

# PYTHON® 1500 SERIES CONTROL VALVES

PNEUMATIC AND ELECTRIC ACTUATED





## Table of Contents

Features and Benefits .....	3
Specifications, Weights, and Dimensions .....	4 - 5
Trim Options and CV Values .....	6
Pneumatic Actuators .....	7
Pneumatic Actuated Shut Off Charts .....	8 - 11
Pneumatic Actuated Model Identification .....	12
CV1500BEL - Belimo Electric Actuator .....	13 - 14
CV1500PSL - PSL Electric Actuator .....	15 - 16
Electric Actuated Model Identification .....	17
Sizing Example .....	18

# Python® – 1500 Series Control Valves



Control valves are a key component in any pressure or temperature control application. With the increasing cost of fuel, delivering media in the most efficient way increases productivity by delivering the required pressure or temperature while avoiding excessive consumption. Precision control also provides repeatability and safety for any process.

## FEATURES

- | Series 1500 valves are globe two-way single seated design valves, which deliver accurate and efficient control for most steam and liquid applications
- | Body with top entry trim and bolted bonnet facilitates easy access to all internal parts for in-line inspection, maintenance, and trim replacement
- | Carbon steel and stainless steel materials
- | 2 Packings: Carbon filled PTFE chevron seals and grafoil
- | Electric actuators for on/off and modulating characteristics
- | Equal percentage and Linear characteristic trims for accurate control
- | Pressure balanced configuration for improved shut off and high pressure applications
- | Metal to metal seats rated for Class IV shut off
- | Optional PTFE soft seat for Class VI shut off
- | 17-4 PH h900 and Stellite plugs and seat for long service and better resistance
- | 50:1 Rangeability
- | Two pneumatic actuators per valve size
- | 6-spring actuator design allows lower hysteresis and higher performance
- | Pneumatic actuators tested to over 4 million cycles
- | Live spring loaded teflon packing for long service and less maintenance



Python® Series 1500  
Control Valve - Threaded  
Connection



Python® Series  
1500 Control Valve -  
Flanged Connection

## ACCESSORIES

### Positioners

- | Pneumatic
- | Electro-Pneumatic
- | Digital

### Controllers

- | Pneumatic
- | Electric

### Transmitters

### Temperature Sensors

## Armstrong International

The Americas | Asia | Europe, Middle East, Africa



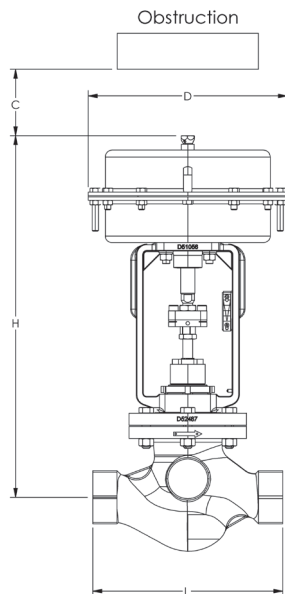
# Python® – 1500 Series Control Valves

List of Materials	
Valve Body	Carbon Steel A216 Gr. WCB Stainless Steel CF8M
Valve/Valve Seat	17-4 PH h900 / Standard Stellite / Option PTFE Soft Seat / Option - 388F (198C) Max.
Valve Spindle	ANSI SS 431
Gland Packing	Carbon Filled V-Teflon - option 1 (450°F (232°C) Max.) Grafoil - option 2 (800°F (427°C) Max.)
Yoke	Ductile Iron
Actuator Spring	SiCr Spring Steel
Actuator Diaphragm	Nitrile Reinforced with Nylon Fiber
Cage Material	ASTM A743 Gr CB30
Sealing Ring Material	Carbon Filled V-Teflon

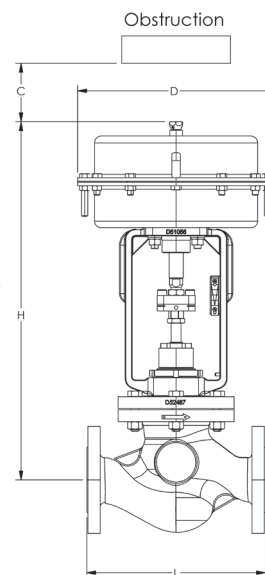
Technical Data		
Flow Characteristic	Equal Percentage and Linear	
Leakage	ANSI Class IV (Metal to Metal) ANSI Class VI (PTFE Soft Seat)	
Rangeability	50:1	
Travel	1/2" to 1-1/2"	13/16" (20 mm)
	2"	1-3/16" (30 mm)
	2-1/2" to 4"	1-9/16" (40 mm)

Dimensions and Weights - 174 cm <sup>2</sup> Actuator and Valve									
Size	Face-to-Face "L"			"C"	"D"	"H"	Weight		
	NPT	150#	300#				NPT	150#	300#
in (mm)	in (mm)	in (mm)	in (mm)	in (mm)	in (mm)	in (mm)	lb (kg)	lb (kg)	lb (kg)
1/2 (15)	6-1/2 (165)	7-1/4 (184)	7-1/2 (190)	5-7/8 (150)	8-1/4 (210)	16-3/4 (426)	29 (13)	29 (13)	29 (13)
3/4 (20)	6-1/2 (165)	7-1/4 (184)	7-5/8 (194)	5-7/8 (150)	8-1/4 (210)	16-3/4 (426)	29 (13)	29 (13)	31 (14)
1 (25)	7-3/4 (197)	7-1/4 (184)	7-3/4 (197)	5-7/8 (150)	8-1/4 (210)	16-3/4 (426)	33 (15)	35 (16)	37 (17)
1-1/4 (32)	9-1/4 (235)	8 (203)	8-1/2 (216)	5-7/8 (150)	8-1/4 (210)	17-3/4 (451)	35 (16)	37 (17)	42 (19)
1-1/2 (40)	9-1/4 (235)	8-3/4 (222)	9-1/4 (235)	5-7/8 (150)	8-1/4 (210)	17-3/4 (451)	37 (17)	40 (18)	46 (21)

