an additional full flow outlet. The regulator includes a unique sintered bronze filter that can be easily removed for cleaning.

The design of these regulators is especially well suited to pilot controllers, instruments, actuators and a wide range of industrial pneumatic systems and equipment.

PRINCIPLE OF OPERATION

Once set to a desired pressure the Leslie Airset AS-1 maintains this setting until re-adjusted. The range spring, which is compressed by the adjustment screw, causes the pin to move downward, opening the supply valve and allowing air flow. The downstream pressure builds up against the control diaphragm forcing it up until the supply valve closes. This is the equilibrium or set pressure, which is closely maintained under changes in operating conditions in the following manner:

Downstream pressure drop — A drop in downstream pressure reduces the diaphragm pressure force, upsetting the equilibrium condition. This unbalance causes the supply valve to open until the pressure builds up once more to the equilibrium condition.

Downstream pressure increase — Any increase in downstream pressure acts on the diaphragm, causing the relief seat in the diaphragm assembly to lift and open. The excess pressure drops almost instantaneously to the equilibrium value, at which point the relief valve closes.

Changes in forward flow — Under forward flow conditions, the range spring force is balanced by the diaphragm pressure force, with the supply valve open just enough to maintain the required equilibrium pressure. When high flow occurs,a specially designed aspirator helps maintain downstream pressure and compensates for droop.

MODELS

AS-1 - Adjustable Air Regulator

ASG-1 - includes gauge

S P E C I F I C A T I O N S

Flow capacity @ 100 psig (700 kPa) supply, 20 psig (140 kPa) outlet: 8 SCFM (13.4 m^3/hr)

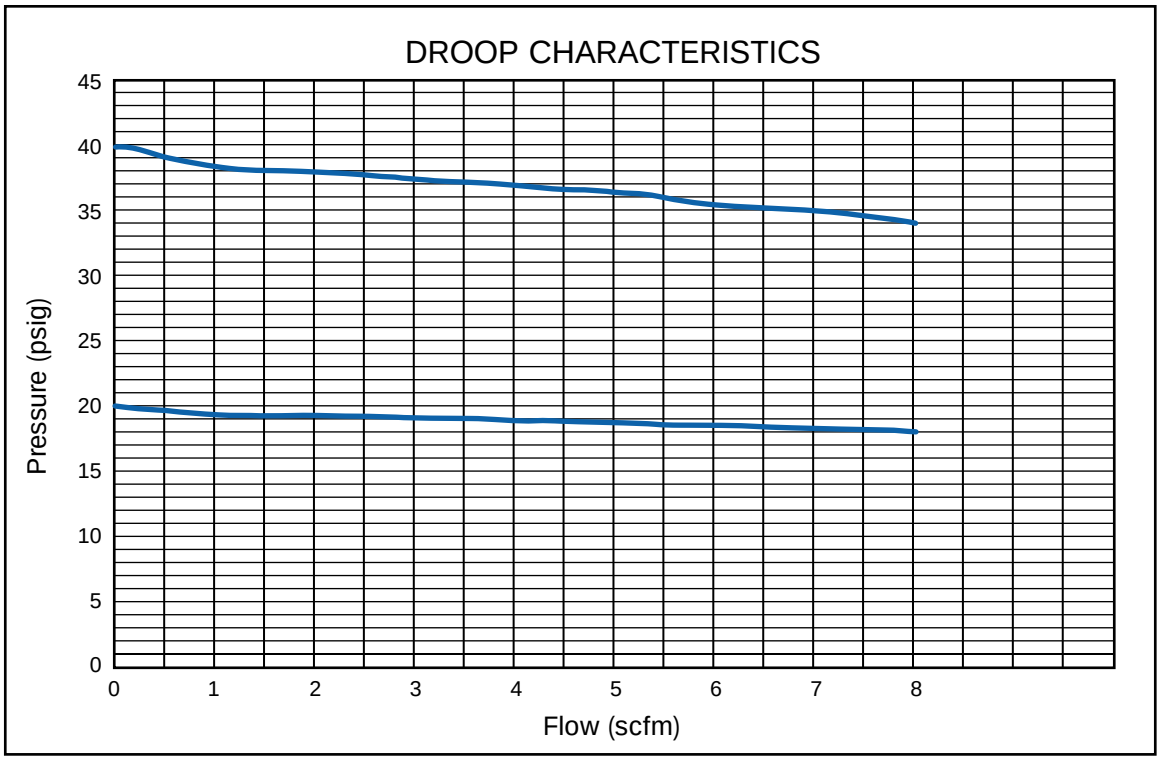
Exhaust capacity @ downstream pressure 5 psig (35 kPa) above setpoint: 0.1 SCFM (0.17 m^3/hr)

Sensitivity: 1” (2.5 cm) of water

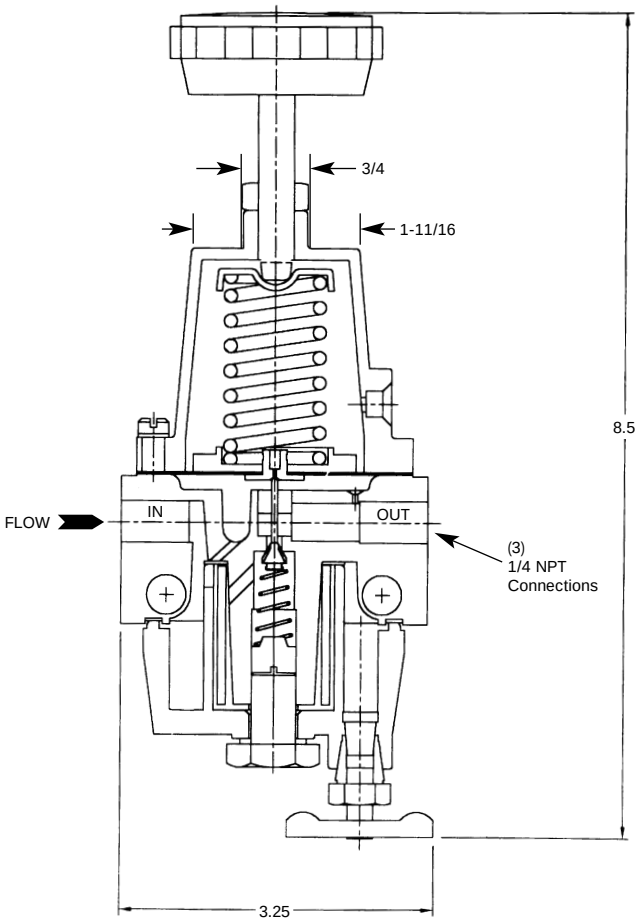
Effect of supply pressure variation: Less than .2 psig (1.4 kPa) for 25 psig (170 kPa)

Supply pressure: 150 psig (1000 kPa) maximum

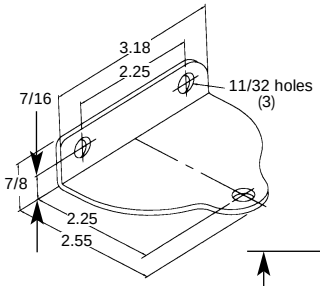
AIRSET TYPE AS-1 SERIES ADJUSTABLE AIR REGULATOR

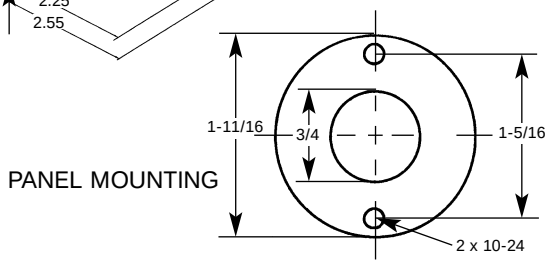


SECTION



MOUNTING BRACKET





The filter element is readily accessible by removing the dripwell bowl and can be cleaned by dipping in kerosene or any similar solvent. The Airset has a drain cock at the bottom edge of the dripwell which permits drainage when the unit is mounted in vertical or panel-mounted horizontal position.

PART NUMBER	RANGE
AS-1 A80472	0.5-30 psi
AS-1 A80473	0.5-60 psi
AS-1 A80474	0.5-100 psi
ASG-1 A81070	0.5-30 psi
ASG-1 A81071	0.5-60 psi
ASG-1 A81072	0.5-100 psi

AIRMATE® TYPE AFG-2 AIR LOADERS AND PANELS

For Constant Air Pressure Loading

PANEL LOADERS

Basic air loader and flush gauges mounted on enameled aluminum plate suitable for flush or surface console mounting. Optional air filter available, connected to air loader inlet connection.

How AIRMATE'S Patented Dual Aspirator Control Gives You Controlled Performance Over the Entire Flow Range:

A comparison of capacity/regulation curves of other leading air loaders with those of Airmate clearly demonstrate Airmate's superior performance. Airmate produces a flatter curve and supplies and more accurate pressure regulation over a greater flow range during performance tests at flow rates from 0 to 40 scfm. From no flow to rated flow, deviations from the set point are insignificant. Override and droop problems, common to ordinary regulators, are eliminated.

MATERIALS OF CONSTRUCTION

Basic Air Loaders .....Die cast aluminum body and spring case
Filter .....Die Cast aluminum bowl with drain cock
Filter Material .....Phenolic resin-impregnated cellulose

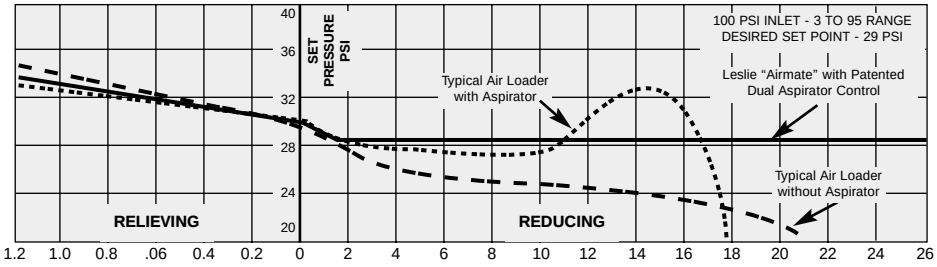
PRESSURE AND TEMPERATURE RANGES

BASIC AIR LOADERS

Maximum Inlet Pressure:	200 psi
Maximum Temperature:	150°F
Reduces Pressure Ranges:	2 to 30 psi 3 to 60 psi 30 to 150 psi[1]
Minimum Pressure Drop:	5 psi
Maximum Ambient Temperature:	150°F
Sympathetic Variations:	65:1[2]
Inlet and Outlet Connections:	1/4" NPT
	Continuous Bleed .04 SCFM

FILTER

Filtration:	Rated for 10 microns, maximum
Maximum Pressure Drop at 50% fouled:	1/4 psi
Filter Area:	4.3 sq. in.
Rating of Filter Area to Normal Flow Area:	88:1
Filter Bowl Capacity:	4.5 cu. in.



1. For applications where accuracy of regulation is not critical, range may be extended to 10 to 150 psi.

2. The change in reduced pressure for an inlet pressure variation is inverse. A 65 psi increase in inlet pressure will produce a 1 psi decrease in reduced pressure.

AIRMATE® AIR LOADERS AND PANELS

DESCRIPTION	CLASS DESIGNATION	ADJUSTABLE RANGES*	DESCRIPTION
 BASIC AIR LOADER**	**AP-2**	2-30 psi 3-60 psi 30-150 psi[1]	 AIR LOADER WITH GAUGE
	AG-2	2-30 psi 3-60 psi 30-150 psi[1]	
 AIR LOADER WITH FILTER**	**AFP-2**	2-30 psi 3-60 psi 30-150 psi[1]	 AIR LOADER WITH FILTER AND GAUGE
	AFG-2	2-30 psi 3-60 psi 30-150 psi	
 BASIC PANEL LOADER	**P-2**	2-30 psi 3-60 psi 30-150 psi[1]	 PANEL LOADER WITH AIR GAUGE AND FILTER
	PF-2	2-30 psi 3-60 psi 30-150 psi[1]	
 PANEL LOADER WITH AIR GAUGE AND PROCESS GAUGE	**30 PP-1**	2-30 psi	 PANEL LOADER WITH AIR AND PROCESS GAUGES AND AIR FILTER
	60 PP-1	3-60 psi	
	150 PP-1	30-150 psi[1]	
	30 PPF-1	2-30 psi	
	60 PPF-1	3-60 psi	
	150 PPF-1	30-150 psi[1]	

CHOICE OF FEATURES TO SUIT YOUR SYSTEM:

Airmate loaders offer a wide range of flexibility for selecting units to fit most system design requirements. The basic loader, protected by U.S. patents, offers several distinct benefits over ordinary air pressure regulators:

- High flow capacity with minimum droop — the result of Leslie-Airmate's exclusive dual aspirator.
- Reduced air waste — Leslie-Airmate has a minimum continuous bleed.
- Rugged construction for long service life.
- Accurate pressure regulation through the entire range — from no flow to maximum rated flow. The set point is not exceeded at high flow rates.
- No significant change of set point pressure when shifting from loading to unloading conditions.

The basic unit is a rugged, all-aluminum, die cast body and spring case to which gauges, filters and panel mountings are added to meet system requirements. The table at left show frequently used combinations, most of which are in stock.

When ordering, specify reduced pressure range required. Units fitted with gauges have these gauge ranges:

Loader Adjustable Range	Gauge Range
2-30 psi 3-60 psi 30-150 psi[1]	0-30 psi 0-60 psi 0-160 psi

AFP-2 is AFG-2 less gauge, with plugged gauge taps for future gauge. (AP-2, AFP-2).

1. For applications where accuracy of regulation is not critical, range may be extended to 10 to 150 psi.

AIRMATE® AIR LOADERS AND PANELS

HOW IT OPERATES:

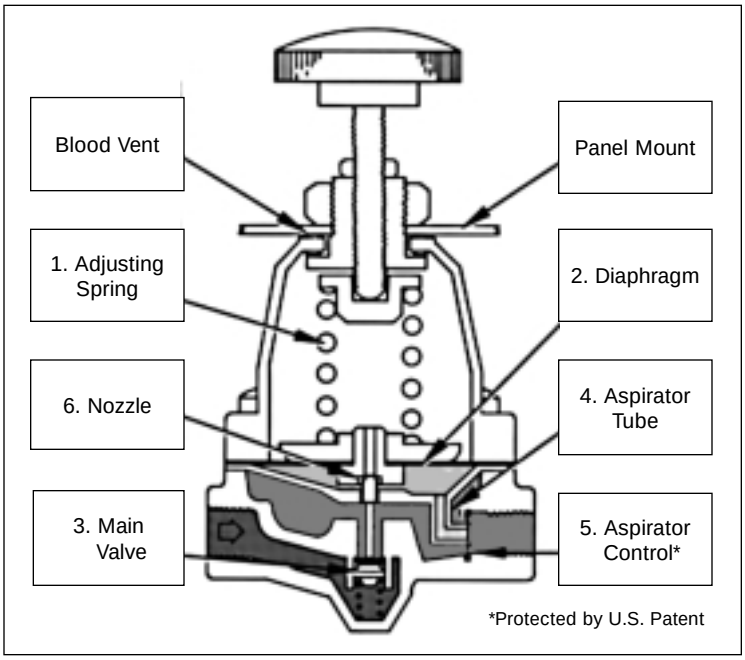
During pressure reduction, the main valve (3) is opened by the adjusting spring (1) acting on the diaphragm (2) allowing air to flow to the reduced pressure side. The adjusting spring force on the diaphragm is opposed by the aspirated outlet pressure, sensed through the aspirator tube (4), positioning the main valve (3).

