



**1/2" – 1-1/2" Model 2296
with Model 25R Actuator**



**2" Model 2296 with
Model 55R Actuator**

MODEL 2296

SST Pneumatic Control Valve

The Model 2296 is a low cost stainless steel globe-style, control valve for plant utility and process applications. It is available in multiple characteristics. Sizes available include 1/2", 3/4", 1", 1-1/2" and 2" (DN 15, 20, 25, 40 and 50).

FEATURES

- Quick change trim.
- Equal percent or linear characterization.
- All wetted trim components of 316 or 316L SST.
- Metal or TFE soft seat.
- SST body.
- Full or reduced port trim.
- Standard non-asbestos construction.

APPLICATIONS

The Model 2296 is capable of handling air, gases, oils, water, steam and many corrosive process fluids. With optional construction it is suitable for cryogenic service.

STANDARD / GENERAL SPECIFICATIONS

Body Sizes: 1/2", 3/4", 1", 1-1/2" and 2".
(DN15, 20, 25, 40, and 50).

Body Material Cast 316L SST.

Body Pressure/ Temperature Rating: Meets ANSI B16.34 for pressure class 150#.

Max. Inlet Pressure: Up to 275 psig (19.0 Barg).

Working Temperature Range: Standard: -20°F to +400°F, (-29°C to +232°C).
Option -36: -425°F to +100°F, (-253°C to +38°C).

End Connections: Female NPT.
150# RF 316L SST Flange, F-to-F dimensions per ISA S75.03
Extended Nipple, Schedule 80, plain end.

Max. Pressure Drop: Up to 275 psid (19.0 Bard).

Seat Leakage: Meets ANSI/FCI 70-2 (Rev. 1982). Metal Seated – Classes II and 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 (=%) or Linear; FTO direction only.

Rangeability:	Port/Seat Description	Rangeability		
		Seat Leakage Class		
		II	IV	VI
	Full - Metal	35:1	50:1	–
	Full - Soft	–	–	50:1
	Reduced - Metal	20:1	25:1	–
	Reduced - Soft	–	–	25:1

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

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

Body Size inch (mm)	Port - Orifice		Max Cv	
	Description	Character	Metal	Soft
1/2" (DN15)	Full	Equal %	6.9	6.8
		Linear	6.6	6.4
	Reduced	Equal %	3.2	5.0
		Linear	3.9	5.1
3/4" (DN20)	Full	Equal %	8.9	8.5
		Linear	9.0	8.5
	Reduced	Equal %	3.5	5.8
		Linear	4.5	6.6
1" (DN25)	Full	Equal %	10.2	9.7
		Linear	11.0	9.9
	Reduced	Equal %	3.5	5.8
		Linear	4.5	6.6
1-1/2" (DN40)	Full	Equal %	15.0	14.0
		Linear	16.1	15.3
	Reduced	Equal %	9.1	8.3
		Linear	10.1	9.1
2" (DN50)	Full	Equal %	31.5	32.5
		Linear	41.2	41.1
	Reduced	Equal %	21.4	19.2
		Linear	28.4	27.7

Actuators: Spring-Diaphragm Type.

Body Sizes inch (mm)	Basic Actuator Model No.	Reversible	Action
1/2" - 1-1/2" (DN15-40)	25R	Yes	Reverse; ATO-FC
2" (DN50)	55R	No	(Increase in air "LOAD" retracts actuator stem.)
1/2" - 1-1/2" (DN15-40)	25D	Yes	Direct; ATC-FO
2" (DN50)	55D	No	(Increase in air "LOAD" extends actuator stem.)

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

See Tables 2 thru 3 for proper selection of required bench setting range spring and full Model number.

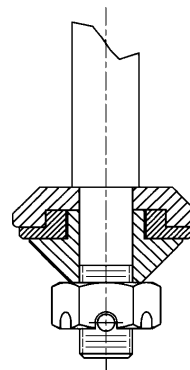


Figure 1

1-1/2" TFE-Soft Seat Design

BODY SUB-ASSEMBLY SPECIFICATIONS

Body/Bonnet Materials: ASTM A351, Gr. CF3M.

Gaskets: Body-to-Bonnet: TFE.
Seat Ring: Fluorogold (TFE).

Trim: 18-8 SST material or better.

Bonnet Bolting: 2" (DN50) body size only. All bolting zinc-plated alloy steel.

Seat Design	Trim Designation No.	Service
Metal	S1	Standard
	CY1	Cryogenic
TFE - Soft	S3	Standard
	CY3	Cryogenic

Standard Construction —

Studs: ASTM A193, Gr. B7;

Nuts: ASTM A194, Gr. 2H.

Opt.-36 Cryogenic Construction —

Studs: ASTM A193, Gr. 8; Cl.1;

Nuts: ASTM A194, Gr. 8/8B.

See Table 4 for complete trim material specifications.

