



# Armstrong® Python™ - 1100 Series Control Valves

Pressure and Temperature Controls

Actuators are light weight and compact

Reverse and direct acting multi-spring actuators

Reinforced rolling diaphragm provides constant effective area throughout the stroke cycle allowing for the most accurate control

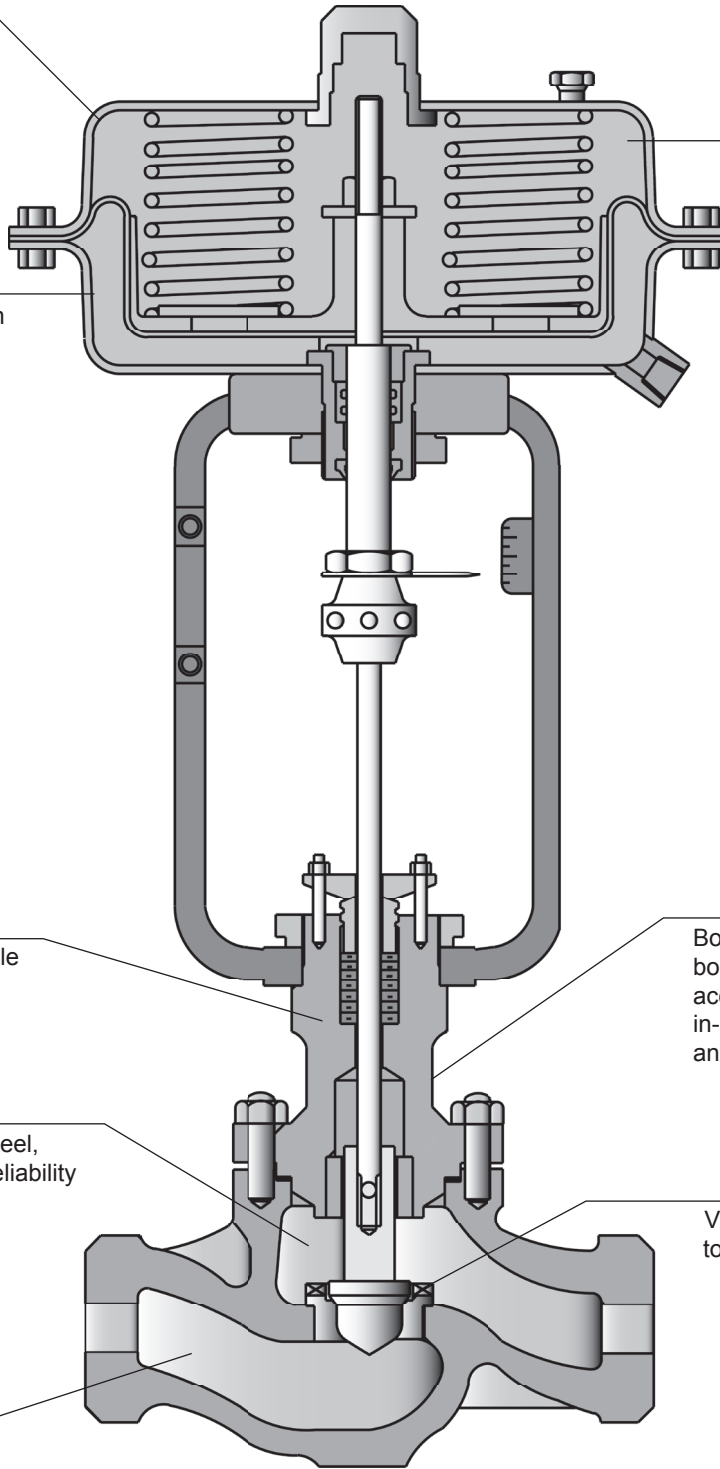
Low friction package available in teflon or graphoil

Body with top entry trim and bolted bonnet facilitates easy access to all internal parts for in-line inspections, maintenance and trim replacement

All trim parts are stainless steel, which means long life and reliability

Variety of trim options available to satisfy vast application range including reduced port trims, enabling nearest accurate selection for precise control requirements

Carbon steel body construction



# Python™ - 1100 Series Control Valves

When accurate control is desired from your steam or water applications the Armstrong Python 1100 Series Control Valve will squeeze every bit of performance out of your system and deliver precise control. With a wide range of materials, sizes, trim, and other features, you are sure to find the Python can accurately control your system. The Python 1100 Series Control Valve is constructed and equipped with state of the art materials and is designed to meet the most stringent budget.

## Product Features

- Series 1100 valves are Globe two-way single seated body design valves, which satisfy the majority of control applications for HVAC, industrial and commercial markets.
- Body with top entry trim and bolted bonnet facilitates easy access to all internal parts for in-line inspection, maintenance and trim replacement.
- Stream line flow path provides large flow capacity.
- Variety of trim options are available to satisfy a vast application range including reduced port trims enabling nearest accurate selection for precise control requirements.
- Trims with top bush guided plugs are available with simple construction for stable operation, assuring high rangeability and turndown ratios.
- Micro trims available for control of minute flow rates.
- Trims with large guide plugs are available for full pressure balancing effect providing an economical choice for high pressure applications.
- All parts are renewable in-line.
- Carbon steel or stainless steel body construction.
- Reverse and direct acting multi-spring actuators.
- Available in 1/2" - 2" NPT and 1/2" - 8" ANSI flange design.
- Rated for class IV shut-off.

## Accessories

- Pneumatic Valve Positioner
- Electro-Pneumatic (E/P) Valve Positioner
- Digital Valve Positioners
- Pressure/Temperature Controllers
- Air Filter Regulator



Python Series 1100  
Control Valve



Python Series 1100  
Control Valve with Positioner



# Armstrong® Python™ - 1100 Series Control Valves

Pressure and Temperature Controls

### Control Valves - 1100 Series List of Materials

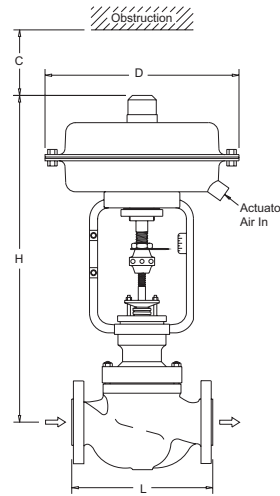
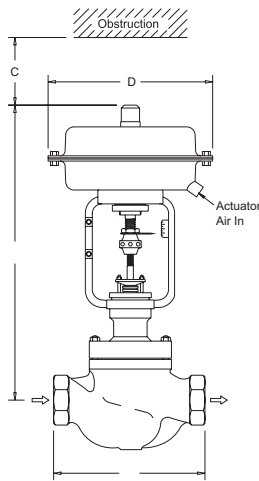
Valve Body*	Carbon Steel A216 Gr. WCB
Bonnet*	
Valve/Valve Seat	Stainless Steel AISI 431
Valve Stem	Stainless Steel 316
Gland Packing	V-Teflon - option 1 (366°F Max.) Grafoil - option 2
Yoke	S.G. Iron
Actuator Spring	Chrome Vanadium/Spring Steel
Actuator Diaphragm	Nitrile Reinforced with Nylon Fiber

\*Stainless steel available.

### Control Valves - 1100 Series Specifications

Flow	Equal Percentage	
Leakage	ANSI Class IV	
Rangeability	50:1	
Travel	1/2" to 1"	11/16" (18 mm)
	1-1/2" to 2"	1-1/8" (28 mm)
	2-1/2" to 4"	1-1/2" (38 mm)
	6" to 8"	2-1/4" (58 mm)
Maximum Temperature	450°F (232°C)*	
Maximum Pressure	300 psig (20 bar)*	

\*Higher pressure and temperature valves available.



