



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
- Cast steel material
- 2 Packings: PTFE chevron seals and grafoil
- Parabolic equal percentage trims for accurate control
*Additional trims are coming soon. Trims such as perforated unbalanced, multi-hole balanced, soft seat Class VI, and micro trims are a few examples.
- Metal to metal seats rated for Class IV shut off
- 17-4 PH h900 plugs and seat for long service and better resistance
- 50:1 Rangeability
- Two pneumatic actuator sizes
- 6 springs design which allows lower hysteresis and higher performance
- Pneumatic actuators tested to over 4 million cycles
- Reverse and direct acting actuators that are field reversible
- Live spring loaded teflon packing for long service and less maintenance
- Electric actuators
- On/Off and modulating characteristic



Python Series 1500
Control Valve -
Flanged Connection

Accessories

Positioners

- Pneumatic
- Electro-Pneumatic
- Digital

Controllers

- Pneumatic
- Electric

Transmitters

Temperature sensor

All dimensions and weights are approximate. Use certified print for exact dimensions. Design and materials are subject to change without notice.

Python® - 1500 Series Control Valves

Table PTC-285-1. List of Materials	
Valve Body	GP240GH (1.0619)
Bonnet	
Valve/Valve Seat	17-4 PH h900
Valve Spindle	ANSI SS 431
Gland Packing	V-Teflon - option 1 (366°F (186°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

Table PTC-285-2. Technical Data		
Flow Characteristic		Equal Percentage
Leakage		ANSI Class IV
Rangeability		50:1
Travel	1/2" to 1-1/2"	20 mm
	2"	30 mm

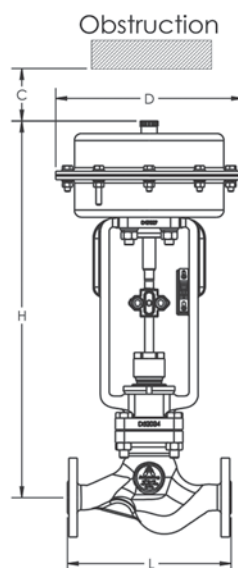
Table PTC-285-3. Dimensions and Weights - 174 cm ² Actuator and Valve						
Size		Face-to-Face "L"	"C"	"D"	"H"	Weight
in	mm	PN40*				PN40*
		mm	mm	mm	mm	kg
1/2	15	130	150	210	431	15
3/4	20	150	150	210	431	16
1	25	160	150	210	433	18
1-1/4	32	180	150	210	458	21
1-1/2	40	200	150	210	458	22

* Flange to EN1092-1. Face to Face to EN558-1 Series 1.

Table PTC-285-4. Dimensions and Weights - 348 cm ² Actuator and Valve						
Size		Face-to-Face "L"	"C"	"D"	"H"	Weight
in	mm	PN40*				PN40*
		mm	mm	mm	mm	kg
1/2	15	130	150	280	481	24
3/4	20	150	150	280	481	24
1	25	160	150	280	483	28
1-1/4	32	180	150	280	508	30
1-1/2	40	200	150	280	508	31
2	50	230	150	280	510	42

* Flange to EN1092-1. Face to Face to EN558-1 Series 1.

Python Series 1500
Control Valve -
Flanged Connection



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Python® - 1500 Series Control Valves

Trim:

Parabolic Top Guided

The Parabolic Top Guided trim is an ideal choice for many applications. It provides equal percent control with precise accuracy. Top Guided trim also can be used in almost any media type with excellent performance. The plug is guided in the lower part of the bonnet minimizing the effect of side thrust on the valve plug and eliminating trim vibration.