The patented dual aspirator control gives you the high accuracy of regulation that is exclusive to Airmate. The signal transmitted through the aspirator tube (4) is self-regulated with respect to changing flows by means of the aspirator control disc (5). The function of this control disc is to maintain a properly varied aspirator signal, regardless of the volume of flow.

When an increased demand occurs, the flow past the aspirator tube (4) increases. The aspiration reduces the pressure under the diaphragm (2) creating an "artificial droop" in the diaphragm chamber. This drop in pressure immediately upsets the balance with the adjusting spring (1), repositioning the main valve (3) to maintain the set pressure with increased flow rate.

Under steady flow conditions, the regulated flow through the aspirator tube (4) maintains the balance between the adjusting spring (1) and the pressure under the diaphragm to hold the set loading pressure.

During the relief cycle, the excess outlet pressure is transmitted through aspirator tube (4) increasing the pressure under the diaphragm. This allows the main valve (3) to close and the excess pressure raises the diaphragm (2). The excess is vented though the nozzle (6) and out the top of the spring case to atmosphere. The valve will relieve until a balance is achieved, when the outlet pressure reaches the set point and is maintained.



LOADING CAPACITY DATA:

2-30 psi RANGE

Classes A-2, AG-2, P-2 etc.

INLET PRESSURE (psi)	OUTLET PRESSURE (psi)	FLOW SCFM[1]
30	2 8	10.4 9.7
100	8 20 30	12.8 27.5 28

3-60 psi RANGE

Classes A-2, AG-2, P-2 etc.

INLET PRESSURE (psi)	OUTLET PRESSURE (psi)	FLOW SCFM[1]
60	10 20 30	16 16 12
100	20 30 60	27.5 28 24
140	30 40 60	32.5 35 34

1. Based on 95% Accuracy of Regulation

GLOSSARY OF TERMS

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ACCURACY OF REGULATION is the value of controlled variable (pressure, or differential pressure) expressed as a percentage of the set value (at minimum controllable flow) when with a constant supply pressure the flow through the regulator is increased from the minimum controllable flow to the rated capacity (also equal to 100% minus the offset (droop) %).

BACK PRESSURE REGULATOR—A device that controls and responds to change in its inlet pressure.

BALANCED—A regulator style featuring a pressure balanced plug. May be single or double seated.

DEAD BAND—The range through which the controlled variable can reverse direction without and observable regulator response.

DIAPHRAGM ACTUATED REGULATOR—A regulator utilizing a diaphragm as the position actuator.

DIFFERENTIAL PRESSURE REGULATOR—A device that maintains a constant differential pressure between a reference pressure and the pressure of the controlled fluid.

DIRECT ACTION—A regulator that decreases its output as the measured variable increases.

DIRECT OPERATED—A regulator that uses a temperature thermal system to directly provide the power to move the plug.

DRIFT—A change in set point over an extended period of time.

DROOP—See accuracy of regulation.

FLOW COEFFICIENT (Cv) is the regulator capacity in GPM of H2O at 20 degrees C with one PSI pressure drop at full rated travel. Refer to ISA S75.01 and S75.02 for Testing Procedures and Sizing Equations.

MINIMUM CONTROLLABLE FLOW is the lowest flow at which a steady regulated condition of the controlled variable can be maintained.

PACKLESS—A construction that does not employ a dynamic seal isolating internal fluid from ambient or atmosphere.

PILOT OPERATED—A regulator that uses a temperature thermal system to power a pilot mechanism which generates an amplified signal to position the plug of the regulator. The pilot may be internal or external.

PRESSURE REDUCING REGULATOR—A device that controls and responds to changes in its outlet pressure.

PRESSURE REGULATOR—A self-operated device, either pilot or direct operated, in which power to position the valve closure member is provided by the pressure of the controlled variable.

PRESSURE TEMPERATURE—A dual function piloted regulator combining the control of both temperature and pressure. Control of pressure and temperature may be by a single pilot or multiple pilots. Pilot(s) may be internal or external or these functions in combination may be available.

PUMP PRESSURE REGULATOR—A device that controls the speed of a pump in response to changes in pump discharge pressure.

REPEATABILITY—Ability to return to any defined point within stated limits of regulation within a specified tolerance.

REVERSE ACTION—A regulator that increases its output as the measured variable increases.

TEMPERATURE REGULATOR—A self operated device in which the energy to position valve closure member(s) is provided by changes of temperature energy of the controlled variable.

UNBALANCED—A regulator where the plug closure number is not pressure balanced. Generally a single regulator.

INDUSTRY STANDARDS

APPLICABLE INDUSTRY STANDARDS

All Leslie control valves are 100% factory tested and serialized. Leslie Controls' quality assurance program is accredited and certified to ISO 9001[1]. All Leslie control valves are also designed, built and tested to meet the following industry standards.

ANSI B1.20.1 Pipe Threads - Conforms to pipe thread requirements.

ANSI B16.1 Cast Iron Flanges and Flanged Fittings - Conforms to wall thickness, flange dimensions, materials, pressure/temperature ratings, markings and hydrostatic test requirements.

ANSI B16.11 Socketweld Ends - Conforms to socketweld end requirements.

ANSI B16.5 Pipe Flanges and Flanged Fittings - Conforms to flange thickness, diameter and drilling requirements.

ANSI B16.10 Face-To-Face Dimensions - Conforms to globe style control valve face-to-face dimension requirements.

ANSI B16.25 Buttwelding Ends - Conforms to requirements of Schedule 40 or Schedule 80 pipe, without backing rings.

ANSI B16.34 Valves, Flanged and Butt-weld - Integral flanged and BWE valve conforms to wall thickness, materials, pressure/temperature ratings, markings, and hydrostatic test requirements.

ANSI B16.37 Hydrotesting of Control Valves - Conforms to hydrotesting requirements.

ANSI/ISA 70-2 Control Valve Seat Leakage - Conforms to Class III, IV, and V shutoff requirements.

ISA S75.01 Flow Equations for Sizing Control Valves.

ISA S75.02 Control Valve Capacity Test Procedure - Conforms to flow capacity test procedure requirements.

ISA S75.03 Uniform Face-To-Face Dimensions for Flanged Globe Style Control Valves - Conforms to face-to-face dimension requirements.

ISA S75.12 Face-To-Face Dimensions for Socketweld End and Screwed End Globe Style Control Valves - Conforms to face-to-face dimension requirements.

ISA S75.15 Face-To-Face Dimensions for Butt-weld End Globe Style Control Valves - Conforms to face-to-face dimension requirements.

MSS SP25 Standard Marking System for Valves, Fittings, Flanges, and Unions - Conforms to marking requirements for flanged, screwed and weld end fittings.

MSS SP84 Steel Valves, Socketweld End and Threaded End - Conforms to end connection requirements.

In addition, when required, control valves can be manufactured and tested in compliance with:

CAN 3 Z299.3
ANSI N45.2
MIL-I-STD-45662
MIL-I-45208
B 31.1

1. Assessed and certified by ABS, Houston, Texas

FLANGE STANDARDS

125 lb. CAST IRON — ANSI STANDARD B16.1

Pipe Size	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	5	6	8	10	12
Diameter of Flange	—	—	4 1/4	4 5/8	5	6	7	7 1/2	8 1/2	9	10	11	13 1/2	16	19
Thickness of Flange (min)[a]	—	—	7/16	1/2	9/16	5/8	11/16	3/4	13/16	15/16	15/16	1	1 1/8	1 3/16	1 1/4
Diameter of Bolt Circle	—	—	3 1/8	3 1/2	3 7/8	4 3/4	5 1/2	6	7	7 1/2	8 1/2	9 1/2	11 3/4	14 1/4	17
Number of Bolts	—	—	4	4	4	4	4	4	8	8	8	8	8	12	12
Diameter of Bolts	—	—	1/2	1/2	1/2	5/8	5/8	5/8	5/8	5/8	3/4	3/4	3/4	7/8	7/8

[a] 125 lb. cast iron flanges have plain faces.

250 lb. CAST IRON — ANSI STANDARD B16.1

Pipe Size	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	5	6	8	10	12
Diameter of Flange	—	—	4 7/8	5 1/4	6 1/8	6 1/2	7 1/2	8 1/4	9	10	11	12 1/2	15	17 1/2	20 1/2
Thickness of Flange (min)[b]	—	—	11/16	3/4	13/16	7/8	1	1 1/8	1 3/16	1 1/4	1 3/8	1 7/16	1 5/8	1 7/8	2
Diameter of Raised Face	—	—	2 11/16	3 1/16	3 9/16	4 3/16	4 15/16	5 11/16	6 5/16	6 15/16	8 5/16	9 11/16	11 15/16	14 1/16	16 7/16
Diameter of Bolt Circle	—	—	3 1/2	3 7/8	4 1/2	5	5 7/8	6 5/8	7 1/4	7 7/8	9 1/4	10 5/8	13	15 1/4	17 3/4
Number of Bolts	—	—	4	4	4	8	8	8	8	8	8	12	12	16	16
Diameter of Bolts	—	—	5/8	5/8	3/4	5/8	3/4	3/4	3/4	3/4	3/4	3/4	7/8	1	1 1/8

[b] 250 lb. cast iron flanges have a 1/16" raised face which is included in the flange thickness dimensions.

150 lb. BRONZE — ANSI STANDARD B16.24

Pipe Size	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	5	6	8	10	12
Diameter of Flange	3 1/2	3 7/8	4 1/4	4 5/8	5	6	7	7 1/2	8 1/2	9	10	11	13 1/2	16	19
Thickness of Flange (min)[c]	5/16	11/32	3/8	13/32	7/16	1/2	9/16	5/8	11/16	11/16	3/4	13/16	15/16	1	1 1/16
Diameter of Bolt Circle	2 3/8	2 3/4	3 1/8	3 1/2	3 7/8	4 3/4	5 1/2	6	7	7 1/2	8 1/2	9 1/2	11 3/4	14 1/4	17
Number of Bolts	4	4	4	4	4	4	4	4	8	8	8	8	8	12	12
Diameter of Bolts	1/2	1/2	1/2	1/2	1/2	5/8	5/8	5/8	5/8	5/8	3/4	3/4	3/4	7/8	7/8

[c] 150 lb. bronze flanges have plain faces with two concentric gasket-retaining grooves between the port and the bolt holes.

300 lb. BRONZE — ANSI STANDARD B16.24

Pipe Size	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	5	6	8	10	12
Diameter of Flange	3 3/4	4 5/8	4 7/8	5 1/4	6 1/2	6 1/2	7 1/2	8 1/4	9	10	11	12 1/2	15	—	—
Thickness of Flange (min)[d]	1/2	17/32	19/32	5/8	11/16	3/4	13/16	29/32	31/32	1 1/16	1 1/8	1 3/16	1 3/8		
Diameter of Bolt Circle	2 5/8	3 1/4	3 1/2	3 7/8	4 1/2	5	5 7/8	6 5/8	7 1/4	7 7/8	9 1/4	10 5/8	13		
Number of Bolts	4	4	4	4	4	8	8	8	8	8	8	12	12		
Diameter of Bolts	1/2	5/8	5/8	5/8	3/4	5/8	3/4	3/4	3/4	3/4	3/4	3/4	7/8		

[d] 300 lb. bronze flanges have plain faces with two concentric gasket-retaining grooves between the port and the bolt holes.

150 lb. STEEL — ANSI STANDARD B16.5

Pipe Size	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	5	6	8	10	12
Diameter of Flange	—	—	4	4 5/8	5	6	7	7 1/2	8 1/2	9	10	11	13 1/2	16	19
Thickness of Flange (min)[e]	—	—	7/16	1/2	9/16	5/8	11/16	3/4	13/16	15/16	15/16	1	1 1/8	1 3/16	1 1/4
Diameter of Raised Face	—	—	2	2 1/2	2 7/8	3 5/8	4 1/8	5	5 1/2	6 3/16	7 5/16	8 1/2	10 5/8	12 3/4	15
Diameter of Bolt Circle	—	—	3 1/8	3 1/2	3 7/8	4 3/4	5 1/2	6	7	7 1/2	8 1/2	9 1/2	11 3/4	14 1/4	17
Number of Bolts	—	—	4	4	4	4	4	4	8	8	8	8	8	12	12
Diameter of Bolts	—	—	1/2	1/2	1/2	5/8	5/8	5/8	5/8	5/8	3/4	3/4	3/4	7/8	7/8

[e] 150 lb. steel flanges have a 1/16" raised face which is included in the flange thickness dimensions.

300 lb. STEEL — ANSI STANDARD B16.5

Pipe Size	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	5	6	8	10	12
Diameter of Flange	—	—	4 7/8	5 1/4	6 1/8	6 1/2	7 1/2	8 1/4	9	10	11	12 1/2	15	17 1/2	20 1/2
Thickness of Flange (min)[f]	—	—	11/16	3/4	13/16	7/8	1	1 1/8	1 3/16	1 1/4	1 3/8	1 7/16	1 5/8	1 7/8	2
Diameter of Raised Face	—	—	2	2 1/2	2 7/8	3 5/8	4 1/8	5	5 1/2	6 3/16	7 5/16	8 1/2	10 5/8	12 3/4	15
Diameter of Bolt Circle	—	—	3 1/2	3 7/8	4 1/2	5	5 7/8	6 5/8	7 1/4	7 7/8	9 1/4	10 5/8	13	15 1/4	17 3/4
Number of Bolts	—	—	4	4	4	8	8	8	8	8	8	12	12	16	16
Diameter of Bolts	—	5/8	5/8	3/4	5/8	3/4	3/4	3/4	3/4	3/4	3/4	3/4	7/8	1	1 1/8

[f] 300 lb. steel flanges have a 1/16" raised face which is included in the flange thickness dimensions.

