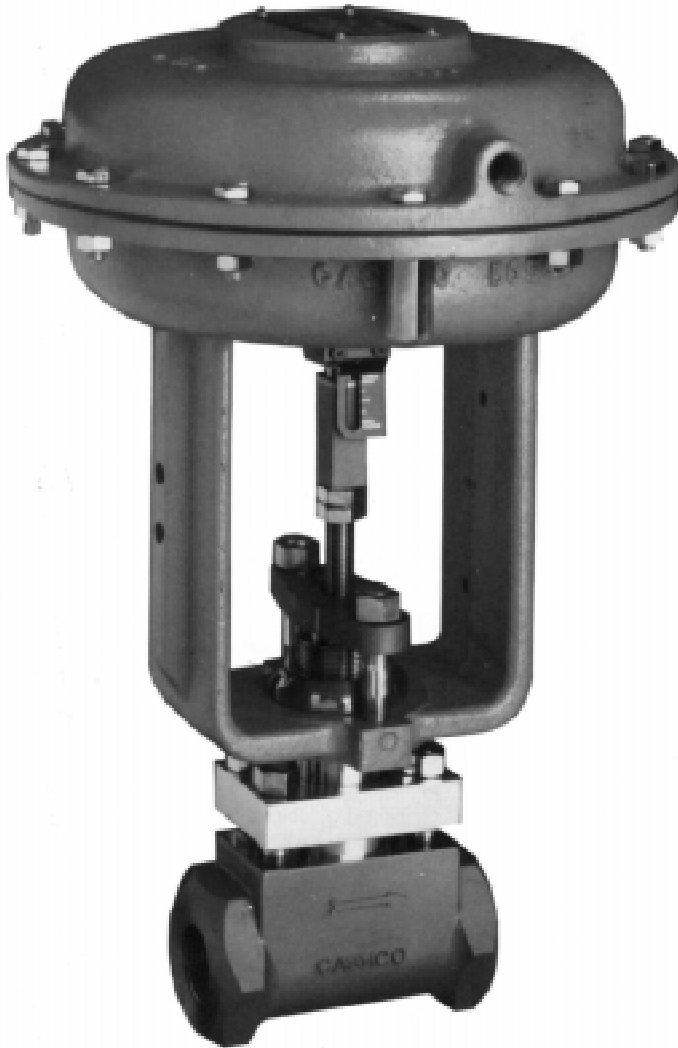




# MODEL 987

## Globe-Pattern Control Valve for General and Chemical Service



Model 987

The Model 987 is a compact, economical, sliding stem, globe-style control valve designed primarily for general as well as chemical service. Use of investment body casting consolidates both carbon steel and stainless steel applications into the standard 316LSST (CF3M) material. The valve's body/trim materials are also available in Alloy 20, Monel, or Hastelloy C constructions.

Standard trim is metal seated design giving Class IV shutoff. Optional composition seat design gives Class VI shutoff. Available in body sizes 1/2" thru 1" (DN15–DN25). End connections available are NPT, with extended pipe nipples or flangeless.

### FEATURES

- All wetted trim components of 316L SST, Alloy 20, Monel or Hastelloy C.
- Standard non-asbestos construction.
- Flow- to -open design for increased...
  - rangeability,
  - maximized stability.
- High pressure drop capability
- Standard TFE V-ring packing.
- Multiple reduced trim selections
- Equal percent characterization.
- External corrosion protection.
- Field reversible actuator
- Nace construction available

### APPLICATIONS

Designed for use in a wide range of applications in corrosive chemical fluids and hostile atmospheres. Can also be applied as a general service control valve for utilities services – steam, air, oil, water, industrial gases, etc, requiring low flow applications. The standard seat/plug/stem material is 316L SST to maximize corrosion resistance. May be applied up to 1500 psig (103 Barg) pressure limit, or 450°F (232°C) temperature limit.

## STANDARD / GENERAL SPECIFICATIONS

**Body Sizes:** 1/2", 3/4", and 1"  
(DN15, 20, 25).

**Body Materials:** SST: CF3M.  
A20: CN-7M.  
MON: M-35-1.  
H-C: CW-12MW  
(Nickel-Molybdenum Chromium).

**Body Pressure/ Temperature Rating:** Meets ANSI B16.34 for 150#/300#/600# pressure classes (SST). See Table 1.

**Max. Inlet Pressure:** SST: Up to 1440 psig (99.3 Barg).  
A20: Up to 1200 psig (82.7 Barg).  
MON: Up to 1030 psig ( 71.0 Barg).  
H-C: Up to 1500 psig (103.5 Barg).

**Working Temperature Range:** -20°F to +450°F  
(-29°C to +232°C).  
A20 material - max temp 300°F (149°C).

**End Connections:** F-to-F dimensions per ISA S75.04., except with optional extended pipe nipples and flanged end connections. See dimensions.  
Standard Female NPT – All sizes and body materials.  
Optional Flangeless - 3/4" and 1"(DN 20 & 25) body sizes only; all body materials. See Table 1 for body material vs. P vs. T vs. end connection. Flange surface finish to 250/125 micro-inch  $R_a$  (equivalent to 250/125 AARH); suitable for use with spiral-wound metallic gaskets.  
Optional Extended Pipe Nipples – All sizes; SST body material only.  
Optional Flanged – CS or SST 150#, 300# or 600# RF flanges for use on SST body material only. F-to-F dimensions per ISA-S75.03.

**Max. Pressure Drop:** Metal Seated – Up to 1500 psid (103.4 Bard).  
TFE Soft Seated – Up to 400 psid (27.6 Bard).  
See Tables 2 and 3.

**Seat Leakage:** Meets ANSI/FCI 70-2.  
Metal Seated – Class IV.  
TFE Soft Seated – Class VI.

**Flow Direction:** Standard: Flow-to-Open (FTO). Minimizes packing sealing pressure level. (Not recommended for Flow-to-Close direction.)

