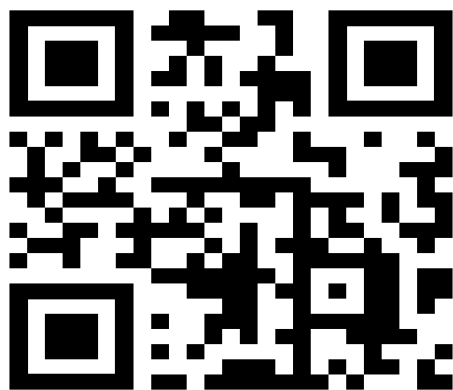


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## GENERAL DATA - E VALVE

(in inches)

Valve Size	Stem Nut (d) Wrench	Blind Flange Wrench		Diaph. Joint Wrench	Diaph. Size	Valve Settings (b)	Pressure Plate Dowel Pin	
		125#	250#				Dia.	Length
1/2	7/16		19/32	1/2	4 1/2	3/64	1/16	3/4
3/4	1/2		19/32	9/16	5 1/8	3/64	3/32	13/16
1	9/16		11/16	9/16	5 3/4	1/16	3/32	3/4
1 1/4	9/16		25/32	9/16	6 1/2	5/64	1/8	15/16
1 1/2	5/8*		7/8	9/16	7 1/4	3/32	1/8	7/8
2	5/8*		1 1/16	3/4	8 1/8	7/64	1/8	1
2 1/2	3/4	1 1/16	1 1/4	3/4	9	1/8	1/8	1 1/16
3	7/8 (a)	7/8	1 1/16	3/4	10	9/64	3/16	1 3/8
3 1/2	7/8 (a)		1 1/16	3/4	11	5/32	3/16	1 9/16
4	15/16 (a)	1 1/16	1 1/4	3/4	13	3/16	3/16	1 9/16
5	1 1/16 & 1 1/8 (a)*	1 1/16	1 1/4	3/4	15	7/32	1/4	2 1/16
6	1 1/4 & 1 5/16 (a)*		1 1/4	15/16 (c)	17 1/2	9/32	1/4	2 1/16
8	1 7/16 & 1 1/2 (a)*		1 1/4	15/16 (c)	20	11/32	5/16	2 7/16
10	1 7/16 & 1 1/2 (a)*		1 1/4	15/16 (c)	25	7/16	5/16	2 1/2
12	1 5/8 & 1 1/16 (a)*		1 7/16	1 1/4*	30	9/16	3/8	2 13/16

(a) These sizes have self-locking nut.

(b) Refer to Valve Setting Drawing No. 8718-A.

(c) 7/8" Wrench required for Bolt Head

(d) Deep socket wrench recommended.

\*ASME Nut Standards changed - 5/8" to 11/16", 1 1/8" to 1 1/8", 1 1/4" to 1 5/16", 1 7/16" to 1 1/2", 1 5/8" to 1 11/16". Both wrenches required on these valves.





# AUXILLIARY FITTINGS

S.E.M. 8B

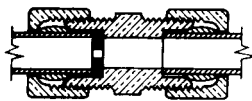
Walden, NY 12586

## BLEEDPORTS

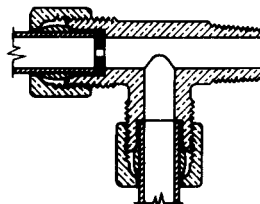
For steam, air and gas service, a 3/32" bleedport orifice is used for main valve sizes up to 8". For 10" and 12" main valve sizes, a 1/8" bleedport orifice is used. If the initial pressure or pressure drop is less than 15 psi, the orifice is reduced to 1/16". For liquids, fuel oil takes 3/32" and all other fluids take 1/16", regardless of pressure conditions. For main valve sizes up to 8" on long pressure drops, the orifice is sometimes increased to 1/8" to eliminate hunting or to make the valve close faster and open slower.



4A Bleedport



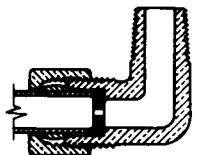
1A Union  
Bleedport



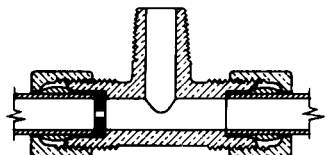
8A Bleedport  
Tee

## RESTRICTIONS

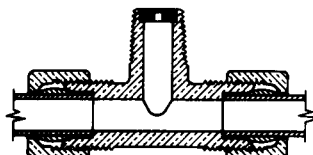
Spare restriction fittings can be supplied blank and drilled for a particular main valve according to the table. If the initial pressure or pressure drop is less than 15 psi an open fitting is used. All back pressure valves employ an open fitting. For liquid services, except back pressure, the restriction orifice is 1/16; for all sizes of main valves.



5A Restriction  
Elbow



7A Safety Pilot  
Restriction Tee



7C Anti-Freeze  
Restriction Tee

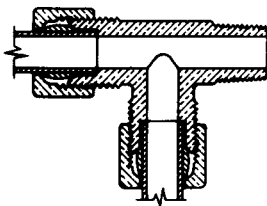
## RESTRICTION ORIFICES\*

Main Valve Size	Orifice Drill Size	Decimal Equivalent
3/8	60	.0400
1/2	60	.0400
3/4	60	.0400
1	60	.0400
1 1/4	58	.0420
1 1/2	58	.0420
2	56	.0465
2 1/2	56	.0465
3	53	.0595
3 1/2	53	.0595
4	51	.0670
5	47	.0785
6	45	.0820
8	42	.0935
10	17	.1730
12	7	.2010

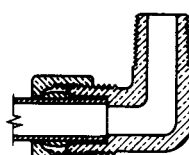
\* Steam, Air, Gas

If the initial pressure or pressure drop is less than 15psi, a No. 5A elbow with orifice removed is used.

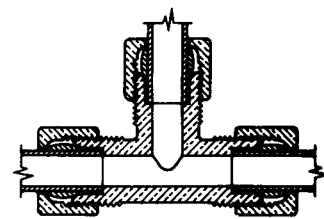
## OPEN FITTINGS



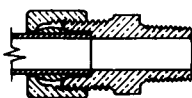
8B Tee



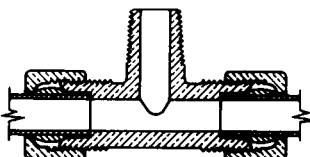
5B Elbow



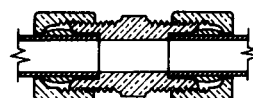
9B Tubing Tee



4B Coupling



7B Tee



1B Union

# MAINTENANCE INFORMATION FOR SPENCE REGULATORS

## PRESSURE PILOT SPRINGS

Part No.	Delivery Pressure	Spring Color	Wire Diameter	Used on Pilot Type
5-05007-0	1 - 10	Aluminum	3/16"	D5, Q5
5-05007-0	3 - 20	Aluminum	3/16"	D, D3-1, N, N33, Q, N20
5-05003-0	5 - 25	Orange	1/4"	D5, Q5
5-05016-0	5 - 25	Uncolored	7/32"	D120
5-05003-0	5 - 50	Orange	1/4"	D, D3-1, N, N33, Q, N14
5-05028-0	10 - 75	Uncolored	5/16"	D120
5-05005-0	10 - 100	Green	5/16"	D, D3-1, N, N33, Q, N20
5-05012-0	20 - 150	Black	11/32"	D, D3-1, N, N33, Q, N20
5-04990-0	100 - 300	Uncolored	7/16"	D2, D4-1, N2, Q2
5-05030-0	40 - 150	Uncolored	3/8"	D120

## TYPE E MAIN VALVE DIAPHRAGMS No. Required

### PRESSURE PILOT DIAPHRAGMS\*

Part No.	MTL.	Size	Used on Pilot Type
4-01621-0	Brz.	3 1/2"	W, P133, A88, Q6, D4-1, D2
4-01623-0	St. Stl.	3 1/2"	D, D3-1, N, N3-1, Q, A43, A53
4-07890-0	Brz.	3 1/2"	A35, A, A81, SP/P
4-01626-0	St. Stl.	3 1/2"	P13, N4, F13, N24
4-01627-0	Brz.	4 1/2"	A43, A84, A86, A93
4-01629-1	St. Stl.	4 1/2"	P14, P110, Q43, F14
4-01630-0	Brz.	5 3/4"	A53, A5, P95, A85
4-01632-0	St. Stl.	5 3/4"	A92, P15, A54, F15
4-10721-0	Brz.	5 3/4"	D5, W5, Q5, A35
4-03927-0	St. Stl.	5 3/4"	Q35, V5, A81, A82
4-01633-0	Brz.	7 1/4"	A73, A70, A75, A87
4-01635-0	St. Stl.	7 1/4"	Q73
4-09685-0	Brz.	4 1/2"	D120, A92, D234
4-01659-0	St. Stl.	4 1/2"	A54, F46

Initial Pressure	No. per Set
10 - 250	2
250 - 400	3
400 - 600	4

Valve Size	Part No.		Dia.
	St. Steel	Brz.	
3/8 & 1/2	4-01629-1	4-01627-0	4 1/2
3/4	4-01662-0	4-01660-0	5 1/8
1	4-01632-0	4-01630-0	5 3/4
1 1/4	4-01664-0	4-09678-0	6 1/2
1 1/2	4-01635-0	4-01633-0	7 1/4
2	4-01638-0	4-09679-0	8 1/8
2 1/2	4-01641-0	4-09680-0	9
3	5-02038-0	4-09681-0	10
3 1/2	5-02331-0	4-01645-0	11
4	5-01647-0	4-09682-0	13
5	5-01649-0	4-09683-0	15
6	5-01651-0	5-09684-0	17 1/2
8	5-01653-0	—	20
10	4-02096-0	—	25
12	5-01656-0	—	30

\*No. of Diaphragms per set per pilot varies with Type of Pilot and delivery pressure. See individual Parts List for quantity required.

**PARTS RECOMMENDED for MAINTENANCE STOCK.**  
See individual Parts List for Repair Kits or recommended Spare Parts.

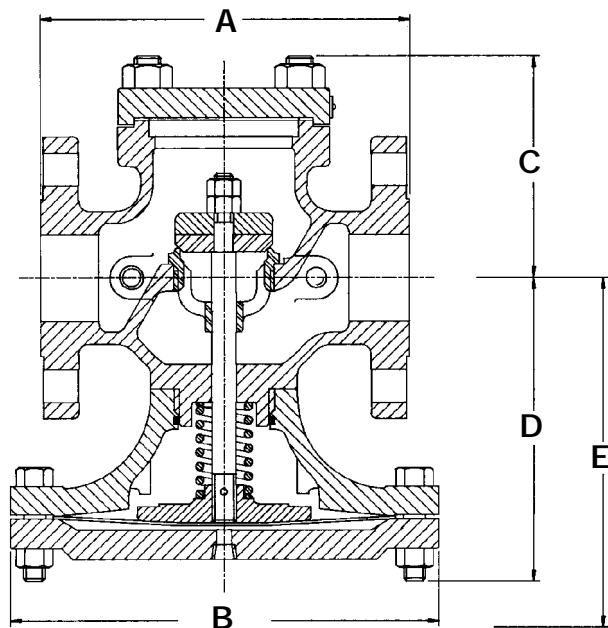


A division of CIRCOR International, Inc.

# Technical Data

SD 3001E

**SPENCE ENGINEERING COMPANY, INC.** 150 COLDENHAM ROAD, WALDEN, NY 12586-2035



**TYPE E MAIN VALVE**

## TYPE E Main Valve Sizes 3/8" through 12"

The Spence Type E Main Valve is of normally closed, single seat design featuring packless construction, balanced metal diaphragms and protected main spring.

When controlled by one or more of the various types of Spence Pilots, this valve will accomplish most functions required of a regulator.

### CAST IRON RATINGS (Maximum Inlet Conditions)

Valve Ends Pressure (Temperature)

- ☐ ANSI NPT Screwed .....250 PSIG .....(450°F)
- ☐ ANSI 125 Flanged .....125 PSIG .....(450°F)
- ☐ ANSI 250 Flanged .....250 PSIG .....(450°F)

### CAST STEEL RATINGS (Maximum Inlet Conditions)

Valve Ends Pressure (Temperature)

- ☐ ANSI NPT Screwed .....300 PSIG.....(600°F)<sup>†</sup>
- ☐ ANSI 150 Flanged .....150 PSIG .....(600°F)
- ☐ ANSI 300 Flanged .....300 PSIG.....(600°F)<sup>†</sup>
- ☐ ANSI 600 Flanged .....600 PSIG.....(600°F)<sup>†</sup>

<sup>†</sup>750°F construction available on request.

### DIMENSIONS (inches) AND WEIGHTS (pounds)

SIZE	FACE TO FACE DIMENSIONS					OTHER DIMENSIONS					APPROX. WT.					
	A					B	C		D	E	ANSI NPT	ANSI 125	ANSI 150	ANSI 250	ANSI 300	ANSI 600
	ANSI NPT	ANSI 125,150	ANSI 250	ANSI 300	ANSI 600			ANSI 600								
3/8	4 3/8	—	—	—	—	5 7/8	2 3/4	—	5 1/4	7 3/8	14	—	—	—	—	—
1/2	4 3/8	—	—	—	6	5 7/8	2 3/4	2 3/4	5 1/4	7 3/8	14	—	—	—	—	20
3/4	4 3/8	—	—	—	6 3/8	6 1/2	2 7/8	3 7/8	5 1/2	7 7/8	18	—	—	—	—	28
1	5 3/8	5 1/2	6	6 1/2	6 1/2	7	3 5/8	4 1/4	6 1/4	8 7/8	23	24	26	27	31	32
1 1/4	6 1/2	6 3/4	7 1/4	7 7/8	7 7/8	7 7/8	4 1/8	4 5/8	6 1/2	9 1/8	33	36	37	40	41	45
1 1/2	7 1/4	6 7/8	7 3/8	8	8	8 3/4	4 3/8	5 1/8	7 1/8	9 3/4	43	45	47	51	55	58
2	7 1/2	8 1/2	9	10 1/4	10 1/4	9 7/8	5 1/4	5 3/4	7 5/8	11 1/4	62	67	73	72	78	83
2 1/2	—	9 3/8	10	11 1/4	11 1/4	10 7/8	5 3/4	7 7/8	8 3/8	12 1/8	—	82	95	100	100	130
3	—	10	10 3/4	12 1/4	12 1/4	11 3/4	6 5/8	9 1/8	9 1/4	14 5/8	—	110	125	130	140	175
4	—	11 7/8	12 1/2	12 1/2	14 1/2	14 3/4	7 5/8	10 5/8	11 7/8	18 1/4	—	200	210	235	230	310
5	—	13 5/8	14 1/2	14 1/2	16 1/2	16 7/8	8 1/2	12 1/2	12 1/2	20 1/8	—	280	295	315	310	490
6	—	15 1/8	16	16	17 3/8	19 3/4	10	13 3/4	14 1/8	22 3/8	—	385	420	455	470	655
8	—	19	20	20	21 5/8	22 1/2	11 1/2	15 3/8	17 1/4	27 3/4	—	657	700	735	710	1070
10	—	23 5/8	25	25	—	28	13 3/4	—	23 3/8	36 1/4	—	1260	1240	1430	1300	—
12	—	26 1/2	28	28	—	33	15 7/8	—	25 1/4	41 1/2	—	2070	2060	2145	2140	—

### RATED FLOW COEFFICIENTS (Cv)

SEAT FACTOR	REGULATOR SIZE															
	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4	5	6	8	10	12	
Full	1.5	2.8	5.4	8.8	14.1	19.8	31	44	74	109	169	248	444	706	1113	
Full 75 %	—	2.1	4.0	6.6	10.6	14.8	23.3	33	56	82	127	186	333	530	835	
Full 50 %	—	1.4	2.7	4.4	7.0	9.9	15.5	22	37	55	85	124	222	353	557	
Normal	.65	1.5	4.8	7.5	10.4	14.6	17.6	24	43	78	115	151	249	377	631	
Normal 75 %	—	—	—	—	—	—	—	18	33	59	87	114	187	283	474	
Normal 50 %	—	—	—	—	—	—	—	12	22	39	58	76	125	189	316	

## OPERATING PRINCIPLE

The regulator is operated by initial steam or fluid pressure. It is normally closed, being held so by initial pressure on the disc and by an internal main spring. When the pilot is opened (see pilot instructions), initial pressure flows through the pilot to the 8B tee. Bleedport 4A restricts the flow and pressure builds under the diaphragm and opens the main valve. The 5A steadies the operation of the regulator.

Delivery pressure feeds back through the control pipe to the pilot diaphragm. As this pressure approaches a balance with the thrust of the adjusting spring, the pilot throttles the loading pressure. In turn, the main valve takes a position established by the loading pressure where just enough steam flows to maintain the set delivery pressure.

## RECOMMENDED INSTALLATION

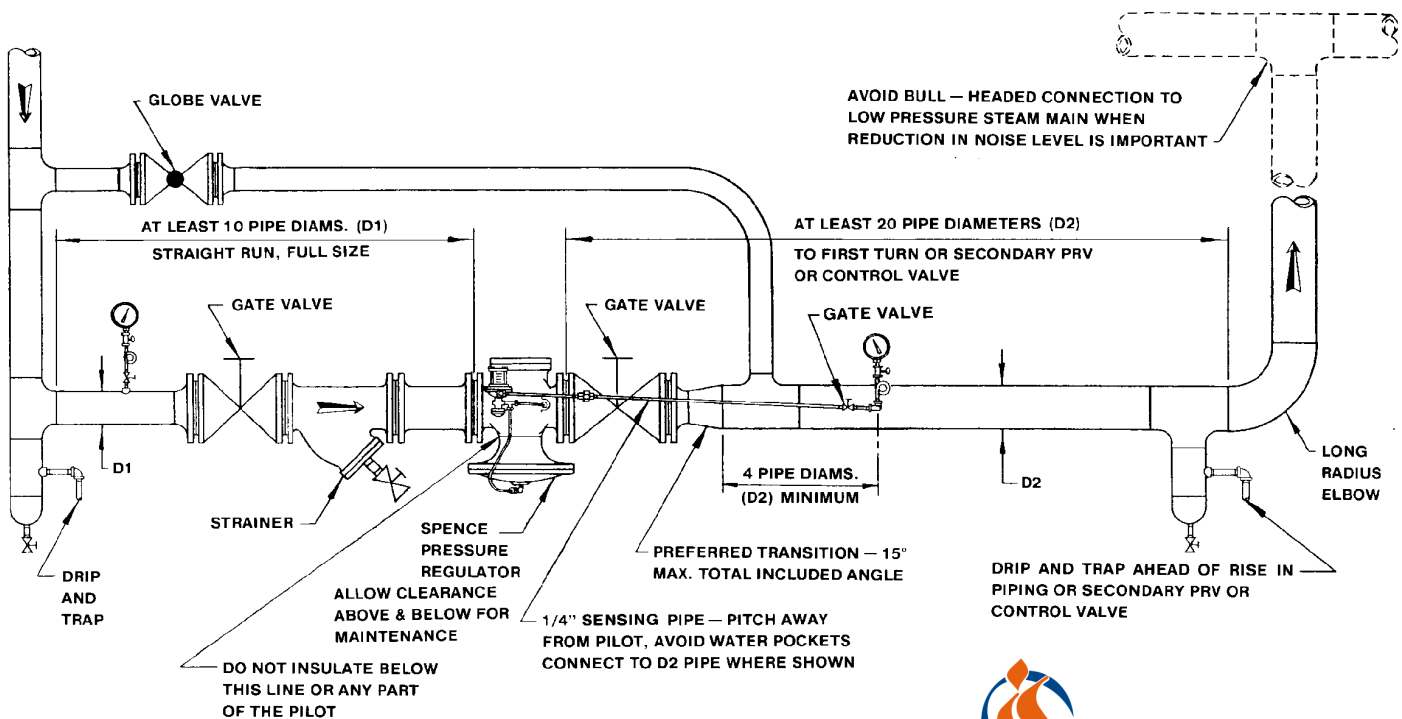


FIGURE 1A - Typical Installation

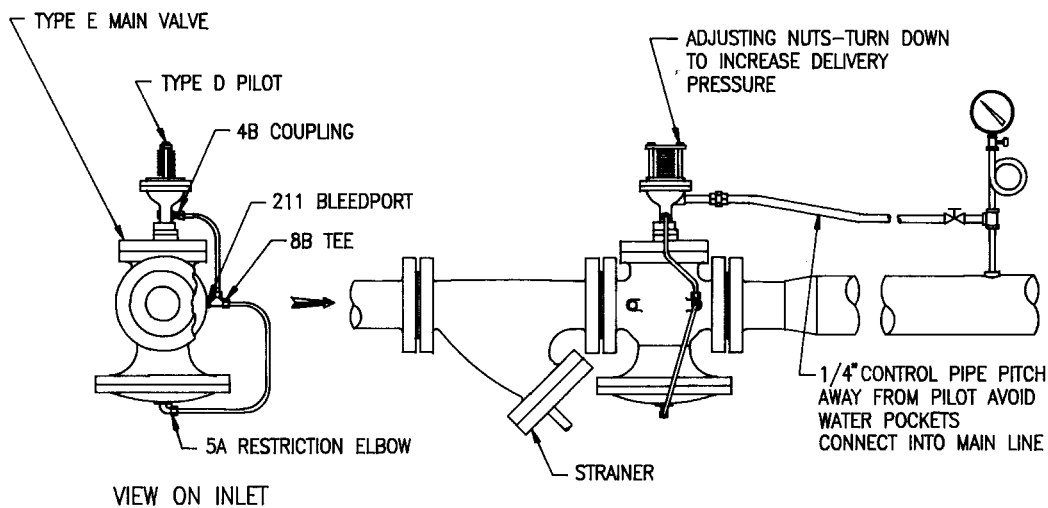


FIGURE 1B - Installation of Integrally Mounted Pilot



## INSTALLATION

### PLANNING

Locate the valve in a straight run of horizontal pipe. Allow headroom above the valve for access through the blind flange. Provide clearance for stem withdrawal underneath. Prevent water hammer and erratic operation by installing traps to provide proper drainage before and after the valve and before secondary PRV or control valve. Avoid damaging effects of scale and dirt in pipe lines by using a strainer as shown in Figure 1. Provide a 3-valve by-pass to facilitate inspection without interrupting service.

To eliminate excessive noise and erratic regulation with steam and other compressible fluids, enlarge the delivery pipe size to effect a reasonable flow velocity at the reduced pressure. A tapered transition is recommended. If possible, avoid a sharp turn close to the regulator outlet and a bull-headed tee connection to the low pressure main.

Install initial and delivery pressure gages to indicate performance. If the pressure rating of the delivery system or connected equipment is less than the initial steam pressure, provide a safety valve.

### MAIN VALVE

Flush the piping system thoroughly to clear it of welding beads, scale, sand, etc. Mount the main valve with diaphragm chamber down and arrow on body pointing in the direction of flow. Screwed end valves should be mounted in unions.

### PILOT

Mount the pilot on either side of the main valve by means of 1/4" nipple and union provided. Make this connection the the 1/4" pipe tap at the inlet of the main valve as shown in Figure 2.

Screw No. 4A bleedport fitting into the 1/8" pipe tap at the outlet of the main valve body. Note bleed orifice in this fitting – vital to operation of regulator.

Screw No. 8B tee into 1/8" pipe tap in pilot. Select tap facing downstream.

Screw No. 5A elbow containing restriction orifice into 1/8" pipe tap on underside of main valve diaphragm chamber. If the initial pressure or pressure drop is less than 15 psi, a No. 5B open elbow is used.

Connect tubing bends as illustrated in Fig. 2. Valves with condensation chamber are fitted up according to Figure 2.

### CONTROL PIPE (if required)

Use 1/4" pipe for this line which connects the pilot diaphragm chamber to the desired point of pressure control. Take the control at a point of minimum turbulence. Avoid control immediately at the valve outlet or after a turn. When the delivery pipe expands in size, select a spot at least 4 pipe diameters beyond the point of enlargement. Pitch away from pilot to avoid erratic operation and excessive fouling. Eliminate water pockets. Locate delivery pressure gage in control pipe to show pressure actually reaching pilot diaphragm.

## START-UP AND SETTING

On pressure reducing valves like the ED, use by-pass to fill the delivery system and raise pressure to slightly below normal required. Close pilot by releasing compression on adjusting spring. See Figure 2. Open 1/4" control pipe valve. Crack outlet stop valve. Crack inlet stop valve. Blow down strainer. **Caution: Never open a reducing valve without positive indication that the high side is clear of condensate.**

Open inlet stop valve and gradually compress adjusting spring until the valve opens and takes control at desired pressure. Alternately choke down on the by-pass and open outlet stop valve until the regulator is on the line. See individual instructions for other pilots.

### HYDROSTATIC TEST PROCEDURE

Install pilot according to instructions. Fully compress pilot spring and open inlet and outlet stop valves before filling system. **SLOWLY** fill system from inlet or high pressure side of regulator. Bleed off trapped air. **SLOWLY** develop test pressure up to **300 PSIG MAXIMUM**. If a higher pressure is required

**CONTACT FACTORY FIRST.** Test pressures may cause normally acceptable leakage at the diaphragm joint. Consult factory for hydrostatic test for other types of regulators.

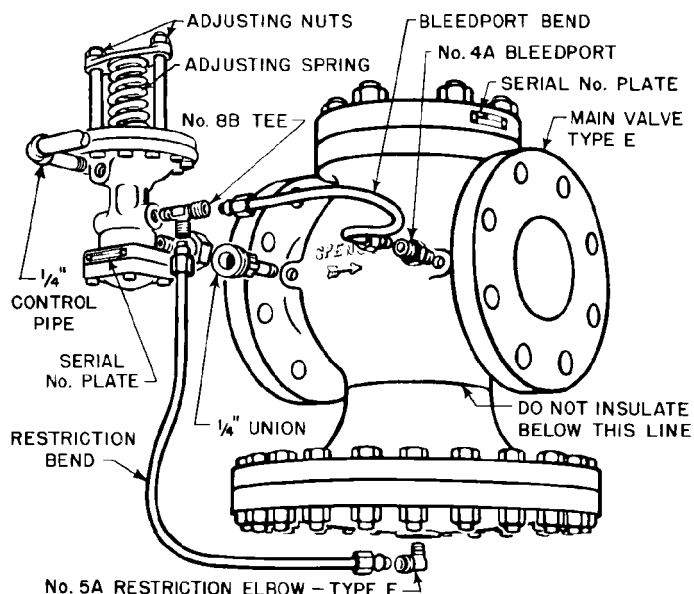


FIGURE 2

## TROUBLE SHOOTING

### FAILURE TO OPEN OR SAGGING DELIVERY PRESSURE

1. Adjusting spring on pilot may have been tampered with.
2. Initial pressure may be down due to partially closed supply valve, clogged strainer or other obstruction.
3. Orifice in No. 5A restriction elbow may be plugged. No. 4A bleedport fitting may have been omitted and an open coupling substituted.
4. Control pipe may be plugged. Most likely points of obstruction are at shutoff valve and entrance to delivery main.
5. Main diaphragm may be broken. Test with air or water before dismantling.

### FAILURE TO CLOSE OR OVER-RIDING DELIVERY PRESSURE

1. Adjusting spring on pilot may have been tampered with.
2. Orifice in bleedport No. 4A may be plugged.
3. By-pass valve may be leaking.
4. On pressure regulators like the ED, the main valve or pilot may be held open by foreign matter in seat. To determine which valve leaks, first close stop valve and 1/4" control pipe valve. Then remove bleedport bend so pilot will exhaust to atmosphere. Crack inlet stop valve. Steam will issue from No. 8B tee. Release compression on adjusting spring to see if pilot closes tight. Open and close several times to wash seat. Steam blowing back from bleedport means main valve disc is held open by foreign matter. Steam may wash the obstruction from the seat if the valve is made to open wide. This can be accomplished, even at light loads, if the control point is beyond the outlet stop valve. Reassemble bleedport bend and place regulator in operation. Then, slowly open and close outlet stop valve.

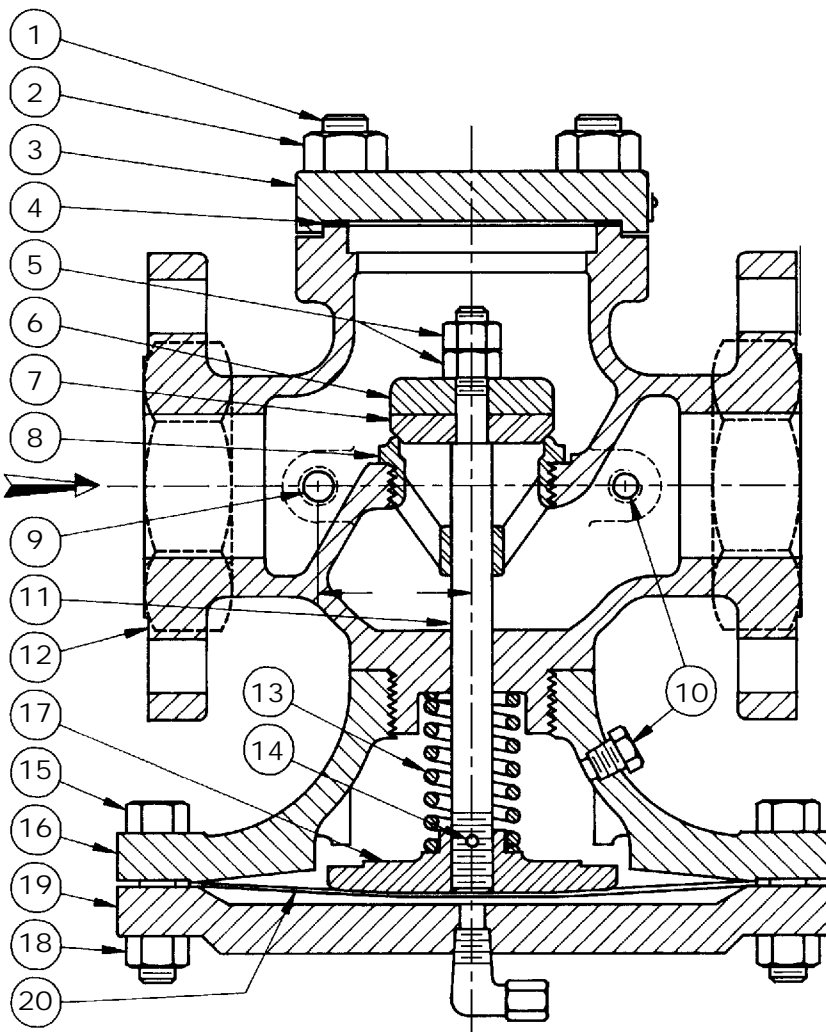
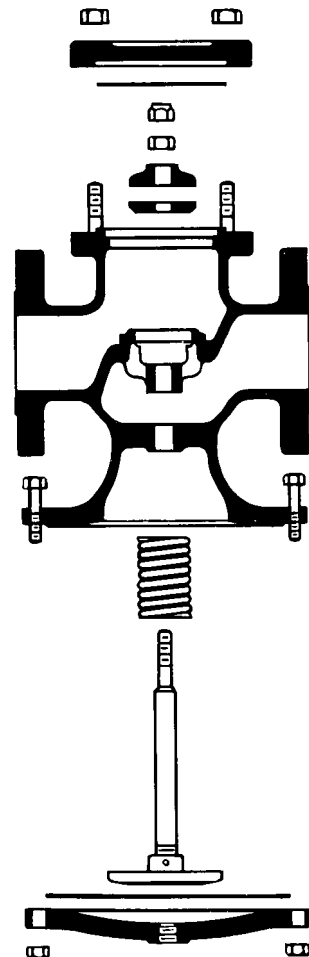


FIGURE 3



# MAINTENANCE

## INSPECTION

Under normal conditions, complete dismantling at regular intervals is not recommended. a valve kept relatively free of dirt will function for years with minimum attention.

After the first few days of operation and twice a year, the following should be checked.

1. Inspect for dirt collected at bleedport No. 4A and restriction elbow No. 5A.
2. Inspect all joints for leakage. Keep bolts tight. Never allow a leak to persist.

## DISMANTLING MAIN VALVE

Connect a source of air or water pressure which can be adjusted by hand to the No. 5A restriction elbow. Apply pressure to jack valve open and prevent stem from turning while removing stem nuts. Usually 50 to 60 psi will suffice. Use penetrating oil on the threads.

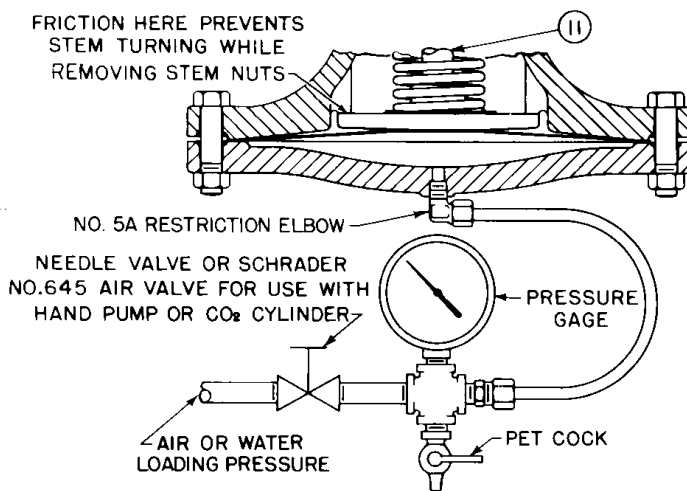


FIGURE 4

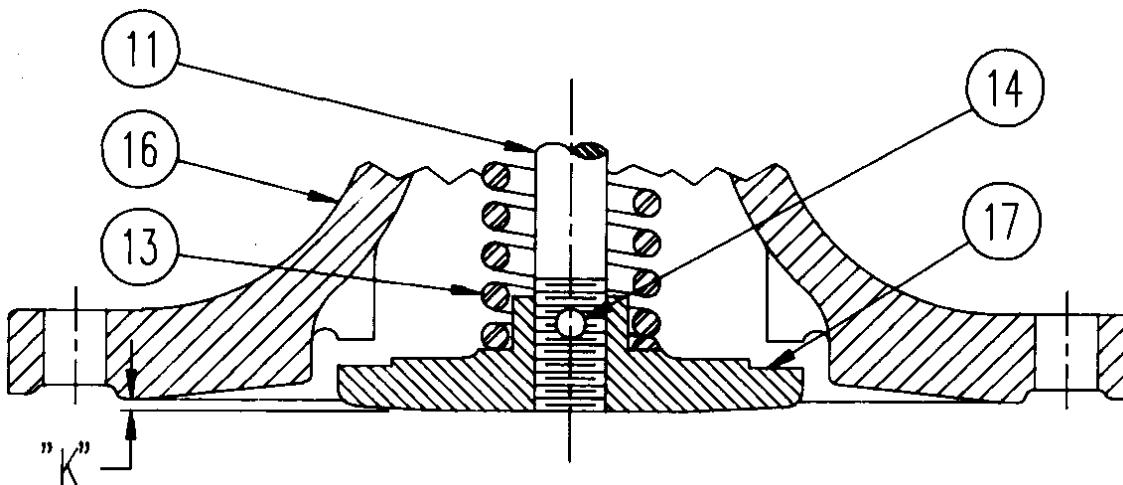


FIGURE 5

## REPLACING SEAT RINGS

These joints should be made up with Copaltite, Permatex or equal high temperature gasket compound. Remove old compound from body and seat ring with a wire brush. Apply new compound sparingly to both parts, threads and shoulders. Let stand until tacky before assembling.

## GRINDING IN

Seats and discs should never require more than the lightest touch up with very fine (400 grit) grinding compound. Heavy grinding will produce galling, wider seating surface and a groove in the disc, all of which tend to cause leakage. Reface a damaged surface before attempting to grind it in. Grind sparingly.

Main stem (11) is slotted for rotation with a screwdriver, Valve spring (13) is omitted from the assembly during grinding. Slip the stem into its normal position. apply compound to the disc, place it on the stem and tighten with one stem nut.

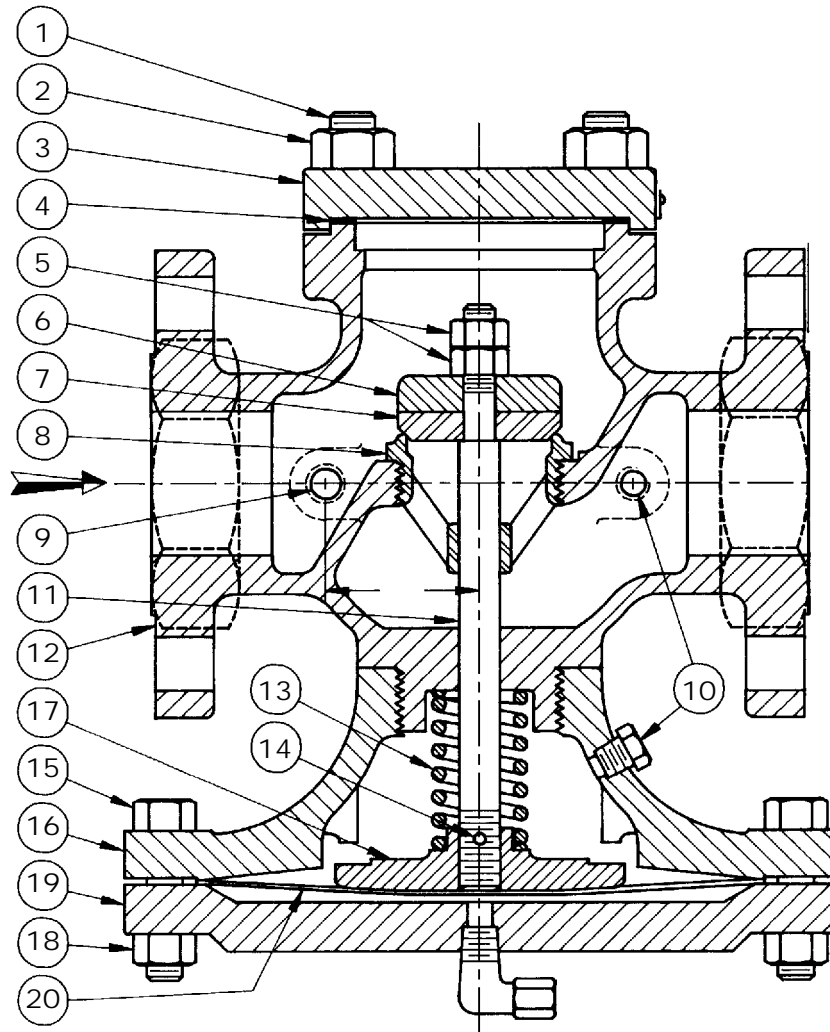
After grinding, disassemble and clean all parts.

## VALVE SETTING

Valve setting is gaged at K to establish correct stem length and diaphragm position. Dimension K is supplied with each replacement stem. For metal diaphragm valves, K is cast on the upper face of pressure plate (17) (Fig. 3).

To install new stem (11), fasten disc (7) firmly on stem with stem nut. Insert stem and disc assembly in valve and screw on pressure plate (17). Omit spring (13) for this operation. Hold disc on seat and adjust position of pressure plate until valve setting K is reached. Push pressure plate against stops in base (16). Remove disc, drop out pressure plate and stem, drill and insert dowel pin (14) to lock the joint. Grind off stem projection flush with face of pressure plate.

VALVE SIZE	TYPE E	
	HOOD (K)	TOTAL
3/8	1/32	3/32
1/2	3/64	7/64
3/4	3/64	1/8
1	1/16	5/32
1-1/4	5/64	3/16
1-1/2	3/32	7/32
2	7/64	1/4
2-1/2	1/8	9/32
3	9/64	3/8
3-1/2	5/32	11/32
4	3/16	13/32
5	7/32	1/2
6	9/32	19/32
8	11/32	3/4
10	7/16	31/32
12	9/16	1-1/4



When ordering parts, it is essential that the valve type, size, service and serial number be stated.

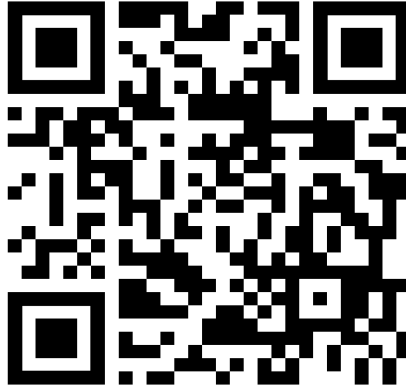
Select part by item number, but order by part number.

Specify complete part number when ordering.