Stroke:

Body Size inch (mm)	Travel/Stroke inch (mm)
1/2"-1-1/2" (DN15-40)	.500" (12.7)
2" (DN50)	.750" (19.0)

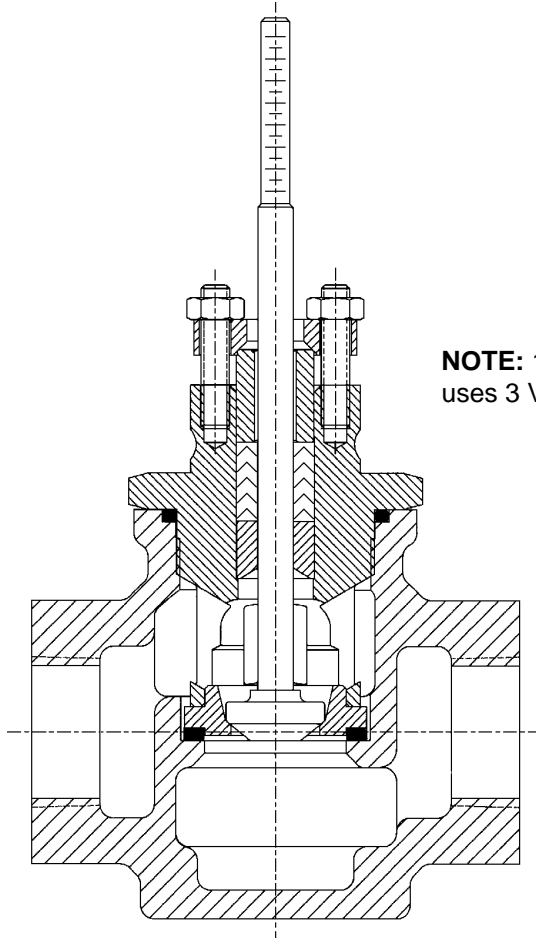
Stem Packing Apparatus:

Packing — All packing ring sets are complete with upper and lower TFE adapters; V-rings of virgin TFE, non-split.

Bolting — 18-8 SST studs and nuts.

Flange — 316 SST.

Follower — 316 SST.



NOTE: 1-1/2" Size uses 3 V-rings.

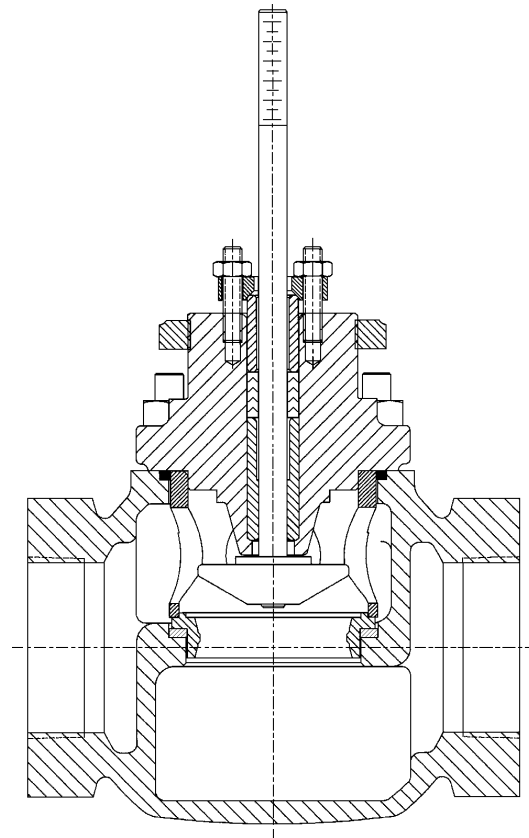


Figure 2
Cross-Section
Body Sizes 1/2"-1-1/2"
Metal Seat

Figure 3
Cross-Section
Body Size 2"
Metal Seat

ACTUATOR SUB-ASSEMBLY SPECIFICATIONS

Size, Stroke & Volumes:

Basic Actuator Model	Diaphragm Area		Nominal Stroke		Volumes	
	in ²	cm ²	in	mm	Clearance in ³ (cm ³)	Displacement in ³ (cm ³)
25R, 25D	31	(202)	.500"	(12.7)	26 (425)	16.5 (270)
55R	50	(325)	.750"	(19.0)	41 (670)	37 (600)
55D					26 (425)	

Ambient Temperature: -20° to +180°F (-28° to +83°C).
 -20° to +140°F (-29° to +60°C) with electrical accessories.

Bench Set & Max/Norm Pressures:

Bench Set psig (Barg)	Air Pressures	
	Normal Supply psig (Barg)	Design Max. psig (Barg)
5-15 (.34-1.03)	20	25
3-13 (.21-.90)	(1.4)	(1.7)
11-30 (.76-2.07)	35	40
6-25 (.41-1.72)	(2.4)	(2.8)

Materials:

Part	Material	
	Model 25	Model 55
Diaphragm	Buna-N w/Poly-ester mesh insert	Neoprene with nylon mesh insert
Upper Casing	Ductile Iron	Pressed Steel
Lower Casing	Ductile Iron	Pressed Steel
Yoke	Ductile Iron*	Cast Iron
Stem	316L SST	416 SST
Diaphragm Plate	Ductile Iron	Steel
Spring Button	—	Cast Iron
Spring Adjustor	—	18-8 SST
Casing Bolting	Plated Steel	
Jam Nuts	18-8 SST	
Bonnet/Yoke Nut	Plated Steel	
Position Indicator, Position Plate, Screws, & Unit Nameplate	SST	

* Yoke integral with lower casing.