**Inherent Flow Characteristic:** Equal Percent; FTO direction only.

**Rangeability:**

Port Description	Rangeability
Full & 1-Step Reduced	50:1
2-Step Reduced	35:1
3-Step Reduced	

**Flow Capacity:** Per ISA S75.11; see Tables 5 & 6.

Body inch (mm)	Port - Orifice		Max Cv	
	Description	Size inch (mm)	Seat Design	
			Metal	Soft
1/2" (DN15)	2-Step Reduced	0.375" (9.5)	2.75	2.60
	3-Step Reduced	0.256" (6.5)	1.10	NA
3/4" (DN20)	1-Step Reduced	0.500" (12.7)	4.13	4.13
	2-Step Reduced	0.375" (9.5)	2.75	2.60
	3-Step Reduced	0.256" (6.5)	1.10	NA
1" (DN25)	Full	0.813" (20.7)	6.95	6.70
	1-Step Reduced	0.500" (12.7)	4.13	4.13
	2-Step Reduced	0.375" (9.5)	2.75	2.60
	3-Step Reduced	0.256" (6.5)	1.10	NA

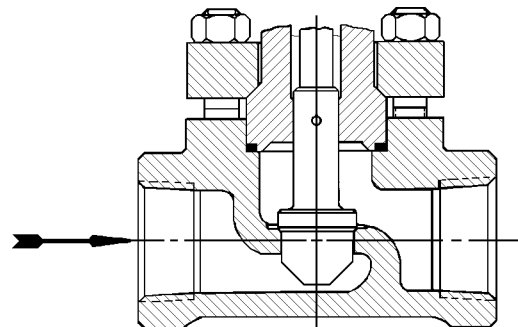
NA = Not Available

**Actuator:** Multi-Spring-Diaphragm Type. Select "direct" or "reverse" action; field reversible.

ATC-FO = Air-to-Close, Fail Open.  
ATO-FC = Air-to-Open, Fail Close.

See Tables 2 and 3 for proper selection of required bench setting range spring.

**Painting:** Standard – All non-SST portions painted with corrosion resistant epoxy paint per Cashco Specification #S-1606 except tubing and fittings.  
Optional – 2-coat epoxy coating per Cashco Specification #S-1547.



**FIGURE 1**  
Model 987- Full Port with Integral Metal Seat

## BODY SUB-ASSEMBLY SPECIFICATIONS

**Body/Bonnet Materials:** SST: ASTM A351, Gr. CF3M (316L).  
 A20: ASTM A351 Gr. CN7M (Alloy 20).  
 MON: ASTM A494 Gr. M-35-1 (Monel).  
 H-C: ASTM A494, Gr. CW-12MW (Similar to "Hastelloy C").

**Trim:** Function of packing design and body material.

Seat Design	Trim Designation #	Body Materials	Basic Trim Description
Metal	S1L, S1LS	SST	316L SST
	A21, A21S	SST or A20	Alloy 20
	M1, M1S	SST, MON or A20	Monel
	HC1, HC1S	SST, MON, A20 or H-C	Hastelloy C
Composition Soft	S3L, S3LS	SST	316LSST/TFE
	A23, A23S	SST or A20	Alloy 20/TFE
	M3, M3S	SST, A20 or MON	Monel/TFE
	HC3, HC3S	SST, A20, MON or H-C	Hast. C/TFE

See Table 4 for complete trim material specifications.

**Gaskets:** Standard – TFE O-ring .

**Stem Size:** 0.375" (9.52mm) diameter, all body sizes.

**Packing:** Standard TFE V-Ring.

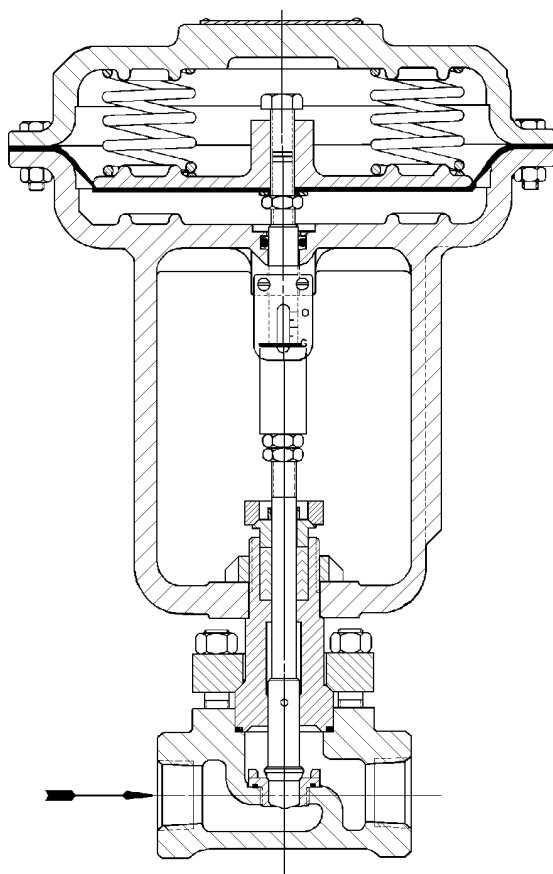
**Bonnet Bolting:** All materials. All standard and optional constructions.

Studs: ASTM A193, Gr. B7.

Nuts: ASTM A194, Gr. 2H.

**Packing Apparatus:** Standard

Flange – 316SSST;  
 Follower - 316LSST.



