

# Pressure Independent Control Series



## Two-Way Cast Iron Flanged Bodies, ANSI 125 and 250

**Description** Siemens Pressure Independent Control Valves integrate three functions into a single device: control valve, adjustable flow limiter, and automatic differential pressure regulator. They are available in both ANSI Class 125 and 250.

- Features**
- Control valve with integrated differential pressure regulator and adjustable flow limiter
  - ANSI 125 and ANSI 250 bodies and flanges
  - 2-1/2-, 3-, 4-, 5-, and 6-inch (65, 80, 100, 125, and 150 mm)
  - Field adjustable presetting
  - < ANSI Class IV leakage (0.01%)
  - Pressure test (P/T) points
  - Can be equipped with SAX, SAV, or SQV electromotoric actuators

### Product Numbers

Table 1.


Product Number	ANSI Pressure Class	Line Size Inch (mm)	Maximum Flow Range GPM (m <sup>3</sup> /h)	Δp Regulator Operating Range psi (kPa)
599-07310	125	2.5 (65)	19 to 110 (4.4 to 25)	3.6 to 90 (25 to 600)
599-07320	250			
599-07330	125		21 to 132 (4.8 to 30)	
599-07335	250			
599-07331	125	3 (80)	31 to 195 (7 to 44)	* to 90 (35 to 600)
599-07336	250			
599-07312	125	4 (100)	55 to 300 (12 to 68)	5 to 90 (35 to 600)
599-07322	250			
599-07317	125		65 to 395 (15 to 90)	
599-07327	250			
599-07313	125	5 (125)	85 to 485 (18 to 110)	5 to 90 (35 to 600)
599-07323	250			
599-07318	125		105 to 595 (23 to 135)	
599-07328	250			
599-07314	125	6 (150)	115 to 650 (26 to 148)	5 to 90 (35 to 600)
599-07324	250			
599-07319	125		140 to 860 (32 to 195)	
599-07329	250			

\* **Note:** See Table 9 for minimum Δp at each given presetting.

## Application

- For use in heating, ventilating and air conditioning systems as a control valve
- For closed loop hot or chilled water applications

## Caution Notations

<b>CAUTION:</b>		Equipment damage may occur if you do not perform a procedure as specified.
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## Specifications

Functional Data	Line size	2-1/2-inch (65 mm) to 6-inch (150 mm)	
	Body style	Flanged	
	Pressure class	ANSI 125 and ANSI 250	
	Pressure regulation flow accuracy	± 5%	
	Valve characteristic	Linear	
	Close-off	100 psi (700 kPa)	
	Leakage rate	< ANSI Class IV (0 to 0.01% of nominal maximum flow)	
	Operating direction	Normally open (push to close)	
	Permissible media	Hot water, chilled water, water/glycol solution	
	Medium temperature range	34°F to 250°F (1°C to 121°C)	
Materials	Nominal stroke	2.5- and 3-inch	3/4-inch (20 mm)
		4- to 6-inch	1-1/2-inch (40 mm)
	Valve body	Cast iron	
	Stem, spring, seat	Stainless steel	
	Plug	Brass (DZR)	
General ambient conditions	Regulator	Stainless steel	
	Seals	EPDM (peroxide cured)	
	Temperature		
	Operation	5°F to 131°F (-15°C to 55°C)	
	Transport	-22°F to 149°F (-30°C to 65°C)	
Storage	5°F to 122°F (-15°C to 50°C)		
Miscellaneous	Humidity		
	Operation	5 to 95% rh	
	Transport	<95% rh	
	Storage	5 to 95% rh	
	Canadian Registration Number	OH7645.5R1 (2.5- and 3-inch LF and HF only)	

