

# Instruction Manual

## CVS 128PQC Series Control Valve

### Introduction

#### Contents

Contained in this manual are installation instructions, maintenance procedures and parts information for the CVS 128PQC Control Valve. Refer to the appropriate manuals for instructions for the accompanying instrumentation and other equipment.

Trained or experienced personnel should carry out operation and installation of all pressure equipment. If you have any questions regarding the equipment, contact your CVS Controls representative.

#### Description

The CVS Series 128PQC Control Valve body assembly is suitable for on-off dump valve service in oil and gas production applications, in either sweet or sour gas conditions. This valve is also useful for on-off high-pressure control of numerous gasses and liquids, and can be used with materials that are viscous or erosive.

This is a single port valve with unbalanced stem-guided valve plug, and push-down-to-close valve plug action. Operated by a Type 128 spring-and-diaphragm actuator, the assembly can be operated in a normally open or normally closed application. This setting can be reversed in the field with minimum disruption and no additional parts.



Figure 1: CVS Type 128PQC Control Valve

**CVS Type 128PQC** is a 1-inch Control Valve, standard configuration is with a solid pipe plug threaded into the bottom connection for straight-through flow. To convert the control valve to angle flow, the pipe plug can be installed in the left port as shown in Figure 2. Note: This configuration from straight-through flow to angle flow can be achieved in the field.

Flow Characteristic: Quick Opening with a 45° taper plug.

The CVS Series 128PQC valve is available with soft-seat, cageless soft seat, or all metal seat construction. All configurations have push-down-to-close valve plug action (Figure 2).

The valve plug shuts off against the integral seat ring in the cage, except in cageless soft-seat construction, where the shut-off is against the seat which is cut into the web of the valve body. Rotation of the valve plug is limited with the use of a nylon insert in the valve plug thread.

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**Description continued,**

Any process leakage passing through the packing is permitted to escape through a leakoff vent which passes through the packing box and out the valve body. This prevents any leakage from passing along the stem into the actuator and also prevents loading pressure leakage from the lower diaphragm from reaching the valve body through the stem.

**Warning:**

The leakoff vent must be kept open at all times. Flammable or other hazardous fluids should be vented into an open, well-ventilated area to prevent fire or explosion.

**Table 1: Specifications**

Factory-set specifications for your individual CVS 128PQC Control Valve are stamped on the nameplate, located on the upper diaphragm casing.

<b>End Connection Style</b>	CVS Type 128 PQC		1-inch NPT Female	
<b>Port Diameters</b>	CVS Type 128PQC	Metal Seat	In 1/4, 3/8, 1/2 mm 6.4, 9.5, 12.7	
		Soft Seat	In 1/4, 3/8, 1/2 mm 6.4, 9.5, 12.7	
	<b>Maximum Inlet Pressures and Temperatures**</b>	-20°F to +100°F (-29°C to 38°C)		3600 psig (248 bar)
		+150°F (+66°C)		3550 psig (245 bar)
+180°F (+82°C)		3520 psig (243 bar)		
<b>Maximum Pressure Drops**</b>	See Table 2			
<b>Actuator Operating Pressures</b>	20 psig (1.4 bar) or 35 psig (2.4 bar)			
<b>Maximum Actuator Casing Pressure</b>	100 psig (6.9 bar)			
<b>Shutoff Classifications</b>	Metal Seat		ASME Class IV ASME/FCI 70-2-1998 – 0.01 percent of maximum valve capacity using air at a pressure drop of 50 psi (3.4 bar, differential), at 50° F to 125° F (10° C to 52° C)	
	Soft Seat		ASME Class IV ASME/FCI 70-2-1998 – Less than one bubble per minute (0.15 ml) per minute using air at a pressure drop of 50 psi (3.4 bar, differential) at 50° F to 125° F (10° C to 52° C)	
<b>Material Temperature Capabilities</b>	Metal Seat		-20°F to +180°F (-29°C to +82°C)	
	Soft Seat		-20°F to +150°F (-29°C to +55°C)	
<b>Flow Characteristic</b>	Quick opening with 45-degree taper valve plug			
<b>Flow Direction</b>	Either direction			
<b>Maximum Rated Travel</b>	3/8 inches (10mm)			
<b>Actuator Diaphragm Effective Area</b>	33 inches <sup>2</sup> (213 cm <sup>2</sup> )			
<b>Actuator Pressure Connection</b>	1/4-inch NPT Female			
<b>Valve Travel Indication</b>	Valve travel is indicated on plastic indicator cover with scale divisions indicated every 25 percent of travel.			
<b>Approximate Weight</b>	CVS Type 128 PQC	17 lb (7.7 kg)		
** Pressure and temperature restrictions outlined in this guide, along with any applicable code limitation, should not be exceeded				