**FIGURE 2**

Model 987- Metal Seated with Reduced Port;  
 Model 25R ATO-FC Actuator

## ACTUATOR SUB-ASSEMBLY SPECIFICATIONS

**Size, Stroke & Volumes:**

Diaphragm Area in <sup>2</sup> (cm <sup>2</sup> )	Nominal Stroke in (mm)	Volumes	
		Clearance in <sup>3</sup> (cm <sup>3</sup> )	Displacement in <sup>3</sup> (cm <sup>3</sup> )
31 (202)	0.500" (9.52)	26 (426)	16.5 (270)

**Ambient Temperature:** -20° to +180°F (-29° to +83°C).

**Bench Set & Max/Norm Pressures:**

Bench Range psig (Barg)	Air Pressures	
	Normal Supply psig (Barg)	Design Max. psig (Barg)
3-15 (.21-1.03)	20 (1.4)	20 (1.4)
8-15 (.55-1.03)		
6-30 (.41- 2.07)	35 (2.4)	35 (2.4)
16-30(1.10 - 2.07)		
3-15 (.21-1.03)	20 (1.4)	20 (1.4)
3-10 (.21- .69)		
6-30 (.41- 2.07)	35 (2.4)	35 (2.4)
6-20 (.41-1.38)		

**Materials:**

Part	Material
Diaphragm	Buna-N w/Polyester Insert
Upper Casing, Lower Casing w/Yoke, Diaphragm Plate	Ductile Iron
Stem	316L SST
Position Indicator	304 SST
Bolting-Casings	Steel Cadmium Plated
Stem Jam Nuts	18-8 SST
Position Plate, Screws & Nameplate	304 SST
Bonnet/Yoke Nut	Steel, Cadmium plated

## OPTION SPECIFICATIONS

**Option -3:** **MANUAL HANDWHEEL.** Overrides the actuator spring force to allow manual stroking of the valve. Single acting design, top-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-7:** **LINE BOLTING.** For flangeless units only. See Figure 3.

**Opt-7A:** Heat treated, alloy steel studs per ASTM A193, Gr. B7; carbon steel nuts per ASTM A194, Gr.2H. Temperature Range:  $-20^{\circ}\leq T\leq 450^{\circ}\text{F}$  ( $-29^{\circ}\leq T\leq 232^{\circ}\text{C}$ ).

**Opt-7C:** Corrosion resistant, 18-8 SST (316SST) strain-hardened studs per ASTM A193, Gr. B8M; 18-8 SST nuts per ASTM A194, Gr. 8M.

Temperature Range:  $-20^{\circ}\leq T\leq 450^{\circ}\text{F}$  ( $-29^{\circ}\leq T\leq 232^{\circ}\text{C}$ )

**Option-15:** **STELLITED SEAT SURFACES.** Available only with metal seated trim designation Nos. S1L or S1LS, and sizes Full, 1-Step Reduced, 2-Step Reduced, and 3-Step-Reduced. Both seating surface of plug and seat ring or integral seat are covered with Stellite #6 material. Recommended for flashing or partially cavitating service, or where extended time periods of ON-OFF or low flow (less than 10% open) operation occur and good shutoff is required.

**Option - 27:** **VISCOUS SERVICE BONNET.** Available on all materials. Two drilled passages allow the fluid to bypass the guiding surface. To stabilize operation for fluids with viscosity greater than 100 Cp.

**Option-30:** **FLANGED END CONNECTIONS.** 150#, 300# or 600# RF socket weld flanges in CS or SST. Schedule 80 pipe nipple socket weld to body. Mating dimensions in accordance with ANSI B16.5.

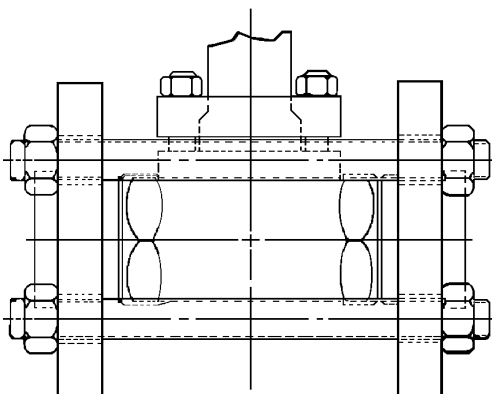
**Option - 32:** **EXTENDED NIPPLE END CONNS.** ONLY available with CF3M SST body material. Pipe of 316LSST Schedule 80 material. Short-threaded pipe nipples seal welded to body prior to assembly. Adds approximately 3 inches (76mm) to the face-to-face dimension of the standard unit. Use for socket weld pipe systems.

**Option -40:** **NACE SERVICE.** Internal wetted portions meet NACE standard MR0175, when the exterior of the valve is not directly exposed to a sour gas environment, buried, insulated or otherwise denied direct atmospheric exposure. Apply in sour gas, sour crude, or service with hydrogen sulfide ( $\text{H}_2\text{S}$ ) in the flow mixture. Limits effects of sulfide stress corrosion cracking. Use with all body/bonnet materials, and with all trim designations. Not available with Option-15 Stellite Trim. Certificate of compliance supplied on request.

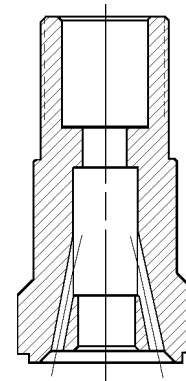
**Option -55:** **SPECIAL CLEANING.** Cleaned and packaged per Cashco Specification #S-1134. Suitable for oxygen service and other fluids. SST BODIES ONLY.

**Option -56:** **SPECIAL CLEANING.** Special cleaning procedure per Cashco Specification #S-1542. Suitable for fluids other than oxygen. For all body materials.

**Option -95:** **EPOXY PAINT.** Special epoxy painting for exterior surfaces. Utilized in harsh atmospheric conditions. Procedures and specs per Cashco Specification #S-1547.