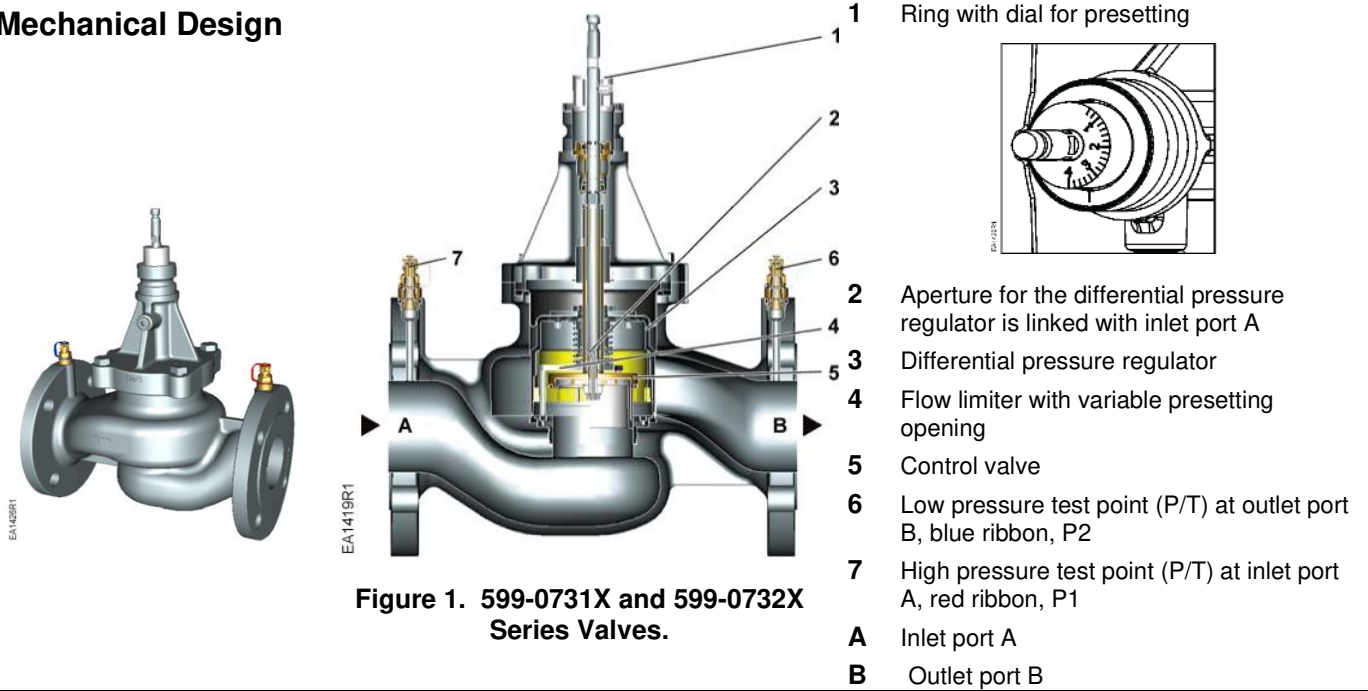
**Table 2. Cast Iron Valve Body Ratings.**

Temperature		Pressure psig (kPa)			
°F	°C	ANSI Class 125		ANSI Class 250	
-20 to 150	-30 to 66	200	(1387)	500	(3447)
200	93	190	(1310)	460	(3171)
250	121	175	(1206)	415	(2861)
300	149	165	(1137)	375	(2585)
400	204	140	(965)	290	(1999)
450	232	125	(861)	250	(1723)