### CAST IRON PARTS LIST - 3/8" to 2"

ITEM NO.	PART NAME	MATERIAL	VALVE SIZE						
			3/8	1/2	3/4	1	1 1/4	1 1/2	2
1	Stud	Steel	04-05516-00	04-05516-00	04-05516-00	04-10118-00	04-05442-00	04-05443-00	04-10119-00
2	Nut	Steel	05-02847-00	05-02847-00	05-02847-00	05-02851-00	05-02854-00	05-02856-00	05-02860-00
3	Blind Flange	Cast Iron	04-02213-00	04-02213-00	04-02171-00	04-02173-00	04-02176-00	04-02178-00	04-02180-00
4	*Gasket	Non-Asbestos	05-16167-00	05-16167-00	05-16168-00	05-16169-00	05-16170-00	05-16171-00	05-16172-00
5	*Stem Nut	Steel	05-02968-00	05-02968-00	05-02969-00	05-02970-00	05-02970-00	05-02971-00	05-02971-00
6	Muffling Plate	Cast Iron	—	—	—	—	—	—	04-03550-01
7	*Disc	Stainless Steel	04-01790-02	04-01800-02	04-01813-02	04-01832-02	04-01850-02	04-01870-02	04-01888-02
8	*Seat Ring	Stainless Steel	04-04109-01	04-04066-01	04-04075-01	04-04084-01	04-04092-01	04-04496-01	04-11544-00
9	Pipe Plug 1/4"	Steel	04-03772-00	04-03772-00	04-03772-00	04-03772-00	04-03772-00	04-03772-00	04-03772-00
10	Pipe Plug 1/8"	Steel	04-03769-00	04-03769-00	04-03769-00	04-03769-00	04-03769-00	04-03769-00	04-03769-00
11	*Stem	Stainless Steel	04-05306-01	04-05306-01	04-05233-01	04-05237-02	04-05248-01	04-05251-02	04-05262-01
12	NPT Body	Cast Iron	04-00638-00	04-00634-00	04-00639-00	04-00640-00	04-00643-00	04-00646-00	04-00649-00
	125 Body	Cast Iron	—	—	—	04-00641-00	04-00644-00	04-00647-00	04-00650-00
	250 Body	Cast Iron	—	—	—	04-00642-00	04-00645-00	04-00648-00	04-00651-00
13	*HP Spring	Steel	05-09106-00	05-09106-00	05-09107-00	05-09108-01	05-09110-00	05-09110-00	05-09368-02
	LP Spring	Steel	05-05000-01	05-05000-01	05-04987-01	05-04979-01	05-05010-01	05-05010-01	05-04989-01
14	*Dowel Pin	Steel	05-03244-00	05-03244-00	05-03245-00	05-03245-00	05-03248-00	05-03248-00	05-03248-00
15	Diaphragm Bolt	Steel	05-04771-00	05-04771-00	05-04774-00	05-04774-00	05-04774-00	05-04775-00	05-04780-00
16	Base	Cast Iron	04-00475-00	04-00475-00	04-00467-00	04-00476-00	04-00468-00	04-00472-00	04-00469-00
17	*Pressure Plate	Cast Iron	04-03695-00	04-03695-00	04-03579-00	04-03580-00	04-03582-00	04-03581-00	04-03584-01
18	Diaphragm Nut	Steel	04-02872-00	04-02872-00	05-02874-00	05-02874-00	05-02874-00	05-02874-00	05-02877-00
19	Hood	Cast Iron	04-02569-00	04-02569-00	04-02572-00	04-02573-00	04-02576-00	04-02577-00	04-02580-01
20	*Diaphragm	Stainless Steel	04-01629-01	04-01629-01	04-01662-00	04-01632-00	04-01664-00	04-01635-00	04-01638-00
	Repair Kit - High Pressure		07-07746-00	07-07747-00	07-07748-00	07-07749-00	07-07750-00	07-07751-00	07-07752-00
	Repair Kit - Low Pressure		—	—	20112	08-11978-00	08-11979-00	08-09124-00	08-11981-00

\*These parts furnished in Repair Kit



### CAST IRON PARTS LIST – 2-1/2" to 8"

ITEM NO.	PART NAME	MATERIAL	VALVE SIZE					
			2 1/2	3	4	5	6	8
1	Stud 125	Steel	04-10119-00	04-05443-00	04-10119-00	04-10120-00	04-10120-00	04-10120-00
	Stud 250	Steel	04-05448-00	04-10119-00	04-05448-00	04-05449-00	04-05449-00	04-05455-0
2	Nut 125	Steel	04-02860-00	05-02856-00	05-02860-00	05-02877-00	05-02860-00	05-02860-00
	Nut 250	Steel	05-02862-00	05-02860-00	05-02862-00	05-02862-00	05-02862-00	05-02862-00
3	Blind Flange 125	Cast Iron	04-02185-00	04-02157-00	04-02158-00	04-02160-00	04-02165-00	04-02167-00
	Blind Flange 250	Cast Iron	04-02183-00	04-02186-00	04-02159-00	04-02161-00	04-02163-00	05-02166-00
4	*Gasket	Non-Asbestos	05-16173-00	05-16174-00	05-16175-00	05-16176-00	05-16178-00	05-16179-00
5	*Stem Nut	Steel	05-02972-00	05-02973-00	05-02974-00	05-02975-00	04-02976-00	04-02977-00
6	Muffling Plate	Cast Iron	04-03515-00	04-03516-00	04-03518-00	04-03519-00	04-03520-00	05-03524-00
7	*Disc	Stainless Steel	04-01906-01	04-01918-00	04-01931-00	04-01938-00	04-01995-00	04-01691-00
8	*Seat Ring	Stainless Steel	04-11539-00	04-11484-00	04-11565-00	04-11700-01	04-15142-00	07-40483-00
9	Pipe Plug 1/4"	Steel	04-03772-00	04-03772-00	04-03772-00	04-03772-00	04-03772-00	04-03772-00
10	Pipe Plug 1/8"	Steel	04-03769-00	04-03769-00	04-03769-00	04-03769-00	04-03769-00	04-03769-00
11	*Stem	Stainless Steel	04-05260-02	04-05279-01	04-05282-02	04-05285-01	04-05288-01	04-05292-01
12	125 Body	Cast Iron	04-00653-00	04-00655-00	04-00659-01	04-00661-01	04-00662-00	04-00665-00
	250 Body	Cast Iron	04-00652-00	04-00654-00	04-00658-01	04-00660-01	04-00663-00	04-00664-00
13	*HP Spring	Steel	05-08257-02	05-09112-02	05-09114-02	05-09115-02	05-09116-01	05-09118-01
	LP Spring	Stainless Steel	05-05021-01	05-05057-01	05-12267-00	05-12268-00	05-12269-00	05-12270-00
14	*Dowel Pin	Steel	05-03252-00	05-03254-00	05-03254-00	05-03258-00	05-03258-00	05-03261-00
15	Diaphragm Bolt	Steel	04-04779-00	05-04780-00	05-04782-00	05-04782-00	05-04786-00	05-04788-00
16	Base	Cast Iron	04-00471-00	04-00470-00	04-00473-01	04-00478-00	04-00479-00	04-00474-00
17	*Pressure Plate	Cast Iron	04-03583-00	04-03585-01	04-03587-00	04-03588-01	04-03589-02	04-03591-00
18	Diaphragm Nut	Steel	05-02877-00	05-02877-00	05-02877-00	05-02877-00	05-02881-00	05-02881-00
19	Hood	Cast Iron	04-02581-00	04-02584-00	04-02588-01	04-02591-00	04-02593-00	04-02595-00
20	*Diaphragm	Stainless Steel	04-01641-00	05-02038-00	05-01647-00	05-01649-00	05-01651-00	05-01653-00
Repair Kit - High Pressure			08-08148-01	08-08567-01	08-08568-01	08-09738-01	08-09720-00	22800
Repair Kit - Low Pressure			—	20113	20114	—	—	—

## CAST STEEL PARTS LIST – 3/8" to 2"

ITEM NO.	PART NAME	MATERIAL	VALVE SIZE						
			3/8	1/2	3/4	1	1 1/4	1 1/2	2
1	Stud NPT, 150, 300	Steel	05-05518-00	05-05518-00	05-05518-00	05-05506-00	05-05507-00	05-05509-00	05-05510-00
	Stud 600	Steel	—	—	05-05507-00	05-05507-00	05-05464-00	05-05501-00	05-05513-00
2	Nut NPT, 150, 300	Steel	05-02848-00	05-02848-00	05-02848-00	05-02852-00	05-02855-00	05-02857-00	05-02857-00
	Nut 600	Steel	—	—	05-02855-00	05-02855-01	05-02859-00	05-02859-00	05-02863-00
3	Blind Flange NPT, 150, 300	Steel	04-02188-00	04-02188-00	04-02190-00	04-02192-00	04-02194-00	04-02196-00	04-02198-00
	Blind Flange 600	Steel	—	—	04-02191-00	04-02193-00	05-02195-00	04-02196-00	04-02199-00
4	*Gasket	Non-Asbestos	05-16167-00	05-16167-00	05-16168-00	05-16169-00	05-16170-00	05-16171-00	05-16172-00
5	*Stem Nut	Steel	05-02968-00	05-02968-00	0502969-00	05-02970-00	05-02970-00	05-02971-00	05-02971-00
6	Muffler Plate	Cast Iron	—	—	—	—	—	—	04-03550-01
7	*Disc	Stainless Steel	04-01790-02	04-01800-02	04-01813-02	04-01832-00	04-01850-02	04-01870-02	04-01888-02
8	*Seat Ring	Stainless Steel	04-04109-01	04-04066-01	04-04075-01	04-04084-01	04-04092-01	04-04496-01	04-11544-00
9	Pipe Plug 1/4	Steel	04-03772-00	04-03772-00	04-03772-00	04-03772-00	04-03772-00	04-03772-00	04-03772-00
10	PipePlug 1/8	Steel	04-03769-00	04-03769-00	04-03769-00	04-03769-00	04-03769-00	04-03769-00	04-03769-00
11	*Stem	Stainless Steel	04-05306-01	04-05306-01	04-05233-01	04-05237-02	04-05248-01	04-05251-02	04-05262-01
12	Body/Base NPT	Steel	07-46419-00	07-46017-00	07-46421-00	07-44654-00	07-44655-00	07-46436-00	07-46444-00
	Body/Base 150	Steel	—	—	—	0@-06427-00	0@-06431-00	0@-06438-00	0@-06447-00
	Body/Base 300	Steel	—	—	—	0@-06428-00	0@-06432-00	0@-04895-00	0@-06450-00
	Body/Base 600	Steel	—	0@-05717-00	0@-06424-00	0@-04617-00	0@-06434-00	0@-06441-00	0@-06455-00
13	*Spring	Steel	05-09106-00	05-09106-00	05-09107-00	05-09108-01	05-09110-00	05-09110-00	05-09368-02
14	*Dowel Pin	Stainless Steel	05-03244-00	05-03244-00	05-03245-00	05-03245-00	05-03248-00	05-03248-00	05-03248-00
15	Diaphragm Stud	Steel	05-05480-00	05-05480-00	05-05481-00	05-05481-00	05-05481-00	05-05481-00	05-05486-00
16	Base	Steel	(w/Body)	(w/Body)	(w/Body)	(w/Body)	(w/Body)	(w/Body)	(w/Body)
17	*Pressure Plate	Cast Iron	04-03695-00	04-03695-00	04-03579-00	04-03580-00	04-03582-00	04-03581-00	05-03584-01
18	Diaphragm Nut	Steel	05-02848-00	05-02848-00	05-02852-00	05-02852-00	05-02852-00	05-02852-00	05-02857-00
19	Hood	Steel	04-02570-00	04-02570-00	04-02574-00	04-02575-00	04-02578-00	04-02579-00	04-02582-00
20	*Diaphragm	Stainless Steel	04-01629-01	04-01629-01	04-01662-00	04-01632-00	04-01664-00	04-01635-00	04-01638-00
	Repair Kit		24140	24141	24142	24144	24146	24148	24150

## CAST STEEL PARTS LIST – 2-1/2" to 8"

ITEM NO.	PART NAME	MATERIAL	VALVE SIZE					
			2 1/2	3	4	5	6	8
1	Stud NPT, 150, 300	Steel	05-05510-00	05-05509-00	05-05509-00	05-05511-00	05-05519-00	05-05519-00
	Stud 600	Steel	05-05478-00	05-05478-00	05-05485-00	05-05475-00	05-05475-00	05-05476-00
2	Nut NPT, 150, 300	Steel	05-02861-00	05-02857-00	05-02857-00	05-02861-00	05-02861-00	05-02861-00
	Nut 600	Steel	05-02861-00	05-02861-00	05-02863-00	05-02865-00	05-02865-00	05-02865-00
3	Blind Flange NPT, 150, 300	Steel	04-02184-00	04-02201-00	04-02204-00	04-02207-00	04-02209-00	04-02211-00
	Blind Flange 600	Steel	04-02200-00	04-02202-00	04-02205-00	04-02208-00	04-02210-00	04-02212-00
4	*Gasket NPT,150,300	Non-Asbestos	05-16173-00	05-16174-00	05-16175-00	05-16176-00	05-16178-00	05-16179-00
	*Gasket 600	Non-Asbestos	05-14952-00	05-14953-00	05-14954-00	05-14955-00	05-14956-00	05-14957-00
5	*Stem Nut	Steel	05-02972-00	05-02973-00	05-02974-00	05-02975-00	05-02976-00	05-02977-00
6	Muffler Plate	Cast Iron	04-03515-00	04-03516-00	04-03518-00	04-03519-00	04-03520-00	04-03524-00
7	*Disc	Stainless Steel	04-01906-01	04-01918-00	05-01931-00	04-01938-00	04-01995-00	04-01691-00
8	*Seat Ring	Stainless Steel	04-11539-00	04-11484-00	04-11565-00	04-11700-01	04-15142-00	04-15144-00
9	Pipe Plug 1/4	Steel	04-03772-00	04-03772-00	04-03772-00	04-03772-00	04-03772-00	04-03772-00
10	PipePlug 1/8	Steel	04-03769-00	04-03769-00	04-03769-00	04-03769-00	04-03769-00	04-03769-00
11	*Stem	Stainless Steel	04-05260-01	04-05279-01	04-05282-02	04-05285-01	04-05288-01	04-05292-01
12	Body 150	Steel	04-00695-00	04-00698-00	04-00704-00	04-00708-01	04-00712-00	04-00715-00
	Body 300	Steel	04-00696-00	04-00699-00	04-00705-00	04-00709-01	04-00713-00	04-00716-00
	Body 600	Steel	04-00697-00	04-00700-00	04-00706-00	04-00711-01	04-00735-00	04-00718-00
13	*Spring	Steel	05-08257-02	05-09112-02	05-09114-02	05-09115-02	05-09116-01	05-09118-01
14	*Dowel Pin	Stainless Steel	05-03252-00	05-03254-00	05-03254-00	05-03258-00	05-03258-00	05-03261-00
15	Diaphragm Stud	Steel	05-05486-00	05-05486-00	05-05487-00	05-05487-00	05-05483-00	05-05483-00
16	Base	Steel	04-00488-00	04-00487-00	04-00490-00	04-00495-00	04-00496-00	04-00491-00
17	*Pressure Plate	Cast Iron	04-03583-00	04-03585-01	04-03587-00	05-03588-01	04-03589-02	04-03591-00
18	Diaphragm Nut	Steel	05-02857-00	05-02857-00	05-02857-00	05-02857-00	05-02861-00	05-02861-00
19	Hood	Steel	04-02646-00	04-02586-00	04-02589-00	04-02592-00	04-02594-00	04-02596-00
20	*Diaphragm	Stainless Steel	04-01641-00	05-02038-00	05-01647-00	05-01649-00	05-01651-00	05-01653-00
	Repair Kit		24152	24158	24155	—	24157	—

### DIAPHRAGM TABLE

Initial Pressure PSIG	Number of Diaphragms per Set
10 – 250	2
251 – 400	3
401 – 600	4

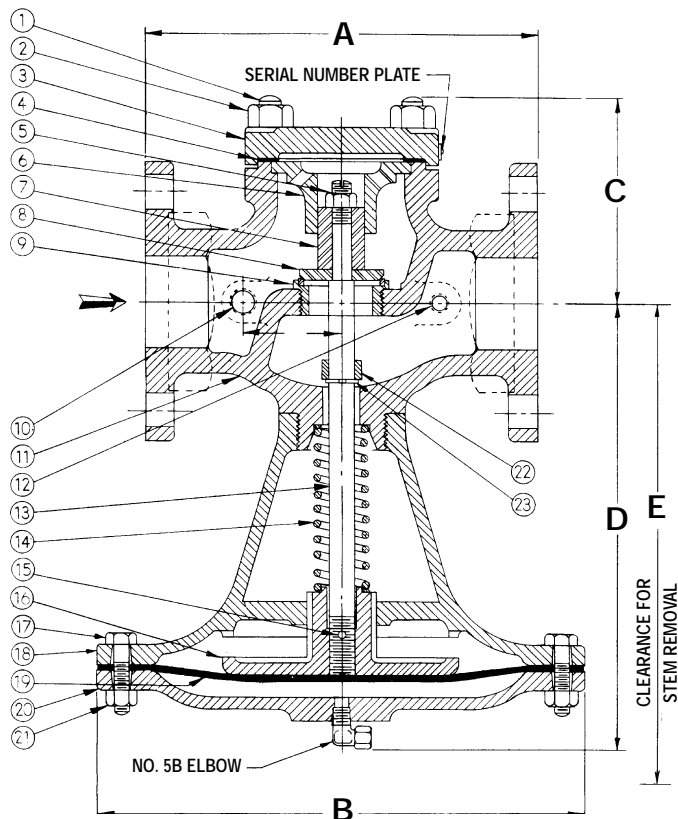


A division of CIRCOR International, Inc.

# Technical Data

SD 3002A

SPENCE ENGINEERING COMPANY, INC. 150 COLDENHAM ROAD, WALDEN, NY 12586-2035



TYPE E2 MAIN VALVE

## TYPE E2 Main Valve Sizes 3/4" through 12"

The Spence Type E2 Main Valve is of normally closed, single seat design featuring packless construction, Hycar diaphragm and protected main spring.

When controlled by one or more of the various types of Spence Pilots, this valve will accomplish most functions required of a regulator.

### CAST IRON RATINGS (Maximum Inlet Conditions)

Valve Ends Pressure (Temperature)

□ ANSI NPT Screwed ...15 PSIG .....(250°F)

□ ANSI 125 Flanged.....15 PSIG .....(250°F)

### CAST BRONZE RATINGS (Maximum Inlet Conditions)

Valve Ends Pressure (Temperature)

□ ANSI NPT Screwed ...15 PSIG .....(250°F)

### DIMENSIONS (inches), WEIGHTS (pounds) AND RATED FLOW COEFFICIENTS (Cv)

SIZE	A		OTHER DIMENSIONS				APPROX. WT.		Cv
	CI, BRZ	CI					CI, BRZ	CI	
	ANSI NPT	ANSI 125	B	C	D	E	ANSI NPT	ANSI 125	
3/4	4 3/4	—	8	2 7/8	7 3/4	11 1/2	18	—	7.6
1	5 3/8	5 1/2	8	3 5/8	8 1/8	12 1/2	19	21	11.7
1 1/4	6 1/2	6 3/4	9	4 1/8	8 1/4	12 1/2	30	33	18.9
1 1/2	7 1/4	6 7/8	9 3/4	4 3/8	8 3/4	13 1/4	36	40	27.4
2	7 1/2	8 1/2	10 1/2	5 1/4	10	15 1/4	50	57	44
2 1/2	—	9 3/8	10 1/2	5 3/4	11 1/2	17 3/4	—	70	68
3	—	10	11 1/4	6 5/8	12 3/4	19 3/4	—	98	96
4	—	11 7/8	13 1/2	6 3/4	13 5/8	21 1/4	—	135	143
5	—	13 5/8	14 1/4	7 1/2	15	23	—	185	202
6	—	15 1/8	16	7 7/8	16 5/8	26	—	250	255
8	—	19	20	9 1/2	19 7/8	30 1/2	—	415	465
10	—	23 5/8	24	10 7/8	23 7/8	38 1/2	—	690	748
12	—	26 1/2	28	12 3/4	27 1/8	44 1/4	—	1060	1118

## OPERATING PRINCIPLE

The regulator is operated by initial steam or fluid pressure. It is normally closed, being held so by initial pressure on the disc and by an internal main spring. When the pilot is opened (see pilot instructions), initial pressure flows through the pilot to the 8B tee. Bleedport 4A restricts the flow and pressure builds under the diaphragm and opens the main valve.

Delivery pressure feeds back through the control pipe to the pilot diaphragm. As this pressure approaches a balance with the thrust of the adjusting spring, the pilot throttles the loading pressure. In turn, the main valve takes a position established by the loading pressure where just enough steam flows to maintain the set delivery pressure.

## RECOMMENDED INSTALLATION

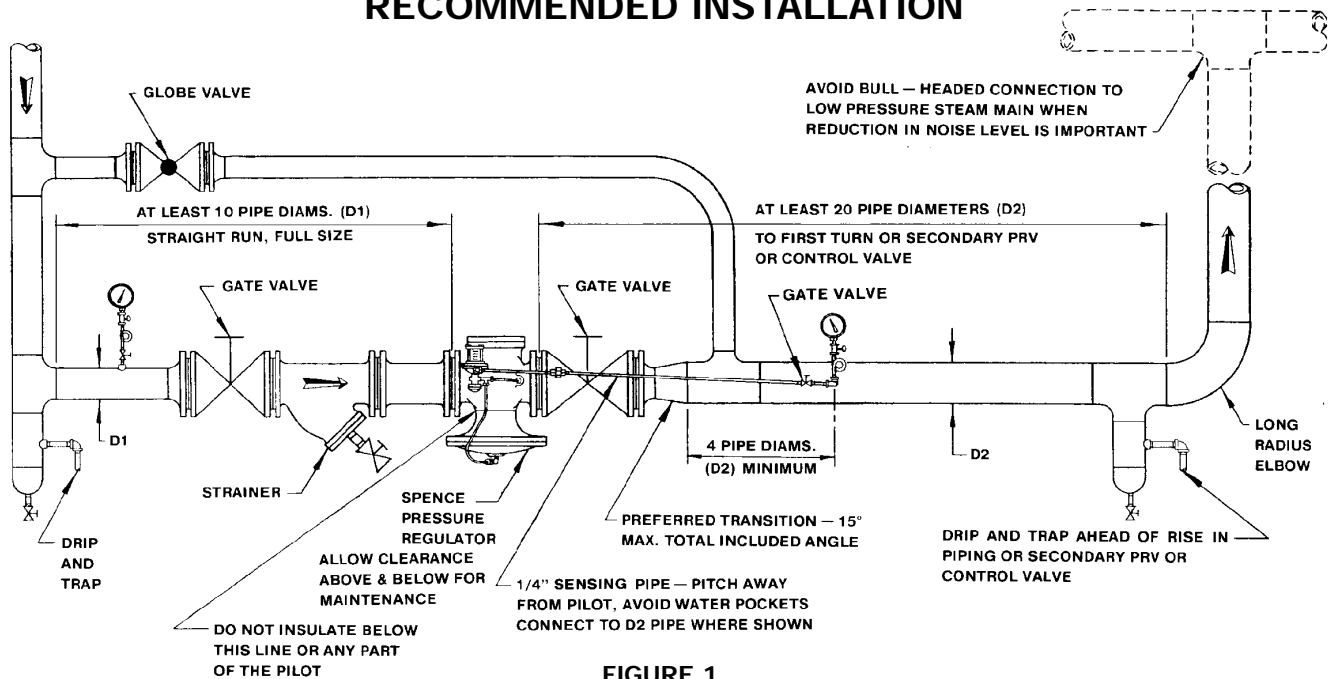


FIGURE 1

## INSTALLATION

### PLANNING

Locate the valve in a straight run of horizontal pipe. Allow headroom above the valve for access through the blind flange. Provide clearance for stem withdrawal underneath. Prevent water hammer and erratic operation by installing traps to provide proper drainage before and after the valve and before secondary PRV or control valve. Avoid damaging effects of scale and dirt in pipe lines by using a strainer as shown in Figure 1. Provide a 3-valve by-pass to facilitate inspection without interrupting service.

To eliminate excessive noise and erratic regulation with steam and other compressible fluids, enlarge the delivery pipe size to effect a reasonable flow velocity at the reduced pressure. A tapered transition is recommended. If possible, avoid a sharp turn close to the regulator outlet and a bull-headed tee connection to the low pressure main.

Install initial and delivery pressure gages to indicate performance. If the pressure rating of the delivery system or connected equipment is less than the initial steam pressure, provide a safety valve.

### MAIN VALVE

Flush the piping system thoroughly to clear it of welding beads, scale, sand, etc. Mount the main valve with diaphragm chamber down and arrow on body pointing in the direction of flow. Screwed end valves should be mounted in unions.

### PILOT

Mount the pilot on either side of the main valve by means of 1/4 inch nipple and union provided. Make this connection the 1/4 inch pipe tap at the inlet of the main valve as shown in Figure 2.

Screw No. 4A bleedport fitting into the 1/8 inch pipe tap at the outlet of the main valve body. Note bleed orifice in this fitting – vital to operation of regulator.

Screw No. 8B tee into 1/8 inch pipe tap in pilot. Select tap facing downstream.

Screw No. 5B elbow into 1/8 inch pipe tap on underside of main valve diaphragm chamber.

Connect tubing bends as illustrated in Fig. 2.

### CONTROL PIPE (if required)

Use 1/4 inch pipe for this line which connects the pilot diaphragm chamber to the desired point of pressure control. Take the control at a point of minimum turbulence. Avoid control immediately at the valve outlet or after a turn. When the delivery pipe expands in size, select a spot at least 4 pipe diameters beyond the point of enlargement. Pitch away from pilot to avoid erratic operation and excessive fouling. Eliminate water pockets. Locate delivery pressure gage in control pipe to show pressure actually reaching pilot diaphragm.

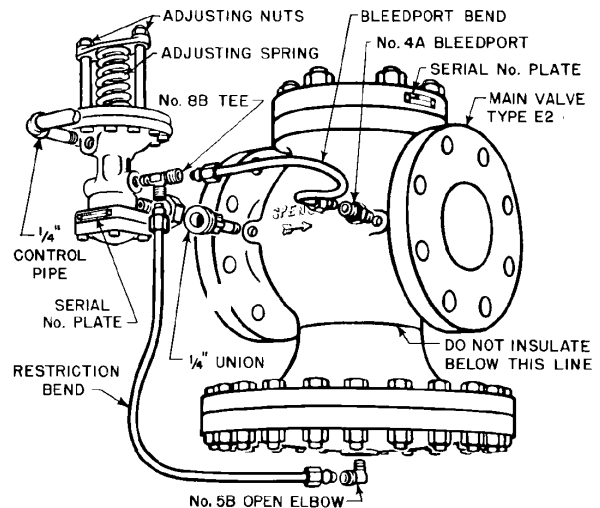


FIGURE 2



## MAINTENANCE

### INSPECTION

Under normal conditions, complete dismantling at regular intervals is not recommended. A valve kept relatively free of dirt will function for years with minimum attention.

After the first few days of operation and twice a year, the following should be checked.

1. Inspect for dirt collected at bleedport No. 4A.
2. Inspect all joints for leakage. Keep bolts tight. Never allow a leak to persist.

### DISMANTLING MAIN VALVE

Connect a source of air or water pressure which can be adjusted by hand to the No. 5B elbow. Apply pressure to jack valve open and prevent stem from turning while removing stem nuts. Usually 30 psi will suffice. Use penetrating oil on the threads.

### REPLACING SEAT RINGS

These joints should be made up with Copaltite, Permatex or equal high temperature gasket compound. Remove old compound from body and seat ring with a wire brush. Apply new compound sparingly to both parts, threads and shoulders. Let stand until tacky before assembling.

### GRINDING IN

Seats and discs should never require more than the lightest touch up with very fine (400 grit) grinding compound. Heavy grinding will produce galling, wider seating surface and a groove in the disc, all of which tend to cause leakage. Reface a damaged surface before attempting to grind it in. Grind sparingly.

Main stem (13) is slotted for rotation with a screwdriver. Valve spring (14) is omitted from the assembly during grinding. Slip the stem into its normal position. Apply compound to the disc, place it on the stem and guide plug, tighten with stem nut.

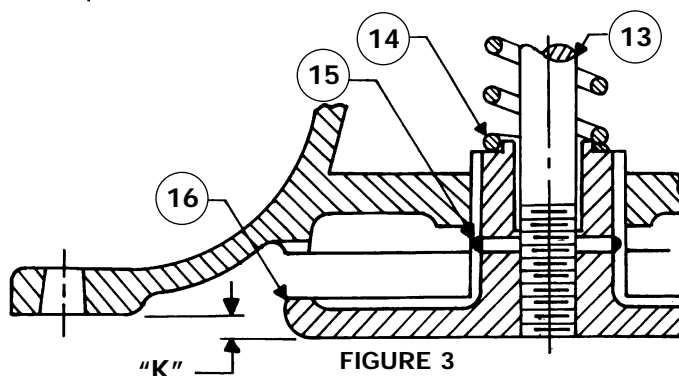
After grinding, disassemble and clean all parts.

VALVE SIZE	TYPE E2	
	HOOD (K)	TOTAL
3/4	1/8	1/4
1	3/16	5/16
1-1/4	7/32	3/8
1-1/2	1/4	7/16
2	9/32	9/16
2-1/2	11/32	11/16
3	13/32	13/16
4	15/32	15/16
5	17/32	1-1/16
6	19/32	1-3/16
8	25/32	1-9/16
10	31/32	1-15/16
12	1-5/32	2-5/16

### VALVE SETTING

Valve setting is gaged at K to establish correct stem length and diaphragm position. Dimension K is supplied with each replacement stem.

To install new stem (13), fasten disc (8) and guide plug firmly on stem with stem nut. Insert stem and disc assembly in valve and screw on pressure plate (16). Omit spring (14) for this operation. Hold disc on seat and adjust position of pressure plate until valve setting K is reached. Push pressure plate against stops in base (18). Remove disc, drop out pressure plate and stem, drill and insert dowel pin (15) to lock the joint. Grind off stem projection flush with face of pressure plate.



## START-UP AND SETTING

On pressure reducing valves like the E2D, use by-pass to fill the delivery system and raise pressure to slightly below normal required. Close pilot by releasing compression on adjusting spring. See Figure 2. Open 1/4" control pipe valve. Crack outlet stop valve. Crack inlet stop valve. Blow down strainer. **Caution: Never open a reducing valve without positive indication that the high side is clear of condensate.**

Open inlet stop valve and gradually compress adjusting spring until the valve opens and takes control at desired pressure. Alternately choke down on the by-pass and open outlet stop valve until the regulator is on the line. See individual instructions for other pilots.

## TROUBLE SHOOTING

### FAILURE TO OPEN OR SAGGING DELIVERY PRESSURE

1. Adjusting spring on pilot may have been tampered with.
2. Initial pressure may be down due to partially closed supply valve, clogged strainer or other obstruction.
3. No. 4A bleedport fitting may have been omitted and an open coupling substituted.
4. Control pipe may be plugged. Most likely points of obstruction are at shutoff valve and entrance to delivery main.
5. Main diaphragm may be broken. Test with air or water before dismantling.

### FAILURE TO CLOSE OR OVER-RIDING DELIVERY PRESSURE

1. Adjusting spring on pilot may have been tampered with.
2. Orifice in bleedport No. 4A may be plugged.

3. By-pass valve may be leaking.

4. On pressure regulators like the E2D, the main valve or pilot may be held open by foreign matter in seat. To determine which valve leaks, first close inlet stop valve and 1/4" control pipe valve. Then remove bleedport bend so pilot will exhaust to atmosphere. Crack inlet stop valve. Steam will issue from No. 8B tee. Release compression on adjusting spring to see if pilot closes tight. Open and close several times to wash seat. Steam blowing back from bleedport means main valve disc is held open by foreign matter. Steam may wash the obstruction from the seat if the valve is made to open wide. This can be accomplished, even at light loads, if the control point is beyond the outlet stop valve. Reassemble bleedport bend and place regulator in operation. Then, slowly open and close outlet stop valve.

## CAST IRON & BRONZE PARTS LIST – 3/4" to 3"

ITEM NO.	PART NAME	MATERIAL	VALVE SIZE						
			3/4	1	1 1/4	1 1/2	2	2 1/2	3
1	Blind Flange Stud	Steel	04-05516-00	04-10118-00	04-05442-00	04-05443-00	04-10119-00	04-10119-00	04-05443-00
2	Blind Flange Nut	Steel	05-02847-00	05-02851-00	05-02854-00	05-02856-00	05-02860-00	04-02860-00	05-02856-00
3	Blind Flange	Cast Iron	04-02171-00	04-02173-00	04-02176-00	04-02178-00	04-02180-00	04-02185-00	04-02157-00
	Blind Flange	Bronze	04-02172-00	04-02174-00	04-02177-00	04-02179-00	04-02181-00	—	—
4	*Gasket	Non-Asbestos	05-02381-00	05-02362-00	05-02382-00	05-02365-00	05-02366-00	05-02367-00	05-02369-00
5	*Stem Nut	Steel	05-02969-00	05-02970-00	05-02970-00	05-02971-00	05-02971-00	05-02972-00	05-02973-00
6	Disc Guide Plate	Cast Iron	04-03576-00	04-03479-00	04-03480-00	04-03478-00	04-03500-00	04-03509-00	04-03496-00
7	Guide Plug	Stainless Steel	—	—	—	04-03751-01	04-03750-00	04-03754-00	04-03755-00
8	*Integral Disc	Stainless Steel	04-01813-02	04-01832-02	04-01850-02	04-01870-02	04-01888-02	04-01906-01	04-01918-00
9	*Seat Ring	Stainless Steel	04-04075-01	04-04084-01	04-04092-01	04-04496-01	04-11593-00	04-11549-00	04-11549-00
10	Pipe Plug 1/4"	Steel	04-03772-00	04-03772-00	04-03772-00	04-03772-00	04-03772-00	04-03772-00	04-03772-00
	Pipe Plug 1/4"	Brass	04-03771-00	04-03771-00	04-03771-00	04-03771-00	04-03771-00	—	—
11	NPT Body	Cast Iron	04-00868-00	04-00869-01	04-00871-01	04-00873-01	04-00875-01	—	—
	NPT Body	Bronze	04-08279-00	04-06932-00	04-09762-00	04-08749-00	04-01568-00	—	—
	125 Body	Cast Iron	—	04-08176-00	04-09964-00	04-09965-00	04-00877-00	04-00879-00	04-00881-00
12	Pipe Plug 1/8"	Steel	04-03769-00	04-03769-00	04-03769-00	04-03769-00	04-03769-00	04-03769-00	04-03769-00
	Pipe Plug 1/8"	Brass	04-03770-00	04-03770-00	04-03770-00	04-03770-00	04-03770-00	—	—
13	*Stem	Stainless Steel	08-08765-00	08-08766-00	08-08766-00	08-08767-00	08-08768-00	08-08769-00	08-08770-00
14	*Main Spring	Steel	05-05093-01	05-05093-01	05-05094-01	05-05095-01	05-05096-01	05-05097-01	05-05098-01
15	*Groove Pin	Steel	05-03247-00	05-03247-00	05-03247-00	05-03251-00	05-03251-00	05-03253-00	05-03255-00
16	*Pressure Plate	Cast Iron	04-03621-00	04-03700-00	04-03622-00	04-03623-01	04-03624-00	04-03625-00	04-03626-00
17	Diaphragm Bolt	Steel	05-04770-00	05-04770-00	05-04773-00	05-04773-00	05-04773-00	04-04773-00	05-04774-00
18	Base	Cast Iron	04-00501-00	04-00501-00	04-00509-00	04-00502-00	04-00505-00	04-00506-00	04-00604-00
19	*Diaphragm	Hycar	05-01668-00	05-01668-00	05-01669-00	05-01670-00	05-01671-00	05-01672-00	05-01673-00
20	Hood	Cast Iron	04-02571-00	04-02571-00	04-02605-00	04-02606-00	04-02607-00	04-02608-00	04-02648-00
21	Diaphragm Nut	Steel	05-02872-00	05-02872-00	05-02874-00	05-02874-00	05-02874-00	05-02874-00	05-02874-00
22	Stem Washer	Stainless Steel	04-06130-00	04-06131-00	04-10048-00	04-06132-00	04-06247-00	04-06248-00	04-06249-00
23	Retaining Ring	Stainless Steel	05-09382-00	05-09383-00	05-09383-00	05-09384-00	05-09392-00	05-09385-00	05-09386-00
24	Top Flange	Cast Iron	04-02246-00	04-02248-00	04-02250-00	04-02252-00	04-02233-00	04-02259-00	04-02261-00
	Repair Kit		08-07940-00	08-07941-00	08-07942-00	08-07943-00	08-07944-01	08-07945-01	08-07946-01

## CAST IRON & BRONZE PARTS LIST – 4" to 12"

ITEM NO.	PART NAME	MATERIAL	VALVE SIZE					
			4	5	6	8	10	12
1	Blind Flange Stud	Steel	04-05443-00	04-10119-00	04-10120-00	04-10120-00	04-10120-00	04-05455-00
2	Blind Flange Nut	Steel	05-02856-00	05-02860-00	05-02860-00	05-02860-00	05-02860-00	05-02864-00
3	Blind Flange	Cast Iron	04-02157-00	04-02158-00	04-02162-00	04-02165-00	04-02167-00	04-02169-00
4	*Gasket	Non-Asbestos	05-02369-00	05-02371-00	05-02397-00	05-02374-00	05-02375-00	04-02398-00
5	*Stem Nut	Steel	05-02973-00	05-02947-00	05-02975-00	05-03044-00	05-03045-00	05-02977-00
6	Disk Guide Plate	Cast Iron	04-03496-00	04-03504-00	04-03473-00	05-03474-00	05-03497-00	05-03475-00
7	Guide Plug	Stainless Steel	04-03756-00	04-03757-00	04-03742-00	04-03743-00	04-03744-00	04-03745-00
8	*Integral Disc	Stainless Steel	04-01922-00	04-01931-00	04-01940-00	04-01995-00	04-01951-00	04-01700-00
9	*Seat Ring	Stainless Steel	04-11759-00	04-11666-00	04-15802-00	07-43794-00	07-43795-00	07-40509-00
10	Pipe Plug 1/4"	Steel	04-03772-00	04-03772-00	04-03772-00	04-03772-00	04-03772-00	04-03772-00
11	125 Body	Cast Iron	04-00883-00	04-00884-01	04-00885-01	04-00887-01	04-00888-01	04-00726-00
12	Pipe Plug 1/8"	Steel	04-03769-00	04-03769-00	04-03769-00	04-03769-00	04-03769-00	04-03769-00
13	*Stem	Stainless Steel	08-08771-00	08-08772-00	08-08773-00	08-08774-00	08-08775-00	08-08776-00
14	*Main Spring	Steel	05-05099-01	05-05100-01	05-05101-01	05-05102-01	05-05103-01	05-05104-01
15	*Groove Pin	Steel	05-03256-00	05-03257-00	05-03259-00	05-03260-00	05-03262-00	05-03262-00
16	*Pressure Plate	Cast Iron	04-03627-00	04-03628-01	04-03629-00	04-03630-00	04-03631-00	04-03632-00
17	Diaphragm Bolt	Steel	05-04774-00	05-04775-00	05-04780-00	05-04780-00	05-04782-00	05-04787-00
18	Base	Cast Iron	04-00507-00	04-00510-01	04-00511-00	04-00514-00	04-00512-01	04-00513-01
19	*Diaphragm	Hycar	05-01674-00	05-01675-00	05-01676-00	05-01677-00	04-01678-00	04-01679-00
20	Hood	Cast Iron	04-02609-00	04-02618-00	04-02610-00	04-02611-00	04-02612-00	04-02614-00
21	Diaphragm Nut	Steel	05-02874-00	05-02874-00	05-02877-00	05-02877-00	05-02877-00	05-02881-00
22	Stem Washer	Stainless Steel	04-06249-00	04-06270-00	04-06250-00	04-06251-00	04-06271-00	04-06272-00
23	Retaining Ring	Stainless Steel	05-09386-00	05-09387-00	05-09388-00	05-09389-00	05-09390-00	05-09391-00
24	Top Flange	Cast Iron	04-02261-00	04-02263-00	04-02268-00	04-02266-00	—	—
	Repair Kit		08-09587-01	08-10980-00	08-10995-00			

\*These parts furnished in Repair Kit

**When ordering parts, it is essential that the valve type, size, service and serial number be stated.**

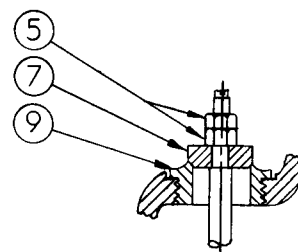
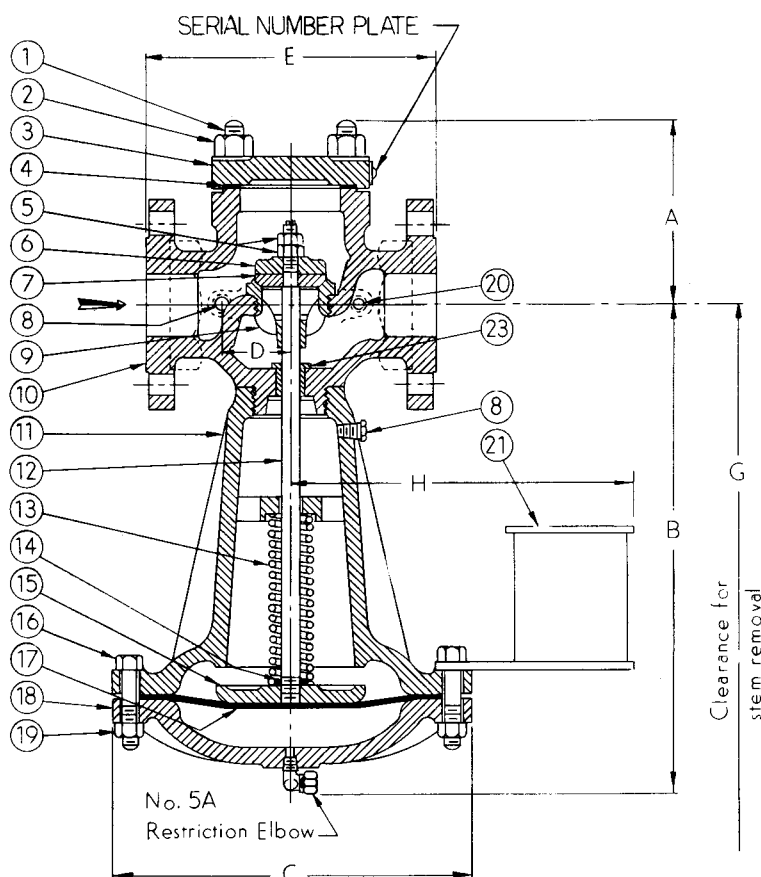
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**Specify complete part number when ordering.**

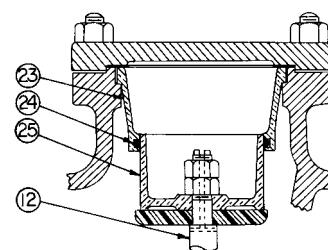


**SPENCE ENGINEERING  
COMPANY**  
Walden, NY 12586

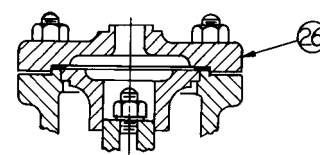
## Parts List TYPE E6 MAIN VALVE



Inner Valve Assembly  
Sizes 3/8" - 1 1/2" Port Inclusive



Internal Balanced



Integral Mounted  
Blind Flange

### DIMENSIONS AND WEIGHTS

Size	Dimensions, Inches										Approx. Shipping Weights		
	E			A	B		C	D	G	H	C.I.		
	C.I.				125 lb.	Scr. 250 lb.					Scr. Ends	125 lb.	250 lb.
	Scr. Ends	125 lb.	250 lb.										
3/4	4 3/4			2 7/8	11 1/4	11 1/4	6 7/8	1 5/16	15 5/8	6 1/4	22		
1	5 3/8	5 1/2	6	3 5/8	11 5/8	11 5/8	6 7/8	1 7/16	16 5/8	6 1/4	23		28
1 1/4	6 1/2	6 3/4	7 1/4	4 1/8	13 1/2	13 1/2	9 1/8	1 13/16	20 1/4	7 3/8	49		54
1 1/2	7 1/4	6 7/8	7 3/8	4 3/8	13 5/8	13 5/8	9 1/8	1 15/16	20 7/8	7 3/8	50		60
2	7 1/2	8 1/2	9	5 1/4	16 1/4	16 1/4	11 1/8	2 1/8	23 3/8	8 3/8	80	86	97
2 1/2		9 3/8	10	5 3/4	16 1/2	16 1/2	11 1/8	2 3/8	25 3/8	8 3/8		97	113
3		10	10 3/4	6 5/8	19 1/4	19 1/4	13 1/2	2 3/4	28 5/8	9 1/2		148	170
3 1/2		10 3/4	11 1/2	6 7/8	19 3/4	19 3/4	13 1/2	3 11/4	30 3/4	9 1/2		164	186
4		11 7/8	12 1/2	7 5/8	18 3/8	23 3/8	13 1/2	3 1/2	33 1/2	11 3/4		199	293
5		13 5/8	14 1/2	8 1/2	18 3/4	23 3/4	13 1/2	3 1/2	35 1/2	11 3/4		240	348
6		15 1/8	16	10	23 1/2	27 3/8	16 3/4	4	39 1/4	13 1/2		348	529
8		19	20	11 1/2	23 3/4	29 5/8	16 3/4	6 1/4	40	13 1/2		508	721
10		23 5/8	25	13 3/4	30 3/4	35 3/8	20	6	48 3/4	19 1/2		1017	1257
12		26 1/2	28	15 7/8	39 3/4	39 3/4	24 3/4	8 1/2	56 3/4	21 7/8		1820	1907

When ordering parts it is essential that the valve type, size, service and serial number be stated.

Select parts by item number but order by part number.

