

Small Control Valve

U.S. Type 860 and 809 (Includes RC210)

DESCRIPTION

The U.S. Type 860 globe control valve features a 1/2 in. (12.7 mm) body with 150 lb ANSI raised face flanges. It is designed to fit directly into pipelines of the same flange size and rating. Its compact size and light weight make it especially suited to modulating control of medium to low flow rates in the pressure range of 150 lb flanges. Its welded construction make it readily available in a variety of materials. Other flange sizes and pressure ratings are available in the Type 809 valve assembly. Consult the factory for details.

APPLICATIONS

The Type 860 and Type 809 valves are widely used in industrial applications where flanged type ends are desired to facilitate removal of the unit from the line or to comply with specific piping standards. The compact design of the valve is especially attractive when flanged up to 3/4 in. (19.1 mm), 1 in. (25.4 mm) or 1-1/2 in. (38.1 mm) line sizes for controlling flow rates within the 1/2 in. (12.7 mm) valve size.

MATERIALS

Body and Bonnet	
Standard	316 SST, carbon steel (WCB)
Optional	Monel [®] , Alloy 20, Hastelloy [®] C and B or ASTM equivalent
Innervalve	
Standard	316 SST
Optional	Stellite [®] , Monel, Alloy 20, Hastelloy C and B or ASTM equivalent
Packing	
Standard	TFE CV rings, graphite
Standard	TFE chevron rings
Optional	Graphite
Actuator	
Standard	Die cast aluminum
Optional	316L SST (may be cast) on standard 1/2 in. (12.7 mm) models

ACTUATOR CHOICES

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



Shown with Type 754 Actuator

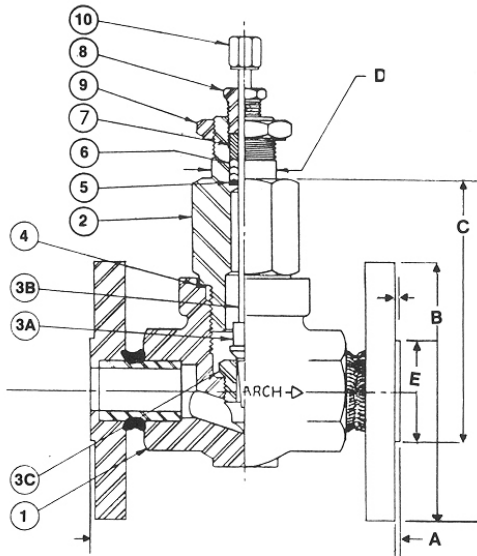
STANDARD FEATURES

- 1/2 in. (12.7 mm) models
- Interchangeable trim sets
- Class 150 raised face flanges
- Trim characteristics: Linear, equal percent, quick open or double taper
- TFE chevron packing
- ANSI Class IV shutoff (size J trim and larger)
- Threaded bonnet for quick disassembly

OPTIONAL FEATURES

- Special face-to-face dimensions
- Oversized flanges
- Ring type joint, tongue and groove, flat face or raised face smooth flanges
- Bellows packing solutions
- Reduced Emissions Kalrez[®] (REK), graphite, spring-loaded chevron and others
- Bonnet extensions for temperature extremes
- Angle pattern body
- Exotic Alloys for complete valves or trims
- Stellite trims & soft seats (PTFE & Kel-F)
- TiN coating of innervalve stem and seat

DIMENSIONS



A	B	C	D	E	F	Stroke
4.24 in. (108 mm)	3.5 in. (89 mm)	2.85 in. (72 mm)	0.875 in. (22 mm)	1.38 in. (35 mm)	0.062 in. (2 mm)	0.562 in. (14 mm)

PRESSURE/TEMPERATURE RATING

Temp ° F (° C)	316 SS. psig (barg)	Carbon Steel. psig (barg)	Hastelloy B. psig (barg)	Hastelloy C. psig (barg)	Monel. psig (barg)	Alloy 20. psig (barg)
100 (38)	275 (19)	285 (19.7)	290 (20)	290 (20)	230 (16)	230 (16)
200 (93)	240 (17)	260 (18)	260 (18)	260 (18)	200 (14)	215 (15)
300 (149)	215 (15)	230 (16)	230 (16)	20 (1.4)	190 (13)	200 (14)
* 400 (204)	195 (13.4)	200 (14)	200 (14)	200 (14)	185 (12.8)	—
500 (260)	170 (12)	170 (12)	170 (12)	170 (12)	170 (12)	—
600 (316)	140 (10)	140 (10)	140 (10)	140 (10)	140 (10)	—
700 (371)	110 (7.6)	110 (7.6)	110 (7.6)	110 (7.6)	110 (7.6)	—
750 (400)	—	95	—	—	—	—
800 (427)	80 (5.5)	—	80 (5.5)	80 (5.5)	80 (5.5)	—
900 (482)	50 (3)	—	—	—	—	—
1000 (538)	20 (1.4)	—	—	—	—	—
Recommended torque in ft-lb (Nm), +/- 2 ft-lb (2.71 Nm)						
Torque	122 (165)	122 (165)	131 (178)	124 (168)	102 (138)	117 (159)

* The maximum temperature for Teflon CV ring packing in the standard bonnet is 400° F (204° C). A cooling fin bonnet or other packing should be used above this point.