### Control Valves - 1100 Series Dimensions and Weights

Size		Face-to-Face "L"						"C"		"D"		"H"		Weight					
in	mm	NPT		150#		300#		in	mm	in	mm	in	mm	NPT		150#		300#	
		in	mm	in	mm	in	mm							lb	kg	lb	kg	lb	kg
1/2	15	6-1/2	165	7	178	—	—	4	102	9-7/16	240	18-1/2	470	31	14	34	15	—	—
3/4	20	6-1/2	165	7-1/8	181	—	—	4	102	9-7/16	240	18-1/2	470	31	14	34	15	—	—
1	25	7-3/4	197	7-1/4	184	7-3/4	197	4	102	9-7/16	240	18-1/2	470	33	15	36	16	40	18
1-1/2	40	9-1/4	25	8-3/4	222	9-1/4	235	5	127	11-7/16	290	20-9/32	515	51	23	55	25	60	27
2	50	10-1/2	267	10	254	10-1/2	267	5	127	11-7/16	290	20-9/32	515	60	27	65	30	71	32
2-1/2	65	—	—	10-7/8	276	11-1/2	292	6	127	15	380	25-3/16	640	—	—	120	54	135	61
3	80	—	—	11-3/4	299	12-1/2	318	6	152	15	380	25-3/16	640	—	—	135	61	154	70
4	100	—	—	13-7/8	353	14-1/2	368	6	152	15	380	26-3/8	670	—	—	176	80	220	100
6	150	—	—	17-3/4	451	18-5/8	473	7	175	17-5/8	448	43-1/2	1105	—	—	330	150	396	180
8	200	—	—	21-3/8	543	22-3/8	568	7	175	17-5/8	448	45-1/4	1150	—	—	551	250	650	295

Note: Additional sizes up to 20" available upon request.

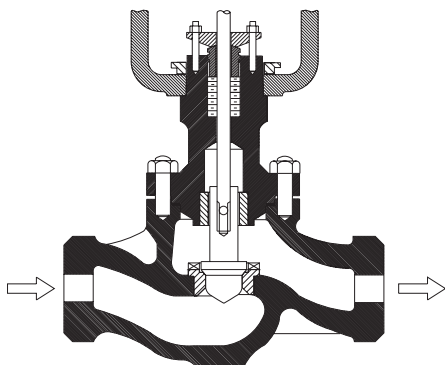
# Python™ - 1100 Series Control Valves



Pressure and Temperature Controls

## Contour Top Guided

The Contour Top Guided trims are the preferred choice for a variety of control applications due to their simple construction. Heavy top guided trim provides maximum support to impart complete stability. The plug shank is guided at the lowest portion of the bonnet minimizing the effect of side thrust on the valve plug and eliminating trim vibration.



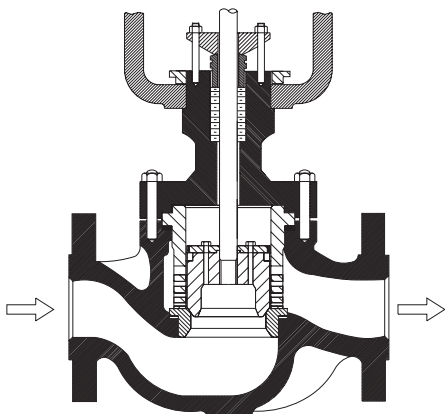
Contoured Top Guided Trim (Unbalanced)

## Multi-Hole Cage Guided - Pressure Balanced

The large guide trims with pressure balancing effect enable the valve to handle higher  $\Delta P$  shut off without employing high power actuators. The flow characteristic is achieved through plug contour. Equalizing holes are opened in the plug which effectively cancel out the unbalanced force impressed on the top and bottom of the valve plug.

Pressure balance sealing is attained; 1) At seating surface 2) Through pressure balance seal rings which are fitted on the plug seal applying pressure along the inner wall of the large guide having a ground, honed and chrome plated surface.

This multi-hole trim also helps with noise attenuation.



Multi-Hole Cage Guided Pressure Balanced Trims

## Contoured Top Guided Cv Values

Valve Size		Trim Size		C <sub>v</sub>
in	mm	in	mm	
*1/2, *3/4, 1	*15, *20, 25	1	25	13
		3/4	20	9
		1/2	15	5
		5/16	8	3
		1/4	6	2
1-1/2	40	1/8	3	1
		1-1/2	40	30
		1-1/4	32	20
2	50	1	25	13
		2	50	50
		1-1/2	40	30
2-1/2	65	1-1/4	32	20
		2-1/2	65	80
		2	50	50
3	80	1-1/2	40	30
		3	80	110
		2-1/2	65	80
4	100	2	50	50
		4	100	200
		3	80	110
6	150	2-1/2	65	80
		6	150	400
		5	125	300
8	200	4	100	200
		8	200	640
		6	150	400
		5	125	300

Note: Additional sizes up to 20" available upon request.  
\* The trim size must be less than or equal to the valve size.

## Multi-Hole Cage Guided Cv Values

Valve Size		Trim Size		C <sub>v</sub>
in	mm	in	mm	
1-1/2	40	1-1/2	40	24
		1-1/4	32	16
		1	25	10
2	50	2	50	40
		1-1/2	40	24
		1-1/4	32	16
2-1/2	65	2-1/2	65	64
		2	50	40
		1-1/2	40	24
3	80	3	80	90
		2-1/2	65	64
		2	50	40
4	100	4	100	160
		3	80	90
		2-1/2	65	64
6	150	6	150	320
		5	125	240
		4	100	160
8	200	8	200	510
		6	150	320
		5	125	240

Note: Additional sizes up to 20" available upon request.



# Python™ - 1100 Series Control Valve

## Multi-Spring Actuators: Series M

The "M" Series control valve actuators are diaphragm actuators with pre-compressed multi-spring construction. They are compact (fewer parts), easy to maintain and quickly reversible. The actuators are suitable for regulating and on/off applications. Various models are available covering small to larger thrust requirements.

The increasing air pressure supply moves the diaphragm and actuator stem opposing the spring force. With decreasing air pressure supply, the spring force moves the diaphragm in the opposite direction and back to the normal position. To get various loading capacities the number of springs are altered.

## Specifications

- Maximum Diaphragm Pressure:  
50 psi (3.5 bar) for Model M and Mp
- Actuator travel:  
11/16", 1-1/8", 1-1/2", 2-1/4"  
(18, 28, 38, 58 mm)
- Diaphragm:  
Nitrile reinforced with Nylon fiber
- Operating Temperature Range:  
-40° to 176°F (-40° to 80°C)
- Connections:  
1/4" NPT (F) for Models 00 and 11  
3/8" NPT (F) for Models 22 and 33
- Permissible Linearity and Hysteresis:  
±5% of Signal Pressure Range

## Features:

- Utility - Applicable for regulating and on-off applications
- High Power - Variety of models provide choice for low and high thrust requirements
- Construction - Due to multi-spring arrangement the actuators are lightweight and compact
- Reversible - The actuators are field reversible without demanding addition or deletion of parts
- Long Service Life - Rigid construction and durable components provide a long lasting service life
- Minimum Maintenance - The actuators are virtually maintenance free
- Accuracy - Rolling diaphragm construction provides constant effective area throughout the stroke

## Direct Acting Actuators (Fail Open)

The actuator stem moves downward with increasing diaphragm pressure. When this pressure is reduced the opposing spring force moves the actuator stem upward. On air failure, the actuator stem is pulled to the extreme upward position by spring force.