*Numbers in Table are Part Numbers*

Item No.	Part Name	Mat'l	VALVE SIZE (inches)													
			3/4	1	1½	1¾	2	2½	3	3½	4	5	6	8	10	12
1	Blind Flange Stud - 125 lb.	Steel	—	4-10118-0	4-05442-0	4-05443-0	4-10119-0	4-10119-0	4-05443-0	4-05443-0	4-10119-0	4-10120-0	4-10120-0	4-10120-0	4-05453-0	4-05451-0
	Blind Flange Stud - 250 lb.	Steel	4-05516-0	4-10118-0	4-05442-0	4-05443-0	4-10119-0	4-05447-0	4-10119-0	4-05445-0	4-05447-0	4-05448-0	4-05449-0	4-05455-0	4-05451-0	4-05451-0
2	Blind Flange Nut - 125 lb.	Steel	—	5-02851-0	5-02854-0	5-02856-0	5-02860-0	5-02860-0	5-02856-0	5-02856-0	5-02860-0	5-02860-0	4-02860-0	5-02860-0	5-02860-0	5-02864-0
	Blind Flange Nut - 250 lb.	Steel	5-02847-0	5-02851-0	5-02854-0	5-02856-0	5-02860-0	5-02862-0	5-02860-0	5-02860-0	5-02862-0	5-02862-0	5-02862-0	5-02862-0	5-02864-0	5-02864-0
3	Blind Flange - 125 lb.	C I	—	4-02173-0	4-02176-0	4-02178-0	4-02180-0	4-02185-0	4-02157-0	4-02157-0	4-02158-0	4-02160-0	4-02165-0	4-02167-0	4-02294-0	4-02168-0
	Blind Flange - 250 lb.	C I	4-02171-0	4-02173-0	4-02176-0	4-02178-0	4-02180-0	4-02183-0	4-02186-0	4-02186-0	4-02159-0	4-02161-0	4-02163-0	4-02166-0	4-02164-0	4-02168-0
	Blind Flange - 250 lb.	Bz	4-02172-0	4-02174-0	4-02177-0	4-02179-0	4-02181-0	—	—	—	—	—	—	—	—	—
4	Blind Flg. Gasket <sup>1</sup>	A <sup>4</sup>	5-02381-0	5-02362-0	5-02382-0	5-02365-0	5-02366-0	5-02367-0	5-02369-0	5-02369-0	5-02371-0	5-02372-0	5-02374-0	5-02375-0	4-02376-0	4-02377-0
5	Stem Nut - "F" Port	Steel	5-02969-0	5-02970-0	5-02970-0	5-02971-0	5-02971-0	5-02971-0	5-02973-0	5-02973-0	5-02974-0	5-02975-0	4-02976-0	4-02977-0	4-02977-0	4-02978-0
6	Muffling Plate - "F" Port	C I	—	—	—	—	4-03550-1	4-03515-0	4-03516-0	4-03517-0	4-03518-0	4-03519-0	4-03520-0	4-03524-0	4-03538-0	4-03539-0
7	Integral Disc - "F" Port	SS	4-01813-2	4-01832-2	4-01850-2	4-01870-2	4-01888-2	4-01906-1	4-01918-0	4-01922-0	4-01931-0	4-01938-0	4-01995-0	4-01691-0	4-01953-0	4-01957-0
		Stell. <sup>5</sup>	4-01814-2	4-01833-2	4-01851-3	4-01871-2	4-01889-2	4-01907-0	4-01919-0	4-05733-0	4-01932-0	4-01939-0	4-01996-0	4-07707-0	4-08268-0	4-08269-0
8	Pipe Plug - 1/4" NPT	Steel	4-03772-0	4-03772-0	4-03772-0	4-03772-0	4-03772-0	4-03772-0	4-03772-0	4-03772-0	4-03772-0	4-03772-0	4-03772-0	4-03772-0	4-03772-0	4-03772-0
9	Seat Ring - "F" Port	SS <sup>3</sup>	4-04075-1	4-04084-1	4-04092-1	4-04496-1	7-40405-5	7-40412-0	7-40422-0	7-40510-0	7-40441-0	7-40450-1	7-40470-0	7-40483-0	7-44463-0	7-44465-0
		Stell.	4-04076-1	4-04085-1	4-04093-1	4-04497-1	7-40404-1	7-40410-0	7-40423-0	7-40440-0	7-40449-0	7-40458-0	7-40469-0	7-40482-0	@-04464-0	@-04466-0
10	Body	250 lb. Scr. <sup>2</sup>	C I	4-00639-0	4-00640-0	4-00643-0	4-00646-0	4-00649-0	—	—	—	—	—	—	—	—
		125 lb. Flg.	C I	—	4-00641-0	4-00644-0	4-00647-0	4-00650-0	4-00653-0	4-00655-0	4-00657-0	4-00659-1	4-00661-1	4-00662-0	4-00665-0	4-01273-0
		250 lb. Flg.	C I	—	4-00642-0	4-00645-0	4-00648-0	4-00651-0	4-00652-0	4-00654-0	4-00656-0	4-00658-1	4-00660-1	4-00663-0	4-00664-0	4-00666-0
11	Base	125 lb.	C I	—	4-00546-0	4-00518-0	4-00518-0	4-00521-0	4-00548-0	4-00520-0	4-00549-0	4-00515-0	4-00519-1	4-00519-1	4-00516-1	4-00524-2
		250 lb.	CI	4-00546-0	4-00546-0	4-00518-0	4-00518-0	4-00521-0	4-00548-0	4-00520-0	4-00549-0	4-00522-1	4-00522-1	4-00523-0	4-00523-0	4-00517-1
12	Stem	125 lb.	SS	—	4-05242-1	4-05246-1	4-05383-1	4-05265-1	4-05391-1	4-05382-1	4-05389-1	4-05281-0	4-05287-1	4-05374-0	4-05290-0	4-05296-0
		250 lb.	SS	4-05232-1	4-05242-1	4-05246-1	4-05383-1	4-05265-1	4-05391-1	4-05382-1	4-05389-1	4-05384-1	4-05386-1	4-05385-1	4-05388-1	4-05277-0
		Int'l Bal. <sup>6</sup>	SS	4-05643-0	4-11180-0	4-05645-0	4-03132-0	4-05647-0	4-11182-0	4-07194-0	4-11181-0	4-08233-0	4-05831-0	4-10709-0	4-07564-0	—
13	Main Spring <sup>1</sup>	Steel	5-05072-1	5-05072-1	5-05071-1	5-05071-1	5-05073-1	5-05073-1	5-05047-0	5-05047-0	5-05047-0	5-05062-0	5-05062-0	5-05039-0	5-05039-0	5-05079-0
14	Groove Pin	Steel	5-03245-0	5-03245-0	5-03248-0	5-03248-0	5-03249-0	5-03252-0	5-03253-0	5-03253-0	5-03255-0	5-04686-0	5-03258-0	5-03302-0	5-03261-0	5-03263-0
15	Pressure Plate	C I	4-03697-0	4-03680-0	4-03698-0	4-03688-0	4-03673-0	4-03633-0	4-03681-0	4-03681-0	4-03681-0	4-03689-0	4-03683-0	4-03685-0	4-03682-0	4-03611-0
16	Diaphragm Bolt	125 lb.	Steel	—	5-04774-0	5-04780-0	5-04780-0	5-04780-0	5-04780-0	5-04785-0	5-04785-0	5-04786-0	5-04786-0	5-04787-0	5-04794-0	5-04798-0
		250 lb.	Steel	5-04774-0	5-04774-0	5-04780-0	5-04780-0	5-04780-0	5-04780-0	5-04785-0	5-04785-0	5-04787-0	5-04787-0	5-04791-0	5-04791-0	5-04798-0
17	Diaphragm <sup>1</sup>	Hycar	5-01600-0	5-01600-0	5-01601-0	5-01601-0	5-01602-0	5-01602-0	5-01603-0	5-01603-0	5-01604-0	5-01604-0	5-01605-0	5-01605-0	5-01606-0	5-01607-0
18	Hood	125 lb.	C I	—	4-02630-0	4-02629-0	4-02629-0	4-02638-0	4-02638-0	4-02634-0	4-02634-0	4-02626-0	4-02626-0	4-02626-0	4-02627-0	4-02661-0
		250 lb.	C I	4-02630-0	4-02630-0	4-02629-0	4-02629-0	4-02638-0	4-02638-0	4-02634-0	4-02634-0	4-02633-0	4-02633-0	4-02632-0	4-02632-0	4-02637-0
19	Diaphragm Nut	125 lb.	Steel	—	5-02874-0	5-02877-0	5-02877-0	5-02877-0	5-02877-0	5-02881-0	5-02881-0	5-02881-0	5-02881-0	5-02881-0	5-02881-0	5-02883-0
		250 lb.	Steel	5-02874-0	5-02874-0	5-02877-0	5-02877-0	5-02877-0	5-02877-0	5-02881-0	5-02881-0	5-02881-0	5-02881-0	5-02881-0	5-02881-0	5-02883-0
20	Pipe Plug - 1/8" NPT	Steel	4-03769-0	4-03769-0	4-03769-0	4-03769-0	4-03769-0	4-03769-0	4-03769-0	4-03769-0	4-03769-0	4-03769-0	4-03769-0	4-03769-0	4-03769-0	4-03769-0
21	Cond. Chamber	125 lb.	Steel	—	8-02154-0	8-02157-0	8-02157-0	8-02160-0	8-02160-0	8-02165-0	8-02165-0	8-02165-0	8-02165-0	8-02167-0	8-02175-0	8-02177-0
		250 lb.	Steel	—	—	8-02157-0	8-02157-0	8-02160-0	8-02160-0	8-02165-0	8-02165-0	8-02165-0	8-02168-0	8-02168-0	8-02175-0	8-02177-0
22	Stem Bushing	Steel	—	—	—	—	—	—	—	—	—	—	—	—	4-02307-0	4-06528-0
23	Bal. Cylinder	Bz	4-01569-1	4-01570-1	4-01571-1	4-01572-1	4-01573-1	4-01574-1	4-07500-0	4-08093-0	4-07248-0	4-07307-0	4-09568-0	4-07199-0	—	—
24	Sealing Ring	EPT	5-04020-0	5-04027-0	5-04030-0	5-04036-0	5-04041-0	5-04049-0	5-04596-0	5-07369-0	5-04528-0	5-04528-0	5-04530-0	5-04530-0	—	—
25	Bal. Piston	Bz	4-03336-0	4-03337-0	4-03338-0	4-03339-0	4-03340-0	4-03341-0	4-04594-0	4-08092-0	4-07249-0	4-07301-0	4-09567-0	4-07198-0	—	—
26	Top Flange	C I	4-02246-0	4-02248-0	4-02250-0	4-02252-0	4-02233-0	4-02259-0	4-02261-0	4-02261-0	4-02263-0	4-02264-0	4-02266-0	—	—	—

1. Recommended Spare Parts

2. Screwed End Bodies also available in Bronze

3. Stainless Steel Seat Rings in sizes 2" - 12" are Bronze with Stainless Steel seating surface.

4. A = Asbestos

5. Stell. = Stellite

6. Int'l Bal. = Internal Balanced

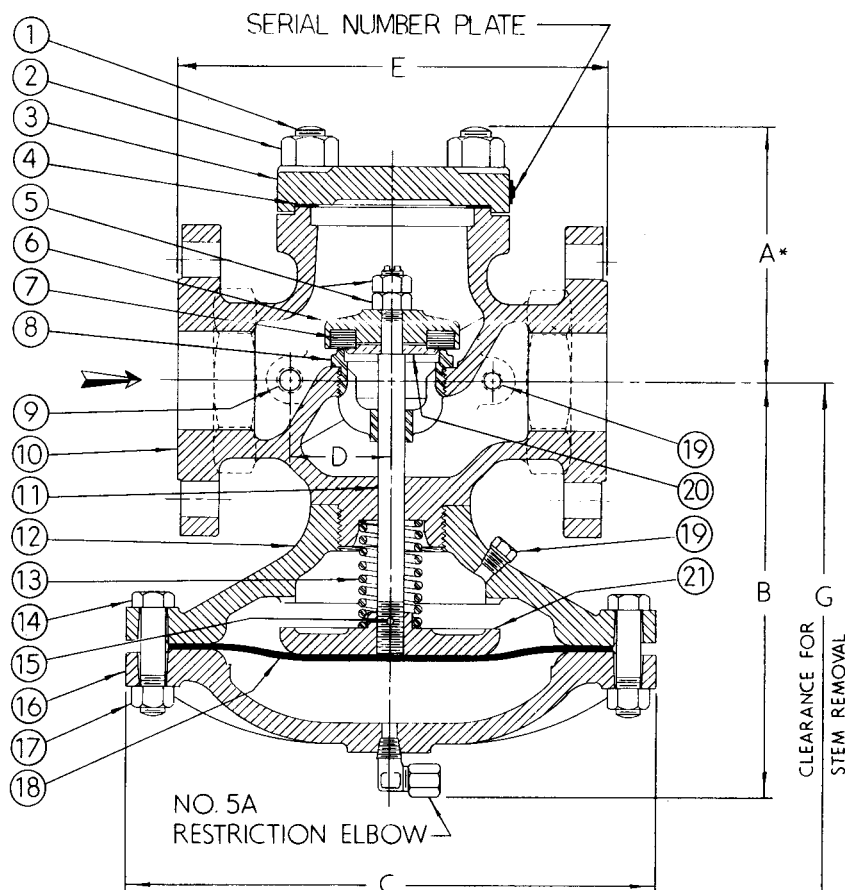
Specify complete Part Numbers when ordering.



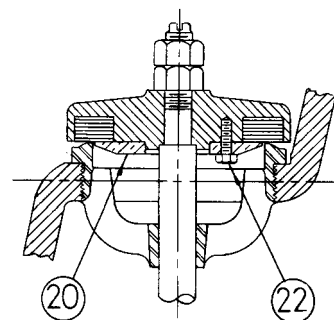
**SPENCE ENGINEERING  
COMPANY**  
Walden, NY 12586

## Parts List TYPE E6 MAIN VALVE

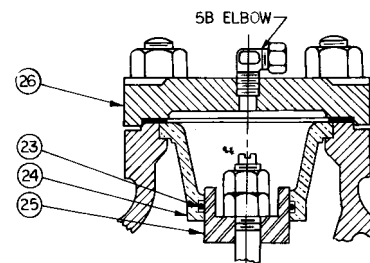
Cast Iron — Sizes 3/4" - 12"  
Screwed Ends and  
125 lb. & 250 Lb. Flanged



Standard Body—Composition Disc



Composition Disc for  
4" Port and Larger



Ext. Balanced  
Construction

### DIMENSIONS AND WEIGHTS

Size	E			Dimensions, Inches					Approx. Shipping Wt. Lbs.		
	C.I. Brz. Scr. Ends	Iron		A	B	C	D	G	C.I. Brz. Scr. Ends	Iron	
		125 Lb.	250 Lb.							125 Lb.	250 Lb.
3/4	4 3/4			2 7/8	6 3/8	6 7/8	1 3/8	7 3/4	18		
1	5 3/8	5 1/2	6	3 5/8	6 5/8	6 7/8	1 1/2	8 3/4	18	27	30
1 1/4	6 1/2	6 3/4	7 1/4	4 1/8	7 3/4	9 1/8	1 7/8	9	37	39	44
1 1/2	7 1/4	6 7/8	7 3/8	4 3/8	7 7/8	9 1/8	2	9 1/2	42	50	56
2	7 1/2	8 1/2	9	5 1/4	8 5/8	11 1/8	2 1/8	11	66	73	81
2 1/2		9 3/8	10	5 3/4	9	11 1/8	2 3/8	12		83	95
3		10	10 3/4	6 5/8	9 7/8	13 1/2	2 3/4	13 7/8		124	146
3 1/2		10 3/4	11 1/2	6 7/8	10 1/2	13 1/2	3 1/4	14 3/4		160	165
4		11 7/8	12 1/2	7 5/8	12 3/4	13 1/2	3 1/2	17 1/8		206	234
5		13 5/8	14 1/2	8 1/2	13 1/4	13 1/2	3 1/2	19 7/8		275	287
6		15 1/8	16	10	15 1/2	16 3/4	4	21 7/8		363	431
8		19	20	11 1/2	17 5/8	16 3/4	6 1/4	27 1/4		508	610
10		23 5/8	25	13 3/4	21 5/8	20	6	34 3/4		1005	1500
12		26 1/2	28	15 7/8	26 3/8	24 3/4	8 1/2	41 1/4		1600	2370

When ordering parts it is essential that the valve type, size, service and serial number be stated. Select parts by item number but order by part number.

*Numbers in Table are Part Numbers*

Item No.	Part Name	Mat'l	VALVE SIZE (inches)													
			3/4	1	1½	1¾	2	2½	3	3½	4	5	6	8	10	12
1	Blind Flange Stud - 125 lb.	Steel	—	4-10118-0	4-05442-0	4-05443-0	4-10119-0	4-10119-0	4-05443-0	4-05443-0	4-10119-0	4-10120-0	4-10120-0	4-10120-0	4-05450-0	4-05451-0
	Blind Flange Stud - Scr. & 250 lb.	Steel	4-05516-0	4-10118-0	4-05442-0	4-05443-0	4-10119-0	4-05447-0	4-05445-0	4-10119-0	4-05447-0	4-05448-0	4-05449-0	4-05455-0	4-05451-0	4-05451-0
2	Blind Flange Nut - 125 lb.	Steel	—	5-02851-0	5-02854-0	5-02856-0	5-02860-0	5-02860-0	5-02856-0	5-02856-0	5-02860-0	5-02860-0	5-02860-0	5-02860-0	5-02864-0	5-02864-0
	Blind Flange Nut - Scr. & 250 lb.	Steel	5-02847-0	5-02851-0	5-02854-0	5-02856-0	5-02860-0	5-02862-0	5-02860-0	5-02860-0	5-02862-0	5-02862-0	5-02862-0	5-02862-0	5-02864-0	5-02864-0
3	Blind Flange - 125 lb.	C I	—	4-02173-0	4-02176-0	4-02178-0	4-02180-0	4-02180-0	4-02157-0	4-02157-0	4-02158-0	4-02160-0	4-02165-0	4-02167-0	4-02164-0	4-02168-0
	Blind Flange - Scr. & 250 lb.	Steel	4-02171-0	4-02173-0	4-02176-0	4-02178-0	4-02180-0	4-02183-0	4-02186-0	4-02186-0	4-02159-0	4-02161-0	4-02163-0	4-02166-0	4-02164-0	4-02168-0
4	Blind Flg. Gasket <sup>1</sup>	A <sup>2</sup>	5-02381-0	5-02362-0	5-02382-0	5-02365-0	5-02366-0	5-02367-0	5-02369-0	5-02369-0	5-02371-0	5-02372-0	5-02374-0	5-02375-0	4-02376-0	4-02377-0
5	Stem Nut	Steel	5-02969-0	5-02970-0	5-02970-0	5-02971-0	5-02971-0	5-02972-0	5-02973-0	5-02973-0	5-02974-0	5-02975-0	4-02976-0	4-02977-0	4-02977-0	4-02978-0
6	Disc Holder - "F" Port	C I/Bz	4-02515-0	4-02517-0	4-02519-0	4-02522-0	4-02525-0	4-02527-0	4-02531-0	4-02531-0	4-02548-1	4-02551-0	4-02533-1	4-02537-1	4-02541-0	4-02545-0
7	Composition Disc - "F" Port <sup>1</sup>	Hycar	5-01715-0	5-01716-0	5-01717-0	5-01718-0	5-01719-0	5-01721-0	5-01722-0	5-01722-0	5-01724-0	5-01726-0	5-01727-0	5-01729-0	5-01731-0	5-01732-0
8	Seat Ring - "F" Port	SS	4-04075-1	4-04084-1	4-04092-1	4-04496-1	7-40405-5	7-40412-0	7-40422-0	7-40410-0	7-40441-0	7-40450-1	7-40470-0	7-40483-0	7-44463-0	7-44465-0
9	Pipe Plug - 1/4" NPT	Steel	4-03772-0	4-03772-0	4-03772-0	4-03772-0	4-03772-0	4-03772-0	4-03772-0	4-03772-0	4-03772-0	4-03772-0	4-03772-0	4-03772-0	4-03772-0	4-03772-0
10	Body - Screwed Ends	C I	4-00639-0	4-00640-0	4-00643-0	4-00646-0	4-00649-0	—	—	—	—	—	—	—	—	—
	- 125 lb. Flanged	C I	—	4-00641-0	4-00644-0	4-00647-0	4-00650-0	4-00653-0	4-00655-0	4-00657-0	4-00659-1	4-00661-1	4-00662-0	4-00665-0	4-01273-0	4-07316-0
	- 250 lb. Flanged	C I	—	4-00642-0	4-00645-0	4-00648-0	4-00651-0	4-00652-0	4-00654-0	4-00656-0	4-00658-1	4-00660-1	4-00663-0	4-00664-0	4-00666-0	4-00667-0
11	Stem	SS	4-05233-1	4-05237-2	4-05248-1	4-05251-2	4-05262-1	4-05267-0	4-05279-1	4-05392-1	4-05282-2	4-05285-1	4-05288-1	4-05292-1	4-05294-1	4-05297-0
12	Base	C I	4-00545-0	4-00545-0	4-00527-0	4-00527-0	4-00526-0	4-00544-0	4-00525-0	4-00529-0	4-00528-1	4-00528-1	4-00530-1	4-00530-1	4-01277-1	4-00531-0
13	Main Spring <sup>1</sup>	Steel	5-04978-0	5-04978-0	5-05009-0	5-05009-0	5-05121-0	5-05018-0	5-05034-0	5-05048-0	5-05061-0	5-05061-0	5-05015-0	5-05015-0	5-05192-0	5-05078-0
14	Diaphragm Bolt	Steel	5-04774-0	5-04774-0	5-04780-0	5-04780-0	5-04780-0	5-04780-0	5-04785-0	5-04785-0	5-04788-0	5-04788-0	5-04791-0	5-04791-0	5-04796-0	5-04798-0
15	Groove Pin	Steel	5-03245-0	5-03245-0	5-03248-0	5-03248-0	5-03249-0	5-03252-0	5-03254-0	5-03253-0	5-03255-0	5-03258-0	5-03258-0	5-06831-0	5-03261-0	5-06834-0
16	Hood	C I	4-02630-0	4-02630-0	4-02629-0	4-02629-0	4-02638-0	4-02638-0	4-02634-0	4-02634-0	4-02633-0	4-02633-0	4-02632-0	4-02632-0	4-02628-0	4-07315-0
17	Diaphragm Nut	Steel	5-02874-0	5-02874-0	5-02877-0	5-02877-0	5-02877-0	5-02877-0	5-02881-0	5-02881-0	5-02881-0	5-02881-0	5-02881-0	5-02881-0	5-02883-0	5-02883-0
18	Diaphragm <sup>1</sup>	Hycar	5-01600-0	5-01600-0	5-01601-0	5-01601-0	5-01602-0	5-01602-0	5-01603-0	5-01603-0	5-01604-0	5-01604-0	5-01605-0	5-01605-0	5-01606-0	5-01607-0
19	Pipe Plug - 1/8" NPT	Steel	4-03769-0	4-03769-0	4-03769-0	4-03769-0	4-03769-0	4-03769-0	4-03769-0	4-03769-0	4-03769-0	4-03769-0	4-03769-0	4-03769-0	4-03769-0	4-03769-0
20	Disc Washer - "F" Port	Bz	4-06092-1	4-06094-1	4-06098-1	4-06099-1	4-06102-1	4-06105-1	4-06108-1	4-06108-1	4-06119-0	4-06122-0	4-06110-1	4-06112-1	4-06113-0	4-06115-0
21	Pressure Plate	C I	4-03697-0	4-03680-0	4-03698-0	4-03688-0	4-03673-0	4-03687-0	4-03672-0	4-03681-0	4-03689-0	4-03588-0	4-03685-0	4-03682-0	4-03611-0	4-03690-0
22	Disc Washer Bolt	Steel	—	—	—	—	—	—	—	—	5-04808-0	5-04808-0	5-04808-0	5-04808-0	5-04808-0	5-04808-0
23	Sealing Ring <sup>1</sup>	EPT	5-04020-0	5-04027-0	5-04030-0	5-04036-0	5-04041-0	5-04049-0	5-04596-0	5-07396-0	5-07508-0	5-07366-0	5-07367-0	5-07368-0	5-09134-0	—
24	Cylinder	Bz	4-01569-1	4-01570-1	4-01571-1	4-01572-1	4-01573-0	4-01574-0	4-07500-0	4-08093-0	4-07248-0	4-07307-0	4-10927-0	4-07252-1	4-09135-0	—
25	Piston	SS	4-03336-0	4-03337-0	4-03338-0	4-03339-0	4-03340-0	4-03341-0	4-04594-0	4-08092-0	4-07249-0	4-07301-0	4-07309-0	4-07254-0	4-09133-0	—
26	Blind Flange - 125 lb. Balanced	C I	—	4-11159-0	4-07331-0	4-11160-0	4-06941-0	4-07910-0	4-07515-0	4-07515-0	4-02794-0	4-11163-0	4-11165-0	4-09214-0	4-11167-0	4-11168-0
	Blind Flange - 250 lb. Balanced	C I	4-10595-0	4-11159-0	4-07331-0	4-11160-0	4-06941-0	4-11115-0	4-11161-0	4-11161-0	4-11162-0	4-11164-0	4-10621-0	4-11166-0	4-11167-0	4-11168-0

1. Recommended Spare Parts

2. Asbestos

Specify complete Part Numbers when ordering.



A division of CIRCOR International, Inc.

# Technical Data

SD 3071

SPENCE ENGINEERING COMPANY, INC. 150 COLDENHAM ROAD, WALDEN, NY 12586-2035



**TYPE C34 VALVE**

## TYPE C34 MAIN VALVE CAST IRON CONSTRUCTION Sizes 1" through 6"

The Spence Type C34 Main Valve is of normally closed, single-seat design. A minimum pressure drop of 10 PSI is required to operate the valve. Standard design features include packless construction, composite diaphragm, protected main spring and balanced composition disc.

This valve is intended for liquid service where load fluctuations are not violent. When controlled by one or more of the various types of Spence Pilots, this valve will accomplish most functions required of a regulator.

### RATINGS (Maximum Inlet Conditions)

Valve Ends Pressure (Temperature)

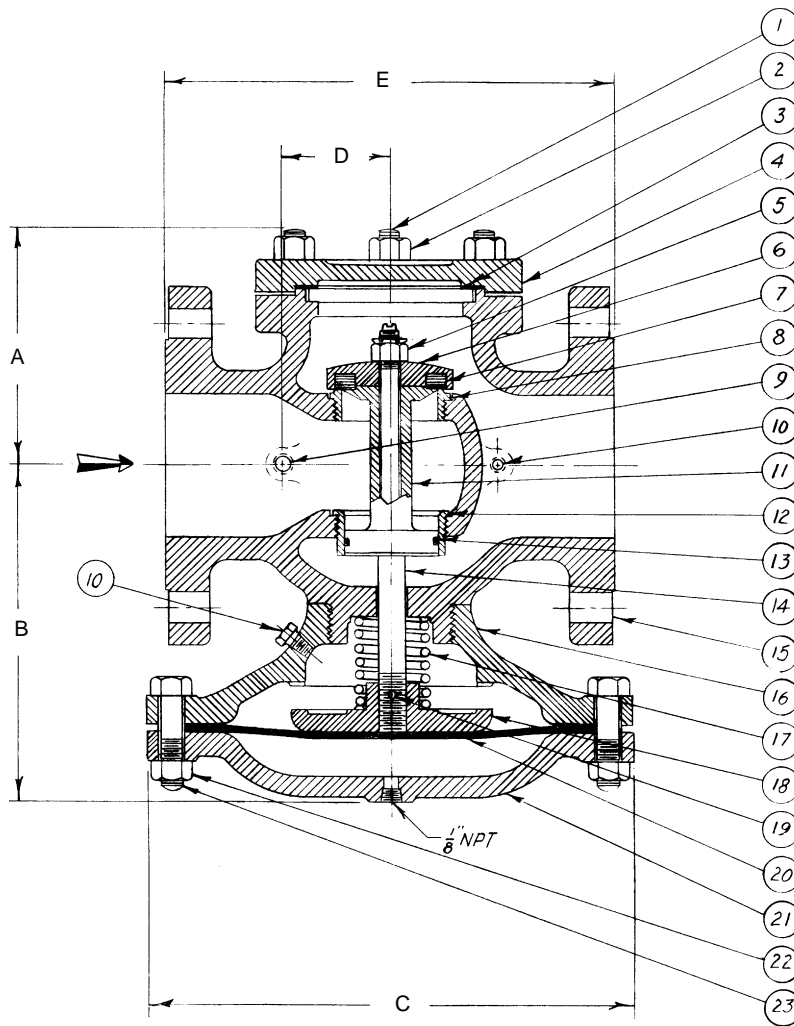
- ☐ ANSI NPT Screwed .....200 PSIG .....(200°F)
- ☐ ANSI 125 Flanged .....165 PSIG .....(200°F)
- ☐ ANSI 250 Flanged .....200 PSIG .....(200°F)

### RATED FLOW COEFFICIENTS (Cv)

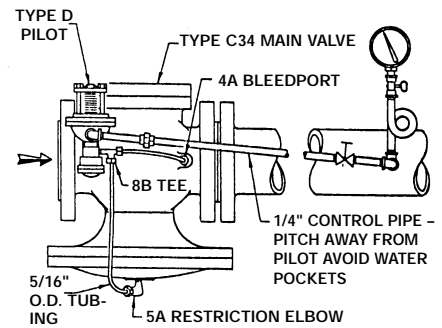
VALVE SIZE	1	1 1/4	1 1/2	2	2 1/2	3	4	5	6
Cv	5.5	12.5	17.3	24	36	53	86	139	196

### DIMENSIONS (inches) AND WEIGHTS (pounds)

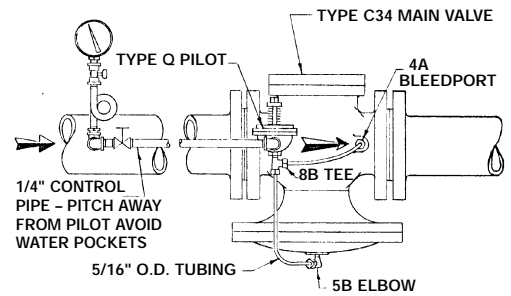
SIZE	FACE TO FACE			OTHER DIMENSIONS						APPROX. WT.		
	E			B	C	D	E	F	G	ANSI NPT	ANSI 125	ANSI 250
	ANSI NPT	ANSI 125	ANSI 250									
1	5 <sup>3</sup> / <sub>8</sub>	—	—	6 <sup>7</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>8</sub>	7	1 <sup>3</sup> / <sub>8</sub>	6	10 <sup>3</sup> / <sub>8</sub>	19	—	—
1 1/4	6 <sup>1</sup> / <sub>2</sub>	—	—	6 <sup>7</sup> / <sub>8</sub>	3 <sup>7</sup> / <sub>8</sub>	7	1 <sup>13</sup> / <sub>16</sub>	6 <sup>5</sup> / <sub>8</sub>	11 <sup>1</sup> / <sub>4</sub>	24	—	—
1 1/2	7 <sup>1</sup> / <sub>4</sub>	—	—	6 <sup>7</sup> / <sub>8</sub>	4 <sup>1</sup> / <sub>4</sub>	7	1 <sup>15</sup> / <sub>16</sub>	6 <sup>3</sup> / <sub>8</sub>	11 <sup>7</sup> / <sub>8</sub>	29	—	—
2	7 <sup>1</sup> / <sub>2</sub>	8 <sup>1</sup> / <sub>2</sub>	9	9 <sup>1</sup> / <sub>8</sub>	4 <sup>1</sup> / <sub>2</sub>	7	2 <sup>1</sup> / <sub>16</sub>	6 <sup>1</sup> / <sub>2</sub>	12 <sup>1</sup> / <sub>2</sub>	46	51	60
2 1/2	—	9 <sup>3</sup> / <sub>8</sub>	10	9 <sup>1</sup> / <sub>8</sub>	5 <sup>1</sup> / <sub>2</sub>	7 <sup>3</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>8</sub>	6 <sup>7</sup> / <sub>8</sub>	14 <sup>1</sup> / <sub>2</sub>	—	65	74
3	—	10	10 <sup>3</sup> / <sub>4</sub>	11 <sup>1</sup> / <sub>8</sub>	6	8 <sup>3</sup> / <sub>4</sub>	2 <sup>3</sup> / <sub>4</sub>	7 <sup>1</sup> / <sub>4</sub>	15 <sup>7</sup> / <sub>8</sub>	—	94	111
4	—	11 <sup>7</sup> / <sub>8</sub>	12 <sup>1</sup> / <sub>2</sub>	13 <sup>1</sup> / <sub>2</sub>	6 <sup>5</sup> / <sub>8</sub>	9 <sup>3</sup> / <sub>8</sub>	3	7 <sup>3</sup> / <sub>4</sub>	17 <sup>3</sup> / <sub>4</sub>	—	148	172
5	—	13 <sup>5</sup> / <sub>8</sub>	14 <sup>1</sup> / <sub>2</sub>	13 <sup>1</sup> / <sub>2</sub>	7 <sup>5</sup> / <sub>8</sub>	10 <sup>7</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>2</sub>	8 <sup>5</sup> / <sub>8</sub>	20 <sup>1</sup> / <sub>4</sub>	—	194	226
6	—	15 <sup>1</sup> / <sub>8</sub>	16	13 <sup>1</sup> / <sub>2</sub>	9 <sup>1</sup> / <sub>8</sub>	13 <sup>1</sup> / <sub>8</sub>	4 <sup>1</sup> / <sub>4</sub>	10 <sup>5</sup> / <sub>8</sub>	25 <sup>1</sup> / <sub>8</sub>	—	280	325



**STANDARD C34 VALVE**



**TYPE C34D  
PRESSURE REGULATOR**

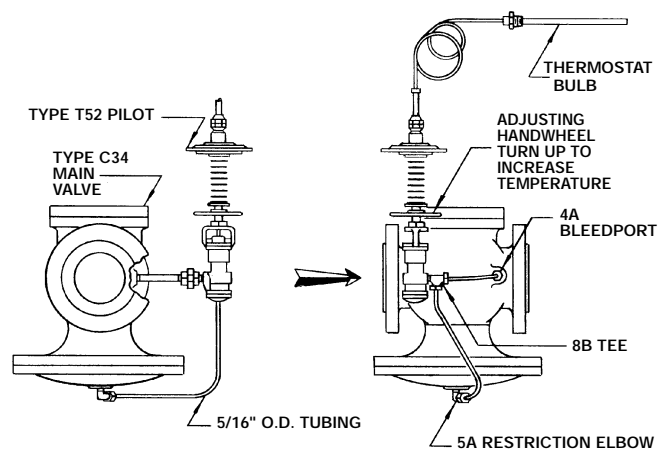


**TYPE C34Q  
BACK PRESSURE REGULATOR**

When ordering parts, it is essential that the valve type, size, service and serial number be stated.

Select part by item number, but order by part number.

Specify complete part number when ordering.



**TYPE C34T52  
TEMPERATURE REGULATOR**



## STANDARD PARTS

ITEM NO.	PART NAME	MATERIAL	VALVE SIZE								
			1	1½	1½	2	2½	3	4	5	6**
1	Blind Flange Stud	Steel	04-05516-00	04-10118-00	40-05442-00	04-05443-00	04-10119-00	04-05448-00	04-10119-00	04-05448-00	04-05448-00
2	Blind Flange Nut	Steel	05-02847-00	05-02851-00	05-02854-00	05-02856-00	05-02860-00	05-02862-00	05-02860-00	05-02862-00	05-02862-00
3	Blind Flange Gasket*	Blugard	05-02381-00	05-02362-00	05-02382-00	05-02365-00	05-02366-00	05-02367-00	05-02369-00	05-02371-00	05-02372-00
4	Blind Flange	Cast Iron	04-02171-00	04-02173-00	04-02176-00	04-02178-00	04-02180-00	04-02183-00	04-02186-00	04-02159-00	04-02161-00
5	Stem Locknut*	Steel	05-03014-00	05-03015-00	05-03016-00	05-03016-00	05-03017-00	05-03017-00	05-03018-00	05-03019-00	05-03020-00
6	Disc Holder	St. Steel†	04-09488-00	04-09489-00	04-09490-00	04-09491-00	04-09492-00	04-09493-00	04-09494-00	04-02531-00	04-02670-00
7	Composition Disc*	Hycar	05-01715-00	05-01716-00	05-01716-00	05-01717-00	05-01718-00	05-01719-00	05-01721-00	05-01722-00	05-01724-00
8	Seat Ring	St. Steel	04-04167-02	04-04169-02	04-04171-02	04-04172-02	04-04175-01	04-04177-01	04-04180-02	04-08681-01	04-08154-01
9	Pipe Plug - 1/4 NPT	Steel	04-03772-00	04-03772-00	04-03772-00	04-03772-00	04-03772-00	04-03772-00	04-03772-00	04-03772-00	04-03772-00
10	Pipe Plug 1/8 NPT	Steel	04-03769-00	04-03769-00	04-03769-00	04-03769-00	04-03769-00	04-03769-00	04-03769-00	04-03769-00	04-03769-00
11	Balance Piston	St. Steel	04-09476-00	04-09477-00	04-09478-00	04-09479-00	04-09480-00	04-09481-00	—	—	—
	Piston Assembly	St. Steel	—	—	—	—	—	—	22445	22525	22443
12	Guide Ring	St. Steel	04-04397-01	04-04399-01	04-04401-01	04-04403-01	04-04405-00	04-04407-00	04-04411-01	04-08680-00	04-08153-00
13	Piston O-Ring*	Nitrile	05-04015-00	05-04019-00	05-04023-00	05-04028-00	05-04033-00	05-04038-00	05-04045-00	05-04050-00	05-04051-00
14	Stem	St. Steel	04-05323-00	04-05355-01	04-05320-01	04-05352-01	04-05349-00	04-05354-00	04-05350-00	04-05348-00	04-05351-00
15	Body - ANSI NPT Scr.	Cast Iron	04-00625-00	04-00619-00	04-00628-00	04-00620-00	—	—	—	—	—
	Body - ANSI 125 Flg.	Cast Iron	—	—	04-10686-00	04-00626-00	04-00682-00	04-00685-00	04-00850-00	04-00684-00	04-00853-01
	Body - ANSI 250 Flg.	Cast Iron	—	—	—	04-00621-00	04-00680-00	04-00622-01	04-00681-00	04-00609-00	04-00683-01
16	Base	Cast Iron	04-00545-00	04-00545-00	04-00545-00	04-00527-00	04-00527-00	04-00526-00	04-00525-00	04-00529-00	04-00528-01
17	Spring*	Steel	05-04983-00	05-05001-00	05-05001-00	05-05138-00	05-05002-00	05-05021-01	05-02011-00	05-004698-00	05-05060-00
18	Pressure Plate	Cast Iron	04-03606-00	04-03657-00	04-03699-00	04-03698-00	04-03705-00	04-03635-00	04-03672-00	04-02324-00	04-03689-00
19	Pin	Steel	05-03244-00	05-03245-00	05-03245-00	05-03248-00	05-03248-00	05-03249-00	05-03254-00	05-03867-00	05-03255-00
20	Diaphragm*	Hycar	05-01600-00	05-01600-00	05-01600-00	05-01601-00	05-01601-00	05-01602-00	05-01603-00	05-01603-00	05-01604-00
21	Hood	Cast Iron	04-02630-00	04-02630-00	04-02630-00	04-02629-00	04-02629-00	04-02638-00	04-02634-00	04-02634-00	04-02633-00
22	Diaphragm Nut	Steel	05-02874-00	05-02874-00	05-02874-00	05-02877-00	05-02877-00	05-02877-00	05-02881-00	05-02881-0	05-02881-00
23	Diaphragm Bolt	Steel	05-04774-00	05-04774-00	05-04774-00	05-04780-00	05-04780-00	05-04780-00	05-04785-00	05-04785-00	05-04788-00

## REPAIR KITS

ITEM NO.	PART NAME	MATERIAL	VALVE SIZE								
			1	1½	1½	2	2½	3	4	5	6**
	Repair Kit		08-09550-00	08-09551-00	08-09552-00	08-09553-00	08-09554-00	08-09555-00	08-09557-00	08-09558-00	08-09559-00

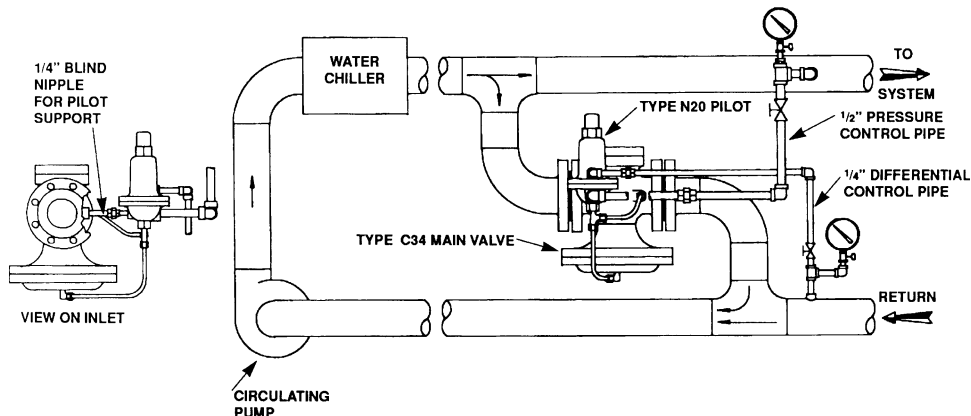
### NOTES:

†5" and 6" Disc Holders are Cast Iron.

\*Parts furnished in Repair Kits

\*\*6" C34 Valves shipped after July, 1992 have top guided construction. The following parts are required:

- 1 - Blind Flange 04-12150-00
- 1 - Guide Bushing 04-12151-00
- 2 - Stem Nuts 05-13842-00
- 1 - Stem 04-12143-00



## TYPE C34N20 DIFFERENTIAL BACK PRESSURE REGULATOR APPLIED TO A CHILLED WATER SYSTEM

# MAINTENANCE INSTRUCTIONS

(Brackets refer to item number)

**CAUTION:** If valve is line mounted, be certain that inlet and outlet stop valves are closed and that internal pressure is relieved before dismantling.

## DISMANTLING

1. Remove blind flange nuts (2) and lift off blind flange (4).
2. Connect an adjustable supply of air or water pressure to the hood (21) (See Fig. 1). Apply 20 to 30 PSIG to lock the stem in the full open position.
3. Apply a penetrating lubricant (such as WD40) to the stem locknut (5). Remove the locknut.
4. Lift out the disc holder (6), disc (7) and balance piston (11). Be careful when lifting the piston through the seat ring (8) so that the piston o-ring (13) is not damaged.
5. Release the hood loading pressure and remove the pressure loading equipment.
6. Remove the diaphragm nuts (22) while supporting the hood (21). Lower the hood to permit the diaphragm (20), stem/pressure plate (14 & 18) and main spring (17) to be withdrawn.
7. If the seat ring (8) requires replacement, remove it from the body. A special wrench is required.
8. If the guide ring (12) requires replacement, the valve must be removed from the line and the seat ring removed first. A special wrench is required to remove the guide ring. The guide ring is extracted through the valve inlet.

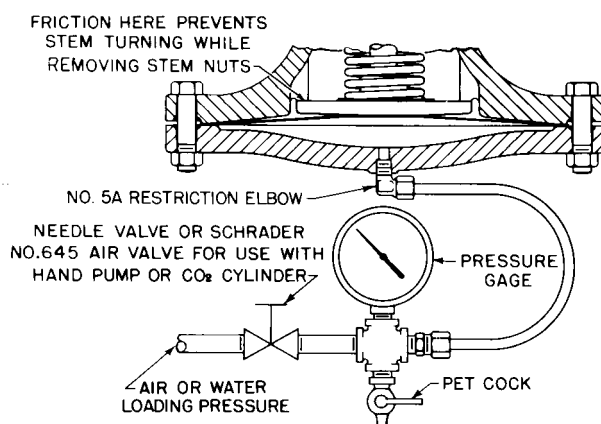


FIGURE 1

## INSPECTION

1. Examine the seat ring (8), guide ring (13) and balance piston (11) for nicks, erosion or other damage from pipeline debris.
2. Inspect the disc (7) and piston o-ring (13) for wear and damage. Replace as required.
3. Examine the stem and inner body contours for accumulations of pipeline fines. Clean as required.

## RING AND DISC REPLACEMENT

1. If seat ring or guide ring are being replaced, clean body threads of old sealing compound with a wire brush. Apply fresh sealing compound (Copaltite or equal) to the shoulder of the ring. Let stand until tacky before installing in valve body.
2. The composition disc (7) is reversible. Carefully pry it from the disc holder (6), flip and reinsert. Replace if both sides are worn.
3. Apply a silicone-base lubricant (Dow 55M or equal) to the piston o-ring (13) before carefully installing it into the groove of the balance piston (11).

## STEM REPLACEMENT

1. Drive out pin (19) from pressure plate (18) and screw out old stem.
2. Secure balance piston (11), disc (7) and disc holder (6) to the new stem (14) with stem nut (5).
3. Insert this assembly into its normal position from the top of the valve. Screw on the pressure plate (18) (omit main spring (17)).
4. With the disc in contact with the seat, adjust the pressure plate until dimension K is obtained. This dimension is supplied with each replacement stem, cast into the pressure plate and appears in Fig. 2.
5. Push the pressure plate up until it stops and remove stem nut. Do not allow stem to turn relative to the pressure plate. Lift out disc and balance piston.
6. Remove stem and pressure plate from valve. Drill and insert pin (19) to lock the adjustment. Grind off stem projection flush with bottom of pressure plate.

Valve Size	1	1 1/4	1 1/2	2	2 1/2	3	4	5	6
Dimension K	3/64	5/64	1/8	7/64	11/64	1/8	5/32	1/4	5/16

## ASSEMBLY

1. Reassemble the valve in the reverse of the procedure described above.
2. When replacing the blind flange gasket (3), clean old gasket material from any serrated surface.
3. Apply a silicone-base lubricant (Dow 55M or equal) to the piston o-ring (13) before reassembly of stem and balance piston.

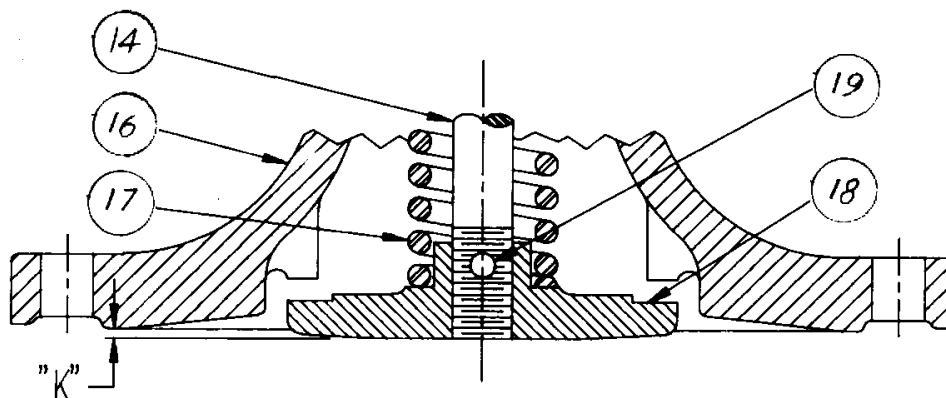


FIGURE 2

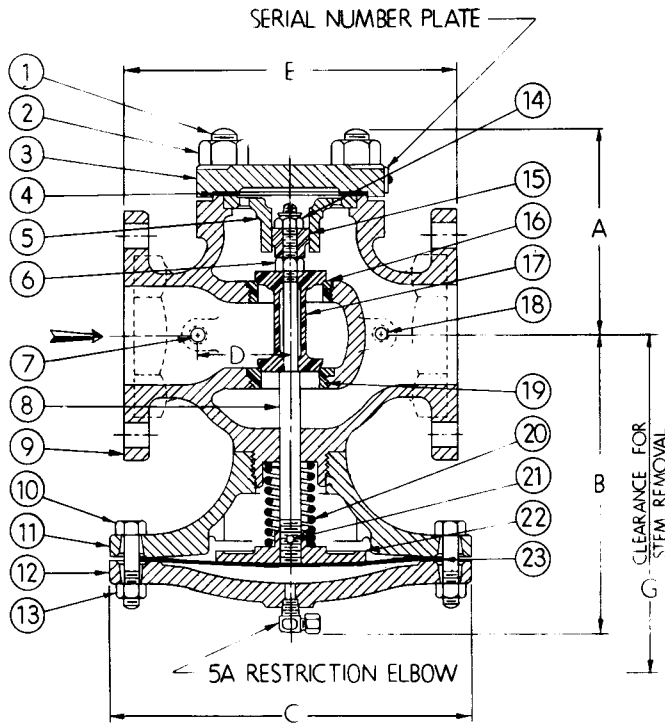


SPENCE ENGINEERING COMPANY, INC.  
Walden, New York 12586

## Parts List TYPE C20 MAIN VALVE Cast Iron

When ordering parts it is essential that the valve type, size, service and serial number be stated.

Select parts by item number but order by part number.



