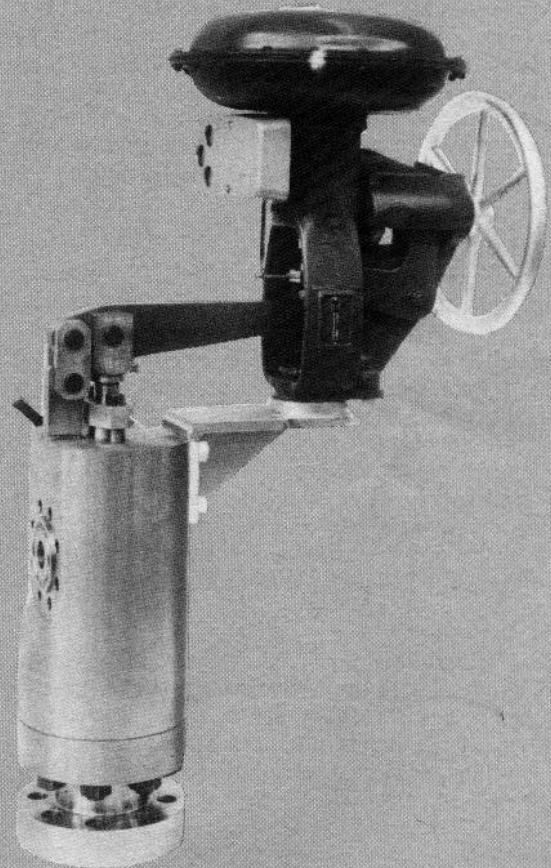


# 77000 Series High Pressure Control Valve

Featuring Heavy Top & Bottom Guided  
Multistage LO-DB® Trim



*Annin*



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## Foreword

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The 77000 Series LO-DB® valves provide control of high pressure compressible fluids without the erosion, vibration and high noise levels associated with conventionally designed control valves. Because of their relatively large flow passages and a shearing action provided by their multiple step plug and seat ring designs, these valves are particularly well suited for applications involving gases with entrained liquids/solids or liquids with entrained solids.

### Adiabatic Flow with Friction

The principle of "Adiabatic Flow with Friction" is to reduce pressure much like the pressure loss which occurs in a long pipeline. This effect is produced by letting the fluid pass through a number of restrictions providing a tortuous flow pattern dissipating energy through high headloss rather than through shock waves.

The flow area of the valve trim is gradually increased toward the downstream section. This compensates for expansion of the gas with pressure drop and ensures a nearly constant fluid velocity throughout the complete throttling process.

The reduced velocity thus minimizes the impact erosion of entrained liquids. The acoustical performance of the 77000 is optimal when pressure ratio does not exceed trim expansion ratio. For higher pressure ratios, LO-DB cartridges in the outlet or special design trim are recommended.

For liquid service, special trim with multiple linear stages followed by expanding stages provides the optimum in cavitation and erosion control.

### Smooth, Stable Control; Fail Safe Action

The high rangeability (50:1) of this LO-DB valve allows wide variations in controlled flow. Operation is stable because the low static unbalance is achieved by support intermediate pressure through internal plug porting, a balance force exists within the plug which reduces the unbalanced force to a minimum. The valve will fail in the proper direction by the actuator spring on air failure. This uniquely balanced trim has no secondary balancing seal and only one seat. Toggle actuation provides a high force amplification and allows extremely good throttling control. The short valve travel reduces packing wear and significantly extends packing life particularly in high pressure/temperature service.

### Tight Shutoff

Protection from seat erosion is ensured by provision of ANSI FCI 70.2, Class V Seat Leakage when standard metal seats are furnished.