**Figure 3**  
Line Bolting



**Figure 4**  
Viscous Service Bonnet

## MOUNTED ACCESSORY SPECIFICATIONS

<b>Positioners:</b>	<p><u>General.</u> Yoke mounted to unit. All feedback linkage exposed to elements of SST materials. Aluminum housing with corrosion resistant polyurethane paint. Standard with 2-gauge cluster. Pneumatic output load as required by actuator bench range. Adjustable zero, stroke, gain and damping settings. Field reversible action. Dedicated airset recommended.</p> <p><u>P/P Pneumatic.</u> Model 9540L. Accepts 3-15 psig (0.2-1.0 Barg); 2-way split ranges 3-9 or 9-15 psig (0.2-0.6 or 0.6-1.0 Barg) input signals. Plastic cover with see-thru panel to view internal gauges.</p> <p><u>I/P Electro-Pneumatic.</u> Model 9520L. Accepts 4-20 mA; 2-way split ranges 4-12 or 12-20 mA input signals. NEMA 3 enclosure, intrinsically safe. FM approved. Gauges mounted on external gauge block.</p> <p><u>Mounting Bracket.</u> P/P – Pneumatic uses a SST bracket. I/P – Electro Pneumatic uses a die cast aluminum bracket.</p>	<p>supply. Class F coil, continuous duty. 0.125" (3 mm) orifice, 50 psid (3.4 Bard) maximum pressure drop.</p> <p><u>Gen. Purpose:</u> ASCO #8320G176. <u>X-Proof:</u> ASCO #EF8320G176.</p> <p><u>Alternate SST:</u> Similar to standard unit, except with 303 SST body. <u>Gen. Purpose:</u> ASCO #8320G201. <u>X-Proof:</u> ASCO #EF8320G201.</p> <p>Standard installation vents actuator and drives valve to failsafe position upon loss of electrical power.</p>	<p><b>Position Indicating Switches:</b></p> <p><u>Standard:</u> Yoke mounted, rotary trip switch; contains 1-SPDT switch. Switch rating is 15A @ 125 or 250 VAC. UL/CSA rating L96. Up to two switch units may be mounted per valve.</p> <p><u>Gen. Purpose:</u> Microswitch #OP-AR. NEMA 4 enclosure. <u>X-Proof:</u> Microswitch #EX-AR. For "hazardous locations" NEMA 7, Class 1, Groups C &amp; D; NEMA 9, Class II, Groups E,F &amp; G.</p> <p><u>Alternate:</u> Proximity Controls Model #12ALO, 2-SPDT switches. Switch rating is 15A @ 125 or 250 VAC; proximity-type. UL listed for Class I, Groups A, B, C, D; Class II, Groups E, F, G; Div. 1 and 2. CSA, BASEEFA and CENELEC listed. Enclosure per NEMA 1, 2, 3, 3R, 3S, 4, 4X, 6, 7, 9, 12 and 13.</p> <p><u>Alternate:</u> Proximity Controls Model #12GLOB, 2-SPDT Switches. Switch rating is 1A @ 125 VAC. BASEEFA certified EX dIIC T6 per BS4683 Part 2, IP68. CENELEC certified EEX dIIC T6 per BS550: Parts 1 &amp; 5.</p>
<b>Air Tubing:</b>	<p>Standard instrument air tubing is Imperial-Eastman "Impolene" thermo-plastic tubing with brass fittings.</p> <p>Optional copper tubing with brass fittings, or SST tube and fittings.</p>		
<b>Airset:</b>	<p>Model 5100P instrument air supply regulator. Use with positioners. Bracket mounted to actuator casing.</p>		
<b>Solenoid Valve:</b>	<p><u>Standard Brass:</u> Available in standard NEMA 3, 4 and 6 weatherproof model, or NEMA 4 &amp; 7 explosion-proof model. Brass body, 1/4" female NPT connections. Nipple mounted or bracket mounted to actuator casing. 120 VAC, 60 Hz power</p>		

## APPLICATION AND SELECTION

The following procedure will help determine a suitable selection for an application. Consult Cashco area Sales Representative for assistance in sizing.

STEP 1.	<p><u>FIVE KNOWNNS.</u> The following minimal parameters/information must be available before a selection procedure can begin:</p> <ol style="list-style-type: none"> <li>a. Service Fluid – What is it? Liquid or gas? SG (std. cond.).</li> <li>b. Inlet Pressure – <math>P_1</math> (upstream pressure).</li> <li>c. Outlet Pressure - <math>P_2</math> (downstream pressure).</li> <li>d. Desired capacity – Cv, GPM, SCFH; minimum, maximum and normal.</li> <li>e. Fluid temperature – <math>T_1</math>, SG (actual).</li> </ol>	STEP 2.	<p><u>RESERVE CAPACITY.</u> The inherent characteristic of the valve is <u>equal percent</u>. Decide the amount of <u>over-capacity</u> in the selection; i.e. =% character with 25% reserve capacity. (NOTE: An equal percent character gives a "low gain" up to near 50% of full signal, a "medium gain" up to about 75% of full signal, and a "high gain" the last 25% of full signal. Cashco recommends using the 25% reserve as a minimum value.)</p>
---------	--	---------	--

STEP 3. SEAT DESIGN. Determine if metal seat design or composition seat design is required.

STEP 4. CAPACITY. Using the knowns from Step 1, calculate the maximum and minimum Cv required.

Example: Max Cv Req'd = 2.50 Cv  
Min Cv Req'd = 0.500 Cv  
=% Character, Metal Seat  
25% reserve capacity

Max Cv Available  
 $2.50 \times 1.25 = 3.12 \text{ Cv}$

Select the body/orifice sizes that are near the 3.12 Cv available level. Table 5 should be used.

Example: Preliminary selections –

- a. 3/4" @ 4.13 Cv Max, 1-Step Reduced port.
- b. 1" @ 6.95 Cv Max, full port.

STEP 5. RANGEABILITY. Check the Min Cv Available from Table 5 for the selection of Step 4.

- a. 0.08 Cv @ Min. Cv available.
- b. 0.14 Cv @ Min Cv available.

As the Min Cv Required is greater than any of the above Min Cv Available, both of the selections are acceptable at minimum flow level. Either may be chosen.