### DIMENSIONS AND WEIGHTS

Size	F			Dimensions, Inches						Approx. Shipping Wt. Lbs.		
	Iron			A	B	C	D	G	Iron			
	Scr. Ends	125 Lb.	250 Lb.						Scr. Ends	125 Lb.	250 Lb.	
2	7 1/2	8 1/2	9	4 5/8	6 7/8	8 3/4	2 1/8	10 3/4	44	51	60	
2 1/2		9 3/8	10	5 1/2	7 1/8	9 7/8	2 3/8	12		71	82	
3		10	10 3/4	6	8	10 7/8	2 3/4	14		95	111	
3 1/2		10 3/4	11 1/2	6 5/8	8 1/8	11 3/4	3 1/4	15 1/4		119	138	
4		11 7/8	12 1/2	6 5/8	9 1/8	12 3/4	3	18 1/4		147	169	
5		13 5/8	14 1/2	7 5/8	11 1/4	14 3/4	3 1/2	22 1/2		220	243	
6		15 1/8	16	9 1/8	12 3/8	16 7/8	4 1/4	23		314	350	
8		19	20	10 1/2	15 1/8	19 3/4	6 1/4	29		482	580	

Numbers in Table are Part Numbers

Item No.	Part Name	Material	Remarks	VALVE SIZE							
				2"	2 1/2"	3"	3 1/2"	4"	5"	6"	8"
1	Blind Flange Stud	Steel		4-05443-0	4-10119-0	4-05447-0	4-10119-0	4-10119-0	4-05447-0	4-05448-0	4-05448-0
2	Blind Flange Nut	Steel		5-02856-0	5-02860-0	5-02862-0	5-02860-0	5-02860-0	5-02862-0	5-02862-0	5-02862-0
3	Blind Flange	C.I.		4-02178-0	4-02180-0	4-02183-0	4-02186-0	4-02186-0	4-02159-0	4-02161-0	4-02163-0
4	Blind Flange Gasket	Asbestos	A	5-02365-0	5-02366-0	5-02367-0	5-02369-0	5-02369-0	5-02371-0	5-02372-0	5-02374-0
5	Disc Guide Plate	C.I. E.T.		4-03495-0	4-03501-0	4-03510-0	4-03498-0	4-03503-0	4-03505-0	4-03507-0	4-03492-0
	Disc Guide Plate	C.I.		4-03494-0	4-03500-0	4-03509-0	4-03496-0	4-03502-0	4-03504-0	4-03506-0	4-03491-0
6	Stem Nut	Steel		5-02970-0	5-02971-0	5-02971-0	5-02971-0	5-02973-0	5-02973-0	5-02974-0	5-02975-0
7	Pipe Plug - 1/4" NPT	Steel		4-03772-0	4-03772-0	4-03772-0	4-03772-0	4-03772-0	4-03772-0	4-03772-0	4-03772-0
8	Stem	St. Steel		4-05359-0	4-05360-1	4-05361-1	4-05362-0	4-05363-1	4-05364-1	4-05365-1	4-05366-1
9	Body - Screwed	C.I.		4-00620-0							
	Body - 125 lb. Flanged	C.I.		4-00626-0	4-00682-0	4-00685-0	4-00852-0	4-00850-0	4-00684-0	4-00853-1	4-00627-0
	Body-250 lb. Flanged	C.I.		4-00621-0	4-00680-0	4-00622-1	4-00686-0	4-00681-0	4-00609-0	4-00683-1	4-00851-1
10	Diaphragm Bolt	Steel		5-04774-0	5-04779-0	5-04779-0	5-04780-0	5-04780-0	5-04780-0	5-04782-0	5-04786-0
11	Base	C.I.		4-00472-0	4-00447-0	4-00446-0	4-00445-0	4-00444-0	4-00443-0	4-00478-0	4-00442-1
12	Hood	C.I.		4-02577-0	4-02580-0	4-02581-0	4-02584-0	4-02583-0	4-02588-0	4-02591-0	4-02593-0
13	Diaphragm Nut	Steel		5-02874-0	5-02877-0	5-02877-0	5-02877-0	5-02877-0	5-02877-0	5-02877-0	5-02881-0
14	Stem Locknut	Steel		5-03016-0	5-03017-0	5-03017-0	5-03017-0	5-03019-0	5-03019-0	5-03020-0	5-03021-0
15	Guide Plug	St. Steel		4-03759-0	4-03760-0	4-03761-0	4-03761-0	4-03763-0	4-03763-0	4-03764-0	4-03765-0
16	Upper Seat Ring	St. Steel		4-04370-0	4-04552-0	4-09005-0	4-04556-0	4-08412-0	4-08298-0	4-04535-0	4-04537-0
17	Double Disc	St. Steel		4-02008-0	4-07834-0	4-08991-0	4-08992-0	4-08993-1	4-08994-0	4-01752-0	4-08995-0
18	Pipe Plug - 1/8" NPT	Steel		4-03769-0	4-03769-0	4-03769-0	4-03769-0	4-03769-0	4-03769-0	4-03769-0	4-03769-0
19	Lower Seat Ring	St. Steel		4-04367-0	4-04546-0	4-09004-0	4-04555-0	4-08411-0	4-08297-0	4-04534-0	4-04536-0
20	Main Spring	Steel	A	5-05084-0	5-05132-0	5-05085-0	5-05092-0	5-05088-0	5-05089-0	5-05091-0	5-05090-0
21	Groove Pin	St. Steel		5-03248-0	5-03248-0	5-03249-0	5-03866-0	5-03254-0	5-03867-0	5-04629-0	5-03258-0
22	Pressure Plate	C.I.		4-03663-0	4-03664-0	4-03665-0	4-03666-0	4-03667-0	4-03586-1	4-03668-0	4-03669-0
23	Diaphragm	St. Steel	A	4-01635-0	4-01638-0	4-01641-0	5-02038-0	5-02331-0	5-01647-0	5-01649-0	5-01651-0

A - Recommended spare parts

10" - 12" Part numbers available on request

Specify complete Part Number when ordering.



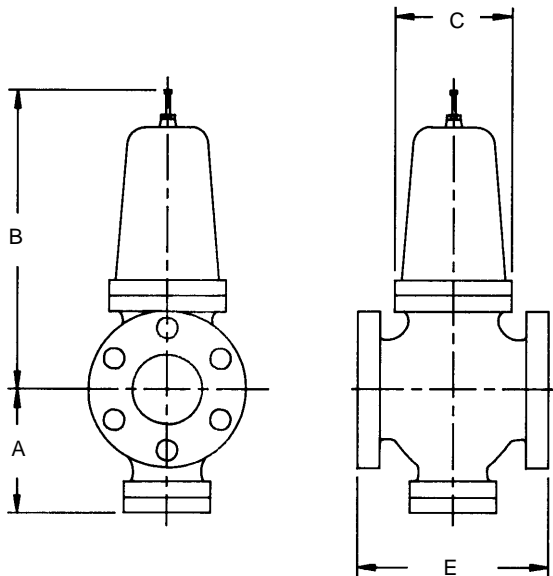


# Technical Data

A division of CIRCOR International, Inc.

**SPENCE ENGINEERING COMPANY, INC.** 150 COLDENHAM ROAD, WALDEN, NY 12586-2035

## TYPE D34 WATER PRESSURE REDUCING VALVE Sizes 1" through 6"



**TYPE D34 VALVE**

The Spence Type D34 Direct Operated Reducing Valve is designed for dead-end water service where the flow is intermittent and changes rapidly, as on domestic water systems. It is especially effective in regulating the flow of water to such fast acting equipment as flushometers and snap cocks. The design is self contained, no control pipe is required.

The preferred position for the Type D34 is in a horizontal line with the spring chamber up. When so mounted, the tendency of sediment to settle in the control ports is practically eliminated.

### RATINGS (Maximum Inlet Conditions)

Valve Ends .....Pressure .....(Temperature)

- ☐ ANSI NPT Screwed.....200 PSIG.....(200°F)
- ☐ ANSI 125 Flanged.....165 PSIG.....(200°F)
- ☐ ANSI 250 Flanged.....200 PSIG.....(200°F)

### SPRING RANGES

- ☐ 10 to 40 PSIG .....☐ 30 to 80 PSIG

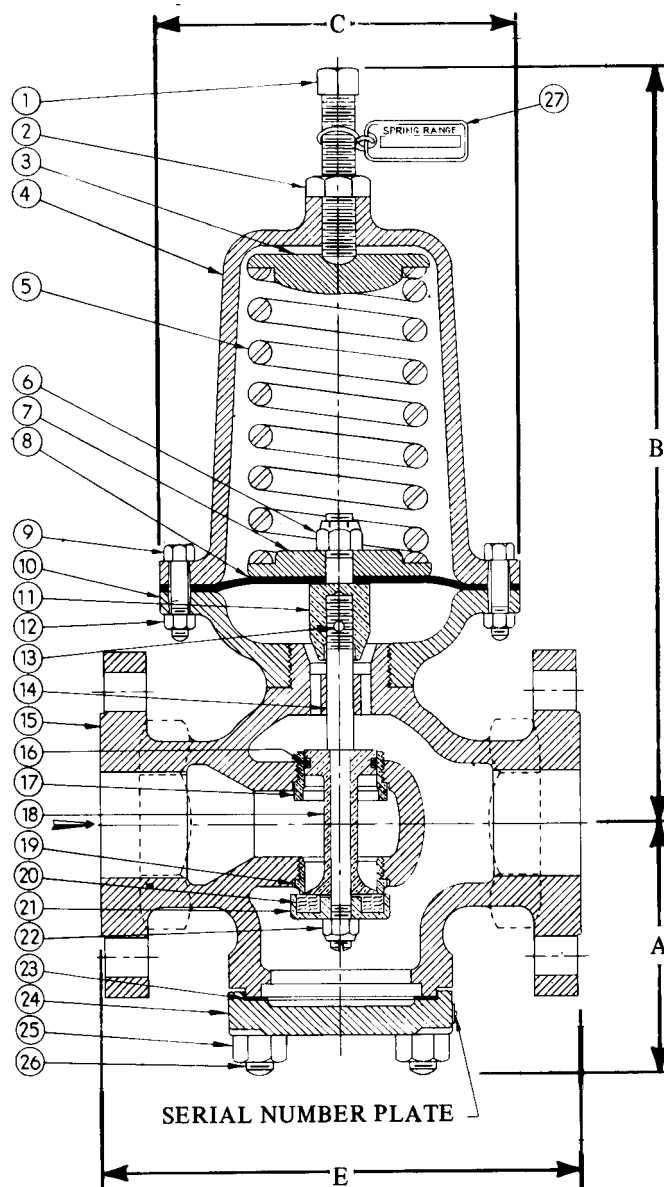
### RATED FLOW COEFFICIENTS (Cv)

VALVE SIZE	1	1 1/4	1 1/2	2	2 1/2	3	4	5	6
Cv	3.3	7.5	10.4	14.4	21.6	32	52	84	118

### DIMENSIONS (inches) AND WEIGHTS (pounds)

SIZE	FACE TO FACE			OTHER DIMENSIONS			APPROX. WT.		
	E			A	B	C	ANSI NPT	ANSI 125	ANSI 250
	ANSI NPT	ANSI 125	ANSI 250						
1	5 3/8	—	—	3 3/8	12 1/8	5 1/2	22	—	—
1 1/4	6 1/2	—	—	3 5/8	12 1/2	5 1/2	24	—	—
1 1/2	7 1/4	—	—	4 1/4	13 3/8	6	34	—	—
2	7 1/2	8 1/2	9	4 5/8	14 3/4	6 3/4	44	51	57
2 1/2	—	9 3/8	10	5 1/2	18 3/4	8	—	78	89
3	—	10	10 3/4	6	21 3/4	9	—	108	128
4	—	11 7/8	12 1/2	6 5/8	26 5/8	11 1/4	—	198	225
5	—	13 5/8	14 1/2	7 5/8	33 1/8	14 1/4	—	352	394
6*	—	15 1/8	16	9 1/8	35 7/8	16	—	500	550

\*Consult factory for parts.



## STANDARD D34 VALVE

When ordering parts, it is essential that the valve type, size, service and serial number be stated.

Select part by item number, but order by part number.

Specify complete part number when ordering.

## STANDARD PARTS

ITEM NO.	PART NAME	MATERIAL	VALVE SIZE								
			1	1¼	1½	2	2½	3	4	5	6 <sup>1</sup>
1	Adjusting Screw	Steel	05-04860-00	05-04862-00	05-04864-00	05-04865-00	05-04866-00	05-04867-00	05-04869-00	05-04871-00	
2	Adjusting Screw Locknut	Steel	05-02942-00	05-02942-00	05-02943-00	05-02944-00	05-02944-00	05-02945-00	05-02946-00	05-02946-00	
3	Spring Button	Cast Iron	05-01042-00	05-01042-00	05-01043-00	05-01044-00	05-01045-00	05-01046-00	05-01047-00	05-01048-00	
4	Spring Chamber	Cast Iron	04-01410-00	04-01410-00	04-01409-01	04-01412-00	04-01413-00	04-01414-00	04-01417-00	04-01416-00	
5	Adjusting Spring - (10-40 psi) - (30-80 psi)	Steel	05-05111-01	05-05111-01	05-05154-00	05-05112-01	05-05114-00	05-05115-01	05-05155-00	05-05156-00	
		Steel	05-05144-00	05-05144-00	05-05145-00	05-05146-00	05-05147-00	05-05148-00	05-05150-00	05-05151-00	
6	Coupling Nut <sup>3</sup>	Steel	05-03016-00	05-03016-00	05-03016-00	05-03018-00	05-03019-00	05-03019-00	05-03020-00	05-03020-00	
7	Pressure Plate <sup>3</sup>	Cast Iron	04-03702-00	04-03702-00	04-03703-00	04-03645-00	04-03646-00	04-03647-00	04-03649-00	04-03650-00	
8	Diaphragm <sup>2,3</sup>	Hycar	05-01608-00	05-01608-00	05-01609-00	05-01610-00	05-01611-00	05-01612-00	05-01614-00	05-01615-00	
9	Diaphragm Bolts	Steel	05-04771-00	05-04771-00	05-04771-00	05-04771-00	05-04778-00	05-04777-00	05-04782-00	05-04783-00	
10	Base	Cast Iron	04-00454-01	04-00454-01	04-00456-00	04-00457-00	04-00458-00	04-00459-00	04-00461-00	04-00462-00	
11	Stem Coupling <sup>3</sup>	St. Steel	04-09484-00	04-09485-00	04-11371-00	04-09486-00	04-09487-00	04-09487-00	04-01496-01	04-01496-01	
12	Diaphragm Nut	Steel	05-02872-00	05-02872-00	05-02872-00	05-02872-00	05-02875-00	05-02875-00	05-02877-00	05-02877-00	
13	Dowel Pin <sup>3</sup>	Steel	05-03864-00	05-03246-00	05-03247-00	05-03251-00	05-03865-00	05-03865-00	05-03867-00	05-03867-00	
14	Stem <sup>3</sup>	St. Steel	04-05333-01	04-05335-01	04-05336-01	04-05339-01	04-05341-00	04-05343-00	04-05346-00	04-08679-00	
15	Body - ANSI NPT Scr - ANSI 125 Flg - ANSI 250 Flg	Cast Iron	04-00921-00	04-00922-00	04-00923-00	04-00926-00	—	—	—	—	
		Cast Iron	—	—	—	04-00914-00	04-00915-00	04-00918-00	04-00920-00	04-00913-00	
		Cast Iron	—	—	—	04-00925-00	04-00927-00	04-00928-01	04-00930-00	04-00931-00	
16	Sealing Ring	Hycar	05-04015-00	05-04019-00	05-04023-00	05-04028-00	05-04033-00	05-04038-00	05-04045-00	05-04050-00	
17	Guide Ring	St. Steel	04-04397-01	04-04399-01	04-04401-01	04-04403-01	04-04405-00	04-04407-00	04-04411-01	04-08680-00	
18	Balanced Piston	St. Steel	04-09476-00	04-09477-00	04-09478-00	04-09479-00	04-09480-00	04-09481-00	—	—	
	Balanced Piston Assembly	St. Steel	—	—	—	—	—	—	22445	22525	
19	Seat Ring <sup>2,3</sup>	St. Steel	04-04167-02	04-04169-02	04-04171-02	04-04172-02	04-04175-01	04-04177-01	04-04180-02	04-08681-01	
20	Composition Disc <sup>2,3</sup>	Hycar	05-01715-00	05-01716-00	05-01716-00	05-01717-00	05-01718-00	05-01719-00	05-01721-00	05-01722-00	
21	Composition Disc Holder <sup>3</sup>	St. Steel	04-09488-00	04-09489-00	04-09490-00	04-09491-00	04-09492-00	04-09493-00	04-09494-00	04-02531-00	
22	Stem Nut <sup>3</sup>	Steel	05-03014-00	05-03015-00	05-03016-00	05-03016-00	05-03017-00	05-03017-00	05-03018-00	05-03019-00	
23	Blind Flange Gasket <sup>2,3</sup>	Non-asbestos	05-02381-01	05-02362-01	05-02382-01	05-02365-01	05-02366-01	05-02367-01	05-02369-01	05-02371-01	
24	Blind Flange	Cast Iron	04-02171-00	04-02173-00	04-02176-00	04-02178-00	04-02180-00	04-02183-00	04-02186-00	04-02159-00	
25	Blind Flange Nut	Steel	05-02847-00	05-02851-00	05-02854-00	05-02856-00	05-02860-00	05-02862-00	05-02860-00	05-02862-00	
26	Blind Flange Studs	Ledloy	04-05516-00	04-10118-00	04-05442-00	04-05443-00	04-10119-00	04-05448-00	04-10119-00	04-05448-00	
27	Range Tag - (10-40 psi) - (30-80 psi)	Aluminum	05-06221-00	05-06221-00	05-06221-00	05-06221-00	05-06221-00	05-06221-00	05-06221-00	05-06221-00	
		Aluminum	05-06222-00	05-06222-00	05-06222-00	05-06222-00	05-06222-00	05-06222-00	05-06222-00	05-06222-00	

### NOTES:

1. Consult Factory for parts.
2. Recommended Spare Parts.
3. These parts furnished in Repair Kit.

## REPAIR KITS

ITEM NO.	PART NAME	MATERIAL	VALVE SIZE								
			1	1¼	1½	2	2½	3	4	5	6
	Repair Kit		33162	33163	33164	33165	33166	33167	33168	33169	33170

# INSTALLATION AND MAINTENANCE INSTRUCTIONS

(Brackets refer to item number)

## PRINCIPLES OF OPERATION

When the water supply is cut in, the valve is in wide open position. Water flowing to the system creates a rising delivery pressure which feeds back through the control ports to the underside of diaphragm [8]. As the pressure on diaphragm [8] approaches a balance with the force exerted by adjusting spring [5], disc [20] is throttled to a position where just enough water flows to maintain the set delivery pressure.

## INSTALLATION

Carefully clear inlet piping system of foreign matter and mount regulator with the flow arrow pointing in the direction of flow. Preferred position for D34 valves is in a horizontal line with spring chamber up. When so mounted, the tendency of sediment to settle in the control ports is practically eliminated.

Provide a three-valve by-pass to facilitate inspection of the reducing valve without interrupting service. Avoid damaging effects of foreign matter in the flow by using a strainer ahead of the valve.

## OPERATION

On starting up, proceed as follows:

1. Open the inlet stop valve gradually until the reducing valve takes control as indicated by the delivery pressure gage.
2. Turn adjusting screw [1] clockwise to increase the delivery pressure, counter-clockwise to lower it.

## TROUBLESHOOTING

Inadequate flow or delivery pressure:

1. Check initial pressure to see if full intended line pressure is applied at the valve inlet.

Reduced pressure builds up:

1. Foreign matter may be lodged between disc [20] and seat ring [19]. Remove blind flange [24] to inspect.
2. Diaphragm [8] may be ruptured. Remove spring chamber [4] to inspect.
3. Sealing ring [16] may be damaged. See dismantling instructions below to replace.

## ERRATIC OPERATION

Complete dismantling is recommended.

1. Check for clogged control ports connecting body outlet with diaphragm chamber.
2. Check for deposits causing sticking of sealing ring [16] or stem [14] in their respective guides.

## DISMANTLING

To change or inspect composition disc or sealing ring:

1. Remove blind flange [24].
2. Remove stem nuts [22]. Keep stem from turning by inserting screw driver in slot on end of stem.
3. Disc holder [21] will drop out. Carefully remove balance piston [18] so as not to damage sealing ring [16] as it is pulled through seat ring [19].

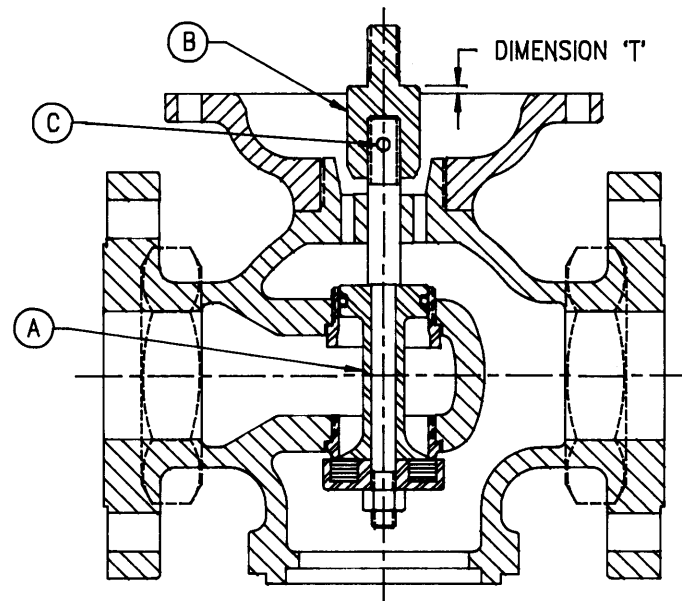
To examine diaphragm or stem:

1. Remove compression from spring by turning adjusting screw [1] counterclockwise.
2. Remove diaphragm bolts [9] and lift off spring chamber [4].
3. Lift pressure plate [7] to withdraw diaphragm and stem from valve.
4. To examine diaphragm, disassemble coupling nut [6] and lift off pressure plate [7].

## VALVE SETTING

Should the threaded connection between stem coupling [11] and stem [14] be disturbed, proceed as follows:

1. Insert stem assembly [A] and hold disc on seat ring in closed position, as shown.
2. Screw stem coupling [B] on stem until travel setting T is reached.
3. Remove stem assembly [A] and lock setting by drilling hole and inserting dowel pin [C].



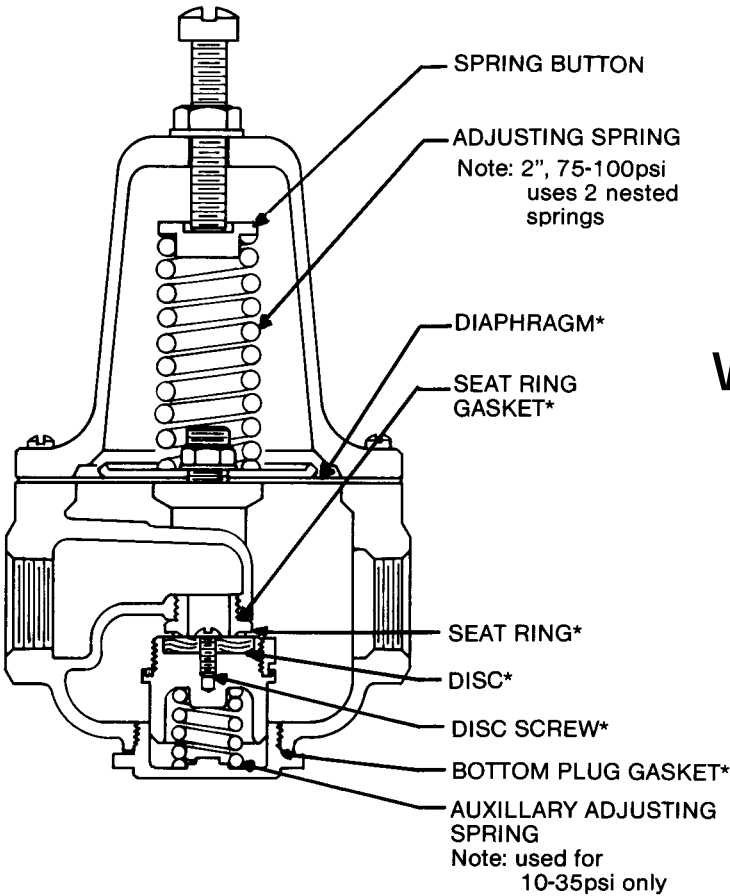
Valve Size	1	1 1/4	1 1/2	2	2 1/2	3	4	5	6
Dimension T	1/16	3/32	1/8	9/64	11/64	3/16	17/64	11/32	3/8





**SPENCE ENGINEERING  
COMPANY**  
Walden, NY 12586

# **Parts List TYPE D36 WATER PRESSURE REDUCING VALVE**



VALVE SIZE	PRESSURE RANGE	ADJUSTING SPRING PART NO.	SPRING BUTTON PART NO.	REPAIR KIT PART NO.
1/2"	10- 35	5-13145-0	5-13098-0	17091
	25- 75	5-13105-0		
	75-100	5-13112-0		
3/4"	10- 35	5-13145-0	5-13098-0	17092
	25- 75	5-13105-0		
	75-100	5-13112-0		
1"	10- 35	5-13145-0	5-13098-0	17093
	25- 75	5-13106-0		
	75-100	5-13112-0		
1 1/4"	10- 35	5-13146-0	5-13101-0	17094
	25- 75	5-13141-0		
	75-100	5-13142-0		
1 1/2"	10- 35	5-13146-0	5-13103-0	17095
	25- 75	5-13143-0		
	75-100	5-13143-0		
2"	10- 35	5-13147-0	5-13102-0	17096
	25- 75	5-13143-0	5-13103-0	
	75-100	5-13119-0		
		5-13119-0		
	75-100	5-13144-0		

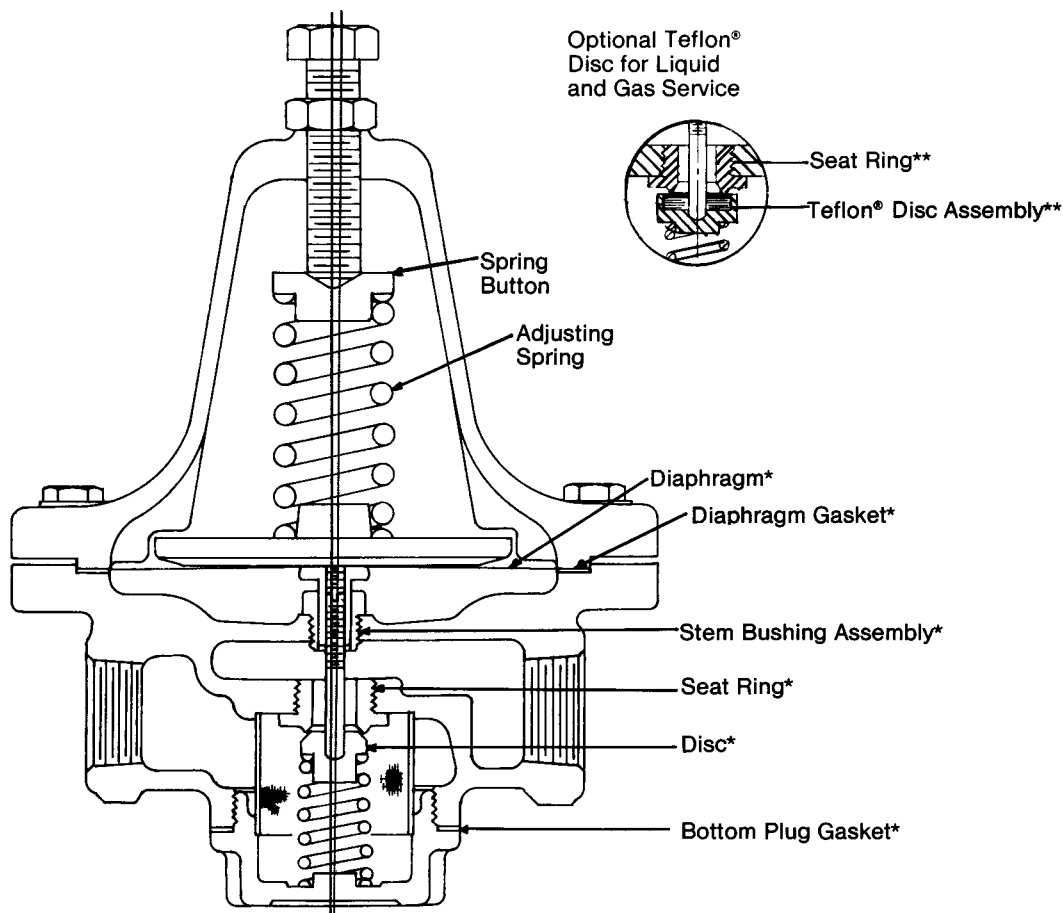
The above parts are all that are available.  
 \* Parts contained in Repair Kit





SPENCE ENGINEERING  
COMPANY  
Walden, NY 12586

## Parts List TYPE D50 PRESSURE REDUCING VALVE



Valve Size	Mat'l.	Delivery Pressure Range	Adjusting Spring Part No.	Spring Button Part No.	Repair/Conversion Kit	
					St. Stl. Seat Part No.	Teflon® Seat
1/2"	C.I. & Brz.	3- 15	5-13105-0	5-13098-0	17082	17086
		10- 30	5-13106-0			
3/4"		25- 80	5-13107-0		17083	17087
		75-140	5-13108-0			
1" & 1 1/4"	C.I. & Brz.	3- 15	5-13106-0	5-13101-0	17084	17088
		10- 30	5-13112-0			
		25- 80	5-13115-0			
		75-140	5-13116-0			
1 1/2" & 2"	C.I. & Brz.	3- 15	5-13117-0	5-13102-0	17085	17089
		10- 30	5-13118-0	5-13103-0		
		30-100	5-13119-0			
1/2"	St. Stl.	3- 15	5-13109-0	5-13099-0	17090	19551
		10- 30	5-13110-0			
		30-140	5-13111-0			
3/4"	St. Stl.	3- 15	5-13114-0		19550	19552
		10- 30	5-13112-0			
1"		30-140	5-13113-0	5-13100-0		

The above parts are all that are available.

\* Parts contained in Repair Kit

\*\* Parts substituted in Teflon® Repair Kit.





# Technical Data

SD 1520B

A Division of CIRCOR International, Inc.

**SPENCE ENGINEERING COMPANY, INC.** 150 COLDENHAM ROAD, WALDEN, NY 12586-2035

## Series 2000 Temperature Regulator Sizes 1/2" through 2"

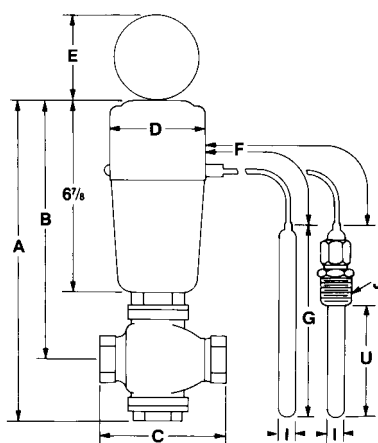
The Spence Series 2000 Temperature Regulator is available with single or double seat in direct or reverse acting. It is also available with two seat areas for three way mixing.

### VALVE RATINGS (Maximum Inlet Conditions)

Valve Ends ASME/ANSI	Pressure PSIG (bar)	Temperature °F (°C)
Class 250 NPT	250 (17.2)	406 (207)

### MODELS

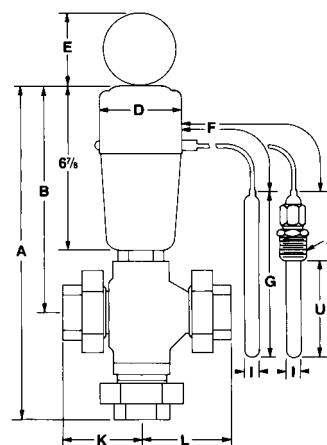
- Type 2010 — Single Seat, Direct Acting
- Type 2020 — Single Seat, Reverse Acting
- Type 2030 — Double Seat, Direct Acting
- Type 2040 — Double Seat, Reverse Acting
- Type 2050 — Three-way Mixing



**SERIES 2000 DIRECT  
& REVERSE ACTING**

### DIRECT & REVERSE ACTING DIMENSIONS inches (mm) AND WEIGHTS pounds (kg)

Size	Type No.	Dimensions						Shipping Weight (Approx.)
		A	B	C	D	E	F†	
1/2" (A, B, C, D, E) 1/2, 3/4	2010	9 3/4	8 1/2	5 1/2	3 1/2	2 13/16	8 Ft.	10 (4.5)
	2020	(248)	(216)	(140)	(89)	(71)		
1/2" 3/4"	2030	12 7/16	9 3/4	7 3/16	3 1/2	2 13/16	8 Ft.	13 (5.9)
	2040	(316)	(248)	(182)	(89)	(71)		
1"	2010	12 7/16	9 3/4	7 3/16	3 1/2	2 13/16	8 Ft.	13 (5.9)
	2020	(316)	(248)	(182)	(89)	(71)		
1 1/4" 1 1/2" 2"	2030	12 7/8	9 31/32	8 15/16	3 1/2	2 13/16	8 Ft.	20 (9.1)
	2040	(327)	(253)	(227)	(89)	(71)		25 (11)
								30 (14)



**TYPE 2050 THREE WAY**

### TYPE 2050 THREE WAY DIMENSIONS inches (mm) AND WEIGHTS pounds (kg)

Size	Dimensions							Shipping Weight (Approx.)
	A	B	D	F†	K	L	E	
1/2" 3/4" 1"	13 7/8 (352)	9 3/4 (248)	3 1/2 (89)	8 Ft.	3 5/16 (84)	3 5/8 (92)	2 13/16 (71)	12 (5.5) 12 (5.5) 13 (5.9)
1 1/4" 1 1/2"	14 21/32 (372)	9 31/32 (253)	3 1/2 (89)	8 Ft.	4 1/8 (105)	4 11/16 (119)		27 (12)
2"	14 7/8 (378)	9 31/32 (253)	3 1/2 (89)	8 Ft.	4 3/16 (106)	4 7/8 (124)		33 (15)

### COPPER BULB DIMENSIONS\* inches (mm)

Bulb Sizes	G	U	I			J (NPT)
			Plain	Union	Well	
Small	13 3/8 (340)	10 1/2 (267)	5/8 (16)	5/8 (16)	3/4 (19)	3/4 or 1
Large	15 5/8 (397)	12 1/2 (317)	1 (25)	1 (25)	1 1/8 (29)	1
Extra Large	19 (483)	16 (406)	1 (25)	1 (25)	1 1/8 (29)	1

\*For Stainless Steel and Coated Bulb Dimensions, consult factory.

SD 1520B/0503

PRINTED IN U.S.A.

## PRODUCT IDENTIFICATION

Each Spence Series 2000 Regulator may be properly identified in the field.

Valve size—(1/2" through 2") is stamped on the raised pads on each side of the valve body.

Direct or Reverse Acting—defined by the letter "D" for direct acting and "R" for reverse acting cast on the end of the valve

body screwed into the bonnet/frame assembly.

Direction of Flow—signified by an arrow cast on the valve.

Single or Double Seated—cast on each side of the valve body directly above the raised rectangular pad stamped with the valve size.

## PRODUCT IDENTIFICATION

### SERIES 2000 TEMPERATURE REGULATOR CODE SELECTION CHART

Model				Orifice Size	Inlet Size	Line & Bulb Style	Mat'l	Range °F
2	0	1	0	T	C	- G	Q	K
1	2	3	4	5	6	7	8	9

#### Model -

Position 1, 2, 3 & 4  
 2010 = Single Seat,  
 Direct Acting  
 2020 = Single Seat,  
 Reverse Acting  
 2030 = Double Seat,  
 Direct Acting  
 2040 = Double Seat,  
 Reverse Acting  
 2050 = Three Way

#### Orifice -

Position 5  
 A  
 B  
 C  
 D  
 E  
 T = Standard

#### Inlet Size -

Position 6  
 C = 1/2  
 D = 3/4  
 E = 1  
 F = 1 1/4  
 G = 1 1/2  
 H = 2

#### Line & Bulb Style -

Position 7  
 G = Indicating  
 N = Non-indicating

#### Material† -

Position 8  
 Q = Copper Bz Armor 8'  
 R = Copper Bz Armor 15'  
 N = Copper Bz Armor 25'  
 P = Copper Bz Armor 40'  
 T = SS Unarmored 8'  
 V = SS Unarmored 15'  
 W = SS Unarmored 25'  
 X = SS Unarmored 40'  
 Z = Other

#### Range °F -

Position 9  
 A = 15/50  
 B = 15/75  
 C = 45/115  
 D = 45/145  
 E = 65/140  
 F = 65/170  
 J = 120/200  
 K = 120/230  
 L = 240/310  
 M = 240/340  
 N = 280/375  
 P = 280/415  
 Z = Other

† For SS Armored Thermal Assembly Material, add (-TV) at the end of the code (ex.: 2010TC-NTH-TV)

† Small bulb standard for J-1 range and higher.

Extra large bulb standard for D range and lower.

Large bulb standard for E and F range

### FLOW AND PRESSURE RATINGS psig (bar)

Size	Single Seat 2010, 2020		Double Seat 2030, 2040		Three Way 2050	
	Flow Coefficient C <sub>v</sub>	Max. Upstream Pressure	Flow Coefficient C <sub>v</sub>	Max. Upstream Pressure	Flow Coefficient C <sub>v</sub>	Max. Difference Between Inlet Pressures*
1/2"C	.40	250 (17.2)	N/A			
1/2"D	1.00					
1/2"E	1.80					
1/2"A	3.29					
1/2"B	4.29	200 (13.8)	250 (17.2)			
1/2"T	5.22	140 (9.7)				
3/4"T	6.85	90 (6.2)				
1"T	9.15	65 (4.5)				
1 1/4"T	14.3	40 (2.8)				
1 1/2"T	15.1	30 (2.1)				
2"T	17.2	20 (1.4)				

#### CAUTION!

The piping system must be adequately designed and supported to prevent extraordinary loads to the pressure equipment.

**Warning:** Injury or death can occur due to failure to completely isolate valve from all sources of pressure before beginning disassembly. Do not proceed until valve has been completely isolated from process stream and vented to atmosphere.

## OPERATING PRINCIPLE

A Spence Series 2000 Temperature Regulator controls the flow of the media passing through its valve by responding to temperature changes at the temperature bulb. The valve is made up of two assemblies: the valve body and the thermal system assemblies. The thermal system of the Series 2000 Temperature Regulator consists of a temperature probe (bulb), pressure chamber (bellows) and a length of tubing (capillary) which connects the two. A liquid is sealed inside the thermal system. For each temperature range, a specific liquid is used.

On temperature increase, the vapor pressure of the liquid in the bulb increases, forcing liquid into the capillary and bellows and increases the pressure exerted on the bellows. On temperature decrease, the vapor pressure of the liquid in the bulb

decreases, withdrawing liquid from the bellows which reduces the pressure exerted on the bellows.

A balance is established between the force exerted by the bellows and the counteracting range spring force. On bellows pressure increase, the bellows volume expands, the compression of the range spring increases and the stem moves downward. On bellows pressure decrease, the bellows volume compresses, the range spring expands and the stem moves upward.

For a direct acting valve, an increase in bulb temperature closes the valve (heating). For a reverse acting valve, an increase in bulb temperature opens the valve (cooling).

## RECOMMENDED INSTALLATION

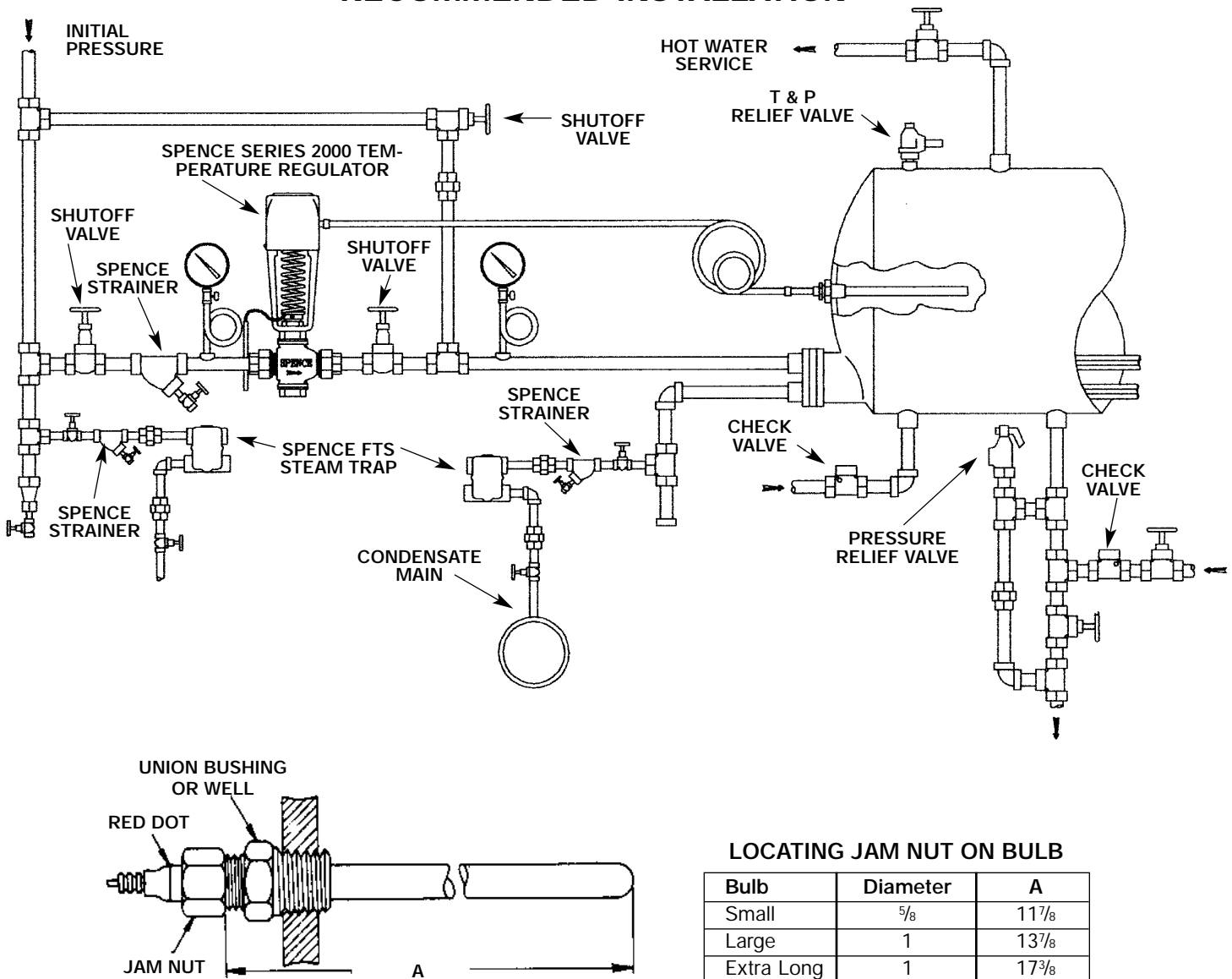


FIGURE 2

## INSTALLATION

**Warning:** Failure of the thermal system or foreign material lodged between the valve's closure members can lead to an over-temperature and/or an over-pressure condition which may cause injury and/or property damage. Never install a Spence Series 2000 Temperature Regulator in a system, which does not have a properly installed, code approved temperature and pressure safety valve or other approved safety device. These devices must be suitable for the equipment and processes involved and in conformance to applicable codes.

### VALVE BODY

The Spence Series 2000 Temperature Regulator should be placed so that the heating or cooling media will flow through it the direction of the arrow cast on the valve body. A Spence Strainer and a Spence FTS Steam trap should be placed ahead of the valve to protect the valve from damaging effects of dirt, scale, foreign material and condensate. A manual shut off valve should be placed before and after the valve. A bypass line with a manual shut off valve should be place around the valve for manual operation if the valve is out of service. See the Figure 1 for a recommended installation diagram. Additional recommended installation diagrams can be found in the Spence Regulator Handbook.

To avoid stresses on the valve or unions, the connecting pipes should be cut to the exact length required and should be in correct alignment. To connect the valve, remove the union ends from the valve body and attach them to the nipples on each side of the valve. When tightening the unions to the valve always use two wrenches. "Never use the valve frame for leverage." The valve should be installed in the vertical position with the thermal assembly on top.

### BULB

The location of the bulb should be chosen carefully so that the temperature of the media around the bulb or well will be representative of the entire body of fluid being heated or cooled. Important: For all applications where the bulb is mounted in the horizontal position the red dot on the bulb must be facing upward. When large volumes of oil are being heated it may be necessary to place the bulb near the heating coils to avoid dangerous hot spots which would result if the bulb was remote for the heating coils.

Plain bulbs (standard for Series 2000), without a union bushing, are used in open tanks, ovens, drying, rooms, kilns, etc. The bulb on these installations should be suspended vertically, pointing downward, and held securely by suitable straps or clamps. If the application requires that the bulb be held in a

horizontal position, the free end of the bulb must not be higher than the fixed end, and the red dot on the bulb must be upward.

### UNION BUSHINGS

When a union bushing is required for the bulb the union bushing is ordered and shipped separate from the valve. The union bushing consists of three parts: the bushing, sleeve and jam nut. Attach the bushing tightly to the equipment. Slide the jam nut and sleeve on the bulb and locate them at a distance as shown in Figure 2. This distance should be maintained during installation and use. This distance will allow for the entire effective length of the bulb to be totally immersed in the media. Insert the bulb into the bushing making sure first that the insertion depth corresponds to Figure 2 and tighten the jam nut to secure the bushing to the bulb.

### WELLS

When a well is required for the bulb the well is ordered and shipped separate from the valve. The well consists of three parts: the cylinder, sleeve and jam nut (a separate union bushing is not required). Attach the cylinder tightly to the equipment. Slide the jam nut and sleeve on the bulb and locate them at a distance as shown in Figure 2. The bulb should be coated with a heat conducting media such as a mixture of graphite and glycerin or high temperature grease. This improves the speed of response of the regulator. Insert the bulb into the well making sure first that the insertion depth corresponds to Figure 2. After the bulb is inserted, position it so that the red dot on the bulb is upward, then tighten the jam nut to secure the bulb to the well.

### REPLACEMENT THERMAL SYSTEMS

The vapor pressure in some systems is too high at ordinary ambient temperatures to permit removal of the shipping block without damage to the bellows. To reduce the vapor pressure to within safe limits, the complete system (bulb, line and bellows) must be cooled as specified in Figure 3.

Allow the system to cool for a period of at least 15 minutes before removing the shipping block. Then, assemble the bellows to the regulator frame as quickly as possible after removal from the cooler so that it will have no chance to warm up. The bulb should remain in the cold bath while the bellows is being assembled.

After the bellows is assembled to the frame, the bulb and bellows may warm up without damaging the bellows.

For Systems with Ranges starting at	Cool System to	Suggested Cooling Means
90°F to 110°F	50°F or lower	Tap water mixed with ice as needed
65°F to 85°F	32°F or lower	Crushed ice mixed with water
45°F to 60°F	10°F or lower	Crushed ice mixed with plenty of salt
-15°F to 40°F	-35°F or lower	Alcohol and "dry ice"

FIGURE 3



## ADJUSTMENT

Unless otherwise specified, the regulator is shipped from the factory with the adjustment nut at its lowest position and must therefore be raised to the desired control setting. When the temperature, for which the regulator has been set, is reached, it will be maintained automatically. After the installation is completed, preset the regulator according to Figure 3.

The operating range of the regulator is indicated on the nameplate. The setting scale is stamped on the side of the frame and is graduated 0 to 10 representing the limits of the operating range. This is an arbitrary scale, since it must necessarily vary for different temperature ranges. Figure 4 gives the approximate temperature equivalent for all scale settings in each temperature range. The values are not absolute and will vary from one regulator to another because of manufacturing tolerances. On initial starting, the controlled temperatures may overshoot slightly, then drop back. Allow sufficient time for the process to stabilize before checking the controlled temperature and making fine adjustments. The arm extending out from the adjusting nut indicates the temperature setting.