### High Allowable Pressure Drops

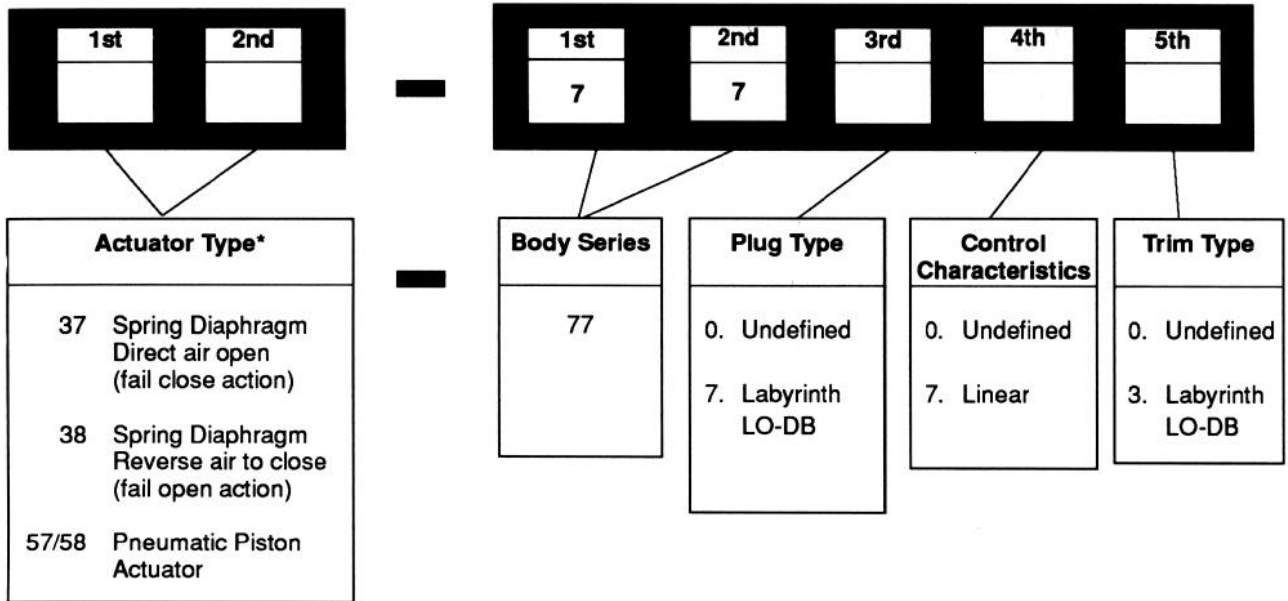
With a balanced trim, a wide range of allowable pressure drops are available with conventional spring diaphragm or positioning cylinder actuators.

### Simple Maintenance

The multiple step trim made from specially chosen hard materials gives maximum service life and the quick change seat ring design provides ease of trim replacement.

Due to short stroke, heavy guiding and velocity control trim, these valves are capable of extended service life without maintenance.

## Numbering System



\*Valve closes in an upward direction

## Ratings (ANSI Class)

Valve Size (in.)	ANSI*								API			
	Inlet 1500	Inlet 1500	Inlet 1500	Inlet 2500	Inlet 2500	Inlet 2500	Inlet 2500	Outlet 2000	Outlet 3000	Outlet 5000	Outlet 10000	
2x3	•	•	•	•	•	•	•	•	•	•	•	
2x4	•	•	•	•	•	•	•	•	•	•	•	
3x3	•	•	•	•	•	•	•	•	•	•	•	
3x4	•	•	•	•	•	•	•	•	•	•	•	
3x6	•	•	•	•	•	•	•	•	•	•	•	
4x4	•	•	•	•	•	•	•	•	•	•	•	
4x6	•	•	•	•	•	•	•	•	•	•	•	
4x8	•	•	•	•	•	•	•	•	•	•	•	
6x6	•	•	•	•	•	•	•	•	•	•	•	
6x8	•	•	•	•	•	•	•	•	•	•	•	

\* Body design ANSI Class 2500 lbs.  
**NOTE:** 900 lbs. ANSI inlet rating is available.

## General Data

- **Body**
    - type: high pressure angle
    - flow direction: side in - bottom out
    - Cv ratio : 50:1
  - **Bonnet**
    - type: integral
  - **Outlet Adapter**
    - bolted to body w/outlet flange
  - **Materials Body and Adapter**
    - forged carbon steel
    - stainless steel
    - chrome molybdenum steel
    - special alloys
    - alloy overlays
  - **Trim**
    - flow characteristic: linear
  - **Actuator**
    - type: spring diaphragm or double acting pneumatic piston, toggle or direct drive operated
    - supply pressure: see tables and individual actuator bulletins
    - failure mode: open/close or fail in position, spring or pneumatic powered
    - manual override: side mounted handwheel hydraulic hand jack
- plug and seat ring type: expanding labyrinth  
 seat ring mounting: clamped for free thermal expansion  
 guiding: heavy top and bottom balanced piston guide  
 capacity: full area, reduced capacity