### This actuator is suitable for the following:

- Fail Open - For valves with plugs that push down to close
- Fail Close - For valves with plugs that push down to open

## Reverse Acting Actuators (Fail Close)

The actuator stem moves upward with increasing diaphragm pressure. When this pressure is reduced the opposing spring force moves the actuator stem downward. On air failure, the actuator stem is pushed to extreme downward position by spring force.

### This actuator is suitable for the following:

- Fail Close - For valves with plugs that push down to close
- Fail Open - For valves with plugs that push down to open

Air Volume Required Per Stroke.	
Model Number	Cubic Feet/Stroke
M-00, Mp-00	0.012
M-11, Mp-11	0.035
M-22, Mp-22	0.082
M-33, Mp-33	0.185

# Python™ - 1100 Series Control Valve



Pressure and Temperature Controls

Contoured Top Guided Shut Off Pressure																		
Model No.	Air Supply Pres. to Diaph.	Spring Setting Range		Diaph. Area	Maximum Differential Pressure (PSI) ΔP / Shut Off Pressure													
		Direct Acting Actuator	Reverse Acting Actuator		Trim Size													
		PSI	PSI		1/8"	1/4" - 5/16"	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"	6"	8"	
M-00	20	3 - 15	3 - 15	30	300	300	206	134	94	—	—	—	—	—	—	—	—	
	23		6 - 18		300	300	300	300	222	—	—	—	—	—	—	—	—	—
	34	6 - 30	6 - 30		300	300	300	300	222	—	—	—	—	—	—	—	—	—
	37		9 - 32		300	300	300	300	300	—	—	—	—	—	—	—	—	—
	40		12 - 35		300	300	300	300	300	—	—	—	—	—	—	—	—	—
M-11	20	3 - 15	3 - 15	55	—	—	—	—	—	121	78	43	—	—	—	—	—	
	23		6 - 18		—	—	—	—	—	—	269	178	102	—	—	—	—	—
	34	6 - 30	6 - 30		—	—	—	—	—	269	178	102	—	—	—	—	—	—
	37		9 - 32		—	—	—	—	—	300	279	162	—	—	—	—	—	—
	40		12 - 35		—	—	—	—	—	300	300	222	—	—	—	—	—	—
M-22	20	3 - 15	3 - 15	95	—	—	—	—	—	—	—	—	51	35	16	—	—	
	23		6 - 18		—	—	—	—	—	—	—	—	—	114	80	38	—	—
	34	6 - 30	6 - 30		—	—	—	—	—	—	—	—	—	114	80	38	—	—
	37		9 - 32		—	—	—	—	—	—	—	—	—	178	125	62	—	—
	40		12 - 35		—	—	—	—	—	—	—	—	—	240	172	85	—	—
M-33	20	3 - 15	3 - 15	140	—	—	—	—	—	—	—	—	—	—	—	10	5	
	23		6 - 18		—	—	—	—	—	—	—	—	—	—	—	—	27	14
	34	6 - 30	6 - 30		—	—	—	—	—	—	—	—	—	—	—	—	27	14
	37		9 - 32		—	—	—	—	—	—	—	—	—	—	—	—	42	25
	40		12 - 35		—	—	—	—	—	—	—	—	—	—	—	—	60	32

Do not exceed 50 PSIG air pressure to the actuator.

Multi-Hole Cage Guided Shut Off Pressure												
Model No.	Air Supply Pres. to Diaph.	Spring Setting Range		Diaph. Area	Maximum Differential Pressure (PSI) ΔP / Shut Off Pressure							
		Direct Acting Actuator	Reverse Acting Actuator		Trim Size							
		PSI	PSI		1-1/2"	2"	2-1/2"	3"	4"	6"	8"	
M-11	20	3 - 15	3 - 15	55	257	150	—	—	—	—	—	—
	23		6 - 18		300	300	—	—	—	—	—	—
	34	6 - 30	6 - 30		300	300	—	—	—	—	—	—
	37		9 - 32		300	300	—	—	—	—	—	—
	40		12 - 35		300	300	—	—	—	—	—	—
M-22	20	3 - 15	3 - 15	95	—	—	298	190	97	—	—	—
	23		6 - 18		—	—	300	300	300	—	—	—
	34	6 - 30	6 - 30		—	—	300	300	300	—	—	—
	37		9 - 32		—	—	300	300	300	—	—	—
	40		12 - 35		—	—	300	300	300	—	—	—
M-33	20	3 - 15	3 - 15	140	—	—	—	—	—	—	133	21
	23		6 - 18		—	—	—	—	—	—	300	258
	34	6 - 30	6 - 30		—	—	—	—	—	—	300	258
	37		9 - 32		—	—	—	—	—	—	300	300
	40		12 - 35		—	—	—	—	—	—	300	300

Do not exceed 50 PSIG air pressure to the actuator.



