



ISO Registered Company

MODEL 521

TOTAL TFE, GLOBE-PATTERN CONTROL VALVE

OVERVIEW

The Cashco Model 521 is a sliding stem, globe style, bellows sealed, pneumatically actuated control valve designed to provide superior long-term performance and maximum corrosion resistance in pure chemical service.

The design allows for all wetted internal parts to be machined from a solid block of isostatically compacted, virgin TFE, thus ensuring maximum density and the lowest possible permeability. An additional design benefit is that the wall thickness integrity is ensured as a result of the TFE body being internally machined after it is secured in a cast 304 SST body shell, thus preventing distortion problems related to the plastic stability of TFE. There is simply no better design or materials available when consideration is given to corrosion resistance and thermal stability.

FEATURES

The Model 521 combines the TFE corrosion resistance with superior design and construction for the Chemical Process Industry:

- Unibody TFE construction minimizes potential leak paths.
- Dual stem seal design: 100,000 full-cycle bellows primary seal plus V-ring secondary stem seal.
- Anti-stem rotation device to prevent bellows damage.
- 304 SST body jacket resists external corrosion.
- Quick change trim with easily replaceable plug-tip.
- Four body sizes - 1/2", 1", 1-1/2", and 2"; (DN 15, 25, 40 and 50).
- Wide selection of trim sizes and forms.
- 150# RF, flanged body with "gasketless" pipe-to-valve joint.
- Optional capability to mate with 300# RF.
- Optional capability to mate with PN16, PN25, or PN40 DIN flanges.
- Class VI shutoff.
- Spring-loaded bonnet seal.
- All wetted parts are machined from isostatically compacted TFE.
- May be applied in full vacuum service.
- Standard Actuator compliant with IEC 60534-6-1 for mounting standardized positioners.



MODEL 521

521-TB
12-20



BODY SIZES AVAILABLE

1/2" (DN15), 1" (DN25), 1-1/2" (DN40), 2" (DN50)



END CONNECTIONS

RF FLANGED



COMMON APPLICATIONS

CHLORINE (WET OR DRY), BROMINE, HYDROCHLORIC, SULFURIC, NITRIC, HYDROFLUORIC ACIDS



DESIGN PRESSURE

MAXIMUM PRESSURE:
UP TO 275 psig (19.0 Barg)

Алматы (7273)495-231
Ангарск (3955)60-70-56
Архангельск (812)63-90-72
Астрахань (8512)99-46-04
Барнаул (3852)73-04-60
Белгород (4722)40-23-64
Благовещенск (4162)22-76-07
Брянск (4832)59-03-52
Владивосток (423)249-28-31
Владикавказ (8672)28-90-48
Владимир (4922)49-43-18
Волгоград (844)278-03-48
Вологда (8172)26-41-59
Воронеж (473)204-51-73
Екатеринбург (343)384-55-89

Иваново (4932)77-34-06
Ижевск (3412)26-03-58
Иркутск (395)279-98-46
Казань (843)206-01-48
Калининград (4012)72-03-81
Калуга (4842)92-23-67
Кемерово (3842)65-04-62
Киров (8332)68-02-04
Коломна (4966)23-41-49
Кострома (4942)77-07-48
Краснодар (861)203-40-90
Красноярск (391)204-63-61
Курск (4712)77-13-04
Курган (3522)50-90-47
Липецк (4742)52-20-81

Магнитогорск (3519)55-03-13
Москва (495)268-04-70
Мурманск (8152)59-64-93
Набережные Челны (8552)20-53-41
Нижний Новгород (831)429-08-12
Новокузнецк (3843)20-46-81
Новый Уренгой (3496)41-32-12
Новосибирск (383)227-86-73
Омск (3812)21-46-40
Орел (4862)44-53-42
Оренбург (3532)37-68-04
Пенза (8412)22-31-16
Петрозаводск (8142)55-98-37
Псков (8112)59-10-37
Пермь (342)205-81-47

Ростов-на-Дону (863)308-18-15
Рязань (4912)46-61-64
Самара (846)206-03-16
Санкт-Петербург (812)309-46-40
Саратов (845)249-38-78
Севастополь (8692)22-31-93
Саранск (8342)22-96-24
Симферополь (3652)67-13-56
Смоленск (4812)29-41-54
Сочи (862)225-72-31
Ставрополь (8652)20-65-13
Сургут (3462)77-98-35
Сыктывкар (8212)25-95-17
Тамбов (4752)50-40-97
Тверь (4822)63-31-35

Тольятти (8482)63-91-07
Томск (3822)98-41-53
Тула (4872)33-79-87
Тюмень (3452)66-21-18
Ульяновск (8422)24-23-59
Улан-Удэ (3012)59-97-51
Уфа (347)229-48-12
Хабаровск (4212)92-98-04
Чебоксары (8352)28-53-07
Челябинск (351)202-03-61
Череповец (8202)49-02-64
Чита (3022)38-34-83
Якутск (4112)23-90-97
Ярославль (4852)69-52-93