**NOTE:** Optional materials to conform to requirements of NACE MR01-75.

## Temperature Ranges/Seat Leakages

Valve Size (in.)	ANSI Class	API	Seat Type	Temperature Range		Maximum Seat Leakage, ANSI FCI 70.2 Class	
				Min.	Max.	IV	V Optional
2x3 through 6x8	2500 lbs.	2000 through 10000	Metal	-20°F	+1050°F	IV	V Optional

## Connections

■ RF Flanged      △ RT Joint

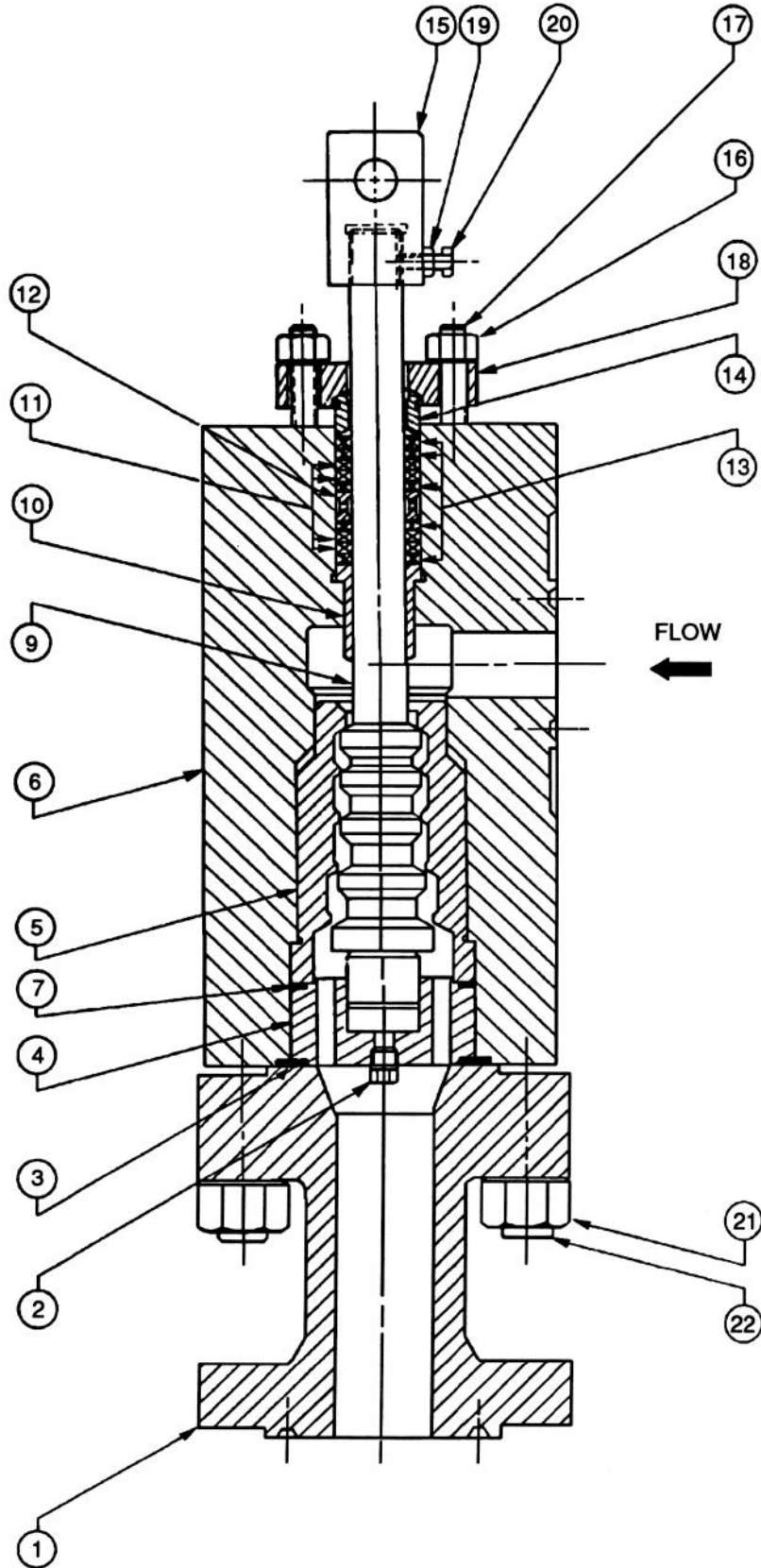
Valve Size (inches)	ANSI Class				API 2000 through 10000
	600	900	1500	2500	
2x3	■ △	■ △	■ △	■ △	△
2x4	■ △	■ △	■ △	■ △	△
3x3	■ △	■ △	■ △	■ △	△
3x4	■ △	■ △	■ △	■ △	△
3x6	■ △	■ △	■ △	■ △	△
4x4	■ △	■ △	■ △	■ △	△
4x6	■ △	■ △	■ △	■ △	△
4x8	■ △	■ △	■ △	■ △	△
6x6	■ △	■ △	■ △	■ △	△
6x8	■ △	■ △	■ △	■ △	△