## Installation

### Warning:

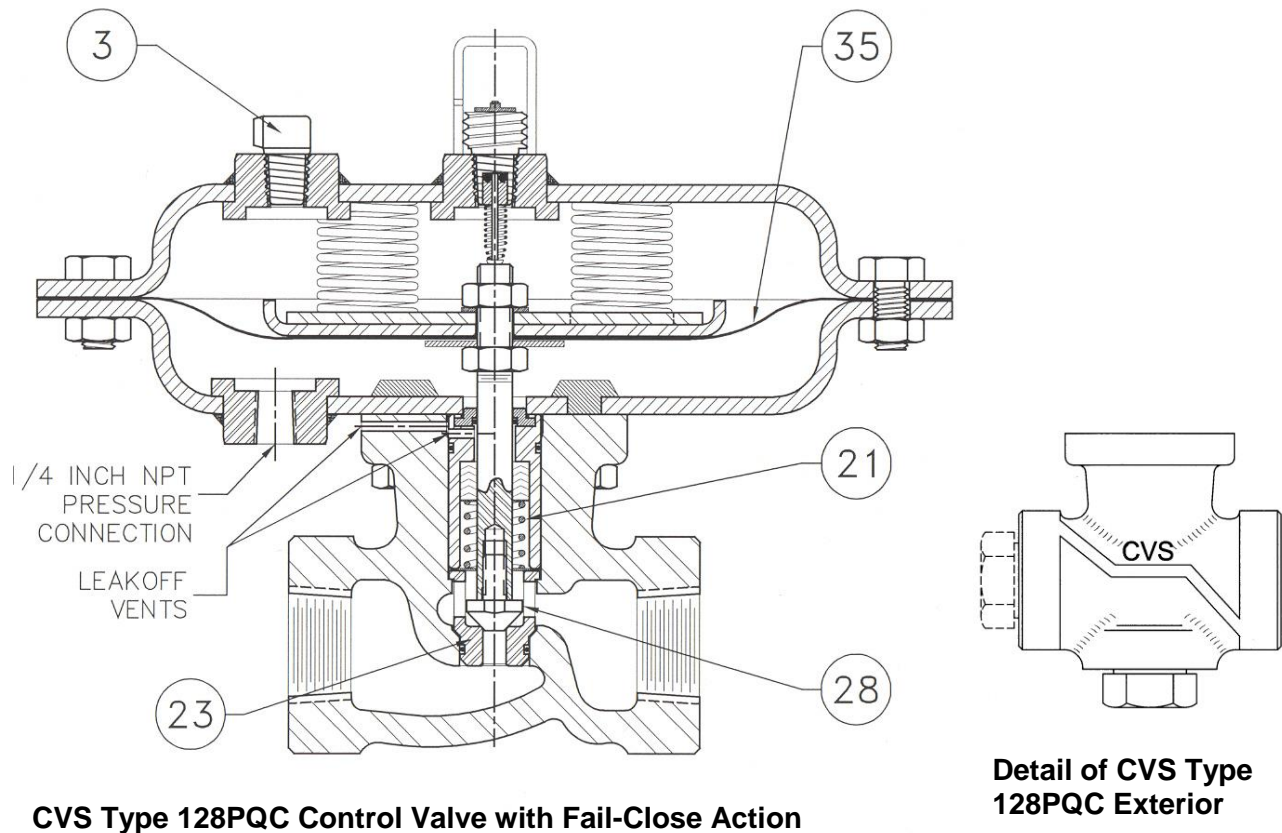
Service conditions must not exceed the limits shown on the valve nameplate, or those outlined in this manual. Consequences could include bursting of pressure-retaining parts and uncontrolled process fluid, resulting in personal injury or property damage. Control valves should also be protected from external damages.

Prior to installing the CVS Series 128PQC Control Valve, perform a complete inspection for damage, and remove any foreign debris. Position the valve for desired flow direction. If angle flow is required, switch the pipe plug to left-hand connection. (Figure 2)

The versatility of this valve allows for installation in any orientation, with the standard method being with the actuator above the body. Standard orientation is best when an angle body or angle configuration has been specified.

When installing the valve into the line, accepted piping practices must be used. A three-valve bypass should be used if continuous operation is required during inspection or maintenance.

For a fail-close control valve, connect the input signal line into the 1/4-inch NPT actuator connection (Figure 2) in the lower diaphragm case assembly. The input signal pressure line should be installed in the upper diaphragm case assembly of a fail-open control valve.



**Figure 2: CVS Type 128PQC Control Valve Typical Constructions**

# Maintenance

## Warning:

Prior to performing any maintenance, isolate the valve from the process pressure. Vent control input signal pressure. Relieve the process pressure and drain process media from both sides of valve (Figure 5, Key 27). A sudden release of pressure or fluid can cause personal injury or property damage.