Python® Series  
1500 Control Valve -  
Threaded Connection



Python® Series  
1500 Control Valve -  
Flanged Connection



Armstrong International

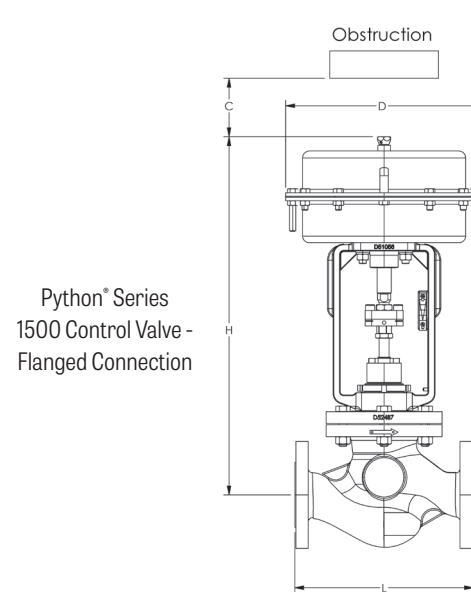
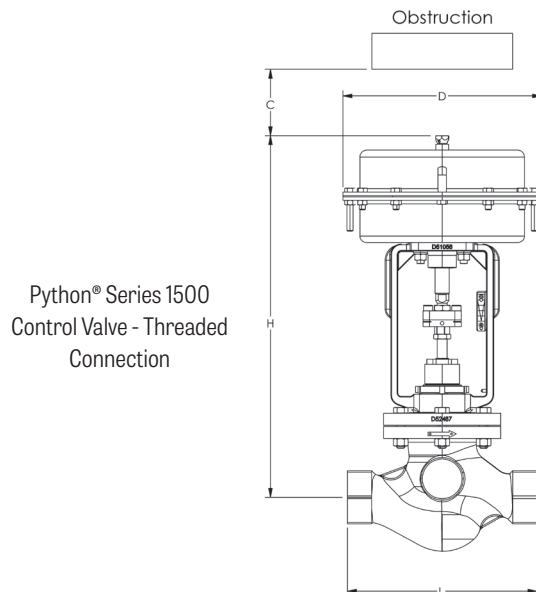
The Americas | Asia | Europe, Middle East, Africa

## Dimensions & Weight -348 cm<sup>2</sup> Actuator and Valve

Size in (mm)	Face-to-Face "L"			"C" in (mm)	"D" in (mm)	"H" in (mm)	Weight		
	NPT	150#	300#				NPT	150#	300#
	in (mm)	in (mm)	in (mm)				lb (kg)	lb (kg)	lb (kg)
1/2 (15)	6-1/2 (165)	7-1/4 (184)	7-1/2 (190)	5-7/8 (150)	11 (280)	18-3/4 (477)	46 (21)	46 (21)	46 (21)
3/4 (20)	6-1/2 (165)	7-1/4 (184)	7-5/8 (194)	5-7/8 (150)	11 (280)	18-3/4 (477)	46 (21)	46 (21)	49 (22)
1 (25)	7-3/4 (197)	7-1/4 (184)	7-3/4 (197)	5-7/8 (150)	11 (280)	18-3/4 (477)	51 (23)	53 (24)	55 (25)
1-1/4 (32)	9-1/4 (235)	8 (203)	8-1/2 (216)	5-7/8 (150)	11 (280)	19-3/4 (502)	53 (24)	55 (25)	60 (27)
1-1/2 (40)	9-1/4 (235)	8-3/4 (222)	9-1/4 (235)	5-7/8 (150)	11 (280)	19-3/4 (502)	55 (25)	53 (26)	64 (29)
2 (50)	10-1/2 (267)	10 (254)	10-1/2 (267)	5-7/8 (150)	11 (280)	19-7/8 (504)	71 (32)	77 (35)	82 (37)
2-1/2 (65)	-	10-13/16 (276)	11-1/2 (292)	5-7/8 (150)	11 (280)	23-7/16 (595)	-	129 (59)	132 (60)
3 (80)	-	11-3/4 (298)	12-1/2 (322)	5-7/8 (150)	11 (280)	23-13/16 (605)	-	150 (68)	158 (72)
4 (100)	-	13-13/16 (352)	14-1/2 (374)	5-7/8 (150)	11 (280)	25 (635)	-	204 (93)	222 (101)

## Dimensions & Weight -700 cm<sup>2</sup> Actuator and Valve

Size in (mm)	Face-to-Face "L"		"C" in (mm)	"D" in (mm)	"H" in (mm)	Weight	
	150#	300#				150#	300#
	in (mm)	in (mm)				lb (kg)	lb (kg)
2 (50)	10 (254)	10-1/2 (267)	5-7/8 (150)	16 (400)	24-1/8 (613)	141 (64)	147 (67)
2-1/2 (65)	10-13/16 (276)	11-1/2 (292)	5-7/8 (150)	16 (400)	26-7/16 (671)	189 (86)	192 (87)
3 (80)	11-3/4 (298)	12-1/2 (322)	5-7/8 (150)	16 (400)	26-13/16 (681)	210 (95)	218 (99)
4 (100)	13-13/16 (352)	14-1/2 (374)	5-7/8 (150)	16 (400)	27-15/16 (708)	264 (120)	282 (128)



Armstrong International

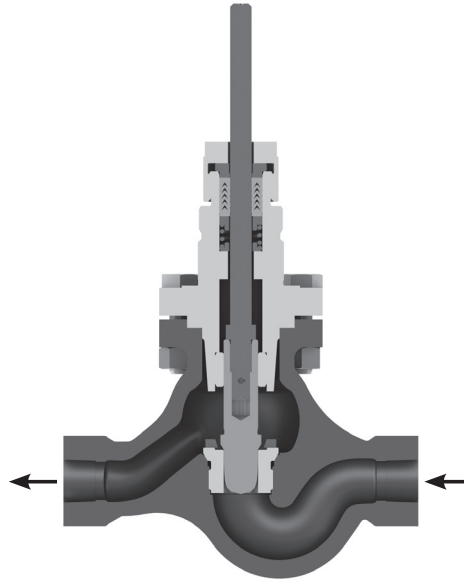
The Americas | Asia | Europe, Middle East, Africa



## TRIM TYPE

### Contour Top Guided Parabolic Unbalanced

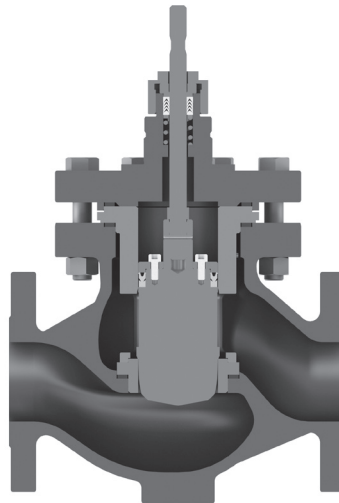
Equal percentage characteristic is ideal for temperature and flow control applications, or valves in parallel. This trim style is the most widely used for accurate control and precise repeatability.



Contour Top  
Guided Parabolic  
Unbalanced

### Cage Guided Parabolic Pressure Balanced

Cage Guided Pressure Balanced is ideal for high pressure applications where the top guided trim may not have adequate shut off capabilities. A balanced trim equalizes the pressure acting above and below the plug, reducing required actuator thrust. This results in a higher shut off capability and a smaller foot print while providing precise control of the application.