**NOTE:** Special valve connections available upon request. Forged valves use studs and nuts to match inlet flange connections. Taper-Lok® connections are available on all valves, Grayloc® connections require inlet adaptor on forged valves.

## Flow Coefficients (Rated $C_v$ ) Critical Flow Factor $F_L = 0.99$

Body Size Inlet x Outlet (inches)	Plug Travel (inches)	Trim Size			
		A		B	
		Trim Expansion Ratio	$C_v$	Trim Expansion Ratio	$C_v$
2x3	1/4	4:1	15	2:1	25
2x4	1/4	4:1	15	2:1	25
3x3	3/8	4:1	35	2:1	50
3x4	3/8	4:1	35	2:1	50
3x6	3/8	4:1	35	2:1	50
4x4	1/2	4:1	60	2:1	80
4x6	1/2	4:1	60	2:1	80
4x8	1/2	4:1	60	2:1	80
6x6	1/2	4:1	85	2:1	125
6x8	1/2	4:1	85	2:1	125

**NOTE:** Special designs are available in oversized and reduced  $C_v$  trim. Please consult Masoneilan.



**Material**

Ref. No.	Temperature:	-20°F	+450°F	+800°F	+1050°F
	Description	Standard Materials			
1	Outlet Spool	Carbon Steel ASTM A105			
2	Pipe Plug	316 St. St. ASTM A479 TP 316			
3	Gasket	304 St. St. w/Grafoil Filler			
4	Spider	316 St. St. w/Stellite			
		410 St. St. ASTM A479			
5	Seat Ring	410 St. St. ASTM A479			
6	Body	Carbon Steel ASTM A105			
		Chrome Molybdenum Steel ASTM A182 Gr FII			
7	Gasket	304 St. St. w/Grafoil Filler			
9	Valve Stem/Plug	17-4 PH St. St. ASTM A564 Gr 630 Condition H900			
		316 St. St. ASTM A479 TP 316 with hard-faced guiding area			
10	Guide Bushing	Stellite			
11	Packing	TFE Aramid Fiber - Crane 285K	Grafoil		
12	Lantern Ring	316 St. St.			
14	Packing Follower	440 C			
15	Stem Adapter	300 St. St.			
16	Packing Flange Nut	ASTM A194 Gr 2H			
17	Packing Flange Stud	ASTM A193 Gr B7			
18	Packing Flange	ASTM A515 Gr 70			
19	Lock Nut	300 St. St.			
20	Anti-rotation Screw	300 St. St.			
21	Body Stud Nut	ASTM A194 Gr 2H			
		ASTM A194 Gr 4			
22	Body Stud	ASTM A193 Gr B7			
		ASTM A193 Gr B16			

**NOTE:** Optional materials to conform to requirements of NACE MR 01-75 are available. Consult Masoneilan.

## Allowable Pressure Drops (psi)

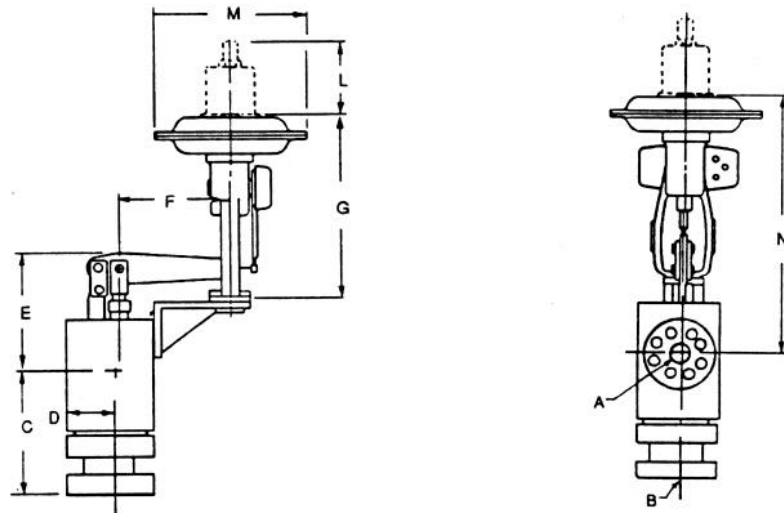
Seat Leakage: per ANSI/FCI 70.2, Class IV