STEP 6. FAILURE ACTION. Consider the process related safety conditions to determine if the valve should “fail open” or “fail close” upon:

- a. loss of air supply pressure.
- b. loss of electric power. \*
- c. loss of both supply air and electric power. \*

\* Requires 3-way solenoid valve.

STEP 7. P vs. T BODY RATINGS. For the desired body material assure that the actual design inlet temperature/pressure limits established in Table 1 are not exceeded.

STEP 8. PRESSURE DROP & ACTUATOR BENCH SET. Maximum pressure drop ( $\Delta P$ ) is normally experienced at shutoff flow. Knowing the maximum  $\Delta P$  required, the desired action/failsafe position (ATO-FC or ATC-FO) and the seat design (metal or composition soft), go to the correct table of Tables 2 or 3 to assure the valve's capability.

Example:  $\Delta P$  shutoff = 40 psid (2.76 Bard). Valve selected – 1" (DN 25) @ 6.95 Cv Max, full port, ATO-FC action.

Selection: Use Table 2. An acceptable actuator Bench Set Range Spring is an 8-15 psig (.55 -1.03 Barg).

**Note:** *If a bench set had been selected such as a 6-30 psig (.41-2.07 Barg), i.e. other than a nominal 3-15 psig (.21-1.03 Barg); a positioner would have been required.*

STEP 9. MATERIALS. Review Table 4. Select the desired trim from Table 4. Consider the use of Option -15, stellited seating surfaces. Consider leakage rate.

Reference materials vs. fluid corrosion tables for suitability of body and trim materials.

STEP 10. ACCESSORIES. Consider use of various valve installed accessories:

- a. P/P positioner
- b. I/P positioner
- c. Position limit switches
- d. Manual handwheel
- e. Solenoid valve
- f. Airset

# TECHNICAL SPECIFICATIONS

**TABLE 1  
MATERIAL PRESSURE / TEMPERATURE RATINGS**

Body/Bonnet Materials		End Connection	English Units		Metric Units	
General	ASTM Spec.		Pressure psig	Temperature °F	Pressure (Barg)	Temperature (°C)
Cast Stainless Steel (SST)	A351 Gr. CF3M/ A351, Gr. CF3M	150# Flanged or Flangeless	275	-20 to +100	(19.0)	(-29 to +38)
			235	200	(16.2)	(94)
			215	300	(14.8)	(149)
			195	400	(13.5)	(205)
			180	450	(12.4)	(232)
		300# Flanged or Flangeless	720	-20 to +100	(49.6)	(-29 to +38)
			620	200	(42.8)	(94)
			560	300	(38.7)	(149)
			515	400	(35.6)	(205)
			495	450	(34.1)	(232)
		NPT, Opt-32 or 600# Flanged or Flangeless	1440	-20 to +100	(99.3)	(-29 to +38)
			1240	200	(85.6)	(94)
			1120	300	(77.3)	(149)
			1025	400	(70.7)	(205)
			990	450	(68.3)	(232)
Alloy 20 (A20)	A351, Gr. CN-7M/ B473, Tp. 20Cb3	150# Flangeless	230	-20 to +100	(15.9)	(-29 to +38)
			200	200	(13.8)	(94)
			180	300	(12.4)	(149)
		300# Flangeless	600	-20 to +100	(41.4)	(-29 to +38)
			520	200	(35.8)	(94)
			465	300	(32.0)	(149)
		NPT or 600# Flangeless	1200	-20 to +100	(82.7)	(-29 to +38)
			1035	200	(71.3)	(94)
			930	300	(64.1)	(149)
Monel (MON)	A484, Gr. M-35-1/ B164, Tp. 405 (Note 1)	150# Flangeless	195	-20 to +100	(13.4)	(-29 to +38)
			170	200	(11.7)	(94)
			160	300	(11.0)	(149)
			155	400	(10.7)	(205)
			155	450	(10.7)	(232)
		300# Flangeless	515	-20 to +100	(35.5)	(-29 to +38)
			450	200	(31.0)	(94)
			420	300	(29.0)	(149)
			410	400	(28.3)	(205)
			410	450	(28.3)	(232)
		NPT or 600# Flangeless	1030	-20 to +100	(71.0)	(-29 to +38)
			905	200	(62.4)	(94)
			845	300	(58.3)	(149)
			820	400	(56.6)	(205)
			820	450	(56.6)	(232)
Cast Ni-Mo-Cr (H-C)	A494, Gr. CW-12MW/ A574, Tp. C-22 (Note 2)	150# Flangeless	230	-20 to +100	(15.8)	(-29 to +38)
			205	200	(14.1)	(94)
			195	300	(13.4)	(149)
			185	400	(12.7)	(205)
			175	450	(12.0)	(232)
		300# Flangeless	600	(-20 to +100)	(41.3)	(-29 to +38)
			540	200	(37.2)	(94)
			505	300	(34.8)	(149)
			465	450	(32.0)	(232)
			NPT or 600# Flangeless	1200	-20 to +100	(82.7)
		1080		200	(74.4)	(94)
		1015		300	(70.0)	(149)
		935		450	(64.4)	(232)

NOTE: 1: Monel M-35-1 is not covered by ANSI B16.34 or ASME.

NOTE 2: H-C material is now recognized by ASME in Sec. VIII of BPVC. It is not covered by ANSI B16.34.