400 lb. STEEL — ANSI STANDARD B16.5

Pipe Size	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	5	6	8	10	12
Diameter of Flange	33/4	4 5/8	4 7/8	5 1/4	6 1/8	6 1/2	7 1/2	8 1/4	9	10	11	12 1/2	15	17 1/2	20 1/2
Thickness of Flange (min)[g]	9/16	5/8	11/16	13/16	7/8	1	1 1/8	1 1/4	1 3/8	1 3/8	1 1/2	1 5/8	1 7/8	2 1/8	2 1/4
Diameter of Raised Face	1/38	1 11/16	2	2 1/2	2 7/8	3 5/8	4 1/8	5	5 1/2	6 3/16	7 5/16	8 1/2	10 5/8	12 3/4	15
Diameter of Bolt Circle	25/8	3 1/4	3 1/2	3 7/8	4 1/2	5	5 7/8	6 5/8	7 1/4	7 7/8	9 1/4	10 5/8	13	15 1/4	17 3/4
Number of Bolts	4	4	4	4	4	8	8	8	8	8	8	12	12	16	16
Diameter of Bolts	1/2	5/8	5/8	5/8	3/4	5/8	3/4	3/4	7/8	7/8	7/8	7/8	1	1 1/8	1 1/4

[g] 400 lb. steel flanges have a 1/4" raised face which is included in the flange thickness dimensions.

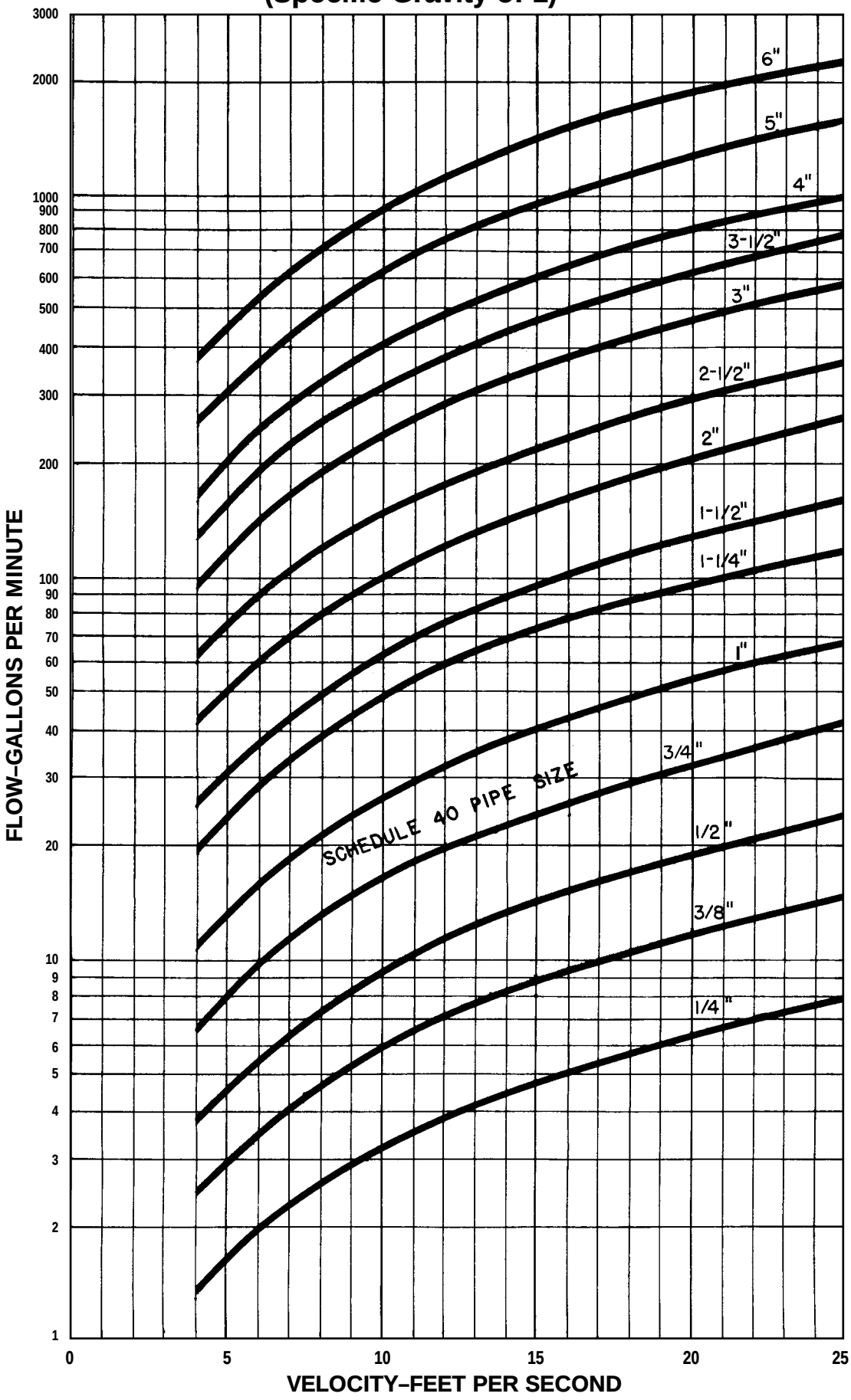
600 lb. STEEL — ANSI STANDARD B16.5

Pipe Size	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	5	6	8	10	12
Diameter of Flange	3 3/4	4 5/8	4 7/8	5 1/4	6 1/8	6 1/2	7 1/2	8 1/4	9	10 3/4	13	14	16 1/2	20	22
Thickness of Flange (min)[h]	9/16	5/8	11/16	13/16	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2	1 3/4	1 7/8	2 3/16	2 1/2	2 5/8
Diameter of Raised Face	1 3/8	1 11/16	2	2 1/2	2 7/8	3 5/8	4 1/8	5	5 1/2	6 3/16	7 5/16	8 1/2	10 5/8	12 3/4	15
Diameter of Bolt Circle	2 5/8	3 1/4	3 1/2	3 7/8	4 1/2	5	5 7/8	6 5/8	7 1/4	8 1/2	10 1/2	11 1/2	13 3/4	17	19 1/4
Number of Bolts	4	4	4	4	4	8	8	8	8	8	8	12	12	16	20
Diameter of Bolts	1/2	5/8	5/8	5/8	3/4	5/8	3/4	3/4	7/8	7/8	1	1	1 1/8	1 1/4	1 1/4

[h] 600 lb. steel flanges have a 1/4" raised face which is included in the flange thickness dimensions.

Flow vs. Velocity Chart

(Specific Gravity of 1)



Pressure to Vacuum

Gage Indicated		Absolute Pressure		
PSIG	Inches of Hg	PSIA	Inches of Hg	Torricelli
-14.70000	29.92000	0.0	0.0	0.0
-14.69998	29.91996	0.00002	0.00004	0.001
-14.69996	29.91992	0.00004	0.00008	0.002
-14.69994	29.91988	0.00006	0.00012	0.003
-14.69992	29.91984	0.00008	0.00016	0.004
-14.69990	29.91980	0.00010	0.00020	0.005
-14.69981	29.91961	0.00019	0.00039	0.010
-14.69961	29.91921	0.00039	0.00079	0.020
-14.69942	29.91882	0.00058	0.00118	0.030
-14.69923	29.91843	0.00077	0.00157	0.040
-14.69903	29.91803	0.00097	0.00197	0.050
-14.69806	29.91606	0.00194	0.00394	0.100
-14.69613	29.91212	0.00387	0.00788	0.200
-14.69449	29.90818	0.00551	0.01182	0.300
-14.69226	29.90424	0.00774	0.01576	0.400
-14.69032	29.90030	0.00968	0.01970	0.500
-14.68066	29.88063	0.01934	0.03937	1.000
-14.66698	29.84126	0.03302	0.07874	2.000
-14.64197	29.80189	0.05803	0.11811	3.000
-14.62262	29.76252	0.07738	0.15748	4.000
-14.60329	29.72315	0.09671	0.19685	5.000
-14.50658	29.52630	0.19342	0.39370	10.000
-14.40980	29.32940	0.29020	0.59060	15.000
-14.31320	29.13260	0.38680	0.78740	20.000
-14.21840	28.93570	0.48160	0.98430	25.000
-14.20870	28.920	0.49130	1.000	25.400
-14.11970	28.740	0.58030	1.181	30.000
-13.75700	28.000	0.94330	1.920	48.770
-12.28300	25.000	2.41700	4.920	124.970
-10.31800	21.000	4.38200	8.920	226.570
-8.84400	18.000	5.85600	11.920	302.770
-7.37000	15.000	7.320	14.920	378.970
-5.89600	12.000	8.804	17.920	455.770
-4.91300	10.000	9.787	19.920	505.970
-3.93000	8.000	10.770	21.920	556.770
-2.94800	6.000	11.752	23.920	607.570
-1.96500	4.000	12.735	25.920	658.370
-0.98300	2.000	13.732	27.920	709.170
-0.49100	1.000	14.209	28.920	733.570
-0.24600	0.500	14.454	29.420	747.270
		ATMOSPHERIC		
0.0	0.0	14.700	29.920	760.000
+ 0.30		15.000	30.540	775.720
+ 1.00		15.700	31.970	811.910
+ 2.00		16.700	34.000	863.630
+ 10.00		24.700	50.290	277.35

PROPERTIES OF WATER

Water Temp.	Saturation Pressure	Weight	Weight Density	Specific Volume
Deg. F	PSIA	lbs/Gallon	lbs/Cu.Ft.	Cu.Ft./lb
32	0.0886	8.344	62.414	0.016022
40	0.1216	8.345	62.426	0.016019
50	0.1780	8.343	62.410	0.016023
60	0.2561	8.338	62.371	0.016033
70	0.3629	8.329	62.305	0.016050
80	0.5068	8.318	62.220	0.016072
90	0.6981	8.304	62.116	0.016099
100	0.9492	8.288	61.996	0.016130
110	1.2750	8.270	61.862	0.016165
120	1.6927	8.250	61.713	0.016204
130	2.2230	8.228	61.550	0.016247
140	2.8892	8.205	61.376	0.016293
150	3.7184	8.180	61.188	0.016343
160	4.7414	8.154	60.994	0.016395
170	5.9926	8.126	60.787	0.016451
180	7.5110	8.097	60.569	0.016510
190	9.340	8.067	60.343	0.016572
200	11.526	8.035	60.107	0.016637
210	14.123	8.002	59.862	0.016705
212	14.696	7.996	59.812	0.016719
220	17.186	7.969	59.613	0.016775
240	24.968	7.898	59.081	0.016926
260	35.427	7.823	58.517	0.017089
280	49.200	7.743	57.924	0.017264
300	67.005	7.661	57.307	0.01745
350	134.604	7.431	55.586	0.01799
400	247.259	7.172	53.648	0.01864
450	422.55	6.880	51.467	0.01943
500	680.86	6.543	48.948	0.02043
550	1045.43	6.143	45.956	0.02176
600	1543.2	5.655	42.301	0.02364
650	2208.4	4.999	37.397	0.02674
700	3094.3	3.651	27.307	0.03662

NOTE: Weight of water per gallon is based on 7.48052 gallons per cubic foot.
Specific gravity of water @ 60°F = 1.00

Pipe Data Tables

Pipe Size (in.)	Outside Diameter (in.)	Weight Class	Carbon Steel Sched.	Stainless Steel Sched.	Wall Thickness (in.)	Inside Diameter (in.)	Circum. (Ext.) (in.)	Circum (Int.) (in.)	Flow Area (sq. in.)	Weight of Pipe (lbs/Ft.)	Weight of Water (lbs/Ft.)	Gallons of Water per Ft.	Section Modulus	Pipe Size (in.)
		—	—	10S	.049	.307		.96	.074	.19	.032	.004	.00437	
1/8	.405	STD	40	40S	.068	.269	1.27	.85	.057	.24	.025	.003	.00523	1/8
		XS	80	80S	.095	.215		.68	.036	.31	.016	.002	.00602	
		—	—	10S	.065	.410		1.29	.132	.33	.057	.007	.01032	
1/4	.540	STD	40	40S	.088	.364	1.70	1.14	.104	.42	.045	.005	.01227	1/4
		XS	80	80S	.119	.302		.95	.072	.54	.031	.004	.01395	
		—	—	10S	.065	.545		1.71	.233	.42	.101	.012	.01736	
3/8	.675	STD	40	40S	.091	.493	2.12	1.55	.191	.57	.083	.010	.0216	3/8
		XS	80	80S	.126	.423		1.33	.141	.74	.061	.007	.0255	
		—	—	5S	.065	.710		2.23	.396	.54	.172	.021	.0285	
		—	—	10S	.083	.674		2.12	.357	.67	.155	.019	.0341	
		STD	40	40S	.109	.622		1.95	.304	.85	.132	.016	.0407	
1/2	.840	XS	80	80S	.147	.546	2.64	1.72	.234	1.09	.102	.012	.0478	1/2
		—	160	—	.187	.466		1.46	.171	1.31	.074	.009	.0527	
		XXS	—	—	.294	.252		.79	.050	1.71	.022	.003	.0577	
		—	—	5S	.065	.920		2.89	.665	.69	.288	.035	.0467	
		—	—	10S	.083	.884		2.78	.614	.86	.266	.032	.0566	
		STD	40	40S	.113	.824	3.30	2.59	.533	1.13	.231	.028	.0706	
3/4	1.050	XS	80	80S	.154	.742		2.33	.433	1.47	.188	.022	.0853	3/4
		—	160	—	.219	.612		1.92	.296	1.94	.128	.015	.1004	
		XXS	—	—	.308	.434		1.36	.148	2.44	.064	.008	.1103	
		—	—	5S	.065	1.185		3.72	1.103	.87	.478	.057	.0760	
		—	—	10S	.109	1.097		3.45	.945	1.40	.409	.049	.1151	
		STD	40	40S	.133	1.049	4.13	3.30	.864	1.68	.375	.045	.1328	
1	1.315	XS	80	80S	.179	.957		3.01	.719	2.17	.312	.037	.1606	1
		—	160	—	.250	.815		2.56	.522	2.84	.230	.027	.1903	
		XXS	—	—	.358	.599		1.88	.282	3.66	.122	.015	.2136	
		—	—	5S	.065	1.530		4.81	1.839	1.11	.797	.096	.1250	
		—	—	10S	.109	1.442		4.53	1.633	1.81	.708	.085	.1934	
		STD	40	40S	.140	1.380		4.34	1.495	2.27	.649	.078	.2346	
1 1/4	1.660	XS	80	80S	.191	1.278	5.22	4.02	1.283	3.00	.555	.067	.2913	1 1/4
		—	160	—	.250	1.160		3.64	1.057	3.76	.458	.055	.3421	
		XXS	—	—	.382	.896		2.81	.630	5.21	.273	.033	.4110	
		—	—	5S	.065	1.770		5.56	2.461	1.28	1.066	.128	.1662	
		—	—	10S	.109	1.682		5.28	2.222	2.09	.963	.115	.2598	
		STD	40	40S	.145	1.610	5.97	5.06	2.036	2.72	.882	.106	.3262	
1 1/2	1.900	XS	80	80S	.200	1.500		4.71	1.767	3.63	.765	.092	.4118	1 1/2
		—	160	—	.281	1.338		4.20	1.406	4.86	.608	.073	.5078	
		XXS	—	—	.400	1.100		3.46	.950	6.41	.420	.049	.5977	
		—	—	5S	.065	2.245		7.05	3.958	1.61	1.72	.206	.2652	
		—	—	10S	.109	2.157		6.78	3.654	2.64	1.58	.190	.4204	
		STD	40	40S	.154	2.067		6.49	3.355	3.65	1.45	.174	.5606	
2	2.375	XS	80	80S	.218	1.939	7.46	6.09	2.953	5.02	1.28	.153	.7309	2
		—	160	—	.344	1.687		5.30	2.241	7.46	.97	.116	.9790	
		XXS	—	—	.436	1.503		4.72	1.774	9.03	.77	.092	1.1040	
		—	—	5S	.083	2.709		8.51	5.764	2.48	2.50	.299	.4939	
		—	—	10S	.120	2.635		8.28	5.453	3.53	2.36	.283	.6868	
		STD	40	40S	.203	2.469		7.76	4.788	5.79	2.07	.249	1.064	
2 1/2	2.875	XS	80	80S	.276	2.323	9.03	7.30	4.238	7.66	1.87	.220	1.339	2 1/2
		—	160	—	.375	2.125		6.68	3.546	10.01	1.54	.184	1.638	
		XXS	—	—	.552	1.771		5.56	2.464	13.69	1.07	.128	1.997	

Pipe Data Tables cont'd.