NOTE: The pressure ratings were taken from ANSI B 16.34, 1981 covering flanged valves. All ratings are for properly torqued, gasketed body-bonnet assemblies. Valve packing is not included in the rating and should be considered separately.

NOTE: The list above is a pressure/temperature rating only and is not an indication of functionality or suitability for control service. Other literature is available to assist in the choosing of valve type, bonnet type, trim and actuator.

1. Valve body (investment cast in all but Monel)
2. Valve bonnet: 1-1/4 in. (31.8 mm) hex (some exotic materials may use round)
3. Innervalve (trim) set
 - a. Plug (integral w/stem on some materials)
 - b. Stem: 3/16 in. (4.7 mm) diameter
 - c. Seat: 5/8 in. (15.9 mm) hex
4. Body bonnet gasket (may not be supplied in exotic materials)
5. Packing adaptor (CV ring packing only)
6. Packing (CV ring)
7. Packing follower (CV ring packing only)
8. Packing gland: 1/2 in. (12.7mm) hex
9. Yoke lock nut: 1-1/8 in. (28.6 mm) hex
10. Stem connector: 3/8 in. (9.5 mm) hex

INNERVALVE CHART

Valve Size	Trim Size	Nominal Cv	Theoretical Turbulent Cv	Orifice Dia. in. (mm)	Orifice Area in. ² (mm ²)	Nominal Rangeability	
						Linear	Equal %
1/2 in. (12.7 mm), 3/4 in. (19.1 mm), 1 in. (25.4 mm)	A	2.5	2.5	0.3750 (9.5)	0.1104 (71.2)	40:1	50:1
	B	2.0	2.0	0.3750 (9.5)	0.1104 (71.2)	40:1	50:1
	C	1.25	1.25	0.2810 (7.1)	0.0620 (40.0)	40:1	50:1
	D	0.8	0.8	0.2500 (6.4)	0.0491 (31.7)	40:1	50:1
	E	0.5	0.5	0.2500 (6.4)	0.0491 (31.7)	40:1	50:1
1/4 in. (6.4 mm), 1/2 in. (12.7 mm), 3/4 in. (19.1 mm), 1 in. (25.4 mm)	F	0.32	0.32	0.1560 (3.9)	0.0191 (12.3)	30:1	40:1
	G	0.2	0.2	0.1560 (3.9)	0.0191 (12.3)	30:1	40:1
	H	0.13	0.13	0.1560 (3.9)	0.0191 (12.3)	30:1	40:1
	I	0.08	0.08	0.1560 (3.9)	0.0191 (12.3)	30:1	40:1
	J	0.05	0.05	0.1560 (3.9)	0.0191 (12.3)	30:1	40:1
	K	0.03	4.8E-02	0.0860 (2.2)	0.0058 (3.7)	25:1	—
	L	0.02	3.4E-02	0.0860 (2.2)	0.0058 (3.7)	25:1	—
	M	0.01	1.6E-02	0.0860 (2.2)	0.0058 (3.7)	25:1	—
	N	0.006	1.0E-02	0.0860 (2.2)	0.0058 (3.7)	25:1	—
	O	0.003	5.3E-03	0.0860 (2.2)	0.0058 (3.7)	25:1	—
1/4 in. (6.4 mm), 1/2 in. (12.7 mm)	P-1	0.002	3.6E-03	0.0625 (1.6)	0.0031 (2.0)	15:1	—
	P-2	0.0013	2.5E-03	0.0625 (1.6)	0.0031 (2.0)	15:1	—
	P-3	0.001	2.0E-03	0.0625 (1.6)	0.0031 (2.0)	15:1	—
	P-4	0.0006	1.4E-03	0.0625 (1.6)	0.0031 (2.0)	15:1	—
	P-5	0.0004	1.0E-03	0.0625 (1.6)	0.0031 (2.0)	15:1	—
	P-6	0.00027	8.3E-04	0.0625 (1.6)	0.0031 (2.0)	15:1	—
	P-7	0.00018	6.8E-04	0.0625 (1.6)	0.0031 (2.0)	15:1	—
	P-8	0.00012	5.6E-04	0.0625 (1.6)	0.0031 (2.0)	15:1	—
	P-9	0.00008	4.6E-04	0.0625 (1.6)	0.0031 (2.0)	15:1	—

NOTE: K...O trims, as well as P-series trims, are considered reduced trims when installed in a 1/2 in. (12.7 mm) valve.