Россия +7(495)268-04-70

Казахстан +7(7172)727-132

Киргизия +996(312)96-26-47

GENERAL SPECIFICATIONS

Body Sub-Assembly

| Body Form: | Globe style; straight body pattern. | Seat Leakage: | ANSI/FCI 70-2 (Rev. 2006), Class VI. | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|--------------------------------------|---|-----------|--|-------------------|--|-----|------|--------------------|-------------------|------|------|-----|-----|----|------|-----|------|--------|------|-----|------|----|------|------|------|
| Body Sizes: | 1/2", 1", 1-1/2" and 2"; (DN 15, 25, 40 and 50). | Flow Direction: | Standard is Flow-to-Open (FTO). | | | | | | | | | | | | | | | | | | | | | | | | |
| Maximum Pressure & Working Temperature: | <p>Pressure Vs. Temperature application zone indicated in Graph No. 1:</p> <p>Pressure: Up to 275 psig (19.0 Barg). Full Vacuum: Down to 0 psia (-14.7 psig, -29.92" Hg); 0 BarA (-1.01 Barg, -760 mm Hg). Temperature Range: 0° to +310°F (-17.4° to + 155°C).</p> | Inherent Flow Characteristic: | Standard – Equal Percentage (Equal %). (Characteristic only maintained in FTO direction.) | | | | | | | | | | | | | | | | | | | | | | | | |
| End Connections: | <p><u>Standard</u> – 150# RF flanged; gasketless design. Flange bolt circle per ANSI B16.5. Bolt holes drilled and tapped to receive flange bolting.</p> <p><u>Optional ANSI</u> - 300# RF per above.</p> <p><u>Optional DIN</u> - Standard ANSI raised face dimensions on body. Mating bolt circle dimensions in accordance with DIN standard 2501 and ISO 2084, classes PN16, PN25 and PN40. Bolt holes drilled and tapped to receive metric bolting. Provided with compression molded TFE annular adapter gaskets to ensure proper loading of integral body gasket. (See Figure 2). Recommended to use flange gasket.</p> | Maximum Pressure Drop: | Up to 275 psid (19.0 Bard). Dependent on actuator size and bench set selection. See Table 2. | | | | | | | | | | | | | | | | | | | | | | | | |
| Stem Seal: | <p>Dual design —</p> <p><u>Primary Seal:</u> TFE bellows with 100,000 full stroke cycle design life.</p> <p><u>Secondary Seal:</u> TFE "V-ring" packing.</p> | Seat Design: | Integral TFE seat. Replaceable TFE plug-tip | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Flow Capacity Range: | <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th colspan="2">Body Size</th> <th colspan="2">Max Capacity (Cv)</th> </tr> <tr> <th>In.</th> <th>(DN)</th> <th>Smallest Trim Size</th> <th>Largest Trim Size</th> </tr> </thead> <tbody> <tr> <td>1/2"</td> <td>(15)</td> <td>.10</td> <td>2.5</td> </tr> <tr> <td>1"</td> <td>(25)</td> <td>.10</td> <td>10.0</td> </tr> <tr> <td>1-1/2"</td> <td>(40)</td> <td>6.3</td> <td>21.0</td> </tr> <tr> <td>2"</td> <td>(50)</td> <td>10.0</td> <td>40.0</td> </tr> </tbody> </table> | Body Size | | Max Capacity (Cv) | | In. | (DN) | Smallest Trim Size | Largest Trim Size | 1/2" | (15) | .10 | 2.5 | 1" | (25) | .10 | 10.0 | 1-1/2" | (40) | 6.3 | 21.0 | 2" | (50) | 10.0 | 40.0 |
| Body Size | | Max Capacity (Cv) | | | | | | | | | | | | | | | | | | | | | | | | | |
| In. | (DN) | Smallest Trim Size | Largest Trim Size | | | | | | | | | | | | | | | | | | | | | | | | |
| 1/2" | (15) | .10 | 2.5 | | | | | | | | | | | | | | | | | | | | | | | | |
| 1" | (25) | .10 | 10.0 | | | | | | | | | | | | | | | | | | | | | | | | |
| 1-1/2" | (40) | 6.3 | 21.0 | | | | | | | | | | | | | | | | | | | | | | | | |
| 2" | (50) | 10.0 | 40.0 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Rangeability: | <p>See Table 1 for theoretical Cv @ % travel.</p> <p><u>Equal % Characteristics</u> - available in all trim sizes.</p> <p>Standard – 50:1, except 1/4" (6 mm) orifice.</p> <p>Minimum – 25:1 for 1/4" (6mm) orifice. See Table 1.</p> | | | | | | | | | | | | | | | | | | | | | | | | |

Actuator Sub-Assembly Models: C27 & C53

| | | | |
|-----------------------------|--|--------------------------------------|--|
| Design: | Spring-diaphragm type. | Supply Connection: | 1/4" female NPT. |
| Ambient Temp. Range: | -50 to +180°F (-45 to +83°C). -20° to +140°F (-29° to +60°C) with electrical accessories. | Mounting Position: | <u>Model</u> Horizontal-to-vertically up, and all angles in between. |
| Bench Set: | See Table 2. | Painting: | <u>Standard</u> – All non corrosion resistant portions are powder coated per Spec. S-1743 and/or with corrosion resistant epoxy paint per Cashco Spec #S-1606. |
| Supply Pressure: | See Table 2. Design Max is 100 psig. | Sizes, Strokes & Volumes: | See Table 3. |
| Stroke: | 1/2" Size = 0.500" 1" through 2" Size = 0.750". | | |

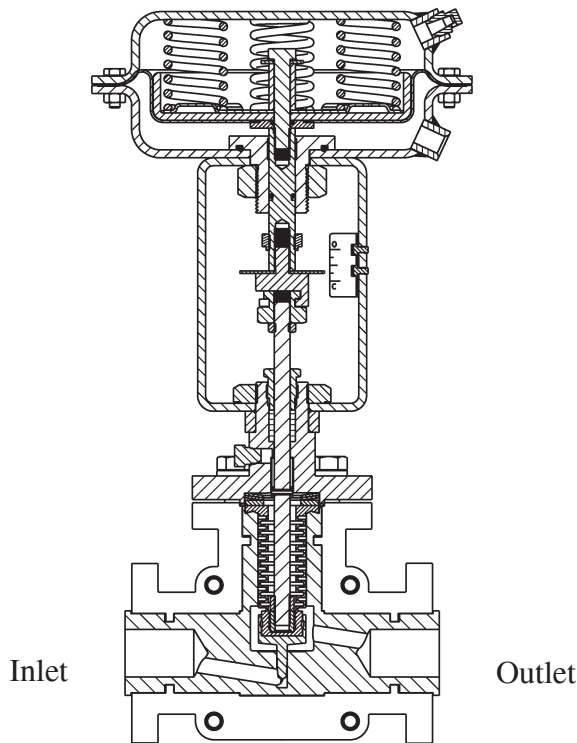
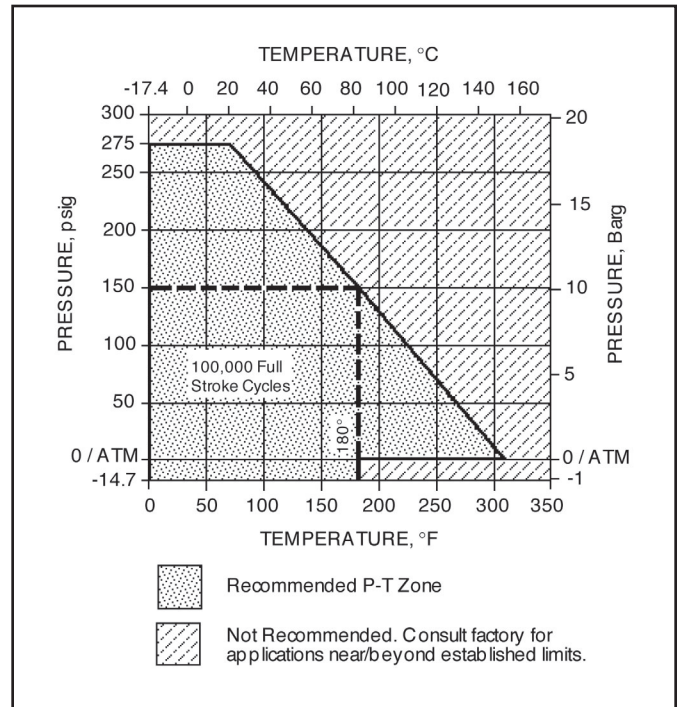


Figure 1
Model "521" Cross-Section



GRAPH NO. 1

MATERIALS SPECIFICATIONS

Body Sub-Assembly

Body, Plug Head & Bellows: Isostatically compacted, high density TFE - tetrafluoroethylene; i.e. PTFE - polytetrafluoroethylene. Precision machined. (Note: TFE or PTFE are used as abbreviations; they are the same material.)

