Control Valve Characteristics

HumidPack and HumidiPackPlus are supplied with the Armstrong Series ACV Control Valve for applications when central steam or steam under pressure is available. The valve utilizes our parabolic plug design offering immediate response and precise modulation of flow throughout the ¾" valve stroke. The parabolic plug also offers high rangeabilities.

Accuracy by Design – Not by Accident

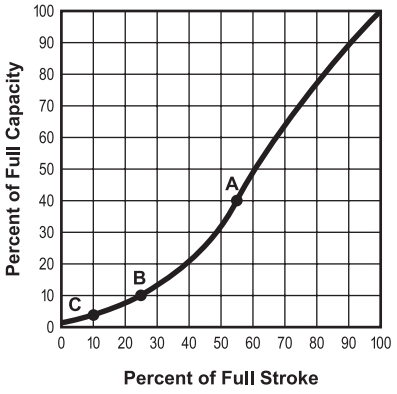
The secret of accurate control is making sure a valve's control characteristics match the application. When they do, the valve controls accurately (without hunting) and performs reliably. When there's no match, the valve simply cannot do what the application demands.

Armstrong uses a modified parabolic plug to handle exceptionally low output. The modification of true linear characteristics provides more precise control when capacity requirements are very low and the valve is just cracked off the seat. Notice in Figure 84-1 that at point A on the curve more than half the valve stroke is devoted to 40% of the unit's capacity. At point B, 1/4 of the stroke is devoted to only 10% of capacity. At point C, 10% of the stroke covers less than 5% of the unit's capacity.

How low can the unit control? Table 85-1 tabulates this function, called rangeability. Rangeability is the ratio between the maximum controllable flow and the minimum controllable flow through the valve. The higher the rangeability of a valve, the more accurately it can control flow when low output is required. If rangeability is too low, the valve will "hunt" excessively when low output is required.

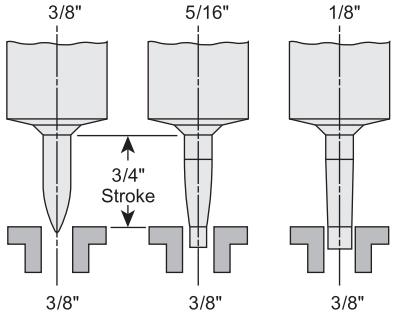
To calculate minimum flow, simply multiply Cv by the percentages shown in the table. For example, a 5/16" orifice in an ACV-02 has a Cv of 2.5. The lowest output that can be controlled is 2% of maximum flow.

Figure 84-1. Modified Linear Curve



Modified linear characteristics curve for valves used under modulating control. The modification of true linear characteristics provides more precise control when capacity requirements are very low and the valve is just cracked off the seat.

Figure 84-2. Parabolic Plug Type Valves



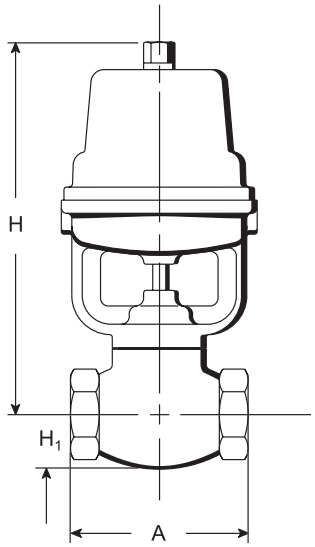
Parabolic plug valve configuration permits accurate modulation of flow over the complete stroke of the valve.

Table 85-1. Control Valve Rangeability (Normally Closed Valves)