Table PTC-286-1. Contoured Top Guided Cv

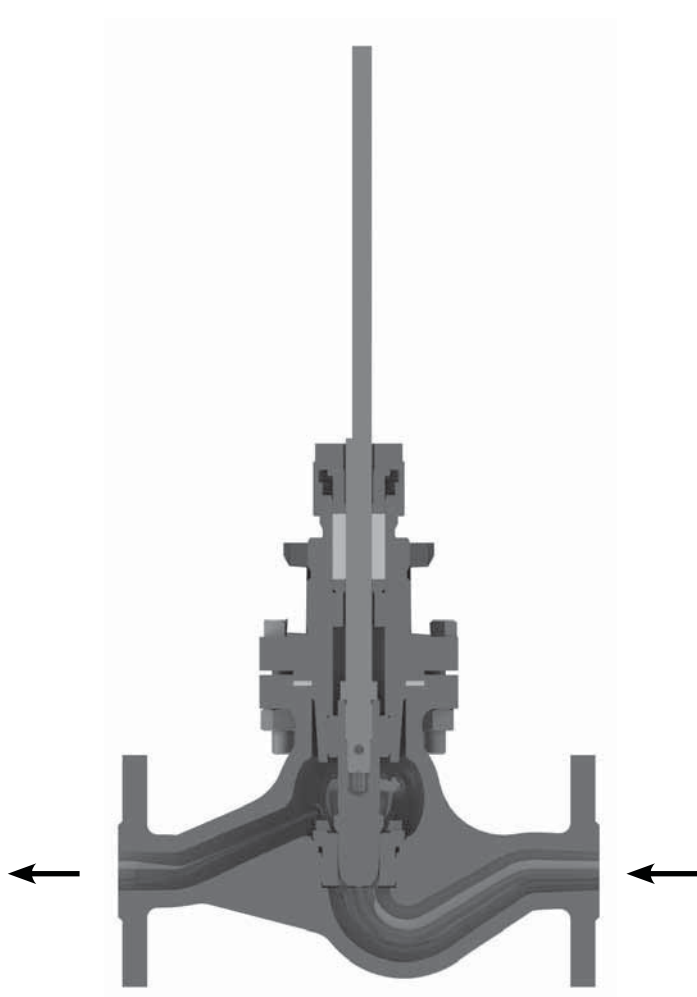
Valve Size		Trim Size	CV	KV
in	mm	in		
1/2, 3/4, 1	15 20 25	1/8	0.12	0.104
		5/32	0.3	0.26
		3/16	0.5	0.43
		9/32	1.2	1.04
		7/16	3	2.6
		1/2	5	4.33
		3/4	9	7.79
1-1/4	32	1	13	11.3
		3/4	9	7.79
		1	13	11.3
1-1/2	40	1-1/4	21	18.2
		1	13	11.3
		1-1/4	21	18.2
2	50	1-1/2	30	26
		1-1/4	21	18.2
		1-1/2	30	26
		2	50	43.3

Shade indicates products that are CE Marked according to the PED (2014/68/UE). All the other models comply with the Article 4.3 of the same directive.

Table PTC-286-2. Pressure Temperature Rating

Temp °C	PN40 bar
Ambient Temp	40
100	37.1
150	35.2
200	33.3
250	30.4
300	27.6
350	25.7
400	23.8

Minimal Temperature: - 10 °C



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Python® - 1500 Series Control Valves

Multi-Spring Actuators

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

Specifications

- Maximum Diaphragm Pressure:
4 bar for Model 174 and 348
- Actuator travel:
174: 20 mm
348: 20 mm/30 mm
- Diaphragm:
Nitrile reinforced with Nylon fiber
- Operating Temperature Range:
-40° to 80°C
- Connections:
1/4" NPT (F) for Models 174 and 348
- Permissible Linearity and Hysteresis:
±5% of Signal Pressure Range

Features:

- 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, 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 constant effective area throughout the stroke.
- Tested to over 4 million cycles. Full 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.

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 PTC-287-1. Air Volume Required Per Stroke

Model Number	Cubic meter (feet)/Stroke
174cm ² 20mm	0.0004 m ³
348cm ² 20mm	0.0008 m ³
348cm ² 30mm	0.0012 m ³

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Python® - 1500 Series Control Valve

Pressure and Temperature Controls

Table PTC-288-1. Contoured Top Guided Shut Off Pressure for Reverse Acting Actuator

Actuator Model No.	Min. Air Supply to Acuator W/ Posit-ioner	Spring Range	Diap. Area	Maximun Differential Pressure bar Δ P / Shut Off Pressure											
				Trim Size											
				CV	0.12	0.3	0.5	1.2	3	5	9	13	21	30	50
	bar	bar	cm ²		1/8"	5/32"	3/16"	9/32"	7/16"	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"
174 20mm	1.3	0.2-1	174cm ²		40	40	40	40	33	15	11	6	3	2	-
	1.5	0.4-1.2			40	40	40	40	40	32	24	14	7	5	-
	2.5	0.6-2.2			40	40	40	40	40	40	37	21	12	8	-
	2.9	1.1-2.6			40	40	40	40	40	40	40	40	23	16	-
348 20mm	1.3	0.2-1	348cm ²		40	40	40	40	40	32	24	14	7	5	-
	1.5	0.4-1.2			40	40	40	40	40	40	40	29	16	11	-
348 30mm	1.3	0.2-1	348cm ²		-	-	-	-	-	-	-	-	7*	5*	3*
	1.5	0.4-1.2			-	-	-	-	-	-	-	-	16*	11*	6*
	2.5	0.6-2.2			-	-	-	-	-	-	-	-	25*	17*	10*
	2.9	1.1-2.6			-	-	-	-	-	-	-	-	40*	33*	19*

Do not exceed 60 psig (4 barg) air pressure to the actuator

* For 2" valves with reduced port trims only.