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 -36 Cont.:

Body Size		Extension Column Length	
inch	mm	inch	mm
1/2"	(DN15)	12"	(305)
3/4"	(DN20)	12"	(305)
1"	(DN25)	12"	(305)
1-1/2"	(DN40)	15"	(381)
2"	(DN50)	15"	(381)

Option -12:

REDUCED ORIFICE. For reducing the maximum flow rate, or for handling higher pressure drops than the standard orifice will handle.

Option -55:

SPECIAL CLEANING. Cleaned and packaged per Cashco Specifications #S-1134. Suitable for oxygen service and other fluids.

Option -36:

CRYOGENIC CONSTRUCTION. For gaseous or liquid cryogenic services in an applicable temperature range of -425° to +100°F (-253° to +38°C). Includes SST extension column, special TFE bonnet and seat ring gaskets, and internally live-loaded TFE packing. Available with metal (CY1) or soft TFE (CY3) seat designs. Cleaned and packaged for oxygen service per Cashco Cleaning Specification #S-1134.

Option -56:

SPECIAL CLEANING. Special cleaning procedure per Cashco Specifications #S-1542. Suitable for fluids other than oxygen.

Option -95:

EPOXY PAINT. Special epoxy painting for exterior surfaces. Utilized in harsh atmospheric conditions. Procedures and specs per Cashco Specifications #S-1547.

MOUNTED ACCESSORY SPECIFICATIONS

Positioners:	<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. (Consult factory for NEMA 4 enclosure.)</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>NEMA 4 & 7 explosion-proof model. Brass body, 1/4" female NPT connections. Nipple mounted or bracket mounted to actuator casing. 120 VAC, 60 Hz power 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, <u>except</u> with .094" (2.38 mm) orifice, 40 psid (2.75 Bard) maximum differential pressure, and 303 SST body.</p> <p><u>Gen. Purpose:</u> ASCO #8320G201. <u>X-Proof:</u> ASCO #EF8320G201.</p>	<p>Standard installation vents actuator and drives valve to fail-safe position upon loss of electrical power.</p>
	<p>Position Indicating Switches:</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 & D; NEMA 9, Class II, Groups E, F & 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>	
Air Tubing:	<p>Standard instrument air tubing is Imperial-Eastman "Impolene" thermoplastic tubing with brass fittings.</p> <p>Optional copper tubing with brass fittings, or SST tube and fittings.</p>		
Airset:	<p>Model 5100P instrument air supply regulator. Use with positioners. Bracket mounted to actuator casing.</p>		
Solenoid Valve:	<p><u>Standard Brass:</u> Available in standard NEMA 3, 4 and 6 weatherproof model, or</p>		

APPLICATION AND SELECTION

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

STEP 1.	<p><u>FIVE KNOWNS.</u> The following minimal parameters/information must be available before a selection procedure can begin:</p> <ol style="list-style-type: none"> a. Service Fluid – What is it? Liquid or gas? SG (std. cond.). b. Inlet Pressure – P₁ (upstream pressure). c. Outlet Pressure - P₂ (downstream pressure). d. Desired capacity – Cv, GPM, SCFH; minimum, maximum and normal. e. Fluid temperature – T₁, SG (actual). 	STEP 2.	<p><u>CHARACTER and RESERVE.</u> Decide whether the inherent characteristic of the valve should be <u>equal percent</u> or <u>linear</u>. Also, decide the amount of <u>overcapacity</u> in the selection; i.e. =% character with 20% reserve capacity. (NOTE: A linear character gives "constant gain" throughout the full stroke. 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.)</p>
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STEP 3. SEAT DESIGN & LEAKAGE. Decide whether the seat design needs to be metal seated or soft seated. If a metal seated design is desired, then it will be necessary to decide if seat leakage is at a rate commensurate with Class II or IV is required.

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

Example: Max Cv Req'd = 7.3 Cv
Min Cv Req'd = 0.8 Cv
=% Character
20% reserve capacity
Metal Seated

Max Cv Available
 $7.3 \div 0.80 = 9.1 \text{ Cv}$

Select the body/orifice sizes that are near the 9.1 Cv Available level. Table 5 should be used as the character is =% and metal seated.

Example: Preliminary selections –
a. 1" @ 10.2 Cv Max, full port.
b. 1-1/2" @ 9.1 Cv Max, reduced port.

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

- a. 0.20 Cv @ Min. Cv.
- b. 0.36 Cv @ Min Cv

As the Min Cv Req'd is greater than any of the previous Min Cv Available, both of the selections are acceptable at minimum flow level.

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 SIZE. Maximum pressure drop (ΔP) is normally experienced at shutoff flow. Knowing the maximum ΔP required, the desired action/fail-safe position (ATO-FC or ATC-FO), the seat design (metal or composition soft), and the desired seat leakage class, go to Table 3 to assure the valve's capability.

