

# Small Control Valve

U.S. Type 807 and Type 752 (Includes RC200, RC220, RC250)

## DESCRIPTION

For more than 60 years, Type 807 and Type 752 valves have performed in some of the world's most demanding applications. If your application requires critical control of liquid, gas or steam, your choice of control valves is one of the most important decisions you will make.

When it comes to specifying a control valve, the variables are complicated and exacting. That is why Research Control® Valves are available in a broad range of options—so we can design a truly engineered solution that matches your requirements.

## APPLICATION

Processing plants, research facilities and government agencies worldwide rely on Research Control Valves for repeatable performance and durability. Built for applications 1 in. (25.4 mm) and under, our Types 807 and 752 control valve are integral components in systems ranging from petrochemical to pharmaceutical manufacturing. It is an ideal choice for additive injection or flow and pressure control.

## CONSTRUCTION

<b>Body – Bonnet</b>	
Standard	316/316L stainless steel, carbon steel (WCB)
Optional	Monel®, alloy 20, Hastelloy® C or ASTM equivalent, DIN 1.4581/1.4571. Other materials available upon request.
<b>Innervalue</b>	
Standard	316 stainless steel
Optional	Stellite®, Monel, alloy 20, Hastelloy C or B or ASTM equivalent
<b>Packing</b>	
Standard	TFE chevron rings
Optional	Graphite, Reduced Emissions Kalrez® (REK)
<b>Actuator</b>	
Standard	Die cast aluminum
Optional	316L stainless steel on 1/2", 3/4" and 1" models

## ACTUATOR CHOICES

<b>Standard</b>	Air to open, fail close Air to close, fail open
<b>Optional</b>	With integral top-mounted positioner
<b>Standard Signals</b>	3-15#, 3-27#, 6-30#
<b>Optional Signals</b>	3-9#, 9-15#, with positioner
<b>Accessories</b>	Filter regulator, gauges, I/P converter, limit switches, handwheel, solenoids



Shown with Type 754 Actuator

## STANDARD FEATURES

- 1/4 in. (6.4 mm), 1/2 in. (12.7 mm), 3/4 (19.1 mm) and 1 in. (25.4 mm) models
- Interchangeable trim sets
- Threaded bonnet for quick disassembly
- Trim characteristics: Linear, equal percent, quick open or double taper
- TFE chevron packing
- ANSI Class IV shutoff (size O and larger)

## OPTIONAL FEATURES FOR 1/2 IN. (12.7 MM), 3/4 IN. (19.1 MM) AND 1 IN. (25.4 MM) MODELS

- Butt and socket weld ends, BSPP, tube connection and others
- Bonnet extensions for temperature extremes
- Bellows packing solutions
- Angle pattern bodies
- Reduced Emissions Kalrez® (REK), graphite, spring loaded chevron and others
- Exotic alloys for complete valves or trims
- Stellite trims & soft seats (PTFE & Kel-F)
- TiN coating of innervalue stem and seat
- Purge or leak ports

## PRESSURE VS TEMPERATURE RATINGS FOR VALVE SUPERSTRUCTURE

The pressure/temperature ratings listed here are based on material cross sections at the joint between the body and bonnet where a gasketed screw type bonnet is used. When the proper torque levels are used, the valve should not experience rupture of the joint or the material. The listed torque levels were used in hydrostatic tests at the factory at 70° F (21.1° C) at maximum body rating and were found to provide acceptable seating. Other factors, such as high or cyclic temperatures, light process gases, or poor gasket surfaces can dictate the ability of a seal to be made. Under such conditions, the only way to be sure of tight sealing is to perform a test under the actual process conditions.

These charts are not intended as an indication of functionality or suitability for control service. Other charts are available to assist in the choosing of valve type, bonnet type, trim type and actuator.

When flanges, fittings or other pressure containing elements are added to the valve, the pressure rating of the total valve assumes the rating of the weakest component.