### Capacities for Saturated Steam Service

Contoured Top Guided Trim														
		lb/hr												
Inlet	Outlet	Trim Size and C <sub>v</sub>												
		in												
(psig)		1/8	1/4	5/16	1/2	3/4	1	1-1/4	1-1/2	2	2-1/2	3	4	6
C <sub>v</sub> Factor		1.0	2.0	3.0	5.0	9.0	13.0	20.0	30.0	50.0	80.0	110.0	200.0	400.0
5	3	18	36	54	91	163	236	363	545	908	1,453	1,998	3,632	7,265
	0 - 2	32	64	97	161	290	418	643	965	1,609	2,574	3,539	6,434	12,868
10	5	31	63	94	156	282	407	626	939	1,564	2,503	3,442	6,258	12,516
	0 - 4	40	81	121	202	363	524	807	1,210	2,017	3,227	4,437	8,067	16,134
15	10	35	69	104	173	312	450	693	1,039	1,732	2,771	3,810	6,927	13,854
	0 - 6	49	97	146	243	437	631	970	1,455	2,425	3,880	5,335	9,700	19,400
20	15	38	75	113	188	339	490	754	1,130	1,884	3,015	4,145	7,537	15,073
	0 - 8	57	113	170	283	510	737	1,133	1,700	2,833	4,533	6,233	11,333	22,666
30	20	59	118	178	296	533	769	1,183	1,775	2,959	4,734	6,509	11,835	23,670
	0 - 12	73	146	219	365	657	949	1,460	2,190	3,650	5,840	8,029	14,599	29,198
40	30	66	132	199	331	596	861	1,324	1,986	3,310	5,297	7,283	13,242	26,483
	25	79	158	237	395	711	1,027	1,580	2,371	3,951	6,322	8,692	15,805	31,609
50	0 - 16	89	179	268	447	804	1,161	1,787	2,680	4,466	7,146	9,826	17,865	35,730
	40	73	145	218	363	653	943	1,451	2,177	3,628	5,805	7,982	14,513	29,026
60	30	98	196	295	491	884	1,277	1,965	2,947	4,911	7,858	10,805	19,646	39,292
	0 - 20	106	211	317	528	951	1,374	2,113	3,170	5,283	8,452	11,622	21,131	42,262
75	50	78	157	235	392	706	1,019	1,568	2,352	3,920	6,272	8,625	15,681	31,362
	35	117	234	351	586	1,054	1,522	2,342	3,513	5,856	9,369	12,882	23,422	46,845
100	0 - 24	122	244	366	610	1,098	1,586	2,440	3,660	6,099	9,759	13,418	24,397	48,794
	65	86	173	259	432	778	1,124	1,729	2,593	4,322	6,915	9,508	17,286	34,573
125	50	130	261	391	652	1,174	1,696	2,609	3,914	6,524	10,438	14,352	26,094	52,188
	0 - 30	146	293	439	732	1,318	1,904	2,930	4,394	7,324	11,718	16,113	29,296	58,592
150	75	150	300	450	751	1,351	1,952	3,002	4,504	7,506	12,009	16,513	30,023	60,047
	60	183	366	548	914	1,645	2,376	3,656	5,484	9,139	14,623	20,106	36,557	73,114
175	0 - 40	187	375	562	937	1,686	2,435	3,746	5,619	9,365	14,984	20,604	37,461	74,922
	100	167	335	502	837	1,507	2,177	3,349	5,024	8,374	13,398	18,422	33,495	66,990
200	75	225	450	675	1,125	2,024	2,924	4,498	6,747	11,245	17,992	24,740	44,981	89,962
	0 - 50	228	456	684	1,141	2,053	2,966	4,563	6,844	11,407	18,250	25,094	45,626	91,252
250	125	183	366	550	916	1,649	2,382	3,664	5,496	9,160	14,656	20,151	36,639	73,278
	100	248	496	745	1,241	2,234	3,227	4,964	7,446	12,410	19,857	27,303	49,642	99,284
300	0 - 60	269	538	807	1,345	2,421	3,496	5,379	8,069	13,448	21,516	29,585	53,791	107,582
	150	198	395	593	988	1,779	2,570	3,953	5,930	9,883	15,813	21,743	39,534	79,067
350	110	300	600	901	1,501	2,702	3,903	6,004	9,006	15,010	24,016	33,022	60,041	120,082
	0 - 70	310	620	929	1,549	2,788	4,027	6,196	9,293	15,489	24,782	34,076	61,956	123,912
400	150	289	578	868	1,446	2,603	3,760	5,785	8,677	14,462	23,139	31,816	57,847	115,695
	125	342	685	1,027	1,712	3,081	4,451	6,847	10,271	17,119	27,390	37,661	68,474	136,948
450	0 - 80	351	701	1,052	1,753	3,155	4,558	7,012	10,518	17,530	28,048	38,567	70,121	140,242
	200	325	650	975	1,626	2,926	4,227	6,503	9,754	16,256	26,010	35,764	65,025	130,051
500	150	413	827	1,240	2,067	3,721	5,374	8,268	12,402	20,670	33,072	45,474	82,681	165,361
	0 - 100	432	865	1,297	2,161	3,890	5,619	8,645	12,968	21,613	34,580	47,548	86,451	172,902
550	250	357	715	1,072	1,787	3,217	4,647	7,149	10,723	17,872	28,595	39,318	71,486	142,973
	200	483	966	1,450	2,416	4,349	6,281	9,664	14,495	24,159	38,655	53,150	96,637	193,273
600	0 - 120	514	1,028	1,542	2,570	4,625	6,681	10,278	15,417	25,695	41,112	56,530	102,781	205,562

\*Capacities based on maximum C<sub>v</sub>. It is recommended to operate the valve between 15-85% of the valve opening. See chart on page 325.

Pressure and Temperature Controls

# Python™ - 1100 Series Control Valve



## Capacities for Saturated Steam Service

Contoured Top Guided Trim														
		kg/hr												
Inlet	Outlet	Trim Size and C <sub>v</sub>												
		mm												
(bar)		3	6	8	15	20	25	32	40	50	65	80	100	150
C <sub>v</sub> Factor		1.0	2.0	3.0	5.0	9.0	13.0	20.0	30.0	50.0	80.0	110.0	200.0	400.0
0.34	0.21	8	16	25	41	74	107	165	247	412	659	906	1,648	3,295
	0 - 0.14	15	29	44	73	131	190	292	438	730	1,167	1,605	2,918	5,837
0.69	0.34	14	28	43	71	128	185	284	426	710	1,135	1,561	2,839	5,677
	0 - 0.28	18	37	55	91	165	238	366	549	915	1,464	2,013	3,659	7,318
1.03	0.69	16	31	47	79	141	204	314	471	785	1,257	1,728	3,142	6,284
	0 - 0.41	22	44	66	110	198	286	440	660	1,100	1,760	2,420	4,400	8,800
1.38	1.03	17	34	51	85	154	222	342	513	855	1,367	1,880	3,419	6,837
	0 - 0.55	26	51	77	129	231	334	514	771	1,285	2,056	2,827	5,141	10,281
2.07	1.38	27	54	81	134	242	349	537	805	1,342	2,147	2,953	5,368	10,736
	0 - 0.83	33	66	99	166	298	430	662	993	1,656	2,649	3,642	6,622	13,244
2.76	2.07	30	60	90	150	270	390	601	901	1,502	2,403	3,304	6,006	12,013
	1.72	36	72	108	179	323	466	717	1,075	1,792	2,868	3,943	7,169	14,338
	0 - 1.10	41	81	122	203	365	527	810	1,216	2,026	3,241	4,457	8,104	16,207
3.45	2.76	33	66	99	165	296	428	658	987	1,646	2,633	3,621	6,583	13,166
	2.07	45	89	134	223	401	579	891	1,337	2,228	3,565	4,901	8,911	17,823
	0 - 1.38	48	96	144	240	431	623	958	1,438	2,396	3,834	5,272	9,585	19,170
4.14	3.45	36	71	107	178	320	462	711	1,067	1,778	2,845	3,912	7,113	14,226
	2.41	53	106	159	266	478	691	1,062	1,594	2,656	4,250	5,843	10,624	21,249
	0 - 1.65	55	111	166	277	498	719	1,107	1,660	2,767	4,427	6,087	11,066	22,133
5.17	4.48	39	78	118	196	353	510	784	1,176	1,960	3,136	4,313	7,841	15,682
	3.45	59	118	178	296	533	769	1,184	1,775	2,959	4,734	6,510	11,836	23,672
	0 - 2.07	66	133	199	332	598	864	1,329	1,993	3,322	5,315	7,309	13,289	26,577
6.89	5.17	68	136	204	340	613	885	1,362	2,043	3,405	5,447	7,490	13,619	27,237
	4.14	83	166	249	415	746	1,078	1,658	2,487	4,146	6,633	9,120	16,582	33,164
	0 - 2.76	85	170	255	425	765	1,104	1,699	2,549	4,248	6,797	9,346	16,992	33,984
8.62	6.89	76	152	228	380	684	988	1,519	2,279	3,798	6,077	8,356	15,193	30,386
	5.17	102	204	306	510	918	1,326	2,040	3,061	5,101	8,161	11,222	20,403	40,807
	0 - 3.45	103	207	310	517	931	1,345	2,070	3,104	5,174	8,278	11,383	20,696	41,392
10.34	8.62	83	166	249	415	748	1,080	1,662	2,493	4,155	6,648	9,141	16,619	33,239
	6.89	113	225	338	563	1,013	1,464	2,252	3,378	5,629	9,007	12,385	22,517	45,035
	0 - 4.14	122	244	366	610	1,098	1,586	2,440	3,660	6,100	9,760	13,420	24,399	48,799
12.07	10.34	90	179	269	448	807	1,166	1,793	2,690	4,483	7,173	9,863	17,932	35,865
	7.58	136	272	409	681	1,226	1,770	2,723	4,085	6,809	10,894	14,979	27,234	54,469
	0 - 4.83	141	281	422	703	1,265	1,827	2,810	4,215	7,026	11,241	15,457	28,103	56,206
13.79	10.34	131	262	394	656	1,181	1,706	2,624	3,936	6,560	10,496	14,432	26,239	52,479
	8.62	155	311	466	776	1,398	2,019	3,106	4,659	7,765	12,424	17,083	31,060	62,119
	0 - 5.52	159	318	477	795	1,431	2,067	3,181	4,771	7,952	12,723	17,494	31,807	63,613
17.24	13.79	147	295	442	737	1,327	1,917	2,950	4,424	7,374	11,798	16,222	29,495	58,991
	10.34	188	375	563	938	1,688	2,438	3,750	5,626	9,376	15,001	20,627	37,504	75,007
	0 - 10.3	196	392	588	980	1,765	2,549	3,921	5,882	9,803	15,686	21,568	39,214	78,428
20.00	17.24	162	324	486	811	1,459	2,108	3,243	4,864	8,107	12,970	17,834	32,426	64,852
	13.79	219	438	658	1,096	1,973	2,849	4,383	6,575	10,959	17,534	24,109	43,834	87,668
	0 - 8.28	233	466	699	1,166	2,098	3,030	4,662	6,993	11,655	18,648	25,642	46,621	93,242