Cage Guided  
Parabolic Pressure  
Balanced

Table 4-1. CV1500 CV Values

Valve Size in (mm)	Trim Size in (mm)	CV
1/2 (15) 3/4 (20) 1 (25)	1/8 (3)	0.12
	5/32 (4)	0.3
	3/16 (5)	0.5
	1/4 (6)	0.7
	9/32 (7)	1.2
	7/16 (11)	3
	1/2 (16)	5
	3/4 (18)	9
1-1/4 (32)	1 (24)	13
	3/4 (18)	9
	1 (24)	13
1-1/2 (40)	1 (24)	13
	1-1/4 (32)	21
	1-1/2 (38)	30
2 (50)	1-1/4 (32)	21
	1-1/2 (38)	30
	2 (50)	50
2-1/2 (65)	1-1/2 (38)	30
	2 (50)	50
	2-1/2 (65)	80
3 (80)	2 (50)	50
	2-1/2 (65)	80
	3 (80)	110
4 (100)	2-1/2 (65)	80
	3 (80)	110
	4 (100)	185



## Multi-Spring Actuators

Multi-Spring Actuators are diaphragm actuators with pre-compressed, multi-spring construction. They are compact, easy to maintain, and are suitable for both modulating and on/off applications. Models are available covering small to large thrust requirements.

### Specifications

### Features:

- | Maximum Diaphragm Pressure: 60 psig (4 barg) for model 174, 348 and 700
- | Actuator travel: 174: 20mm  
348: 20mm/30mm/40mm  
700: 30mm/40mm
- | Diaphragm: Nitrile reinforced with Nylon fiber
- | Operating Temperature Range: -40° to 176°F (-40° to 80°C)
- | Connections: 1/4" NPT (F) for Models 174, 348 and 700
- | Permissible Linearity and Hysteresis: ±5% of Signal Pressure Range
- | Construction – Due to multi-spring arrangement, the actuators are lightweight and compact.
- | Long service life – Rigid, rolling diaphragm construction and durable components provide a long lasting service life.
- | Minimum maintenance – The actuators are virtually maintenance free.
- | Accuracy – Rolling diaphragm construction provides a constant effective area throughout the stroke.
- | Tested to over 4 million full stroke cycles.

## 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.

## 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.

**Table 5-1. Air Volume Required Per Stroke**

Model Number	Cubic Feet/Stroke
174cm <sup>2</sup> 20mm	0.014 ft <sup>3</sup> (0.0004 m <sup>3</sup> )
348cm <sup>2</sup> 20mm	0.027 ft <sup>3</sup> (0.0008 m <sup>3</sup> )
348cm <sup>2</sup> 30mm	0.041 ft <sup>3</sup> (0.0012 m <sup>3</sup> )
348cm <sup>2</sup> 40mm	0.053 cu.ft/stroke (0.0015 m <sup>3</sup> )
700cm <sup>2</sup> 30mm	0.085 cu.ft/stroke (0.0024 m <sup>3</sup> )
700cm <sup>2</sup> 40mm	0.113 cu.ft/stroke (0.0032 m <sup>3</sup> )

**Pressure Temperature Rating for Carbon Steel Valves**

Temp °F (°C)	Class 150 psig (barg)	Class 300 psig (barg)
100 (38)	285 (20)	740 (51)
200 (93)	260 (18)	675 (47)
300 (149)	230 (16)	655 (45)
400 (204)	200 (14)	635 (44)
500 (260)	170 (12)	600 (41)
600 (316)	140 (10)	550 (38)
650 (343)	125 (9)	535 (37)
700 (371)	110 (8)	535 (37)
750 (399)	95 (7)	505 (35)
800 (427)	80 (6)	410 (28)

**Pressure Temperature Rating for CF8M Valves**

Temp °F (°C)	Class 150 psig (barg)	Class 300 psig (barg)
up to 100 (38)	275 (19)	720 (50)
200 (93)	235 (16)	620 (42)
300 (149)	215 (15)	560 (39)
400 (204)	195 (14)	515 (36)
500 (260)	170 (12)	480 (33)
600 (316)	140 (10)	450 (32)
650 (343)	125 (9)	445 (31)
700 (371)	110 (8)	430 (30)



# Python® – 1500 Series Control Valves

**Table 6 - 1. Contoured Top Guided Parabolic Unbalanced Equal Percentage and Linear Shut Off Pressure for Reverse Acting Actuator**

Actuator Model No.	Min. Air Supply to Actuator with Positioner psi (bar)	Spring Range psi (bar)	Diap. Area Inch <sup>2</sup>	Maximum Differential Pressure psig (barg) / Δ P / Shut Off Pressure																
				CV	Trim Size															
					0.12	0.3	0.5	0.7	1.2	3	5	9	13	21	30	50	85	110	185	
				1/8"	5/32"	3/16"	1/4"	9/32"	7/16"	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"		
174 20mm	20 (1.3)	3-15 (0.2 - 1)	27in <sup>2</sup>	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	478 (33)	214 (15)	156 (11)	87 (6)	44 (3)	29 (2)	-	-	-	-		
	23 (1.5)	6-18 (0.4 - 1.2)		725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	465 (32)	344 (24)	198 (14)	107 (7)	73 (5)	-	-	-	-		
	37 (2.5)	9-32 (0.6 - 2.2)		725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	716 (49)	530 (37)	310 (21)	170 (12)	118 (8)	-	-	-	-			
	43 (2.9)	16-38 (1.1 - 2.6)		725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	590 (41)	326 (23)	229 (16)	-	-	-	-			
348 20mm	20 (1.3)	3-15 (0.2 - 1)	54in <sup>2</sup>	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	344 (24)	198 (14)	107 (7)	73 (5)	-	-	-	-		
	23 (1.5)	6-18 (0.4 - 1.2)		725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	421 (29)	232 (16)	162 (11)	-	-	-	-			
348 30mm	20 (1.3)	3-15 (0.2 - 1)	54in <sup>2</sup>	-	-	-	-	-	-	-	-	-	107 (7) *	73 (5) *	39 (3)	-	-	-		
	23 (1.5)	6-18 (0.4 - 1.2)		-	-	-	-	-	-	-	-	-	232 (16) *	162 (11) *	91 (6)	-	-	-		
	37 (2.5)	9-32 (0.6 - 2.2)		-	-	-	-	-	-	-	-	-	358 (25) *	251 (17) *	142 (10)	-	-	-		
	43 (2.9)	16-38 (1.1 - 2.6)		-	-	-	-	-	-	-	-	-	671 (46) *	474 (33) *	271 (19)	-	-	-		
348 40mm	20 (1.3)	3-15 (0.2 - 1)	54in <sup>2</sup>	-	-	-	-	-	-	-	-	-	-	-	-	21 (2)	13 (.9)	7 (.5)		
	23 (1.5)	6-18 (0.4 - 1.2)		-	-	-	-	-	-	-	-	-	-	-	-	52 (4)	33 (2)	20 (1.4)		
	43 (2.9)	16-38 (1.1 - 2.6)		-	-	-	-	-	-	-	-	-	-	-	-	158 (11)	103 (7)	65 (5)		
700 30mm	20 (1.3)	3-15 (0.2 - 1)	108in <sup>2</sup>	-	-	-	-	-	-	-	-	-	234 (16) *	164 (11) *	92 (6)	-	-	-		
	23 (1.5)	6-18 (0.4 - 1.2)		-	-	-	-	-	-	-	-	-	487 (33) *	343 (24) *	195 (14)	-	-	-		
	43 (2.9)	16-38 (1.1 - 2.6)		-	-	-	-	-	-	-	-	-	725 (50) *	725 (50) *	557 (38)	-	-	-		
700 40mm	20 (1.3)	3-15 (0.2 - 1)	108in <sup>2</sup>	-	-	-	-	-	-	-	-	-	-	-	-	52 (4)	33 (2)	20 (1)		
	23 (1.5)	6-18 (0.4 - 1.2)		-	-	-	-	-	-	-	-	-	-	-	-	113 (8)	74 (5)	46 (3)		
	43 (2.9)	16-38 (1.1 - 2.6)		-	-	-	-	-	-	-	-	-	-	-	-	328 (23)	215 (15)	136 (9)		