To change the temperature setting, turn the adjusting nut up if a higher temperature is desired and down if a lower temperature is desired. The adjusting pin needed for this purpose is chained to the end of the indicating arm.

On regulators equipped with a temperature indicator, the orientation of the indicator may be changed by loosening the bracket retaining screws and rotate the indicator a maximum of 180°F in either direction.

All Series 2000 Regulators are provided with a safety spring which will prevent the bellows from expanding (even though the valve

has reached the end of its travel) and draining the bulb of its fill. This prevents a buildup in vapor pressure which would damage the bellows.

There is, however, a limiting temperature applicable to each thermostat fill used. It is the temperature above which the chemistry of the fill will decompose. This limiting temperature is, therefore, the maximum allowable temperature on Series 2000 Regulators supplied with bulbs as indicated in Figure 5.

**APPROXIMATE TEMPERATURE EQUIVALENTS  
FOR VARIOUS SCALE SETTINGS**

Regulator Setting	Range, °F							
	-15/50	-15/75	45/115	45/145	65/140	65/170	240/310	240/340
0	*	*	*	*	*	*	*	*
1	-15	-12	45	50	65	70	236	240
2	-3	5	58	70	80	91	250	267
3	8	22	72	87	92	108	265	281
4	18	35	81	102	103	125	275	296
5	26	45	92	114	114	137	285	308
6	34	55	101	124	124	147	295	318
7	40	63	108	135	131	158	303	329
8	47	77	115	143	138	167	310	337
9	53	80	122	152	145	177	317	347
10	58	86	129	158	157	183	322	353

Regulator Setting	Range, °C							
	-26/10	-26/24	7.2/46	7.2/63	18/60	18/77	116/154	116/171
0	*	*	*	*	*	*	*	*
1	-26	-24	7	10	18	21	113	116
2	-19	-15	14	21	27	33	121	131
3	-13	-6	22	31	33	42	129	138
4	-8	2	27	39	39	52	135	147
5	-3	7	33	46	46	58	141	153
6	1	13	38	51	51	64	146	159
7	4	17	42	57	55	70	151	165
8	8	25	46	62	59	75	154	169
9	12	27	50	67	63	81	158	175
10	14	30	54	70	69	84	161	178

\* Control points at these settings are slightly below the low end of the regulator range.

**FIGURE 4**

Bulb Ranges				Maximum Allowable Temperature		
Short °F	Long °F	Short °C	Long °C	Fill	°F	°C
-15/50	-15/75	925/10	-25/20	Propane	450	230
45/115	45/145	10/45	10/60	Isobutane	450	230
65/140	65/170	20/60	20/75	Butane	450	230
90/165	90/195	35/70	35/90	Ethyl/Chloride	300	150
120/200	120/230	50/90	50/110	Isopentane	300	150
240/310	240/340	115/155	115/170	N-Propyl Alcohol	350	175

**FIGURE 5**

## STARTUP

After the installation, be certain all shutoff valves are closed and the valve is pre-adjusted according to Figure 4. Crack open the inlet shutoff valve. Blow down the strainer upstream of the valve. Let blow for several minutes, particularly on new

installations. Gradually open the downstream shutoff valve. Gradually open the inlet shutoff valve carefully watching the temperature and adjust the valve to achieve the desired set point.

## MAINTENANCE

The adjusting nut of each regulator is permanently lubricated before leaving the factory, and the valve stem is equipped with a spring loaded Teflon packing gland assembly so that no maintenance should be required for the life of the regulator.

The valve stem is set and locked at the factory in a permanent position to give the valve its proper travel. No adjustment should be made on the valve stem after the regulator leaves

the factory.

The Spence Strainer protects the valve disc and seat of the regulator from the destructive effects of scale, etc. The strainer should be blown out at regular intervals by removing the plug. For quick blowouts, a hand valve may be installed on the strainer in place of the plug.

## TROUBLESHOOTING

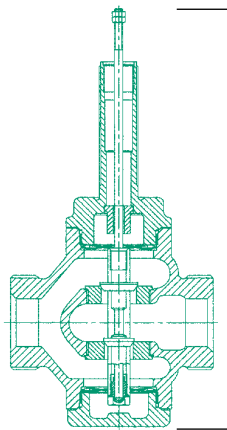
<b>PROBLEM</b>	<b>VALVE TYPE</b>	<b>POSSIBLE CAUSES</b>
Valve does not close	Single Seat, Direct Acting  Double Seat, Direct Acting	a. Leakage through valve— note allowable leakage rate b. Sediment trapped under seat— strainer required c. Upstream pressure too high— check catalog for recommended maximum pressure d. Location of bulb in process— 1. Red dot must be in upward position 2. Change location of bulb (bulb located in “cold spot”) poor process agitation e. Dead system— leak in temperature system f. Reverse acting used where direct acting is required See above (except c)
Valve does not open	Single Seat, Direct Acting	a. Incorrect range setting— Adjust range spring screw b. Direct acting used where reverse acting is required c. Location of bulb in process— 1. Red dot must be in upward position 2. Change location of bulb d. Range °C instead of °F
Erratic Action (Snap action or wide temperature control band)	Single Seat	a. Valve installed with flow reversed
Poor Temperature Control	All	a. Location of bulb in process— 1. Red dot must be in upward position 2. Change location of bulb b. Oversized valve— 1. Proper size valve will enhance temperature control 2. Oversize valve give high temperature overshoot c. Valve installed with flow reversed (single seat only) d. Bellows and line hotter than bulb (requires dual fill - ranges A - D)

*It is solely the responsibility of the system designer and the user to select products and materials suitable for their specific application requirements and to ensure proper installation, operation and maintenance of these products. Assistance shall be afforded with the selection of the materials based on the technical information supplied to Leslie Controls, Inc.; however, the system designer and user retain final responsibility. The designer should consider applicable Codes, material compatibility, product ratings and application details in the selection and application. Improper selection, application or use of the products described herein can cause personal injury or property damage. If the designer or user intends to use the product for an application or use other than originally specified, he must reconfirm that the selection is suitable for the new operating conditions.*

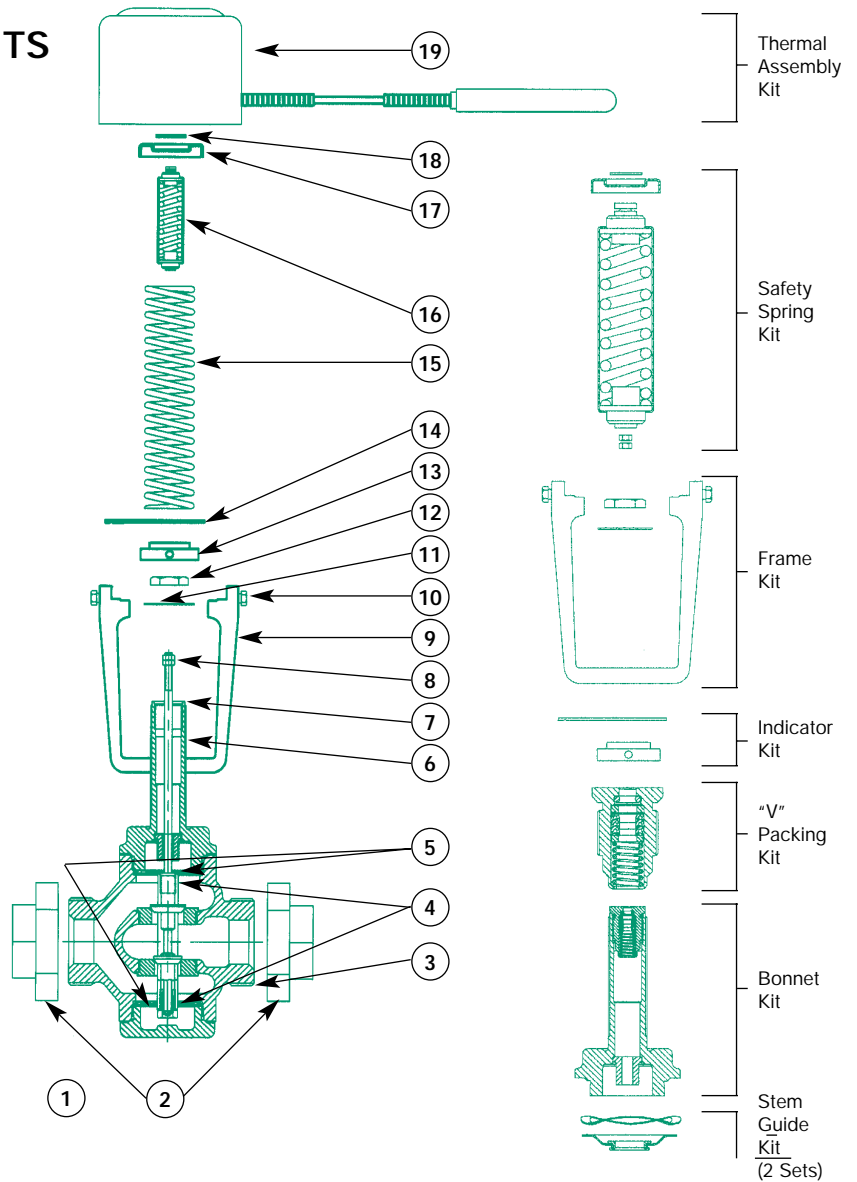
# REPLACEMENT PART KITS

## PARTS LIST

ITEM #	PART NAME
1	Complete Valve
2	Union Ends
3	Body Assembly
4	Stem Guide
5	Washer, Wave Spring
6	Bonnet
7	"V" Packing Ass'y
8	Nuts
9	Frame
10	Mounting Screws
11	Lock Washer
12	Frame Locking Nut
13	Adjusting Nut
14	Indicator Ass'y.
15	Adjusting Spring
16	Safety Spring Ass'y.
17	Guide
18	E-Ring
19	Thermal System Assembly



Body Assembly Kit



## KITS LIST (All Valves & Sizes)

KIT NAME	MATERIAL	PART #
Thermal System Indicating - 8'	SS	GT*
Thermal System Indicating - 15'	Bronze	GR*
Thermal System Indicating - 15'	SS	GV*
Thermal System Non-Indicating - 8'	Bronze	NQ*
Thermal System Non-Indicating - 8'	SS	NT*
Thermal System Non-Indicating - 15'	Bronze	NR*
Thermal System Non-Indicating - 15'	SS	NV*

KIT NAME	MATERIAL	PART #
"V" Packing Kit	Bronze/Teflon	2819
Safety Spring Kit	Bronze/Steel	2815
Frame Kit	Steel	2814
Indicator Kit	Steel/SS	2811
Adjusting Spring - Gold (Short Range)	Steel	2812
Adjusting Spring - Silver (Long Range)	Steel	2813
Thermal System Indicating - 8'	Bronze	GQ*

\*See Model Number Code on page 2 to add appropriate letter for temperature range.

## KITS LIST

KIT NAME	MATERIAL	VALVE SIZE										
		1/2 A	1/2 B	1/2 C	1/2 D	1/2 E	1/2 T	3/4 T	1 T	1-1/4 T	1-1/2 T	2 T
Union End Kit - Single Seat	Cast Iron	2822	2822	2822	2822	2822	2822	2823	2826	2827	2828	2829
Union End Kit - Double Seat	Cast Iron	—	—	—	—	—	2824	2825	2826	2827	2828	2829
Union End Kit - 3-Way	Cast Iron	—	—	—	—	—	2830	2831	2832	2833	2834	2835
Body Assembly Kit - 2010	Bronze	2010AC	2010BC	2010CC	2010DC	2010EC	2010TC	2010TD	2010TE	2010TF	2010TG	2010TH
Body Assembly Kit - 2020	Bronze	2020AC	2020BC	2020CC	2020DC	2020EC	2020TC	2020TD	2020TE	2020TF	2020TG	2020TH
Body Assembly Kit - 2030	Bronze	—	—	—	—	—	2030TC	2030TD	2030TE	2030TF	2030TG	2030TH
Body Assembly Kit - 2040	Bronze	—	—	—	—	—	2040TC	2040TD	2040TE	2040TF	2040TG	2040TH
Body Assembly Kit - 2050	Bronze	—	—	—	—	—	2050TC	2050TD	2050TE	2050TF	2050TG	2050TH
Stem Guide Kit	Steel/Monel	2820	2820	2820	2820	2820	2820	2820	2820	2821	2821	2821
Bonnet Ass'y Kit - Single Seat	Bronze	2818	2818	2818	2818	2818	2818	2818	2816	2817	2817	2817
Bonnet Ass'y Kit - Double Seat	Bronze	—	—	—	—	—	2816	2816	2816	2817	2817	2817
Bonnet Ass'y Kit - 3-Way	Bronze	—	—	—	—	—	2816	2816	2816	2817	2817	2817





SPENCE ENGINEERING COMPANY  
Walden, NY 12586

## INSTALLATION, OPERATING AND MAINTENANCE INSTRUCTIONS FOR TYPE N6 DIFFERENTIAL PRESSURE VALVES

### INTENDED PURPOSE

Type N6 Differential Pressure Valves are designed to maintain pump discharge pressures at a constant differential above a separate source of pressure. When installed in a boiler feed pump discharge line as a by-pass valve, a connection from the steam drum is made to the top chamber of the N6. The desired differential is made by adjusting the spring. The boiler feed-water pressure will then be maintained by the N6 at a constant pressure above steam drum pressure by modulating the quantity of water by-passed to pump suction. When installed in a by-pass line across a pumped system the N6 will maintain a constant differential of supply main pressure over return main pressure by modulating the quantity of by-passed water.

### GENERAL DESCRIPTION

Type N6 design and materials are aimed at providing long trouble free service. A high temperature rubber sealing ring and teflon piston provide smooth operation. The monel stem guide bushing and stainless steel valve trim afford maximum service life. The pressure and temperature limits are 250 psi and 350 F. Two spring ranges are available. The range of spring differential pressures are 5 to 50 psi and 40 to 125 psi.

### PRINCIPLES OF OPERATION

Flow enters the valve such that the initial pressure acts against the working face of the disc and tends to move it open. Opposing the opening are the forces of the differential adjusting spring and the loading pressure acting on the piston. The differential adjusting spring force creates the differential between the retained pressure (supply main or boiler feed water) under the disc and the loading pressure (return main or boiler drum) on top of the piston.

### INSTALLATION INSTRUCTIONS

Carefully clear inlet piping system of foreign matter such as: welding beads, scale, sand, pipe compound, etc. Allow head room above the valve for maintenance. Provide a three valve by-pass to facilitate inspection of the regulator without interrupting service. Preferred position for N6 valve is in a horizontal line with spring chamber up and arrow on body pointing in direction of flow. The loading line should be  $\frac{1}{4}$  pipe connected to the spring chamber tap.

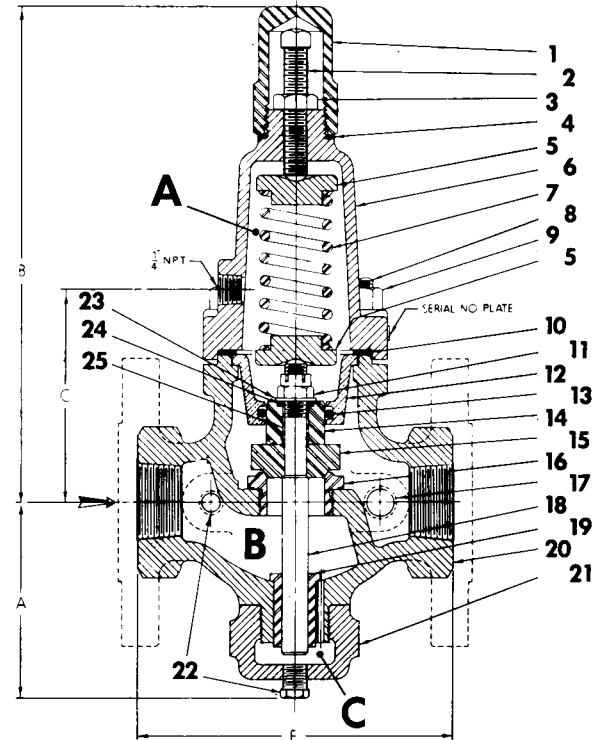
Avoid damaging effects of foreign matter in the flow by using SPENCE strainer ahead of the valve.

**IMPORTANT:** After valve is in service at operating pressure and temperature, check all gasketed joints and re-tighten. Failure to follow these instructions may result in damage to gaskets and mating surfaces.

### OPERATING INSTRUCTIONS

On starting up proceed as follows:

1. N6 Valves are shipped with the adjusting spring precompressed. This precompression may result in a differential pressure higher than desired. Remove adjusting screw cover and loosen adjusting screw locknut. It is recommended that the precompression be removed by turning the adjusting screw counter-clockwise until the screw turns easily indicating the spring load has been removed.
2. Open the inlet stop valve gradually until the N6 differential valve takes control as indicated by the differential pressure gage.
3. Adjustment of pressure: Turn adjusting screw clockwise to increase the differential pressure; counter-clockwise to decrease it.
4. With no compression on the adjusting spring the pump discharge pressure and the boiler pressure applied to the spring chamber will be the same, due to the fact that the piston and the disc have the same area and are balanced. To increase differential compress adjusting spring until desired differential is obtained.



PC. No.	Name	PC. No.	Name
1	Top Cap	14	Piston
2	Adjusting Screw	15	Skirted Disc
3	Adj. Scr. Locknut	16	Seat Ring
4	Top Cap Gasket	17	Pipe Plug 1/4"
5	Spring Buttons	18	Stem
6	Spring Chamber	19	Bushing
7	Adjusting Spring	20	Body
8	Spring Chamber Studs	21	Body Cap
9	Spring Chamber Nuts	22	Pipe Plug 1/8"
10	Spring Chamber Gasket	23	Washer
11	Stem Locknut	24	Sealing Ring
12	Cylinder	25	Tube
13	Sealing Ring		

### DIMENSIONS AND WEIGHTS

Size	Dimensions, Inches					Approx. Wt. Lb.	
	E		A	B	C	Scr. Ends	Flg. 250 lb.
	Scr. Ends	Flg. 250 lb.					
3/4	4-3/4		3	7-3/8	3	10	
1	5-3/8		3-3/8	8-1/2	3-5/8	12	
1-1/4	6-1/2		3-7/8	9-3/8	3-7/8	20	
1-1/2	7-1/4		4	10-7/8	4-1/4	26	
2	7-1/2		4-5/8	11-3/4	4-7/8	38	
2-1/2		10	4-3/4	14-1/2	5-3/8		74

## TROUBLE SHOOTING

1. Failure to Open — differential too high.
  - a. Differential adjusting spring setting may have been tampered with.
  - b. Valve piston (14) and sealing ring (13) may be binding.
  - c. Valve stem (18) and bushing (19) may be binding.
2. Failure to Close — differential too low.
  - a. Foreign material may be between the seat and disc of the main valve.
  - b. Line from steam header may be plugged, restricted or broken.
  - c. Differential adjusting spring setting may have been tampered with.
  - d. Chamber "C" may be dirt plugged or port in bushing (19) may be plugged.
  - e. "O" Ring or piston may be damaged and leaking.

## MAINTENANCE

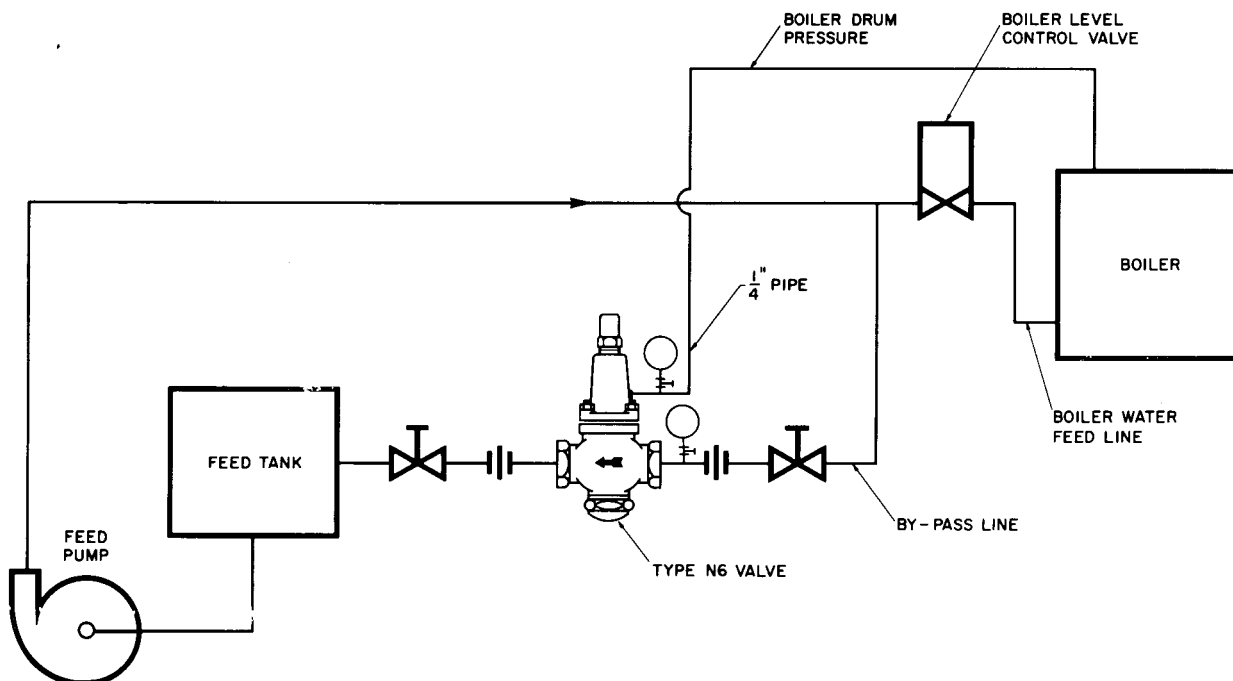
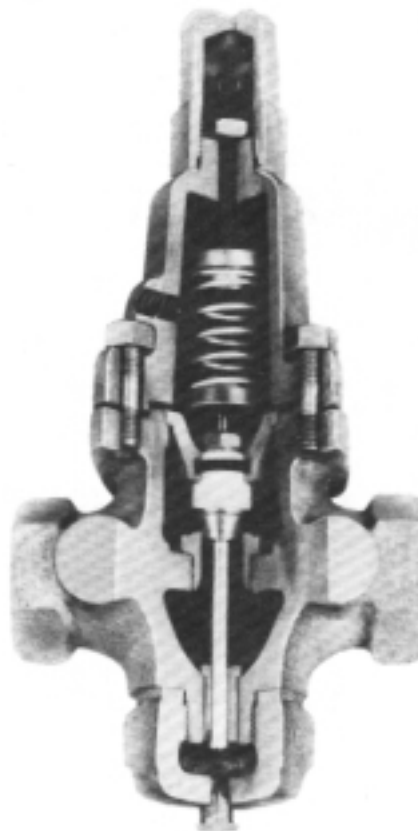
1. Inspection
  - a. Under normal conditions, complete dismantling at regular intervals is not recommended. A valve kept relatively free of dirt will function for years with minimum attention.
  - b. After the first few days of operation and twice a year:
    1. Inspect for dirt collected in chamber "C". Remove plug (22) to "blow down".
    2. Inspect for dirt collected in cylinder (12).
    3. Inspect all joints for leakage. Keep all joints tight, never allow a leak to persist.

## DISMANTLING N6 VALVE FOR CLEANING

1. Shut off supply and discharge valves and line from steam headers.
2. Remove top cap (1).
3. Loosen lock nut (3) and unscrew adjusting screw (2) until spring tension is released. (This step can be omitted if setting adjustments cannot be made after cleaning).
4. Disconnect pressure sensing line from boiler steam header.
5. Remove the four spring chamber hex head nuts (9).
6. Separate spring chamber (6) from valve body (20). Spring (7) and buttons (5) will drop out.
7. Remove valve disc assembly which consists of No. 11, 12, 13, 14, 15 and 18.
8. Assemble in reverse order. Use silicone lubricant on piston (14) so that it will move freely through sealing ring (13).

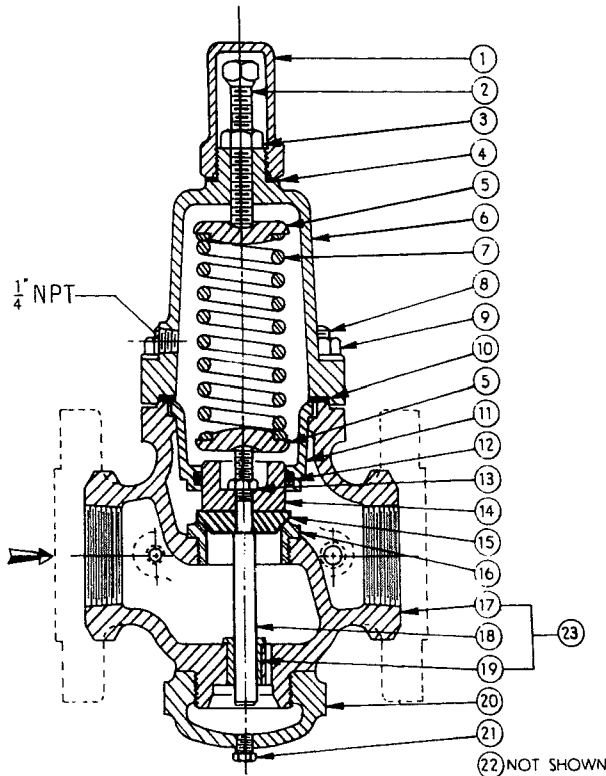
## VALVE GRINDING

1. Use fine (grit 400 to 800) compound on the seat, using light pressure.
2. Check seating by blueing the valve disc bevel face before reassembling.
3. Clean all parts with kerosene or carbon tetrachloride before reassembling.
4. Lubricate sealing ring (13) with a silicone lubricant or soap solution to facilitate insertion into guide area of body. Do not use petroleum base lubricants on rubber sealing rings.





**SPENCE ENGINEERING  
COMPANY**  
Walden, NY 12586



## Parts List TYPE N6

### DIFFERENTIAL PRESSURE VALVE

When ordering parts it is essential that the valve type, size, service and serial number be stated.

Select parts by item number but order by part number.  
Specify complete part number when ordering.

Item No.	Part Name	Remarks	Material	VALVE SIZE					
				3/4	1	1 1/4	1 1/2	2	2 1/2
1	Top Cap	See Note	Steel	4-01303-0	4-01303-0	4-01303-0	4-01331-0	4-01331-0	4-01331-0
2	Adjusting Screw		Steel	5-04860-0	5-04860-0	5-04860-0	5-04863-0	5-04864-0	5-04864-0
3	Adj. Screw Locknut		Steel	5-02942-0	5-02942-0	5-02942-0	5-02943-0	5-02943-0	5-02943-0
4	Top Cap Gasket	A, B	Cu. Asb.	5-02356-0	5-02356-0	5-02356-0	5-02357-0	5-02357-0	5-02357-0
5	Spring Buttons		Steel	4-01040-0	4-01040-0	4-01040-0	4-01060-0	5-01050-0	5-01062-0
6	Spring Chamber		C.I.	4-01398-0	4-01399-0	4-01400-0	4-01401-0	4-01402-0	4-01403-0
7	Adj. Spring (5-50 psi)		All. Stl.	5-04957-0	5-04958-0	5-04959-0	5-04960-0	5-04961-0	5-04962-0
	Adj. Spring (40-125 psi)		17-7PH	5-04972-1	5-04973-1	5-04974-1	5-04975-1	5-04976-1	5-04977-1
	Adj. Spring (100-200 psi)		All. Stl.	5-10327-0	5-10328-0	5-10329-0	5-10330-0	5-10331-0	5-10332-0
8	Spr. Chamber Studs		Steel	4-05516-0	4-10118-0	4-05442-0	4-05443-0	4-10119-0	4-05447-0
9	Spr. Chamber Nuts		Steel	5-02847-0	5-02851-0	5-02854-0	5-02856-0	5-02860-0	5-02862-0
10	Spr. Chamber Gasket	A, B	Asb.	5-02381-0	5-02362-0	5-02382-0	5-02365-0	5-02366-0	5-02367-0
11	Cylinder	B	Bronze	4-01569-1	4-01570-1	4-01571-1	4-01572-1	4-01573-1	4-01574-1
12	Sealing Ring	A, B	Viton	5-04021-0	5-04026-0	5-10463-0	5-04034-0	5-04044-0	5-04048-0
13	Stem Locknut	B	Steel	5-03015-0	5-03016-0	5-03016-0	5-03017-0	5-03017-0	5-03018-0
14	Piston	B	St. Steel	4-03336-0	4-03337-0	4-03338-0	4-03339-0	4-03340-0	4-03341-0
15	Disc	B	St. Steel	4-02007-0	4-01832-2	4-01850-2	4-01870-2	4-01888-2	4-01906-1
16	Seat Ring	B	St. Steel	4-04075-1	4-04084-1	4-04092-1	4-04496-1	4-11544-0	4-11539-0
17	Body	*	C.I.	—	—	—	—	—	—
18	Stem	B	St. Stl.	4-05311-1	4-05312-1	4-05313-1	4-05314-1	4-05315-1	4-05316-2
19	Bushing	*	17-4PH	4-01094-1	4-01099-2	4-01095-1	4-10630-0	4-10630-0	4-10522-0
20	Body Cap		C.I.	4-01300-0	4-01300-0	4-01301-0	4-01301-0	4-01302-0	4-01325-0
21	Pipe Plug 1/8" NPT		Steel	4-03769-0	4-03769-0	4-03769-0	4-03769-0	4-03769-0	4-03769-0
22	Pipe Plug 1/4" NPT		Steel	4-03772-0	4-03772-0	4-03772-0	4-03772-0	4-03772-0	4-03772-0
23	Body & Bushing		C.I.	7-42862-1	7-42863-1	7-42864-1	7-42865-1	7-42866-1	7-42867-1
	Repair Kit			7-08362-1	7-08363-1	7-08364-1	7-08365-1	7-08366-1	7-08367-1

\*Included in Item 23

Sizes 3/4" - 2" inclusive are Screwed Ends

Size 2 1/2" is 250 lb. Flanged

A Recommended Spare Parts

B Included in Repair Kit

Note:

Top Cap for 1 1/2", 2" and 2 1/2" is Cast Iron







# Technical Data

A Division of CIPCOR International, Inc.

**SPENCE ENGINEERING COMPANY, INC.** 150 COLDENHAM ROAD, WALDEN, NY 12586-2035

## NOISE SUPPRESSOR

### 3/8" - 2" INLET SIZES

DIMENSIONS: Inches

#### SUPPRESSOR ENDS

INLET (A)	x	OUTLET (B)
<input type="checkbox"/> ANSI NPT	x	ANSI NPT
<input type="checkbox"/> ANSI NPT	x	ANSI 150#
<input type="checkbox"/> ANSI NPT	x	ANSI 300#
<input type="checkbox"/> ANSI 150#	x	ANSI 150#
<input type="checkbox"/> ANSI 300#	x	ANSI 150#
<input type="checkbox"/> ANSI 300#	x	ANSI 300#

#### CONSTRUCTION

Pressure Shell: Welded steel components

Acoustic Material: Stainless Steel

Temperature Rating: 500°F

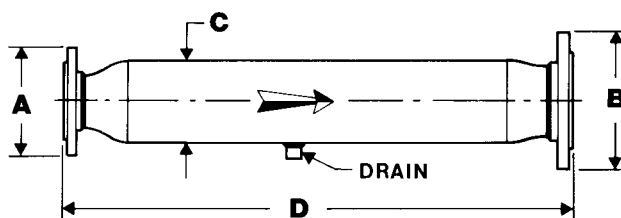
#### NOTES:

ANSI 150# flanges are flat faced.

It is recommended that the noise suppressor be insulated to reduce condensation formation in the acoustic material.

The Spence Noise Suppressor is designed to attenuate the noise generated by a pressure reducing station. These devices are particularly effective in limiting the propagation of valve-generated noise into the downstream piping. Being of the dissipative reactive type, they are effective over a broad frequency band (up to 12,000 Hz). Depending upon flow and piping configuration, noise attenuation of up to 20 decibels is obtainable.

Installed at the reducing valve outlet, the required pipeline expansion takes place within the noise suppressor. This expanded outlet feature eliminates the expense and noise often associated with separate expansion fittings. The straight through design minimizes pressure drop, permitting normal valve sizing.

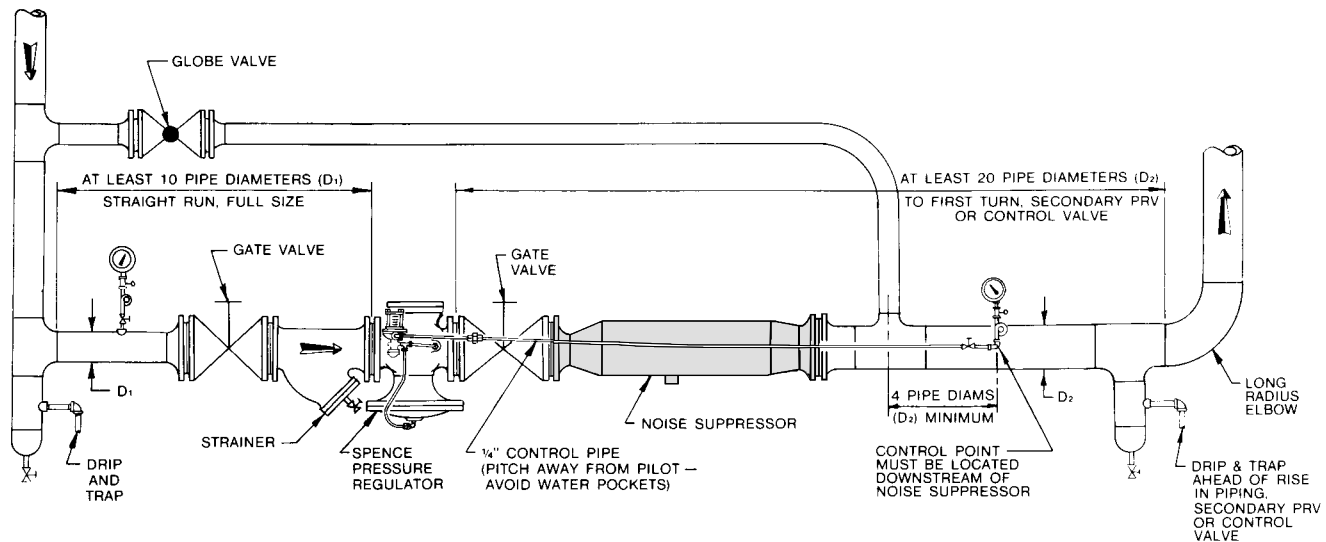


## DIMENSIONS AND WEIGHTS

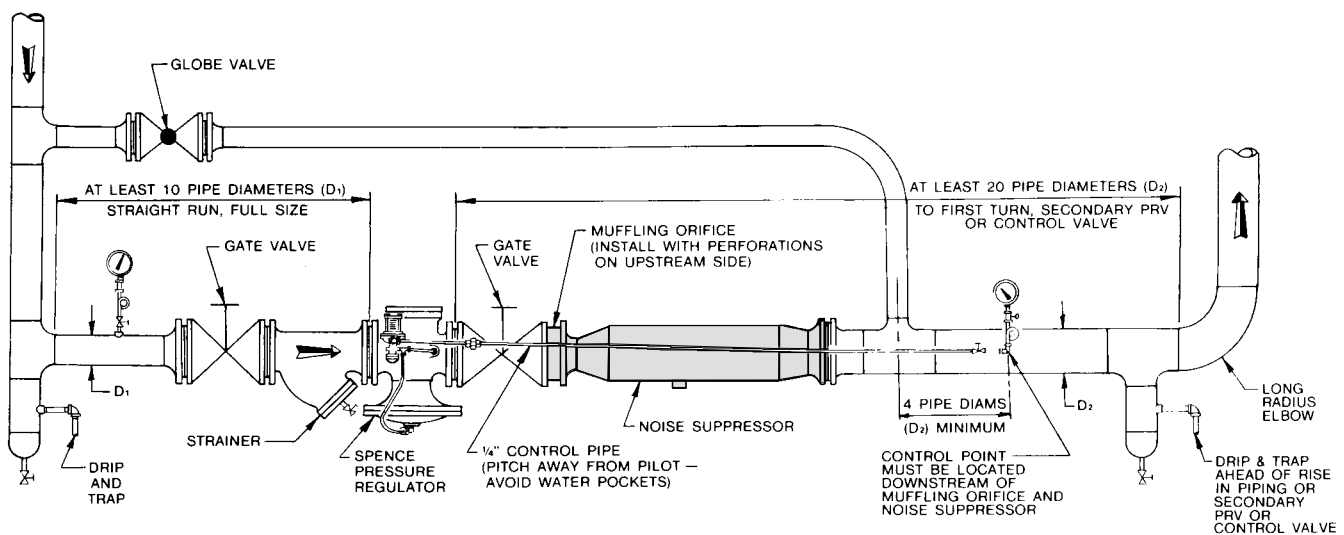
NOMINAL PIPE SIZE			D* — INSTALLED LENGTH (Inches)			APPROX. WEIGHT (Pounds)					
A INLET	B OUTLET	C SHELL	NPT x NPT NPT x 300# 300# x 300#	NPT x 150# 300# x 150#	150# x 150#	NPT x NPT	NPT x 150#	NPT x 300#	150# x 150#	300# x 150#	300# x 300#
3/8	3/4	2	19-13/16	19-5/8	--	8	9	10	--	--	--
	1	2	20	19-3/4	--	8	10	11	--	--	--
	1-1/2	2-1/2	22-3/4	22-1/2	--	12	15	18	--	--	--
1/2	1	2	20	19-3/4	19-9/16	8	10	11	12	12	13
	1-1/4	2-1/2	22-5/8	22-5/16	22-1/8	12	13	16	15	15	17
	1-1/2	2-1/2	22-3/4	22-1/2	22-5/16	12	15	18	16	16	19
3/4	1-1/4	2-1/2	23-5/16	23	22-13/16	12	14	16	15	16	18
	2	3	26-1/2	26-1/4	26-1/16	16	21	23	22	23	25
1	1-1/2	2-1/2	21-1/8	20-7/8	20-5/8	13	16	19	18	19	22
	2	3	26-11/16	26-7/16	26-3/16	16	21	23	23	24	26
1 1/4	2	3	24-5/16	24-1/16	23-3/4	16	21	23	23	25	27
	3	4	34-11/16	34-5/16	34	--	40	47	42	45	51
1 1/2	3	4	31-13/16	31-7/16	31-3/16	--	39	44	43	46	52
2	3	4	31-7/8	31-1/2	31-1/4	--	40	46	45	47	53
	4	5	40-1/8	39-3/4	39-1/2	--	66	76	72	74	84

\*±1/4" for 8" Shell and under

## RECOMMENDED INSTALLATION OF PRESSURE REGULATOR WITH NOISE SUPPRESSOR



## RECOMMENDED INSTALLATION OF PRESSURE REGULATOR WITH MUFFLING ORIFICE AND NOISE SUPPRESSOR





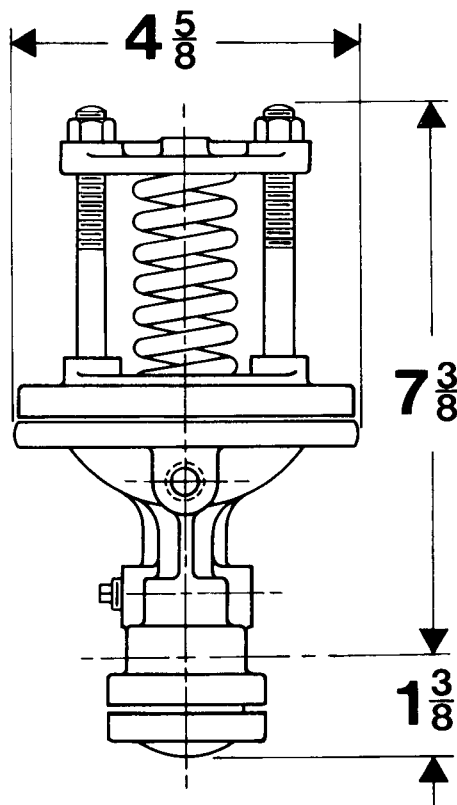
# Technical Data

SD 4111B

A division of CIRCOR International, Inc.

**SPENCE ENGINEERING COMPANY, INC.** 150 COLDENHAM ROAD, WALDEN, NY 12586-2035

DIMENSIONS: Inches



**STANDARD D PILOT**  
7 LBS.

## TYPE D PRESSURE REDUCING PILOT

The combination of a Type D pilot and a Spence Type E or Type C main valve produces a Spence Pressure Regulator. This regulator will reduce a steady or varying initial pressure to a constant, adjustable delivery pressure.

The Type D pilot is spring loaded. Normal accuracy of regulation is  $\pm 1$  psi. The adjustable range of delivery pressure is governed by the choice of adjusting spring as shown in Table 1.

PRESSURE RANGE (PSIG)	ADJUSTING SPRING - Item 4		
	PART NO.	WIRE DIA. (Inch)	COLOR
3 - 20*	05-05007-00	3/16	Aluminum
5 - 50*	05-05003-00	1/4	Orange
10 - 100	05-05005-00	5/16	Green
20 - 150	05-05012-00	11/32	Black

\*With Vacuum Spring Assembly, minimum range is 30 inches Hg; maximum is reduced by 15 PSIG.

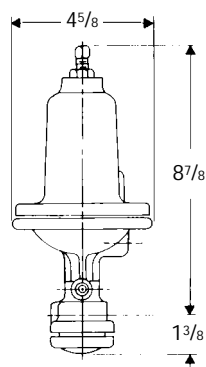
**TABLE 1**

### RATINGS (Maximum Inlet Conditions)

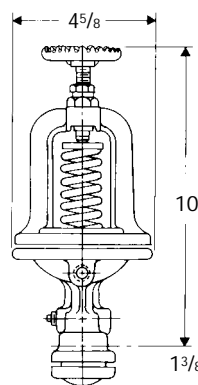
Construction	Pressure	(Temperature)
<input type="checkbox"/> Cast Iron .....	250 PSIG .....	(450°F)
<input type="checkbox"/> Cast Steel .....	600 PSIG .....	(750°F)

### OPTIONS

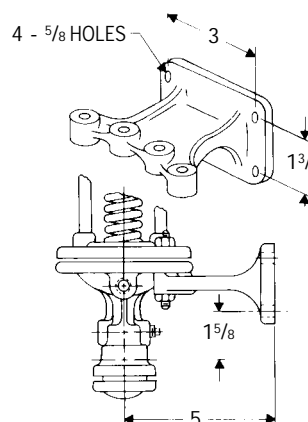
- ☐ Spring Chamber
- ☐ Adjusting Handwheel
- ☐ Wall Bracket
- ☐ Locking Device
- ☐ Composition Disc
- ☐ Integral Mount Body
- ☐ Vacuum Spring Assembly



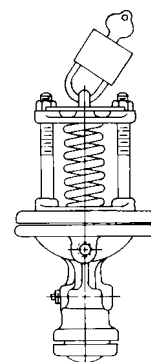
**SPRING CHAMBER**  
8 1/2 LBS.



**ADJUSTING HAND-  
WHEEL**  
8 LBS.



**WALL BRACKET**  
9 LBS.



**LOCKING  
DEVICE**  
7 1/2 LBS.

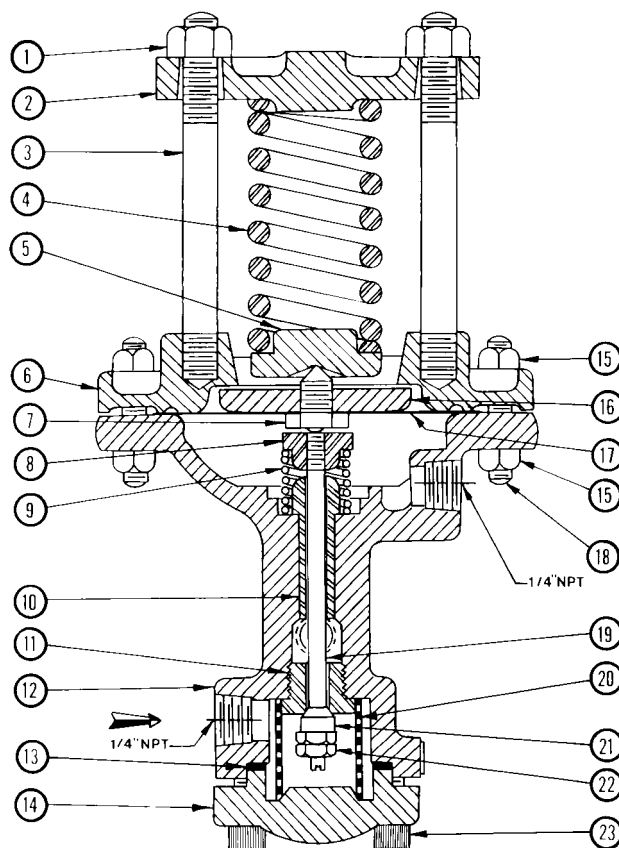
SD 4111B/0309

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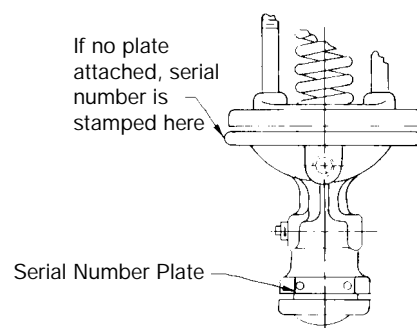
When ordering parts, it is essential that the pilot type, service and serial number be stated.

Part numbers listed apply to pilots with serial numbers later than AA 001. For earlier models, part numbers will be furnished on request.