Pressure and Temperature Controls

\*Capacities based on maximum C<sub>v</sub>. It is recommended to operate the valve between 15-85% of the valve opening. See chart on page 325.



# Armstrong® Python™ - 1100 Series Control Valve

## Capacities for Saturated Steam Service

Multi-Hole Cage Guided Trim		lb/hr							
Inlet	Outlet	Trim Size and C <sub>v</sub>							
		in							
(psig)		1	1-1/4	1-1/2	2	2-1/2	3	4	6
C <sub>v</sub> Factor		10.0	16.0	24.0	40.0	64.0	90.0	160.0	320.0
100	75	1,501	2,402	3,603	6,005	9,607	13,511	24,019	48,037
	60	1,828	2,925	4,387	7,311	11,698	16,451	29,246	58,491
	0 - 40	1,873	2,997	4,495	7,492	11,988	16,857	29,969	59,938
125	100	1,675	2,680	4,019	6,699	10,718	15,073	26,796	53,592
	75	2,249	3,598	5,398	8,996	14,394	20,242	35,985	71,970
	0 - 50	2,281	3,650	5,475	9,125	14,600	20,532	36,501	73,002
150	125	1,832	2,931	4,397	7,328	11,724	16,487	29,311	58,622
	100	2,482	3,971	5,957	9,928	15,885	22,339	39,713	79,427
	0 - 60	2,690	4,303	6,455	10,758	17,213	24,206	43,033	86,066
175	150	1,977	3,163	4,744	7,907	12,651	17,790	31,627	63,254
	110	3,002	4,803	7,205	12,008	19,213	27,018	48,033	96,065
	0 - 70	3,098	4,956	7,435	12,391	19,826	27,880	49,565	99,130
200	150	2,892	4,628	6,942	11,569	18,511	26,031	46,278	92,556
	125	3,424	5,478	8,217	13,695	21,912	30,813	54,779	109,559
	0 - 80	3,506	5,610	8,415	14,024	22,439	31,554	56,097	112,194
250	200	3,251	5,202	7,803	13,005	20,808	29,261	52,020	104,041
	150	4,134	6,614	9,922	16,536	26,458	37,206	66,145	132,289
	0 - 100	4,323	6,916	10,374	17,290	27,664	38,903	69,161	138,322
300	250	3,574	5,719	8,578	14,297	22,876	32,169	57,189	114,378
	200	4,832	7,731	11,596	19,327	30,924	43,486	77,309	154,618
	0 - 120	5,139	8,222	12,334	20,556	32,890	46,251	82,225	164,450

\*Capacities based on maximum C<sub>v</sub>. It is recommended to operate the valve between 15-85% of the valve opening. See chart on page 325.

Multi-Hole Cage Guided Trim		kg/hr							
Inlet	Outlet	Trim Size and C <sub>v</sub>							
		mm							
(bar)		25	32	40	50	65	80	100	150
C <sub>v</sub> Factor		10.0	16.0	24.0	40.0	64.0	90.0	160.0	320.0
6.89	5.17	681	1089	1634	2724	4358	6128	10895	21790
	4.14	829	1327	1990	3316	5306	7462	13266	26531
	0 - 2.76	850	1359	2039	3398	5438	7646	13594	27188
8.62	6.89	760	1215	1823	3039	4862	6837	12155	24309
	5.17	1020	1632	2448	4081	6529	9182	16323	32645
	0 - 3.45	1035	1656	2483	4139	6623	9313	16557	33113
10.34	8.62	831	1330	1994	3324	5318	7479	13295	26591
	6.89	1126	1801	2702	4503	7206	10133	18014	36028
	0 - 4.14	1220	1952	2928	4880	7808	10980	19520	39039
12.07	10.34	897	1435	2152	3586	5738	8070	14346	28692
	7.58	1362	2179	3268	5447	8715	12255	21788	43575
	0 - 4.83	1405	2248	3372	5621	8993	12646	22482	44965
13.79	10.34	1312	2099	3149	5248	8397	11808	20991	41983
	8.62	1553	2485	3727	6212	9939	13977	24848	49695
	0 - 5.52	1590	2545	3817	6361	10178	14313	25445	50891
17.24	13.79	1475	2360	3539	5899	9439	13273	23596	47193
	10.34	1875	3000	4500	7501	12001	16877	30003	60006
	0 - 10.3	1961	3137	4706	7843	12548	17646	31371	62742
20.00	17.24	1621	2594	3891	6485	10376	14592	25941	51882
	13.79	2192	3507	5260	8767	14027	19725	35067	70134
	0 - 8.28	2331	3730	5595	9324	14919	20980	37297	74594

\*Capacities based on maximum C<sub>v</sub>. It is recommended to operate the valve between 15-85% of the valve opening. See chart on page 325.

Designs, materials, weights and performance ratings are approximate and subject to change without notice. Visit [www.armstronginternational.com](http://www.armstronginternational.com) for up-to-date information.

# Python™ - 1100 Series Control Valve

## Valve Sizing

To determine the size of valve you need, calculate the required Cv value for your application. Once you have calculated the required Cv, refer to the valve Cv charts on page 317 to determine the size and trim of valve. Globe style control valves have the best control in the midrange of the valve's capacity. It is best to pick a valve so the calculated Cv is between 15% and 85% of the valve opening, see page 324. See the formulas below for steam and water applications. Consult factory for other types of fluids.

## For Saturated Steam Service

### Subcritical Flow

When  $\Delta P < 0.81(P_1/2)$

$$C_v = \frac{W}{2.1\sqrt{\Delta P(P_{1A} + P_{2A})}}$$

### Critical Flow

When  $\Delta P \geq 0.81(P_1/2)$

$$C_v = \frac{W}{1.633(P_{1A})}$$

## For Liquid Service

$$C_v = \frac{(GPM)\sqrt{G}}{\sqrt{\Delta P}}$$

- Cv = Valve flow coefficient
- W = Maximum flow capacity of steam, lbs/hr
- P<sub>1A</sub> = Inlet Pressure, psia (psig + 14.7)
- P<sub>2A</sub> = Outlet Pressure, psia (psig + 14.7)
- ΔP = Pressure drop (P<sub>1</sub> - P<sub>2</sub>) psi
- GPM = Maximum flow capacity of Liquid, GPM
- G = Specific Gravity

## Actuator Sizing

To determine the required actuator, you need to determine the differential pressure (shut off pressure). The shut off pressure for a pressure reduction application is the pressure difference between P<sub>1</sub> and P<sub>2</sub>. The shut off pressure for a temperature control application is the P<sub>1</sub> pressure.