\* Indicates 2" valve with reduced port trim  
Do not exceed 60 psig (4 barg) air pressure to the actuator



# Python® – 1500 Series Control Valves



**Table 6 - 2. Contoured Top Guided Parabolic Unbalanced Equal Percentage and Linear Shut Off Pressure for Direct Acting Actuator**

Actuator Model No.	Min. Air Supply to Actuator with Positioner psi (bar)	Spring Range psi (bar)	Diap. Area Inch <sup>2</sup>	Maximum Differential Pressure psig (barg) Δ P / Shut Off Pressure															
				CV	Trim Size														
					0.12 1/8"	0.3 5/32"	0.5 3/16"	0.7 1/4"	1.2 9/32"	3 7/16"	5 1/2"	9 3/4"	13 1"	21 1-1/4"	30 1-1/2"	50 2"	85 2-1/2"	110 3"	185 4"
174 20mm	18 (1.2)	3-15 (0.2 - 1)	27in <sup>2</sup>													-	-	-	-
	22 (1.5)			725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	664 (46)	303 (21)	222 (15)	126 (9)	67 (5)	45 (3)	-	-	-	-	
	29 (2)			-	-	-	-	-	725 (50)	725 (50)	691 (48)	405 (28)	223 (15)	156 (11)	-	-	-	-	
	36 (2.5)			-	-	-	-	-	-	-	725 (50)	684 (47)	380 (26)	267 (18)	-	-	-	-	
	44 (3)			-	-	-	-	-	-	-	-	725 (50)	537 (37)	378 (26)	-	-	-	-	
	51 (3.5)			-	-	-	-	-	-	-	-	725 (50)	694 (48)	490 (34)	-	-	-	-	
	58 (4)			-	-	-	-	-	-	-	-	-	725 (50)	601 (41)	-	-	-	-	
348 20mm	18 (1.2)	3-15 (0.2 - 1)	54in <sup>2</sup>	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	399 (28)	177 (12)	128 (9)	71 (5)	35 (2.5)	23 (1.6)	-	-	-	-	
	22 (1.5)			-	-	-	-	-	725 (50)	725 (50)	691 (48)	405 (28)	223 (15)	156 (11)	-	-	-	-	
	29 (2)			-	-	-	-	-	-	-	725 (50)	725 (50)	537 (37)	378 (26)	-	-	-	-	
	36 (2.5)			-	-	-	-	-	-	-	-	-	725 (50)	601 (41)	-	-	-	-	
	44 (3)			-	-	-	-	-	-	-	-	-	-	725 (50)	-	-	-	-	
348 30mm & 40mm	18 (1.2)	3-15 (0.2 - 1)	54in <sup>2</sup>	-	-	-	-	-	-	-	-	-	10 (.7)	10 (.7)	-	-	-	-	
	22 (1.5)			-	-	-	-	-	-	-	-	-	205 (14)	143 (10)	80 (6)	45 (3)	29 (2)	-	
	29 (2)			-	-	-	-	-	-	-	-	-	519 (36)	366 (25)	208 (14)	121 (8)	79 (5)	-	
	36 (2.5)			-	-	-	-	-	-	-	-	-	725 (50)	588 (41)	337 (23)	197 (14)	129 (9)	-	
	44 (3)			-	-	-	-	-	-	-	-	-	-	725 (50)	465 (32)	273 (19)	179 (12)	-	
	51 (3.5)			-	-	-	-	-	-	-	-	-	-	-	594 (41)	349 (24)	229 (16)	-	
	58 (4)			-	-	-	-	-	-	-	-	-	-	-	722 (50)	425 (29)	279 (19)	-	
700 30mm & 40mm	18 (1.2)	3-15 (0.2 - 1)	108in <sup>2</sup>	-	-	-	-	-	-	-	-	-	144 (10)	100 (7)	55 (4)	30 (2)	19 (1)	11 (1)	
	22 (1.5)			-	-	-	-	-	-	-	-	-	523 (36)	368 (25)	210 (14)	122 (8)	79 (5)	50 (3)	
	29 (2)			-	-	-	-	-	-	-	-	-	725 (50)	725 (50)	468 (32)	275 (19)	180 (12)	114 (8)	
	36 (2.5)			-	-	-	-	-	-	-	-	-	-	725 (50)	428 (30)	281 (19)	179 (12)		
	44 (3)			-	-	-	-	-	-	-	-	-	-	-	-	581 (40)	382 (26)	243 (17)	
	51 (3.5)			-	-	-	-	-	-	-	-	-	-	-	-	725 (50)	480 (33)	306 (21)	
	58 (4)			-	-	-	-	-	-	-	-	-	-	-	-	-	584 (40)	373 (26)	

\* For 2" valves with reduced port trims only.  
Do not exceed 60 psig (4 barg) air pressure to the actuator.