Scheduled inspections and maintenance are vital to continued operation of all pressure control valves and systems. Parts are subject to wear and tear, and must be replaced as necessary, depending on the intensity of service conditions. Unless the valve body requires maintenance or replacement, it may remain in the pressure system or on the vessel.

## Replacing Packing and Trim

Follow these procedures when replacing the entire packing and trim assembly or individually replacing packing and trim parts. Unless otherwise indicated, key numbers in this section reference Table 3 for parts listings for replacement packing and trim assembly, Figure 3 for packing and trim assembly key numbers and Figure 5 control valve assembly key numbers.

1. Detach the control valve from all pressure, and release pressure from valve body and actuator. Ensure the valve is completely closed.
2. Remove the four nuts (Key 32) from the screws of the lower diaphragm casing. After disconnecting the input signal tubing, remove the actuator from the valve body, along with attached trim parts.

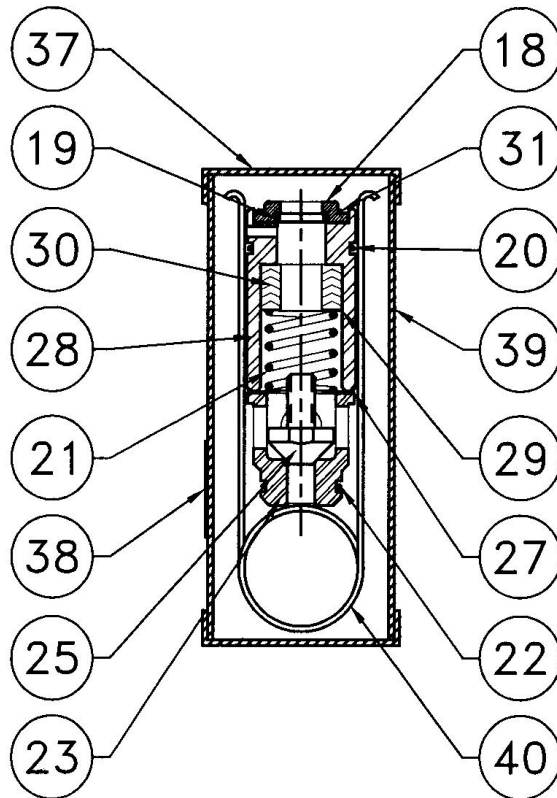
**Table 2: Maximum Allowable Shutoff Pressure Drops**

Seating	Actuator Action	Flowing Pressure Drop Tends To:	Port Diameter		Cadmium Coloured Main Spring CVS14A8831X012				Red Main Spring CVS14A9077X012			
			In	mm	At 20 Psig (1.4 bar) Operating Signal Pressure (2 Springs Req'd)		At 35 Psig (2.4 bar) Operating Signal Pressure (4 Springs Req'd)		At 20 Psig (1.4 bar) Operating Signal Pressure (2 Springs Req'd)		At 35 Psig (2.4 bar) Operating Signal Pressure (4 Springs Req'd)	
					Psi	Bar	Psi	Bar	Psi	Bar	Psi	Bar
Metal (All Types)	Fail Close	Open Valve	1/4	6.4	1510	104	3370	232	3380	233	3600	248
			3/8	9.5	520	36	1340	92	1340	92	3120	215
			1/2	12.7	220	15	690	47	700	48	1720	118
	Close Valve	1/4	6.4	940	65	1860	128	1370	94	2920	201	
		3/8	9.5	1130	78	2450	169	1540	106	3300	227	
		1/2	12.7	1330	92	2920	201	1710	118	3600	248	
	Fail Open	Close Valve	1/4	6.4	170	12	350	24	---	---	---	---
			3/8	9.5	530	36	610	42	---	---	---	---
			1/2	12.7	540	37	1150	79	---	---	---	---
Soft	Fail Close	Open Valve	1/4	6.4	1000	69	1000	69	1000	69	1000	69
			3/8	9.5	710	49	1000	69	1000	69	1000	69
			1/2	12.7	400	28	830	57	830	57	1000	69
	Close Valve	1/4	6.4	940	65	1000	69	1000	69	1000	69	
		3/8	9.5	1000	69	1000	69	1000	69	1000	69	
		1/2	12.7	1000	69	1000	69	1000	69	1000	69	
	Fail Open	Close Valve	1/4	6.4	560	39	660	45	---	---	---	---
			3/8	9.5	480	33	960	66	---	---	---	---
			1/2	12.7	540	37	1000	69	---	---	---	---