Once you have calculated your shut off pressure, select the actuator model and spring setting range that exceeds your calculated shutoff pressure with the trim size previously selected. Select reverse acting for air to open (fail close) applications or direct acting for air to close (fail open) applications.

Make sure the required air pressure is available for the spring range selected.

## Sizing Example 1:

- Fluid: Saturated Steam
- P<sub>1</sub> = 140 psig
- P<sub>2</sub> = 20 psig
- Flow: 13,000 lbs/hr
- Actuator: Air to open (Fail Close)

### Solution:

Valve Selection: Select the correct formula needed to calculate Cv. We need to use the critical flow formula since  $\Delta P > .81(P_1/2)$ .

$$C_v = \frac{13,000}{1.633(140 + 14.7)} = 52$$

Refer to the Cv charts on Page 4. Select a 2-1/2" Multi-hole cage guided with 2-1/2" Trim. Top bush guided would work as well, but multi-hole cage was chosen to help with noise attenuation.

*Actuator Selection:* Determine your shutoff pressure (ΔP).

$$\Delta P = 140 - 20 = 120 \text{ psi}$$

Refer to chart 6-2 (multi-hole cage guided) and go to the 2-1/2" trim size column. Follow the column until you get to a pressure greater than 120 psi, then follow the row horizontally to determine you need a Model M-22 with the 3-15 psi spring range.

Complete valve selection is 1100 series, 2-1/2" 150# Flange with 2-1/2" Multi-hole cage trim and M-22 actuator with 3-15 psi spring range.

## Sizing Example 2:

- Fluid: Saturated Steam
- Application: Temperature Control
- P<sub>1</sub>: 125 psig
- Flow: 1750 lbs/hr
- Actuator: Air to open (Fail Close)

### Solution:

Since this is a temperature control application and we do not know the P<sub>2</sub> pressure, we will size the valve with a 30% pressure drop. We need to use the subcritical flow formula.

$$C_v = \frac{1750}{2.1\sqrt{(37)((125+14.7)+(88+14.7))}} = 8.8$$

Refer to the Cv charts on Page 4. Select a 1" Contoured top guided with full port trim. The 1" is chosen over the 3/4" because the valve will control best between 15% - 85% of maximum valve capacity. The 3/4" valve would be operating at 98% of valve capacity.

## Actuator Selection:

For temperature control applications, the shut off pressure is the P<sub>1</sub> pressure. Refer to chart 6-1 (Contoured Top Guided) and go to the 1" trim size column. Follow the column until you get to a pressure greater than 125 psi, then follow the row horizontally to determine you need a Model M-00 with a 6 - 18 psi spring range.

Complete valve selection is 1100 series 1" NPT with 1" contoured top guided trim and M-00 actuator with 6 - 18 psi spring range.



# Python™ - 1100 Series Control Valve

## Determine the percentage of 'valve open' at any calculated $C_v$

You must first solve for a required  $C_v$  with one of the formulas on page 323. Using sizing example 2, we calculated a  $C_v$  of 8.8 and we chose a 1" contoured top guided valve with a full 1" trim with a maximum  $C_v$  of 13.

Step 1: Locate selected valve trim size in the far right-hand column. The maximum  $C_v$  for this trim can be found by moving two columns to the left.

Step 2: Locate the calculated  $C_v$  (flow coefficient) on the far left side.

Step 3: Follow calculated  $C_v$  to the right until it intersects with the curve associated with the trim size found in step 1.

Step 4: From the point of intersection, travel vertically to the bottom of the chart.

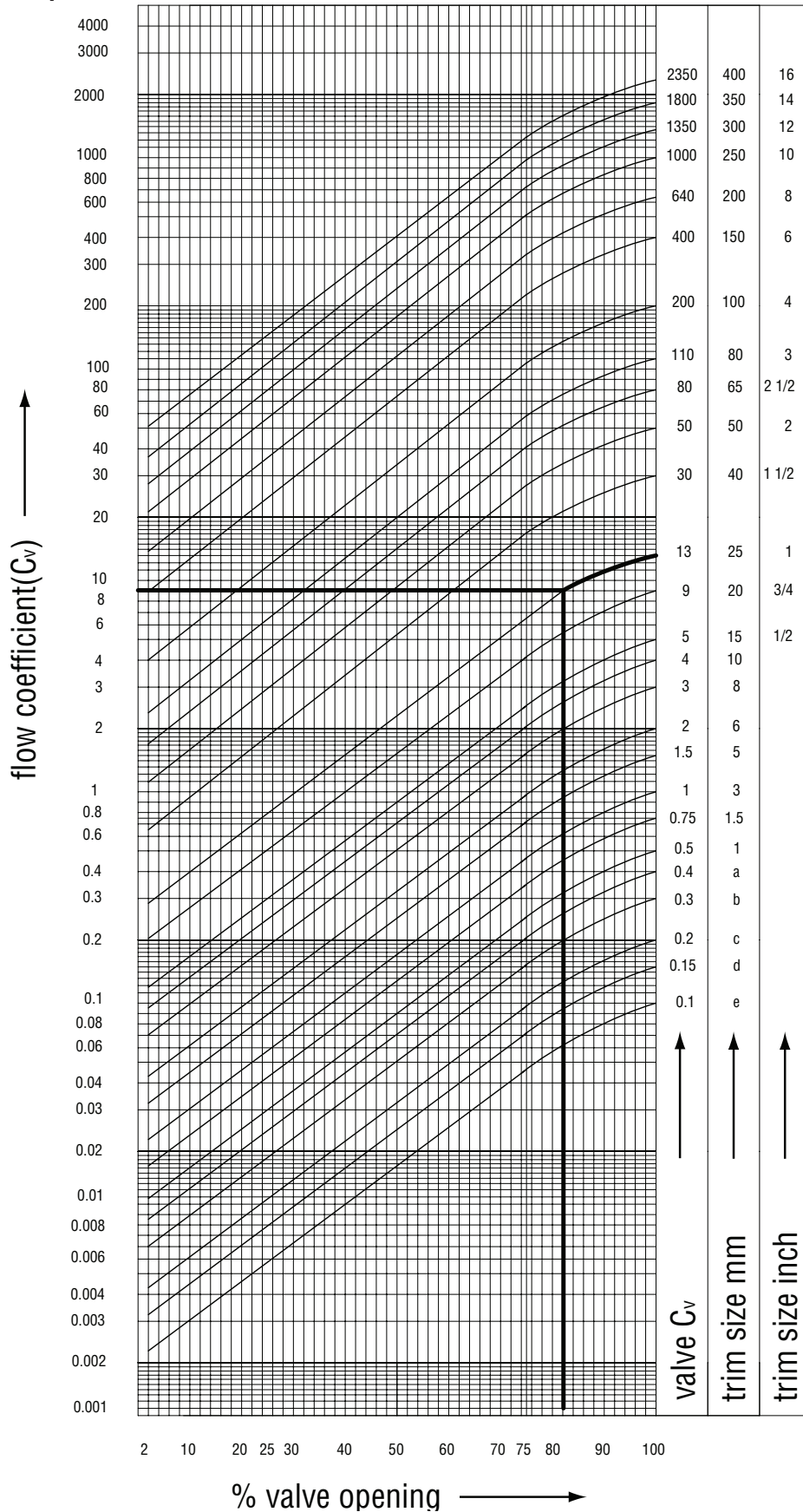
This point indicates the percentage of valve open, at the calculated  $C_v$ . In this case the valve will operate at 83% of the valves maximum capacity.