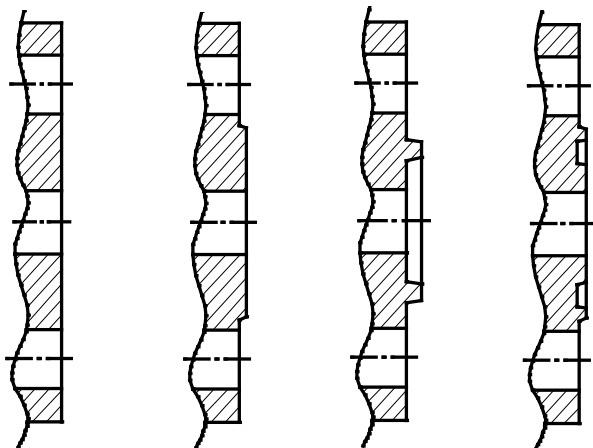
NOTE: P-1...P-9 trims should be used in 1/4 in. (6.4 mm) valves. However, they are available in 1/2 in. (12.7 mm) valve on special order. Consult the factory for availability and materials. Occasionally, P-1...P-9 are made on the smaller 0.042 in. (1.1 mm) orifice and the methods of manufacture and flow standards are the same as the 0.025 in. (0.6 mm) orifice. The actual diameter of the plug may vary slightly from the dimensions listed.

Information Specific to RC210 Control Valves with DIN Flanges

DESCRIPTION

- Control valve in sizes 1 in., 3/4 in. and 1/2 in.
- Globe cast body with welded on flanges or cast housing
- Suitable for control of medium and low flow
- Many variations not listed here

FLANGES



EN 1092-1			
Form A	Form B1, B2	Form C	Form D
DIN 2526	DIN 2526	DIN 2526	DIN 2522
Form A-B	Form C-E	Form F	Form N

EN 1092-1		DIN 2526	ANSI B16-5
Form A	RA 12.5 mm	Form B	RF (Raised Face)
RFSF (Raised Face Smooth Finish)	—	—	RFSF (Raised Face Smooth Finish)
Not applicable		Form C	FF (Flat Face)
FFSF (Flat Face Smooth Finish)	—	—	FFSF (Flat Face Smooth Finish)
Form B1	RA 3.2 mm to PN40	Form D	—
Form B2	RA 0.8 mm to PN63	Form E	—
Form C	Tongue	Form F	T
Form D	Groove	Form N	G, RTJ

ACTUATOR CHOICES

Pneumatic Actuator

Standard Type	Air to open, fail close Air to close, fail open
Optional Type	With integral top-mounted positioner
Standard Material	Die cast Aluminium with Epoxy paint
Optional Material	316L S/S (For 1/2 in. valves only)

Electric Actuator

Optional Special Types Available	Explosion-proof: Air to open, fail close Air to close, fail open
---	--

PRESSURE VS TEMPERATURE RATING ACC. DIN

Max. pressure in bar.

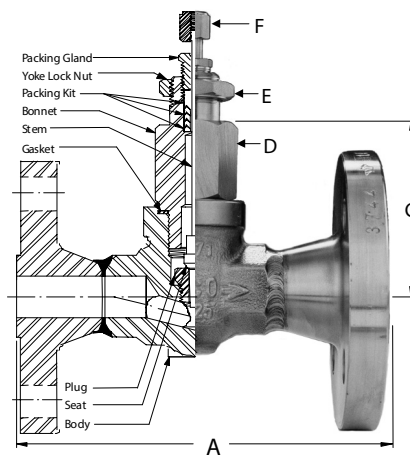
°C	PN16	PN40	PN100	PN160	PN320
20	16	40	100	160	320
100	14	34	85	136	271
200	11	29	72	115	2229
300	10	25	64	102	203
400	9	24	60	195	191
500	8	22	54	87	174

PRESSURE VS TEMPERATURE RATING ACC. ANSI

Max. pressure in bar.

°C	150#	300#	600#	900#	2500#
20	19	50	99	149	340
100	16	42	84	127	320
200	14	36	71	107	269
300	10	32	63	95	242
400	7	29	59	89	226
500	3	27	54	82	190

DIMENSIONS



Dims.	C	D	E	F
RC 1 in.	100	1-3/4 in.	1-1/8 in.	1/2 in.
RC 3/4 in.	99	1-1/2 in.	1-1/8 in.	1/2 in.
RC 1/2 in.	72	1-1/4 in.	1-1/8 in.	1/2 in.