\* Contact CVS Controls for pressure drop

### Replacing Packing and Trim continued,

3. Accessible areas should be cleaned at this stage, and all necessary maintenance performed. The actuator and attached trim parts can be turned over and held by the valve body.
4. To separate trim and access packing parts or seal O-rings, first loosen and remove the valve plug (Key 25) and remove the packing box washer (Key 27).
5. Remove the packing box (Key 28), O-ring retainer (Key 18), stem O-ring (Key 19) and diaphragm casing O-ring (Key 31) off the stem.
6. Install replacement parts as necessary.
  - 6.1. If a complete packing and trim assembly is being installed, remove the assembly from the tube (Key 37), keeping the web sleeve (Key 39) on the assembly so the parts remain in place. Roll the sleeve back as necessary during installation.
  - 6.2. Continue pushing the assembly onto the stem until the valve plug and cage are pushed away from the packing box washer or wiper ring. Roll the web sleeve back into place just past the packing box.
  - 6.3. If installing nitrile/cotton packing, the packing rings may be lubricated with silicon based product.
7. Slide the packing box onto the stem until the packing box, the O-ring (Key 19) and the O-ring retainer (Key 18) and the diaphragm casing O-ring (Key 31) are sealed against the diaphragm casing.
  - 7.1. Ensuring proper positioning of the O-rings will prevent them from being cut when other parts are compressed against them.
  - 7.2. Advance the packing spring washer (Key 29), packing spring (Key 21), second packing spring washer, wiper ring and packing box washer (Key 27, if included in the assembly) down onto the stem.
8. For installation of the packing and trim assembly, it is necessary to remove the sleeve, cage puller (Key 40) and cage (Key 23) from the valve plug depending on individual valve configuration.
9. Fix the valve plug onto the stem, rotating the plug until the shoulder makes snug contact with the stem. No further tightening is necessary.
10. To replace the cage or access the cage O-ring (Key 22), remove the cage from the body (Key 26) using the cage puller or a wire hook. Replacement parts can be installed as necessary.
11. Attach the actuator and trim to the valve body (Key 26), paying special attention to the cage O-ring to prevent damage. Thread the four nuts (Key 32) to the lower diaphragm casing assembly screws. Nuts must be tightened to 15-foot-pounds (20N•m).
12. Reconnect the input signal tubing to the actuator connection of the appropriate diaphragm casing.



**Figure 3: Replacement Packing and Trim Assemblies for Metal Seated Constructions**

## Changing Main Spring Range

Unless otherwise indicated, refer to Table 3 for parts listings for replacement packing and trim assembly, Figure 3 for packing and trim assembly key numbers and Figure 5 for control valve assembly key numbers.

1. Isolate off the control valve from all pressure, and release pressure from valve body and actuator.
2. Release pressure and drain the process media from both sides of the valve body. Ensure the valve is completely closed.
3. If necessary, disconnect the input signal tubing; remove the diaphragm casing nuts (Key 15), cap screws (Key 14) and upper diaphragm casing (Key 1).
4. For fail-close action applications, install main springs (Key 12), using quantities and descriptions as outlined in Table 2.

**Note:** It is important to avoid loosening the stem-nut (Key 15), as this may prevent the valve from shutting off or from fully opening at full pressure, and resulting in the need for complete disassembly of the control valve to properly install the stem and diaphragm.

5. For fail-open applications, unfasten the locknut (Key 16), remove the flat washer (Key 33), diaphragm (Key 35), diaphragm plate (Key 34), spring plate (Key 2), and main springs (Key 12).
6. Refer to Table 2 and install main springs as indicated.
7. Reassemble the removed parts (Keys 2, 34, 35, 33, and 16). The locknut (Key 16) must be tightened to 12 foot-pounds (16 N•m).
8. Attach the upper diaphragm casing using the cap screws, and casing nuts, tightening in an even crisscross pattern to avoid crushing the diaphragm. Tighten to 15 foot-pounds (20 N•m).
9. Reconnect the input signal tubing to the actuator connection of the appropriate diaphragm casing.

## Reversing Action or Replacing Actuator Parts

Unless otherwise indicated, refer to Table 3 for parts listings for replacement packing and trim assembly, Figure 3 for packing and trim assembly key numbers and Figure 5 for control valve assembly key numbers.

1. Isolate the control valve from all pressure, and release pressure from valve body and actuator and ensure the valve is completely closed.
2. Remove the input signal tubing, diaphragm casing nuts (Key 15), cap screws (Key 14) and upper diaphragm casing (Key 1).
3. Remove the following:
  - 3.1. Main springs (Key 12)
  - 3.2. Stem nut (Key 15)
  - 3.3. Locknut (Key 16) and lock washer (Key 4)
  - 3.4. Spring plate (Key 2)
  - 3.5. Diaphragm plate (Key 34) and diaphragm (Key 35)
  - 3.6. Flat washer (Key 33)
4. Unscrew the four nuts (Key 32) from the screws of the lower diaphragm casing. After disconnecting the input signal tubing, remove the actuator from the valve body along with attached trim parts.
5. Remove the following:
  - 5.1. Valve plug (Key 25)
  - 5.2. Packing box washer (Key 27)
  - 5.3. Slide the packing box (Key 28), O-ring retainer (Key 18), stem O-ring (Key 19) and the diaphragm casing O-ring (Key 31) off the stem.
6. Replace the valve stem, bottom stem nut or lock nut (Key 15 or 16) as required.
7. Refer to Figure 4 and ensure that the lower shoulder of the bottom stem nut (Key 15) (for fail-open assembly) or locknut (Key 16) (for fail-close assembly) is the proper distance from the plug end of the stem.