The valve has the greatest control between 15 and 85% of the valve opening.

# Python™ - 1100 Series Control Valve



Trim: Contoured Top Bush Guided



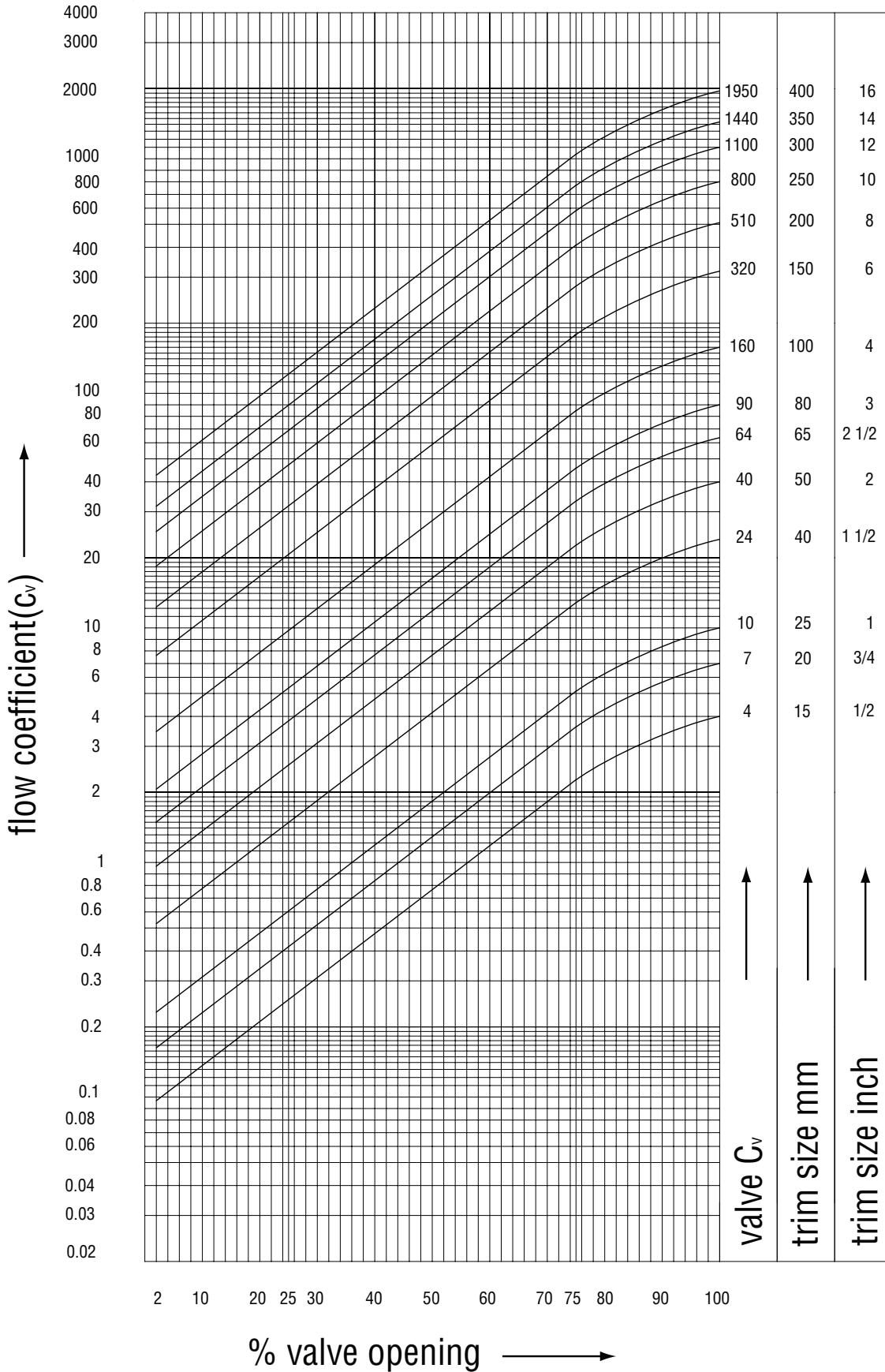
Pressure and Temperature Controls

Designs, materials, weights and performance ratings are approximate and subject to change without notice. Visit [www.armstronginternational.com](http://www.armstronginternational.com) for up-to-date information.



# Armstrong® Python™ - 1100 Series Control Valve

## Trim: Multi-Hole Cage Guided



# Python™ - 1100 Series Control Valve

## SRP981 Pneumatic Positioner

The SRP981 positioner is designed to control pneumatic valve actuators with pneumatic control signals. It is used to reduce the adverse effects of valve friction, for higher thrust and shorter positioning time. It offers an easy adjustment by two mechanical screws.

### Input:

Signal range: 3 to 15 psig (0.2 to 1 bar) split range down to  $\Delta w$  3 psi (0.2 bar)

### Response characteristic:

Amplification: adjustable

Sensitivity: <0.1% F.S.

Non-linearity (terminal based adjustment): <1.0% F.S.

Hysteresis: <0.3% F.S.

Supply air dependency: <0.3% / 1.5 psi (0.1 bar)

Temperature effect: <0.5% / 10 K

Mechanical vibration: 10-60 Hz up to 0.14 mm

60 - 500 Hz up to 2 g

<0.25% of travel span

### Supply:

Supply air pressure: 20 to 50 psig (1.4 to 3.5 bar)

Supply air: free of oil, dust and water according to IEC 654-2

### Connection:

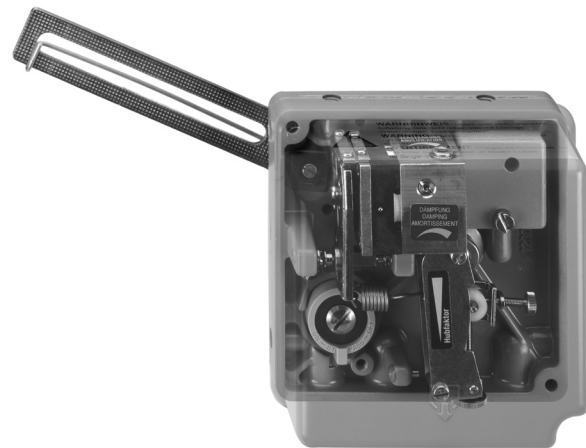
Pneumatic: Female threads G 1/8 according to ISO 228

### Materials:

Base Plate: Aluminum (Alloy No. 230) finished with DD varnish

## Features

- Independent adjustment of stroke range and zero
- Adjustable amplification and damping
- Split range up to 4-fold possible
- Input signal from 3-15 psi (0.2-1 bar)
- Supply pressure up to 50 psi (3.5 bar)
- Low vibration effect in all directions
- Ambient temperature -40 to 176°F (-40 to 80°C)
- Protection class IP54 or IP65
- Explosion protection:
  - II 2 G EEx c (constructive safety) + accessories in
  - II 2 G EEx i according to ATEX
- Additional inputs/outputs (optional)
  - Position feedback 4 to 20 mA
  - Built-in independent inductive limit switches (2-/3 wire) or micro switches
- Accessories
  - Booster relay to minimize stroke time
  - Gauge manifold
- Gauges (optional)
  - External gauge manifolds
  - Integrated gauges
  - Indicating ranges:
    - Input: 0 to 23 psig (0 to 1.6 bar)
    - Output: 0 to 150 psig (0 to 10 bar)



# **Python™ - 1100 Series Control Valve**

## **SRI990 Analog Positioner**

The analog positioner SRI990 with analog input 4 to 20 mA is designed to control pneumatic valve actuators. The modular structure of this product line enables conversion from an analog to an “intelligent” positioner with HART, Fieldbus or FoxCom.