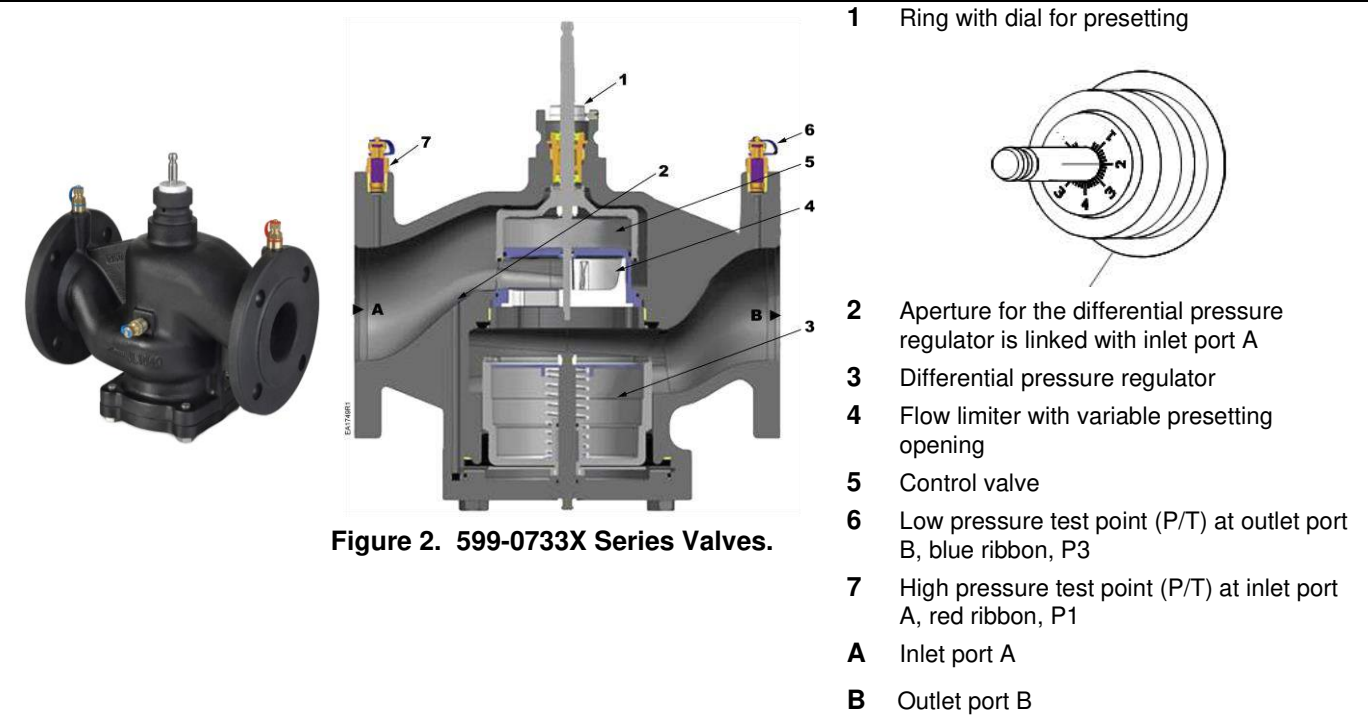
**Table 3. Close-off Pressures for Electronic Actuators.**

Valve Size In. (mm)	SAX Non-Spring Return		SAV		SQV	
	psi	kPa	psi	kPa	psi	kPa
2-1/2 (65)	100	700	100	700	100	700
3 (80)	100	700	100	700	100	700
4 (100)	–	–	100	700	100	700
5 (125)	–	–	100	700	100	700
6 (150)	–	–	100	700	100	700

**Mechanical Design**



**Figure 1. 599-0731X and 599-0732X Series Valves.**



**Figure 2. 599-0733X Series Valves.**

**Pressure Test Points**

The 599-0731X and 599-0732X Series PICV are equipped with two pressure test points (P1, P2) for measuring the differential pressure across the valve during commissioning or operation. See Figure 3.

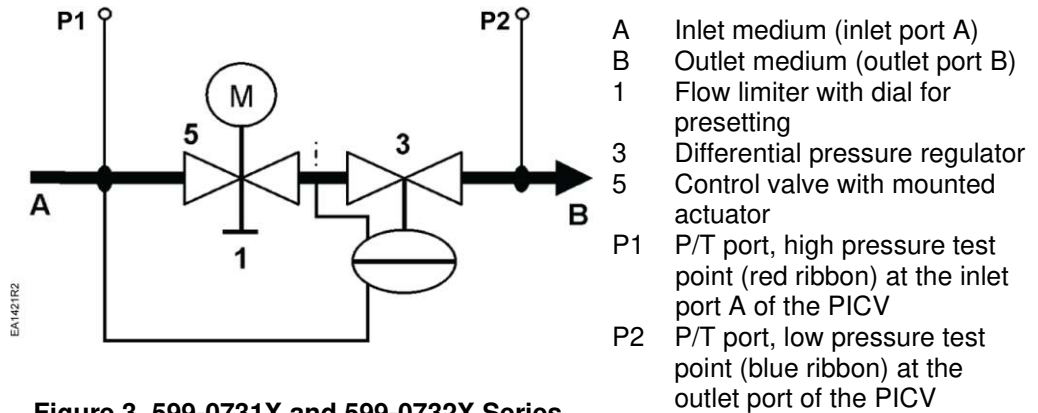
The 599-0733X Series PICV are equipped with three pressure test points (P1, P2, P3) for measuring and monitoring the differential pressure across the control valve and across the PICV during commissioning or for analysis during operation. See Figure 4.