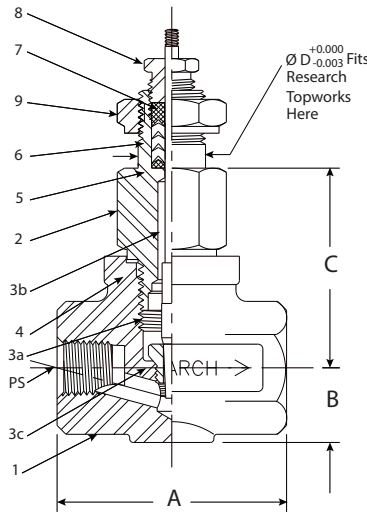
The following charts exclude packing or end fittings:

1/4 in. Research Control Valve						
Temp	316 S/S psi (bar)	Carbon Steel psi (bar)	Hastelloy B or = psi (bar)	Hastelloy C or = psi (bar)	Monel psi (bar)	Alloy 20 psi (bar)
100° F (37.8° C)	5000 (345)	4000 (276)	5000 (345)	5000 (345)	4000 (276)	5000 (345)
200° F (93.3° C)	5000 (345)	3700 (255)	5000 (345)	5000 (345)	4000 (276)	5000 (345)
300° F (148.9° C)	4750 (328)	3500 (241)	5000 (345)	5000 (345)	3880 (268)	4850 (334)
400° F (204.4° C)	4190 (289)	3200 (221)	5000 (345)	5000 (345)	3770 (260)	4700 (324)
500° F (260.0° C)	4000 (276)	2900 (200)	4900 (338)	4900 (338)	3740 (258)	4500 (310)
600° F (315.6° C)	3820 (263)	2600 (179)	4850 (334)	4850 (334)	3740 (258)	4200 (290)
700° F (371.1° C)	3640 (351)	2300 (159)	4800 (331)	4800 (331)	3640 (251)	3900 (269)
800° F (426.7° C)	3580 (247)	—	4750 (328)	4750 (328)	3580 (247)	3700 (255)
900° F (482.2° C)	2840 (196)	—	—	4500 (310)	2280 (157)	3000 (207)
1000° F (537.8° C)	1160 (80)	—	—	4000 (276)	940 (65)	1500 (103)
1100° F (593.3° C)	Consult factory for higher temperatures.			3500 (241)	—	—
1200° F (648.9° C)	Consult factory for higher temperatures.			3000 (207)	—	—
Recommended torque in ft-lb (Nm), +/- 2 ft-lb (2.71 Nm)						
	37 (50)	37 (50)	39 (53)	37 (50)	31 (42)	35 (47)

1/2 in. Research Control Valve						
Temp	316 S/S psi (bar)	Carbon Steel psi (bar)	Hastelloy B or = psi (bar)	Hastelloy C or = psi (bar)	Monel psi (bar)	Alloy 20 psi (bar)
100° F (37.8° C)	5000 (345)	4000 (276)	5000 (345)	5000 (345)	4000 (276)	5000 (345)
200° F (93.3° C)	4750 (328)	3800 (262)	5000 (345)	5000 (345)	3780 (261)	5000 (345)
300° F (148.9° C)	4310 (297)	3600 (248)	5000 (345)	5000 (345)	3520 (243)	4950 (341)
400° F (204.4° C)	3860 (266)	3300 (228)	5000 (345)	5000 (345)	3420 (236)	4850 (334)
500° F (260.0° C)	3640 (251)	3100 (214)	4900 (338)	4900 (338)	3390 (234)	4600 (317)
600° F (315.6° C)	3470 (239)	2900 (200)	4850 (334)	4870 (336)	3390 (234)	4300 (296)
700° F (371.1° C)	3310 (228)	2700 (186)	4800 (331)	4610 (318)	3310 (228)	4200 (290)
800° F (426.7° C)	3255 (224)	—	4750 (328)	4430 (305)	2090 (114)	4000 (276)
900° F (482.2° C)	3190 (220)	—	—	4200 (290)	2070 (143)	3000 (207)
1000° F (537.8° C)	1860 (128)	—	—	4000 (276)	850 (59)	1500 (103)
1100° F (593.3° C)	Consult factory for higher temperatures.			3400 (234)	—	—
1200° F (648.9° C)	Consult factory for higher temperatures.			3000 (207)	—	—
Recommended torque in ft-lb (Nm), +/- 2 ft-lb (2.71 Nm)						
	122 (165)	122 (165)	131 (178)	124 (168)	102 (138)	117 (159)