Valve Size (inches)	Plug Travel (inches)	Rated Cv	Actuator Size	Actuator Travel	Air to Open				Air to Close		
					Bench Range (psig)	Allowable Pressure Drop (psi)	Bench Range (psig)	Allowable Pressure Drop (psi)	Allowable Pressure Drops (psi)		
									Bench Range 3-15 psig		
									Supply Pressure psig		
30	35	55									
2x3	1/4	25	15	1 1/2	11-30	5000	14-31	7200	5000	7200	-
2x4	1/4	25	15	1 1/2	11-30	5000	14-31	7200	5000	7200	-
3x3	3/8	50	18L	2 1/2	12-30	4000	15-33	7200	-	6000	7200
3x4	3/8	50	18L	2 1/2	12-30	4000	15-33	7200	-	6000	7200
3x6	3/8	50	18L	2 1/2	12-30	4000	15-33	7200	-	6000	7200
4x4	1/2	80	24	3 1/2	9-30	3000	18-45	7200	-	5000	7200
4x6	1/2	80	24	3 1/2	9-30	3000	18-45	7200	-	5000	7200
4x8	1/2	80	24	3 1/2	9-30	3000	18-45	7200	-	5000	7200
6x6	1/2	125	24	3 1/2	19-46	4000	21-49	7200	-	4000	7200
6x8	1/2	125	24	3 1/2	19-46	4000	21-49	7200	-	4000	7200

**NOTE:** For side mounted piston actuator, electric motor and hydraulic actuation please consult Masoneilan.



## Dimensions



**Body Assembly Dimensions (inches)**

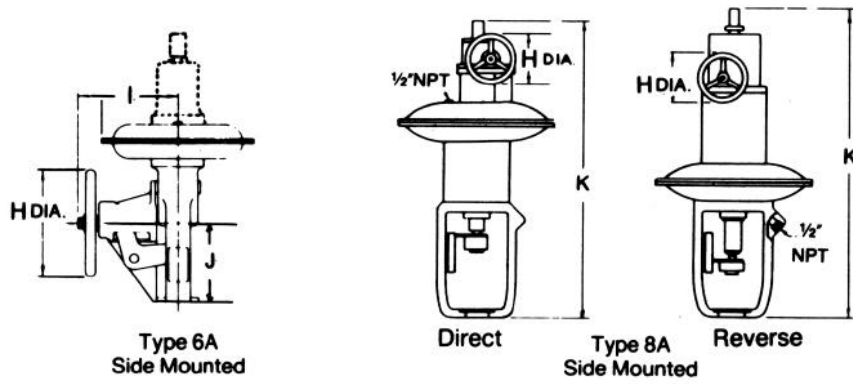
Valve* Inlet A	Valve* Outlet B	C	D	E	F	G	L
2	3	20.2	5.0	14 <sup>3</sup> / <sub>8</sub>	13 <sup>7</sup> / <sub>8</sub>	22 <sup>1</sup> / <sub>4</sub>	11
	4	21.2					
3	3	29.26	6.5	16 <sup>1</sup> / <sub>8</sub>	17	33	19 <sup>1</sup> / <sub>8</sub>
	4	29.1					
	6	31.1					
4	6	37.4	8.0	21 <sup>1</sup> / <sub>4</sub>	18 <sup>3</sup> / <sub>4</sub>	33 <sup>1</sup> / <sub>2</sub>	18 <sup>7</sup> / <sub>8</sub>
	8	39.6					
6	6	40.94	10.0	25 <sup>1</sup> / <sub>4</sub>	18 <sup>4</sup> / <sub>5</sub>	41 <sup>1</sup> / <sub>4</sub>	17 <sup>3</sup> / <sub>4</sub>
	8	42					