# Python® – 1500 Series Control Valves

**Table 6 - 3, Cage Guided Parabolic Pressure Balanced Shut Off Pressure for Reverse Acting Actuator**

Actuator Model No.	Min. Air Supply to Actuator with Positioner	Spring Range	Diap. Area	Maximum Differential Pressure psig (barg) / Δ P / Shut Off Pressure				
				Trim Size				
				CV	30	50	85	110
	psig (barg)	psig (barg)	Inch <sup>2</sup>	1 - 1/2"	2"	2 - 1/2"	3"	4"
174 20mm	20 (1.3)	3-15 (0.2 - 1)	27in <sup>2</sup>	218 (15)	-	-	-	-
	23 (1.5)	6-18 (0.4 - 1.2)		725 (50)	-	-	-	-
	37 (2.5)	9-32 (0.6 - 2.2)		725 (50)	-	-	-	-
	43 (2.9)	16-38 (1.1 - 2.6)		725 (50)	-	-	-	-
348 20mm	20 (1.3)	3-15 (0.2 - 1)	54in <sup>2</sup>	725 (50)	-	-	-	-
	23 (1.5)	6-18 (0.4 - 1.2)		725 (50)	-	-	-	-
348 30mm	20 (1.3)	3-15 (0.2 - 1)	54in <sup>2</sup>	595 (41)	566 (39)	-	-	-
	23 (2.5)	6-18 (0.4 - 1.2)		725 (50)	725 (50)	-	-	-
	37 (2.5)	9-32 (0.6 - 2.2)		725 (50)	725 (50)	-	-	-
	43 (2.9)	16-38 (1.1 - 2.6)		725 (50)	725 (50)	-	-	-
348 40mm	20 (1.3)	3-15 (0.2 - 1)	54in <sup>2</sup>	-	-	522 (36)	457 (32)	384 (26)
	23 (2.5)	6-18 (0.4 - 1.2)		-	-	725 (50)	725 (50)	725 (50)
	43 (2.9)	16-38 (1.1 - 2.6)		-	-	725 (50)	725 (50)	725 (50)
700 30mm	20 (1.3)	3-15 (0.2 - 1)	108in <sup>2</sup>	725 * (50)	725 (50)	-	-	-
	23 (2.5)	6-18 (0.4 - 1.2)		725 * (50)	725 (50)	-	-	-
	43 (2.9)	16-38 (1.1 - 2.6)		725 * (50)	725 (50)	-	-	-
700 40mm	20 (1.3)	3-15 (0.2 - 1)	108in <sup>2</sup>	-	-	725 (50)	725 (50)	725 (50)
	23 (2.5)	6-18 (0.4 - 1.2)		-	-	725 (50)	725 (50)	725 (50)
	43 (2.9)	16-38 (1.1 - 2.6)		-	-	725 (50)	725 (50)	725 (50)

\* Indicates 2" valve with reduced port trim

Armstrong International

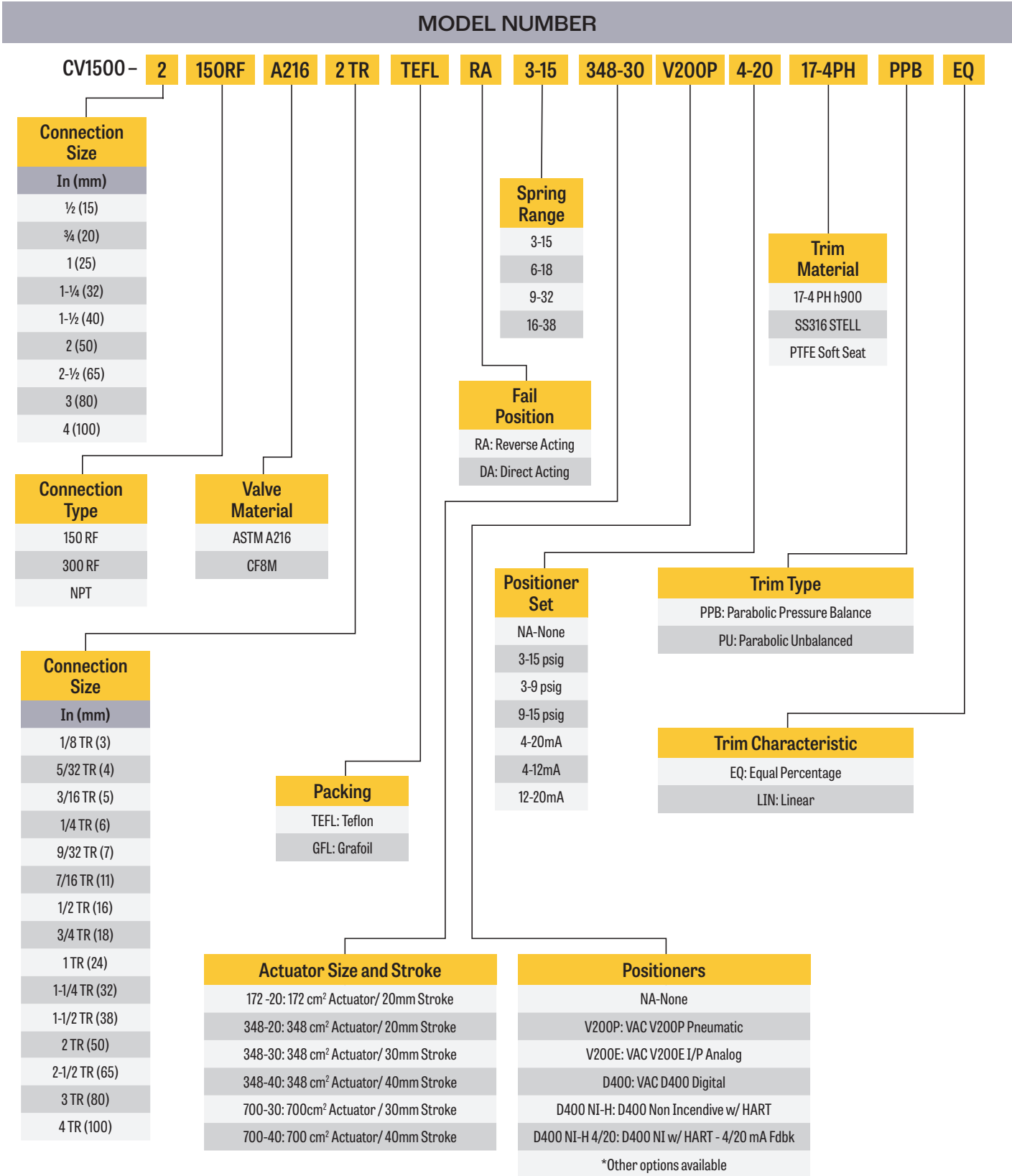
The Americas | Asia | Europe, Middle East, Africa

**Table 6 - 4, Cage Guided Parabolic Pressure Balanced Shut Off Pressure for Direct Acting Actuator**

Actuator Model No.	Min. Air Supply to Actuator W/ Positioner	Spring Range	Diap. Area	Maximum Differential Pressure psi (bar) / Δ P / Shut Off Pressure					
				Trim Size					
				CV	30	50	85	110	185
	psi (bar)	psi (bar)	Inch <sup>2</sup>						
174 20mm	23 (1.5) 29 (2)	3-15 (0.2 - 1)	27in <sup>2</sup>		1 - 1/2"	2"	2 - 1/2"	3"	4"
					536 (37)	-	-	-	-
					725 (50)	-	-	-	-
348 20mm	23 (1.5)	3-15 (0.2 - 1)	54in <sup>2</sup>		725 (50)	-	-	-	-
348 30mm & 40mm	23 (1.5) 29 (2)	3-15 (0.2 - 1)	54in <sup>2</sup>		725 (50)	725 (50)	725 (50)	725 (50)	710 (49) 725 (50)
					-	-	-	-	-



# Python® – Pneumatic Actuated Model Identification



\*Stainless Steel valves only available flanged.

Armstrong International

The Americas | Asia | Europe, Middle East, Africa

# Python® BEL – Belimo Electric Linear Actuator



For 24VAC/24VDC fail safe, proportional modulating control of the CV1500 in HVAC and hydronic systems.