Body Shell and Bonnet: Investment castings. Cast 304 SST per ASTM A351-CF8.

Body & Bonnet Bolting: 18-8 SST.

Bonnet Gasket: TFE.

Secondary Packing: TFE - "V-ring".

Belleville Spring Washers: 18-8 SST.

Stem Assembly: Standard: 316 SST stem and anti-rotational stop; 420 SST pin (body sizes 1/2" (DN 15) and 1" (DN 25)), silver soldered (body sizes 1-1/2" (DN 40) and 2" (DN 50)). Embedded stem-to-bellows connection nut of 316 SST.

Optional: Two optional stem constructions available - both utilize Hastelloy body to bonnet bolting.

Option "D" - Hastelloy C-22 stem, anti-rotational stop and pin, and embedded stem-to-bellows connector nut.

Option "F" - Hastelloy C-22 stem only. Stop and pin of standard materials.

NOTE: Alternate stem materials should be considered when the fluid is known to permeate TFE and is corrosive to 316 SST in the presence of moisture. See Section "Chemical Resistance" and Options "D" and "F" above.

Packing Follower: 18-8 SST.

Actuator Sub-Assembly

| Part | Material |
|--|---------------------------|
| Diaphragm | Buna-N w/Polyester Insert |
| Lower & Upper Case, Yoke | Steel |
| Attachment Hub | 17-4 PH SST |
| Stem | 316/316L SST |
| Diaphragm Plate, Stem Spacer, Stem Lock Washer, Spring Plate, Hub Nut, Stem Bolt | Steel |
| Spring | Epoxy Coated Steel |
| Diaphragm Washer | 316/316L SST |
| Diaph. Washer O-ring, Hub O-ring, Stem O-ring | Buna-N |
| Bolts & Nuts | Steel Plated |