Pipe Size (in.)	Outside Diameter (in.)	Weight Class	Carbon Steel Sched.	Stainless Steel Sched.	Wall Thickness (in.)	Inside Diameter (in.)	Circum. (Ext.) (in.)	Circum (Int.) (in.)	Flow Area (sq. in.)	Weight of Pipe (lbs/Ft.)	Weight of Water (lbs/Ft.)	Gallons of Water per Ft.	Section Modulus	Pipe Size (in.)
		—	—	5S	.083	3.334		10.47	8.730	3.03	3.78	.454	.744	
		—	—	10S	.120	3.260		10.24	8.347	4.33	3.62	.434	1.041	
		STD	40	40S	.216	3.068		9.64	7.393	7.58	3.20	.384	1.724	
3	3.500	XS	80	80S	.300	2.900	11.00	9.11	6.605	10.25	2.86	.343	2.225	3
		—	160	—	.438	2.624		8.24	5.408	14.32	2.35	.281	2.876	
		XXS	—	—	.600	2.300		7.23	4.155	18.58	1.80	.216	3.424	
		—	—	5S	.083	4.334		13.62	14.75	3.92	6.39	.766	1.249	
		—	—	10S	.120	4.260		13.38	14.25	5.61	6.18	.740	1.761	
		STD	40	40S	.237	4.026		12.65	12.73	10.79	5.50	.661	3.214	
4	4.500	XS	80	80S	.337	3.826	14.14	12.02	11.50	14.98	4.98	.597	4.271	4
		—	120	—	.438	3.624		11.39	10.31	19.00	4.47	.536	5.178	
		—	160	—	.531	3.438		10.80	9.28	22.51	4.02	.482	5.898	
		XXS	—	—	.674	3.152		9.90	7.80	27.54	3.38	.405	6.791	
		—	—	5S	.109	5.345		16.79	22.44	6.36	9.72	1.17	2.498	
		—	—	10S	.134	5.295		16.63	22.02	7.77	9.54	1.14	3.029	
		STD	40	40S	.258	5.047		15.86	20.01	14.62	8.67	1.04	5.451	
5	5.563	XS	80	80S	.375	4.813	17.48	15.12	18.19	20.78	7.88	.945	7.431	5
		—	120	—	.500	4.563		14.34	16.35	27.04	7.09	.849	9.250	
		—	160	—	.625	4.313		13.55	14.61	32.96	6.33	.759	10.796	
		XXS	—	—	.750	4.063		12.76	12.97	38.55	5.61	.674	12.090	
		—	—	5S	.109	6.407		20.13	32.24	7.60	13.97	1.68	3.576	
		—	—	10S	.134	6.357		19.97	31.74	9.29	13.75	1.65	4.346	
		STD	40	40S	.280	6.065		19.05	28.89	18.97	12.51	1.50	8.496	
6	6.625	XS	80	80S	.432	5.761	20.81	18.10	26.07	28.57	11.29	1.35	12.22	6
		—	120	—	.562	5.501		17.28	23.77	36.39	10.30	1.24	14.98	
		—	160	—	.719	5.187		16.30	21.15	45.35	9.16	1.10	17.81	
		XXS	—	—	.864	4.897		15.38	18.84	53.16	8.16	.978	20.02	
		—	—	5S	.109	8.407		26.41	55.51	9.93	24.06	2.88	6.131	
		—	—	10S	.148	8.329		26.17	54.48	13.40	23.61	2.83	8.212	
		—	20	—	.250	8.125		25.53	51.85	22.36	22.47	2.69	13.39	
		—	30	—	.277	8.071		25.36	51.16	24.70	22.17	2.66	14.69	
		STD	40	40S	.322	7.981		25.07	50.03	28.55	21.70	2.60	16.81	
		—	60	—	.406	7.813		24.55	47.94	35.64	20.77	2.49	20.58	
8	8.625	XS	80	80S	.500	7.625	27.10	23.95	45.66	43.39	19.78	2.37	24.51	8
		—	100	—	.594	7.437		23.36	43.46	50.95	18.83	2.26	28.14	
		—	120	—	.719	7.187		22.58	40.59	60.71	17.59	2.11	32.58	
		—	140	—	.812	7.001		21.99	38.50	67.76	16.68	2.00	35.65	
		XXS	—	—	.875	6.875		21.60	37.12	72.42	16.10	1.93	37.56	
		—	160	—	.906	6.813		21.40	36.46	74.69	15.80	1.89	38.48	
		—	—	5S	.134	10.482		32.93	86.29	15.19	37.39	4.48	11.71	
		—	—	10S	.165	10.420		32.74	85.28	18.65	36.95	4.43	14.30	
		—	20	—	.250	10.250		32.20	82.52	28.04	35.76	4.29	21.15	
		—	30	—	.307	10.136		31.84	80.69	34.24	34.96	4.19	25.57	
		STD	40	40S	.365	10.020		31.48	78.86	40.48	34.20	4.10	29.90	
10	10.750	XS	60	80S	.500	9.750	33.77	30.63	74.66	54.74	32.35	3.88	39.43	10
		—	80	—	.594	9.562		30.04	71.84	64.43	31.13	3.73	45.54	
		—	100	—	.719	9.312		29.25	68.13	77.03	29.53	3.54	53.22	
		—	120	—	.844	9.062		28.47	64.53	89.29	27.96	3.35	60.32	
		XXS	140	—	1.000	8.750		27.49	60.13	104.13	26.06	3.12	68.43	
		—	160	—	1.125	8.500		26.70	56.75	115.64	24.59	2.95	74.29	

Pipe Data Tables cont'd.

Pipe Size (in.)	Outside Diameter (in.)	Weight Class	Carbon Steel Sched.	Stainless Steel Sched.	Wall Thickness (in.)	Inside Diameter (in.)	Circum. (Ext.) (in.)	Circum (Int.) (in.)	Flow Area (sq. in.)	Weight of Pipe (lbs/Ft.)	Weight of Water (lbs/Ft.)	Gallons of Water per Ft.	Section Modulus	Pipe Size (in.)
		—	—	5S	.156	12.438		39.08	121.50	20.98	52.65	6.31	19.2	
		—	—	10S	.180	12.390		38.92	120.57	24.17	52.25	6.26	22.0	
		—	20	—	.250	12.250		38.48	117.86	33.38	51.07	6.12	30.2	
		—	30	—	.330	12.090		37.98	114.80	43.77	49.74	5.96	39.0	
		STD	—	40S	.375	12.000		37.70	113.10	49.56	49.00	5.88	43.8	
		—	40	—	.406	11.938		37.50	111.93	53.52	48.50	5.81	47.1	
12	12.750	XS	—	80S	.500	11.750	40.06	36.91	108.43	65.42	46.92	5.63	56.7	12
		—	60	—	.562	11.626		36.52	106.16	73.15	46.00	5.51	62.8	
		—	80	—	.688	11.374		35.73	101.64	88.63	44.04	5.28	74.6	
		—	100	—	.844	11.062		34.75	96.14	107.32	41.66	4.99	88.1	
		XXS	120	—	1.000	10.750		33.77	90.76	125.49	39.33	4.71	100.7	
		—	140	—	1.125	10.500		32.99	86.59	139.67	37.52	4.50	109.9	
		—	160	—	1.312	10.126		31.81	80.53	160.27	34.89	4.18	122.6	
		—	—	5S	.156	13.688		43.00	147.15	23.07	63.77	7.64	23.2	
		—		10S	.188	13.624		42.80	145.78	27.73	63.17	7.57	27.8	
		—	10	—	.250	13.500		42.41	143.14	36.71	62.03	7.44	36.6	
		—	20	—	.312	13.376		42.02	140.52	45.61	60.89	7.30	45.0	
		STD	30	—	.375	13.250		41.63	137.88	54.57	59.75	7.16	53.2	
		—	40	—	.438	13.124		41.23	135.28	63.44	58.64	7.03	61.3	
14	14.000	XS	—	—	.500	13.000	43.98	40.84	132.73	72.09	57.46	6.90	69.1	14
		—	60	—	.594	12.812		40.25	128.96	85.05	55.86	6.70	80.3	
		—	80	—	.750	12.500		39.27	122.72	106.13	53.18	6.37	98.2	
		—	100	—	.938	12.124		38.09	115.49	130.85	50.04	6.00	117.8	
		—	120	—	1.094	11.812		37.11	109.62	150.79	47.45	5.69	132.8	
		—	140	—	1.250	11.500		36.13	103.87	170.28	45.01	5.40	146.8	
		—	160	—	1.406	11.188		35.15	98.31	189.11	42.60	5.11	159.6	
		—	—	5S	.165	15.670		49.23	192.85	27.90	83.57	10.02	32.2	
		—	—	10S	.188	15.624		49.08	191.72	31.75	83.08	9.96	36.5	
		—	10	—	.250	15.500		48.69	188.69	42.05	81.74	9.80	48.0	
		—	20	—	.312	15.376		48.31	185.69	52.27	80.50	9.65	59.2	
		STD	30	—	.375	15.250		47.91	182.65	82.58	79.12	9.49	70.3	
		XS	40	—	.500	15.000		47.12	176.72	82.77	76.58	9.18	91.5	
16	16.00	—	60	—	.656	14.688	50.27	46.14	169.44	107.50	73.42	8.80	116.6	16
		—	80	—	.844	14.312		44.96	160.92	136.61	69.73	8.36	144.5	
		—	100	—	1.031	13.938		43.79	152.58	164.82	66.12	7.93	170.5	
		—	120	—	1.219	13.562		42.61	144.50	192.43	62.62	7.50	194.5	
		—	140	—	1.438	13.124		41.23	135.28	233.64	58.64	7.03	220.0	
		—	160	—	1.594	12.812		40.26	128.96	245.25	55.83	6.70	236.7	
		—	—	5S	.165	17.67		55.51	245.22	31.43	106.26	12.74	40.8	
		—	—	10S	.188	17.62		55.37	243.95	35.76	105.71	12.67	46.4	
		—	10	—	.250	17.50		54.98	240.53	47.39	104.21	12.49	61.1	
		—	20	—	.312	17.38		54.59	237.13	58.94	102.77	12.32	75.5	
		STD	—	—	.375	17.25		54.19	233.71	70.59	101.18	12.14	89.6	
		—	30	—	.438	17.12		53.80	230.30	82.15	99.84	11.96	103.4	
		XS	—	—	.500	17.00		53.41	226.98	93.45	98.27	11.79	117.0	
18	18.00	—	40	—	.562	16.88	56.55	53.02	223.68	104.87	96.93	11.62	130.1	18
		—	60	—	.750	16.50		51.84	213.83	138.17	92.57	11.11	168.3	
		—	80	—	.938	16.12		50.66	204.24	170.92	88.50	10.61	203.8	
		—	100	—	1.156	15.69		49.29	193.30	207.96	83.76	10.04	242.3	
		—	120	—	1.375	15.25		47.91	182.66	244.14	79.07	9.49	277.6	
		—	140	—	1.562	14.88		46.73	173.80	274.22	75.32	9.03	305.5	
		—	160	—	1.781	14.44		45.36	163.72	308.50	70.88	8.50	335.6	

Pipe Data Tables cont'd.