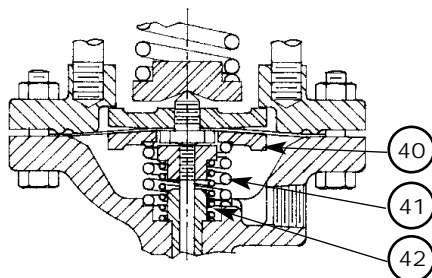
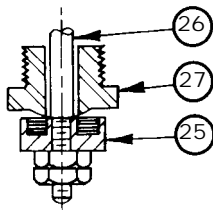
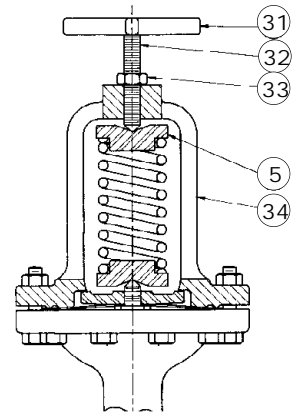
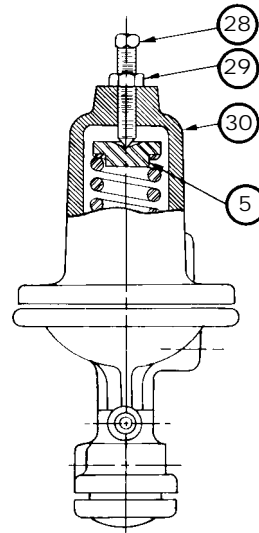
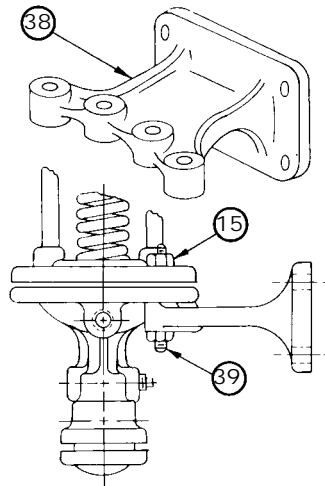
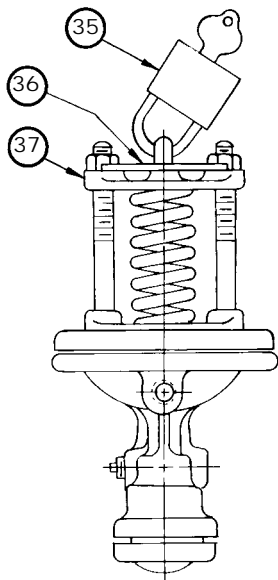
Select part by item number, but order by part number. Specify complete part number when ordering.



ITEM NO.	PART NAME	MATERIAL	PART NO.	REMARKS
1	Adjusting Nut	Steel	05-02874-00	
2	Spring Yoke	Iron	05-06183-00	
3	Standard	Steel	04-05219-00	
4	Adjusting Spring	Steel	See Table	
5	Spring Button	Steel	04-01040-00	
6	Cowl	Cast Iron	04-01508-00	Iron Body
	Cowl	Steel	04-01592-00	Steel Body
7	*Diaphragm Screw	Steel	04-04822-00	
8	*Pusher Plate	Steel	04-03718-00	
9	*Valve Spring	Inconel	05-04985-00	
10	Bushing	St. Steel	04-01080-00	
11	*Seat Ring	Seco Metal	04-04057-90	
12	Body, Bushing, Plug	Cast Iron	07-03514-00	
	Body, Bushing, Plug	Steel	07-04267-02	
13	*Gasket	Blugard	05-02378-01	Iron Body, Non-Asbestos
	*Gasket	Flexitalic	05-11718-00	Steel Body, Non-Asbestos
14	Blind Flange	Cast Iron	04-02151-00	
	Blind Flange	Steel	04-11678-00	
15	Diaphragm Nut	Steel	05-02871-00	Iron Body
	Diaphragm Nut	Steel	05-02845-00	Steel Body
16	*Pressure Plate	Steel	04-03679-00	
17	*Diaphragm	St. Steel	04-01623-00	
18	Diaphragm Bolt	Steel	05-04764-00	Iron Body
	Diaphragm Stud	Steel	05-05490-00	Steel Body
19	*Stem	St. Steel	04-05229-00	
20	*Screen	St. Steel	04-04700-00	Steam Service
	*Screen	St. Steel	04-04701-00	Water Service
21	*Disc	Seco Metal	04-01772-90	
22	*Stem Nut	Steel	05-02888-00	Steam Service
	*Stem Nut	Brass	05-02886-00	Water Service
23	Blind Flange Bolt	Steel	05-04803-00	Iron Body
	Blind Flange Bolt	Steel	05-11719-00	Steel Body
	Repair Kit	Cast Iron Pilot	07-04164-00	
	Repair Kit	Steel Pilot	08-10375-00	



\*These parts furnished in Repair Kit



## OPTIONS

ITEM NO.	PART NAME	MATERIAL	PART NO.	REMARKS
----------	-----------	----------	----------	---------

### LOCKING DEVICE

35	Padlock	Brass	05-03204-00	
36	Lock Bar	Steel	04-00436-00	
37	Spring Yoke Ass'y	Iron	07-43507-00	

### WALL BRACKET

38	Wall Bracket	Cast Iron	04-01029-00	
39	Diaphragm Bolt	Steel	05-04766-00	Iron Body
	Diaphragm Stud	Steel	05-05462-00	Steel Body
15	Diaphragm Nut	Steel	05-02871-00	Iron Body
	Diaphragm Nut	Steel	05-02845-00	Steel Body

### COMPOSITION DISC

27	*Seat Ring	St. Steel	04-04060-00	
26	*Stem	St. Steel	04-05381-00	
25	*Disc Assembly	Brass	07-53512-00	

### ENCLOSED SPRING CHAMBER

28	Adjusting Screw	Steel	05-04860-00	
29	Locknut	Steel	05-02942-00	
30	Spring Chamber	Iron	04-01393-00	
	Spring Chamber	Bronze	04-01395-00	
	Spring Chamber	Steel	04-01394-00	
	Enclosed Spring Chamber Kit	Cast Iron	08-01868-00	

### ADJUSTING HANDWHEEL

31	Handwheel	Aluminum	04-12985-01	
32	Adjusting Screw	Steel	04-04752-02	
33	Locknut	Steel	05-02942-00	
34	Yoke	Cast Iron	04-06170-00	Iron Body
	Yoke	Ductile Iron	04-06167-02	Steel Body
	Handwheel Kit	Cast Iron	08-01867-00	

### VACUUM SPRING ASSEMBLY

40	Floating Plate	Iron	04-03710-00	
41	Vacuum Spring	302 St. Steel	05-05055-00	
42	Valve Spring	Inconel	05-09353-00	

\*These parts furnished in Repair Kit

## MAINTENANCE

(Brackets refer to item number)

### DISMANTLING

- 1 - Release adjusting spring (4) compression.
- 2 - Remove diaphragm nuts (15) and lift off cowl (6). Lift out diaphragm assembly (7, 16 & 17).
- 3 - Disassemble diaphragm assembly by removing diaphragm screw (7) from pressure plate (16).
- 4 - Remove blind flange bolts (23) and take off blind flange (14). Remove screen (20) and gasket (13).
- 5 - Hold the pusher plate (8) and remove stem nuts (22). Lift out stem assembly (8 & 19) and valve spring (9). The disc (21) will drop off.
- 6 - If the seat ring (11) requires replacement, remove it from pilot body with a socket wrench.

### ASSEMBLY

- 1 - Reassemble the pilot in the reverse of the procedure described above.
- 2 - When replacing diaphragms, apply sealing compound (Copaltite or equal) sparingly to the shoulder of the diaphragm screw (7). For steel pilots only, apply sealing compound to the diaphragm flange of the pilot body.
- 3 - When replacing gaskets, be sure that any serrated sealing surfaces are cleaned of old gasket material.

### INSPECTION

- 1 - Examine the seat and disc sealing surfaces for nicks or other signs of damage by pipeline debris. Slight imperfections may be removed by lapping the surfaces together. Otherwise, the seat and disc must be replaced.
- 2 - Examine the stem for a build-up of pipeline contaminants or erosion. Remove any build-up with a wire brush and polish with very fine crocus cloth. Work carefully to avoid bending the stem.

### LAPPING OPERATIONS

**Lap sparingly using 500 grit lapping compound and light pressure. Heavy grinding may cause galling, wide sealing surfaces and a grooved disc. all of which tend to produce leakage.**

After the sealing surfaces are lapped in, disassemble and clean all parts.

### SEAT, DISC AND STEM REPLACEMENT

- 1 - Clean the body threads of old sealing compound using a wire brush. Apply new sealing compound (Copaltite or equal) to the shoulder of seat ring. Let stand until tacky before installing in pilot body.
- 2 - Lap in stem to disc joint with lapping compound.

- 3 - Secure disc (21) to stem (19) with a stem nut (22). Insert this assembly into pilot body (omit valve spring).
- 4 - Apply lapping compound to the disc and lap in the seat to disc joint. The stem is slotted for rotation with a screwdriver.
- 5 - Screw pusher plate (8) on stem (19). Holding disc against its seat, adjust the pusher plate so that dimension C = 11/64" (See Figure 1). A gage (part number 05-02416-00) is supplied with each repair kit.
- 6 - Remove stem nut, being careful not to disturb the pusher plate adjustment, and lift stem out the top of the pilot. Grind off stem Projection B flush with upper surface of the pusher plate.

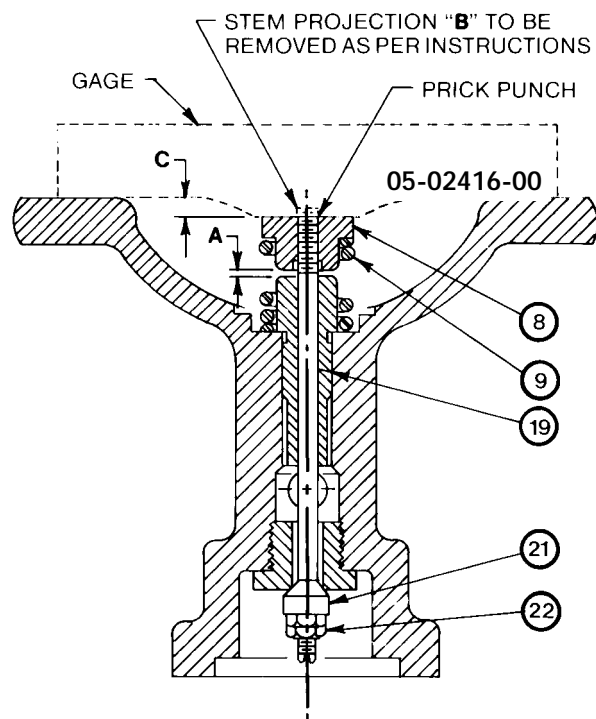


FIGURE 1 - TRAVEL SETTING

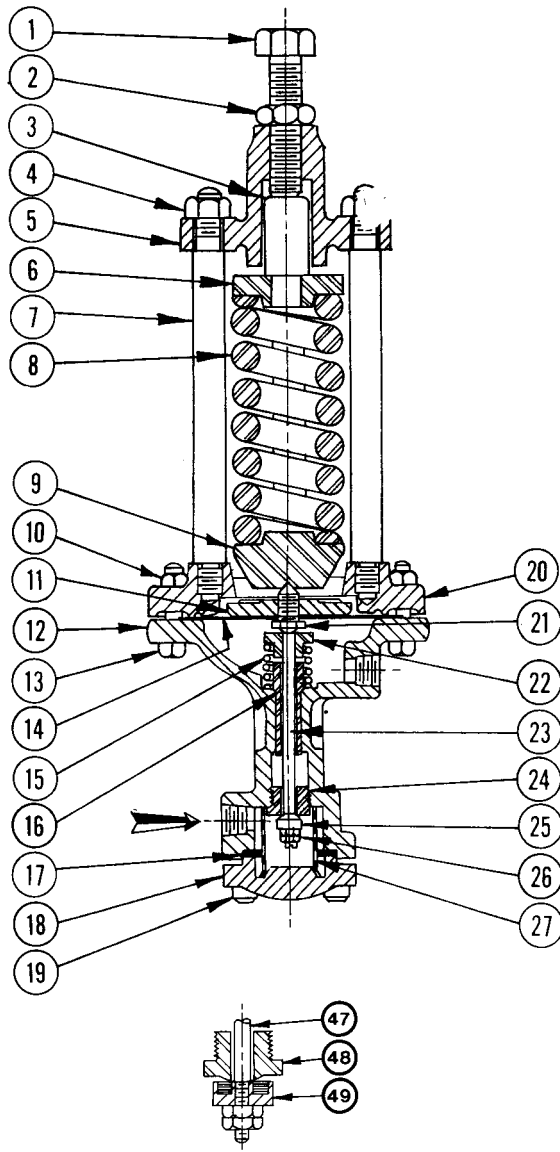
- 7 - Reinsert stem into pilot body. Install disc and stem nut. Check dimension C and, if correct, lock the adjustment by prick punching the thread at several points. Work carefully to avoid bending the stem.
- 8 - Scrape away burrs raised by prick punching. Upper surface of pusher plate must be smooth and flat.
- 9 - Check that valve travel A = 3/64". This need not be exact. Stem should move smoothly. Binding indicates a bent stem.
- 10 - Remove stem nut and disc; withdraw stem. Install stem with valve spring disc and both stem nuts in place.



**SPENCE ENGINEERING  
COMPANY**  
Walden, NY 12586

When ordering parts it is essential that the pilot type, service and serial number be stated.

Select parts by item number but order by part number.  
Specify complete part number when ordering.



**COMPOSITION DISC**

Item No.	Part Name	Remarks	Material	Part No.
47	Stem	B	St. Steel	4-05381-0
48	Seat Ring	B	St. Steel	4-04060-0
49	Comp. Disc Assembly	B	Brass	7-53512-0

**A - Recommended Spare Parts**

**B - These parts furnished in Repair Kit: (Steam Screen)**

	<u>C.I. &amp; Brz.</u>	<u>C. Stl.</u>
St. Stl. Disc	8-09157-0	8-10357-0
Comp. Disc	8-09158-0	8-10380-0

**Note 1 Applies to Iron and Bronze Body Pilots**

**Note 2 Applies to Steel Body Pilots**

**Use Pilot Setting Instruction 9-98165-0**

## Parts List - TYPE D2 PILOT

Item No.	Part Name	Remarks	Material	Part No.
1	Adjusting Screw		Steel	4-04760-0
2	Adjusting Screw Locknut		Steel	5-02953-0
3	Guide Stud		St. Steel	4-05419-0
4	Standard Nut		Steel	5-02874-0
5	Spring Yoke		Cast Iron	4-06179-0
6	Upper Spring Button		Steel	4-01078-0
7	Standard		Steel	4-05213-0
8	Adjusting Spring		All. Steel	5-04990-0
9	Lower Spring Button		Steel	4-01041-0
10	Diaphragm Nut	Note 1	Steel	5-02871-0
	Diaphragm Nut	Note 2	Steel	5-02845-0
11	Pressure Plate	B	Steel	4-03679-0
12	Body & Bushing		Iron	7-03514-0
	Body & Bushing		Bronze	8-04265-0
	Body & Bushing	Screwed	Steel	7-04267-2
	Body & Bushing	Flanged Inlet	Steel	8-09518-2
	Body & Bushing	Secoweld Screwed	Steel	8-09517-2
	Body & Bushing	Secoweld Flanged Inlet	Steel	8-07124-2
13	Diaphragm Bolt	Note 1	Steel	5-04764-0
	Diaphragm Stud	Note 2	Steel	5-05490-0
14	Diaphragm	A, B 3 Per Set	St. Steel	4-01623-0
15	Valve Spring	A, B	Inconel	5-04985-0
16	Bushing	See Item 12	St. Steel	4-01080-0
17	Gasket	A, B Note 1	Asbestos	5-02378-0
	Gasket	A, B Note 2	Flexitalic	5-11718-0
18	Blind Flange		Iron	4-02151-0
	Blind Flange		Bronze	4-02153-0
	Blind Flange		Steel	4-11678-0
19	Blind Flange Bolt	Note 1	Steel	5-04803-0
	Blind Flange Bolt	Note 2	Steel	5-11719-0
20	Cowl		Iron	4-01505-0
	Cowl		Steel	4-01591-0
21	Diaphragm Screw	B	Steel	4-04822-0
22	Pusher Plate	B	Steel	4-03718-0
23	Stem	B	St. Steel	4-05229-0
24	Seat Ring	B	St. Steel	4-04057-0
25	Disc	B	St. Steel	4-01772-0
26	Stem Nut	B	Steel	5-02888-0
27	Screen - Water		Monel	4-04701-0
	Screen - Steam	B	Monel	4-04700-0
28	Pipe Plug - 1/8 NPT	Not Shown	Steel	4-03769-0
	Pipe Plug - 1/8 NPT	Not Shown	Brass	4-03770-0

### ENCLOSED SPRING CHAMBER

29	Spring Chamber	Steel	7-40529-0
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### ADJUSTING HANDLE

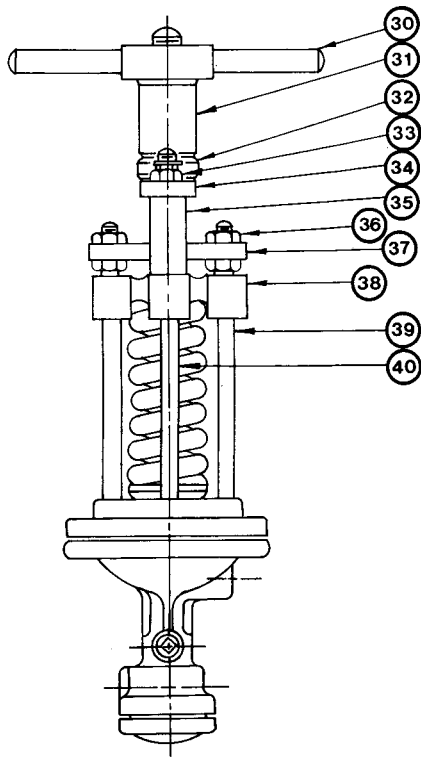
30	Handle & Hub Assembly	Steel	8-09774-0
31	Adjusting Stud Spacer	Brass	4-05600-0
32	Thrust Bearing	Steel	5-00552-0
33	Guide Std. Locknut	Steel	5-03016-0
34	Cross Bar	Steel	4-00434-0
35	Guide Std. Spacer	Brass	4-04936-0
36	Support Std. Nut	Steel	5-02942-0
37	Adjusting Stud Assembly	—	7-40550-0
38	Spring Yoke	Cast Iron	4-06173-0
39	Support Standard	Steel	4-05223-0
40	Guide Standards	Steel	4-05221-0

### WALL BRACKET

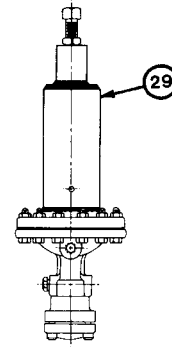
41	Wall Bracket	Cast Iron	4-01029-0
42	Diaphragm Bolt	Steel	5-04766-0
	Diaphragm Stud	Steel	5-05462-0
10	Diaphragm Nut	Steel	5-02871-0
	Diaphragm Nut	Steel	5-02845-0

### FLANGED INLET

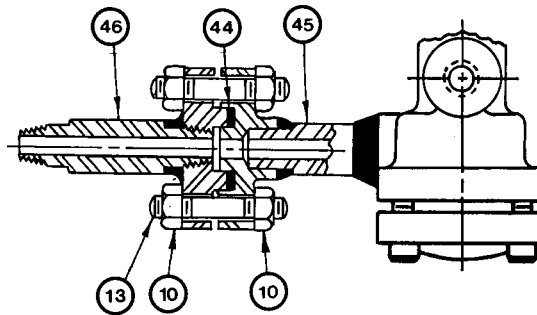
44	Gasket	Stl. Asb.	5-02370-0
45	Flange Assembly-Female	Steel	7-43516-0
46	Flange Assembly-Male	Steel	7-40535-0
13	Stud	Steel	5-05490-0
10	Nut	Steel	5-02845-0



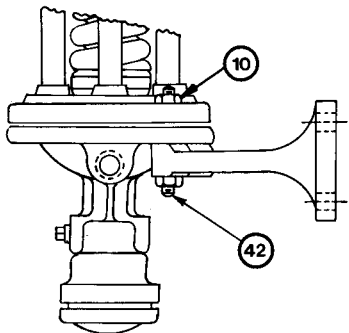
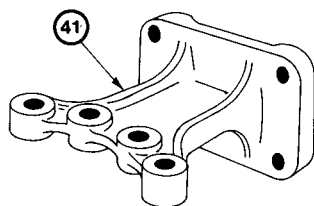
ADJUSTING HANDLE



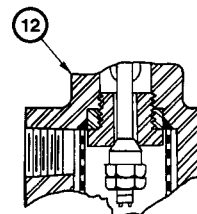
Enclosed Spring Chamber



FLANGED INLET



WALL BRACKET



ALTERNATE: SECOWELD CONSTRUCTION



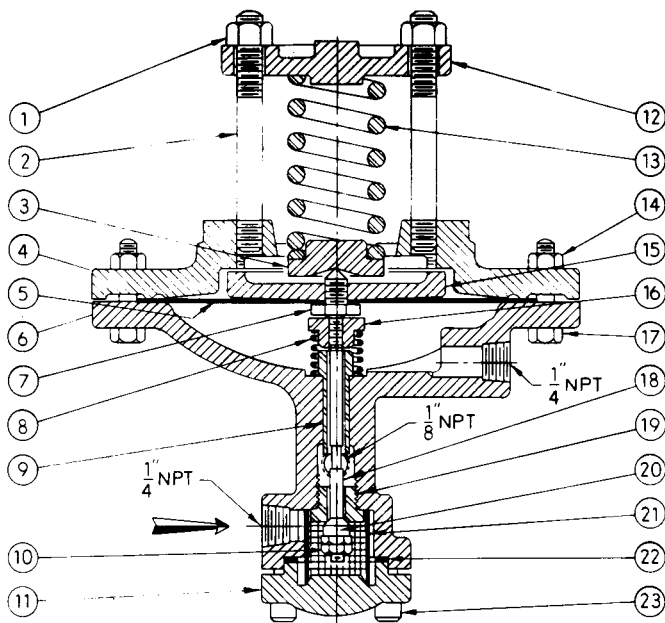


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COMPANY**  
Walden, NY 12586

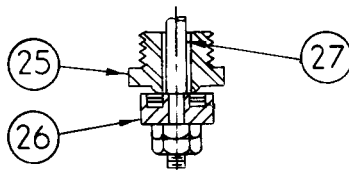
## Parts List - TYPE D5 PILOT

When ordering parts it is essential that the pilot type, service and serial number be stated.

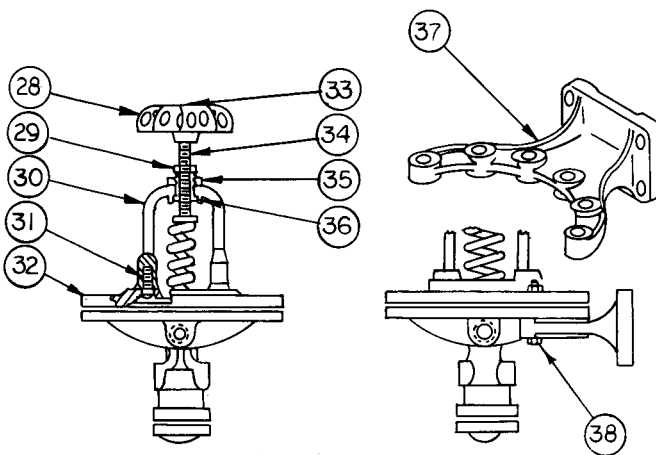
Select parts by item number but order by part number. Specify complete part number when ordering.



TYPE D5 PILOT - METAL DISC

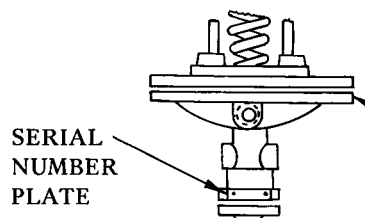


COMPOSITION DISC



ADJUSTING HANDWHEEL

WALL BRACKET



SERIAL  
NUMBER  
PLATE

If no plate attached  
Serial Number is  
stamped here.

Item No.	Part Name	Remarks	Material	Part No.
1	Adjusting Nut		Steel	5-02874-0
2	Standard		Steel	4-05219-0
3	Spring Button		Steel	4-01040-0
4	Cowl		Iron	4-01521-1
5	Diaphragm - 2 per set	A, B	St. Steel	4-03927-0
6	Body & Bushing		Iron	8-04698-0
	Body & Bushing		Bronze	8-04699-0
7	Diaphragm Screw	B	Steel	4-04822-0
8	Valve Spring	A, B	Inconel	5-04985-0
9	Bushing	*	St. Steel	4-01080-0
10	Stem Nut	B	Steel	5-02888-0
11	Blind Flange		Iron	4-02151-0
	Blind Flange		Bronze	4-02153-0
12	Spring Yoke		Iron	5-06183-0
13	Adj. Spring 1-10 psi		Steel	5-05007-0
	Adj. Spring 5-25 psi		Steel	5-05003-0
14	Diaphragm Nut		Steel	5-02871-0
15	Pressure Plate	B	Iron	4-03684-1
16	Pusher Plate	B	Steel	4-03718-0
17	Diaphragm Bolt		Steel	5-04764-0
18	Stem	B	St. Steel	4-05229-0
19	Seat Ring	B	St. Steel	4-04057-0
20	Disc	B	St. Steel	4-01772-0
21	Screen, Steam	B	Monel	4-04700-0
22	Gasket	A, B	Asbestos	5-02378-0
23	Blind Flange Bolt		Steel	5-04803-0
24	Pipe Plug 1/8" NPT (Not Shown)		Steel	4-03769-0
	Pipe Plug 1/8" NPT (Not Shown)		Brass	4-03770-0

Composition Disc

25	Seat Ring		St. Steel	4-04060-0
26	Composition Disc Ass'y		Brass	7-53512-0
27	Stem		St. Steel	4-05381-0

Adjusting Handwheel

28	Handwheel		Mall. Iron	5-06139-0
29	Adj. Screw Locknut		Steel	5-02952-0
30	Handwheel Yoke		Duct. Iron	4-06169-0
31	Yoke Bolts		Steel	5-04805-0
32	Cowl		Cast Iron	4-01523-0
33	Handwheel Nut		Steel	5-02872-0
34	Adjusting Screw		Steel	4-04752-0
35	Yoke Bushing Locknut		Steel	5-02947-0
36	Yoke Bushing		Bronze	4-01152-0

Wall Bracket

37	Wall Bracket		Iron	4-01027-0
38	Diaphragm Bolt		Steel	5-04767-0

A - Recommended spare parts

B - Furnished in Repair Kit - SM-St. Stl. Disc 7-08372-0

\* - Bushing furnished with Body (Item No. 6)



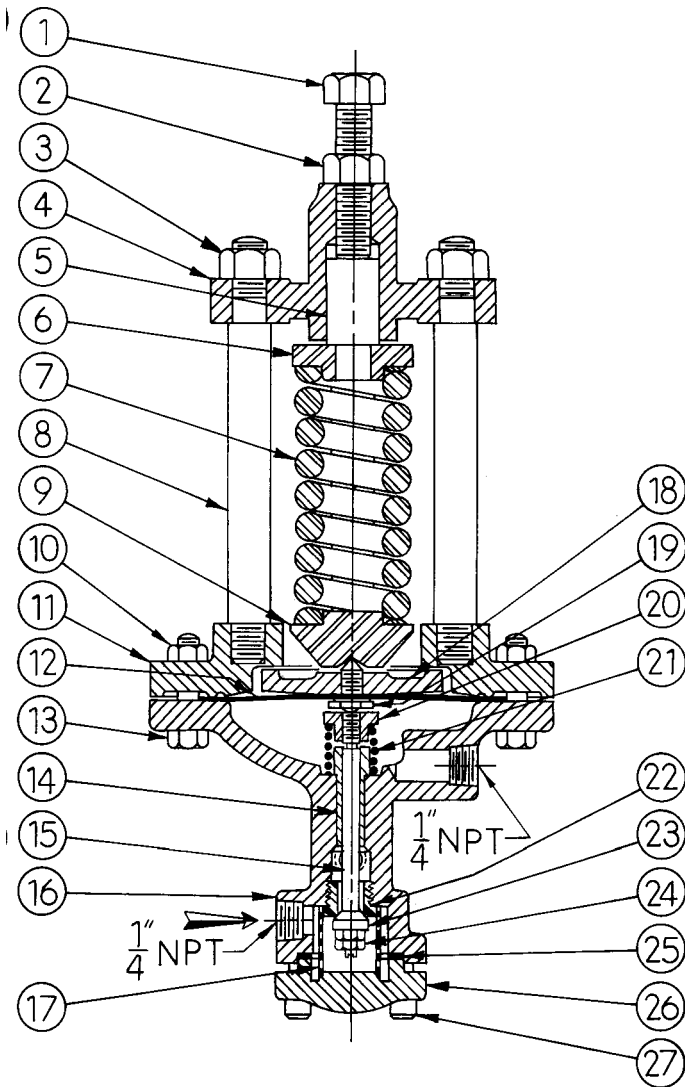


**SPENCE ENGINEERING  
COMPANY**  
Walden, NY 12586

## Parts List - TYPE D120 PILOT

When ordering parts it is essential that the pilot type, service and serial number be stated.

Select parts by item number but order by part number.

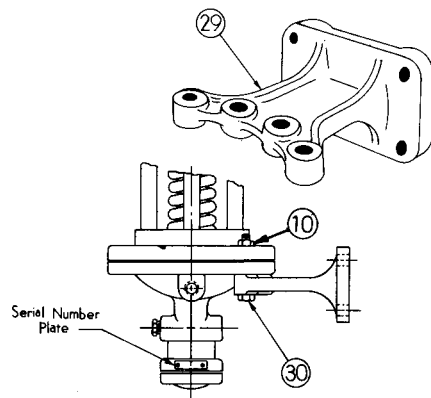


Item No.	Part Name	Remarks	Material	Part No.
1	Adjusting Screw		Steel	4-04760-0
2	Locknut		Steel	5-02877-0
3	Standard Nut		Steel	5-02877-0
4	Spring Yoke		Cast Iron	4-06177-0
5	Guide Stud		St. Steel	4-05419-0
6	Upper Spring Button		Steel	4-01078-0
7	Adj. Spring 5-25 PSI Adj. Spring 10-75 PSI Adj. Spring 40-150 PSI	Use 2 Diaph. Use 2 Diaph. Use 3 Diaph.	Steel Steel Alloy St.	5-05016-0 5-05028-0 5-05030-0
8	Standard		Steel	5-05200-0
9	Lower Spring Button		Steel	4-01041-0
10	Diaphragm Nut Diaphragm Nut	Note 1 Note 2	Steel Steel	5-02872-0 5-02848-0
11	Cowl Cowl		Cast Iron Steel	4-01513-0 4-01514-0
12	Diaphragm	A, B See Item 7	St. Steel	4-01659-0
13	Diaphragm Bolt Diaphragm Stud	Note 1 Note 2	Steel Steel	5-04770-0 5-05480-0
14	Bushing	See Item 16	St. Steel	4-01132-0
15	Stem	B	St. Steel	4-05305-1
16	Body & Bushing Body & Bushing		Cast Iron Steel	8-09159-0 8-09160-1
17	Screen - Steam	B	Monel	4-04700-0
18	Pressure Plate	B	Cast Iron	4-03599-0
19	Diaphragm Screw	B	Steel	4-04822-0
20	Pusher Plate	B	Steel	4-03717-0
21	Valve Spring	A, B	Inconel	5-04985-0
22	Seat Ring	B	St. Steel	4-04062-0
23	Disc	B	St. Steel	4-07283-1
24	Stem Nut	B	Steel	5-02891-0
25	Gasket Gasket	A, B Note 1 A, B Note 2	Asbestos Flexitalic	5-02378-0 5-11718-0
26	Blind Flange Blind Flange		Cast Iron Steel	4-02151-0 4-11678-0
27	Blind Flange Bolt Blind Flange Bolt	Note 1 Note 2	Steel Steel	5-04803-0 5-11719-0
28	Pipe Plug - 1/4 NPT	Not Shown	Steel	4-03772-0

A - Recommended Spare Parts

B - Furnished in Repair Kit: 8-09154-0 Note 1

8-10356-0 Note 2



**WALL BRACKET**

### WALL BRACKET

29	Wall Bracket		Iron	4-01028-0
30	Diaphragm Bolt		Steel	5-04781-0
10	Diaphragm Nut		Steel	5-02872-0

Note 1 Applies to Iron Body Pilots

Note 2 Applies to Steel Body Pilot



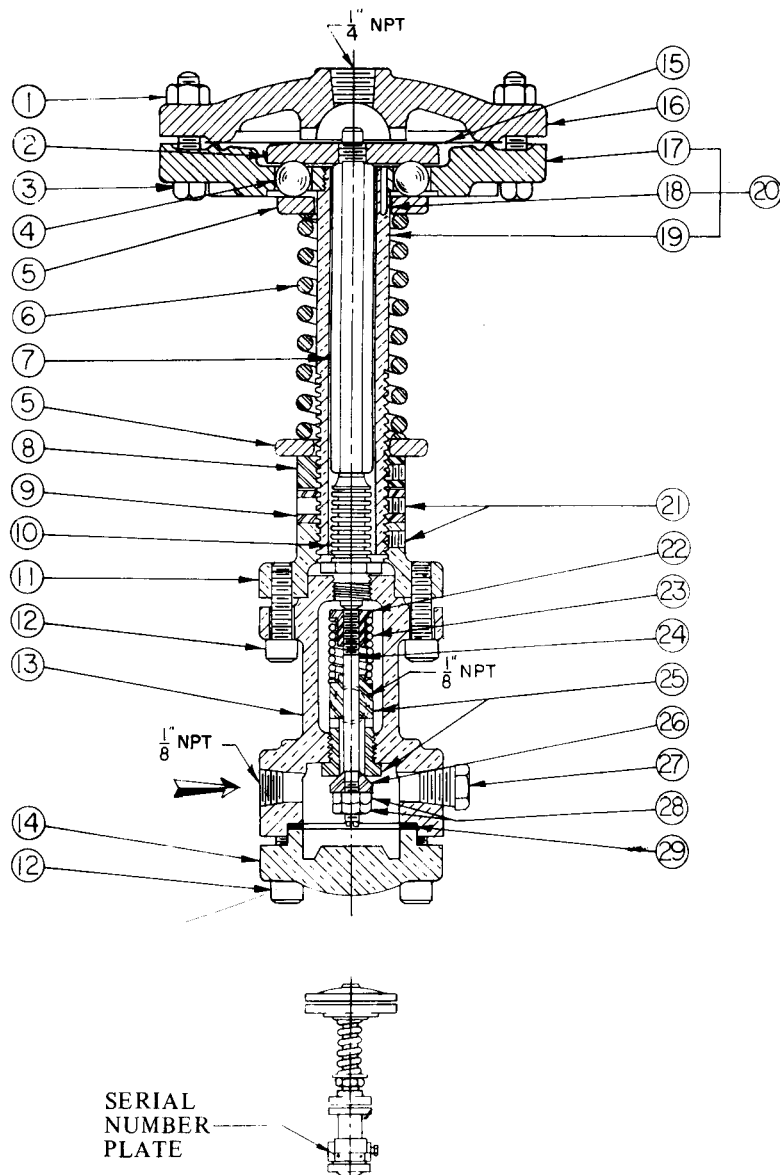


SPENCE ENGINEERING  
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## PARTS LIST PRESSURE SAFETY PILOT

When ordering parts it is essential that the pilot type, service and serial number be stated.

Select parts by item number but order by part numbers. Specify complete part numbers when ordering.



Item No.	Part Name	Material	Part No.
1	Diaphragm Nut	Steel	5-02871-0
2	Pressure Plate	Iron	4-03654-0
3	Diaphragm Bolt	Steel	5-04764-0
4	Pressure Plate Balls	Steel	5-00553-0
5	Spring Buttons	Steel	4-01059-0
6	Adj. Spring 5-30 psi	Steel	5-05007-0
	Adj. Spring 31-65 psi	Steel	5-05003-0
	Adj. Spring 66-120 psi	Steel	5-05005-0
	Adj. Spring 121-175 psi	Steel	5-05012-0
7	Pressure Stem	Brass	4-05425-0
8	Barrel Adj. Nut	Steel	4-02908-0
9	Barrel Locknut	Steel	4-02910-0
10	Bellows Assy. †	Bronze	4-00010-0
	Bellows Assy.	St. Stl.	4-00011-0
11	Bonnet	Bronze	4-00979-0
	Bonnet	Steel	4-00980-0
12	Bl. Flg. & Bonnet Bolts	Steel	5-04803-0
13	Body	Bronze	4-00856-0
	Body	Steel	4-00857-0
14	Blind Flange	Bronze	4-02153-0
	Blind Flange	Steel	4-02152-0
15	Diaphragm* †	St. Stl.	4-01626-0
16	Hood	Iron	4-02563-0
17	Cowl	Iron	4-01543-0
18	Groove Pin	Steel	5-03243-0
19	Barrel	Alum.	4-01262-0
20	Cowl Assy. (incl. items	Iron	0-00317-0
21	Barrel Lock Set Ser.	Steel	5-04874-0
22	Pusher Plate †	Steel	4-03726-0
23	Valve Spring †	Inconel	5-04982-0
24	Valve Stem †	St. Stl.	4-05379-0
25	Seat Ring †	St. Stl.	4-04380-0
26	Disc †	St. Stl.	4-01780-0
27	Pipe Plug-1/8" NPT	Brass	4-03770-0
	Pipe Plug-1/8" NPT	Steel	4-03769-0
28	Stem Nuts †	Steel	5-02888-0
29	Gasket †	Asbestos	5-02378-0

\* Use 2 diaphragms for delivery pressures up to 65 psi,  
3 diaphragms for 66-175 psi.

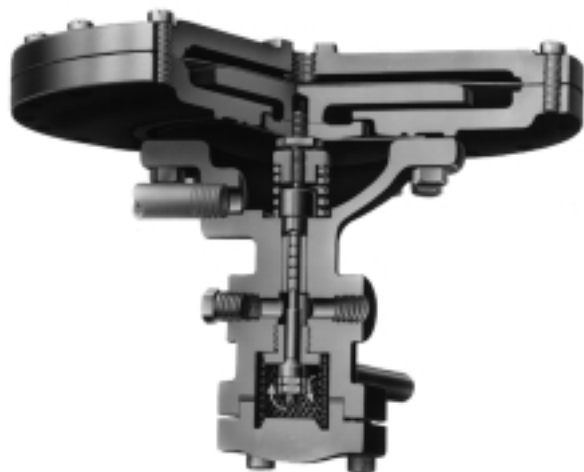
† These parts furnished in a repair kit — 8-09117-0 Brz.  
8-09118-0 Steel





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**TYPE A73 PILOT**

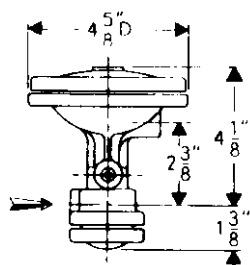
## TYPE A SERIES AIR ADJUSTED PILOT

The A Series Pilots, when combined with a Spence Main Valve, will control a steady or varying inlet pressure to a constant delivery pressure. The pilots can control either pressure or temperature.

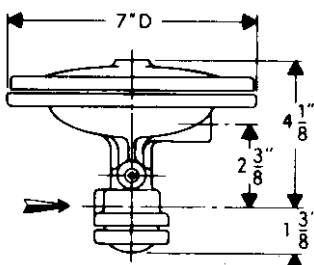
When used as a pressure reducing valve with an A or B Panel, the A Series pilot offers all the advantages of a pilot operated regulator plus the advantage of controlling the regulator from a remote point. When used with a pneumatic controller such as the P60 or T60, the regulator is an indicating pneumatic pressure or temperature controller with P.I. modes.

### RATINGS (Maximum Inlet Conditions)

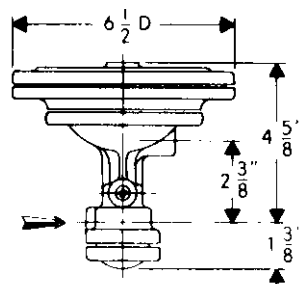
Construction	Pressure	(Temperature)
Cast Iron	250 PSIG	450°F
Cast Bronze	250 PSIG	450°F
Cast Steel	600 PSIG	600°F



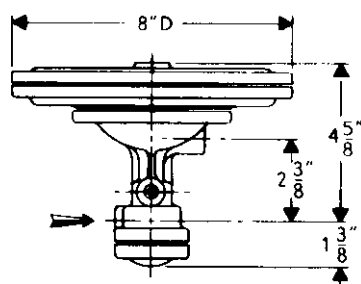
Type A or A83  
(wt 6 lb)



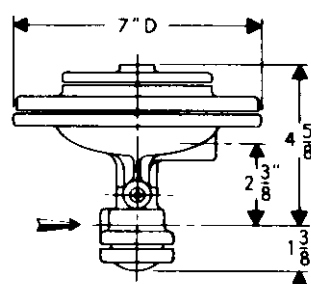
Type A82  
(wt 11 lb)



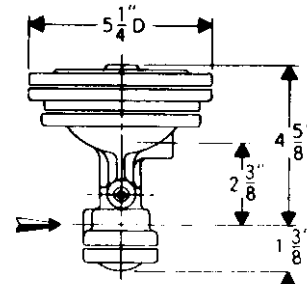
Type A53 or A 85  
(wt 12 lb)



Type A73, A70 or A87  
(wt 15 lb)



Type A35  
(wt 14 lb)



Type A43, A46, A84  
or A86 (wt 11 lb)

## OPERATING PRINCIPLE

The regulator is operated by initial steam or fluid pressure. It is normally closed, being held so by initial pressure on the disc and by an internal main spring. When the pilot is opened, initial pressure flows through the pilot to the 8B tee. Bleedport 4A restricts the flow and pressure builds under the diaphragm and opens the main valve. The 5A restriction elbow steadies the operation of the regulator.

Delivery pressure feeds back through the control pipe to the pilot diaphragm. As this pressure approaches a balance with the air loading signal, the pilot throttles the loading pressure. In turn, the main valve takes a position established by the loading pressure where just enough steam flows to maintain the set delivery pressure. For temperature control, refer to SD for temperature pilot.

# INSTALLATION

## PLANNING

Locate the regulator in a horizontal pipe. Prevent water hammer and erratic operation by providing a trap ahead of the regulator. Avoid damaging effects of scale and dirt in pipelines by using a strainer to protect the regulator. Provide a three valve bypass to facilitate inspection of the regulator without interrupting service.

## MAIN VALVE

Flush the main piping system thoroughly to clear it of welding beads, scale, sand, etc. Mount main valve with diaphragm chamber down and arrow on body pointing in the direction of flow. Screwed end valve should be mounted in unions.

## PILOT

Mount the pilot on either side of the main valve by means of a 1/4" nipple and union provided. Make this connection to the 1/4" pipe tap on the inlet of the main valve. Screw 4A bleedport fitting into 1/8" pipe tap on the outlet of the main valve body.

**NOTE: Bleed orifice in this fitting is vital to operation of regulator.** Screw 8B tee into 1/8" pipe tap in pilot. Select tap facing downstream. Screw 5A elbow containing restriction orifice into 1/8" pipe tap on underside of main valve diaphragm chamber. If initial pressure or pressure drop is less than 15 psi, a 5B open elbow without orifice is used. Connect tubing bends as illustrated in Figure 2.

## CONTROL PIPE

Use 1/4" pipe for this line which connects the pilot diaphragm chamber to the desired point of pressure control. On instantane-

ous heaters with steam in the shell, tap the control pipe into shell. (See Figure 1) Otherwise, enter delivery steam pipe at point of entrance to heater. Pitch the control pipe away from the pilot and avoid water pockets. Locate delivery pressure gage in control pipe to show pressure actually reaching pilot diaphragm. Use a compound gage.

## INSULATION

Insulation may be applied to the upper portion (globe and flanges) of the main valve. Do not insulate the diaphragm chamber, condensation chamber (if used) or any part of pilot.

## RECOMMENDED INSTALLATION

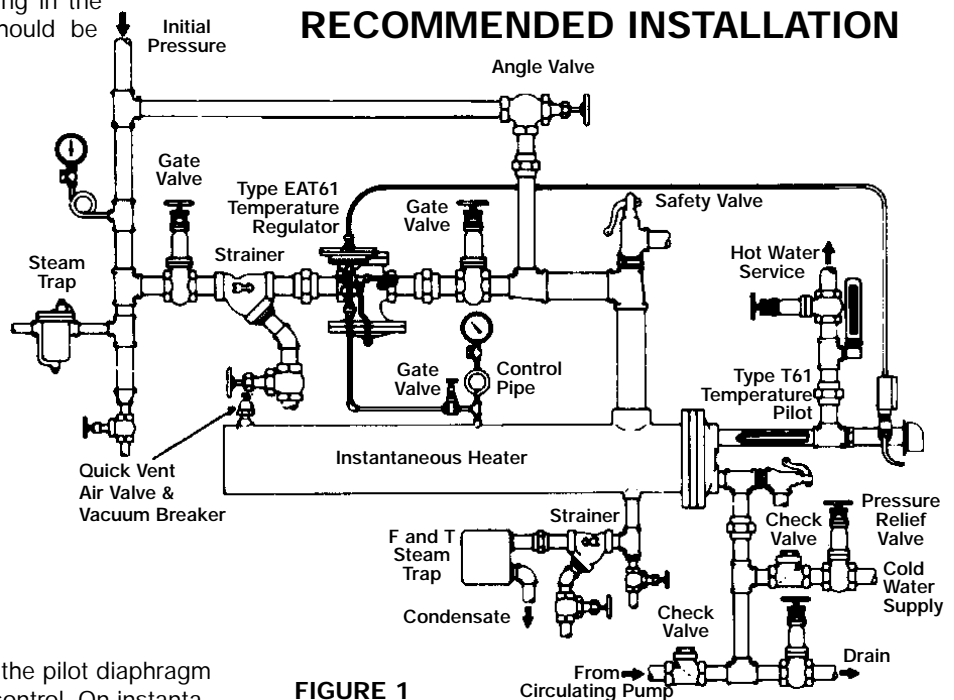


FIGURE 1

## START-UP AND SETTING

For pressure reduction, refer to the SD covering the main valve. The instructions for the A Pilot are the same except that they are air loaded instead of spring loaded. For temperature control, refer to the SD covering the temperature pilot.