## Reversing Action or Replacing Actuator Parts cont'd

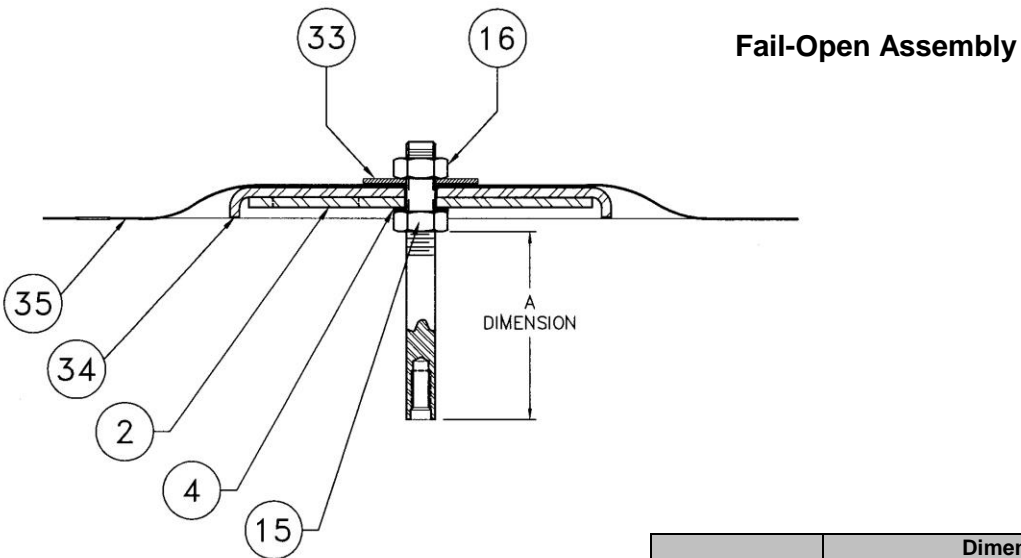
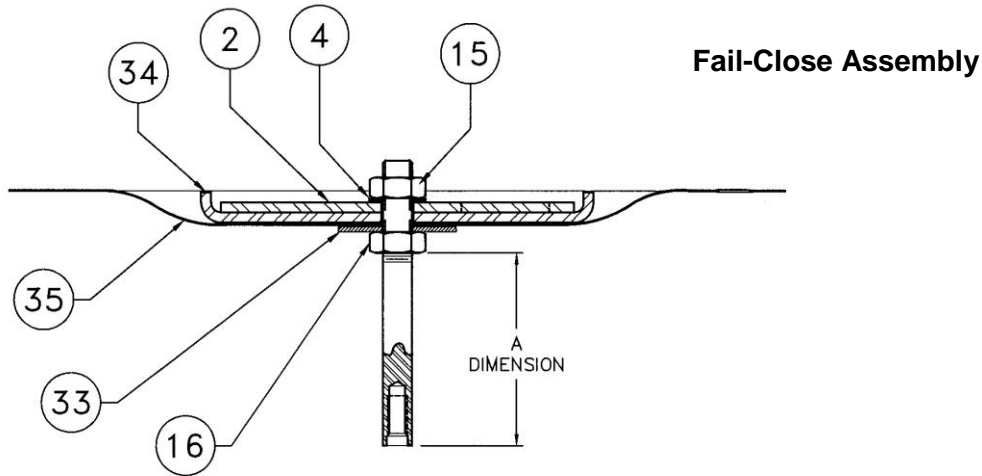
8. Perform the following assembly sequences as necessary to achieve the required control valve action:
  - 8.1. **Fail-close action:** install the following parts: flat washer (Key 33), diaphragm (Key 35), diaphragm plate (Key 34), spring plate (Key 2), lock washer (Key 4) and stem nut (Key 15). Tighten stem nut to 12 foot-pounds (16 N•m).
  - 8.2. **Fail-open action,** install the following parts: lock washer (Key 4), spring plate, diaphragm plate, diaphragm, flat washer (Key 33) and locknut (Key 16). Tighten the locknut to 12-foot-pounds (16 N•m).
9. With fail-open application, place the main springs (Key 12) into the lower diaphragm casing, ensuring that the lower ends of the springs rest over the weld stud heads of the lower diaphragm casing.
10. Following steps 6 through 10 of the "Replacing Packing and Trim" section, install packing and trim parts to secure the stem.
11. When reversing action from previous direction, move the vent (Key 3) to the 1/4-inch NPT actuator connection of the lower diaphragm casing (for fail-open action) or upper diaphragm casing (for fail-close action).
12. For fail-close application, place the main springs so that they rest in the spring plate holes and will not touch the upper diaphragm casing vent boss.
13. Mount the upper diaphragm casing, cap screws, and casing nuts, tightening in an even crisscross pattern to avoid crushing the diaphragm. Tighten to 15 foot-pounds (20 N•m).
14. Replace the actuator and attached trim parts into the valve body (Key 26) with nuts (Key 15) to the lower diaphragm casing integral assembly screws. Tighten nuts to 15 foot-pounds (20 N•m).
15. Reconnect the input signal tubing to the actuator connection of the appropriate diaphragm casing.