Pipe Size (in.)	Outside Diameter (in.)	Weight Class	Carbon Steel Sched.	Stainless Steel Sched.	Wall Thickness (in.)	Inside Diameter (in.)	Circum. (Ext.) (in.)	Circum (Int.) (in.)	Flow Area (sq. in.)	Weight of Pipe (lbs/Ft.)	Weight of Water (lbs/Ft.)	Gallons of Water per Ft.	Section Modulus	Pipe Size (in.)
		—	—	5S	.188	19.62		61.65	302.46	39.78	131.06	15.71	57.4	
		—	—	10S	.218	19.56		61.46	300.61	46.06	130.27	15.62	66.3	
		—	10	—	.250	19.50		61.26	298.65	52.73	129.42	15.51	75.6	
		STD	20	—	.375	19.25		60.48	290.04	78.60	125.67	15.12	111.3	
		XS	30	—	.500	19.00		59.69	283.53	104.13	122.87	14.73	145.7	
		—	40	—	.594	18.81		59.10	278.00	123.11	120.46	14.44	170.4	
20	20.00	—	60	—	.812	18.38	62.83	57.73	265.21	166.40	114.92	13.78	225.7	20
		—	80	—	1.031	17.94		56.35	252.72	208.87	109.51	13.13	277.1	
		—	100	—	1.281	17.44		54.78	238.83	256.10	103.39	12.41	331.5	
		—	120	—	1.500	17.00		53.41	226.98	296.37	98.35	11.79	375.5	
		—	140	—	1.750	16.50		51.84	213.82	341.09	92.66	11.11	421.7	
		—	160	—	1.969	16.06		50.46	202.67	379.17	87.74	10.53	458.5	
		—	—	5S	.188	21.62		67.93	367.25	43.80	159.14	19.08	69.7	
		—	—	10S	.218	21.56		67.75	365.21	50.71	158.26	18.97	80.4	
		—	10	—	.250	21.50		67.54	363.05	58.07	157.32	18.86	91.8	
		STD	20	—	.375	21.25		66.76	354.66	86.61	153.68	18.42	135.4	
		XS	30	—	.500	21.00		65.97	346.36	114.81	150.09	17.99	117.5	
22	22.00	—	60	—	.875	20.25	69.12	63.62	322.06	197.41	139.56	16.73	295.0	22
		—	80	—	1.125	19.75		62.05	306.35	250.81	132.76	15.91	366.4	
		—	100	—	1.375	19.25		60.48	291.04	302.88	126.12	15.12	432.6	
		—	120	—	1.625	18.75		58.90	276.12	353.61	119.65	14.34	493.8	
		—	140	—	1.875	18.25		57.33	261.59	403.00	113.36	13.59	550.3	
		—	160	—	2.125	17.75		55.76	247.45	451.06	107.23	12.85	602.4	
		—	—	5S	.218	23.56		74.03	436.10	55	188.98	22.65	96.0	
		—	10	10S	.250	23.50		73.83	433.74	63	187.95	22.53	109.6	
		STD	20	—	.375	23.25		73.04	424.56	95	183.95	22.05	161.9	
		XS	—	—	.500	23.00		72.26	415.48	125	179.87	21.58	212.5	
		—	30	—	.562	22.88		71.86	411.00	141	178.09	21.35	237.0	
24	24.00	—	40	—	.688	22.62	75.40	71.08	402.07	171	174.23	20.88	285.1	24
		—	60	—	.969	22.06		69.31	382.35	238	165.52	19.86	387.7	
		—	80	—	1.219	21.56		67.74	365.22	297	158.26	18.97	472.8	
		—	100	—	1.531	20.94		65.78	344.32	367	149.06	17.89	570.8	
		—	120	—	1.812	20.38		64.01	326.08	430	141.17	16.94	652.1	
		—	140	—	2.062	19.88		62.44	310.28	483	134.45	16.12	718.9	
		—	160	—	2.344	19.31		60.67	292.98	542	126.84	15.22	787.9	
		—	—	5S	.250	29.50		92.68	683.49	79	296.18	35.51	172.3	
		—	10	10S	.312	29.38		92.29	677.71	99	293.70	35.21	213.8	
30	30.00	STD	—	—	.375	29.25	94.25	91.89	671.96	119	291.18	34.91	255.3	30
		XS	20	—	.500	29.00		91.11	660.52	158	286.22	34.31	336.1	
		—	30	—	.625	28.75		90.32	649.18	196	281.31	33.72	414.9	

RATINGS FOR ASTM A216-WCB
ASME B16.34-2004 TABLE 2-1.1

A STANDARD CLASS

Temperature, ºF	Working Pressure by Classes, psig						
	150	300	600	900	1500	2500	4500
-20 to 100	285	740	1480	2220	3705	6170	11110
200	260	680	1360	2035	3395	5655	10185
300	230	655	1310	1965	3270	5450	9815
400	200	635	1265	1900	3170	5280	9505
500	170	605	1205	1810	3015	5025	9040
600	140	570	1135	1705	2840	4730	8515
650	125	550	1100	1650	2745	4575	8240
700	110	530	1060	1590	2665	4425	7960
750	95	505	1015	1520	2535	4230	7610
800	80	410	825	1235	2055	3430	6170
850	65	320	640	955	1595	2655	4785
900	50	230	460	690	1150	1915	3455
950	35	135	275	410	685	1145	2055
1000	20	85	170	255	430	715	1285

B SPECIAL CLASS

Temperature, ºF	Working Pressure by Classes, psig						
	150	300	600	900	1500	2500	4500
-20 to 100	290	750	1500	2250	3750	6250	11250
200	290	750	1500	2250	3750	6250	11250
300	285	740	1480	2220	3700	6170	11105
400	280	735	1465	2200	3665	6105	10995
500	280	750	1465	2200	3665	6105	10995
600	280	735	1465	2200	3665	6105	10995
650	275	715	1430	2145	3575	5960	10730
700	265	690	1380	2075	3455	5760	10365
750	245	635	1270	1905	3170	5285	9515
800	195	515	1030	1545	2570	4285	7715
850	155	400	795	1195	1995	3320	5980
900	110	285	575	860	1435	2395	4305
950	65	170	345	515	855	1430	2570
1000	40	105	215	320	535	895	1605

NOTE: Upon prolonged exposure to temperatures above 800ºF, the carbide phase of steel may be converted to graphite. Permissible, but not recommended for prolonged use above 800ºF.

RATINGS FOR ASTM A217-WC9
ASME B16.34-1996 TABLE 2-1.10

A STANDARD CLASS

Temperature, ºF	Working Pressure by Classes, psig						
	150	300	600	900	1500	2500	4500
-20 to 100	290	750	1500	2250	3750	6250	11250
200	260	750	1500	2250	3750	6250	11250
300	230	730	1455	2185	3640	6070	10925
400	200	705	1410	2115	3530	5880	10585
500	170	665	1330	1995	3325	5540	9965
600	140	605	1210	1815	3025	5040	9070
650	125	590	1175	1765	2940	4905	8825
700	110	570	1135	1705	2840	4730	8515
750	95	530	1065	1595	2660	4430	7970
800	80	510	1015	1525	2540	4230	7610
850	65	485	975	1460	2435	4060	7305
900	50	450	900	1350	2245	3745	6740
950	35	385	755	1160	1930	3220	5795
1000	20	266	535	800	1335	2230	4010
1050	20	175	350	525	875	1455	2625
1100	20	110	220	330	550	915	1645
1150	20	70	135	205	345	570	1030
1200	15	40	80	125	205	345	615

B SPECIAL CLASS

Temperature, ºF	Working Pressure by Classes, psig						
	150	300	600	900	1500	2500	4500
-20 to 100	290	750	1500	2250	3750	6250	11250
200	290	750	1500	2250	3750	6250	11250
300	285	740	1480	2220	3695	6160	11090
400	280	730	1455	2185	3640	6065	10915
500	280	725	1450	2175	3620	6035	10865
600	275	720	1440	2165	3605	6010	10815
650	275	715	1430	2145	3580	5965	10735
700	270	705	1415	2120	3535	5895	10605
750	270	705	1415	2120	3535	5895	10605
800	270	705	1415	2120	3535	5895	10605
850	260	680	1355	2030	3385	5645	10160
900	230	600	1200	1800	3000	5000	9000
950	180	470	945	1415	2360	3930	7070
1000	130	335	670	1005	1670	2785	5015
1050	85	220	435	655	1095	1820	3280
1100	55	135	275	410	685	1145	2055
1150	35	85	170	255	430	715	1285
1200	20	50	105	155	255	430	770

NOTES: Not to be used over 1100ºF.

Flanged end valve ratings terminate at 1000ºF.

RATINGS FOR A351 CF8M (316SS)

ASME B16.34-1996 TABLE 2-2.2

A STANDARD CLASS

Temperature, ºF	Working Pressure by Classes, psig						
	150	300	600	900	1500	2500	4500
-20 to 100	275	720	1440	2160	3600	6000	10800
200	235	620	1240	1860	3095	5160	9290
300	215	560	1120	1680	2795	4660	8390
400	195	515	1025	1540	2570	4280	7705
500	170	480	955	1435	2390	3980	7165
600	140	450	900	1355	2255	3760	6770
650	125	440	885	1325	2210	3680	6625
700	110	435	870	1305	2170	3620	6515
750	95	425	855	1280	2135	3560	6410
800	80	420	845	1265	2110	3520	6335
850	65	420	835	1255	2090	3480	6265
900	50	415	830	1245	2075	3460	6230
950	35	385	775	1160	1930	3220	5795
1000	20	365	725	1090	1820	3030	5450
1050	20	160	720	1080	1800	3000	5400
1100	20	305	610	915	1525	2545	4575
1150	20	235	475	710	1185	1970	3550
1200	20	185	370	555	1925	1545	2775
1250	20	145	295	440	735	1230	2210
1300	20	115	235	350	585	970	1750
1350	20	95	190	290	480	800	1440
1400	20	75	150	225	380	630	1130
1450	20	60	115	175	290	485	875
1500	15	40	85	125	205	345	620

B SPECIAL CLASS

Temperature, ºF	Working Pressure by Classes, psig						
	150	300	600	900	1500	2500	4500
-20 to 100	290	750	1500	2250	3750	6250	11250
200	265	690	1380	2075	3455	5260	10365
300	240	625	1250	1870	3120	5200	9360
400	220	575	1145	1720	2865	4775	8600
500	205	535	1065	1600	2665	4440	7795
600	195	505	1005	1510	2520	4195	7555
650	190	495	985	1480	2465	4105	7395
700	185	485	970	1455	2425	4040	7270
750	185	475	955	1430	2385	3975	7150
800	180	470	945	1415	2355	3930	7070
850	175	465	930	1400	2330	3885	6990
900	180	465	925	1390	2315	3860	6950
950	185	460	915	1375	2290	3815	6870
1000	170	420	840	1260	2105	3505	6310
1050	160	420	840	1260	2105	3505	6310
1100	145	380	765	1145	1905	3180	5720
1150	115	295	590	885	1480	2465	4435
1200	90	230	465	695	1155	1930	3470
1250	70	185	370	555	1920	1535	2765
1300	55	145	290	435	730	1215	2185
1350	45	120	240	360	600	1000	1800
1400	35	95	190	285	470	785	1415
1450	30	75	145	220	365	605	1095
1500	20	50	105	155	260	430	770

NOTE: Flanged end ratings terminate at 1000ºF.

FCI 70-2 Seat Leakage

Class II = .5% Valve Rated Capacity Differential of 45 to 60 psi
Test Medium Water

Class III = .1% Valve Rated Capacity Differential of 45 to 60 psi
Test Medium Water

Class IV = .01% Valve Rated Capacity Differential of 45 to 60 psi
Test Medium Water

Class V = 5 x 10-4 ml / min of water / in. seat diameter / psi DP
Tested @ Rated Differential
Test Medium Water

Class VI =

1"	.15 ml/min.	1 bubble/min.
1.5"	.30 ml/min.	2 bubble/min.
2"	.45 ml/min.	3 bubble/min.
2.5"	.60 ml/min.	4 bubble/min.
3"	.90 ml/min.	6 bubble/min.
4"	1.7 ml/min.	11 bubble/min.
6"	4 ml/min.	27 bubble/min
8"	6.75 ml.min.	45 bubble/min.

Differential of 50 psi
Test Medium Air or Nitrogen

Leslie
"ZERO" Less than one drop per minute, Tested @ Rated Differential
Test Medium Water

LIQUID BODY VELOCITY LIMITATION

Carbon Steel (WCB)

Continuously Modulating or DP > 500 psi	20 ft/sec
Intermittent Modulating or DP < 500 psi	30 ft/sec
2% Intermittent Flow	40 ft/sec

Alloy or Stainless Steel

Continuously Modulating or DP > 500 psi	45 ft/sec
Intermittent Modulating or DP < 500 psi	60 ft/sec
2% Intermittent Flow	90 ft/sec

Notes: Use Alloy or SS if flashing or cavitation exists
Body erosion and noise will occur above these limits

Compressible Velocity

Noise cannot be predicted >=Mach .5
Carbon Steel Limit is .35 Mach
Alloy or SS Limit is .9 Mach

INSULATION DECIBEL REDUCTION

Thickness	Type	Decibel Reduction
1"	Thermal	-4
2"	Thermal	-8
3.5"	Thermal	-10.5
5"	Thermal	-13
	Cladding	add -5

NOISE ATTENUATION

PIPE SIZE	PIPE SCHEDULE												
	10	20	30	40	60	80	100	120	140	160	STD	XS	XXS
1	—	—	—	0	—	-3	—	—	—	-6	0	-3	—
1.5	—	—	—	0	—	-3	—	—	—	-6	0	-3	-9
2	—	—	—	0	—	-3	—	—	—	-7	0	-3	-9
3	—	—	—	0	—	-3	—	—	—	-9	0	-3	-9
4	—	—	—	0	—	-5	—	-6	—	-7	0	-6	-9
6	—	—	—	0	—	-4	—	-6	—	-8	0	-6	-10
8	—	+2	+1	0	-2	-4	-6	-7	-8	-9	0	-4	-9
10	—	+3	+1	0	-3	-4	-6	-8	-9	-10	0	-3	—
12	—	+3	+1	-1	-3	-5	-7	-9	-10	-11	0	-3	—
14	+3	+1	0	-2	-4	-6	-8	-10	-11	-12	0	-3	—
16	+3	+1	0	-3	-5	-7	-9	-10	-12	-13	0	-3	—
18	+3	+1	-2	-4	-6	-8	-10	-11	-13	-14	0	-3	—
20	+3	0	-3	-4	-7	-9	-10	-12	-14	-15	0	-3	—
24	+3	0	-4	-6	-9	-10	-12	-14	-15	-16	0	-3	—
30	+1	-3	-5	—	—	—	—	—	—	—	0	-3	—

PRESSURE TEMPERATURE LIMITS

Body Material and End Connection Selection

BASED ON: ANSI B16.1-1989 (Cast Iron) B16.24-1991 (Cast Bronze) B16.5-1996 (All Steels)

Enter selection table at the service temperature and read down the column. Obtain a figure for maximum allowable pressure which equals or exceeds the inlet pressure in the system. The materials are ranked in the order of their relative cost.

It is wise in most cases to make several tentative selections for body material and end connection to determine which is most economical. For instance, it may be advantageous to go to a higher body rating than to select a stronger alloy.

See product design limitations published in Leslie bulletins and data sheets prior to final selection. Regular type (not bold) indicate temperatures recommended by Leslie Controls for each material.

Bold type areas indicate temperatures permitted by ANSI B16.5-1996, but NOT recommended by Leslie Controls.