Example: ΔP shutoff = 200 psid (13.8 Bard). Seat Leakage Class IV, metal seated. ATO-FC action.

Selection: Using Table 3, neither selection can handle the ΔP with the "lower" bench set range. In the "higher" 11-30 psig (.76-2.07 Barg) bench set range, both selections are acceptable with a ΔP capability of 275 psid (18.9 Bard). Because the selected bench set range is other than a nominal 3-15 psig bench set, a positioner MUST be supplied.

Note: *If a bench set had been selected such as a 5-15 psig (.34-1.03 Barg), i.e. a nominal 3-15 psig (.21-1.03 Barg); a positioner would not have been required.)*

STEP 9. MATERIALS. Select the desired trim from Table 4. 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		Option Nos.	End Connection	English Units		Metric Units	
General	ASTM Spec.			Pressure psig	Temperature °F	Pressure Barg	Temperature °C
Cast Stainless Steel (SST)	A351 Grade CF3M	Std. & Opt.-36*	ALL	275	-20 to +100	18.9	-29 to +38
				235	200	16.2	94
				215	300	14.8	149
				195	400	13.4	205

* For Option -36: -425°F to 100°F (-253°C to +38°C).

TABLE 2
MAXIMUM PRESSURE DROP – psid (Bard)
COMPOSITION SOFT SEAT

Actuator Action	Body Size Inch (mm)	Port-Orifice		Seat Leakage Class	Maximum Operating Pressure Drop psid (Bard)	Actuator		Air Supply Pressure psig (Barg)	
		Description	Size inch (mm)			Bench Settings psig (Barg)	Model No.		
ATO-FC (Reverse)	1/2", 3/4" & 1" (DN15, 20, 25)	Full	.750" (19.0)	VI	175 (12.1)	5-15 (.34-1.03)	25R-10	20 (1.4)	
					275 (18.9)	11-30 (.76-2.07)	25R-11	35 (2.4)	
		Opt.-12 Red.	.500" (9.5)	VI	275 (18.9)	5-15 (.34-1.03)	25R-10	20 (1.4)	
	1-1/2" (DN40)	Full	1.188" (30.2)	VI	45 (3.1)	5-15 (.34-1.03)	25R-10	20 (1.4)	
					210 (14.5)	11-30 (.76-2.07)	25R-11	35 (2.4)	
		Opt.-12 Red.	.750" (19.0)	VI	175 (12.1)	5-15 (.34-1.03)	25R-10	20 (1.4)	
	2" (DN50)	Full	1.938" (49.2)	VI	275 (18.9)	11-30 (.76-2.07)	25R-11	35 (2.4)	
					40 (2.8)	5-15 (.34-1.03)	55R-40	20 (1.4)	
		Opt.-12 Red.	1.688" (42.9)	VI	135 (9.3)	11-30 (.76-2.07)	55R-41	35 (2.4)	
	ATC-FO (Direct)	1/2", 3/4" & 1" (DN15, 20, 25)	Full	.750" (19.0)	VI	55 (3.8)	5-15 (.34-1.03)	55R-40	20 (1.4)
						185 (12.7)	11-30 (.76-2.07)	55R-41	35 (2.4)
			Opt.-12 Red.	.500" (9.5)	VI	275 (18.9)	3-13 (.21-.90)	25D-10	20 (1.4)
1-1/2" (DN40)		Full	1.188" (30.2)	VI	100 (6.9)	3-13 (.21-.90)	25D-10	20 (1.4)	
					185 (12.7)	6-25 (.41-1.72)	25D-11	35 (2.4)	
		Opt.-12 Red.	.750" (19.0)	VI	275 (18.9)	3-13 (.21-.90)	25D-10	20 (1.4)	
2" (DN50)		Full	1.938" (49.2)	VI	70 (4.8)	3-13 (.21-.90)	55D-40	20 (1.4)	
					120 (8.3)	6-25 (.41-1.72)	55D-41	35 (2.4)	
		Opt.-12 Red.	1.688" (42.9)	VI	100 (6.9)	3-13 (.21-.90)	55D-40	20 (1.4)	
						160 (11.0)	6-25 (.41-1.72)	55D-41	35 (2.4)