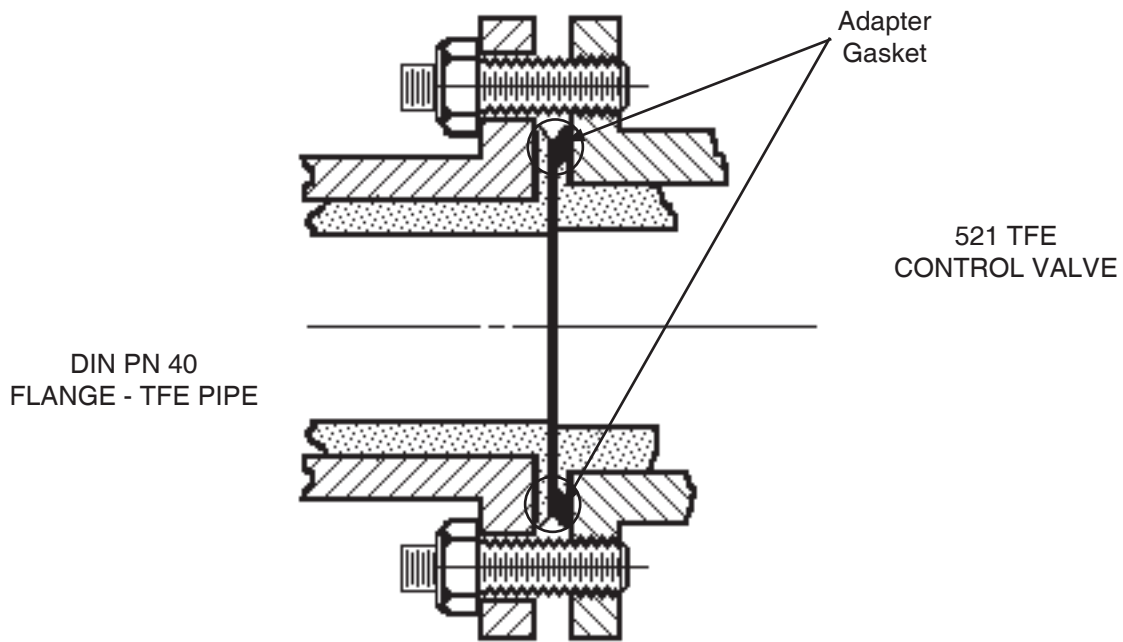


FIGURE 2
ANSI / DIN ADAPTER GASKET

TECHNICAL SPECIFICATIONS

**TABLE 1
MODEL 521
THEORETICAL CAPACITY**

EQUAL % CHARACTERISTIC

F_L Factor = 0.90

| Body Size | | Orifice Size | | Rangeability | Minimum Controllable C_v | C_v @ 10% Travel Increments | | | | | | | | | |
|-----------|------|--------------|---------|--------------|----------------------------|-------------------------------|------|------|------|-------------|------|------|------|------|-------------|
| In. | (DN) | In. | (mm) | | | 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 100% |
| 1/2" | (15) | 0.250" | (6.35) | 25:1 | 0.004 | .015 | .015 | .015 | .016 | .020 | .027 | .038 | .052 | .075 | 0.10 |
| | | | | | 0.006 | .015 | .017 | .020 | .024 | .033 | .045 | .064 | .085 | .12 | 0.16 |
| | | | | | 0.010 | .015 | .019 | .026 | .036 | .051 | .069 | .099 | .13 | .19 | 0.25 |
| | | | | | 0.016 | .023 | .035 | .046 | .058 | .081 | .11 | .15 | .21 | .29 | 0.40 |
| | | 0.438" | (11.12) | 50:1 | 0.025 | .040 | .051 | .063 | .085 | .12 | .17 | .24 | .33 | .46 | 0.63 |
| | | | | | 0.020 | .020 | .041 | .061 | .102 | .14 | .20 | .32 | .46 | .68 | 1.00 |
| | | | | | 0.032 | .051 | .071 | .10 | .15 | .24 | .33 | .49 | .73 | 1.0 | 1.60 |
| | | | | | 0.050 | .068 | .11 | .16 | .24 | .35 | .51 | .73 | 1.1 | 1.7 | 2.50 |
| 1" | (25) | 0.250" | (6.35) | 25:1 | 0.004 | .015 | .015 | .016 | .019 | .023 | .028 | .039 | .052 | .066 | 0.10 |
| | | | | | 0.006 | .015 | .016 | .018 | .024 | .033 | .044 | .062 | .084 | .12 | 0.16 |
| | | | | | 0.010 | .015 | .019 | .026 | .038 | .053 | .069 | .097 | .13 | .18 | 0.25 |
| | | | | | 0.015 | .015 | .025 | .044 | .064 | .087 | .11 | .16 | .21 | .30 | 0.40 |
| | | | | | 0.025 | .035 | .046 | .069 | .091 | .13 | .17 | .23 | .34 | .46 | 0.63 |
| | | 0.562" | (14.27) | 50:1 | 0.020 | .052 | .078 | .103 | .129 | .15 | .21 | .31 | .46 | .68 | 1.00 |
| | | | | | 0.032 | .065 | .091 | .11 | .14 | .22 | .32 | .49 | .72 | 1.08 | 1.60 |
| | | | | | 0.050 | .07 | .12 | .17 | .24 | .35 | .52 | .77 | 1.14 | 1.70 | 2.50 |
| | | | | | 0.080 | .10 | .17 | .27 | .37 | .58 | .85 | 1.24 | 1.84 | 2.70 | 4.00 |
| | | 0.875" | (22.22) | 50:1 | 0.100 | .14 | .22 | .32 | .46 | .68 | 1.02 | 1.49 | 2.18 | 3.50 | 5.00 |
| | | | | | 0.126 | .18 | .26 | .40 | .58 | .90 | 1.33 | 1.95 | 2.85 | 4.25 | 6.30 |
| | | | | | 0.150 | .22 | .34 | .50 | .72 | 1.06 | 1.57 | 2.32 | 3.42 | 5.08 | 7.50 |
| 1-1/2" | (40) | 0.875" | (22.22) | 50:1 | 0.200 | .28 | .40 | .62 | .90 | 1.32 | 1.92 | 2.77 | 4.13 | 6.73 | 10.0 |
| | | | | | 0.126 | .20 | .28 | .40 | .60 | .88 | 1.31 | 1.93 | 2.86 | 4.24 | 6.30 |
| | | 1.500" | (38.10) | 50:1 | 0.150 | .22 | .34 | .51 | .74 | 1.06 | 1.57 | 2.34 | 3.45 | 5.08 | 7.50 |
| | | | | | 0.200 | .28 | .42 | .62 | .97 | 1.38 | 2.11 | 3.07 | 4.54 | 6.70 | 10.0 |
| | | | | | 0.300 | .41 | .70 | .97 | 1.45 | 2.14 | 3.14 | 4.64 | 6.88 | 10.1 | 15.0 |
| 0.420 | .62 | .90 | 1.38 | 2.14 | 3.14 | 5.82 | 13.6 | 15.9 | 18.0 | 21.0 | | | | | |
| 2" | (50) | 1.500" | (38.10) | 50:1 | 0.200 | .32 | .48 | .73 | 1.05 | 1.53 | 2.25 | 3.26 | 4.80 | 6.69 | 10.0 |
| | | | | | 0.300 | .42 | .63 | .97 | 1.45 | 2.14 | 3.16 | 4.64 | 6.88 | 10.9 | 15.0 |
| | | | | | 0.500 | .76 | 1.27 | 2.16 | 3.60 | 5.64 | 8.38 | 11.8 | 16.0 | 20.7 | 25.0 |
| | | 1.750" | (44.45) | 50:1 | 0.700 | 1.18 | 2.09 | 3.55 | 5.74 | 8.78 | 14.9 | 20.9 | 26.1 | 30.7 | 35.0 |
| | | | | | 0.800 | 1.49 | 2.58 | 4.31 | 9.65 | 16.1 | 21.7 | 26.8 | 31.6 | 36.0 | 40.0 |

| TABLE 2 MAXIMUM PRESSURE DROP - PSID (BARD) DIRECT ATO-FC AND REVERSE ATC-FO | | | | | | | | |
|--|-------------------|--------------|--------|-------------------|-------------|-------------|-----------------|--------|
| LINE SIZE | PORT SIZE | ORIFICE SIZE | | ACTUATOR MODEL | BENCH RANGE | | ATO-FC & ATC-FO | |
| | | INCH | (mm) | | PSIG | (BARG) | PSID | (BARD) |
| 1/2" (DN15) | FULL | 0.438 | (11.1) | C27 | 3-17 | (0.21-1.17) | 275 | (19.0) |
| | 1-STEP REDUCED | 0.250 | (6.4) | C27 | 3-17 | (0.21-1.17) | 275 | (19.0) |
| 1" (DN25) | FULL | 0.875 | (22.2) | C27 | 7-28 | (0.48-1.93) | 262 | (18.1) |
| | 1-STEP REDUCED | 0.562 | (14.3) | C27 | 5-15 | (0.34-1.03) | 275 | (19.0) |
| | 2-STEP REDUCED | 0.250 | (6.4) | C27 | 3-17 | (0.21-1.17) | 275 | (19.0) |
| 1-1/2" (DN40) | FULL | 1.500 | (38.1) | C27 | 15-60 | (1.03-4.14) | 205 | (14.1) |
| | | | | C53 | 5-15 | (0.34-1.03) | 89 | (6.1) |
| | 1-STEP REDUCED | 0.875 | (22.2) | C27 | 7-28 | (0.48-1.93) | 262 | (18.1) |
| 2" (DN50) | FULL | 1.750 | (44.5) | C27 | 15-60 | (1.03-4.14) | 144 | (9.9) |
| | | | | C53 | 5-15 | (0.34-1.03) | 59 | (4.1) |
| | 1-STEP REDUCED | 1.500 | (38.1) | C27 | 15-60 | (1.03-4.14) | 205 | (14.1) |
| | | | | C53 | 5-15 | (0.34-1.03) | 89 | (6.1) |

1) CF = Consult Factory where differential pressures are below 50 psid preventing seat leakage evaluation per Cashco S-1597 at 50 psid.
2) Excessive differential pressures have been derated to a maximum of 275 psid (19.0 barg) corresponding with the MAWP of the valve. Further derating may be necessary based on valve body pressure/temperature ratings.
3) ATC-FO values for 5-15 psig bench range based on maximum 20 psig (1.4 barg) supply pressure with use of a positioner. ATC-FO values for 7-28 psig bench range based on maximum 35 psig (2.4 barg) supply pressure with use of a positioner. ATC-FO values for 15-60 psig bench range based on maximum 75 psig (5.2 barg) supply pressure with use of a positioner.
4) DO NOT apply ATC-FO arrangement with I/P Transducer without limiting supply pressures to values listed in note 3 above. Permanent trim damage could result.

| TABLE 3 Actuator Size, Stroke & Volumes | | | | | | | | |
|--|--------------------|--------|---------|--------------------|-----------------|--------------------|-----------------|--------------------|
| Nominal Diaphragm Area | | Stroke | | Actuator Action | Volumes | | | |
| | | | | | Clearance | | Displacement | |
| in ² | (cm ²) | in | (mm) | | in ³ | (cm ³) | in ³ | (cm ³) |
| 32 | (209) | 0.50" | (12.7) | ATC | 30.3 | (496.5) | 16.2 | (265.5) |
| | | | | ATO | 28.2 | (462.1) | 16.4 | (268.7) |
| | | 0.75" | (19.05) | ATC | 25.8 | (422.8) | 25.4 | (416.2) |
| | | | | ATO | 24.4 | (399.8) | 24.1 | (394.9) |
| 53 | (342) | | | ATC | 38.4 | (629.3) | 39.3 | (644.0) |
| | | | | ATO | 36.9 | (604.7) | 39.0 | (639.0) |

OPTION SPECIFICATIONS

Option-3:

Manual Handwheel: Handwheel overrides the actuator spring force to allow manual stroking of the valve. Single acting design, side-mounted, enclosed handwheel. For ATO-FC action, handwheel operator "opens" the valve against spring force; may be utilized as a travel stop to prevent full closure. For ATC-FO action,

handwheel operator "closes" the valve against spring force; may be utilized as a travel stop to prevent full opening.