Code Designations
2 = Class B Cast Iron
6 = Grade WC1 (0.50% Moly)
4 = Grade C5 (5.50% Chrome)
22 = Cast Bronze
8 = Grade WC6 (1.25% Chrome)
9 = Grade CF8 (304 SST)
3 = Grade WCB Carbon Steel
7 = Grade WC9 (2.25% Chrome)
5 = Grade CF8M (316 SST)

END CONNECTIONS	BODY MAT'L CODE	ASTM SPEC.	MAXIMUM PRESSURE (PSIG) AT SERVICE TEMPERATURE (ºF) - (NON-SHOCK)																			
			100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	1050
125# FLANGES THREADS	2	A126	200	200	190	175	165	150	140	125												
150# FLANGES SWE, BWE THREADS	22	B61	225	225	215	205	195	180	170	160	150	140										
	3	A216	285		260		230		200		170		140	125	110	95	80	**65**	**50**	**35**	**20**	
	6	A217	265		260		230		200		170		140	125	110	95	80	65	**50**	**35**	**20**	
	8	A217	290		260		230		200		170		140	125	110	95	80	65	50	35	20	
	7	A217	290		260		230		200		170		140	125	110	95	80	65	50	35	20	
	4	A217	290		260		230		200		170		140	125	110	95	80	65	50	35	20	
	9	A351	275		230		205		190		170		140	125	110	95	80	65	50	35	20	
	5	A351	275		235		215		195		170		140	125	110	95	80	65	50	35	20	
250# FLANGES THREADS	2	A126	500	500	460	415	375	335	290	250												
300# FLANGES SWE, BWE THREADS	22	B61	500	500	475	450	425	400	375	350	325	300										
	3	A216	740		675		655		635		600		550	535	535	505	410	**270**	**170**	**105**	**50**	
	6	A217	695		680		655		640		620		605	590	570	530	510	485	**450**	**280**	**165**	
	8	A217	750		750		720		695		665		605	590	570	530	510	485	450	320	215	**145**
	7	A217	750		750		730		705		665		605	590	570	530	510	485	450	375	260	**175**
	4	A217	750		745		715		705		665		605	590	570	530	510	485	370	275	200	145
	9	A351	720		600		540		495		465		435	430	425	415	405	395	390	380	329	**305**
	5	A351	720		620		560		515		480		450	445	430	425	420	420	415	385	350	345
600# FLANGES SWE, BWE THREADS	3	A216	1480		1350		1315		1270		1200		1095	1075	1065	1010	825	**535**	**345**	**205**	**105**	
	6	A217	1390		1360		1305		1280		1245		1210	1175	1135	1065	1015	975	**900**	**560**	**330**	
	8	A217	1500		1500		1445		1385		1330		1210	1175	1135	1065	1015	975	900	640	430	**290**
	7	A217	1500		1500		1455		1410		1330		1210	1175	1135	1065	1015	975	900	755	520	**350**
	4	A217	1500		1490		1430		1410		1330		1210	1175	1135	1055	1015	965	740	550	400	290
	9	A351	1440		1200		1080		995		930		875	860	850	830	805	790	780	765	640	**615**
	5	A351	1440		1240		1120		1025		955		900	890	870	855	845	835	830	775	700	685
900# FLANGES SWE, BWE	3	A216	2220		2025		1970		1900		1795		1640	1610	1600	1510	1235	**805**	**515**	**310**	**155**	
	6	A217	2085		2035		1955		1920		1865		1815	1765	1705	1595	1525	1460	**1350**	**845**	**495**	
	8	A217	2250		2250		2165		2080		1995		1815	1765	1705	1595	1525	1460	1350	955	650	**430**
	7	A217	2250		2250		2185		2115		1995		1815	1765	1705	1595	1525	1460	1350	1130	780	**525**
	4	A217	2250		2235		2150		2115		1995		1815	1765	1705	1585	1525	1450	1110	825	595	430
	9	A351	2160		1800		1620		1490		1395		1310	1290	1275	1245	1210	1190	1165	1145	965	**925**
	5	A351	2160		1860		1680		1540		1435		1355	1330	1305	1280	1265	1255	1245	1160	1050	1030
1500# FLANGES SWE, BWE	3	A216	3705		3375		3280		3170		2995		2735	2685	2665	2520	2060	**1340**	**860**	**515**	**260**	
	6	A217	3470		3395		3260		3200		3105		3025	2940	2840	2660	2540	2435	**2245**	**1405**	**825**	
	8	A217	3750		3750		3610		3465		3325		3025	2940	2840	2660	2540	2435	2245	1595	1080	**720**
	7	A217	3750		3750		3640		3530		3325		3025	2940	2840	2660	2540	2435	2245	1885	1305	**875**
	4	A217	3750		3725		3580		3530		3325		3025	2940	2840	2640	2540	2415	1850	1370	995	720
	9	A351	3600		3000		2700		2485		2330		2185	2150	2125	2075	2015	1980	1945	1910	1605	**1545**
	5	A351	3600		3095		2795		2570		2390		2255	2220	2170	2135	2110	2090	2075	1930	1750	1720
2500# FLANGES SWE, BWE	3	A216	6170		5625		5470		5280		4990		4560	4475	4440	4200	3430	**2230**	**1430**	**860**	**430**	
	6	A217	5785		5660		5435		5330		5180		5040	4905	4730	4430	4230	4060	**3745**	**2345**	**1370**	
	8	A217	6250		6250		6015		5775		5540		5040	4905	4730	4430	4230	4060	3745	2655	1800	**1200**
	7	A217	6250		6250		6070		5880		5540		5040	4905	4730	4430	4230	4060	3745	3145	2170	**1455**
	4	A217	6250		6205		5965		5880		5540		5040	4905	4730	4400	4230	4030	3085	2285	1655	1200
	9	A351	6000		5000		4500		4140		3880		3640	3580	3540	3460	3360	3300	3240	3180	2675	**2570**
	5	A351	6000		5160		4660		4280		3980		3760	3700	3620	3560	3520	3480	3460	3220	2915	2865
3500# FLANGES SWE, BWE	3	A216	8640		7870		7655		7390		6985		6385	6265	6215	5880	4800	**3120**	**2000**	**1200**	**600**	
	6	A217	8100		7920		7605		7460		7250		7055	6865	6620	6200	5920	5680	**5240**	**3280**	**1920**	
	8	A217	8750		8750		8420		8085		7750		7055	6865	6620	6200	5920	5680	5240	3720	2520	**1680**
	7	A217	8750		8750		8495		8230		7750		7055	6865	6620	6200	5920	5680	5240	4405	3040	**2040**
	4	A217	8750		8685		8350		8230		7750		7055	6865	6620	6160	5920	5640	4320	3200	2320	1680
	9	A351	8400		7000		6300		5795		5430		5095	5010	4955	4845	4705	4620	4535	4450	3745	**3600**
	5	A351	8400		7225		6525		5990		5570		5265	5180	5065	4925	4845	4730	4590	4505	4240	4200
4500# FLANGES SWE, BWE	3	A216	11110		10120		9845		9505		8980		8210	8055	7990	7560	6170	**4010**	**2570**	**1545**	**770**	
	6	A217	10415		10185		9780		9595		9320		9070	8825	8515	7970	7610	7305	**6740**	**4215**	**2470**	
	8	A217	11250		11250		10830		10400		9965		9070	8825	8515	7970	7610	7305	6740	4785	3240	**2160**
	7	A217	11250		11250		10925		10585		9965		9070	8825	8515	7970	7610	7305	6740	5665	3910	**2625**
	4	A217	11250		11170		10740		10585		9965		9070	8825	8515	7920	7610	7250	5555	4115	2985	2160
	9	A351	10800		9000		8100		7450		6985		6550	6445	6370	6230	6050	5940	5830	5725	4815	**4630**
	5	A351	10800		9290		8390		7705		7165		6770	6660	6515	6410	6335	6265	6230	5795	5245	5155

NOTES: FOR 125# ANSI CAST IRON, PRESSURE LIMIT @ 353*F, THE TEMPERATURE OF 125 PSIG SATURATED STEAM
FOR 250# ANSI CAST IRON, PRESSURE LIMIT @ 406*F, THE TEMPERATURE OF 250 PSIG SATURATED STEAM
FOR 400# ANSI STEEL PRESSURE/TEMPERATURE LIMITS, SEE 5/0.3.3 - 5/79 - 3R

MATERIAL SELECTION CHART

The following chart is intended to serve as a visual guide or indicator in the selection of piping and valve materials for use with various fluids in process industries. It will be well to remember that this is a tentative comparison of materials under a similar set of conditions. Therefore the suggestions given are subject to change in accordance with the specific conditions of the actual problem.

For example, it is quite possible to have unusual conditions of pressure, temperature, concentration, or product control which would prevent the use of a material normally satisfactory for the fluid involved.

Legend

1 — generally found satisfactory in practice
2 — generally unsatisfactory in practice
3 — caution: tests should be made to determine suitability
4 — actual information unknown

	IRON AND STEEL	NI.RESIST CAST IRON	18-8 MO	MONEL METAL	NICKEL	RED BRASS	ACID-RESISTING BRONZE	ALUMINUM	"TYGON T" (Plastic)*
Acetate solvents, crude	3	3	3	1	1	3	1	1	2
Acetate solvents, pure	3	1	1	1	1	1	1	1	2
Acetic acid, crude	3	3	1	3	3	3	1	3	2
Acetic acid, pure	2	2	1	1	3	2	1	1	2
Acetic acid vapors	2	2	1	3	4	3	2	3	2
Acetic anhydride	3	1	1	1	4	2	3	1	3
Acetone	1	1	1	1	1	1	1	1	2
Acetylene	1	1	1	1	1	2	2	1	2
Alcohols	1	1	1	1	1	1	1	1	3
Aluminum sulfate	2	3	1	1	4	3	3	3	1
Ammonia gas	1	1	1	1	1	2	2	1	3
Ammonium chloride	3	1	3	1	1	3	3	2	1
Ammonium hydroxide	1	1	1	3	3	2	2	1	3
Ammonium nitrate	1	3	1	3	3	2	2	1	3
Ammonium phosphate (mono)	2	3	1	3	4	3	1	2	1
Ammonium phosphate (di)	3	1	1	1	4	3	3	1	1
Ammonium phosphate (tri)	1	1	1	1	1	3	3	1	1
Ammonium sulfate	1	1	3	1	1	3	1	4	1
Asphalt	1	1	1	1	1	1	1	4	2
Beer (1)	3	3	1	1	1	1	1	1	1
Beet sugar liquors	1	1	1	1	1	3	3	1	1
Benzene or benzol	1	1	1	1	1	1	1	1	2
Benzine	1	1	1	1	1	1	1	1	2
Borax	1	1	1	1	1	3	3	3	1
Boric acid	2	3	1	1	1	3	1	1	1
Butane, butylenes, butadiene	1	1	1	3	3	1	1	1	2
Calcium bisulfite	2	2	1	2	2	2	3	3	1
Calcium chloride	1	1	3	1	1	1	1	2	4
Calcium hypochloride	3	3	3	3	3	3	3	4	3
Cane sugar liquors	1	1	1	1	1	1	1	1	1
Carbolic acid or phenol	3	3	1	1	1	3	3	1	3
Carbon dioxide, dry	1	1	1	1	1	1	1	1	1
Carbon dioxide, wet	3	3	1	1	1	3	3	1	1
Carbon disulfide	1	1	1	3	4	2	2	1	2
Carbon acid	2	2	1	1	1	3	3	1	1
Carbon tetrachloride (2)	3	3	3	1	1	3	3	3	3
Chlorine, dry (3)	1	1	3	1	1	3	3	4	1
Chlorine, wet (3)	2	2	2	2	2	2	2	2	3
Chlorex	1	4	4	1	4	1	1	4	3

	IRON AND STEEL	NI.RESIST CAST IRON	18-8 MO	MONEL METAL	NICKEL	RED BRASS	ACID-RESISTING BRONZE	ALUMINUM	"TYGON T" (Plastic)*
Chromic acid	3	3	1	3	3	2	3	3	3
Citric acid	2	3	1	1	1	3	1	1	1
Coke oven gas	1	4	1	3	4	3	3	1	3
Copper sulfate	2	3	1	3	3	2	2	2	1
Core oils	1	4	4	4	4	1	1	4	4
Cottonseed oil	1	1	1	1	1	3	1	4	3
Creosote, crude	1	1	1	1	1	3	1	1	2
Doctor solutions	1	1	1	1	4	2	2	2	1
Ethers	4	4	1	1	1	1	1	1	3
Ethylene glycol	1	1	1	1	1	1	1	1	1
Ferric chloride	2	2	2	2	2	2	2	2	1
Ferric sulfate	2	2	1	3	3	2	3	2	1
Formaldehyde	3	3	1	1	1	1	1	1	3
Formic acid	2	4	3	3	3	2	3	2	1
Freon, wet	3	1	3	1	1	1	1	1	2
Freon, dry	1	1	1	1	1	1	1	1	2
Furfural	1	4	4	1	1	1	1	1	3
Gasoline, sour	3	3	1	3	4	2	2	1	3
Gasoline, refined	1	1	1	1	4	1	1	1	3
Gelatine	4	4	1	1	1	2	3	1	1
Glucose	1	1	1	1	1	1	1	1	1
Glue	1	1	1	1	1	1	1	1	1
Glycerine glycerol	1	1	1	1	1	1	1	1	1
Hydrochloric acid	2	2	2	3	3	2	3	2	1
Hydrocyanic acid	3	4	1	1	4	4	1	1	3
Hydrofluoric acid	3	2	2	3	3	2	3	2	3
Hydrogen gas	1	1	1	1	1	1	1	1	1
Hydrogen peroxide	2	2	1	1	1	2	3	1	3
Hydrogen sulfide	1	1	1	3	3	2	2	1	3
Hydrogen sulfide, wet	3	3	1	3	3	2	2	1	1
Lacquers and solvents	3	1	1	1	1	1	1	1	2
Lime-sulfur	1	1	1	1	1	2	2	4	1
Magnesium chloride	3	3	3	1	1	3	1	2	1
Magnesium hydroxide	1	1	1	1	1	3	3	2	4
Magnesium sulfate	1	1	1	1	1	1	1	1	1
Mercuric chloride	3	3	2	3	3	2	2	2	1
Mercury	1	1	1	1	1	2	2	2	1
Milk	2	2	1	3	1	2	2	1	1
Molasses	1	1	1	1	1	1	1	1	1

MATERIAL SELECTION CHART – CONT'D.