## Parts Ordering

CVS 128-PQC valves have individual serial numbers, found on the valve nameplate. Please refer to that number when ordering parts or contacting your CVS Controls Sales Representative. Individual parts numbers are listed as follows. Please include these numbers when ordering replacement parts.

**Table 3: Replacement Packing and Trim Assembly Part Numbers**

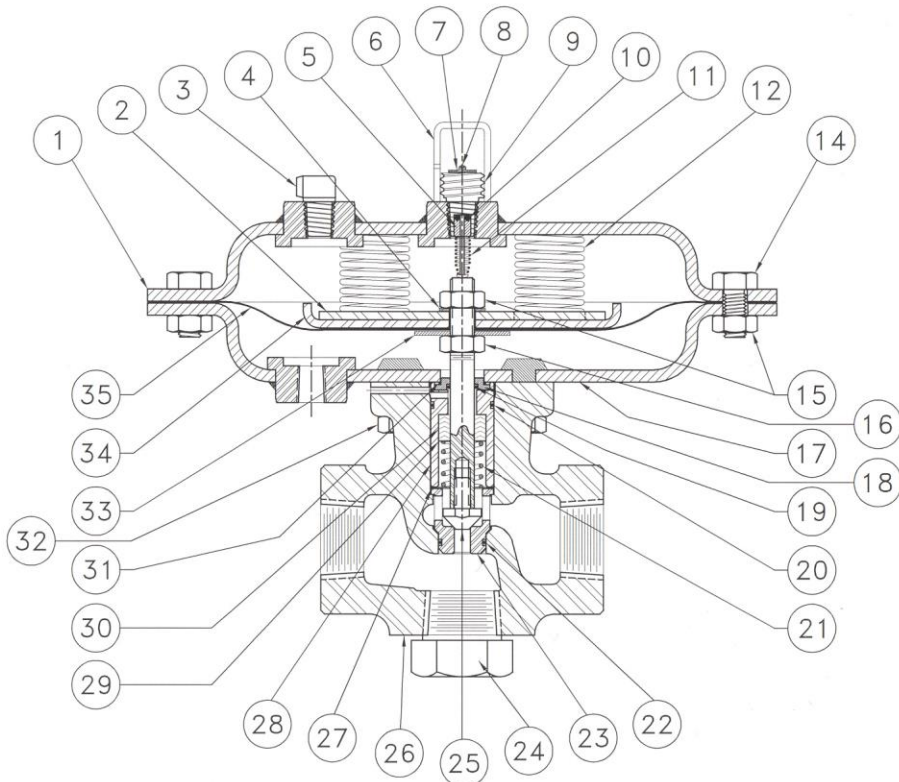
Port Diameter		TFE V-Ring Packing and Heat-Treated 440C SST Valve Plug and Cage	TFE V-Ring Packing, Nitronic 50 SST Valve Plug and Cage, and Inconel X750 Packing Spring
In	mm	CVS Type 128PQC 17-7PH SST Packing Spring	CVS Type 128 PQC
1/4	6.5	CVS15A2611X012	CVS15A2611X042
3/8	9.5	CVS15A2611X022	CVS15A2611X052
1/2	12.7	CVS15A2611X032	CVS15A2611X062



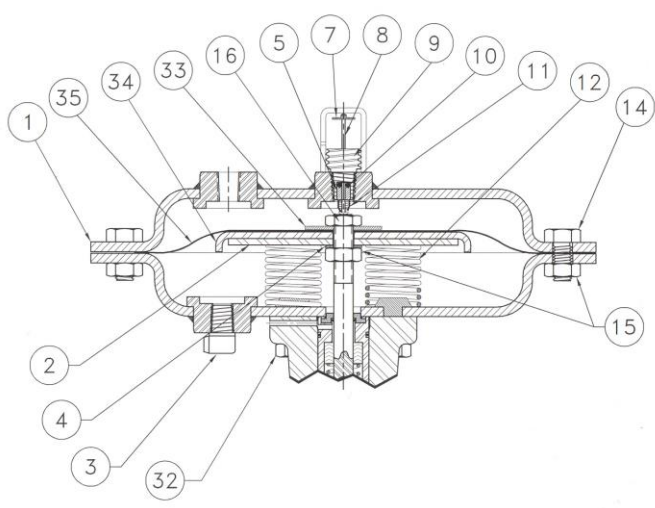
Valve Design	Dimension A			
	Fail-Open		Fail-Close	
	In.	mm	In.	mm
CVS 128PQC	2.72	69.1	2.46	62.5