Control Valve Model	Valve		Rangeability		Standard Operators											
	Equivalent Diameter		Ratio of Flow Max:Min	Flow Coefficient CV	Armstrong C-1801		Honeywell MP953D		Honeywell MP953F		Belimo NVF24		Honeywell M9182A		Belimo AF24SR	
					Maximum Operating Pressure, psig (bar)											
	in	mm			psig	bar	psig	bar	psig	bar	psig	bar	psig	bar	psig	bar
	1-1/2	38	63:1	27	N/A		25	1.7	150	10.3	N/A		100	6.8	100	6.8
	1-1/4	32	69:1	21												
CV-06	1-1/8	28	61:1	19.5												
	1	25	53:1	18			30	2.1					125	8.6	125	8.6
	7/8	22	44:1	16												
	3/4	20	33:1	13												
	1	25	53:1	13	N/A		70	4.8	150	10.3	60	4.1	150	10.3	150	10.3
	3/4	20	33:1	10.5												
CV-04	5/8	16	25:1	8.5												
	9/16	14	105:1	7												
	1/2	15	97:1	6												
	7/16	11	75:1	5												
	3/4	20	118:1	7.5	80	5.5	80	5.5	150	10.3	60	4.1	150	10.3	150	10.3
	5/8	16	123:1	6.5												
CV-03	9/16	14	105:1	6												
	1/2	15	97:1	5.5	150	10.3	150	10.3								
	7/16	11	75:1	4												
	1/2	15	97:1	4	150	10.3	150	10.3	150	10.3	60	4.1	150	10.3	150	10.3
	7/16	11	75:1	3.5												
	3/8	10	70:1	3												
CV-02	5/16	8	49:1	2.5												
	1/4	6	31:1	1.7												
	3/16	5	18:1	0.9												
	1/8	3	37:1	0.45												
	1/16	1.5	10:1	0.09												

Table 85-2. Selection Formulas

For Steam	Formula Key
For Water: $GPM = \frac{C_v \times \sqrt{\Delta P}}{\sqrt{G}}$	Cv = Valve flow coefficient G = Specific gravity GPM = Maximum flow capacity of liquid GPM
For Steam: When $P_2 > \frac{P_1}{2}$ $W = 3 \times C_v \times \sqrt{\Delta P \times P_2}$	P1 = Inlet pressure, psia (psig + 14.7) P2 = Outlet pressure, psia (psig + 14.7) ³P = Pressure drop (P1 - P2) psi
When $P_2 \leq \frac{P_1}{2}$ $W = 1.5 \times C_v \times P_1$	W = Maximum flow capacity of steam, lb/hr



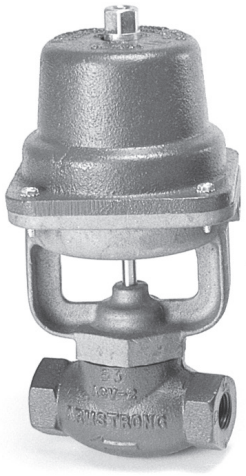


Table 86-1. Specifications						Dimensions and Weights					
Model Number	Pipe Size		Body Material	Trim Material	Vessel Design Limitation	Minimum ³P	A		H_1		Weight
	in	mm					in	mm	in	mm	lb	kg
Control Valve												
ACV-02	1/2	15	Cast Iron	300 Series Stainless Steel	250 psig @ 400°F 17 bar @ 204°C	2psi (.14 bar)	4-1/8	105	1-1/8	29	9-3/4	4.4
ACV-03	3/4	20					4-1/4	108	1-5/16	33	10-1/2	4.8
ACV-04	1	25					5-1/2	140	1-7/8	48	11-3/4	5.3
ACV-06	1-1/2	40					8	203	2-7/16	62	22	10
ECV-02	1/2	15	T-316 Stainless Steel		400 psig @ 400°F 27.5 bar @ 204°C		4-1/8	105	1-1/8	29	8-1/2	3.9
ECV-03	3/4	20					4-1/4	108	1-5/16	33	9-1/2	4.3

Table 86-2. Physical Data "H" Dimension												
Model Number	Armstrong C-1801		Honeywell MP953D		Honeywell MP953F		Honeywell M9182A		Belimo AF24SR		Belimo NVF24-MFT-US E	
	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
ACV/ECV-02	8-1/2	216	7	178	11-7/8	302	11-5/8	295	15-3/16	386	11-5/8	295
ACV/ECV-03	8-7/8	225	7-3/8	187	12-1/4	311	11-13/16	300	15-9/16	395	12	305
ACV-04	—		7-3/8	187	12-3/4	324	12-3/8	314	16-3/16	411	12-1/2	318
ACV-06	—		9	229	13-7/8	352	12-15/16	329	17-5/16	440	13-5/8	346

How to Order

Body Material

A = Cast Iron
E = T-316 Stainless Steel

Product Line

CV = Control Valve

Connection Size

02 = 1/2"
03 = 3/4"
04 = 1"
06 = 1-1/2"

Standard Operator Types

Pneumatic Modulating

AM = Armstrong C-1801
HAM = Honeywell MP953D and F

Electric Modulating

HEM = Honeywell M9182A
BLEM = Belimo AF24SR
BNVEM = Belimo NVF24-MFT-US-E

*Designs, materials, weights and performance ratings are approximate and subject to change without notice. Visit **armstrong**international.com for up-to-date information.*