**TABLE 2  
MAXIMUM PRESSURE DROP – psid (Bard)  
METAL SEATED**

Actuator Action	Body Size Inch (mm)	Port-Orifice		Maximum Operating Pressure Drop psid (Bard)	Actuator		Air Supply Pressure psig (Barg)		
		Description	Size Inch (mm)		Bench Settings psig (Barg)	Model No.			
ATO-FC (Rev.)	1" (DN25)	Full	0.813" (20.7)	NR —	3-15 (.21-1.03)	25R-01	20	(1.4)	
	3/4" & 1" (DN20 & 25)	1-Step Reduced	0.500" (12.7)	NR —					
	1/2", 3/4" & 1" (DN15, 20 & 25)	2-Step Reduced	0.375" (9.5)	135 (9.3)					
			3-Step Reduced	0.256" (6.5)	625 (43.1)				
	1" (DN25)	Full	0.813" (20.7)	250 (17.2)	8-15 (.55-1.03)	25R-02	20	(1.4)	
	3/4" & 1" (DN20 & 25)	1-Step Reduced	0.500" (12.7)	785 (54.1)					
	1/2", 3/4" & 1" (DN15, 20 & 25)	2-Step Reduced	0.375" (9.5)	1500 (103.4)					
			3-Step Reduced	0.256" (6.5)	1500 (103.4)				
	1" (DN25)	Full	0.813" (20.7)	120 (8.3)	6-30 (.41-2.07)	25R-03	35	(2.4)	
	3/4" & 1" (DN20 & 25)	1-Step Reduced	0.500" (12.7)	470 (32.4)					
	1/2", 3/4" & 1" (DN15, 20 & 25)	2-Step Reduced	0.375" (9.5)	975 (67.2)					
			3-Step Reduced	0.256" (6.5)	1500 (103.4)				
1" (DN25)	Full	0.813" (20.7)	765 (52.8)	16-30 (1.10-2.07)	25R-04	35	(2.4)		
3/4" & 1" (DN20 & 25)	1-Step Reduced	0.500" (12.7)	1500 (103.4)						
1/2", 3/4" & 1" (DN15, 20 & 25)	2-Step Reduced	0.375" (9.5)	1500 (103.4)						
		3-Step Reduced	0.256" (6.5)	1500 (103.4)					
ATC-F0 (Direct)	1" (DN25)	Full	0.813" (20.7)	50 (3.4)	3-15 (.21-1.03)	25D-01	20	(1.4)	
	3/4" & 1" (DN20 & 25)	1-Step Reduced	0.500" (12.7)	310 (21.4)					
	1/2", 3/4" & 1" (DN15, 20 & 25)	2-Step Reduced	0.375" (9.5)	700 (48.3)					
			3-Step Reduced	0.256" (6.5)	1500 (103.4)				
	1" (DN25)	Full	0.813" (20.7)	380 (26.2)	3-10 (.21-.69)	25D-02	20	(1.4)	
	3/4" & 1" (DN20 & 25)	1-Step Reduced	0.500" (12.7)	1100 (75.9)					
	1/2", 3/4" & 1" (DN15, 20 & 25)	2-Step Reduced	0.375" (9.5)	1500 (103.4)					
			3-Step Reduced	0.256" (6.5)	1500 (103.4)				
	1" (DN25)	Full	0.813" (20.7)	50 (3.4)	6-30 (.41-2.07)	25D-03	35	(2.4)	
	3/4" & 1" (DN20 & 25)	1-Step Reduced	0.500" (12.7)	310 (21.4)					
	1/2", 3/4" & 1" (DN15, 20 & 25)	2-Step Reduced	0.375" (9.5)	700 (48.3)					
			3-Step Reduced	0.256" (6.5)	1500 (103.4)				
1" (DN25)	Full	0.813" (20.7)	700 (48.3)	6-20 (.41-1.38)	25D-04	35	(2.4)		
3/4" & 1" (DN20 & 25)	1-Step Reduced	0.500" (12.7)	1500 (103.4)						
1/2", 3/4" & 1" (DN15, 20 & 25)	2-Step Reduced	0.375" (9.5)	1500 (103.4)						
		3-Step Reduced	0.256" (6.5)	1500 (103.4)					

NR = Not Recommended

**NOTE:** All above pressure drop values are based on Flow-to-Open (FTO) direction. Consult factory before applying in FTC direction.

**TABLE 3  
MAXIMUM PRESSURE DROP – psid (Bard)  
COMPOSITION SOFT SEAT**

Actuator Action	Body Size Inch (mm)	Port-Orifice		Maximum Operating Pressure Drop psid (Bard)	Actuator		Air Supply Pressure psig (Barg)
		Description	Size Inch (mm)		Bench Settings psig (Barg)	Model No.	
AT0-FC (Rev.)	1" (DN25)	Full	0.813" (20.7)	NR —	3-15 (.21-1.03)	25R-01	20 (1.4)
	3/4" & 1" (DN20 & 25)	1-Step Reduced	0.500" (12.7)	115 (7.9)			
	1/2", 3/4" & 1" (DN15, 20 & 25)	2-Step Reduced	0.375" (9.5)	290 (20.0)			
	1" (DN25)	Full	0.813" (20.7)	325 (22.4)	8-15 (.55-1.03)	25R-02	20 (1.4)
	3/4" & 1" (DN20 & 25)	1-Step Reduced	0.500" (12.7)	400 (27.6)			
	1/2", 3/4" & 1" (DN15, 20 & 25)	2-Step Reduced	0.375" (9.5)	400 (27.6)			
	1" (DN25)	Full	0.813" (20.7)	195 (13.4)	6-30 (.41-2.07)	25R-03	35 (2.4)
	3/4" & 1" (DN20 & 25)	1-Step Reduced	0.500" (12.7)	400 (27.6)			
	1/2", 3/4" & 1" (DN15, 20 & 25)	2-Step Reduced	0.375" (9.5)	400 (27.6)			
	1" (DN25)	Full	0.813" (20.7)	400 (27.6)	16-30 (1.1-2.07)	25R-04	35 (2.4)
3/4" & 1" (DN20 & 25)	1-Step Reduced	0.500" (12.7)	400 (27.6)				
1/2", 3/4" & 1" (DN15, 20 & 25)	2-Step Reduced	0.375" (9.5)	400 (27.6)				
ATC-F0 (Direct)	1" (DN25)	Full	0.813" (20.7)	130 (9.0)	3-15 (.21-1.03)	25D-01	20 (1.4)
	3/4" & 1" (DN20 & 25)	1-Step Reduced	0.500" (12.7)	400 (27.6)			
	1/2", 3/4" & 1" (DN15, 20 & 25)	2-Step Reduced	0.375" (9.5)	400 (27.6)			
	1" (DN25)	Full	0.813" (20.7)	400 (27.6)	3-10 (.21-.69)	25D-02	20 (1.4)
	3/4" & 1" (DN20 & 25)	1-Step Reduced	0.500" (12.7)	400 (27.6)			
	1/2", 3/4" & 1" (DN15, 20 & 25)	2-Step Reduced	0.375" (9.5)	400 (27.6)			
	1" (DN25)	Full	0.813" (20.7)	130 (9.0)	6-30 (.41-2.07)	25D-03	35 (2.4)
	3/4" & 1" (DN20 & 25)	1-Step Reduced	0.500" (12.7)	400 (27.6)			
	1/2", 3/4" & 1" (DN15, 20 & 25)	2-Step Reduced	0.375" (9.5)	400 (27.6)			
	1" (DN25)	Full	0.813" (20.7)	400 (27.6)	6-20 (.41-1.38)	25D-04	35 (2.4)
3/4" & 1" (DN20 & 25)	1-Step Reduced	0.500" (12.7)	400 (27.6)				
1/2", 3/4" & 1" (DN15, 20 & 25)	2-Step Reduced	0.375" (9.5)	400 (27.6)				