Legend

1 — generally found satisfactory in practice
2 — generally unsatisfactory in practice
3 — caution: tests should be made to determine suitability
4 — actual information unknown

	IRON AND STEEL	NI.RESIST CAST IRON	18-8 MO	MONEL METAL	NICKEL	RED BRASS	ACID-RESISTING BRONZE	ALUMINUM	"TYGON T" (Plastic)*
Natural gas	1	1	1	1	1	3	3	1	3
Nickel chloride	4	4	3	3	3	2	2	2	1
Nickel sulfate	4	4	3	3	3	3	3	2	1
Nitrating acids (sulfuric > 15%)	3	3	3	2	2	2	2	2	2
Nitrating acids (sulfuric < 15%)	2	2	3	2	2	2	2	2	2
Nitrating acids (nitric > 15%)	2	2	2	2	2	2	2	2	3
Nitrating acids (sulfuric + nitric = 1%)	2	3	1	2	2	2	2	1	2
Nitric acid, crude	2	4	3	2	2	2	2	3	4
Nitric acid, pure	2	4	1	2	2	2	2	3	3
Oleic acid	3	3	1	1	4	3	1	1	3
Oxalic acid	3	3	4	1	4	3	1	1	1
Oxygen	1	4	1	1	4	1	1	1	1
Palmitic acid	3	3	1	1	4	3	1	1	1
Petroleum oils	1	1	3	4	4	3	3	4	2
Petroleum oils, refined	1	1	1	1	1	1	1	1	2
Phosphoric acid, crude	3	4	3	3	3	2	2	2	1
Phosphoric acid, pure (< 45%)	2	4	1	3	4	2	3	2	3
Phosphoric acid, pure (< 45%, cold)	2	4	1	3	4	2	2	2	3
Phosphoric acid, pure (< 45%, hot)	2	4	3	3	2	2	2	2	3
Picric acid (molten)	1	4	1	2	2	2	2	4	2
Picric acid	3	4	1	2	2	2	2	1	1
Potassium chloride	1	1	3	1	1	1	1	3	1
Potassium hydroxide	3	1	3	1	1	2	2	2	1
Potassium sulfate	1	1	3	1	1	1	1	1	1
Propane gas	1	1	1	1	1	1	1	1	2
Rosin, dark	1	1	1	1	1	3	1	1	2
Rosin, light	2	3	1	1	1	2	2	1	2
Shellac, orange	1	1	1	1	1	1	1	1	1
Shellac, bleached	2	3	1	1	1	3	3	1	1
Sodium carbonate	1	1	1	1	1	3	3	2	1
Sodium bicarbonate	3	1	1	1	1	3	1	3	1
Sodium bisulfate	2	3	3	1	1	3	1	3	1
Sodium chloride	1	1	3	1	1	1	1	3	1
Sodium cyanide	1	3	1	3	3	2	2	2	1
Sodium hydroxide	1	1	3	1	1	3	3	2	1
Sodium hypochlorite	2	3	3	3	3	2	2	2	3
Sodium metaphosphate	3	4	1	1	4	3	1	1	1
Sodium nitrate	1	1	1	1	1	3	3	1	3
Sodium perborate and peroxide	3	1	1	1	1	3	3	1	3
Sodium phosphate (mono)	3	4	1	1	1	3	1	1	1
Sodium phosphate (di)	3	1	1	1	1	1	1	1	4
Sodium phosphate (tri)	1	1	1	1	1	2	2	2	4
Sodium silicate	1	1	1	1	1	2	2	2	1
Sodium sulfate	1	1	3	1	1	1	1	4	1
Sodium sulfide	1	1	1	1	1	2	2	2	1
Sodium thiosulfate	3	4	1	3	3	2	2	3	1
Sludge acid	2	3	2	3	4	2	3	2	3
Stearic acid	3	3	1	1	1	3	3	1	1
Sulfate liquors	1	1	1	1	4	2	2	2	1
Sulfur	1	3	3	3	3	2	2	1	3
Sulfur chloride	3	1	3	1	1	2	2	4	3
Sulfur dioxide, dry	1	1	1	1	4	1	1	1	1
Sulfur trioxide, dry	1	1	1	1	4	1	1	1	1
Sulfuric acid(98% to fuming) (4)	1	1	3	2	2	2	2	3	2
Sulfuric acid (75-95%) (5)	1	4	2	2	2	2	2	2	3
Sulfuric acid (10-75%)	2	3	2	1	3	2	3	2	3
Sulfuric acid (< 10%)	2	3	3	1	3	3	1	2	3
Sulfurous acid	2	4	1	2	2	2	1	3	3
Tar	1	1	1	1	1	1	1	1	2
Tartaric acid	2	3	1	1	1	3	1	1	1
Toluene or toluol	1	4	4	1	4	1	1	1	2
Trichloroethylene	3	3	3	1	1	3	3	4	2
Turpentine	3	1	1	1	4	3	3	1	1
Varnish	3	3	1	1	1	3	3	1	3
Vegetable oils	1	1	1	1	1	1	1	1	1
Vinegar	3	3	1	1	1	3	3	3	3
Water, acid mine (oxidizing salts)	2	3	1	2	2	2	2	2	3
Water, acid mine (no oxidizing salts)	3	1	2	1	1	3	1	2	3
Water, fresh (boiler feed)	1	1	4	1	1	1	1	3	1
Water, distilled	2	2	1	3	1	2	2	1	1
Water, distilled (condensate)	1	1	1	1	1	1	1	1	1
Water, salt	3	1	3	1	3	1	1	3	1
Whiskey and wines	2	3	1	3	1	3	3	3	1
Zinc chloride	3	3	2	1	4	2	2	2	1
Zinc sulfate	3	1	4	1	4	3	3	4	1

1. Iron and steel used for handling beer in the alcohol industry but not permissible in the beverage industry.
2. Based on industrial uses of the solvent galvanized steel commonly used for tanks, piping, etc. Iron and steel are widely used in manufacture of solvent with good success.
3. Industrial applications of "dry" chlorine frequently involve locations where moisture is present. Steel gives good results as piping material but something better is required for critical parts. Steel valves trimmed with monel give good results. Non-metals required for wet gas and aqueous solutions.
4. When gas is wet apply recommendation for sulfuric acid (< 10%).
5. Special high chrome-nickel allows having good resistance to a wide range of concentrations are being used. Ordinary iron and steel good where concentration is always over 90%. Absorption of moisture from the air dilutes exposed acid and makes it more corrosive to iron.

* Temperatures and concentrations should be known in all cases in order to suggest proper procedure. In general, when the operating temperature is increased, a corresponding decrease in concentration is indicated for satisfactory service. Recommendations in above table are based on room temperatures. Recommendations in this table are based on "TYGON T", one of the "TYGON T" series of formulations. Special formulations can be prepared to provide specific properties other than those listed. We suggest that in all cases of special applications the U.S. Stoneware Process Equipment Division be consulted.

† Synthetic Rubber — Product of E.I. DuPont De Nemours.

CONVERSION TABLES

LIQUID WEIGHTS and MEASURES

To Convert	To	Multiply By
Gallons	Liters	3.7853
Gallons	Cu. Inches	231
Gallons	Cu. Feet	0.1337
Gallons	Cu. Meters	0.00379
Gallons	Lbs. of Water	8.339
Liters	Gallons	0.26418
Liters	Cu. Inches	61.025
Liters	Cu. Feet	0.0353
Liters	Cu. Meters	0.001
Liters	Lbs. of Water	2.202
Cu. Inches	Gallons	0.00433
Cu. Inches	Liters	0.01639
Cu. Inches	Cu. Feet	0.00058
Cu. Inches	Cu. Meters	0.000016
Cu. Inches	Lbs. of Water	0.0362
Cu. Feet	Gallons	7.48052
Cu. Feet	Liters	28.316
Cu. Feet	Cu. Inches	1728
Cu. Feet	Cu. Meters	0.0283
Cu. .Feet	Lbs. of Water	62.371
Cu. Meters	Gallons	264.17
Cu. Meters	Liters	999.972
Cu. Meters	Cu. Inches	61023.74
Cu. Meters	Cu. Feet	35.3145
Cu. Meters.	Lbs. of Water	2202.61
Lbs. of Water	Gallons	0.11992
Lbs. of Water	Liters	0.45419
Lbs. of Water	Cu. Inches	27.643
Lbs. of Water	Cu. Feet	0.01603
Lbs. of Water	Cu. Meters	0.000454

LINEAL MEASURES

Inches	mm	25.4
Inches	cm	2.54
Inches	Meters	0.0254
Feet	cm	30.48
Feet	Meters	0.3048
mm	Inches	0.03937
mm	Feet	0.00328
cm	Inches	0.3937
cm	Feet	0.03281
Meters	Feet	3.28

AREA

Sq. Inches	Sq. Feet	0.006944
Sq. Inches	Sq. cm	6.4516
Sq. Feet	Sq. Inches	144
Sq. Feet	Sq. cm	929.03
Sq. Feet	Sq. Meters	0.0929
Sq. cm	Sq. Inches	0.155
Sq. cm	Sq. Feet	0.00108
Sq. cm	Sq. Meters	0.0001
Sq. Meter	Sq. Inches	1550
Sq. Meter	Sq. Feet	10.76

CONVERSIONS of PRESSURE and HEAD

To Convert	To	Multiply By
Lbs. per Sq .In.	Lbs. per Sq. Ft.	144
Lbs. per Sq. In.	Atmospheres	0.06805
Lbs. per Sq. In.	Ins. of Water	27.728
Lbs. per Sq. In.	Ft. of Water	2.3106
Lbs. per Sq. In.	Ins. of Mercury	2.03602
Lbs. per Sq. In.	mm of Mercury	51.715
Lbs. per Sq. In.	Bar	0.06895
Lbs. per Sq. In.	kg per Sq. cm	0.070307
Lbs. per Sq. In.	kg per Sq. M	703.070
Lbs. per Sq. Ft.	Lbs. per Sq. In.	0.0069445
Lbs. per Sq. Ft.	Atmospheres	0.000473
Lbs. per Sq. Ft.	Ins. of Water	0.1926
Lbs. per Sq. Ft.	Ft. of Water	0.01605
Lbs. per Sq. Ft.	Ins. of Mercury	0.014139
Lbs. per Sq. Ft.	mm of Mercury	0.35913
Lbs. per Sq. Ft.	Bar	0.000479
Lbs. per Sq. Ft.	kg per Sq. cm	0.000488
Lbs. per Sq. Ft.	kg per Sq. M	4.88241
Atmospheres	Lbs. per Sq. In.	14.696
Atmospheres	Lbs. per Sq. Ft.	2116.22
Atmospheres	Ins. of Water	407.484
Atmospheres	Ft. of Water	33.957
Atmospheres	Ins. of Mercury	29.921
Atmospheres	mm of Mercury	760
Atmospheres	Bar	1.01325
Atmospheres	kg per Sq. cm	1.0332
Atmospheres	kg per Sq. M	10332.27
Ins. of Water	Lbs. per Sq. In.	0.03609
Ins. of Water	Lbs. per Sq. Ft.	5.1972
Ins. of Water	Atmospheres	0.002454
Ins.of Water	Ft. of Water	0.08333
Ins. of Water	Ins. of Mercury	0.07343
Ins. of Water	mm of Mercury	1.8651
Ins. of Water	Bar	0.00249
Ins. of Water	kg per Sq. cm	0.00253
Ins. of Water	kg per Sq. M	25.375
Ft. of Water	Lbs. per Sq. In.	0.432781
Ft. of Water	Lbs. per Sq. Ft.	63.3205
Ft. of Water	Atmospheres	0.029449
Ft. of Water	Ins. of Water	12
Ft. of Water	Ins. of Mercury	0.88115
Ft. of Water	mm of Mercury	22.3813
Ft. of Water	Bar	0.029839
Ft. of Water	kg per Sq. cm	0.03043
Ft. of Water	kg per Sq. M	304.275
Ins. of Mercury	Lbs. per Sq. In.	0.491154
Ins. of Mercury	Lbs. per Sq. Ft.	70.7262
Ins. of Mercury	Atmospheres	0.033421
Ins. of Mercury	Ins. of Water	13.6185
Ins. of Mercury	Ft. of Water	1.1349
Ins. of Mercury	mm of Mercury	25.40005
Ins. of Mercury	Bar	0.033864
Ins. of Mercury	kg per Sq. cm	0.03453
Ins. of Mercury	kg per Sq. M	345.316
mm of Mercury	Lbs. per Sq. In.	0.019337
mm of Mercury	Lbs. per Sq. Ft.	2.7845
mm of Mercury	Atmospheres	0.001316
mm of Mercury	Ins. of Water	0.53616
mm of Mercury	Ft. of Water	0.04468
mm of Mercury	Ins. of Mercury	0.03937
mm of Mercury	Bar	0.00133
mm of Mercury	kg per Sq. cm	0.00136
mm of Mercury	kg per Sq. M	13.59509
kg per Sq. cm	Lbs. per Sq. In.	14.2233
kg per Sq. cm	Lbs. per Sq. Ft.	2048.155
kg per Sq. cm	Atmospheres	0.96784
kg per Sq. cm	Ins. of Water	394.38
kg per Sq. cm	Ft. of Water	32.865
kg per Sq. cm	Ins. of Mercury	28.959
kg per Sq. cm	mm of Mercury	735.559
kg per Sq. cm	Bar	0.98067
kg per Sq. cm	kg per Sq. M	10000

TEMPERATURE

To convert Fahrenheit to Celsius: $\frac{°F - 32}{1.8}$

To convert Celsius to Fahrenheit: (1.8 x °C) + 32

VELOCITY

1 Ft per Sec. = 0.3048 M Per Sec.

1 M per Sec. = 3.2808 Ft. per Sec.

NOTE: All weights and measures of water are based on temperature of 60°F. Temperature of Water and Mercury is 68°F and 32°F respectively.