**Figure 4: Stem and Diaphragm Assembly Dimensions**

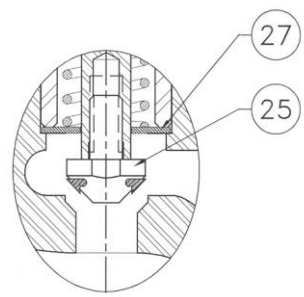




**CVS Type 128PQC Control Valve: Fail-Closed with Cage-Style Metal Seat and Single TFE-V-Ring Packing**



**Fail-Open Actuator Detail**



**CVS Design 128PQC  
Cageless Soft-Seat Detail**

**Figure 5: Typical CVS Series 128PQC Control Valve Assembly**

# Parts List

Key	Description				Part Number	
1	Upper Diaphragm Casing, Steel				CVS24A8816X012	
2	Spring Plate, Zinc Plated Steel				CVS14A8819X012	
3	Vent Assembly				CVS1C8937000A2	
4	Washer, Steel				CVS1A742328992	
5	Indicator Bushing, 316 SST				CVS13A2323X012	
6	Indicator Cover, Plastic				CVS15A1580X012	
7	Travel Indicator Disc Nut, Plastic				CVS1F730506992	
8	Machine Screw, SST				CVS14A8818X012	
9	Indicator Fitting SST				CVS15A0726X012	
10	O-Ring, Nitrile				CVS1H292606992	
11	Spring, 302 SST				CVS16A0431X012	
12	Main Spring, Cadmium Plated Steel				See Table 2	
13	Nameplate, Aluminum				CVS24A7156X012	
14	Cap Screw, Plated Steel (2 req'd)				CVS1E760324052	
15	Hex Nut, Cadmium Plated Steel (17 req'd)				CVS1A346524122	
16	Locknut, Plated Steel				CVS15A7591X012	
17	Lower Diaphragm Casing, Steel				CVS24A8810X012	
18	O-Ring Retainer, Polyethylene	CVS Type 128PQC		CVS14A9053X012		
19	O-Ring, Nitrile	CVS Type 128PQC		CVS1P420706992		
20	O-Ring, Viton	CVS Type 128PQC		CVS1U841806382		
21	Spring	CVS Type 128PQC	Inconel X750	CVS15A1809X012		
22	O-Ring, Nitrile	CVS Type 128PQC		CVS11A8741X012		
23	Cage	316 SST	CVS Type 128PQC	1/4" (6.4 mm)	CVS14A8823X022	
				3/8" (9.5 mm)	CVS14A8805X022	
				1/2" (12.7 mm)	CVS14A7157X022	
		Austenitic SST w/ Tungsten Carbide Seating Surface	CVS Type 128PQC	1/4" (6.4 mm)	CVS15A6800X012	
				3/8" (9.5 mm)	CVS15A6801X012	
24	Pipe Plug, Steel				CVS1A794728992	
25	Valve Plug	Metal Seat	CVS Type 128 PQC 1" Body	1/4" (6.4 mm) and 3/8" (9.5 mm) port	316 SST	CVS16A2087X012
					Austenitic SST w/ Tungsten Carbide Seating Surface	CVS15A6804X012
				1/2" (12.7 mm) port	316 SST	CVS14A6618X012
		Composition Seat, Austenitic SST/polyethylene	CVS Type 128 PQC 1" Body	1/4" (6.4 mm) through 1/2" (12.7 mm) port	CVS15A3199X012	
		Valve Plug Stem, 316 SST		1" Body, CVS Type 128PQC		CVS14A8806X012
26	Valve Body, WCB Steel		1" NPT, CVS Type 128PQC		CVS24A8802X012	
27	Packing Box Washer, SST		1/2" (12.7 mm) or smaller port		CVS14A6617X012	
28	Packing Box, SST		CVS Type 128PQC		CVS14A8809X012	
29	Washer, SST (2 req'd)		CVS Type 128PQC		CVS14A8808X012	
30	Packing Set, TFE	CVS Type 128PQC	Complete Set		CVS14A8812X012	
			Individual Parts	Male Adaptor		CVS1J227206242
				V-Ring (4 req'd)		CVS1J255206992
				Female Adaptor		CVS1J233201012
				Wiper Ring		CVS1R2516X0012
31	O-Ring, Nitrile				CVS13A1584X012	
33	Washer, Cadmium Plated Steel				CVS14A9770X012	
34	Diaphragm Plate, Zinc Plated Steel				CVS14A8814X012	
35	Diaphragm, Neoprene w/nitrile insert				CVS14A8813X012	
37	Paper Tube				---	
38	Paper Label				---	
39	Protective Sleeve-Web				---	
40	Cage Puller				CVS15A2525X012	