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

**TABLE 3
MAXIMUM PRESSURE DROP – psid (Bard)
METAL SEATED**

Actuator Action	Body Size Inch (mm)	Port-Orifice		Seat Leakage Class	Maximum Operating Pressure Drop		Actuator		Air Supply Pressure psig (Barg)
		Description	Size inch (mm)		psid	(Bard)	Bench Settings psig (Barg)	Model No.	
ATC-FC (Reverse)	1/2", 3/4" & 1" (DN15, 20, 25)	Full	.750" (19.0)	IV	65 (4.5)	5-15 (.34-1.03)	25R-10	20 (1.4)	
				II	175 (12.1)				
		Opt.-12 Red.	.500" (9.5)	IV	275 (18.9)	11-30 (.76-2.07)	25R-11	35 (2.4)	
				IV	275 (18.9)	5-15 (.34-1.03)	25R-10	20 (1.4)	
	1-1/2" (DN40)	Full	1.188" (30.2)	IV	NR	5-15 (.34-1.03)	25R-10	20 (1.4)	
				II	45 (3.1)				
				IV	145 (10.0)				
		Opt.-12 Red.	.750" (19.0)	II	210 (14.5)	11-30 (.76-2.07)	25R-11	35 (2.4)	
				VI	65 (4.5)	5-15 (.34-1.03)	25R-10	20 (1.4)	
				II	175 (12.1)				
	2" (DN50)	Full	1.938" (49.2)	IV	NR	5-15 (.34-1.03)	55R-40	20 (1.4)	
				II	40 (2.8)				
				IV	90 (6.2)				
		Opt.-12 Red.	1.688" (42.9)	II	135 (9.3)	11-30 (.76-2.07)	55R-41	35 (2.4)	
				IV	NR	5-15 (.34-1.03)	55R-40	20 (1.4)	
				II	55 (3.8)				
	ATC-FO (Direct)	1/2", 3/4" & 1" (DN15, 20, 25)	Full	.750" (19.0)	IV	205 (14.1)	3-13 (.21-.90)	25D-10	20 (1.4)
					II	275 (18.9)	6-25 (.41-1.72)	25D-11	35 (2.4)
Opt.-12 Red.			.500" (9.5)	IV	275 (18.9)	3-13 (.21-.90)			
				IV	275 (18.9)	3-13 (.21-.90)	25D-10	20 (1.4)	
1-1/2" (DN40)		Full	1.188" (30.2)	IV	NR	3-13 (.21-.90)	25D-10	20 (1.4)	
				II	100 (6.9)				
	IV			115 (7.9)					
	Opt.-12 Red.	.750" (19.0)	II	185 (12.7)	6-25 (.41-1.72)	25D-11	35 (2.4)		
			IV	205 (14.1)	3-13 (.21-.90)	25D-10	20 (1.4)		
			II	275 (18.9)					
2" (DN50)	Full	1.938" (49.2)	IV	275 (18.9)	6-25 (.41-1.72)	25D-11	35 (2.4)		
			IV	NR	3-13 (.21-.90)	55D-40	20 (1.4)		
			II	70 (4.8)					
	Opt.-12 Red.	1.688" (42.9)	IV	75 (5.2)	6-25 (.41-1.72)	55D-41	35 (2.4)		
			II	120 (8.3)	3-13 (.21-.90)	55D-40	20 (1.4)		
			IV	50 (3.4)					
Opt.-12 Red.	1.688" (42.9)	II	100 (6.9)	3-13 (.21-.90)	55D-40	20 (1.4)			
		IV	115 (7.9)	6-25 (.41-1.72)	55D-41	35 (2.4)			
		II	160 (11.0)						

NR = Not Recommended.

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

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

Part Description	Trim Designation Nos.			
	Metal		Composition/Soft	
	Std.-None	Opt.-36	Std.-None	Opt.-36
	S1	CY1	S3	CY3
Plug/Stem Assy.	316 SST	316 SST	–	–
Seat Ring	316 SST	316 SST	316 SST	316 SST
Stem	–	–	316 SST	316 SST
Adapters	–	–	316 SST	316 SST
Castle Nut	–	–	18-8 SST	18-8 SST
Cotter Pin	–	–	316 SST	316 SST
Seat Disc	–	–	TFE	TFE
Guide Bushing	17-4PH SST			
Seat Ring Gasket	Fluorogold			
Bonnet Gasket	TFE			

**TABLE 5
FLOW CAPACITY – Cv
EQUAL PERCENT (=%) CHARACTER
F_L FACTORS
METAL SEATED**

Body Size inch/(mm)	Port Size	FL @ 10% Travel	Minimum Flow *	Percent of Travel - %										FL @ 100% Travel
				10	20	30	40	50	60	70	80	90	100	
1/2" (DN15)	Full	.90	.14	.2	.4	.6	.7	1.2	2.6	4.2	5.7	6.4	6.9	.90
	Opt.-12 Reduced	.90	.13	.2	.4	.5	.7	.9	1.3	1.6	1.9	2.6	3.2	
3/4" (DN20)	Full	.90	.18	.2	.4	.6	.7	1.2	2.6	4.5	6.8	8.0	8.9	.90
	Opt.-12 Reduced	.90	.14	.2	.4	.5	.7	.8	1.1	1.4	1.7	2.6	3.5	
1" (DN25)	Full	.90	.20	.1	.3	.5	.8	1.1	2.2	4.4	7.1	9.0	10.2	.90
	Opt.-12 Reduced	.90	.14	.2	.4	.5	.6	.8	1.1	1.4	1.7	2.6	3.5	
1-1/2" (DN40)	Full	.90	.30	.8	1.3	2.0	2.6	3.6	5.3	6.9	10.2	12.9	15.0	.90
	Opt.-12 Reduced	.90	.36	.6	.9	1.3	1.7	2.1	2.6	3.7	5.5	7.6	9.1	
2" (DN50)	Full	.90	.63	1.1	1.7	2.3	3.0	4.0	7.3	12.6	19.5	25.8	31.5	.90
	Opt.-12 Reduced	.90	.86	.7	1.1	1.5	1.9	2.4	3.9	5.2	8.0	13.9	21.4	

* Based on Class IV seat leakage.