3/4 in. and 1 in. Research Control Valve				
Temp	316 S/S psi (bar)		Carbon Steel psi (bar)	
	3/4 in. (19.1 mm)	1 in. (25.4 mm)	3/4 in. (19.1 mm)	1 in. (25.4 mm)
100° F (37.8° C)	1500 (103)	1500 (103)	1500 (103)	1500 (103)
200° F (93.3° C)	1450 (100)	1450 (100)	1350 (93)	1350 (93)
300° F (148.9° C)	1325 (91)	1325 (91)	1325 (91)	1325 (91)
400° F (204.4° C)	1175 (81)	1175 (81)	1275 (88)	1275 (88)
500° F (260.0° C)	1100 (76)	1100 (76)	1200 (83)	1200 (83)
600° F (315.6° C)	1050 (72)	675 (46)	1100 (76)	1100 (76)
700° F (371.1° C)	840 (58)	250 (17)	1075 (74)	1075 (74)
800° F (426.7° C)	575 (40)	—	—	—
3/4 in. and 1 in. Torque = 290 ft-lb (393 Nm)				

**DIMENSIONS**



1. Valve Body
2. Valve Bonnet
3. Trim Set (innervalue)
4. Body Bonnet Gasket
5. Packing Adaptor
6. Packing (CV ring)
7. Packing Follower
8. Packing Gland
9. Yoke Lock Nut

PS	A	B	C	D	Stroke
0.25 in. (6.4 mm)	2.12 in. (53.8 mm)	0.68 in. (17.3 mm)	1.87 in. (47.5 mm)	0.625 in. (115.9 mm)	0.437 in. (11.1 mm)
0.50 in. (12.7 mm)	2.75 in. (69.9 mm)	1.00 in. (25.4 mm)	2.85 in. (72.4 mm)	0.875 in. (22.2 mm)	0.562 in. (14.3 mm)
0.75 in. (19.1 mm)	3.37 in. (85.6 mm)	1.18 in. (30.0 mm)	3.84 in. (97.5 mm)		
1 in. (25.4 mm)	4.00 in. (101.6 mm)	1.50 in. (38.1 mm)	3.95 in. (100.3 mm)		