Table PTC-288-2. Contoured Top Guided Shut Off Pressure for Direct Acting Actuator

Actuator Model No.	Min. Air Supply to Acutator W/ Positioner	Spring Range	Diap. Area	Maximun Differential Pressure bar Δ P / Shut Off Pressure											
				Trim Size											
				CV	0.12	0.3	0.5	1.2	3	5	9	13	21	30	50
	bar	bar	cm ²		1/8"	5/32"	3/16"	9/32"	7/16"	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"
174 20mm	1.2	0.2-1	174cm ²		40	40	40	40	33	15	11	6	3	2	-
	1.5				-	-	-	-	40	40	30	18	10	7	-
	2				-	-	-	-	-	40	40	37	20	14	-
	2.5				-	-	-	-	-	-	40	31	22	-	
	3				-	-	-	-	-	-	-	40	30	-	
	3.5				-	-	-	-	-	-	-	40	37	-	
	4				-	-	-	-	-	-	-	-	40	-	
348 20mm	1.2	0.2-1	348cm ²		40	40	40	40	40	32	24	4	7	5	-
	1.5				-	-	-	-	-	40	40	37	20	14	-
	2				-	-	-	-	-	-	40	40	30	-	
	2.5				-	-	-	-	-	-	-	40	40	-	
	3				-	-	-	-	-	-	-	-	40	-	
348 30mm	1.2	0.2-1	348cm ²		-	-	-	-	-	-	-	-	7*	5*	3
	1.5				-	-	-	-	-	-	-	-	20*	14*	8
	2				-	-	-	-	-	-	-	-	40*	30*	17
	2.5				-	-	-	-	-	-	-	-	40*	40*	26
	3				-	-	-	-	-	-	-	-	40*	34	
	3.5				-	-	-	-	-	-	-	-	-	-	40
	4				-	-	-	-	-	-	-	-	-	-	40

Do not exceed 4 barg air pressure to the actuator

* For 2" valves with reduced port trims only.

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Python® - Pneumatic Actuators

MODEL NUMBER

CV1500 – 2 150RF CTS 2 TR 17-4PH PPB EQ TEFL RA 3-15 348-30 SRD 3-15 NA

Connection Size

1/2
3/4
1
1-1/4
1-1/2
2

Connection Type

PN40

Valve Material

GP240GH

Trim Material

17-4 PH h900

Spring Range

3-15
6-18
9-32
16-38

Fail Position

RA: Reverse Acting
DA: Direct Acting

Pressure and Temperature Controls

Trim Size

1/8 TR
5/32 TR
3/16 TR
9/32 TR
7/16 TR
1/2 TR
3/4 TR
1 TR
1-1/4 TR
1-1/2 TR
2 TR

Trim Type

PU= Parabolic Unbalanced

Trim Characteristic

EQ: Equal Percentage

Packing

TEFL: Teflon
GFL: Grafoil

Positioner Set

NA-None
3-15 psi
3-9 psi
9-15 psi
4-20 psi
4-12 psi
12-20 psi

Accessories

NA – None
LSM – Limit Switch Mechanical
LSP – Limit Switch Proximity
FB – 4-20mA Feedback

Actuator Size and Stroke

172 -20= 172 cm² Actuator/ 20mm Stroke
348-20 = 348 cm² Actuator/ 20mm Stroke
348-30 = 348 cm² Actuator/ 30mm Stroke

Positioners

NA-None
SRP -Foxboro Pneumatic
SRI - Foxboro I/P Analog
SRIEx - Foxboro I/P Analog Explosion Proof
SRD - Foxboro Digital
SRDH – Foxboro Digital w/Hart
SRDF – Foxboro Digital w/Fieldbus



Python® - Electric Linear Actuators

When accurate control of your steam or water application is desired and air is not available, the Python AEL 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 AEL 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: 230 V (24 V AC)
- Frequency 50 Hertz
- Terminal board connection
- Auto/Manual control
- Control signal 4-20 mA, 0-10 volts
- Protection class IP 67
- High thrust capabilities
- Electronic position control
- Metal internal gears
- Compact design
- Mounts to the standard 1500 Series valve body
- Actuators available for valves from 1/2" to 2"