Actuator sizing will be dictated by the valve size selection. All valve selections should be done in accordance with the flow parameters and system specifications. The actuator is mounted directly to the CV1500 bonnet by means of an innovative clamp and collar.

The actuator operates in response to a 2-10 VDC input signal, or with the addition of a 500 Ω resistor, a 4-20 mA input signal from an electric controller or positioner. A 2-10 VDC VDC feedback signal is provided for position indication.



Technical Data	
Flow Characteristic	Equal Percentage or Linear
Leakage	ANSI Class IV (Metal to Metal) ANSI Class VI (PTFE Soft Seat)
Rangeability	50:1
Voltage	24VAC/24VDC
Control Signal	2-10V / 4-20mA

List of Materials	
Valve Body	Carbon Steel A216 Gr. WCB Stainless Steel CF8M
Valve/Valve Seat	17-4 PH h900 / Standard Stellite / Option PTFE Soft Seat / Option - 388F (198C) Max.
Valve Spindle	ANSI SS 431
Gland Packing	Carbon Filled V-Teflon (450°F (232°C) Max.)

## Product Features:

- | Power: 24VAC/VDC
- | Fail Safe: 35 second run time
- | Frequency: 50 or 60 Hz
- | Pillar mechanical clamp collar connection
- | Auto/Manual control
- | Control Signal: 2-10V or 4-20mA
- | Protection Class: Nema 2, IP54, UL enclosure type 2
- | ½" – 1-1/2" (15 – 40 mm) Belimo SKVX24-MFT
- | 2" (50 mm) Belimo AVKB24-MFT
- | 2.5" thru 4" (65 – 100 mm) RVX24-MFT

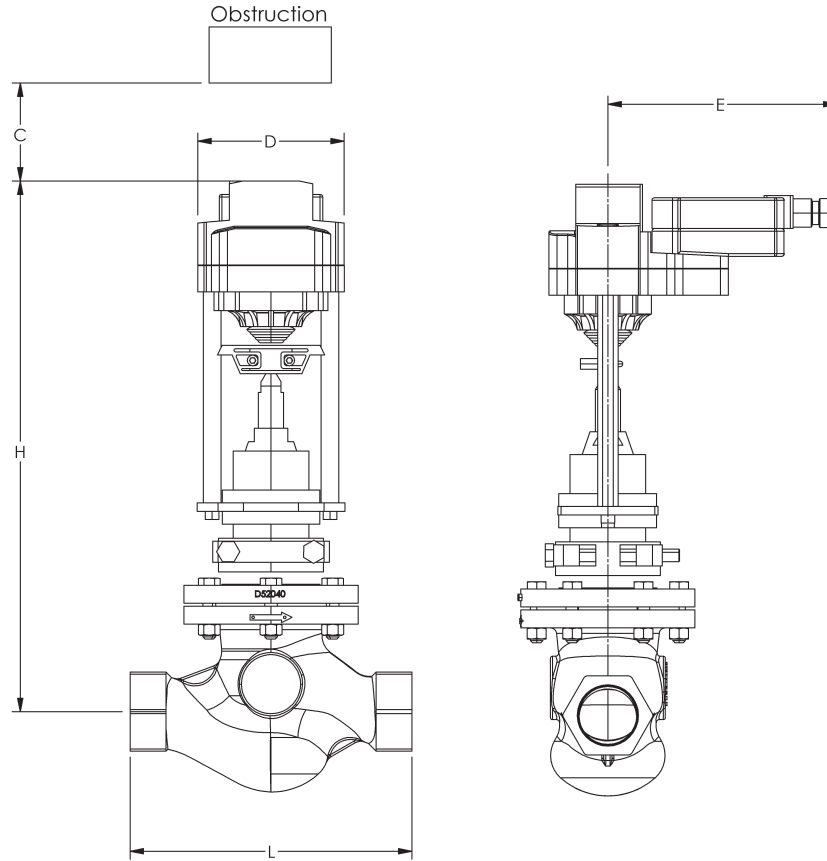
BEL max shut off pressure is 200psi for sizes 1/2" – 1".  
 BEL max shut off pressure is 100psi for sizes 1-1/4" – 2-1/2".  
 BEL max shut off pressure is 75psi for 3".  
 BEL max shut off pressure is 50psi for 4".

## Armstrong International

The Americas | Asia | Europe, Middle East, Africa



# Python® BEL – Belimo Electric Linear Actuator



**Dimensions and Weight - BEL1500 (Belimo) Electric Actuator**

Size in (mm)	Face-to-Face "L"			"C" in (mm)	"D" in (mm)	"E" in (mm)	"H" in (mm)	Weight		
	NPT in (mm)	150# in (mm)	300# in (mm)					NPT lb (kg)	150# lb (kg)	300# lb (kg)
1/2 (15)	6-1/2 (165)	7-1/4 (184)	7-1/2 (190)	4 (102)	4 (102)	8-1/4 (210)	14-3/4 (375)	13 (6)	14 (6)	15 (7)
3/4 (20)	6-1/2 (165)	7-1/4 (184)	7-5/8 (194)	4 (102)	4 (102)	8-1/4 (210)	14-3/4 (375)	13 (6)	15 (7)	17 (8)
1 (25)	7-3/4 (197)	7-1/4 (184)	7-3/4 (197)	4 (102)	4 (102)	8-1/4 (210)	14-3/4 (375)	18 (8)	20 (9)	23 (11)
1-1/4 (32)	9-1/4 (235)	8 (203)	8-1/2 (216)	4 (102)	4 (102)	8-1/4 (210)	15-3/4 (400)	22 (10)	23 (11)	28 (13)
1-1/2 (40)	9-1/4 (235)	8-3/4 (222)	9-1/4 (235)	4 (102)	4 (102)	8-1/4 (210)	15-3/4 (400)	23 (10)	26 (13)	32 (15)
2 (50)	10-1/2 (267)	10 (254)	10-1/2 (267)	4 (102)	5-1/2 (140)	10-1/4 (260)	19-3/4 (502)	44 (20)	49 (22)	55 (25)
2-1/2 (65)	-	10-13/16 (276)	11-1/2 (292)	4 (102)	5-1/2 (140)	10-1/4 (260)	25-1/2 (650)	-	66 (30)	71 (32)
3 (80)	-	11-3/4 (298)	12-1/2 (322)	4 (102)	5-1/2 (140)	10-1/4 (260)	26-1/4 (667)	-	82 (37)	90 (41)
4 (100)	-	11-3/4 (298)	14-1/2 (374)	4 (102)	5-1/2 (140)	10-1/4 (260)	27-3/4 (705)	-	131 (60)	148 (67)

BEL max shut off pressure is 200psi for sizes 1/2" – 1".

BEL max shut off pressure is 100psi for sizes 1-1/4" – 2-1/2".

BEL max shut off pressure is 75psi for 3".