**INNERVALVE CHART**

Valve Size	Trim Designation	Nominal Cv	Theoretical Turbulent Cv	Orifice Dia.	Orifice Area	Nominal Rangeability Linear	Equal %
1 in. (25.4 mm)	6.0	6.0	6.0	0.6250 (15.9 mm)	0.3068 in. <sup>2</sup> (197.9 mm <sup>2</sup> )	50:1	60:1
	5.0	5.0	5.0	0.6250 (15.9 mm)	0.3068 in. <sup>2</sup> (197.9 mm <sup>2</sup> )	50:1	60:1
	4.5	4.5	4.5	0.5000 (12.7 mm)	0.1963 in. <sup>2</sup> (126.6 mm <sup>2</sup> )	50:1	60:1
3/4 in. (19.1 mm) and 1 in. (25.4 mm)	4.0	4.0	4.0	0.5000 (12.7 mm)	0.1963 in. <sup>2</sup> (126.6 mm <sup>2</sup> )	50:1	60:1
	3.5	3.5	3.5	0.5000 (12.7 mm)	0.1963 in. <sup>2</sup> (126.6 mm <sup>2</sup> )	50:1	60:1
1/2 in. (12.7 mm), 3/4 in. (19.1 mm) and 1 in. (25.4 mm)	A	2.5	2.5	0.3750 (9.5 mm)	0.1104 in. <sup>2</sup> (71.2 mm <sup>2</sup> )	40:1	50:1
	B	2.0	2.0	0.3750 (9.5 mm)	0.1104 in. <sup>2</sup> (71.2 mm <sup>2</sup> )	40:1	50:1
	C	1.25	1.25	0.2810 (7.1 mm)	0.0620 in. <sup>2</sup> (40.0 mm <sup>2</sup> )	40:1	50:1
	D	0.8	0.8	0.2500 (6.4 mm)	0.0491 in. <sup>2</sup> (31.7 mm <sup>2</sup> )	40:1	50:1
	E	0.5	0.5	0.2500 (6.4 mm)	0.0491 in. <sup>2</sup> (31.7 mm <sup>2</sup> )	40:1	50:1
1/4 in. (6.4 mm), 1/2 in. (12.7 mm), 3/4 in. (19.1 mm) and 1 in. (25.4 mm)	F	0.32	0.32	0.1560 (3.9 mm)	0.0191 in. <sup>2</sup> (12.3 mm <sup>2</sup> )	30:1	40:1
	G	0.2	0.2	0.1560 (3.9 mm)	0.0191 in. <sup>2</sup> (12.3 mm <sup>2</sup> )	30:1	40:1
	H	0.13	0.13	0.1560 (3.9 mm)	0.0191 in. <sup>2</sup> (12.3 mm <sup>2</sup> )	30:1	40:1
	I	0.08	0.08	0.1560 (3.9 mm)	0.0191 in. <sup>2</sup> (12.3 mm <sup>2</sup> )	30:1	40:1
	J	0.05	0.05	0.1560 (3.9 mm)	0.0191 in. <sup>2</sup> (12.3 mm <sup>2</sup> )	30:1	40:1
	K	0.03	4.8E-02	0.0860 (2.2 mm)	0.0058 in. <sup>2</sup> (3.7 mm <sup>2</sup> )	25:1	—
	L	0.02	3.4E-02	0.0860 (2.2 mm)	0.0058 in. <sup>2</sup> (3.7 mm <sup>2</sup> )	25:1	—
	M	0.01	1.6E-02	0.0860 (2.2 mm)	0.0058 in. <sup>2</sup> (3.7 mm <sup>2</sup> )	25:1	—
	N	0.006	1.0E-02	0.0860 (2.2 mm)	0.0058 in. <sup>2</sup> (3.7 mm <sup>2</sup> )	25:1	—
	O	0.003	5.3E-03	0.0860 (2.2 mm)	0.0058 in. <sup>2</sup> (3.7 mm <sup>2</sup> )	25:1	—
1/4 in. (6.4 mm) and 1/2 in. (12.7 mm)	P1	0.002	3.6E-03	0.0625 (1.6 mm)	0.0031 in. <sup>2</sup> (2.0 mm <sup>2</sup> )	15:1	—
	P2	0.0013	2.5E-03	0.0625 (1.6 mm)	0.0031 in. <sup>2</sup> (2.0 mm <sup>2</sup> )	15:1	—
	P3	0.001	2.0E-03	0.0625 (1.6 mm)	0.0031 in. <sup>2</sup> (2.0 mm <sup>2</sup> )	15:1	—
	P4	0.0006	1.4E-03	0.0625 (1.6 mm)	0.0031 in. <sup>2</sup> (2.0 mm <sup>2</sup> )	15:1	—
	P5	0.0004	1.0E-03	0.0625 (1.6 mm)	0.0031 in. <sup>2</sup> (2.0 mm <sup>2</sup> )	15:1	—
	P6	0.00027	8.3E-04	0.0625 (1.6 mm)	0.0031 in. <sup>2</sup> (2.0 mm <sup>2</sup> )	15:1	—
	P7	0.00018	6.8E-04	0.0625 (1.6 mm)	0.0031 in. <sup>2</sup> (2.0 mm <sup>2</sup> )	15:1	—
	P8	0.00012	5.6E-04	0.0625 (1.6 mm)	0.0031 in. <sup>2</sup> (2.0 mm <sup>2</sup> )	15:1	—
	P9	0.00008	4.6E-04	0.0625 (1.6 mm)	0.0031 in. <sup>2</sup> (2.0 mm <sup>2</sup> )	15:1	—
1/4 in. (6.4 mm)	P10	0.00005	1.9E-04	0.0420 (1.1 mm)	0.0014 in. <sup>2</sup> (0.9 mm <sup>2</sup> )	15:1	—
	P11	0.000036	1.6E-04	0.0420 (1.1 mm)	0.0014 in. <sup>2</sup> (0.9 mm <sup>2</sup> )	15:1	—
	P12	0.000024	1.3E-04	0.0420 (1.1 mm)	0.0014 in. <sup>2</sup> (0.9 mm <sup>2</sup> )	15:1	—
	P13	0.000016	1.1E-04	0.0420 (1.1 mm)	0.0014 in. <sup>2</sup> (0.9 mm <sup>2</sup> )	15:1	—
	P14	0.00001	8.4E-05	0.0420 (1.1 mm)	0.0014 in. <sup>2</sup> (0.9 mm <sup>2</sup> )	15:1	—
	P15	0.000006	6.6E-05	0.0420 (1.1 mm)	0.0014 in. <sup>2</sup> (0.9 mm <sup>2</sup> )	15:1	—
	P16	0.000004	5.3E-05	0.0420 (1.1 mm)	0.0014 in. <sup>2</sup> (0.9 mm <sup>2</sup> )	15:1	—
	P17	0.0000027	4.4E-05	0.0420 (1.1 mm)	0.0014 in. <sup>2</sup> (0.9 mm <sup>2</sup> )	15:1	—
	P18	0.0000018	3.6E-05	0.0420 (1.1 mm)	0.0014 in. <sup>2</sup> (0.9 mm <sup>2</sup> )	15:1	—

### DESCRIPTION

The Type NRMA Non-Rotating Manual Actuation design is used in applications where either our low-flow trims, cooling fins or bellows are needed and when applications demand human interaction. The manual actuator can be mounted on all RC series valves, including all "P" Trims and all Bonnets. Exchanging between electrical, pneumatic and manual actuators is therefore possible at any time with simple additions. The actuator is encapsulated and completely maintenance-free—designed for fine control.