Python Series 1500
AEL Electric Actuator

Table PTC-290-1. Technical Data

Flow Characteristics	Equal Percentage
Leakage	ANSI Class IV
Rangeability	50:1
Voltage	24V, 230V Power Supply

Table PTC-290-2. List of Materials

Valve Body	GP240GH
Bonnet	
Valve/Valve Seat	Stainless Steel AISI 17-4 PH h900
Valve Stem	Stainless Steel 431
Gland Packing	V-Teflon - Option 1 (366°F (186°C) max)
	Grafoil - Option 2 (800°F (427°C) max)
Yoke	Steel
Actuator Housing	Aluminum

Table PTC-290-3. Pressure Temperature Rating

Temp °C	PN40 bar
Ambient temp	40
100	37.1
150	35.2
200	33.3
250	30.4
300	27.6
350	25.7
400	23.8

Minimal Temperature: - 10 °C

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Python® - Electric Linear Actuators

Table PTC-291-1. Top Guided

Size of Valve		PN40*				
in	mm	Switch-off thrust (N)	Max. load thrust (N) ON/OFF	Speed (mm/min)	Modulating Model	ON/OFF Model
1/2	15	1900	1600	24	AEL1430	AEL1490
3/4	20	1900	1600	24	AEL1430	AEL1490
1	25	1900	1600	24	AEL1430	AEL1490
1-1/4	32	4600	4000	48	AEL1438	AEL1498
1-1/2	40	4600	4000	48	AEL1438	AEL1498
2	50	7200	6300	48	AEL1438	AEL1498

Table PTC-291-2. Contoured Top Guided Shut Off Pressure for Modulating Electric Actuators - bar

Actuators	Cv Value	0.12	0.3	0.5	1.2	3	5	9	13	21	30	50
	Trim size	1/8	5/32	3/16	9/32	7/16	1/2	3/4	1	1-1/4	1-1/2	2
AEL1430		40	40	40	40	40	40	40	27	-	-	-
AEL1438		-	-	-	-	-	-	-	-	40	-	-
AEL1438		-	-	-	-	-	-	-	-	-	35	-
AEL1438		-	-	-	-	-	-	-	-	-	-	25

Table PTC-291-3. Contoured Top Guided Shut Off Pressure for On/Off Electric Actuators - bar

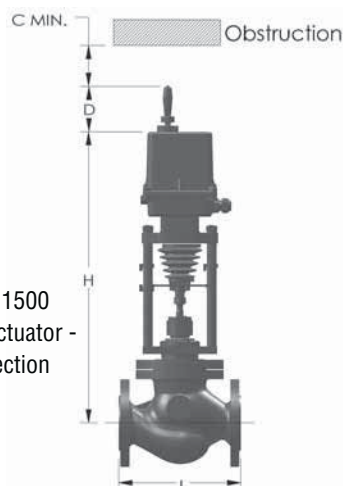
Actuators	Cv Value	0.12	0.3	0.5	1.2	3	5	9	13	21	30	50
	Trim size	1/8	5/32	3/16	9/32	7/16	1/2	3/4	1	1-1/4	1-1/2	2
AEL1490		40	40	40	40	40	40	40	40	-	-	-
AEL1498		-	-	-	-	-	-	-	-	40	-	-
AEL1498		-	-	-	-	-	-	-	-	-	40	-
AEL1498		-	-	-	-	-	-	-	-	-	-	36

Table PTC-291-4. Dimensions and Weights

Size		Face-to-Face "L"	"C"	"D"	"H"	Weight
in	mm	PN40*				PN40*
		mm	mm	mm	mm	kg
1/2	15	130	160	87	500	10
3/4	20	150	160	87	500	11
1	25	160	160	87	502	13
1-1/4	32	180	160	87	546	19
1-1/2	40	200	160	87	546	20
2	50	230	160	87	548	29