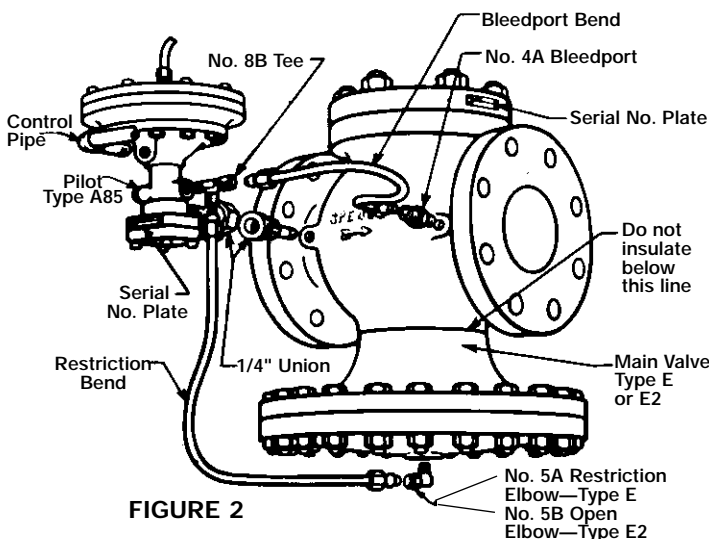


FIGURE 2

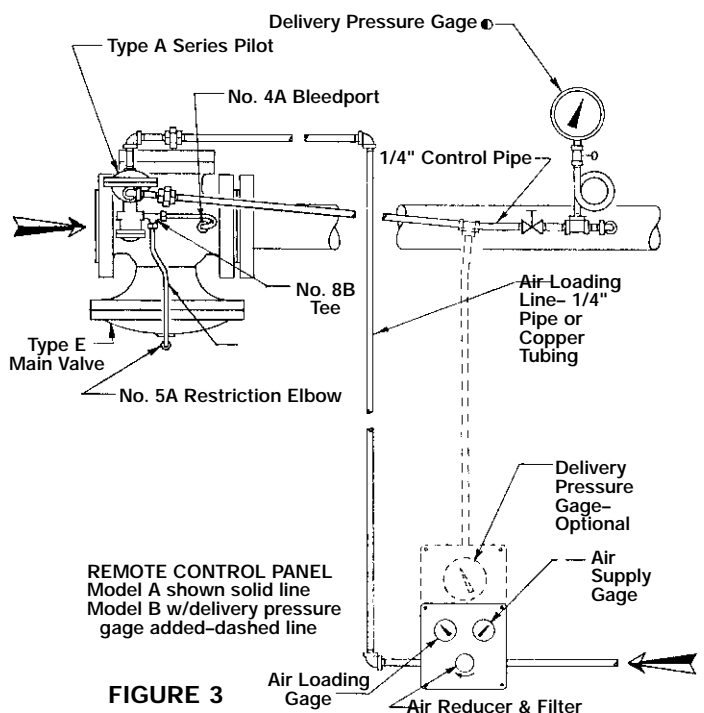


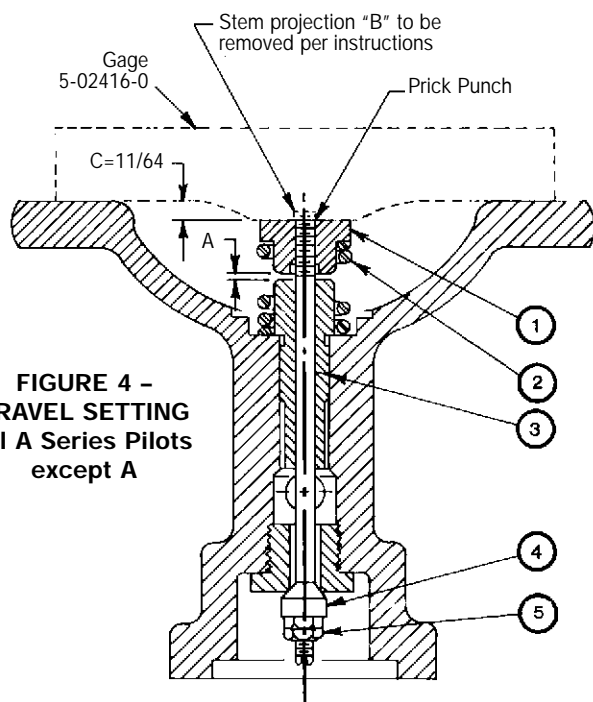
FIGURE 3



## MAINTENANCE

### DISMANTLING

- 1 - Remove diaphragm nuts and lift off cowl. Lift out diaphragm assembly.
- 2 - Disassemble diaphragm assembly by removing diaphragm screw from pressure plate.
- 3 - Remove blind flange bolts and take off blind flange. Remove screen and gasket.
- 4 - Hold the pusher plate and remove stem nuts. Lift out stem assembly and valve spring. The disc will drop off.
- 5 - If the seat ring requires replacement, remove it from pilot body with a socket wrench.



**FIGURE 4 -  
TRAVEL SETTING  
All A Series Pilots  
except A**

### ASSEMBLY

- 1 - Reassembly the pilot in the reverse of the procedure described above.
- 2 - When replacing diaphragms, apply sealing compound (Copaltite or equal) sparingly to the shoulder of the diaphragm screw. For steel pilots only, apply sealing compound to the diaphragm flange of the pilot body.
- 3 - When replacing gaskets, be sure that any serrated sealing surfaces are cleaned of old gasket material.

### INSPECTION

- 1 - Examine the seat and disc sealing surfaces for nicks or other signs of damage by pipeline debris. Slight imperfections may be removed by lapping the surfaces together. Otherwise, the seat and disc must be replaced.
- 2 - Examine the stem for a buildup of pipeline contaminants or erosion. Remove any buildup with a wire brush and polish with very fine crocus cloth. Work carefully to avoid bending the stem.

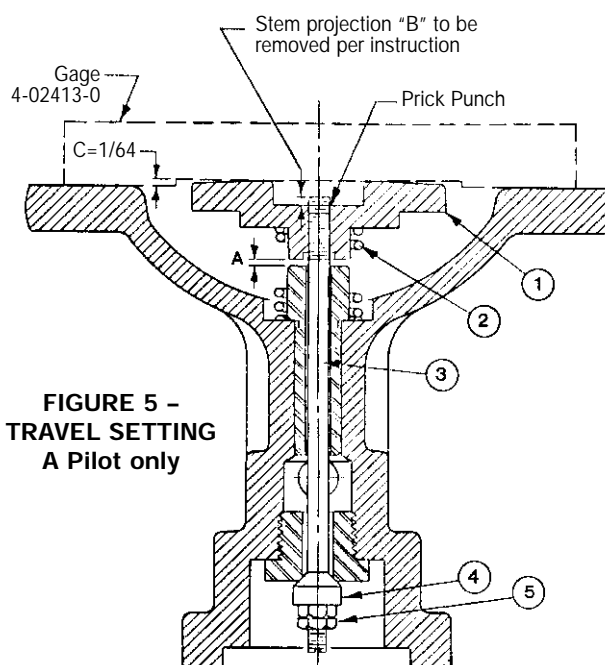
### LAPPING OPERATIONS

Lap sparingly using 500 grit lapping compound and light pressure. Heavy grinding may cause galling, wide sealing surfaces and a grooved disc, all of which tend to produce leakage.

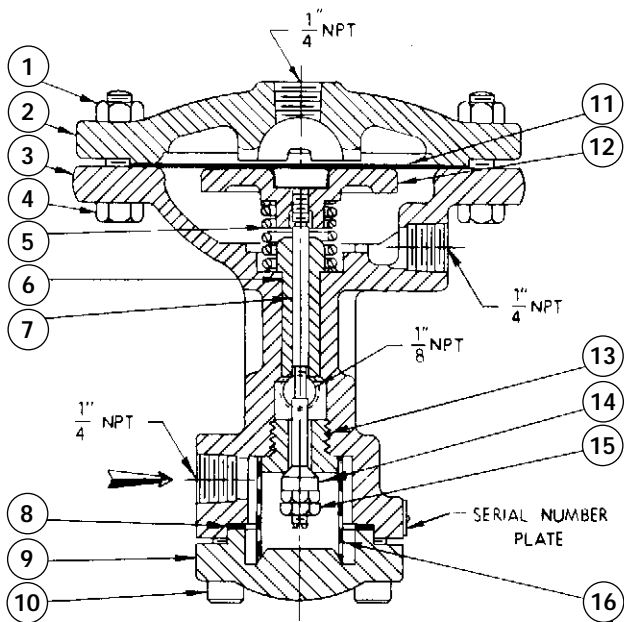
After the sealing surfaces are lapped in, disassemble and clean all parts.

### SEAT, DISC AND STEM REPLACEMENT

- 1 - Clean the body threads of old sealing compound using a wire brush. Apply new sealing compound (Copaltite or equal) to the shoulder of seat ring. Let stand until tacky before installing in pilot body.
- 2 - Lap in stem to disc joint with lapping compound.
- 3 - Secure disc (4) to stem (3) with a stem nut (5). Insert this assembly into pilot body (omit valve spring).
- 4 - Apply lapping compound to the disc and lap in the seat to disc joint. The stem is slotted for rotation with a screwdriver.
- 5 - Screw pusher plate (1) on stem (3). Holding disc against its seat, adjust the pusher plate so that dimension C = 11/64" for all "A" Series Pilots except dim C = 1/64" on A Pilot only (See Figure 4).
- 6 - Remove stem nut, being careful not to disturb the pusher plate adjustment, and lift stem out the top of the pilot. Grind off stem Projection B flush with upper surface of the pusher plate.
- 7 - Reinsert stem into pilot body. Install disc and stem nut. Check dimension C and, if correct, lock the adjustment by prick punching the thread at several points. Work carefully to avoid bending the stem.
- 8 - Scrape away burrs raised by prick punching. Upper surface of pusher plate must be smooth and flat.
- 9 - Check that valve travel A = 3/64". This need not be exact. Stem should move smoothly. Binding indicates a bent stem.
- 10 - Remove stem nut (C) and disc (A); withdraw stem (B). Install stem (B) with valve spring (E), disc (A) and both stem nuts (C) in place.



**FIGURE 5 -  
TRAVEL SETTING  
A Pilot only**

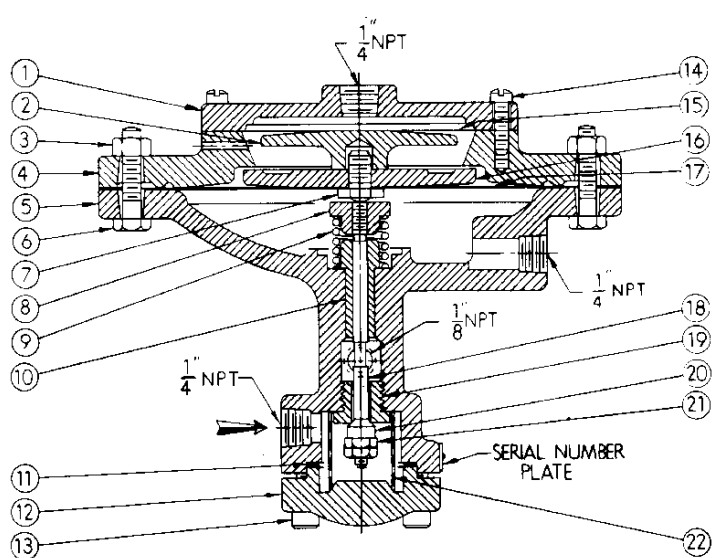


**TYPE A PILOT**

**TYPE A, A82 & A83 PARTS**

ITEM NO.	PART NAME	MATERIAL	PART NO.
1	Diaphragm Nut	Steel	05-02871-00
2	Hood, A & A83 Hood, A & A83 Hood, A & A83 Hood, A82	Iron Bronze Steel Iron	04-02563-00 04-02565-00 04-02564-00 04-02600-00
3	Body & Bushing, A & A83 Body & Bushing, A & A83 Body & Bushing, A & A83 Body & Bushing, A82 Body & Bushing, A82	Iron Bronze Steel Iron Bronze	07-03514-00 08-04265-00 07-04267-02 08-04698-00 08-04699-00
4	Diaphragm Bolt Diaphragm Nut	Steel Steel	05-04764-00 05-02871-00
5	*Valve Spring	Inconel	05-04985-00
6	Bushing (see item 3)	St. Steel	04-01080-00
7	*Stem	St. Steel	04-05229-00
8	*Gasket, Iron & Bronze Bodies *Gasket, Steel Bodies	Non-asbestos Flexitalic	05-02378-00 05-11718-00
9	Blind Flange Blind Flange Blind Flange	Iron Bronze Steel	04-02151-00 04-02153-00 04-11678-00
10	Blind Flange Bolt, Iron & Bronze Bodies Blind Flange Bolt, Steel Bodies	Steel Steel	05-04803-00 05-11719-00
11	*Diaphragm, A (2 required)	St. Steel	04-01626-00
12	*Pusher Plate, A, Iron & Bronze Bodies *Pusher Plate, A, Steel Bodies	Iron Steel	04-03728-00 04-09520-00
13	*Seat Ring	St. Steel	04-04057-90
14	*Disc	St. Steel	04-01772-90
15	*Stem Nut	Steel	05-02888-00
16	Screen, Water Screen, Heavy Oil *Screen, Steam	Monel Monel Monel	04-04701-00 04-04702-00 04-04700-00
17	Pipe Plug, 1/8 NPT (not shown) Pipe Plug, 1/8 NPT (not shown)	Steel Brass	04-03769-00 04-03770-00
18	*Diaphragm Screw Nut, A82 & A83	Steel	04-02925-00
19	*Diaphragm Screw, A82 & A83	Steel	04-04819-00
20	*Diaphragm, A82 (2 required) *Diaphragm, A83 (2 required)	St. Steel St. Steel	04-03927-00 04-01623-00
21	Floating Plate, A82 Floating Plate, A83	Iron Iron	04-03638-00 04-03710-00
22	*Vacuum Spring, A82 & A83	St. Steel	05-05055-00
23	*Pusher Plate, A82 & A83	Steel	04-08177-00

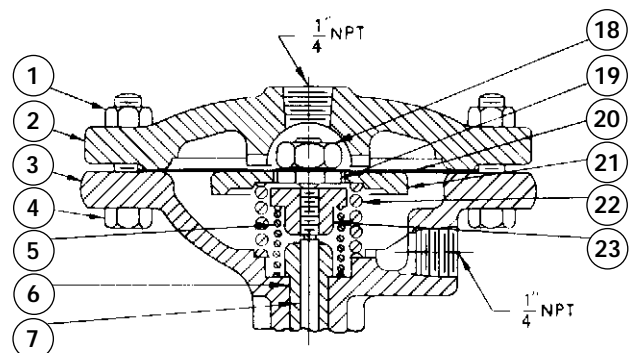
\*These parts furnished in Repair Kit



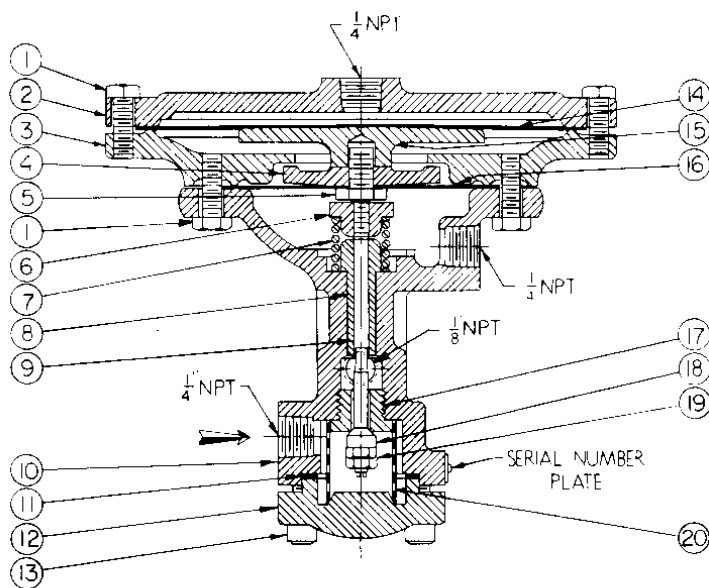
**TYPE A35 PILOT**

**TYPE A35 PARTS**

ITEM NO.	PART NAME	MATERIAL	PART NO.
1	Hood	Iron	04-02623-00
2	Loading Pressure Plate	Iron	04-03641-00
3	Diaphragm Nuts	Steel	05-02871-00
4	Cowl	Iron	04-01540-00
5	Body & Bushing Body & Bushing	Iron Bronze	08-04698-00 08-04699-00
6	Control Diaphragm Bolts Control Diaphragm Nuts	Steel Steel	05-04764-00 05-02871-00
7	*Diaphragm Screw	Steel	04-04821-00
8	*Pusher Plate	Steel	04-03718-00
9	*Valve Spring	Inconel	05-04985-00
10	Bushing	St. Steel	04-01080-00
11	*Gasket	Non-asbestos	05-02378-00
12	Blind Flange Blind Flange	Iron Bronze	04-02151-00 04-02153-00
13	Blind Flange Bolts	Steel	05-04803-00
14	Loading Diaphragm Bolts	Steel	05-04832-00
15	*Loading Diaphragms (2 req'd)	St. Steel	04-01626-00
16	*Control Pressure Plate	Iron	04-03684-01
17	*Control Diaphragm (2 req'd)	St. Steel	04-03927-00
18	*Stem	St. Steel	04-05229-00
19	*Seat Ring	St. Steel	04-04057-00
20	*Disc	St. Steel	04-01772-00
21	*Stem Nut	Steel	05-02888-00
22	*Screen-Steam Screen-Heavy Oil Screen-Water	Monel Monel Monel	04-04700-00 04-04702-00 04-04701-00
23	Pipe Plug 1/8 NPT (not shown) Pipe Plug 1/8 NPT (not shown)	Steel Brass	04-03769-00 04-03770-00



**TYPES A82 and A83 PILOTS**



**TYPES A43, A46, A53, A70, A73 A84, A85 A86  
and A87 PILOTS**

### REPAIR KITS

PILOT NAME	IRON & BRONZE PART NUMBER	STEEL PART NO.
A	08-08115-00	08-10372-00
A35	08-08552-00	—
A82	08-09107-00	—
A83	08-09108-00	08-10360-00
A43, A46	08-08175-00	08-10370-00
A53	08-08117-00	08-10369-00
A70	08-09106-00	08-10362-00
A73	08-08178-00	08-10368-00
A84	08-08179-00	08-10367-00
A85	08-08180-00	08-10366-00
A86	08-08181-00	08-10365-00
A87	08-08182-00	08-10364-00

### TYPE A43, A46, A53, A70, A73, A84, A85, A86, A87 PARTS

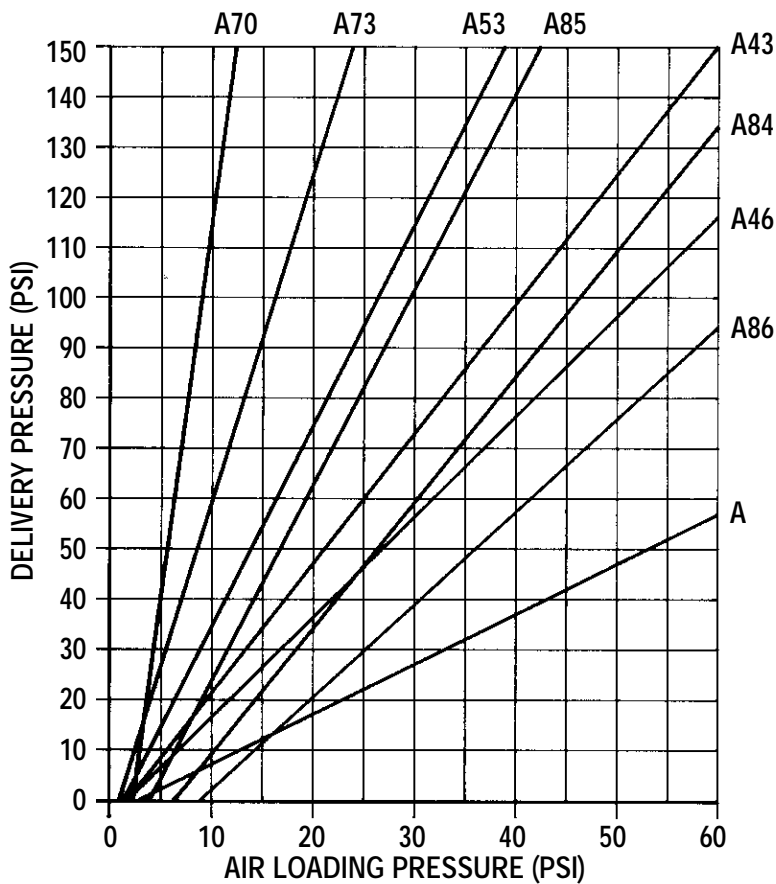
ITEM NO.	PART NAME	MATERIAL	PART NO.
1	Loading & Control Diaphragm Bolt Control Diaphragm Bolts, A70	Steel Steel	05-04809-00 05-04837-00
2	Hood, A43, A84 Hood, A53, A85 Hood, A73, A87, A70 Hood, A46, A86	Iron Iron Iron Iron	04-02622-00 04-02621-00 04-02620-00 04-02624-00
3	Cowl, A43, A84, Iron & Bronze Bodies Cowl, A53, A85, Iron & Bronze Bodies Cowl, A73, A87, Iron & Bronze Bodies Cowl, A70, Iron & Bronze Bodies Cowl, A46, A86, Iron & Bronze Bodies Cowl, A43, A84, Steel Bodies Cowl, A53, A85, Steel Bodies Cowl, A73, A87, Steel Bodies Cowl, A46, A86, Steel Bodies Cowl, A70, Steel Bodies	Iron Iron Iron Iron Iron Duct. Iron Duct. Iron Duct. Iron Duct. Iron Duct. Iron	04-01538-00 04-01536-00 04-01534-00 04-01510-00 04-01541-00 04-01539-00 04-01537-00 04-01535-00 04-04583-00 04-01511-00
4	*Control Pressure Plate *Control Pressure Plate, A70	Steel Steel	04-03679-00 04-08432-00
5	*Diaphragm Screw	Steel	04-04821-00
6	*Pusher Plate	Steel	04-03718-00
7	*Valve Spring *Valve Spring, A70	Inconel Inconel	05-04985-00 05-05197-00
8	Bushing (see item 10)	St. Steel	04-01080-00
9	*Stem	St. Steel	04-05229-00
10	Body & Bushing Body & Bushing Body & Bushing Body & Bushing, A70	Iron Bronze Steel Iron	07-03514-00 08-04265-00 07-04267-02 08-04801-00
11	*Gasket, Iron & Bronze Bodies *Gasket, Steel Bodies	Non-asbestos Flexitalic	05-02378-01 05-11718-00

ITEM NO.	PART NAME	MATERIAL	PART NO.
12	Blind Flange Blind Flange Blind Flange	Iron Bronze Steel	04-02151-00 04-02153-00 04-11678-00
13	Blind Flange Bolt, Iron & Bronze Bodies Blind Flange Bolt, Steel Bodies	Steel Steel	05-04803-00 05-11719-00
14	*Loading Diaphragm, A43, A46, A84, A86 (2 req'd) A53, A85 (2 req'd) A73, A87, A70 (2 req'd)	St. Steel St. Steel St. Steel	04-01629-01 04-01632-00 04-01635-00
15	Loading Pressure Plate, A43, A84 Loading Pressure Plate, A53, A85 Loading Pressure Plate, A70, A73, A87 Loading Pressure Plate, A46, A86	Iron Iron Iron Iron	04-03641-00 04-03640-00 04-03639-00 04-03642-00
16	Control Diaphragms (2 req'd) *Control Diaphragms, A70 (4 req'd)	St. Steel St. Steel	04-01623-00 04-01620-00
17	*Seat Ring	St. Steel	04-04057-90
18	*Disc	St. Steel	04-01772-90
19	*Stem Nut	Steel	05-02888-00
20	*Screen, Steam Screen, Heavy Oil Screen, Water	Monel Monel Monel	04-04700-00 04-04702-00 04-04701-00
21	Pipe Plug, 1/8 NPT (not shown) Pipe Plug, 1/8 NPT (not shown)	Steel Brass	04-03769-00 04-03770-00
22	*Floating Plate, A84, A85, A86, A87	Steel	04-03710-00
23	*Vacuum Spring, A84, A85 *Vacuum Spring, A86 *Vacuum Spring, A87	St. Steel St. Steel St. Steel	05-05055-00 05-04970-00 05-04968-00
24	*Pusher Plate, A84, A85, A86 *Pusher Plate, A87	Steel Steel	04-08177-00 04-07070-00

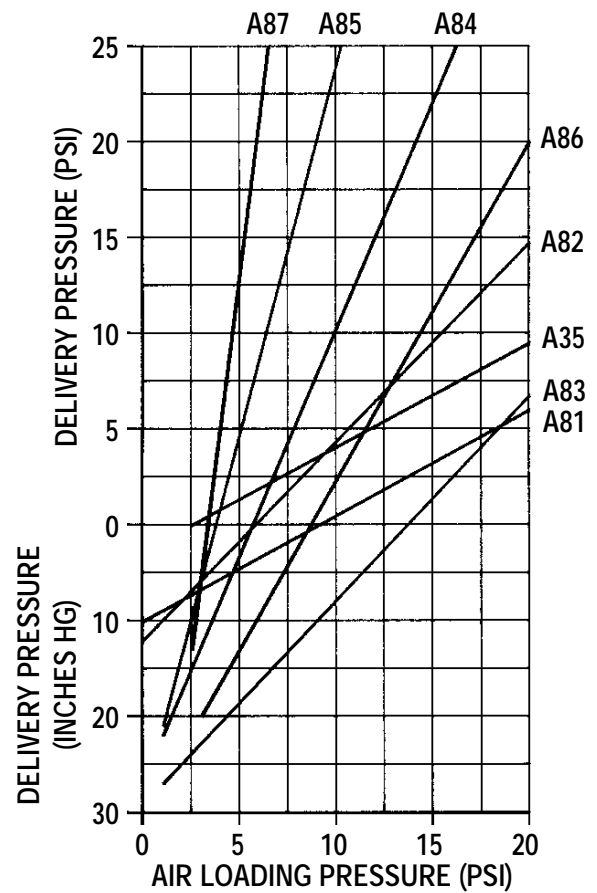
\*These parts furnished in Repair Kit

When ordering parts, it is essential that the pilot type, service and serial number be stated.

Select part by item number, but order by part number. Specify complete part number when ordering.

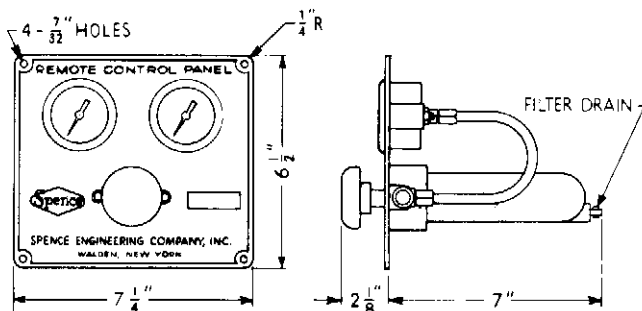


**FIGURE 6**  
Response Curves for Pilots for positive pressure

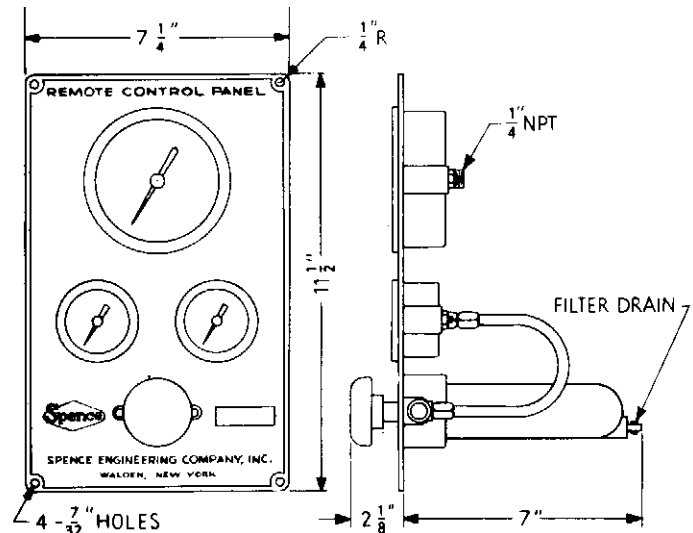


**FIGURE 7**  
Response Curves for Pilots for vacuum  
& pressure

## PANEL BOARD DIMENSIONS



**FIGURE 8**  
Type A Panel (cut out 5 1/4" high by 6" wide)



**FIGURE 9**  
Type B Panel (cut out 10 1/4" high by 6" wide)

Air adjustment panels are available in two models as illustrated. Model A includes an air adjusting valve incorporating its own bleed and two gages: one for the supply air, the other to indicate the adjusting air. It is complete and ready to be mounted directly on a control board or box.

Model B is the same as Model A with the exception that it has, in addition, a gage indicating the delivery pressure. The air filter regulator bleeds only on a lowering of the pressure set point.



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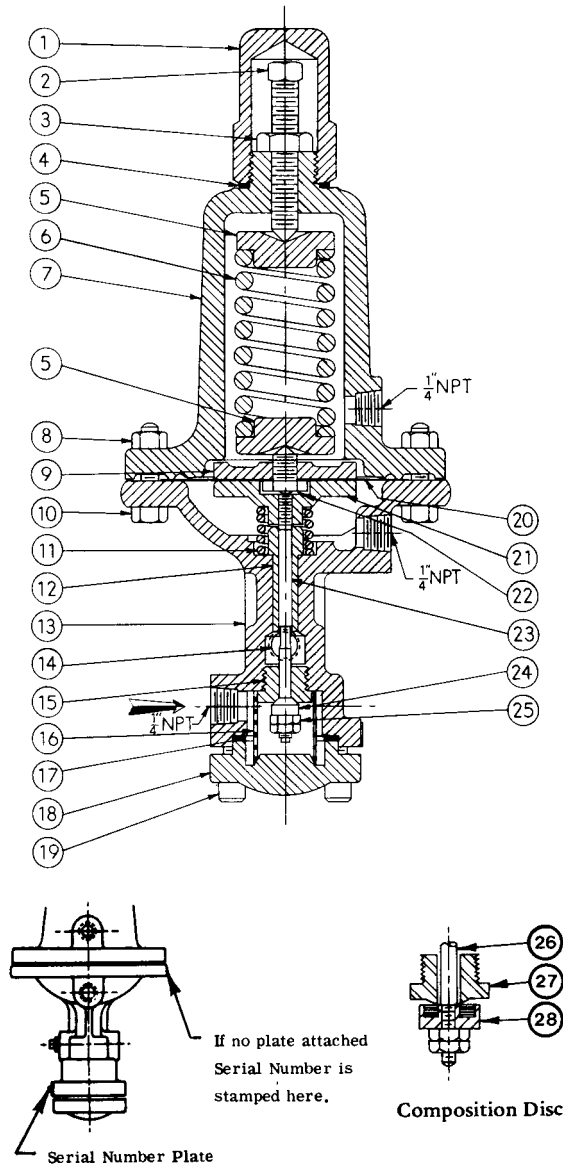
**Walden, NY 12586**

## Parts List - TYPE N PILOT

When ordering parts it is essential that the pilot type, service and serial number be stated.

Part numbers listed apply to pilots with serial numbers later than AA 001. For earlier models part numbers will be furnished on request.

Select parts by item number but order by part number. Specify complete part number when ordering.



Item No.	Part Name	Remarks	Material	Part No.
1	Top Cap		Steel	4-01303-0
	Top Cap		Brass	4-01304-0
2	Adjusting Screw		Steel	5-04860-0
3	Locknut		Steel	5-07789-0
4	Top Cap Gasket	A, B	Copper Asb.	5-02356-0
5	Spring Button		Steel	4-01040-0
6	Adjusting Spring	3-20 PSI (Alum.)	Steel	5-05007-0
	Adjusting Spring	5-50 PSI (Orange)	Steel	5-05003-0
	Adjusting Spring	10-100 PSI (Green)	Steel	5-05005-0
	Adjusting Spring	20-150 PSI (Black)	Steel	5-05012-0
7	Spring Chamber	Note 3	Iron	4-01420-0
	Spring Chamber		Bronze	4-01421-0
	Spring Chamber		Steel	4-01422-0
8	Diaphragm Nut	Note 1	Steel	5-02871-0
	Diaphragm Nut	Note 2	Steel	5-02845-0
9	Pressure Plate	B	Steel	4-03679-0
10	Diaphragm Bolt	Note 1	Steel	5-04764-0
	Diaphragm Bolt	Note 2	Steel	5-05490-0
11	Valve Spring	A, B	Inconel	5-04985-0
12	Bushing	See Item 13	St. Steel	4-01080-0
13	Body & Bushing		Iron	7-03514-0
	Body & Bushing		Bronze	8-04265-0
	Body & Bushing	Screwed	Steel	7-04267-2
	Body & Bushing	Flanged Inlet	Steel	7-41105-2
	Body & Bushing	Secoweld Flanged Inlet	Steel	7-41379-2
14	Pipe Plug - 1/8 NPT		Steel	4-03769-0
	Pipe Plug - 1/8 NPT		Brass	4-03770-0
15	Seat Ring	B	St. Steel	4-04057-0
16	Screen - Water		Monel	4-04701-0
	Screen - Heavy Oil		Monel	4-04702-0
	Screen - Steam	B	Monel	4-04700-0
17	Gasket	A, B Note 1	Asbestos	5-02378-0
	Gasket	A, B Note 2	Flexitalic	5-11718-0
18	Blind Flange		Iron	4-02151-0
	Blind Flange		Bronze	4-02153-0
	Blind Flange		Steel	4-11678-0
19	Blind Flange Bolt	Note 1	Steel	5-04803-0
	Blind Flange Bolt	Note 2	Steel	5-11719-0
20	Diaphragm	A, B 2 Required	St. Steel	4-01623-0
21	Pusher Plate	B Note 1	Iron	4-03728-0
	Pusher Plate	B Note 2	Steel	4-09520-0
22	Diaphragm Screw	B	Steel	4-04822-0
23	Stem	B	St. Steel	4-05229-0
24	Disc	B	St. Steel	4-01772-0
25	Stem Nut	B	Steel	5-02888-0

### COMPOSITION DISC

26	Stem		St. Steel	4-05381-0
27	Seat Ring		St. Steel	4-04060-0
28	Comp. Disc Asm.		Brass	7-53512-0

### FLANGED INLET

29	Gasket		Stl. Asb.	5-02370-0
30	Flange Asm. - Fem.	See Item 13	Steel	7-43516-0
31	Flange Asm. - Male		Steel	7-40535-0
10	Stud		Steel	5-05490-0
8	Nut		Steel	5-02845-0

A - Recommended Spare Parts

B - Furnished in Repair Kit (St. Steel Disc & Steam Screen)

8-09109-0 Note 1, 8-10359-0 Note 2

Note 1 Applies to Iron and Bronze Body Pilots

Note 2 Applies to Steel Body Pilot

Note 3 For C.I. Spring Chamber with Steel Body Pilot use

5-04764-0 & 5-02871-0 Diaphragm Bolting



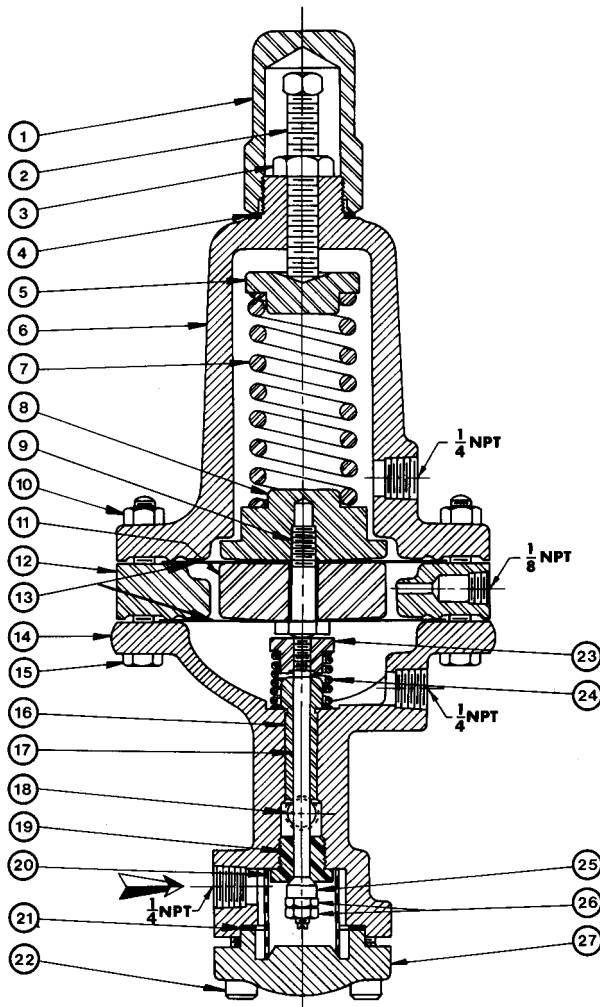


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## Parts List TYPE N33 PILOT

When ordering parts it is essential that the pilot type, service and serial number be stated.

Select parts by item number but order by part number.



Item No.	Part Name	Remarks	Material	Part No.
1	Cap		Steel	4-01303-0
2	Adjusting Screw		Brass	4-01304-0
3	Seal Nut		Steel	5-07789-0
4	Cap Gasket	A, B	Copper Asb.	5-02356-0
5	Spring Button		Steel	4-01040-0
6	Spring Chamber		Cast Iron	4-01420-0
	Spring Chamber		Bronze	4-01421-0
	Spring Chamber		Steel	4-01422-0
7	Adjusting Spring	3-20 PSI (Alum.)	Steel	5-05007-0
	Adjusting Spring	5-50 PSI (Orange)	Steel	5-05003-0
	Adjusting Spring	10-100 PSI (Green)	Steel	5-05005-0
	Adjusting Spring	20-150 PSI (Black)	Steel	5-05012-0
8	Spring Button		Steel	4-01037-0
9	Diaphragm Screw	B	Steel	4-04818-0
10	Diaphragm Nut		Steel	5-02871-0
11	Diaphragm Spacer		Steel	4-04940-0
12	Body Spacer		Cast Iron	4-04937-0
	Body Spacer		Bronze	4-10127-0
	Body Spacer		Steel	4-04938-0
13	Diaphragm	A, B-2 per set 4 Required	St. Steel	4-01623-0
14	Body & Bushing		Cast Iron	7-03514-0
	Body & Bushing		Bronze	8-04265-0
	Body & Bushing		Steel	7-04267-2
15	Cap Screw		Steel	5-04767-0
16	Bushing		St. Steel	4-01080-0
17	Stem	B	St. Steel	4-05229-0
18	Pipe Plug - 1/8 NPT		Steel	4-03769-0
	Pipe Plug - 1/8 NPT		Brass	4-03770-0
19	Seat Ring	B	St. Steel	4-04057-0
20	Screen - Steam	B	Monel	4-04700-0
21	Gasket	A, B Note 1	Asbestos	5-02378-0
	Gasket	A, B Note 2	Flexitalic	5-11718-0
22	Cap Screw	Note 1	Steel	5-04803-0
	Cap Screw	Note 2	Steel	5-11719-0
23	Pusher Plate	B	Steel	4-03718-0
24	Spring	B	Inconel	5-04985-0
25	Disc	B	St. Steel	4-01772-0
26	Stem Nuts	B	Steel	5-02888-0
	Blind Flange		Cast Iron	4-02151-0
	Blind Flange		Bronze	4-02153-0
	Blind Flange		Cast Steel	4-11678-0

A - Recommended Spare Parts

B - Furnished in Repair Kit:

7-08302-0 Cast Iron & Bronze

8-10363-0 Cast Steel

Note 1 Applies to Iron and Bronze Body Pilots

Note 2 Applies to Steel Body Pilot







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## Parts List TYPE Q PILOT

When ordering parts it is essential that the pilot type, service and serial number be stated.

Select parts by item number but order by part number. Specify complete part number when ordering.

### \* Recommended Spare Parts

Item No.	Part Name	Material	Part No.
1	Adjusting Nut	Steel	5-02874-0
2	Spring Yoke	Iron	5-06183-0
3	Standard	St. Steel	4-05219-0
4	Adj. Spring 3-20 psi	Steel	5-05007-0
	Adj. Spring 5-50 psi	Steel	5-05003-0
	Adj. Spring 10-100psi	Steel	5-05005-0
	Adj. Spring 20-150 psi	Steel	5-05012-0
5	Spring Button	Steel	4-01040-0
6	Pressure Plate	Steel	4-03679-0
7	Diaphragm Screw	St. Steel	4-04823-0
8	Diaphragm Nut	Steel	5-02871-0
9	Cowl	Iron	4-01508-0
* 10	Diaphragm Note 1	St. Steel	4-01623-0
11	Diaphragm Bolt & Diaphragm Nut	Steel	5-04764-0
12	Disc Adjusting Screw	St. Steel	4-04761-0
13	Dowel Pin	St. Steel	5-03242-0
14	Body	Iron	4-00737-0
	Body	Bronze	4-00739-0
	Body	Steel	4-00738-0
15	Disc	St. Steel	4-01712-0
16	Seat Ring	St. Steel	4-04381-0

### Adjusting Handwheel

17	Handwheel	Mall. Iron	5-06139-0
18	Handwheel Nut	Steel	5-02872-0
19	Adjusting Screw	Steel	4-04752-0
20	Adj. Screw, Locknut	Steel	5-02952-0
21	Cowl Yoke Note 2	Iron	4-06166-0
	Cowl Yoke Note 3	Duct. Iron	4-06167-0
22	Yoke Bushing, Locknut	Steel	5-02947-0
23	Yoke Bushing	Bronze	4-01152-0

### Enclosed Spring Chamber

24	Adjusting Screw	Steel	5-04860-0
25	Locknut	Steel	5-02942-0
26	Spring Chamber	Iron	4-01393-0
	Spring Chamber	Bronze	4-01395-0
	Spring Chamber	Steel	4-01394-0

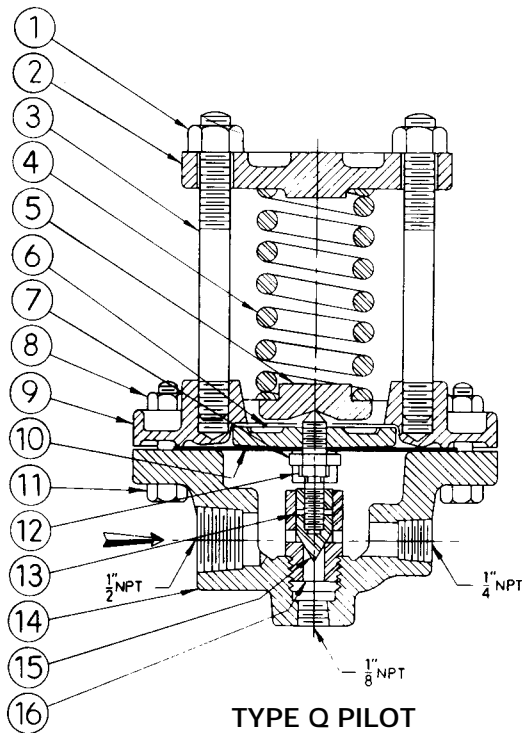
### Locking Device

27	Padlock	Brass	5-03204-0
28	Lock Pin	Steel	4-03272-0
29	Lock Bar	Steel	4-00436-0
30	Spring Yoke & Lock Pin	Iron	4-06182-0
		Steel	4-03272-0

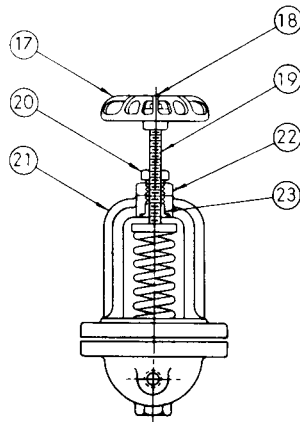
### Wall Bracket

31	Wall Bracket	Iron	4-01029-0
32	Diaphragm Bolt & Diaphragm Nut	Steel	5-04766-0
		Steel	5-02871-0

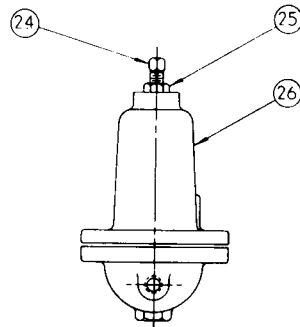
Note 1 — Requires 2 per set.  
Note 2 — Applies to iron pilot.  
Note 3 — Applies to bronze and steel pilots.