**Operation**

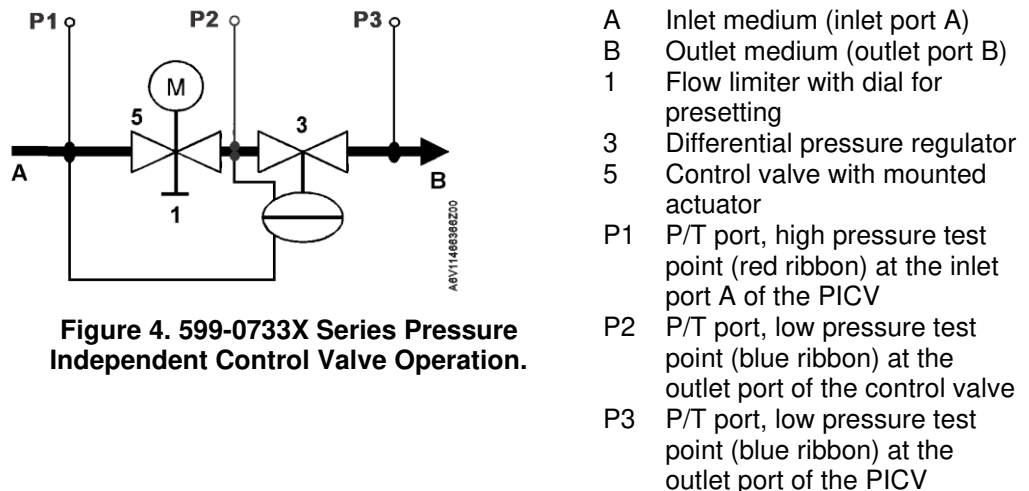
The Pressure Independent Control Valves combine three functions (see Figure 3):

- a control valve (5) for controlling the volumetric flow,
- a field-adjustable flow limiter (4) with a dial (1) for a pre-settable maximum volumetric flow,
- a differential pressure regulator (3) that automatically adjusts to pressure fluctuations in the hydraulic system respectively across the control valve to maintain a constant flow.

The mechanical series-connected differential pressure regulator keeps the differential pressure constant across the control valve, thus maintaining constant flow. The desired maximum volumetric flow can be preset with the field adjustable flow limiter. The building automation system controller (not shown) and the actuator regulate the volumetric flow and consequently the desired temperature in buildings, rooms or zones.



**Figure 3. 599-0731X and 599-0732X Series Pressure Independent Control Valve Operation.**



**Figure 4. 599-0733X Series Pressure Independent Control Valve Operation.**

**Medium Flow**

The medium entering the Pressure Independent Control Valve (inlet port A) first passes through the variable presetting opening (see Figure 1 and Figure 2) which is connected to the ring with a dial (1) for presetting the desired maximum volumetric flow. The actuator (M in Figure 3 and Figure 4) opens and accurately positions the control valve. Then, the medium flows through control valve (5) with a linear characteristic.

Before leaving the Pressure Independent Control Valve (outlet port B), the medium passes through a built-in mechanical differential pressure regulator (3). This differential pressure regulator is the heart of the Pressure Independent Control Valve and ensures that the selected volumetric flow is maintained across the whole working range and independent of the inlet pressure.

**Manual Control**

Manual control is only possible with a mounted actuator.

**Advantages**

The advantages of Pressure Independent Control Valves are:

- Once the flow limiter is set to design flow, the hydronic circuit self balances, even when changes to the system are made, such as additions.
- For any heat demand the Pressure Independent Control Valve with mounted actuator can be set to the desired volumetric flow and will remain constant regardless of pressure fluctuations in the system.

Constant flow regardless of pressure changes in the system leads to a more stable control, less wasted energy and greater comfort.

**Volumetric Flow/  
Dial Presetting**

Tables to determine the dial setting for a desired volumetric flow.

**Table 4. 2-1/2-Inch Valves Flow Rates.**

Low Flow Valves P/N 599-07310, 599-07320			599-0733X Series Valves P/N 599-07330, 599-07335		
Setting	Max. GPM	Max. m <sup>3</sup> /h	Setting	Max. GPM	Max. m <sup>3</sup> /h
4.0	110.0	25.0	4.0	132	30
3.8	102.1	23.2	3.8	125	28.5
3.6	94.7	21.5	3.6	118	26.9
3.4	87.7	19.9	3.4	111	25.2
3.2	81.3	18.5	3.2	104	23.6
3.0	75.3	17.1	3.0	96	21.9
2.8	69.7	15.8	2.8	89	20.2
2.6	64.5	14.6	2.6	81	18.5
2.4	59.6	13.5	2.4	74	16.8
2.2	55.0	12.5	2.2	66	15
2.0	50.6	11.5	2.0	58	13.2
1.8	46.4	10.5	1.8	52	11.9
1.6	42.2	9.6	1.6	47	10.6
1.4	38.0	8.6	1.4	42	9.6
1.2	33.7	7.7	1.2	38	8.6
1.0	29.2	6.6	1.0	32	7.2
0.8	24.5	5.6	0.8	26	5.9
0.6	19.3	4.4	0.6	21	4.8