It offers an easy adjustment by means of switches and potentiometers.

### **Input**

Two wire system  
Reverse polarity protection: Built-in standard feature  
Signal range: 4 to 20 mA  
Characteristic of setpoint: linear  
Operating range: 3 to 21.5 mA  
Voltage: DC 6 to 36 V (unloaded circuit)  
Load: 300 Ohms, 6 V at 20 mA

### **Supply**

Supply air pressure: 20 to 50 psig (1.4 to 3.5 bar)  
Supply air: according to IEC 654-2

### **Response characteristics**

Sensitivity: <0.2% of travel span  
Non-linearity: <±0.8% of travel span  
Hysteresis: <0.5% of travel span  
Temperature effect: <±0.5% / 10 K  
Supply air dependence: <0.3% / 15 psi (1 bar)  
Mechanical vibration:  
10-60 Hz up to 0.14 mm,  
60-500 Hz up to 2 g: <0.25% of travel span

### **Features**

- Ambient temperature -40 to 176°F (-40 to 80°C)
- Additional inputs/outputs (optional):
  - Position feedback 4 to 20 mA
  - Built-in independent inductive limit switches (2-/3 wire) or micro switches
- Accessories
  - Booster relay to minimize stroke time
  - Gauge manifold
- Configuration by means of switches and potentiometers
- Load 300 Ohms
- Low air consumption
- Supply air pressure up to 50 psi
- Single acting or double acting
- Mechanical travel indicator
- Reverse polarity protection and interlock diode
- Switch for pneumatic test
- Protection class IP 65 with ATEX and NEMA 4X with FM and CSA
- Explosion protection:
  - II 2 G EEx i/II 2 G EEx n (intrinsic safety) according to ATEX
  - Intrinsic safety according to FM and CSA
- Stainless steel housing for offshore or food and beverage applications



# Python™ - 1100 Series Control Valve



## SRD991 Intelligent Positioner with HART, PROFIBUS PA, FOUNDATION Fieldbus H1 or FoxCom for EEx ia Intrinsically Safe Applications

The microprocessor controlled positioner SRD991 is designed to control pneumatic valve actuators and can be operated locally or by means of control systems (e.g. the Foxboro I/A Series System). The advanced diagnostic can be partially shown on the local LCD of the positioner or fully on a PC or a DCS workstation with a DTM based software (VALcare or Valve Monitor).

The positioner is available with different communication protocols. This includes versions with analog setpoint (4 to 20 mA) and superimposed HART- or FoxCom signal; digital with FoxCom protocol, or fieldbus communication according to PROFIBUS-PA and FOUNDATION fieldbus H1 according to IEC 1158-2 based on FISCO.

The SRD991 also has the capability to control a Partial Stroke Test (PST) that offers operators a tool to identify the trouble-proof function of ESD (Emergency Shut Down) valves.

### Features

#### Version "Intelligent"

- Autostart with self calibration
- Self diagnostic, status and diagnostic messages

#### Version "Intelligent with Communication"

- Communication HART, FOUNDATION Fieldbus H1, PROFIBUS-PA or FoxCom
- Configuration by means of local keys, Hand Held Terminal, PC or I/A Series system or with an infrared interface by means of IRCOM

#### Version "Intelligent without Communication"

- Input signal 4-20 mA

#### Applicable to all SRD991 Models:

- Supply air pressure up to 50 psig (3.4 bar)
- Single or double acting
- Protection class IP 65, NEMA 4X
- Explosion protection:
  - II 2 G EEx i / II 2 G EEx n (intrinsic safety) according to ATEX
  - Intrinsic safety according to FM and CSA
- Ambient temperature -40 to 176°F (-40 to 80°C)
- Display and Local User Interface:
  - Multilingual Full-Text Graphic LCD or LEDs
  - Status- and Diagnostic-Messages displayed on LCD
  - Easy configuration by means of 3 push buttons
- Mechanical travel indicator
- Suitable for safety applications up to SIL3
- Partial Stroke Test (PST) for Emergency Shut Down applications
- Infrared Interface for wireless communication
- Stainless steel housing for offshore or food and beverage applications



- Additional Inputs/outputs (optional):
  - 2 binary outputs (limits)
  - Position feedback 4 to 20 mA, 1 Alarm output
  - 2 binary inputs
  - Built-in independent inductive limit switches (2- 3-wire) or micro switches
  - Sensors for supply air pressure and output pressure
  - Binary Inputs/Outputs dedicated to SIS logic solvers
- Accessories
  - Booster relay to minimize stroke time
  - Gauge Manifold



# Armstrong® Python™ - 1100 Series Control Valve

## 43AP Pressure Controller

- 4 to 400% proportional band
- 3-15 psi signal output
- 316 stainless steel spiral pressure element
- Enclosure meets IEC IP53 NEMA Type 3

## 43AP Temperature Controller

- 4 to 400% proportional band
- 15 Ft. capillary
- 316 stainless steel well with 6" insertion length
- Enclosure meets IEC IP53 NEMA Type 3

## Features

- Wide selection of measuring elements
- Wide choice of control modes
- Broad range of integral (reset) and derivative adjustments
- Power failures do not influence process driven indication
- Weatherproof construction
- Versatile mounting
- Internal bumpless automatic-manual transfer station

These instruments indicate and control pressure, temperature, vacuum and differential pressure. They provide process industries with a highly dependable and versatile group of instruments.

## Accuracy:

Input to pointer:  $\pm 0.5\%$  of span for qualified elements.  
Input to output: Depends on measuring element used.

## Repeatability:

0.2% of span

## Deadband:

0.1% of span

## Ambient Temperature Effect:

Maximum control point shift at midspan per 100°F (55°C) change within normal operating conditions is 1% of input span.

## Supply Pressure Effect:

Maximum control point shift at midspan per 1 psi (7 kPa) change within normal operating conditions is 0.2% of input span.



# Python™ - 1100 Series Control Valve

## Foxboro/Eckardt Controllers

The 718C Series expands the capability of standard 1/8 DIN controllers with advanced features:

- Modbus serial communication to I/A Series for Windows NT, where data collection capabilities and remote operation are needed.
- Adaptive Auto-Tune for quick start ups
- Anti-Windup for keeping your batch process under control

The NEMA 4X faceplates allow these units to be used in applications where washdowns and dust conditions exist.

The Soft Start function prevents thermal shock.

Designed specifically for equipment manufacturers who need communications to data acquisition equipment, the light and compact (1/8 DIN size) is able to perform in the most demanding applications with easy yet reliable control.

The 718C Series start-up is as simple as:

- wiring the instrument
- configuring set points and alarm thresholds
- initiating the autotune function

Engineers, technicians and operators, skilled or unskilled in process control theory, can obtain perfect process control.

## Foxboro 718C Electric Controller

- For digital control with universal input and local set point. Installed in a fiberglass enclosure with a thermal strip and auto tune instructions.
- One (1) mA output, 3 relays, 2 digital inputs and auxiliary power supply for transmitters.
- No communication
- 24 Vdc, 110 AC, 240 AC power supply