NR= Not Recommended

**NOTE:** All above pressure drop values are based on Flow-to-Open (FTO) direction. Consult factory before applying in FTC direction.

**TABLE 4  
TRIM MATERIALS VS. DESIGNATION NOS.**

Part Description	METAL SEAT – Trim Designation Nos.							
	S1L*	S1LS*	M1	M1S	A21	A21S	HC1	HC1S
Plug/Stem Assy.	316L SST	316L SST	Monel 405	Monel 405	20Cb3	20Cb3	Hast C-22	Hast C-22
Seat Ring **	316L SST	316L SST	Monel 405	Monel 405	20Cb3	20Cb3	Hast C-22	Hast C-22
Guide Bushing	Integral w/Bonnet	Stellite #6	Integral w/Bonnet	Stellite #6	Integral w/Bonnet	Stellite #6	Integral w/Bonnet	Stellite #6

Part Description	COMPOSITION / SOFT SEAT – Trim Designation Nos.							
	S3L	S3LS	M3	M3S	A23	A23S	HC3	HC3S
Plug/Stem Assy.	316L SST	316L SST	Monel 405	Monel 405	20Cb3	20Cb3	Hast C-22	Hast C-22
Seat Ring **	316L SST	316L SST	Monel 405	Monel 405	20Cb3	20Cb3	Hast C-22	Hast C-22
Guide Bushing	Integral w/Bonnet	Stellite #6	Integral w/Bonnet	Stellite #6	Integral w/Bonnet	Stellite #6	Integral w/Bonnet	Stellite #6
Seat Insert	TFE	TFE	TFE	TFE	TFE	TFE	TFE	TFE

\* Use these trim designation numbers for Option -15 Stellite Seating surfaces.

\*\* On Full Port designs of both Metal and Composition Seats, the seat ring is integral to the body.

Material	Material Specifications
316L SST	ASTM A479, Alloy S31603; Wrought Barstock, Annealed
20Cb3	ASTM B473, Alloy N08020; Wrought Barstock, Annealed
Monel 405	ASTM B164, Class B Alloy N04405; Wrought Barstock
Hastelloy C-22	ASTM A574, Alloy No6022; Wrought Barstock, Annealed

**TABLE 5  
FLOW CAPACITY – Cv  
EQUAL PERCENT (=%) CHARACTER  
Cv @ 10% TRAVEL INCREMENTS  
METAL SEAT**

Body Size inch/(mm)	Port Size Description	FL @ 10% Travel	Minimum Flow	Percent of Travel - %										FL @ 100% Travel
				10	20	30	40	50	60	70	80	90	100	
1" (DN25)	Full	.90	.14	.19	.40	.51	.61	.89	1.22	2.08	4.24	6.44	<b>6.95</b>	.90
3/4" & 1" (DN20 & 25)	1-Step Reduced	.90	.08	.12	.22	.29	.39	.51	.74	1.14	1.82	2.97	<b>4.13</b>	.90
1/2", 3/4" & 1" (DN15, 20 & 25)	2-Step Reduced	.90	.08	.10	.12	.15	.22	.32	.53	.91	1.62	2.37	<b>2.75</b>	.90
	3-Step Reduced	.90	.03	.04	.05	.06	.08	.12	.18	.31	.49	.74	<b>1.10</b>	.90

**TABLE 6  
FLOW CAPACITY – Cv  
EQUAL PERCENT (=%) CHARACTER  
Cv @ 10% TRAVEL INCREMENTS  
COMPOSITION SOFT SEAT**

Body Size inch/(mm)	Port Size Description	FL @ 10% Travel	Minimum Flow	Percent of Travel - %										FL @ 100% Travel
				10	20	30	40	50	60	70	80	90	100	
1" (DN25)	Full	.90	.13	.29	.42	.56	.74	.91	1.20	2.17	4.36	5.87	<b>6.70</b>	.90
3/4" & 1" (DN20 & 25)	1-Step Reduced	.90	.08	.11	.14	.18	.28	.42	.67	1.12	1.91	3.14	<b>4.13</b>	.90
1/2", 3/4" & 1" (DN15, 20 & 25)	2-Step Reduced	.90	.12	.13	.14	.15	.16	.17	.29	.57	1.00	1.84	<b>2.60</b>	.90