**Table 5. 3-Inch Valves Flow Rates.**

<b>599-0733X Series Valves P/N 599-07331, 599-07336</b>		
<b>Setting</b>	<b>Max. GPM</b>	<b>Max. m<sup>3</sup>/h</b>
4.0	195	44.3
3.8	183	41.5
3.6	171	38.8
3.4	161	36.5
3.2	151	34.2
3.0	138	31.3
2.8	125	28.3
2.6	114	25.9
2.4	103	23.5
2.2	95	21.5
2.0	85	19.4
1.8	76	17.2
1.6	66	15.0
1.4	60	13.6
1.2	54	12.2
1.0	47	10.6
0.8	40	9.0
0.6	31	7.1

**Table 6. 4-Inch Valves Flow Rates.**

<b>Low Flow Valves P/N 599-07312, 599-07322</b>			<b>High Flow Valves P/N 599-07317, 599-07327</b>		
<b>Setting</b>	<b>Max. GPM</b>	<b>Max m<sup>3</sup>/h</b>	<b>Setting</b>	<b>Max. GPM</b>	<b>Max m<sup>3</sup>/h</b>
4.0	300	68	4.0	395	90
3.8	273	62	3.8	360	82
3.6	250	57	3.6	327	74
3.4	229	52	3.4	298	68
3.2	210	48	3.2	272	62
3.0	194	44	3.0	250	57
2.8	179	41	2.8	230	52
2.6	166	38	2.6	212	48
2.4	154	35	2.4	196	45
2.2	143	32	2.2	181	41
2.0	132	30	2.0	168	38
1.8	122	28	1.8	154	35
1.6	112	26	1.6	141	32
1.4	102	23	1.4	128	29
1.2	91	21	1.2	114	26
1.0	80	18	1.0	99	23
0.8	67	15	0.8	83	19
0.6	55	12	0.6	65	15

**Table 7. 5-Inch Valves Flow Rates.**

Low Flow Valves P/N 599-07313, 599-07323			High Flow Valves P/N 599-07318, 599-07328		
Setting	Max. GPM	Max m <sup>3</sup> /h	Setting	Max. GPM	Max m <sup>3</sup> /h
4.0	485	110	4.0	595	135
3.8	446	101	3.8	550	125
3.6	412	94	3.6	511	116
3.4	382	87	3.4	475	108
3.2	355	81	3.2	443	101
3.0	330	75	3.0	414	94
2.8	308	70	2.8	387	88
2.6	286	65	2.6	361	82
2.4	266	60	2.4	336	76
2.2	246	56	2.2	312	71
2.0	227	52	2.0	288	66
1.8	207	47	1.8	264	60
1.6	188	43	1.6	240	55
1.4	167	38	1.4	215	49
1.2	147	33	1.2	188	43
1.0	125	29	1.0	161	37
0.8	104	24	0.8	132	30
0.6	85	18	0.6	105	23

**Table 8. 6-Inch Valves Flow Rates.**

Low Flow Valves P/N 599-07314, 599-07324			High Flow Valves P/N 599-07319, 599-07329		
Setting	Max. GPM	Max m <sup>3</sup> /h	Setting	Max. GPM	Max m <sup>3</sup> /h
4.0	650	148	4.0	860	195
3.8	610	139	3.8	796	181
3.6	571	130	3.6	737	167
3.4	533	121	3.4	683	155
3.2	497	113	3.2	632	144
3.0	462	105	3.0	586	133
2.8	429	98	2.8	542	123
2.6	398	90	2.6	501	114
2.4	367	83	2.4	463	105
2.2	338	77	2.2	427	97
2.0	310	70	2.0	392	89
1.8	282	64	1.8	358	81
1.6	255	58	1.6	324	74
1.4	228	52	1.4	291	66
1.2	201	46	1.2	256	58
1.0	173	39	1.0	220	50
0.8	143	33	0.8	182	41
0.6	115	26	0.6	140	32

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## Engineering Notes



### CAUTION:

Install the valve so that the flow of the medium matches the direction of the arrow on the valve body. Failure to do so may damage the differential pressure regulator.