Option-57:

SPECIAL CLEANING: Per Cashco Specification S-1589 for Chlorine Service. Unit construction includes Alloy 20 body to bonnet bolting per Chlorine Institute Pamphlet No. 6.

MOUNTED ACCESSORY SPECIFICATIONS

| | |
|--|--|
| <p>Positioners: <i>NOTE: PMV Positioners are not FM Approved at this time. If you need FM Approval, please specify the Siemens PS2.</i></p> <p><u>General:</u> PMV Positioners. Aluminum housing with corrosion resistant powder coated epoxy. Pneumatic output load as required by actuator bench range. Field reversible action. Mounting dimensions per IEC 60534-6-1 Standard.</p> <p>P/P Pneumatic. Model P5 features SST cam with a simple cam locking device, tapped exhaust port for venting media, external zero adjustment. Input signal 3-15 psig, Includes gauge ports, no gauges. Analog only.</p> <p>I/P Electro-Pneumatic. Model D20 Digital or Hart compatible. Features single button self-calibration. input signal 4-20mA. Optional gauge block with gauges for Models D20 D and D20 A. Model D20 D is general purpose. Model D20 A is Intrinsically safe, Ex ia ATEX. Model D20 E is ATEX EEX d IIB+H₂, T6 FM Approved.- Approval Pending Gauge block is built in, no gauges. Not available with limit switch option.</p> <p>Model D3 Digital, Hart, Profibus, or Fieldbus compatible. Input signal 4-20mA. Features large graphic display. Optional gauge block for Models D3 X and D3 I, no gauges. Model D3 X is general purpose. Model D3 I is Intrinsically safe, ATEX EEX ia IIC T4. Model D3 E is ATEX EEX d IIB+H₂, T6 CSA CLS 1 DIV 1 FM CLS 1 DIV 1 - Approval Pending Gauge block is built in, no gauges. Not available with limit switch option.</p> <p>Model PS2 is Digital, Hart, Fieldbus and Profibus compatible. Input signal 4-20mA. Features a Makrolon housing, (Aluminum for Explosion Proof.) Mounting dimensions per IEC 60534-6-1 Standard. Model PS2-1 is general purpose. Model PS2-2 is Intrinsically safe, ATEX Ex ia IIC T6/T4, FM CLS 1 DIV 1, CSA CLS 1 DIV 1, SIL 2 Model PS2-3 EX d IIC T6/T4, SIL 2 All I/P positioners not available with 764's.</p> | <p>Instrument Air Tubing: Instrument air tubing SST with SST fittings.</p> <p>Airset: Model 5200P instrument air supply regulator. Use with positioners. Bracket mounted to actuator casing. Supplied with gauge. See technical bulletin 5200P-TB.</p> <p>3-Way Solenoid Valve: <u>Standard Brass:</u> Available in standard weather-proof model. Brass body, 1/4" female NPT connections. Nipple mounted to actuator casing. 120 VAC, 60 Hz power supply, CSA Approved Class 3221-01, NEMA 2,3,3S,4,4X. 8" HF utilizes a direct mount NAMUR mount style.</p> <p><u>X-Proof or SST construction:</u> Consult Factory.</p> <p>Standard installation vents actuator and drives valve to fail-safe position upon loss of electrical power.</p> <p>Consult factory for 230/1/50, or 120 VDC power supplies, or intrinsically safe (IS) service.</p> <p>Transducer: FM, CSA approved NEMA 4X Cl 1, Div 1 and Cl 1, Div 2</p> <p>Other Accessories: 764 P/PD pressure controller. Lockup valve. Position transmitter.</p> <p>Limit Switches: Model D20 and D3 positioners, switches are available, unit is enclosed in the positioner housing.</p> <p>Limit switch options not available on Explosion proof rated positioners.</p> |
|--|--|

CHEMICAL RESISTANCE

General Statement: Statements located within this technical bulletin concerning suitability of fluids with TFE materials are general statements, and should not be construed as recommendations. Any statements of suitability are the result of a compilation of various sources of information based on experience, tests, and published technical literature. No guarantee or warranty is in anyway implied for a given particular service or application.

Additional Reference: For an inclusive listing covering a broader range of service application fluids, reference "Handbook of Corrosion Resistant Piping", P.A. Schweitzer, Industrial Press; or "Compass Corrosion Guide", 2nd Edition, K.M. Pruett, Compass Publications. This publication will include information based on the following fluid variables:

1. Solution concentration
2. Pressure
3. Temperature

Chemical Resistance of TFE. TFE is, in general, inert to chemical corrosion of nearly all known industrial or commercial chemicals. When applied within the P vs. T zone of Graph No. 1, the following partial listing represents general classifications of fluids that normally do not corrode TFE:

- Strong inorganic acids – HCl, H₂SO₄, aqua regia
- Strong caustics or bases - NaOH, KOH
- Bleaches
- Oxidizers (except F₂ related chemicals)
- Organic acids
- Aliphatic and aromatic hydrocarbon solvents
- Chlorides
- Sulfates
- Peroxides
- Phenols
- Alcohols
- Esters
- Ketones
- Ethers

A partial listing of fluids that are known to chemically react with TFE and should not be applied are:

- Molten alkali metals – Na, K, Li
- Molten anhydrous bases – NaOH
- Fluorine gas (dry) above 250°F (121°C)
- Strong fluorinating agents – ClF₃, OF₂
- Hydrogen fluoride (dry) above 220°F(104°C)

Absorption. Depending on concentration, pressure and temperature conditions, some fluids absorb trace (minute) quantities into the wetted surfaces of TFE. When pressure is suddenly reduced or temperature increased, the absorbed fluids can "expand" and cause physical damage to the polymerized molecules. Blisters may be formed. Controls to eliminate/minimize sudden temperature and/or pressure changes are recommended. Chemical resistance is not compromised when absorption occurs.

Permeation. Depending on concentration, pressure and temperature conditions, certain fluids permeate (pass through) TFE molecular structure in trace quantities. Effects of pressure/temperature changes are similar to absorption effects. As with absorption, chemical resistance of the TFE is not reduced. Added considerations are:

- a. purging of non-wetted (backside) of bellows
- b. alternate stem materials.