## Keys 5, 7, 8, 9, 10, 11

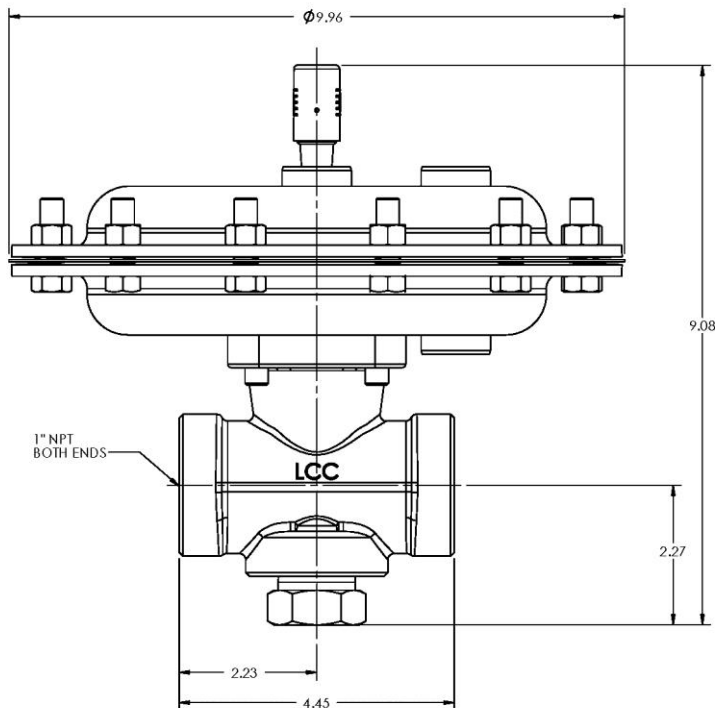
Complete Assembly	CVS35A1588X0A2
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# PRODUCT BULLETIN – CVS 128PQC

## Flow Coefficients

VALVE SIZE	PORT DIAMETER		MAXIMUM TRAVEL		QUICK OPENING													
					Valve Opening— Percent of Total Travel													
	mm	Inches	mm	Inches	10	30	70	100	10	30	70	100	10	30	70	100	100	
					Kv				Cv				Xt				FL	
	Globe Valve—Flow Up																	
1	6.35	1/4	9.5	3/8	.566	1.14	1.38	1.38	.654	1.32	1.60	1.60	.539	.694	.539	.539	.77	
	9.53	3/8	9.5	3/8	.828	2.02	2.60	2.60	.957	2.33	3.01	3.01	.578	.699	.746	.746	.82	
	12.7	1/2	9.5	3/8	1.02	2.71	3.88	3.88	1.18	3.13	4.49	4.49	.614	.677	.803	.824	.91	
Globe Valve—Flow Down																		
1	6.35	1/4	9.5	3/8	.616	1.28	1.38	1.38	.712	1.48	1.60	1.60	.575	.601	.567	.567	.82	
	9.53	3/8	9.5	3/8	.91	2.23	2.71	2.71	1.05	2.58	3.13	3.13	.559	.613	.717	.717	.87	
	12.7	1/2	9.5	3/8	1.12	2.80	3.58	3.65	1.30	3.24	4.14	4.22	.512	.607	.899	.887	.91	
Angle Valve—Flow Up																		
1	6.35	1/4	9.5	3/8	.699	1.22	1.38	1.38	.808	1.41	1.60	1.60	.398	.706	.553	.553	.77	
	9.53	3/8	9.5	3/8	.943	2.14	2.98	2.98	1.09	2.47	3.44	3.44	.433	.636	.605	.605	.76	
	12.7	1/2	9.5	3/8	1.08	2.77	4.61	4.84	1.25	3.20	5.33	5.59	.510	.660	.674	.663	.90	
Angle Valve—Flow Down																		
1	6.35	1/4	9.5	3/8	.676	1.36	1.46	1.46	.782	1.57	1.69	1.69	.397	.520	.500	.500	.77	
	9.53	3/8	9.5	3/8	.798	2.33	3.16	3.16	.923	2.69	3.65	3.65	.515	.495	.507	.507	.77	
	12.7	1/2	9.5	3/8	1.18	3.10	4.40	4.40	1.36	3.58	5.09	5.09	.414	.469	.602	.602	.78	

## Dimensions - Inches



# CVS

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## CONTROLS

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