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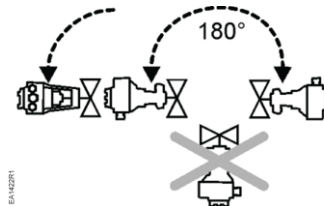
## Recommendations

- A strainer or dirt trap should be fitted upstream of the valve to enhance reliability and service life.
- Remove dirt, welding beads, and so on from valves and pipes.
- Do not insulate the actuator bracket; air circulation must be ensured.

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## Mounting Notes

Pressure Independent Control Valves and actuators can be easily assembled on site. Neither special tools nor adjustments, besides the presetting, are required. Prior to mounting the actuator, the required volumetric flow must be set. Each valve is supplied with a bib tag indicating the maximum GPM flow for each setting of the flow limiter.



**Figure 5. Accepted Mounting Positions.**

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## Installation

- Install the valve so that the flow follows the direction of the arrow indicated on the valve body identification tag.
- For best performance, install the valve assembly with the actuator above the valve body. The valve and actuator can be installed in any position between vertical and horizontal. It is not recommended to install the valve assembly below horizontal or upside down.
- For flange dimensions and bolt hole information, see *Cast Iron Flange Dimensions for 2-1/2 through 6" Valves Technical Bulletin* (155-303P25 [TB 248]).
- Allow sufficient space for servicing the valve and actuator. See Figure 9. 599-0733X Series Valves.
- Table 10 for valve body dimensions, and dimensions of the service envelope recommended around the actuator.

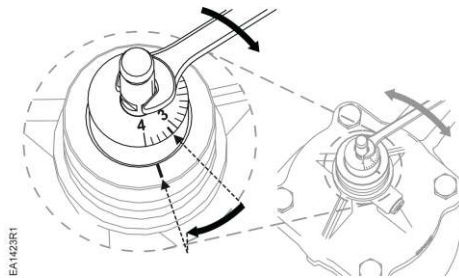
**NOTE:** Instructions for field mounting an actuator, spring adjustments, wiring diagrams, and start-up are covered in the Technical Instructions and Installation Instructions for each actuator.



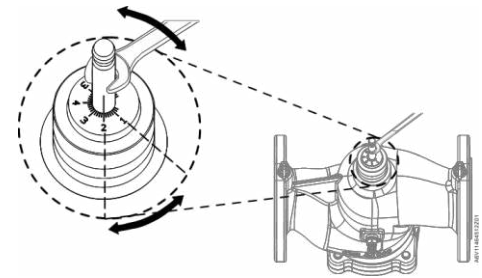
**Presetting**

It is recommended to mount the actuator before the presetting.

1. Mount the actuator in the desired orientation and tighten the valve neck coupling.
2. If using an SQV Actuator, slide the anti-rotation device over the stem with the open end guided by the actuator pillar. Do not tighten on valve stem.
3. Mount the valve stem coupling and tighten slightly.
4. Make the presetting as shown below. Do NOT adjust presetting to a dial reading lower than 0.6. Use an open-ended, 8 mm wrench to turn the stem with dial to the desired presetting position.
5. Tighten the stem coupling.
6. Using a 2.5 mm hex wrench, tighten the SQV anti-rotation device onto the valve stem.



**Figure 6. Maximum GPM Flow Presetting Scale for 599-0731X and 599-0732X Series Valves.**



**Figure 7. Maximum GPM Flow Presetting Scale for 599-0733X Series Valves.**

**Table 9. Presettings with Corresponding Nominal Flow and Minimum  $\Delta p$  for 599-0733X Series Valves**

Size	Presetting	4	3.8	3.6	3.4	3.2	3	2.8	2.4	2.2	2	1.8	1.6	1.4	1.2	1	0.8	0.6
2.5"	Nominal Flow (gpm)	132	125	118	111	104	96	89	74	66	58	52	47	42	38	32	26	21
	Min $\Delta p$ (psi)	4.4	4.3	4.2	4.2	4.1	4	4	3.8	3.8	3.7	3.6	3.5	3.5	3.4	3.3	3.3	3.2
3"	Nominal Flow (gpm)	195	183	171	161	151	138	125	103	95	85	76	66	60	54	47	40	31
	Min $\Delta p$ (psi)	4.9	4.8	4.7	4.6	4.5	4.3	4.2	4	3.9	3.8	3.6	3.5	3.4	3.3	3.1	3	2.9

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**Commissioning Notes**

- The valves must be commissioned with the actuator correctly fitted.
- The Pressure Independent Control Valves must be open when flushing or pressure testing the system. Strong pressure impacts can damage closed Pressure Independent Control Valves.
- Differential pressure  $\Delta p_{\max}$  across the valve's control path is not allowed to exceed 90 psi.