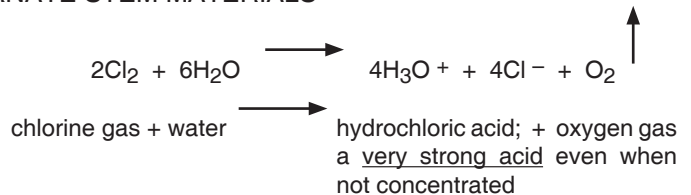
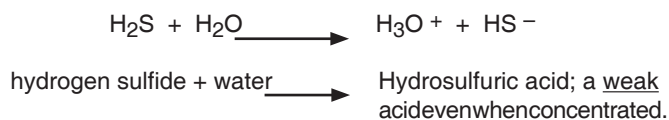
See Table 4 for a partial listing of fluids known to permeate TFE.

| TABLE 4 Chemicals Known To Permeate TFE | | |
|--|------------------------------|----------------------------------|
| * Ammonium beryllium fluoride | Ethylene chloride | Naphthalene |
| Benzene | Ethylene dibromide | Nitric acid |
| * Bromine | Ethylene dichloride | Nitrobenzene |
| * Bromine (water - 3% saturated) | * FREON Fluorocarbons | Nitromethane |
| * Bromine chloride | Hexane | Oxygen |
| Butane | * Hydrobromic acid | Perchloroethylene |
| Butyl bromide | * Hydrochloric acid | Phenol |
| Butyl chloride | * Hydrofluoric acid | * Phosgene |
| Butyl phenol | Hydrogen | Potassium cyanide |
| Butylene (Butadiene) | * Hydrogen chloride | Propane |
| Carbon bisulfide | * Hydrogen cyanide | Propylene oxide |
| * Carbon tetrachloride | * Hydrogen fluoride gas | Styrene monomer |
| Chlorinated phenol | Hydrogen sulfide | Sulfur trioxide |
| * Chlorine (5% in CCl ₄) | * Iodine (gas) | Sulfuric acid |
| * Chlorine dioxide | * Iodine (Tincture of) | Tetrahydrofuran |
| * Chlorine | Methane | Toluene |
| * Chlorobenzene | Methyl chloride | Toluene (25%) + kerosene (75%) |
| * Chlorobenzyl chloride | ** Methyl chloroform | 1,1,2-Trichloroethane |
| Chloroform (Trichloromethane) | ** Methyl chloromethyl ether | Trichloroethylene |
| * o-Dichlorobenzene | Methyl ethyl ketone | ** Trimethyl propane |
| Dichloroethane | Methyl isobutyl ketone | Vinyl chloride monomer (liquid) |
| Diethyl ether | ** Methylene bromide | ** Vinylidene chloride (monomer) |
| * Ethyl benzene (acidic) | Methylene chloride | Xylene |
| Ethyl ether | Naphtha | |
| * Fluids where alternate stem materials are recommended. | | |
| ** Corrosion effects on metallic parts unknown. | | |

CONSIDERATIONS FOR ALTERNATE STEM MATERIALS

When a fluid permeates TFE, the rate of permeation is very low, and the molecules will diffuse uniformly into the “gaseous void” or “non-wetted” zone in the center portion of the bellows of a Model 521. These molecules can come in contact with metallic, non-TFE parts, including the stem. With each stroke of the valve stem downwards, molecules of water vapor in the atmosphere are entrapped in the peaks and valleys of the stem’s microstructure, and are drawn down into the secondary packing rings. As the stem retracts, a molecule of the permeated fluid may be pulled up into the packing rings. If the molecules of moisture and permeated fluid come into contact, a “solution” may be formed. This “solution” will be highly “concentrated” and can be highly corrosive. If the stem material is vulnerable to the concentrated solution, chemical attack of the valve stem in the mid-range of the packing zone may begin. Once this mechanism begins, the result may lead to premature stem failure.

Examples of gases which permeate TFE in microscopic quantities are hydrogen sulfide (H₂S) and chlorine gas (Cl₂). When dissolved in moisture (H₂O) —



— acids are formed in both cases. The hydrosulphuric acid is a weaker acid that 316 SST is sufficiently corrosion resistant against. However, the hydrochloric acid is a strong acid that corrosively attacks 316 SST. Both increased pressure and temperature accelerate the corrosive mechanism. However, the overall rate of corrosion is very low as the permeation rate is very low. Chlorine gas is an example of a fluid where alternate stem construction of Hastelloy C-276 will maximize unit life and proper functioning of the secondary stem seal design. Use of alternate stem material is subjective and dependent on many various factors, and is like most CPI decisions, based on value judgement.

NOTE: The corrosive effects are primarily limited to the stem/secondary packing rings zone where moisture and acid molecules interface.

TABLE 5
Flange Stud Bolting Size / Thread Guide

| Body Size | | End Connection Flange | | | Recommended Stud Length | |
|---|------|-----------------------|-----------------|-----------------------|-------------------------|------|
| in. | (DN) | 150# - Dim "F" | 300# - Dim. "F" | PN 16/25/40 - Dim "F" | in | (mm) |
| 1/2" | (15) | 1/2"-13 UNC-2B | 1/2"-13 UNC-2B | 14 mm - M12 x 1.75-6H | 2.00" | (50) |
| 1" | (25) | 1/2"-13 UNC-2B | 5/8"-11 UNC-2B | 14 mm - M12 x 1.75-6H | 2.25" | (56) |
| 1-1/2" | (40) | 1/2"-13 UNC-2B | 3/4"-10 UNC-2B | 18 mm - M16 x 2.0-6H | 2.75" | (70) |
| 2" | (50) | 5/8"-11 UNC-2B | 5/8"-11 UNC-2B | 18 mm - M16 x 2.0-6H | 3.00" | (75) |
| "L" - # Bolt Holes | | 4 | 4/8 * | 4 | -- | -- |
| * 2" - 300# flg. requires 8; all others 4. NOTE: All flange bolt holes straddle center lines. | | | | | | |

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DIMENSIONS & WEIGHTS

English Units - inches and lbs.

| End Conn. | Dimension | Body Size | | | |
|----------------------------|-----------|--------------------------------------|-------|--------|-------|
| | | 1/2" | 1" | 1-1/2" | 2" |
| ACTUATOR MODEL # C27 & C53 | | | | | |
| ALL | A | 4.63 | 5.88 | 7.75 | 7.69 |
| | B (C27) | 14.09 | 15.34 | 17.21 | 17.15 |
| | B (C53) | NA | NA | 17.35 | 17.29 |
| | C (C27) | 17.28 | 18.53 | 20.40 | 20.34 |
| | C (C53) | NA | NA | 21.32 | 21.26 |
| | D | C27 Act. = 9.00" / C53 Act. = 11.56" | | | |
| | E | C27 Act. = 9.97" / C53 Act. = 11.21" | | | |
| | F | 5.19 | 7.44 | 8.75 | 10.40 |
| H | 3.53 | 4.88 | 6.50 | 6.38 | |
| 150# FLGD. | G | 1.75 | 2.13 | 2.50 | 3.00 |
| | K | 2.38 | 3.12 | 3.88 | 4.75 |
| 300# FLGD. | G | 1.88 | 2.44 | 3.06 | 3.25 |
| | K | 2.62 | 3.50 | 4.50 | 5.00 |
| DIN FLGD. | G | 1.88 | 2.44 | 3.06 | 3.25 |
| | K | 2.56 | 3.35 | 4.33 | 4.92 |
| Wt. w C27 Act. | | 28 | 38 | 60 | 65 |
| Wt. w C53 Act. | | -- | -- | 70 | 75 |