**TABLE 6
FLOW CAPACITY – Cv
LINEAR (Lin) CHARACTER
F_L FACTORS
METAL SEATED**

Body Size inch/(mm)	Port Size	FL @ 10% Travel	Minimum Flow *	Percent of Travel - %										FL @ 100% Travel
				10	20	30	40	50	60	70	80	90	100	
1/2" (DN15)	Full	.90	.13	.7	2.2	3.5	4.3	4.8	5.2	5.4	6.0	6.4	6.6	.90
	Opt.-12 Reduced	.90	.16	.9	1.3	2.2	2.6	3.0	3.4	3.6	3.7	3.8	3.9	
3/4" (DN20)	Full	.90	.18	.9	2.3	3.3	4.3	5.2	6.0	6.3	7.5	8.4	9.0	.90
	Opt.-12 Reduced	.90	.18	.6	1.1	2.0	2.5	3.0	3.6	3.9	4.2	4.4	4.5	
1" (DN25)	Full	.90	.22	1.0	2.1	3.2	4.0	5.2	6.0	7.0	8.7	10.1	11.0	.90
	Opt.-12 Reduced	.90	.18	.6	1.1	2.0	2.5	3.0	3.6	3.9	4.2	4.4	4.5	
1-1/2" (DN40)	Full	.90	.32	1.8	3.7	5.5	7.2	8.7	10.5	11.9	13.8	15.3	16.1	.90
	Opt.-12 Reduced	.90	.40	1.4	2.9	4.0	5.0	5.8	6.4	7.1	8	9.4	10.1	
2" (DN50)	Full	.90	.82	3.1	7.2	11.9	17.8	23.1	28.8	32.8	36.4	39.3	41.2	.90
	Opt.-12 Reduced	.90	1.14	3.2	5.2	8.1	10.6	13.2	15.7	18.1	21.8	25.3	28.4	

* Based on Class IV seat leakage.

TABLE 7
FLOW CAPACITY – Cv
EQUAL PERCENT (=%) CHARACTER
F_L FACTORS
TFE SOFT SEAT

Body Size inch/(mm)	Port Size	FL @ 10% Travel	Minimum Flow *	Percent of Travel - %										FL @ 100% Travel
				10	20	30	40	50	60	70	80	90	100	
1/2" (DN15)	Full	.90	.14	.4	.6	.7	1.1	1.6	3.2	4.6	5.8	6.4	6.8	.90
	Opt.-12 Reduced	.90	.20	.4	.5	.7	.8	1.0	1.4	1.8	2.6	3.9	5.0	
3/4" (DN20)	Full	.90	.17	.3	.5	.7	1.0	1.5	3.2	4.9	6.7	7.9	8.5	.90
	Opt.-12 Reduced	.90	.23	.4	.6	.7	.8	1.0	1.4	1.6	2.3	4.0	5.8	
1" (DN25)	Full	.90	.19	.4	.5	.7	.8	1.4	3.0	5.3	7.7	9.0	9.7	.90
	Opt.-12 Reduced	.90	.23	.4	.6	.7	.8	1.0	1.4	1.6	2.3	4.0	5.8	
1-1/2" (DN40)	Full	.90	.28	1.1	1.8	2.5	3.1	4.1	5.2	6.3	9.0	11.6	14.0	.90
	Opt.-12 Reduced	.90	.33	.6	.8	1.1	1.5	2.3	3.0	3.8	5.5	7.1	8.3	
2" (DN50)	Full	.90	.65	1.2	1.8	2.6	4.0	5.4	7.7	12.2	19.6	26.4	32.5	.90
	Opt.-12 Reduced	.90	.77	.8	1.2	1.6	2.2	3.4	5.0	6.5	9.8	13.2	19.2	

* Based on Class VI seat leakage.