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**Maintenance Notes**

The Pressure Independent Control Valves are maintenance-free.

When performing service work on the valve or actuator:

- Switch off the pump and disconnect the power supply.
- Close the shut-off valves in the piping network.
- Fully reduce pressure in the piping network and allow the pipes to cool down completely.

Remove the electrical connections only if necessary.

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**Stem Seals**

The stem seals cannot be exchanged. In case of leakage, replace the entire valve.

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**Warranty**

Application-related technical data are guaranteed only when the valves are used in connection with the Siemens actuators.

Siemens warranty is void, if used with non-Siemens actuators.

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## Dimensions

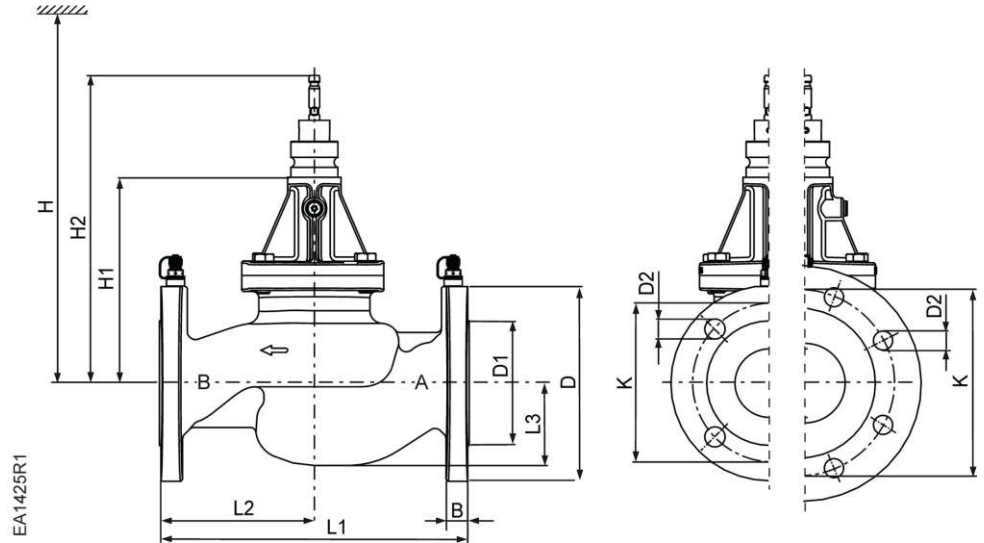


Figure 8. 599-0731X and 599-0732X Series Valves.

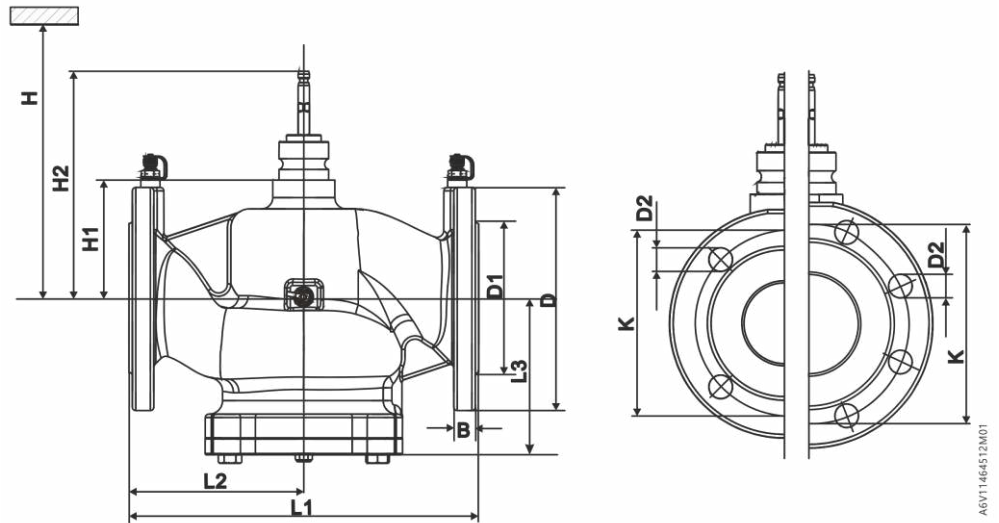


Figure 9. 599-0733X Series Valves.