BEL max shut off pressure is 50psi for 4".

Armstrong International

The Americas | Asia | Europe, Middle East, Africa



# Python® PSL Electric Linear Actuators



When accurate control of your steam or water application is desired and air is not available, the Python® PSL Electric Control Valve will deliver precise control. The electric version of the popular 1500 series control valve is built to out perform and deliver accurate control. The PSL Series Electric Control Valve is constructed and equipped with state of the art industrial materials combined with the standard 1500 series main valve.



## Product Features:

- | Power: 24V AC/DC (115V AC available)
- | Frequency 50 or 60 Hertz
- | Terminal board connection
- | Pillar mechanical connection
- | Control signal 4-20 mA, 2-10 volts
- | Protection class IP 67
- | High thrust capabilities
- | Electronic position control
- | Mounts to the standard 1500 Series valve body
- | Actuators available for valves from 1/2" to 4"
- | 140°F max. ambient temperature

Technical Data	
Flow Characteristics	Equal Percentage
Leakage	ANSI Class IV (Metal to Metal) ANSI Class VI (PTFE Soft Seat)
Rangeability	50:1
Voltage	24VAC/VDC, 120VAC and 240VAC Power Supply

List of Materials	
Valve Body	Carbon Steel A216 GR. WCB Stainless Steel CF8M
Valve/Valve Seat	Stainless Steel 17-4 PH h900 / Standard Stellite / Option PTFE Soft Seat / Option - 388F (198C) Max.
Valve Stem	Stainless Steel 431
Gland Packing	Carbon Filled V-Teflon - Option 1 (450°F (232°C) max) Grafoil - Option 2 (800°F (427°C) max)
Yoke	Stainless Steel
Actuator Housing	Aluminum
Cage Material	ASTMA743 Gr CB30
Sealing Ring Material	Carbon Filled V-Teflon

Pressure Temperature Rating for Carbon Steel Valves		
Temp °F (°C)	Class 150 psi (bar)	Class 300 psi (bar)
100 (38)	285 (20)	740 (51)
200 (93)	260 (18)	675 (47)
300 (149)	230 (16)	655 (45)
400 (204)	200 (14)	635 (44)
500 (260)	170 (12)	600 (41)
600 (316)	140 (10)	550 (38)
650 (343)	125 (9)	535 (37)
700 (371)	110 (8)	535 (37)
750 (399)	95 (7)	505 (35)
800 (427)	80 (6)	410 (28)

Pressure Temperature Rating for CF8M Valves		
Temp °F (°C)	Class 150 psig (barg)	Class 300 psig (barg)
up to 100 (38)	275 (19)	720 (50)
200 (93)	235 (16)	620 (42)
300 (149)	215 (15)	560 (39)
400 (204)	195 (14)	515 (36)
500 (260)	170 (12)	480 (33)
600 (316)	140 (10)	450 (32)
650 (343)	125 (9)	445 (31)
700 (371)	110 (8)	430 (30)

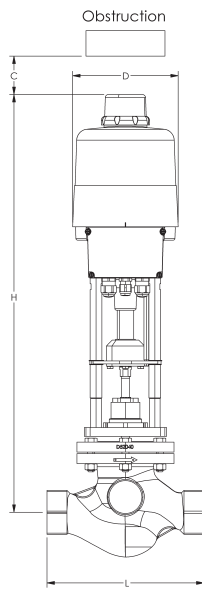
## Armstrong International

The Americas | Asia | Europe, Middle East, Africa

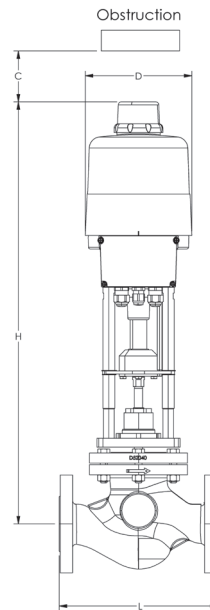


# Python® PSL Electric Linear Actuators

PSL Actuator Maximum Shutoff Pressure									
Size in (mm)	Face-to-Face "L"			"C" in (mm)	"D" in (mm)	"H" in (mm)	Weight		
	NPT	150#	300#				NPT	150#	300#
	in (mm)	in (mm)	in (mm)				lb (kg)	lb (kg)	lb (kg)
1/2 (15)	6-1/2 (165)	7-1/4 (184)	7-1/2 (190)	6-1/4 (160)	7 (178)	23-7/8 (606)	22 (10)	22 (10)	22 (10)
3/4 (20)	6-1/2 (165)	7-1/4 (184)	7-5/8 (194)	6-1/4 (160)	7 (178)	23-7/8 (606)	22 (10)	23 (10)	23 (10)
1 (25)	7-3/4 (197)	7-1/4 (184)	7-3/4 (197)	6-1/4 (160)	7 (178)	23-7/8 (606)	26 (12)	28 (13)	31 (14)
1-1/4 (32)	9-1/4 (235)	8 (203)	8-1/2 (216)	6-1/4 (160)	7 (178)	24-7/8 (632)	37 (16)	38 (17)	42 (19)
1-1/2 (40)	9-1/4 (235)	8-3/4 (222)	9-1/4 (235)	6-1/4 (160)	7 (178)	24-7/8 (632)	38 (17)	41 (18)	47 (21)
2 (50)	10-1/2 (267)	10 (254)	10-1/2 (267)	6-1/4 (160)	7 (178)	28-1/16 (713)	54 (24)	59 (26)	64 (29)
2-1/2 (65)	-	10-7/8 (276)	11-1/2 (292)	6-1/4 (160)	7 (178)	34-3/8 (874)	-	81 (36)	86 (39)
3 (80)	-	11-3/4 (298)	12-1/2 (318)	6-1/4 (160)	7 (178)	35-1/8 (891)	-	99 (44)	107 (48)
4 (100)	-	13-7/8 (352)	14-1/2 (368)	6-1/4 (160)	7 (178)	37-1/8 (942)	-	148 (67)	165 (74)



Python® Series 1500  
PSL Electric Actuator -  
Threaded Connection



Python® Series 1500  
PSL Electric Actuator -  
Flanged Connection

## CV1500PSL Unbalanced Shut Off Pressure for Reverse Acting

Actuator Model	Thrust	Cv Value Trim Size fractional in (mm)	0.12	0.3	0.5	0.7	1.2	3	5	9	13	21	30	50	80	110	185
			1/8 (3)	5/32 (4)	3/16 (5)	1/4 (6)	9/32 (7)	7/16 (11)	1/2 (13)	3/4 (19)	1 (25)	1-1/4 (32)	1-1/2 (38)	2 (51)	2-1/2 (64)	3 (76)	4 (102)
PSL204AMS12	1011 lbf	psi	725	725	725	725	725	725	725	725	725	725	528	-	-	-	-
	4.50 kN	bar	50	50	50	50	50	50	50	50	50	50	36.4	-	-	-	-
PSL208AMS11	1798 lbf	psi	-	-	-	-	-	-	-	-	-	725*	725**	532	338	234	130
	8.00 kN	bar	-	-	-	-	-	-	-	-	-	50.0*	50.0**	36.7	23.3	16.1	9.0