Metric Units - mm and kg

| End Conn. | Dimension | Body Size | | | |
|----------------------------|-----------|-------------------------------------|-------|-------|-------|
| | | DN15 | DN25 | DN40 | DN50 |
| ACTUATOR MODEL # C27 & C53 | | | | | |
| ALL | A | 117.6 | 149.4 | 196.9 | 195.3 |
| | B (C27) | 357.9 | 389.6 | 437.1 | 435.6 |
| | B (C53) | NA | NA | 440.7 | 439.2 |
| | C (C27) | 438.9 | 470.7 | 518.2 | 516.6 |
| | C (C53) | NA | NA | 541.5 | 540.0 |
| | D | C27 Act. = 228.6 / C53 Act. = 293.6 | | | |
| | E | C27 Act. = 253.1 / C53 Act. = 284.7 | | | |
| | F | 131.8 | 189.0 | 222.3 | 264.2 |
| H | 89.7 | 124.0 | 165.1 | 162.1 | |
| 150# FLGD. | G | 44.5 | 54.1 | 63.5 | 76.2 |
| | K | 60.5 | 79.2 | 98.6 | 120.7 |
| 300# FLGD. | G | 47.8 | 62.0 | 77.7 | 82.6 |
| | K | 66.5 | 88.9 | 114.3 | 127.0 |
| DIN FLGD. | G | 47.8 | 62.0 | 77.7 | 82.6 |
| | K | 65.0 | 85.0 | 110.0 | 125.0 |
| Wt. w C27 Act. | | 12.7 | 17.2 | 27.2 | 29.5 |
| Wt. w C53 Act. | | -- | -- | 31.7 | 34.0 |

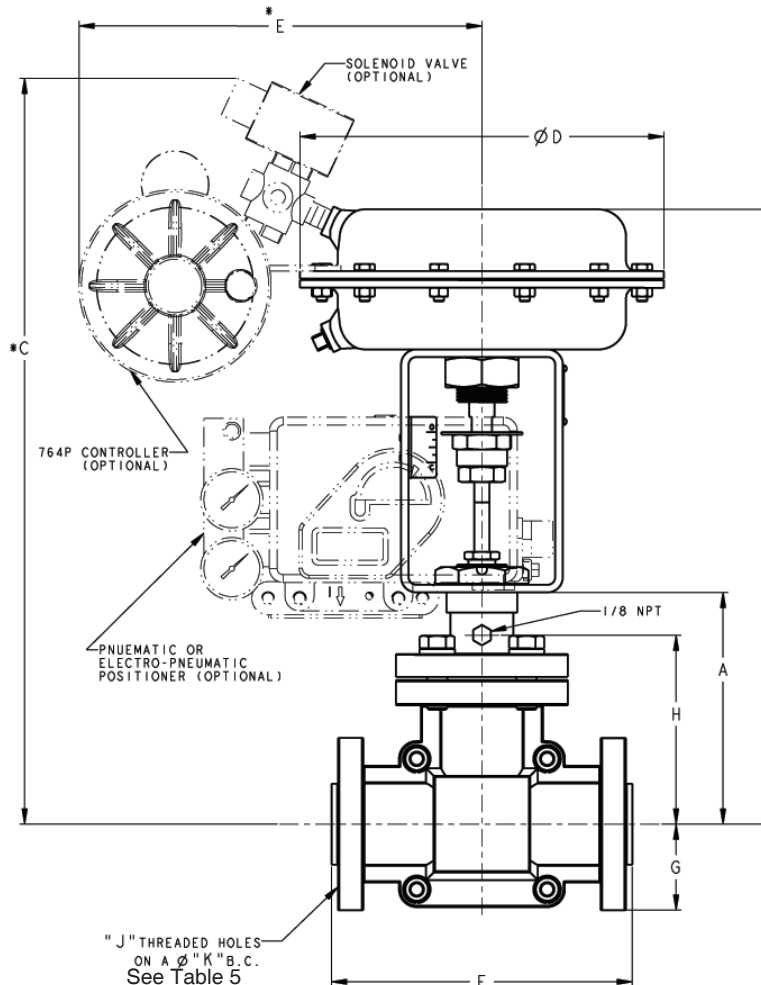


Figure 3
Body & Actuator

MODEL 521 PRODUCT CODER

12/02/20

An "X" in POS 12 followed by a 5-digit control number overrides remaining selections.

| | | | | | | | | | | | | | | | | | |
|----------|----------|-------|---|-------|-------|----------|----------|---|----------|--------|--------|--------|--------|--------|--------|--------|----------|
| S | T | POS 3 | — | POS 5 | POS 6 | 0 | 7 | — | 0 | POS 11 | POS 12 | POS 13 | POS 14 | POS 15 | POS 16 | POS 17 | G |
|----------|----------|-------|---|-------|-------|----------|----------|---|----------|--------|--------|--------|--------|--------|--------|--------|----------|

| POSITION 3 - BODY SIZE | | |
|------------------------|------|------|
| Body Size | | CODE |
| in | (DN) | |
| 1/2" | (15) | 1 |
| 1" | (25) | 2 |
| 1-1/2" | (40) | A |
| 2" | (50) | 4 |

| POSITION 5 - STEM MAT'L & END CONNECTIONS | | | |
|---|-----------|------|--------|
| Stem | RF Flange | | |
| | 150# * | 300# | DIN ** |
| | CODE | | |
| Standard | B | G | 1 |
| Option "D" Hast. C Stem, Anti-Rotation Stop & Pin | D | H | 2 |
| Option "F" Hast. C Stem, SST Pin & Anti- Rotation Stop | F | J | 3 |

* Standard End Connection
** DIN PN 16/25/40

| POSITION 6 - TRIM C _v SIZE | | | |
|---------------------------------------|-----------------------------|--------------------------|------|
| Orifice Size | Applicable Valve Body Sizes | Trim C _v Size | CODE |
| .250" | 1/2" & 1" | 0.10 Reduced | E |
| | | 0.16 Reduced | F |
| | | 0.25 Reduced | G |
| | | 0.40 Reduced | H |
| | | 0.63 Full | J |
| .438" | 1/2" Only | 1.00 Reduced | K |
| | | 1.60 Reduced | L |
| | | 2.50 Full | M |
| .562" | 1" Only | 1.00 Reduced | P |
| | | 1.60 Reduced | R |
| | | 2.50 Reduced | S |
| | | 4.00 Reduced | T |
| | | 5.00 Full | U |
| | | 6.30 Reduced | V |
| .875" | 1" & 1-1/2" | 7.50 Reduced | W |
| | | 10.0 Full | 1 |
| | | 10.0 Reduced | Y |
| 1.500" | 1-1/2" & 2" | 15.0 Reduced | 2 |
| | | 21.0 Full | 6 |
| | 2" Only | 25.0 Full | 3 |
| 1.750" | 2" Only | 35.0 Reduced | 4 |
| | | 40.0 Full | 5 |