**Table 10. Dimensions and Weights.**

Product Number	Valve Size Inches (mm)	B	Ø D	Ø D1	Ø D2	L1	L2	L3	Ø K	H1	H2	H			Weight Pounds (kg)
												SAX	SAV	SQV	
599-07310	2.5 (65)	0.69 (17.5)	7.01 (178)	N/A	0.75 (19)	10.87 (276)	5.43 (138)	3.11 (79)	5.50 (140)	7.68 (195)	11.42 (290)	25.08 (637)	—	26.93 (684)	42 (19)
599-07330		0.69 (17.5)	7.01 (178)	N/A	0.75 (19)	10.87 (276)	5.43 (138)	5.1 (129.5)	5.50 (140)	4.09 (104)	7.89 (200.5)	21.5 (546)	—	23.35 (593)	42 (19)
599-07320		1.00 (25.4)	7.48 (190)	4.96 (126)	0.88 (22.4)	11.50 (292)	5.75 (146)	3.31 (84)	5.88 (149.4)	7.68 (195)	11.42 (290)	25.08 (637)	—	26.93 (684)	56 (25.4)
599-07335		0.94 (24)	7.48 (190)	4.96 (126)	0.88 (22.4)	11.50 (292)	5.75 (146)	5.1 (129.5)	5.88 (149.4)	4.09 (104)	7.89 (200.5)	21.5 (546)	—	23.35 (593)	62 (28.1)
599-07331	3 (80)	0.75 (19)	7.50 (191)	N/A	0.75 (19)	11.75 (298)	5.87 (149)	5.77 (146.5)	6.00 (152)	4.09 (104)	7.89 (200.5)	21.5 (546)	—	23.35 (593)	59 (26.8)
599-07336		1.06 (27)	8.25 (210)	5.74 (145.8)	0.88 (22.4)	12.5 (318)	6.26 (159)	5.77 (146.5)	6.62 (168)	4.09 (104)	7.89 (200.5)	21.5 (546)	—	23.35 (593)	80 (36.3)
599-07312 599-07317	4 (100)	0.98 (25)	9.00 (228.6)	N/A	0.75 (19)	13.86 (352)	7.40 (188)	4.49 (114)	7.5 (190.5)	13.07 (332)	19.23 (488.5)	—	31.38 (797)	32.32 (821)	123 (55.6)
599-07322 599-07327		1.14 (29)	10 (254)	6.94 (176.3)	0.88 (22.4)	14.40 (365.8)	7.63 (193.8)	4.61 (117)	7.88 (200.2)	13.07 (332)	19.23 (488.5)	—	31.38 (797)	32.32 (821)	156 (70.8)
599-07313 599-07318	5 (125)	0.98 (25)	10 (254)	N/A	0.88 (22.4)	15.75 (400)	8.07 (205)	5.30 (134.7)	8.50 (215.9)	14.06 (357)	15.63 (397)	—	34.06 (865)	35.00 (889)	170 (77.2)
599-07323 599-07328		1.52 (38.6)	10.9 (276.9)	8.31 (211.1)	0.88 (22.4)	16.62 (422.2)	8.51 (216.1)	5.50 (139.6)	9.25 (235)	14.06 (357)	15.63 (397)	—	34.92 (887)	35.87 (911)	221 (100)
599-07314 599-07319	6 (150)	1.05 (26.70)	11 (279.4)	N/A	0.88 (22.4)	17.76 (451)	9.17 (233)	6.15 (156.3)	9.50 (241.3)	15.79 (401)	17.48 (444)	—	36.06 (916)	37.01 (940)	235 (106)
599-07324 599-07329		1.58 (40.1)	12.5 (317.5)	9.69 (246.1)	0.88 (22.4)	18.62 (473)	9.61 (244)	6.34 (161.1)	10.63 (270)	15.79 (401)	17.48 (444)	—	36.93 (938)	37.87 (962)	303 (138)

ØD1 = Raised area of flange

H = Total actuator height plus minimum distance to the wall or the ceiling for mounting, connection, operation, maintenance, etc.

H1 = Dimension from the pipe center to install the actuator (upper edge)

H2 = Valve in the «Open» position means that the valve stem is fully extended

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