TABLE 8
FLOW CAPACITY – Cv
LINEAR (Lin) CHARACTER
F_L FACTORS
TFE SOFT SEAT

Body Size inch/(mm)	Port Size	FL @ 10% Travel	Minimum Flow *	Percent of Travel - %										FL @ 100% Travel
				10	20	30	40	50	60	70	80	90	100	
1/2" (DN15)	Full	.90	.13	1.4	2.5	3.4	4.1	4.7	5.1	5.5	6.0	6.2	6.4	.90
	Opt.-12 Reduced	.90	.20	1.0	1.6	2.0	2.5	2.9	3.3	3.7	4.0	4.5	5.1	
3/4" (DN20)	Full	.90	.17	1.4	2.5	3.6	4.5	5.2	5.9	6.6	7.5	8.1	8.5	.90
	Opt.-12 Reduced	.90	.25	.9	1.5	2.0	2.5	3.0	3.5	4.0	4.4	5.3	6.6	
1" (DN25)	Full	.90	.20	1.4	2.5	3.7	4.8	5.7	6.5	7.5	8.5	9.3	9.9	.90
	Opt.-12 Reduced	.90	.25	.9	1.5	2.0	2.5	3.0	3.5	4.0	4.4	5.3	6.6	
1-1/2" (DN40)	Full	.90	.31	2.4	4.2	5.8	7.1	8.4	9.6	11.0	12.8	14.2	15.3	.90
	Opt.-12 Reduced	.90	.18	1.9	2.9	3.9	4.7	5.4	6.0	6.8	7.5	8.5	9.1	
2" (DN50)	Full	.90	.82	2.7	6.5	11.0	16.7	21.9	27.4	31.9	35.9	39.2	41.1	.90
	Opt.-12 Reduced	.90	1.11	3.4	6.8	9.8	12.3	14.5	16.9	18.8	21.8	24.1	27.7	

* Based on Class VI seat leakage.

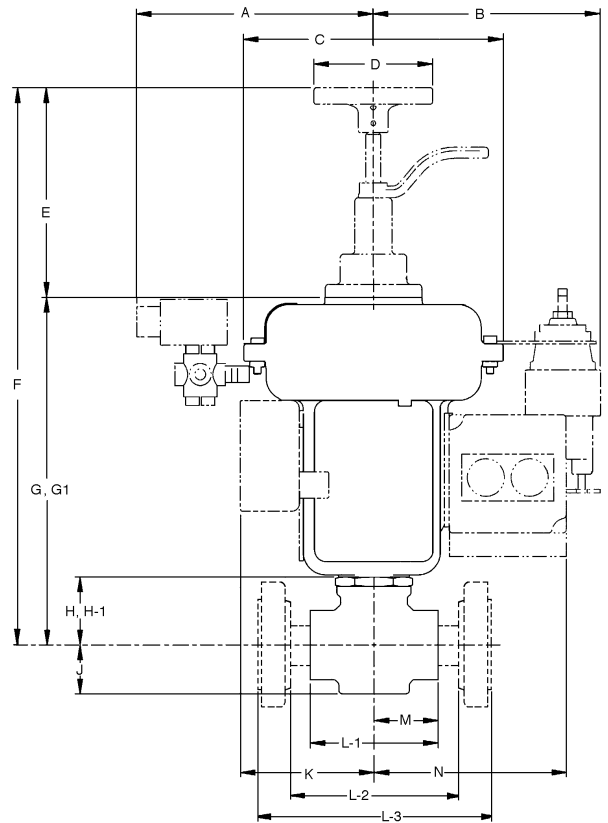
DIMENSIONS & WEIGHTS

ENGLISH UNITS – Inch & Lbs.

Dimensions	Body Size					
	1/2", 3/4" & 1"		1-1/2"		2"	
	Basic Actuator Model No.					
	25D	25R	25D	25R	55D	55R
A	7.98		7.98		6.98	8.41
B	7.63		7.63		8.47	8.35
C	8.75		8.75		10.50	10.50
D	4.00		4.00		4.00	4.00
E	6.98		6.98		7.58	9.27
F	18.56		18.68		23.73	27.42
G	11.57		11.70		19.56	18.15
G1*	24.62		26.99		32.61	34.61
H	2.26		2.39		3.25	3.25
H-1*	15.21		17.58		19.71	19.71
J	1.63		1.75		2.31	2.31
K	4.50		4.50		4.33	4.33
L-1 (NPT)	4.31		5.12		6.50	6.50
L-2 (Ext. Nipple)	7.31		8.12		9.50	9.50
L-3 (150# Flg)	7.25		8.75		10.00	10.00
M	2.16		2.56		3.25	3.25
N	6.48		6.48		6.51	6.51
SHIP WT. - LBS **	29	29	32	32	37	43

* For Opt.-36 cryogenic extension column construction

** Opt.-36 1/2" - 1" sizes add 5#,
1-1/2" - 2" sizes add 8 #.



METRIC UNITS – mm & kg

Dimensions	Body Size					
	DN15, 20 & 25		DN40		DN50	
	Basic Actuator Model No.					
	25D	25R	25D	25R	55D	55R
A	203		203		177	214
B*	194		194		215	212
C	222		222		267	267
D	102		102		102	102
E	177		177		193	235
F	471		474		603	697
G	294		297		497	461
G1*	625		686		828	879
H	57		61		83	83
H-1*	386		447		500	500
J	41		44		59	59
K	114		114		110	110
L-1 (NPT)	109		130		165	165
L-2 (Ext. Nipple)	185		206		241	241
L-3 (150# Flg)	184		222		254	254
M	55		65		83	83
N	165		165		165	165
SHIP WT. - Kg **	13	13	15	15	17	20

* For Opt.-36 cryogenic extension column construction

** Opt.-36 1/2" - 1" sizes add (2.3 kg),
1-1/2" - 2" sizes add (3.6 kg).

PRODUCT CODE 07/01/98

TABLE 4

END CONNECTION	
Type Connection	CODE
NPT-Screwed	1
Extended Pipe Nipples Opt-32	2
150#Flanged Opt-30	3