**TABLE 7  
APPLICATION RECOMMENDATIONS**

	Fluid	Options	Trim Designation Nos.
<b>GASES</b>	Inert Industrial (N <sub>2</sub> , He, Ar)	—	S1L, S3L
	Oxygen	OPT-55	S1L, S3L, M1, M3
	Hydrocarbons - Clean	OPT-40	ALL
	Hydrocarbons - Dirty	OPT-40	S1LS, M1S, A21S, HC1S
	Corrosive - Clean	OPT-40	ALL
	Corrosive - Dirty	OPT-15	S1LS
<b>LIQUIDS</b>	Clean, Non-Cavitating, Non-Flashing	—	ALL
	Clean, Cavitating, Flashing	OPT-15	S1LS
	NACE (H <sub>2</sub> S + HC's)	OPT-40	ALL
	Corrosive	OPT-40	ALL
	Abrasive	—	N/R
<b>STEAM</b>	P1 < 150 psig (P1 < 10.3 Barg)	—	S1L
	Saturated 150 psig < P1 < 400 psig (10.3 Barg < P1 < 27.6 Barg)	OPT-15	S1L, S1LS
	Superheated 360°F < T1 < 450°F (182°C < T1 < 232°F)	OPT-15	S1LS

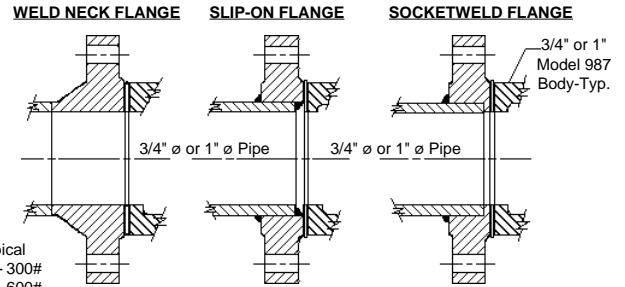
N/R = Not Recommended

**TABLE 8  
PIPING FLANGES FOR FLANGELESS VALVE CONNECTIONS**

Basic Flange Size	Flange Pressure Class		
	150#	300#	600#
1/2"	N/A	N/A	N/A
3/4"	N/A	√	√
1"	√	√	√
1" x 1/2" Reducing	√	√	√
1" x 3/4" Reducing	√	√	√

√ Available

**FLANGE SIZE = PIPE SIZE = BODY SIZE**



Typical  
3/4" - 300#  
3/4" - 600#  
1" - 150#  
1" - 300#  
1" - 600#

**REDUCING SOCKETWELD FLANGE**      **REDUCING SLIP-ON FLANGE**

Typical  
1" x 3/4" - 150#  
1" x 1/2" - 150#  
1" x 3/4" - 300#  
1" x 1/2" - 300#  
1" x 3/4" - 600#  
1" x 1/2" - 600#

**FLANGE SIZE = BODY SIZE: PIPE SIZE < FLANGE/BODY SIZE**  
**FLANGE SIZE = 1" REDUCING**

**DIMENSIONS & WEIGHTS**

*ENGLISH UNITS - inch & lbs.*

SIZE	A	Plain End Nipple B1	ANSI R.F.S.W. Flange Class		C	D	E	F*	G*	H	Ship Weight
			150#	300#							
1/2"											
3/4"	4.00	7.00	7.25	7.50	12.19	19.13	8.75	19.00	18.00	4.00	27 **
1"				7.50							

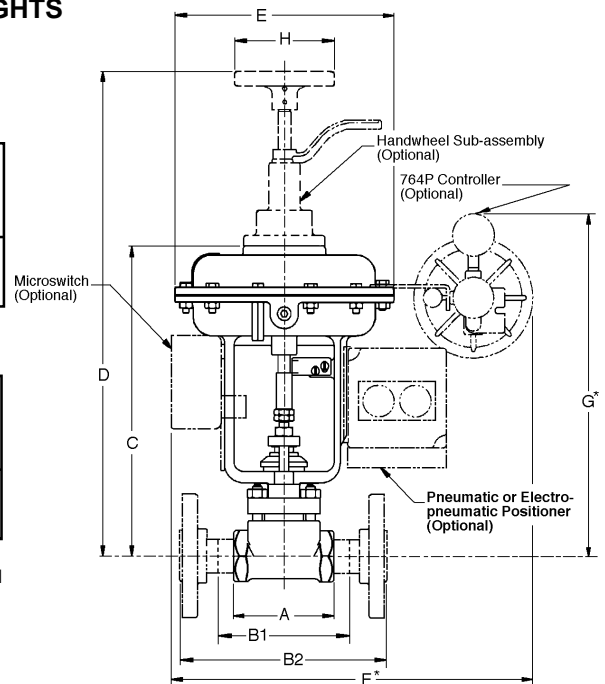
*METRIC UNITS - mm & Kilo.*

SIZE	A	Plain End Nipple B1	ANSI R.F.S.W. Flange Class		C	D	E	F*	G*	H	Ship Weight
			150#	300#							
DN15											
DN20	102	178	184	190	310	486	222	482	457	102	13 **
DN25				203							

\* Maximum dimension for any combination of standard mounted options (except the handwheel sub-assembly).

\*\* Basic valve with actuator, no accessories or manual handwheel operator. Add for: positioner approx. 4# (1.8 kg); limit switch approx. 3# (1.4 kg); manual handwheel operator approx. 6# (2.7 kg).

- MISC. NOTES: 1. Pneumatic Connections - 1/4"  
2. Electrical Conduit Connection - 1/2" NPT for Microswitch, Electro-pneumatic Positioner, Solenoid Valve and Transducer  
3. Electrical Conduit Connection - 3/4" NPT for Proximity Limit Switch.



Standard Options Not Shown: Proximity Limit Switch, Air Supply Regulator (5100P), Solenoid Valve (ASCO 3-way) and Transducer