NOTES:

STEAM TABLE[1]

h = Total heat of steam, Btu per pound
v = Specific volume, cubic feet per pound

TOTAL TEMPERATURE, °F																	Temp-erature °F (sat.)	Pres-sure psi (gage)
480	500	520	540	560	580	600	620	640	660	680	700	720	740	750				
1277.6	1287.1	1296.6	1306.2	1315.7	1325.3	1334.8	1344.5	1354.2	1363.8	1373.5	1383.2	1393.0	1402.8	1407.7	h	212	0
37.96	38.78	39.60	40.41	41.23	42.04	42.86	43.68	44.49	45.31	46.12	46.94	47.75	48.56	48.97	v		
1277.1	1286.6	1296.2	1305.7	1315.3	1324.8	1334.4	1344.1	1353.8	1363.5	1373.2	1382.9	1392.7	1402.6	1407.5	h	228	5
27.86	28.46	29.06	29.67	30.27	30.87	31.47	32.07	32.67	33.27	33.87	34.47	35.07	35.67	35.96	v		
1276.6	1286.2	1295.8	1305.3	1314.9	1324.5	1334.1	1343.8	1353.5	1363.2	1372.9	1382.6	1392.5	1402.3	1407.2	h	240	10
22.26	22.74	23.22	23.71	24.19	24.68	25.16	25.64	26.12	26.60	27.08	27.56	28.04	28.52	28.76	v		
1276.2	1285.7	1295.3	1304.9	1314.5	1324.2	1333.8	1343.5	1353.2	1362.9	1372.6	1382.4	1392.3	1402.1	1407.0	h	250	15
18.528	18.933	19.337	19.741	20.144	20.547	20.95	21.35	21.75	22.15	22.56	22.96	23.36	23.76	23.96	v		
1275.7	1285.3	1294.9	1304.5	1314.1	1323.8	1333.5	1343.2	1352.9	1362.6	1372.3	1382.1	1391.9	1401.8	1406.7	h	259	20
15.862	16.210	16.558	16.905	17.251	17.597	17.943	18.288	18.633	18.977	19.322	19.666	20.01	20.35	20.52	v		
1275.2	1284.8	1294.5	1304.1	1313.8	1323.4	1333.1	1342.8	1352.5	1362.3	1372.1	1381.9	1391.7	1401.6	1406.5	h	267	25
13.862	14.168	14.473	14.778	15.082	15.385	15.688	15.990	16.293	16.595	16.896	17.198	17.499	17.8001	7.951	v		
1274.7	1284.4	1294.0	1303.7	1313.4	1323.1	1332.8	1342.5	1352.2	1362.0	1371.8	1381.6	1391.5	1401.4	1406.3	h	274	30
12.307	12.580	12.852	13.123	13.394	13.665	13.935	14.204	14.473	14.742	15.011	15.279	15.547	15.815	15.949	v		
1273.7	1283.4	1293.2	1302.9	1312.6	1322.4	1332.1	1341.9	1351.7	1361.5	1371.3	1381.1	1391.0	1400.9	1405.8	h	287	40
10.044	10.269	10.493	10.717	10.940	11.162	11.384	11.605	11.826	12.047	12.268	12.488	12.708	12.927	13.037	v		
1272.7	1282.5	1292.3	1302.1	1311.9	1321.7	1331.5	1341.3	1351.1	1360.9	1370.8	1380.6	1390.5	1400.4	1405.4	h	298	50
8.478	8.670	8.861	9.051	9.240	9.429	9.618	9.806	9.993	10.181	10.368	10.555	10.741	10.928	11.021	v		
1271.6	1281.5	1291.4	1301.3	1311.1	1321.0	1330.8	1340.6	1350.5	1360.3	1370.2	1380.1	1390.0	1399.9	1404.9	h	308	60
7.329	7.496	7.663	7.829	7.994	8.159	8.323	8.486	8.649	8.812	8.975	9.138	9.300	9.462	9.543	v		
1270.6	1280.6	1290.5	1300.5	1310.4	1320.2	1330.1	1340.0	1349.9	1359.8	1369.7	1379.6	1389.6	1399.5	1404.5	h	316	70
6.450	6.599	6.747	6.894	7.041	7.187	7.332	7.477	7.622	7.766	7.910	8.054	8.198	8.341	8.413	v		
1269.5	1279.6	1289.6	1299.6	1309.6	1319.5	1329.4	1339.4	1349.3	1359.3	1369.2	1379.1	1389.1	1399.0	1404.0	h	324	80
5.756	5.891	6.024	6.156	6.288	6.419	6.550	6.680	6.810	6.940	7.069	7.199	7.327	7.456	7.520	v		
1268.5	1278.6	1288.7	1298.8	1308.8	1318.8	1328.7	1338.7	1348.7	1358.6	1368.6	1378.5	1388.5	1398.5	1403.5	h	331	90
5.195	5.317	5.439	5.559	5.679	5.799	5.918	6.036	6.154	6.272	6.389	6.506	6.623	6.740	6.798	v		
1267.4	1277.7	1287.8	1297.9	1308.0	1318.0	1328.1	1338.1	1348.0	1358.0	1368.0	1378.0	1388.1	1398.1	1403.1	h	338	100
4.730	4.843	4.955	5.066	5.176	5.285	5.394	5.503	5.611	5.719	5.827	5.934	6.041	6.148	6.201	v		
1264.7	1275.2	1285.5	1295.8	1306.0	1316.2	1326.4	1336.5	1346.6	1356.6	1366.7	1376.8	1386.9	1397.0	1402.0	h	353	125
3.860	3.954	4.047	4.140	4.232	4.323	4.413	4.503	4.593	4.683	4.772	4.861	4.949	5.038	5.082	v		
1261.9	1272.6	1283.2	1293.6	1304.0	1314.3	1324.6	1334.8	1345.0	1355.2	1365.3	1375.4	1385.6	1395.8	1400.8	h	366	150
3.252	3.334	3.414	3.494	3.573	3.652	3.730	3.807	3.884	3.960	4.037	4.113	4.188	4.264	4.301	v		
1259.0	1270.0	1280.8	1291.4	1302.0	1312.4	1322.8	1333.2	1343.5	1353.7	1363.9	1374.2	1384.4	1394.6	1399.7	h	378	175
2.804	2.877	2.948	3.019	3.089	3.157	3.226	3.294	3.361	3.429	3.495	3.562	3.628	3.694	3.727	v		
1256.0	1267.3	1278.3	1289.2	1299.9	1310.5	1321.0	1331.4	1341.8	1352.2	1362.5	1372.8	1383.1	1393.3	1398.5	h	388	200
2.460	2.525	2.590	2.653	2.716	2.777	2.839	2.900	2.960	3.019	3.079	3.139	3.198	3.256	3.286	v		
1253.0	1264.5	1275.8	1286.9	1297.8	1308.5	1319.2	1329.8	1340.3	1350.7	1361.1	1371.5	1381.9	1392.2	1397.3	h	397	225
2.187	2.247	2.306	2.364	2.421	2.477	2.533	2.587	2.642	2.696	2.750	2.804	2.857	2.910	2.936	v		
1249.9	1261.7	1273.2	1284.5	1295.6	1306.5	1317.3	1328.0	1338.7	1349.2	1359.7	1370.2	1380.6	1391.0	1396.2	h	406	250
1.9654	2.021	2,076	2.129	2.181	2.233	2.284	2.334	2.384	2.434	2.483	2.532	2.580	2.629	2.653	v		
1246.6	1258.8	1270.6	1282.1	1293.4	1304.5	1315.5	1326.3	1337.0	1347.7	1358.3	1368.8	1379.3	1389.8	1395.0	h	414	275
1.7816	1.8338	1.8846	1.9342	1.9829	2.031	2.078	2.125	2.171	2.217	2.262	2.307	2.352	2.396	2.418	v		
1243.3	1255.8	1267.9	1279.7	1291.2	1302.5	1313.6	1324.5	1335.4	1346.1	1356.8	1367.4	1378.0	1388.6	1393.8	h	422	300
1.6266	1.6759	1.7237	1.7703	1.8159	1.8607	1.9048	1.9483	1.9912	2.034	2.076	2.118	2.159	2.200	2.220	v		
1236.4	1249.6	1262.4	1274.7	1286.6	1298.2	1309.7	1320.9	1332.0	1343.0	1353.9	1364.7	1375.4	1386.1	1391.4	h	436	350
1.3795	1.4243	1.4675	1.5094	1.5501	1.5900	1.6291	1.6676	1.7056	1.7430	1.7801	1.8168	1.8531	1.8892	1.9071	v		
1229.0	1243.2	1256.6	1269.4	1281.8	1293.9	1305.7	1317.2	1328.6	1339.8	1350.9	1361.9	1372.8	1383.6	1389.0	h	448	400
1.1908	1.2325	1.2724	1.3108	1.3480	1.3842	1.4196	1.4544	1.4885	1.5222	1.5554	1.5883	1.6207	1.6529	1.6689	v		
1221.2	1236.3	1250.5	1264.0	1276.9	1289.4	1301.6	1313.5	1325.1	1336.5	1347.8	1359.0	1370.1	1381.1	1386.5	h	460	450
1.0416	1.0811	1.1186	1.1544	1.1889	1.2224	1.2550	1.2868	1.3180	1.3488	1.3789	1.4088	1.4382	1.4675	1.4819	v		
1212.8	1229.0	1244.0	1258.3	1271.8	1284.8	1297.3	1309.6	1321.5	1333.2	1344.7	1356.1	1367.3	1378.4	1384.0	h	470	500
0.9204	0.9584	0.9941	1.0280	1.0604	1.0917	1.1221	1.1516	1.1805	1.2088	1.2367	1.2641	1.2913	1.3180	1.3313	v		
	1221.4	1237.4	1252.4	1266.5	1280.0	1293.0	1305.6	1317.8	1329.8	1341.6	1353.2	1364.6	1375.8	1381.4	h	480	550
	0.8565	0.8909	0.9234	0.9542	0.9838	1.0124	1.0401	1.0671	1.0935	1.1195	1.1449	1.1700	1.1947	1.2070	v		
	1213.2	1230.3	1246.1	1261.0	1275.1	1288.5	1301.5	1314.1	1326.3	1338.3	1350.2	1361.8	1373.2	1378.9	h	489	600
	0.7703	0.8040	0.8353	0.8649	0.8931	0.9203	0.9465	0.9720	0.9968	1.0211	1.0450	1.0684	1.0916	1.1030	v		

1. Adapted with permission from “Thermodynamic Properties of Steam”, Keenan and Keyes, published by John Wiley & Sons, Inc.

STEAM TABLE[1]

h = Total heat of steam, Btu per pound
v = Specific volume, cubic feet per pound

Pressure psi (gage)	Temperature F° (sat.)		Saturated Liquid	Saturated Vapor	TOTAL TEMPERATURE, °F												
					220	240	260	280	300	320	340	360	380	400	420	440	460
0	212	h	180.1	1150.4	1154.4	1164.2	1173.8	1183.3	1192.8	1202.3	1211.7	1221.1	1230.5	1239.9	1249.3	1258.8	1268.2
		v	0.0167	26.80	27.15	28.00	28.85	29.70	30.53	31.37	32.20	33.03	33.85	34.68	35.50	36.32	37.14
5	228	h	196.2	1156.3		1162.3	1172.2	1182.0	1191.6	1201.2	1210.8	1220.3	1229.7	1239.2	1248.7	1258.2	1267.6
		v	0.0168	20.089		20.48	21.11	21.74	22.36	22.98	23.60	24.21	24.82	25.43	26.04	26.65	27.25
10	240	h	208.4	1160.6			1170.7	1180.6	1190.5	1200.2	1209.8	1219.4	1229.0	1238.5	1248.1	1257.6	1267.1
		v	0.0169	16.303			16.819	17.330	17.836	18.337	18.834	19.329	19.821	20.31	20.80	21.29	21.77
15	250	h	218.8	1164.1			1169.1	1179.3	1189.3	1199.1	1208.9	1218.6	1228.3	1237.9	1247.5	1257.0	1266.6
		v	0.0170	13.746			13.957	14.390	14.816	15.238	15.657	16.072	16.485	16.897	17.306	17.714	18.121
20	259	h	227.9	1167.1			1167.5	1177.9	1188.1	1198.1	1208.0	1217.8	1227.5	1237.2	1246.8	1256A	1266.1
		v	0.0171	11.898			11.911	12.288	12.659	13.025	13.387	13.746	14.103	14.457	14.810	15.162	15.512
25	267	h	236.0	1169.7				1176.5	1186.8	1197.0	1207.0	1216.9	1226.7	1236.5	1246.2	1255.9	1265.5
		v	0.0171	10.498				10.711	11.040	11.364	11.684	12.001	12.315	12.628	12.938	13.247	13.555
30	274	h	243.4	1172.0				1175.0	1185.6	1195.9	1206.0	1216.0	1225.9	1235.8	1245.6	1255.3	1265.0
		v	0.0172	9.401				9.484	9.781	10.072	10.359	10.643	10.925	11.204	11.482	11.758	12.0033
40	287	h	256.3	1175.9					1183.0	1193.6	1204.0	1214.3	1224.4	1234.3	1244.3	1254.1	1263.9
		v	0.0173	7.787					7.947	8.192	8.432	8.668	8.902	9.134	9.364	9.592	9.819
50	298	h	267.5	1179.1					1180.3	1191.3	1202.0	1212.5	1222.7	1232.9	1242.9	1252.9	1262.8
		v	0.0174	6.655					6.676	6.889	7.096	7.300	7.501	7.700	7.896	8.091	8.285
60	308	h	277.4	1181.9						1188.9	1199.9	1210.6	1221.1	1231.4	1241.6	1251.7	1261.7
		v	0.0175	5.816						5.9321	6.116	6.296	6.473	6.648	6.820	6.991	7.161
70	316	h	286.4	1184.2						1186.4	1197.7	1208.7	1219.4	1229.9	1240.2	1250.4	1260.6
		v	0.0176	5.168						5.200	5.366	5.528	5.687	5.843	5.997	6.150	6.301
80	324	h	294.6	1186.2							1195.5	1206.7	1217.7	1228.3	1238.8	1249.2	1259.4
		v	0.0177	4.652							4.773	4.921	5.065	5.207	5.347	5.485	5.621
90	331	h	302.1	1188.1							1193.2	1204.7	1215.9	1226.7	1237.4	1247.9	1258.2
		v	0.0178	4.232							4.292	4.429	4.562	4.693	4.821	4.947	5.071
100	338	h	309.1	1189.7							1190.8	1202.7	1214.1	1225.2	1236.0	1246.6	1257.1
		v	0.0178	3.882							3.895	4.022	4.146	4.267	4.385	4.502	4.617
125	353	h	324.8	1193.0								1197.3	1209.4	1211.1	1232.3	1243.3	1254.1
		v	0.0180	3.220								3.258	3.365	3.468	3.569	3.667	3.764
150	366	h	338.5	1195.6									1204.5	1216.7	1228.4	1239.8	1251.0
		v	0.0182	2.752									2.818	2.910	2.998	3.085	3.169
175	378	h	350.8	1197.6									1199.3	1212.2	1224.5	1236.3	1247.8
		v	0.0183	2.404									2.414	2.498	2.577	2.655	2.730
200	388	h	361.9	1199.3										1207.4	1220.3	1232.6	1244.5
		v	0.0185	2.134										2.180	2.253	2.324	2.393
225	397	h	372.1	1200.6										1202.5	1216.0	1228.8	1241.1
		v	0.0186	1.9183										1.9276	1.9964	2.062	2.126
250	406	h	381.6	1201.7											1211.5	1224.9	1237.6
		v	0.0187	1.7422											1.7870	1.8488	1.9081
275	414	h	390.5	1202.6											1206.8	1220.8	1234.0
		v	0.0188	1.5954											1.6130	1.6717	1.7277
300	422	h	398.8	1203.2												1216.5	1230.3
		v	0.0190	1.4711												1.5222	1.5755
350	436	h	414.1	1204.1												1207.5	1222.4
		v	0.0192	1.2720												1.2831	1.3326
400	448	h	428.1	1204.6													1214.0
		v	0.0194	1.1194													1.1468
450	460	h	440.9	1204.6													
		v	0.0196	0.9985													
500	470	h	452.9	1204.2													
		v	0.0198	0.9004													
550	480	h	464.1	1203.7													
		v	0.0200	0.8191													
600	489	h	474.7	1203.0													
		v	0.0202	0.7503													

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