\*2500# Flanged In/Out Dimensions

**Actuator Dimensions (inches)**

Valve Size (inches)	N						M		
	No. 15		No. 18 (16")		No. 24		No. 15	No. 18	No. 24
	Direct	Reverse	Direct	Reverse	Direct	Reverse			
2x3	34.7	45.7					17.5		
2x4	34.7	45.7					17.5		
3x3			44.3	63.4				20.7	
3x4			44.3	63.4				20.7	
3x6			44.3	63.4				20.7	
4x4					47.5	66.4			27.0
4x6					47.5	66.4			27.0
4x8					47.5	66.4			27.0
6x6					57.0	74.8			27.0
6x8					57.0	74.8			27.0

## Dimensions



### Handwheels Dimensions (inches)

Valve Size (inches)	Actuator			Side Mounted Handwheel				
	Actuator Removal Clearance	E Direct	F Reverse	Model	H	I	J	K
15	5.6	25.4	35.3	6A3	18.0	15.0	12.6	--
18	5.6	26.8	36.8	6A3	18.0	15.0	12.6	--
18 W/16" Spring	5.6	33.2	42.1	8A	8.0	--	--	53
18 W/20" Spring	5.6	--	52.0	8A	8.0	--	--	53
24	5.0	34.7	45.5	8A	12.0	--	--	58
24 W/20" Spring	5.0	--	49.5	8A	12.0	--	--	62

For additional actuator data refer to SD CR3000.

## Weights (lbs.)

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Approximate shipping weights are for estimating purposes only, complete with actuator and accessories.

Valve Size (inches)	Weights 10000 API & 2500 ANSI Forged Valves
2x3	1200
2x4	1200
3x3	2800
3x4	2800
3x6	3000
4x4	5000
4x6	5000
4x8	5000
6x6	7000
6x8	7000

Valve Size (in.)	Cubage (cu. ft.)
2x3	25
3x4	50
4x6	100
6x8	120

## Accessories and Options

### Side Mounted Handwheels

6A3 <input type="checkbox"/>	8A <input type="checkbox"/>
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### Oversize Actuators

Standard Actuator	to	Oversize Actuator
15		18
18		18 (16) 24
18 (16)		18 (20) 24
18 (20)		24 (16) 24

7400 Series Positioner  
(See Specification Data CS3000)

Instrument Signals 3-15, 3-27 and 6-30 psi  
3-9 and 9-15 psi Split Range

8012 Electropneumatic Valve Positioner  
(See Specification Data CS5000)

Instrument Signals 10-50 mA; 104 ohms  
4-20 mA; 173 ohms

8005A/8006A Electropneumatic Transducer  
(See Specification Data CS6000)

Input Signals 10-50 mA; 104 ohms  
4-20 mA; 173 ohms

Output Signals (Direct or Reverse)

Model 8005A: 3-15 psi

Model 8006A: 3-15, 6-30, 0-20 or 0-35 psi

I/PEX 9000 Electropneumatic Transducer  
(See Specification Data CS9000)

Input Range 4-20 mA

Split range up to 3 times

Output (Direct or Reverse)

3-15 psi, adjustable to 0-20 psi

Refer to specific actuator and accessory specification literature for complete information.

Model 6000 Electropneumatic Transducer  
(See Specification Data CS6600)

Input Range 4-20 mA

Output 3-15 psi

Internal Regulator  
Integral Universal Mounting Bracket

496 Rotary Switches  
(See Specification Data CS7000)

496-1 (1 switch)

496-2 (2 switches)

80-4 or 80-40 Airset (See Specification Data CY7800)

77-6 Lockup Valve (See Specification Data CY7700)

77-8 3-Way Transfer Valve

(See Specification Data CY8000)

2" Gauge 0-30 psi

2700 Controllers

(See Specification Data CW6000)

### Additional Options Available

Bailey Positioner AP3-AP6 on Piston Acuator

Other Body Materials

Other Flange Facings (Taper-Lok, Grayloc)

Other Trim Materials

Unbalanced Plug Design

Volume Tank and Trip Valves

NACE Compliance

Hand Operated

Electric Actuators/Hydraulic Actuators

Direct Piston Actuation

Hydraulic Handjack

Volume Boosters

Dust Boots Plug and Actuator Stem

Non-Destructive Examination

Facilities: Australia, Brazil, Canada, France, Germany, Italy, Japan, Mexico, Netherlands, Singapore, Spain, United Kingdom, United States

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