### APPLICATIONS

When you turn the hand wheel, the valve interior moves in a linear motion. This linear movement, from the hand wheel to the internal coupling, prevents damage to the trim and seat, distinguishing this design from conventional manual control valves.

### FEATURES

- Hand drive, linear
- Suitable for Badger Meter® modular construction

### MATERIALS

<b>Case</b>	1.4404 (316L)
<b>Yoke</b>	1.4404 (316L)
<b>Hand Wheel</b>	Duroplast

### SPECIFICATIONS

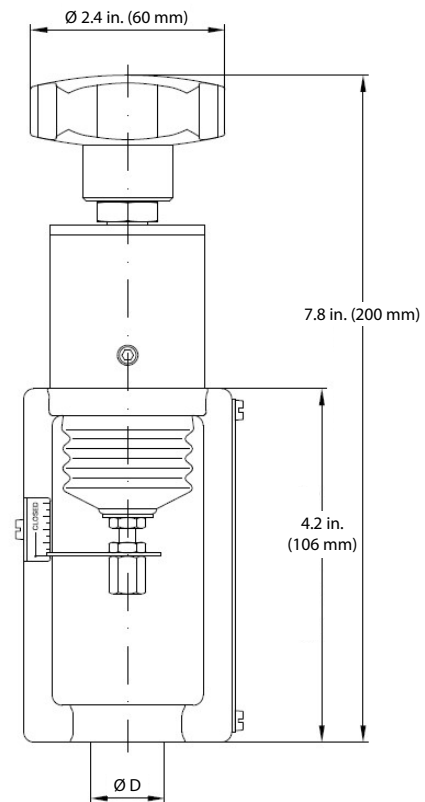
<b>Weight</b>	Approximately 3.3 lb (1.5 kg)
<b>Temperature</b>	-40...176° F (-40...80° C)
<b>Valve Lift</b>	0.04 in. (1 mm) / 360° turn

### SIZES FOR RESEARCH CONTROL VALVES

Sizes	Ø Average	Stroke
1/4 in. standard	0.625 in.	11.1 mm
1/2 in., 3/4 in., 1 in. standard	0.875 in.	14.3 mm
1/2 in., 3/4 in., 1 in. heavy duty guiding	0.875 in.	14.3 mm



### DIMENSIONS



RCV Valves		Trim Sizes Equal %															
% Lift	% Cv	6.0	5	4.5	4	3.5	A	B	C	D	E	F	G	H	I	J	% Lift
0%	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0%
5%	1.0%	0.06	0.05	0.04	0.04	0.03	0.02	0.02	0.01	0.008	0.005	0.003	0.002	0.001	0.001	0.000	5%
10%	1.9%	0.11	0.10	0.09	0.08	0.07	0.05	0.04	0.02	0.015	0.010	0.006	0.004	0.002	0.002	0.001	10%
20%	3.8%	0.23	0.19	0.17	0.15	0.13	0.10	0.08	0.05	0.031	0.019	0.012	0.008	0.005	0.003	0.002	20%
25%	4.8%	0.29	0.24	0.22	0.19	0.17	0.12	0.10	0.06	0.038	0.024	0.015	0.010	0.006	0.004	0.002	25%
30%	5.9%	0.35	0.29	0.26	0.23	0.20	0.15	0.12	0.07	0.047	0.029	0.019	0.012	0.008	0.005	0.003	30%
40%	8.8%	0.53	0.44	0.40	0.35	0.31	0.22	0.18	0.11	0.070	0.044	0.028	0.018	0.011	0.007	0.004	40%
50%	13.2%	0.79	0.66	0.59	0.53	0.46	0.33	0.26	0.16	0.105	0.066	0.042	0.026	0.017	0.011	0.007	50%
60%	19.8%	1.19	0.99	0.89	0.79	0.69	0.49	0.40	0.25	0.158	0.099	0.063	0.040	0.026	0.016	0.010	60%
70%	29.6%	1.78	1.48	1.33	1.19	1.04	0.74	0.59	0.37	0.237	0.148	0.095	0.059	0.039	0.024	0.015	70%
75%	36.3%	2.18	1.81	1.63	1.45	1.27	0.91	0.73	0.45	0.290	0.181	0.116	0.073	0.047	0.029	0.018	75%
80%	44.4%	2.67	2.22	2.00	1.78	1.56	1.11	0.89	0.56	0.356	0.222	0.142	0.089	0.058	0.036	0.022	80%
90%	66.7%	4.00	3.33	3.00	2.67	2.33	1.67	1.33	0.83	0.533	0.333	0.213	0.133	0.087	0.053	0.033	90%
100%	100%	6.00	5.00	4.50	4.00	3.50	2.50	2.00	1.25	0.800	0.500	0.320	0.200	0.130	0.080	0.050	100%
Valve Sizes		1"	1"	1"	1", 3/4"	1", 3/4"	1-1/2"	1-1/2"	1-1/2"	1-1/2"	1-1/2"	1-1/4"	1-1/4"	1-1/4"	1-1/4"	1-1/4"	