## CV1500PSL Pressure Balanced Shut Off Pressure for Reverse Acting

Actuator Model	Thrust	Cv Value Trim Size fractional in (mm)	0.12	0.3	0.5	0.7	1.2	3	5	9	13	21	30	50	80	110	185
			1/8 (3)	5/32 (4)	3/16 (5)	1/4 (6)	9/32 (7)	7/16 (11)	1/2 (13)	3/4 (19)	1 (25)	1-1/4 (32)	1-1/2 (38)	2 (51)	2-1/2 (64)	3 (76)	4 (102)
PSL204AMS12	1011 lbf	psi	-	-	-	-	-	-	-	-	-	-	725	-	-	-	-
	4.50 kN	bar	-	-	-	-	-	-	-	-	-	-	50.0	-	-	-	-
PSL208AMS11	1798 lbf	psi	-	-	-	-	-	-	-	-	-	-	725**	725	725	725	725
	8.00 kN	bar	-	-	-	-	-	-	-	-	-	-	50.0**	50.0	50.0	50.0	50.0

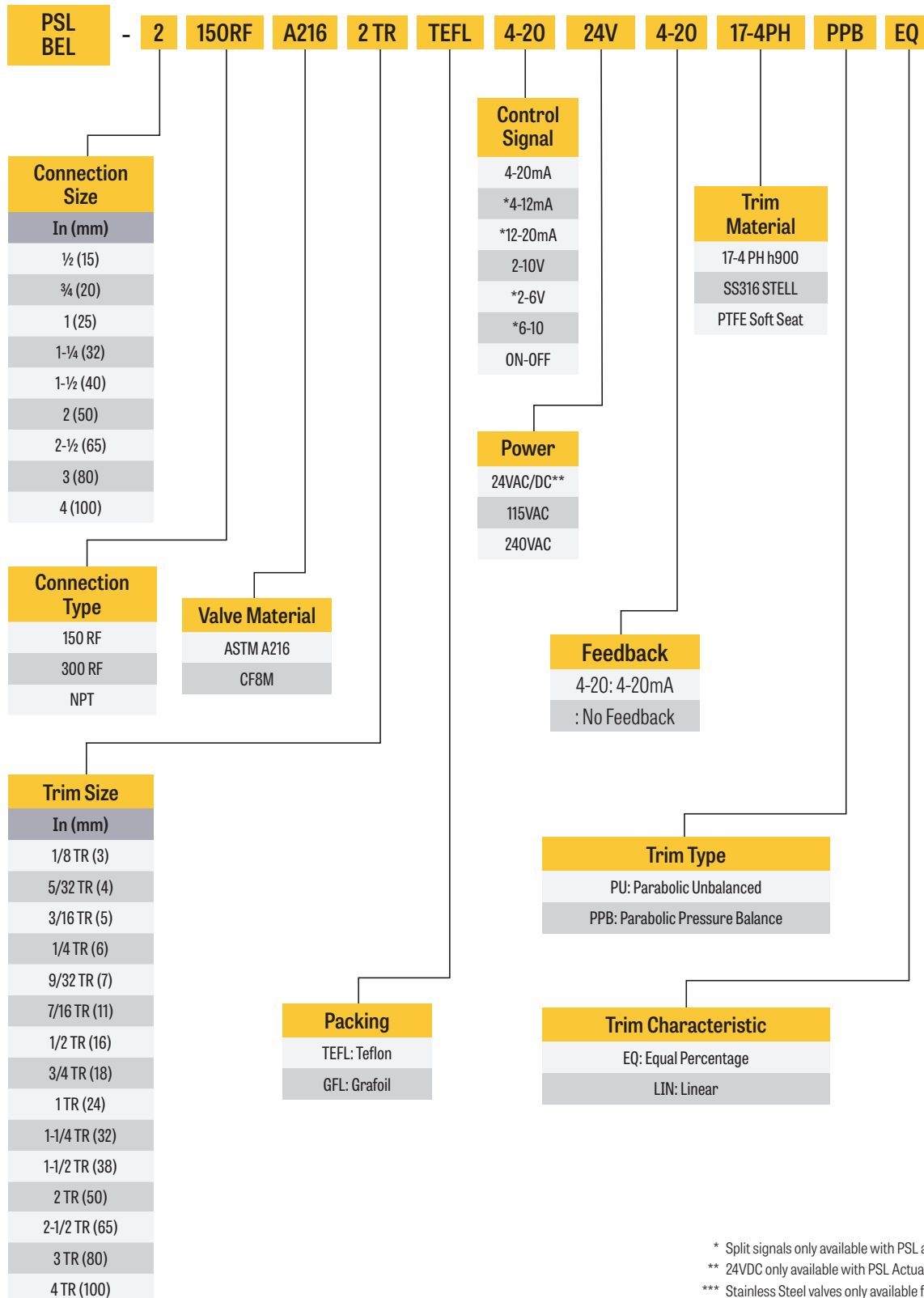
\* Only available in a 2in. valve with reduced trim.

\*\* Only available in a 2 or 2-1/2in valve with reduced trim.

Armstrong International

The Americas | Asia | Europe, Middle East, Africa

## MODEL NUMBER



Armstrong International

The Americas | Asia | Europe, Middle East, Africa



## 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 4 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's maximum Cv. See the formulas below for steam and water applications. Consult factory for other types of fluids.

### For Saturated Steam Service

#### Subcritical Flow

When  $\Delta P < 0.81(P1/2)$

$$Cv = \frac{W}{2.1\sqrt{\Delta P(P1A+P2A)}}$$

#### Critical Flow

When  $\Delta P \geq 0.81(P1/2)$

$$Cv = \frac{W}{1.633(P1A)}$$

### For Liquid Service

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

Cv = Valve flow coefficient

W = Maximum flow capacity of steam, lbs/hr

P1A = Inlet Pressure, psia (psig + 14.7)

P2A = Outlet Pressure, psia (psig + 14.7)

$\Delta P$  = Pressure drop (P1 - P2) psig

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 P1 and P2. The shut off pressure for a temperature control application is the P1 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

Application: Temperature Control

P1: 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 P2 pressure, we will size the valve with a 30% pressure drop. We need to use the subcritical flow formula.

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

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.

These formulas are derived from the ANSI/ISA-75.01.01 standard to allow for easy daily use. These simplified formulas contain assumptions on some parameters and will always give a conservative sizing.





INTELLIGENT THERMAL UTILITIES SOLUTIONS FROM A GLOBAL  
LEADER IN ENERGY MANAGEMENT AND ENJOYABLE EXPERIENCES

**Armstrong International**

The Americas | Asia | Europe, Middle East, Africa

[armstronginternational.com](https://armstronginternational.com)