Dim. A	DN15	DN20	DN25	DN32	DN40	DIN 3202
PN 16/40	130	150	160	180	200	
PN 100/160	210	230	230	260	260	
PN 320	230	260	260	300	300	

	1/2 in.	3/4 in.	1 in.	1-1/2 in.	2 in.	ANSI B16.10-1973
150#	108	184	184	222	254	
300#	152	194	197	235	267	
600#	165	206	210	251	286	
900#/1500#	216	229	254	305	368	
2500#	264	273	308	384	451	

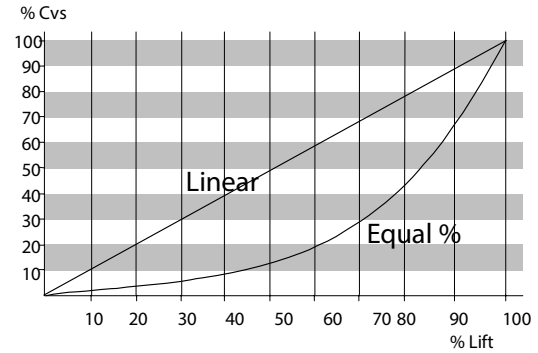
INNERVALVE CHART

Valve Size	Trim Size	Nominal Cvs	Theoretical Turbulent Cv
1 in.	V	6.0	6.0
	U	5.0	5.0
	T	4.5	4.5
3/4 in. and 1 in.	S	3.0	4.0
	R	3.5	3.5
1/2 in. and 3/4 in.	A	2.5	2.5/2.2
	B	2.0	2.0
	C	1.25	1.25
	D	0.80	0.80
	E	0.50	0.50
	F	0.32	0.32
	G	0.20	0.20
	H	0.13	0.13
	I	0.08	0.08
	J	0.05	0.05
	K	0.03	4.8E-02
	L	0.02	3.4E-02
	M	0.01	1.6E-02
	N	0.006	1.0E-02
	O	0.003	5.3E-03
1/2 in.	P1	2.0 E-03	3.6E-03
	P2	1.3 E-03	2.5E-03
	P3	1.0 E-03	2.0E-03
	P4	6.0 E-04	1.4E-03
	P5	4.0 E-04	1.0E-03
	P6	2.7 E-04	8.3E-04
	P7	1.8 E-04	6.8E-04
	P8	1.2 E-04	5.6E-04
	P9	8.0 E-05	4.6E-04

Seat Leakage

0.01% of Cvs for "O" and larger ANSI Class IV
 0.1% of Cvs for "P1" and smaller ANSI Class III
 Optional: Metallic or soft seated (PTFE or Kel-F).

Innervalue Characteristics



Control. Manage. Optimize.

Research Control is a registered trademark of Badger Meter, Inc. Other trademarks appearing in this document are the property of their respective entities. Due to continuous research, product improvements and enhancements, Badger Meter reserves the right to change product or system specifications without notice, except to the extent an outstanding contractual obligation exists. © 2021 Badger Meter, Inc. All rights reserved.

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

Case	1.4404 (316L)
Yoke	1.4404 (316L)
Hand Wheel	Duroplast

SPECIFICATIONS

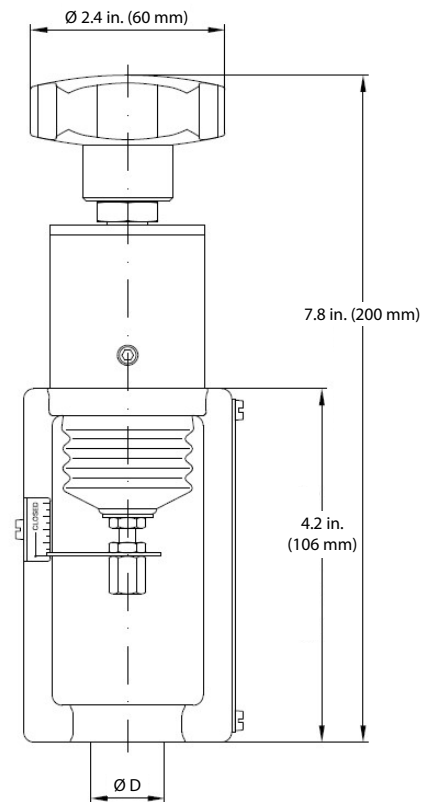
Weight	Approximately 3.3 lb (1.5 kg)
Temperature	-40...176° F (-40...80° C)
Valve Lift	0.04 in. (1 mm) / 360° turn

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