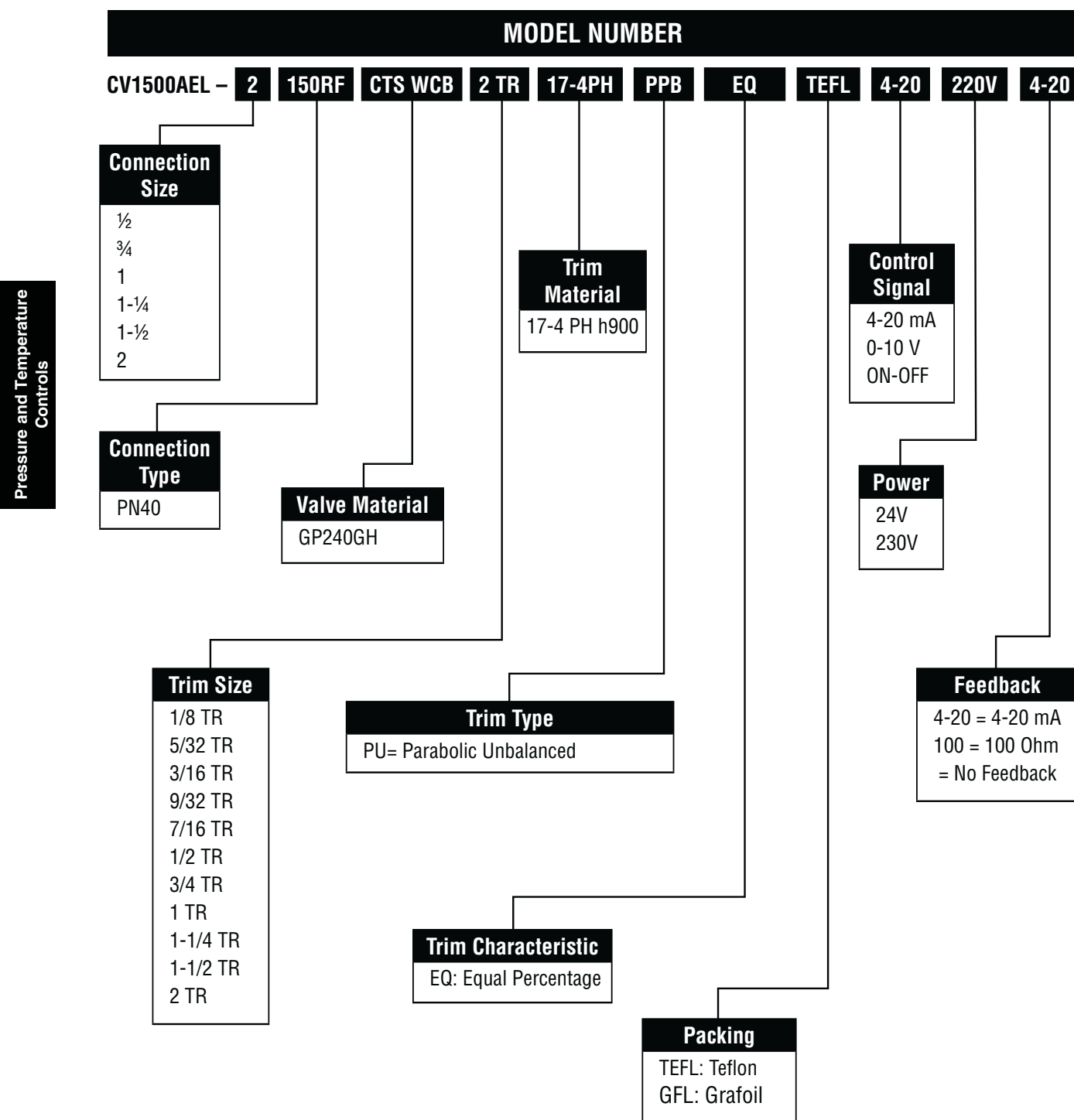
* Flange to EN1092-1. Face to Face to EN558-1 Series 1.

Python Series 1500
AEL Electric Actuator -
Flanged Connection





Python® - Electric Linear Actuators



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Python® - 1500 Series Control Valves

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 PTC-286 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 $\Delta P < 0.81(P_1/2)$

$$C_v = \frac{0.0724 \cdot Q}{\sqrt{\Delta P(P_{1A} + P_{2A})}}$$

Critical Flow

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

$$C_v = \frac{Q}{10.74 \cdot P_{1A}}$$

For Liquid Service

$$C_v = \frac{Q_L \sqrt{G}}{864.7 \sqrt{\Delta P}}$$

Cv = Valve flow coefficient*

Q = Maximum flow capacity of steam, kg/h

P_{1A} = Inlet Pressure, bar absolute

P_{2A} = Outlet Pressure, bar absolute

ΔP = Pressure drop (P₁ - P₂) bar

Q_L = Maximum flow capacity of Liquid, l/h

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: 8,6 bar

Flow: 794 kg/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.

(ΔP = 2,6)

P₂ = 6 bar

$$C_v = \frac{0.0724 \cdot 794}{\sqrt{2,6(9,6 + 7)}} = 8,75$$

Refer to the Cv charts on Page PTC-286. 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.

For detailed sizing using the ANSI/ISA-75.01.01 approach, use Armstrong selection software.

*Conversion factor CV to KV = 0,865

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