TABLE 3

CHARACTERISTIC & PORT SIZE		
Character	Port Size	CODE
Equal%	Full	A
	Opt.-12 Red.	B
Linear	Full	C
	Opt.-12 Red.	D

TABLE 2

TRIM DESIGNATION NOS. & SEAT LEAKAGE CLASS					
Metal Seated			TFE/Soft Seated		
Std	Opt-36 Cryo	Std	Opt-36 Cryo		
S1	CY1 *	S3	CY3 *		
Seat Leakage Class					
II	IV	II	IV	VI	
1	2	3	4	5	6
CODE					

* For Cryogenic Service Only

TABLE 1

BODY - SIZE & MATERIAL				
Size	Material	STD.	CRYO.	
1/2"	SST	A	F	
3/4"	SST	B	G	
1"	SST	C	H	
1-1/2"	SST	D	J	
2"	SST	E	K	

Trim Designation Number
End Connection
Characteristic & Port Size
Body/Size Material

TABLE 5

ACTUATOR MODEL NO., BENCH SET RANGE & ACTION											
Bench Range (psig)	Reverse Action ATO-FC					Bench Range (psig)	Direct Action ATC-FO				
	Body Size						Body Size				
	1/2" thru 1-1/2"		2"				1/2" thru 1-1/2"		2"		
	25R Basic		55R Basic				25D Basic		55D Basic		
	Model No.	CODE	Model No.	CODE		Model No.	CODE	Model No.	CODE		
5-15	-10	A	-40	C	3-13	-10	1	-40	3		
11-30	-11	B	-41	D	6-25	-11	2	-41	4		

TABLE 6

POSITIONER - AIRSET						CODE
Special Construction						X
No Positioner						0
I/P-Electro-Pneu. Model #9520L	CODE w/Airset	CODE wo/Airset	P/P-Pneumatic Model #9540L	CODE w/Airset	CODE wo/Airset	
Direct 4-20 ma	A	G	Direct 3-15 psig	1	R	
Reverse 20-4 ma	B	H	Reverse 15-3 psig	2	S	
Direct Split Range 4-12 ma	C	J	Direct Split Range 3-9 psig	5	V	
Direct Split Range 12-20 ma	D	K	Direct Split Range 9-15 psig	6	W	
Reverse Split Range 12-4 ma	E	L	Reverse Split Range 15-9 psig	7	Y	
Reverse Split Range 20-12 ma	F	M	Reverse Split Range 9-3 psig	8	Z	

TABLE 7

TUBING	CODE
NONE (NO Positioner, airset, solenoid, etc.)	0
Standard-Impolene Plastic Tubing, Brass Fittings	1
Copper tubing, Brass fittings	2
SST tubing & fittings	3

When ordering a valve per one of Cashco's special drawings the code "X" and the 5-digit number following overrides all other options. Otherwise, proceed with the following tables.

46 **7** **0A**

MODEL "2296", GLOBE-STYLE CONTROL VALVE

TABLE 8

POSITION LIMIT SWITCHES				CODE
NO LIMIT SWITCHES/TRANSMITTERS				0
TYPE LIMIT SWITCH	MFGR/ MODEL	NO. OF SPDT SWITCHES PER UNIT	TRIP POSITIONS	CODE
Rotary Trip NEMA 4	Micro-switch #OP-AR	1	Plug Closed	1
		1	Plug Full Open	2
		2	Plug Closed & Plug Full Open	3
Rotary Trip NEMA 7 X-Proof	Micro switch #EX-AR	1	Plug Closed	A
		1	Plug Full Open	B
		2	Plug Closed & Plug Full Open	C
Proximity Rotary Trip X-Proof	Proximity Controls #12AL0	2	Any	K
Proximity Rotary Trip I/S	Proximity Controls #12-GLOB	2	Any	L

TABLE 9

AIRSET RANGE	CODE
No Airset	0
For 5-15,3-13 Bench ranges: (0-30 psig)	A
For 11-30,6-25 Bench ranges: (0-60 psig)	B

TABLE 10

ACCESSORIES	CODE
NONE (other than indicated on this Coder Sheet)	0
VALVE MTD ACCESSORIES Any of the following: 3-Way Solenoid Valve 764P Press Controller Extra Airset(s) I/P Transducer Lockup Valve	9
Manual Handwheel Opt-3	A
Manual Handwheel Opt-3 plus "Code 9" above	Z

NOTE: Use of a "9" code requires that a "99 Coder" sheet be completed.

TABLE 11

PAINTING AND CLEANING	Option	Standard Commercial Cleaning	Cleaned to Spec. #S-1542	Cleaned to Spec. #S-1134 (O ₂ Cleaned)
		CODE	CODE	CODE
Std/Commercial	—	0	3	6
Epoxy-Basic Valve	-95	1	4	7
Epoxy-Basic Valve plus Accessories	-95	2	5	8

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