| POSITION 11 - ACTUATOR / BENCH SET / ACTION / SIZE | | | | |
|--|--------------------|-------------------------|------------------------|-------------|
| Model | Bench Setting psig | Reverse Action ATO - FC | Direct Action ATC - FO | Valve Size |
| | | CODE | | |
| C27 | 3-17 | A | E | 1/2" & 1" |
| | 5-15 | B | F | 1" |
| | 7-28 | C | H | 1" & 1-1/2" |
| | 15-60 | D | J | 1-1/2" & 2" |
| C53 | 5-15 | K | L | 1-1/2" & 2" |
| No Actuator | | 0 | | All |

| POSITION 12 - 764P * (Bracket Mounted) - AIRSET (Bracket Mounted) - SOLENOID VALVES | | | |
|---|--|--------------|--------|
| 764P Action | Solenoid Valve *** Exhaust on Deenergization | | |
| | None | 120VAC 60 Hz | 24 VDC |
| None | CODE | | |
| Reverse ** | 2 | 8 | E |
| Reverse W/ Airset ** | 3 | 9 | F |
| Direct ** | 4 | A | G |
| Direct W/ Airset ** | 5 | B | H |
| For Special Construction Contact Cashco for Special Code | X | | |

* Refer to 764-TB for Product Code of Controller.
** Select Code 1 on Position 13 if positioner is needed.
*** Solenoid rated as 4/4X only.

| POSITION 13 - DIRECT ACTING POSITIONER with AIRSET (Bracket Mounted) (3-15 psig) 4-20 mA Specify Split Range in Special Instructions on the P.O. | | | | | |
|--|--------------------|----------------|------|----------|----------|
| Positioner Model | Ratings | Analog/Digital | Hart | Fieldbus | Profibus |
| | | CODE | | | |
| P5 P/P * | Gen. Purpose | 1 | | | |
| D20 D I/P | Gen. Purpose | C | D | | |
| D20 A I/P * ‡ | Intrinsically Safe | 2 | 5 | | |
| D20 E I/P *** ‡ | Explosion Proof | E | F | | |
| D3 X I/P | Gen. Purpose | L | M | N | P |
| D3 I I/P | Intrinsically Safe | 3 | 6 | 8 | A |
| D3 E I/P **** ‡ | Explosion Proof | G | H | J | K |
| PS2-1 I/P | Gen. Purpose | Q | R | S | T |
| PS2-2 I/P | Intrinsically Safe | & | 7 | 9 | B |
| PS2-3 I/P *** | Explosion Proof | < | U | V | W |
| None ** | | 0 | | | |

* Stock Item
** Actuator Assembly includes dimensions for (Namur) Mounting per IEC 60534-6-1.
*** Not available with limit/proximity switch option. Select codes "8", "9" or "0" in Pos. 15.
**** Not available with options. Please select code "0" in Pos. 15.
‡ PMV Positioners are not FM Approved at this time. If you need FM Approval, please specify the Siemens PS2.

| POSITION 14 - GAUGE BLOCK | |
|---------------------------|------|
| Option for Positioner | Code |
| None * | 0 |
| Gauge Block ** | 1 |

* For P5 gauge ports built in. No gauges.
* For D20 E, D3 E & PS2-3 gauge block is standard. No gauges.
** For D20 D & D20 A and PS2-1 & PS2-2 - gauge block with gauges.
** For D3 X & D3 I gauge block only - no gauges.

| POSITION 15 - POSITIONER OPTIONS | | | | | | | |
|----------------------------------|--------------------------|-------------------------------|----------------------|------------------------|------------------------|-------------------------|-------------------------|
| Options | POSITIONERS | | | I/P TRANSDUCERS * | | | |
| | Inductive Limit Switches | Micro-switches Limit Switches | Position Transmitter | 3-15 PSIG No Airset ** | 3-15 PSIG W/ Airset ** | 0-60 PSIG No Airset *** | 0-60 PSIG W/ Airset *** |
| | CODE | | | | | | |
| P5 | | | | 4 | 5 | | |
| D3 & D20 | 7 | T | 9 | | | | |
| PS2 | | | 8 | | | | |
| No Positioner | | | | C | F | R | S |
| None | 0 | | | | | | |

* For 0-60 Psig Transducer please contact the factory.
** If 5-15 psig Bench Range is selected in Pos. 11, codes R & S are invalid options.
*** If 15-60 psig Bench Range is selected in Pos. 11, codes 4, 5, C & F are invalid options.

Алматы (7273)495-231
Ангарск (3955)60-70-56
Архангельск (8182)63-90-72
Астрахань (8512)99-46-04
Барнаул (3852)73-04-60
Белгород (4722)40-23-64
Благовещенск (4162)22-76-07
Брянск (4832)59-03-52
Владивосток (423)249-28-31
Владикавказ (8672)28-90-48
Владимир (4922)49-43-18
Волгоград (844)278-03-48
Вологда (8172)26-41-59
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Киров (8332)68-02-04
Коломна (4966)23-41-49
Кострома (4942)77-07-48
Краснодар (861)203-40-90
Красноярск (391)204-63-61
Курск (4712)77-13-04
Курган (3522)50-90-47
Липецк (4742)52-20-81

Магнитогорск (3519)55-03-13
Москва (495)268-04-70
Мурманск (8152)59-64-93
Набережные Челны (8552)20-53-41
Нижегород (831)429-08-12
Новокузнецк (3843)20-46-81
Новосибирск (383)227-86-73
Омск (3812)21-46-40
Орел (4862)44-53-42
Оренбург (3532)37-68-04
Пенза (8412)22-31-16
Петрозаводск (8142)55-98-37
Псков (8112)59-10-37
Пермь (342)205-81-47

Ростов-на-Дону (863)308-18-15
Рязань (4912)46-61-64
Самара (846)206-03-16
Санкт-Петербург (812)309-46-40
Саратов (845)249-38-78
Севастополь (8692)22-31-93
Саранск (8342)22-96-24
Симферополь (3652)67-13-56
Смоленск (4812)29-41-54
Сочи (862)225-72-31
Ставрополь (8652)20-65-13
Сургут (3462)77-98-35
Сыктывкар (812)25-95-17
Тамбов (4752)50-40-97
Тверь (4822)63-31-35

Тольятти (8482)63-91-07
Томск (3822)98-41-53
Тула (4872)33-79-87
Тюмень (3452)66-21-18
Ульяновск (8422)24-23-59
Улан-Удэ (3012)59-97-51
Уфа (347)229-48-12
Хабаровск (4212)92-98-04
Чебоксары (8352)28-53-07
Челябинск (351)202-03-61
Череповец (8202)49-02-64
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