Trim Sizes O through P-18 are available only in linear characteristic. See Product Data Sheets for maximum Cvs.

RCV Valves		Trim Sizes Equal %															
% Lift	% Cv	6.0	5	4.5	4	3.5	A	B	C	D	E	F	G	H	I	J	% Lift
0%	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0%
5%	1.0%	0.30	0.25	0.23	0.20	0.18	0.13	0.10	0.06	0.040	0.025	0.016	0.010	0.007	0.004	0.003	5%
10%	1.9%	0.60	0.50	0.45	0.40	0.35	0.25	0.20	0.13	0.080	0.050	0.032	0.020	0.013	0.008	0.005	10%
20%	3.8%	1.20	1.00	0.90	0.80	0.70	0.50	0.40	0.25	0.160	0.100	0.064	0.040	0.026	0.016	0.010	20%
25%	4.8%	1.50	1.25	1.13	1.00	0.88	0.63	0.50	0.31	0.200	0.125	0.080	0.050	0.033	0.020	0.013	25%
30%	5.9%	1.80	1.50	1.35	1.20	1.05	0.75	0.60	0.38	0.240	0.150	0.096	0.060	0.039	0.024	0.015	30%
40%	8.8%	2.40	2.00	1.80	1.60	1.40	1.00	0.80	0.50	0.320	0.200	0.128	0.080	0.052	0.032	0.020	40%
50%	13.2%	3.00	2.50	2.25	2.00	1.75	1.25	1.00	0.63	0.400	0.250	0.160	0.100	0.065	0.040	0.025	50%
60%	19.8%	3.60	3.00	2.70	2.40	2.10	1.50	1.20	0.75	0.480	0.300	0.192	0.120	0.078	0.048	0.030	60%
70%	29.6%	4.20	3.50	3.15	2.80	2.45	1.75	1.40	0.88	0.560	0.350	0.224	0.140	0.091	0.056	0.035	70%
75%	36.3%	4.50	3.75	3.38	3.00	2.63	1.88	1.50	0.94	0.600	0.375	0.240	0.150	0.098	0.060	0.038	75%
80%	44.4%	4.80	4.00	3.60	3.20	2.80	2.00	1.60	1.00	0.640	0.400	0.256	0.160	0.104	0.064	0.040	80%
90%	66.7%	5.40	4.50	4.05	3.60	3.15	2.25	1.80	1.13	0.720	0.450	0.288	0.180	0.117	0.072	0.045	90%
100%	100%	6.00	5.00	4.50	4.00	3.50	2.50	2.00	1.25	0.800	0.500	0.320	0.200	0.130	0.080	0.050	100%
Valve Sizes		1"	1"	1"	1", 3/4"	1", 3/4"	1-1/2"	1-1/2"	1-1/2"	1-1/2"	1-1/2"	1-1/4"	1-1/4"	1-1/4"	1-1/4"	1-1/4"	

Numbers are for reference or comparison only.

# Research Control Valves

## CV vs Lift Curve

% Lift	% Maximum Cv	
	Linear	Equal %
0%	0%	0%
5%	5%	1%
10%	10%	2%
20%	20%	4%
25%	25%	5%
30%	30%	6%
40%	40%	9%
50%	50%	13%
60%	60%	20%
70%	70%	30%
75%	75%	36%
80%	80%	44%
90%	90%	67%
100%	100%	100%

**% Cv vs. % Lift**