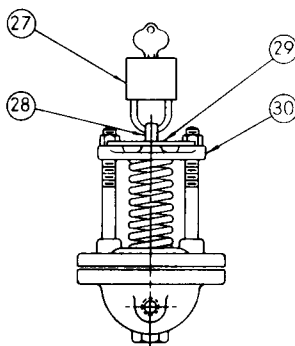
**TYPE Q PILOT**



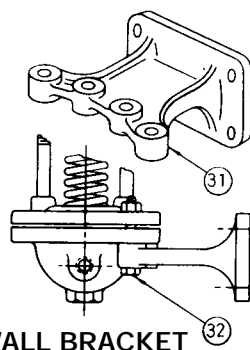
**ADJUSTING HANDWHEEL**



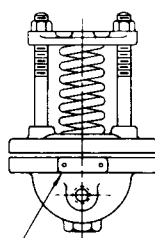
**ENCLOSED  
SPRING CHAMBER**



**LOCKING DEVICE**



**WALL BRACKET**



**SERIAL NUMBER PLATE OR NUMBER STAMPED IN OVER CONTROL PIPE TAP**





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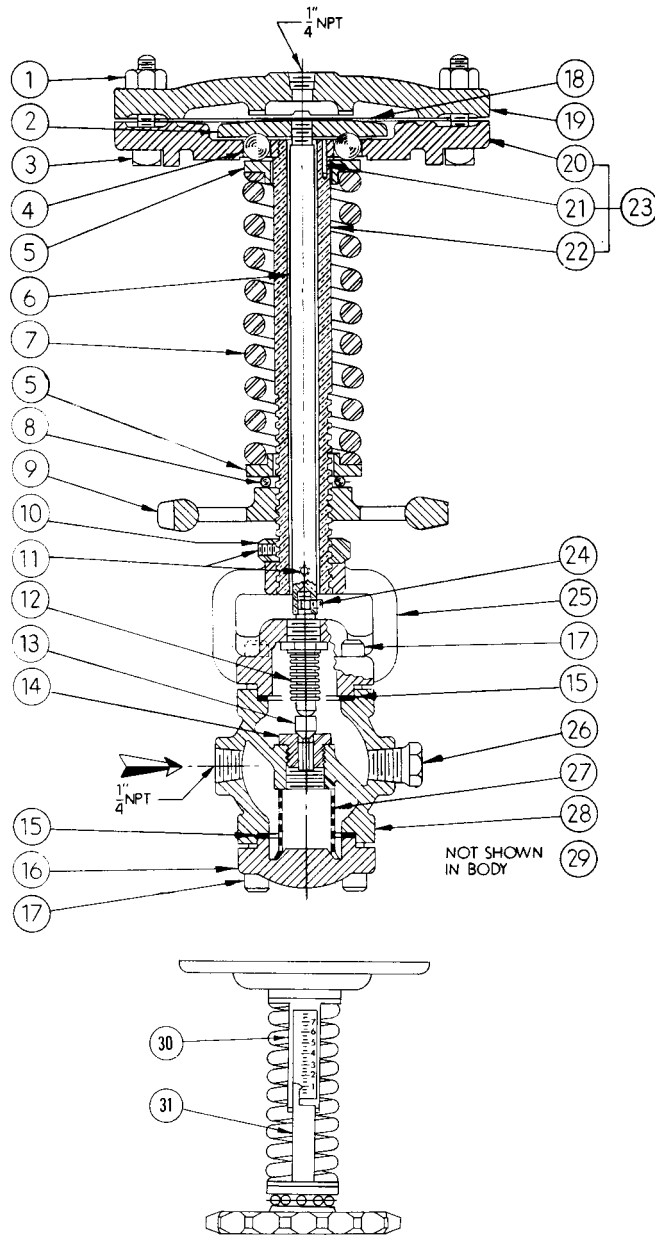
## Parts List TYPES P13, P14, P15 & P32 PILOTS

When ordering parts it is essential that the pilot type, service and serial number be stated.

Select parts by item number but order by part number.  
Specify complete part number when ordering.

### P13, P14 & P15 PILOTS

Item No.	Part Name	Remarks	Material	Part No.
1	Diaphragm Nut Diaphragm Nut Diaphragm Nut	P13 P14 P15	Steel Steel Steel	5-02845-0 5-02847-0 5-02871-0
2	Pressure Plate Pressure Plate Pressure Plate	P13 P14 P15	Iron Iron Iron	4-03654-0 5-03602-1 4-03604-0
3	Diaphragm Bolt Diaphragm Bolt Diaphragm Bolt	P13 P14 P15	Steel Steel Steel	5-05490-0 5-00961-0 5-04764-0
4	Pressure Plate Ball		Steel	5-00553-0
5	Spring Button		Steel	4-01052-0
6	Stem		Alum.	4-05654-0
7	Adjusting Spring Adjusting Spring Adjusting Spring	P13 P14 See Table P15 See Table	Steel Steel Steel	5-05137-0 — —
8	Bearing		Steel	5-00550-0
9	Handwheel		Cast Iron	4-02502-0
10	Barrel Nut		Steel	4-02908-0
11	Bonnet Set Screw		Steel	5-04874-0
12	Bellows Assembly Bellows Assembly	A, B Note 1 A, B Note 2	Bronze St. Steel	7-60302-0 7-60536-0
13	Disc	B	St. Steel	4-01776-0
14	Seat Ring	B	St. Steel	4-04057-0
15	Gasket Gasket	A, B Note 1 A, B Note 2	Asbestos Flexitalic	5-02378-0 5-11718-0
16	Blind Flange Blind Flange Blind Flange		Cast Iron Bronze Steel	4-02151-0 4-02153-0 4-11678-0
17	Cap Screw Cap Screw	Note 1 Note 2	Steel Steel	5-04803-0 5-11719-0
18	Diaphragm P13 Diaphragm P14 Diaphragm P15	A, B - 4 Required A, B - See Table A, B - See Table	St. Steel St. Steel St. Steel	4-01626-0 4-01629-1 4-01632-0
19	Hood Hood Hood	P13 P14 P15	Cast Iron Cast Iron Cast Iron	4-02563-0 4-02601-0 4-02603-0
20	Cowl P13 Cowl P14 Cowl P15	See Item 23 See Item 23 See Item 23	Cast Iron Cast Iron Cast Iron	4-01543-0 4-01528-0 4-01530-0
21	Groove Pin	See Item 23	Steel	5-03243-0
22	Barrel	See Item 23	Alum.	4-01247-0
23	Cowl Assembly Cowl Assembly Cowl Assembly	P13 P14 P15	Cast Iron Cast Iron Cast Iron	0-00301-0 0-00303-0 0-05197-0
24	Set Screw		Steel	5-04872-0
25	Bonnet Bonnet Bonnet		Cast Iron Bronze Steel	4-00976-0 4-00978-0 4-10021-1
26	Pipe Plug - 1/4 NPT Pipe Plug - 1/4 NPT		Steel Brass	4-03772-0 4-03771-0
27	Screen - Water Screen - Steam	B	Monel Monel	4-04701-0 4-04700-0
28	Body Body Body		Cast Iron Bronze Steel	4-00741-0 4-00761-0 4-10912-1
29	Pipe Plug - 1/8 NPT Pipe Plug - 1/8 NPT		Steel Brass	4-03769-0 4-03770-0



### ADJUSTMENT INDICATOR

30	Adj. Indicator Plate		Alum.	5-03512-0
31	Adj. Indicator Pointer		Alum.	5-03513-0

### P14

Diaphragm Pressure Range	Adjusting Spring		Color Code	Number of Diaphragms
	Part No.	Wire Dia. In.		
5 - 30 PSI	5-05135-0	1/4	Red	2
20 - 100 PSI	5-05122-0	11/32	Green	2
40 - 150 PSI	5-05137-0	3/8	Black	3

### P15

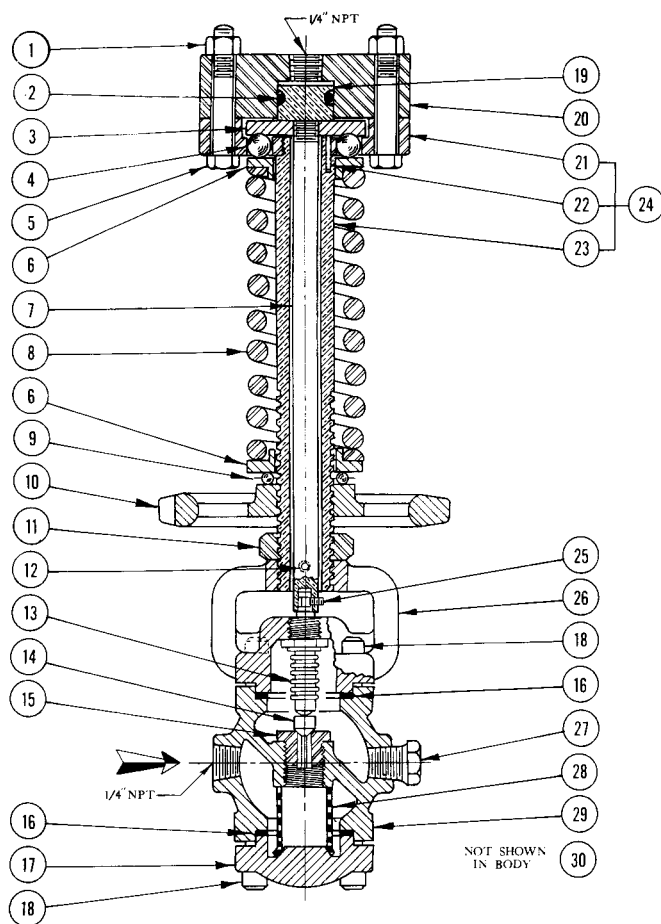
Diaphragm Pressure Range	Adjusting Spring		Color Code	Number of Diaphragms
	Part No.	Wire Dia. In.		
3 - 10 PSI	5-05134-0	.177	Blue	1
5 - 25 PSI	5-05135-0	1/4	Red	2

A - Recommended Spare Parts

B - Furnished in following Repair Kits: (Steam Screen)

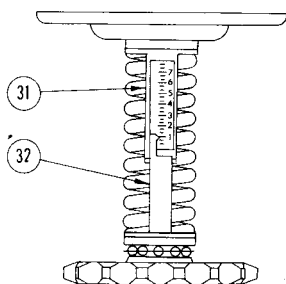
	Cast Iron & Bronze	Cast Steel
P13	8-09111-0	8-09112-1
P14	8-09113-0	8-09114-1
P15	8-09115-0	8-09116-1

Note 1 Applies to Iron and Bronze Body Pilots  
Note 2 Applies to Steel Body Pilot



## P32 PILOT

Item No.	Part Name	Remarks	Material	Part No.
1	Hood Nut		Steel	5-02872-0
2	Piston Ring	A, B	Hycar	5-04017-0
3	Pressure Plate		Iron	4-03652-1
4	Pressure Plate Ball		Steel	5-00553-0
5	Hood Bolt		Steel	5-04772-0
6	Spring Button		Steel	4-01052-0
7	Stem		Alum.	4-05654-0
8	Adjusting Spring	See Table	Steel	—
9	Bearing		Steel	5-00550-0
10	Handwheel		Cast Iron	4-02502-0
11	Barrel Nut		Steel	4-02908-0
12	Bonnet Set Screw		Steel	5-04874-0
13	Bellows Assembly	A, B Note 1	Bronze	7-60302-0
14	Bellows Assembly Disc	A, B Note 2	St. Steel	7-60536-0
15	Seat Ring	B	St. Steel	4-04057-0
16	Gasket	A, B Note 1	Asbestos	5-02378-0
17	Gasket	A, B Note 2	Flexitalic	5-11718-0
18	Blind Flange		Iron	4-02151-0
19	Blind Flange		Cast Steel	4-11678-0
20	Cap Screw	Note 1	Steel	5-04803-0
21	Cap Screw	Note 2	Steel	5-11719-0
22	Piston		Bronze	4-03363-0
23	Hood		St. Steel	4-02566-0
24	Cowl	See Item 24	Steel	4-01542-0
25	Groove Pin	See Item 24	Steel	5-03243-0
26	Barrel	See Item 24	Alum.	4-01247-0
27	Cowl Assembly		Steel	0-05198-0
28	Set Screw		Steel	5-04872-0
29	Bonnet		Iron	4-00976-0
30	Bonnet		Steel	4-10021-1
31	Pipe Plug - 1/4 NPT		Steel	4-03772-0
32	Screen - Steam	B	Monel	4-04700-0
33	Body		Iron	4-00741-0
34	Body		Steel	4-10912-1
35	Pipe Plug - 1/8 NPT		Steel	4-03769-0



## ADJUSTMENT INDICATOR

## ADJUSTMENT INDICATOR

31	Adj. Indicator Plate		Alum.	5-03512-0
32	Adj. Indicator Pointer		Alum.	5-03513-0

A - Recommended Spare Parts

B - Furnished in Repair Kits:

8-09119-0 Cast Iron (Steam Screen)

8-09120-1 Cast Steel (Steam Screen)

Use pilot setting instruction Form S.I.O.I - 63A

## P32

Diaphragm Pressure Range	Adjusting Spring		Color Code
	Part No.	Wire Dia. No.	
200-450 PSI	5-05135-0	1/4	Red
400-1200 PSI	5-05122-0	11/32	Green
1000-2000 PSI	5-05137-0	3/8	Black

Note 1 Applies to Iron Body Pilots

Note 2 Applies to Steel Body Pilot



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## Parts List

### TYPES F13, F14, F15 & F32 PILOTS

When ordering parts it is essential that the pilot type, service and serial number be stated.

Select parts by item number but order by part number. Specify complete part number when ordering.

#### F13, F14 & F15 PILOTS

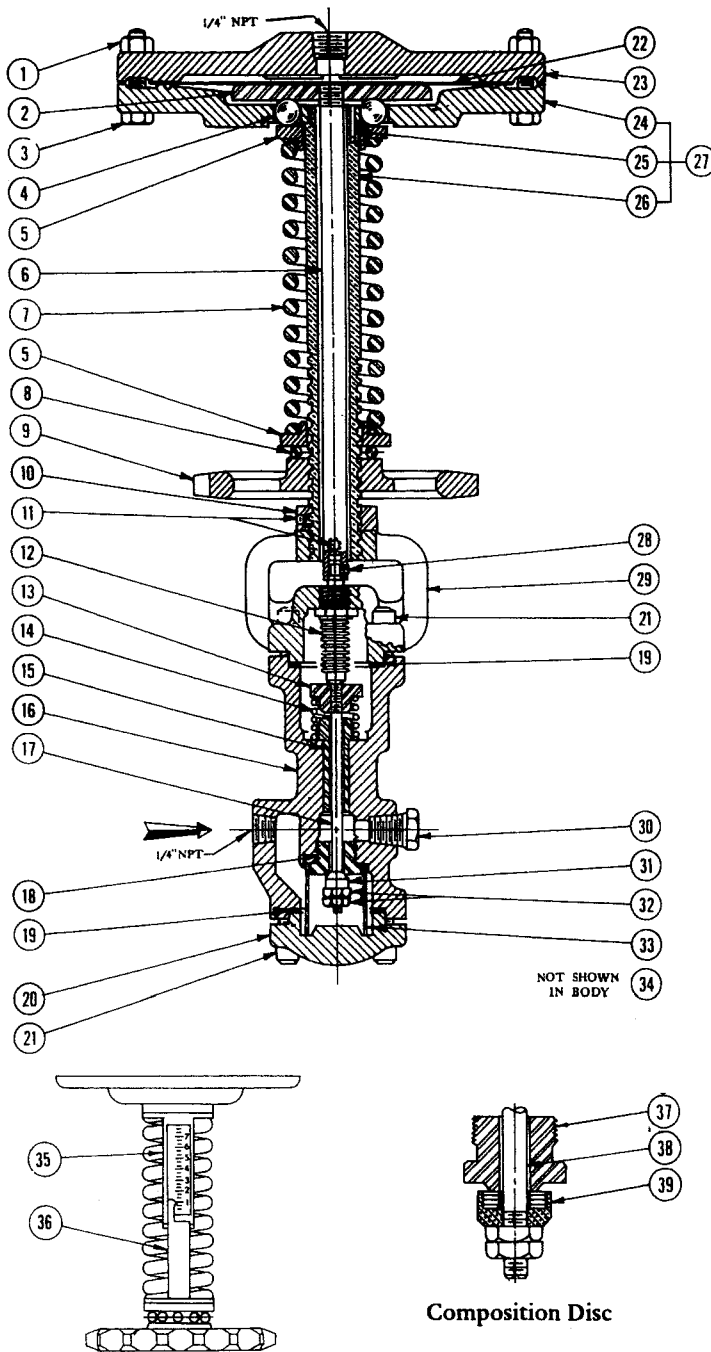
Item No.	Part Name	Remarks	Material	Part No.
1	Diaphragm Nut	F13	Steel	5-02845-0
	Diaphragm Nut	F14	Steel	5-02847-0
	Diaphragm Nut	F15	Steel	5-02871-0
2	Pressure Plate	F13	Iron	4-03654-0
	Pressure Plate	F14	Iron	5-03602-1
	Pressure Plate	F15	Iron	4-03604-0
3	Diaphragm Bolt	F13	Steel	5-05490-0
	Diaphragm Bolt	F14	Steel	5-00961-0
	Diaphragm Bolt	F15	Steel	5-04764-0
4	Pressure Plate Ball		Steel	5-00553-0
5	Spring Button		Steel	4-01052-0
6	Temperature Stem		Alum.	4-05654-0
7	Adjusting Spring	F13	Steel	5-05137-0
	Adjusting Spring	F14 See Table	Steel	—
	Adjusting Spring	F15 See Table	Steel	—
8	Bearing		Steel	5-00550-0
9	Handwheel		Cast Iron	4-02502-0
10	Barrel Nut		Steel	4-02908-0
11	Barrel Set Screw		Steel	5-04874-0
12	Bellows Assembly	A, B	Bronze	7-60302-0
	Bellows Assembly	A, B	St. Steel	7-60536-0
13	Pusher Plate	B	Steel	4-03718-0
14	Valve Spring	A, B	Inconel	5-04985-0
15	Bushing	See Item 16	St. Steel	4-01080-0
16	Body & Bushing		Iron	8-10107-0
	Body & Bushing		Bronze	8-10109-0
	Body & Bushing		Steel	8-10108-1
17	Valve Stem	B	St. Steel	4-05229-0
18	Seat Ring	B	St. Steel	4-04057-0
19	Gasket	A, B Note 1	Asbestos	5-02378-0
	Gasket	A, B Note 2	Flexitallic	5-11718-0
20	Blind Flange		Cast Iron	4-02151-0
	Blind Flange		Bronze	4-02153-0
	Blind Flange		Steel	4-11678-0
21	Bl. Flg. & Bonn. Bolts	Note 1	Steel	5-04803-0
	Bl. Flg. & Bonn. Bolts	Note 2	Steel	5-11719-0
22	Diaphragm F13	A, B - 4 Required	St. Steel	4-01626-0
	Diaphragm F14	A, B - See Table	St. Steel	4-01629-1
	Diaphragm F15	A, B - See Table	St. Steel	4-01632-0
23	Hood	F13	Cast Iron	4-02563-0
	Hood	F13	Bronze	4-02565-0
	Hood	F13	Steel	4-02564-0
	Hood	F14	Cast Iron	4-02601-0
	Hood	F14	Steel	4-02602-0
	Hood	F15	Cast Iron	4-02603-0
24	Cowl F13	See Item 27	Cast Iron	4-01543-0
	Cowl F13	See Item 27	Steel	4-01544-0
	Cowl F14	See Item 27	Cast Iron	4-01528-0
	Cowl F14	See Item 27	Steel	4-01529-0
	Cowl F15	See Item 27	Cast Iron	4-01530-0
25	Groove Pin	See Item 27	Steel	5-03243-0
26	Barrel	See Item 27	Alum.	4-01247-0
27	Cowl Assembly	F13	Cast Iron	0-00301-0
	Cowl Assembly	F13	Steel	0-05300-0
	Cowl Assembly	F14	Cast Iron	7-00303-0
	Cowl Assembly	F14	Steel	0-05301-0
	Cowl Assembly	F15	Cast Iron	0-05197-0
28	Stem Set Screw		Steel	5-04872-0
29	Bonnet		Cast Iron	4-00976-0
	Bonnet		Bronze	4-00978-0
	Bonnet		Steel	4-10021-1
30	Pipe Plug - 1/4 NPT		Steel	4-03772-0
	Pipe Plug - 1/4 NPT		Brass	4-03771-0
31	Disc	B	St. Steel	4-01772-0
32	Stem Nuts	B	Steel	5-02888-0
33	Screen - Water		Monel	4-04701-0
	Screen - Heavy Oil		Monel	4-04702-0
	Screen - Steam	B	Monel	4-04700-0
34	Pipe Plug - 1/8 NPT		Steel	4-03769-0
	Pipe Plug - 1/8 NPT		Brass	4-03770-0

A - Recommended Spare Parts

B - Furnished in Repair Kits: (Stainless Steel Disc & Steam Screen)

	Cast Iron & Bronze	Cast Steel
F13	8-09132-0	8-09133-1
F14	8-09134-0	8-09135-1
F15	8-09136-0	8-09137-1

Note 1 Applies to Iron and Bronze Body Pilots  
Note 2 Applies to Steel Body Pilots



#### ADJUSTMENT INDICATOR

##### ADJUSTMENT INDICATOR

35	Adj. Indicator Plate		Alum.	5-03512-0
36	Adj. Indicator Pointer		Alum.	5-03513-0

##### COMPOSITION DISC

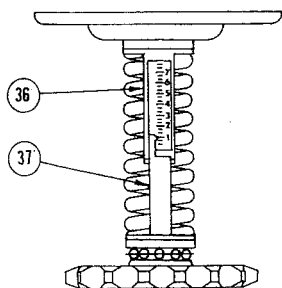
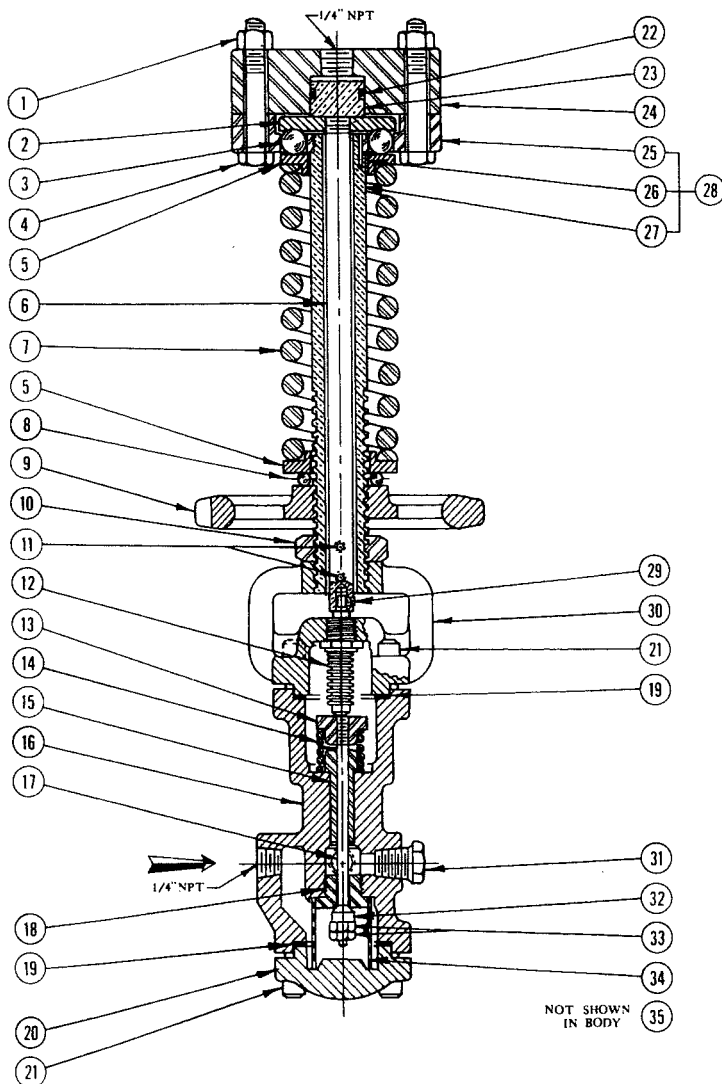
37	Seat Ring		St. Steel	4-04060-0
38	Stem		St. Steel	4-05381-0
39	Comp. Disc Ass'y.		Brs.	7-53512-0

#### F14

Controlled Pressure Range	Adjusting Spring		Color Code	Number of Diaphragms
	Part No.	Wire Dia. In.		
3 - 30 PSI	5-05135-0	1/4	Red	2
20 - 100 PSI	5-05122-0	11/32	Green	2
40 - 150 PSI	5-05137-0	3/8	Black	3

#### F15

Controlled Pressure Range	Adjusting Spring		Color Code	Number of Diaphragms
	Part No.	Wire Dia. In.		
3 - 10 PSI	5-05134-0	.177	Blue	1
5 - 25 PSI	5-05135-0	1/4	Red	2



**ADJUSTMENT INDICATOR**

## F32 PILOT

Item No.	Part Name	Remarks	Material	Part No.
1	Hood Nut		Steel	5-02872-0
2	Pressure Plate		Iron	4-03652-1
3	Pressure Plate Ball		Steel	5-00553-0
4	Hood Bolt		Steel	5-04772-0
5	Spring Button		Steel	4-01052-0
6	Stem		Alum.	4-05654-0
7	Adjusting Spring	See Table	Steel	—
8	Bearing		Steel	5-00550-0
9	Handwheel		Cast Iron	4-02502-0
10	Barrel Nut		Steel	4-02908-0
11	Set Screw		Steel	5-04874-0
12	Bellows Assembly	A, B Note 1	Bronze	7-60302-0
13	Bellows Assembly	A, B Note 2	St. Steel	7-60536-0
14	Pusher Plate	B	Steel	7-03718-0
15	Valve Spring	B	Inconel	5-04985-0
16	Bushing	See Item 16	St. Steel	4-01080-0
17	Body & Bushing		Iron	8-10107-0
18	Body & Bushing		Bronze	8-10109-0
19	Body & Bushing		Steel	8-10108-1
20	Valve Stem	B	St. Steel	4-05229-0
21	Seat Ring	B	St. Steel	4-04057-0
22	Gasket	A, B Note 1	Asbestos	5-02378-0
23	Gasket	A, B Note 2	Flexitalic	5-11718-0
24	Blind Flange		Cast Iron	4-02151-0
25	Blind Flange		Bronze	4-02153-0
26	Blind Flange		Steel	4-11678-0
27	Bl. Flg. & Bonnet Bolt		Steel	5-04803-0
28	Bl. Flg. & Bonnet Bolt		Steel	5-11719-0
29	Piston Ring	A, B	Hycar	5-04017-0
30	Piston		Bronze	4-03363-0
31	Hood		St. Steel	4-02566-0
32	Cowl	See Item 28	Steel	4-01542-0
33	Groove Pin	See Item 28	Steel	5-03243-0
34	Barrel	See Item 28	Alum.	4-01247-0
35	Cowl Assembly		Steel	0-05198-0
36	Set Screw		Steel	5-04872-0
37	Bonnet		Cast Iron	4-00976-0
38	Bonnet		Bronze	4-00978-0
39	Bonnet		Steel	4-10021-1
40	Pipe Plug - 1/4 NPT		Steel	4-03772-0
41	Pipe Plug - 1/4 NPT		Brass	4-03771-0
42	Disc	B	St. Steel	4-01772-0
43	Stem Nut	B	Steel	5-02888-0
44	Screen - Water		Monel	4-04701-0
45	Screen - Steam	B	Monel	4-04700-0
46	Pipe Plug - 1/8 NPT		Steel	4-03769-0
47	Pipe Plug - 1/8 NPT		Brass	4-03770-0

### A - Recommended Spare Parts

### B - Furnished in Repair Kit:

8-09140-0 Cast Iron & Bronze (Steam Screen)

8-09141-1 Cast Steel (Steam Screen)

Use pilot setting instruction Form S.I.O.I - 60A

### ADJUSTMENT INDICATOR

36	Adj. Indicator Plate		Alum.	5-03512-0
37	Adj. Indicator Pointer		Alum.	5-03513-0

### F32

Controlled Pressure Range	Adjusting Spring		Color Code
	Part No.	Wire Dia. No.	
200-450 PSI	5-05135-0	1/4	Red
400-1200 PSI	5-05122-0	11/32	Green
1000-2000 PSI	5-05137-0	3/8	Black

Note 1 Applies to Iron & Bronze Body Pilots

Note 2 Applies to Steel Body Pilot



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**SPENCE ENGINEERING COMPANY, INC.** 150 COLDENHAM ROAD, WALDEN, NY 12586-2035

## TYPE T14 & T14D TEMPERATURE PILOT

The combination of a Spence Type T14 or Type T14D Pilot with a Spence Type E or Type C Main Valve produces a temperature regulator or a combined pressure and temperature regulator in a single pilot-operated valve.

This pilot is recommended for use with storage heaters, jacketed kettles and vats.

### RATINGS (Maximum Inlet Conditions)

Material	Construction	Pressure	(Temperature)
Cast Iron	Screwed Ends	250 PSIG	450°F
	Flanged ANSI 125	125 PSIG	450°F
	Flanged ANSI 250	250 PSIG	450°F
Cast Bronze	Screwed Ends	250 PSIG	450°F
Cast Steel	Screwed Ends	300 PSIG	600°F
	Flanged ANSI 150	150 PSIG	500°F
	Flanged ANSI 300	300 PSIG	600°F
	Flanged ANSI 600	600 PSIG	600°F

### TEMPERATURE RANGES

- |  |  |
|--|--|
| <input type="checkbox"/> 20° to 120°F  | <input type="checkbox"/> 150° to 300°F |
| <input type="checkbox"/> 50° to 150°F  | <input type="checkbox"/> 170° to 270°F |
| <input type="checkbox"/> 70° to 170°F  | <input type="checkbox"/> 250° to 350°F |
| <input type="checkbox"/> 120° to 220°F | <input type="checkbox"/> _____         |

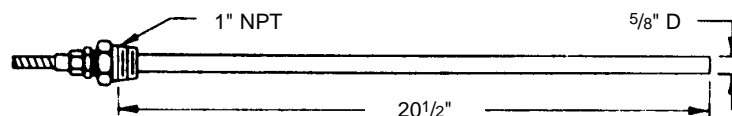
### THERMOSTAT ASSEMBLY

Standard Thermostat Assemblies and Wells:

- |  |                                 |
|--|---------------------------------|
| <input type="checkbox"/> Stainless Steel | <input type="checkbox"/> Bronze |
|--|---------------------------------|

Flexible tubing and capillary are available to 50 feet.

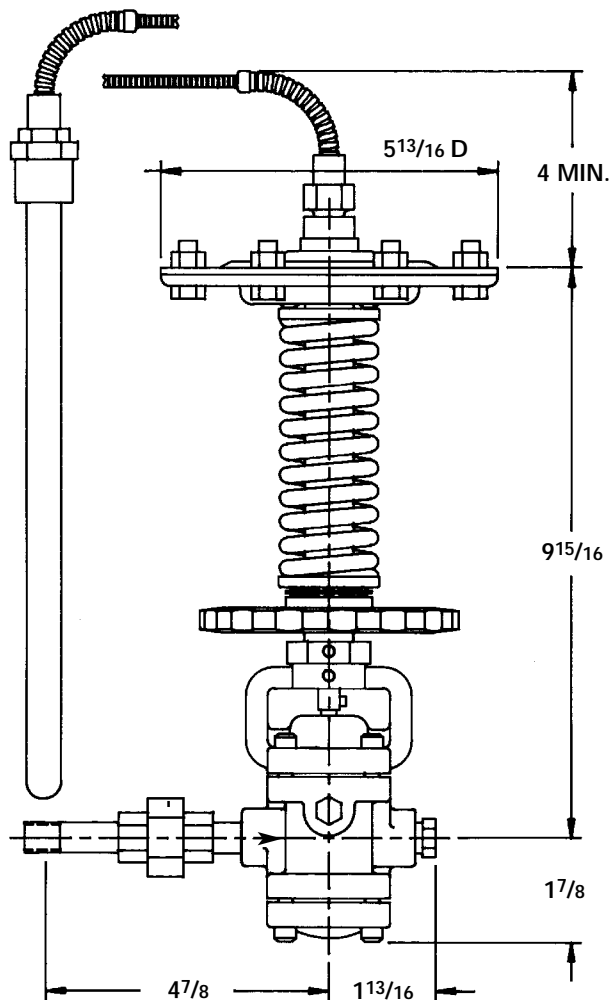
### THERMOSTAT



Style #700 bronze bulb with 10 feet of brass flexible tubing will be furnished unless otherwise specified. For other bulb styles, see SD9501.

### OPTIONS

- |   |   |
|---|---|
| <input type="checkbox"/> Thermostat Well  | <input type="checkbox"/> Adjustment Indicator |
| <input type="checkbox"/> Dial Thermometer | <input type="checkbox"/> Integral Mount Body  |



**T14 PILOT**

SD 4511A/9811

PRINTED IN U.S.A.

## OPERATING PRINCIPLE

The regulator is operated by its initial steam pressure. The main valve is normally closed, being held so by initial pressure on the disc and by an internal main spring. The pilot is opened when the temperature at the thermostat bulb is lower than the setting of the temperature adjusting spring.

When steam is turned on, it flows to the pilot through the connecting nipple and union (see Fig. 1). At the No. 8B tee on the pilot outlet, the flow divides. One branch is connected to bleedport No. 4A and the other to restriction elbow No. 5A and the underside of the main valve diaphragm. Bleedport No. 4A restricts the flow, builds pressure under the diaphragm and opens the main valve. Restriction No. 5A steadies the operation of the regulator.

As the temperature of the heated medium rises, vapor pressure is generated in the thermostat bulb and transmitted to the pilot temperature diaphragm. When the vapor pressure becomes sufficient to over-balance the combined thrust of the temperature adjusting and pressure limit springs, the regulator throttles to maintain the set temperature.

When a Type D Pressure Pilot is added (Type T14D), the operation remains the same as described above except the delivery pressure is limited to the setting of this pilot. On decreasing load, the temperature pilot reassumes the control and throttles the delivery pressure as required to maintain the desired temperature. For additional information on the Type D Pilot, please refer to SD4111.

## RECOMMENDED INSTALLATION

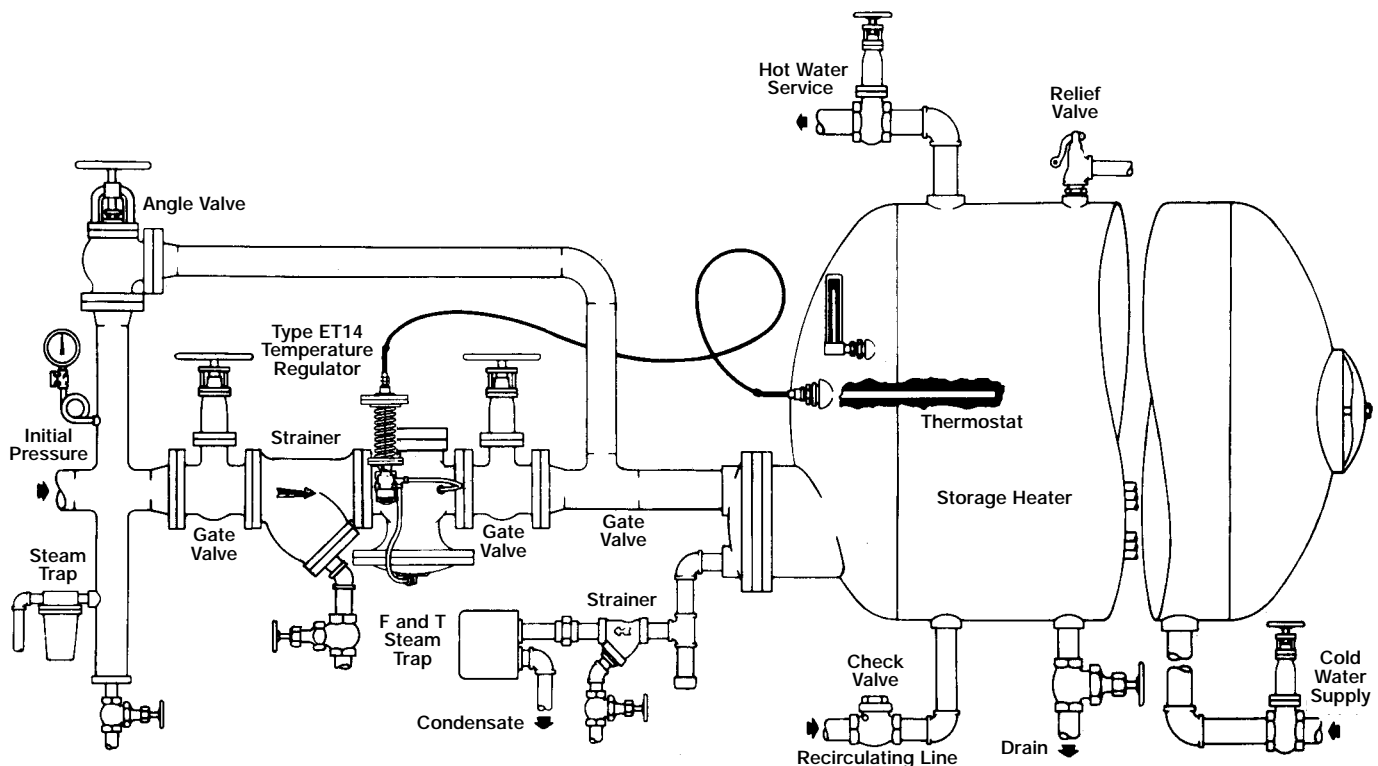


FIGURE 1



# INSTALLATION

## PLANNING

Locate the regulator in a horizontal pipe. Prevent water hammer and erratic operation by providing a trap ahead of the regulator. Avoid damaging effects of scale and dirt in pipelines by using a strainer to protect the regulator. Provide a three valve bypass to facilitate inspection of the regulator without interrupting service.

The preferred thermostat position is horizontal. When vertical or slanting, the tip end of the bulb must point downward. Locate the thermostat as close to the heater outlet as practical. Expose the entire length of the bulb to the active flow leaving the heater. If the pressure rating of the heater or connected equipment is less than the initial steam pressure, provide a safety valve.

Hot water and similar liquid systems require a relief valve to prevent dangerous overpressure due to expansion. Instantaneous heaters, when operated on intermittent demand (as in domestic water heating), require the following conditions for best temperature regulation.

- Constant forced recirculation of fluid through the heater.
- Omission of thermostat well to reduce temperature lag. Use of a thermostat compatible with the heated medium is preferred over the use of a standard thermostat installed in a well which is compatible with the heated medium. When the use of a well is unavoidable, an appropriate heat transfer medium should be installed between the well and the thermostat.

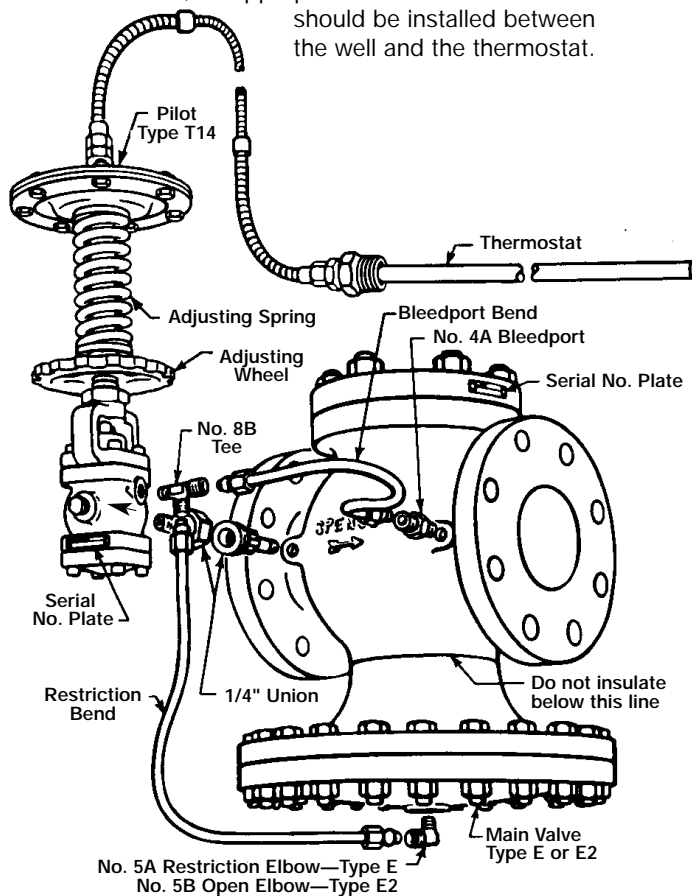


FIGURE 2

## MAIN VALVE

Flush the piping system thoroughly to clear it of welding beads, scale, sand, etc. Mount the main valve with diaphragm chamber down and arrow on body pointing in the direction of flow. Screwed end valves should be mounted in unions.

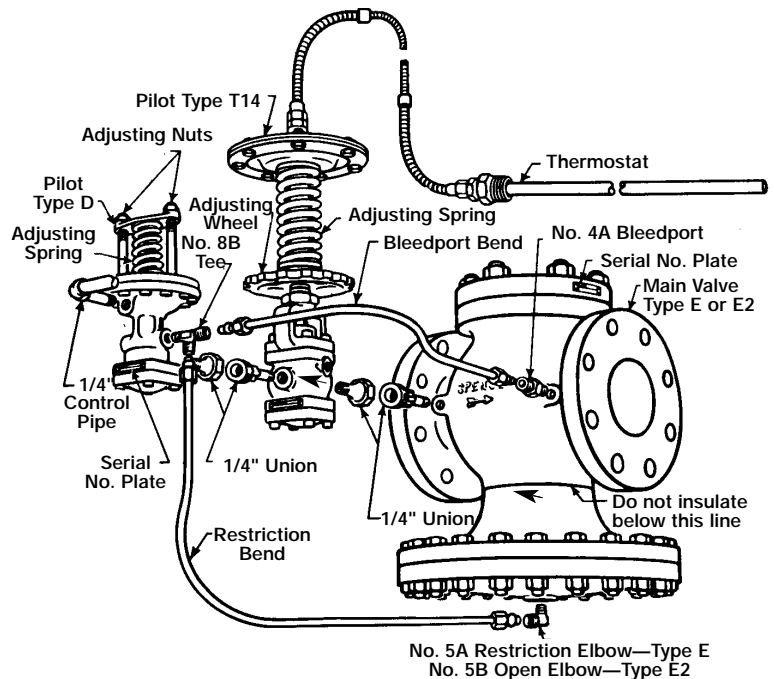


FIGURE 3

## PILOT

Mount the pilot on either side of the main valve by means of 1/4 inch nipple and union provided. Make this connection the 1/4 inch pipe tap at the inlet side of the main valve as shown in Figure 2.

Screw No. 4A bleedport fitting into the 1/8 inch pipe tap at the outlet side of the main valve body. Note bleed orifice in this fitting – vital to operation of regulator.

Screw No. 8B tee into 1/8 inch pipe tap in pilot. Select tap facing downstream.

Screw No. 5A elbow containing restriction orifice into 1/8 inch pipe tap on underside of main valve diaphragm chamber. If the initial pressure or pressure drop is less than 15 psi, a No. 5B open elbow without orifice.

Connect tubing bends as illustrated in Fig. 2. Valves with condensation chamber are fitted up according to Figure 3.

## CONTROL PIPE (required for T14D only)

Use 1/4 inch pipe for this line which connects the pilot pressure diaphragm chamber (Fig. 2) to the desired point of pressure control. On instantaneous heaters with steam in shell, tap the control pipe into the shell. Otherwise, enter the delivery steam pipe at point of entrance to heater. Pitch the control pipe away from the pilot and avoid water pockets. Insulation may be applied to the upper portion (globe and flanges) of the main valve. Do not insulate the diaphragm chamber or any part of the pilot (Fig. 1).

---

## START-UP AND SETTING

**For ET14:** Close bypass and open outlet stop valve. Blow down strainer. Gradually open inlet stop valve. Turn temperature adjusting wheel (Fig. 1) to obtain desired control temperature.

**For ET14D:** Close bypass, open 1/4" control pipe valve and turn up the temperature adjusting wheel (Fig. 1) until 1/2" of thread is exposed. Back off pressure adjusting screw to remove all compression from D Pilot adjusting spring.

Crack open the outlet stop valve. Crack open the inlet stop valve, blow down strainer and then slowly open the inlet valve wide. Gradually compress D Pilot adjusting spring until the valve opens and takes control at set pressure. Open outlet stop valve slowly and adjust temperature by turning adjusting wheel until desired operating temperature is reached.

---

## TROUBLE SHOOTING

### FAILURE TO OPEN OR SAGGING DELIVERY PRESSURE

1. Adjusting spring on pilot may have been tampered with.
2. Initial pressure may be down due to partially closed supply valve, clogged strainer or other obstruction.
3. Bleedport may have been omitted and an open coupling substituted.
4. Orifice in No. 5A restriction elbow may be plugged.
5. Control pipe may be plugged. Most likely points of obstruction are at shutoff valve and entrance to delivery main.
6. Make sure heater is properly trapped and free of condensate.
7. Main valve diaphragm may be broken. Check the main valve with air pressure in diaphragm chamber before dismantling.
8. Leak in the thermostat bulb may allow heated fluid pressure if sufficiently high to back up into the thermal system to hold pilot closed.

### FAILURE TO CLOSE – OVERHEATING

1. Adjusting spring on pilot may have been tampered with.
2. By-pass may be leaking.
3. Thermostat located too far from instantaneous heater outlet.
4. Thermostat may be kinked or broken or have lost it's fill. Alternately warm and cool thermostat 10°F above and below it's set point. If thermostat is operative, the pin between the lever and pressure diaphragm will become loose and snug as the temperature stem on opposite end of the lever moves up and down.
5. Orifice in bleedport may be plugged.
6. A lift of condensate to a hot well may require more pressure in heater than the heated medium. Arrange drainage of the heater by gravity or install a pump to lift condensate.
7. Main valve or pilot may be held open by foreign matter. To determine which valve leaks:
  - a. Close stop valves and 1/4" control pipe valve if D Pilot is used.

- b. Remove bleedport bend so pilot will exhaust to atmosphere.
- c. Turn down temperature adjusting wheel and bypass some steam to the heater to overheat the thermostat and close the temperature pilot.

**For Type T14:** Crack open inlet stop valve. If steam issues from 8B tee on pilot, there is an obstruction under it's seat or the thermostat is defective.

**For Type T14D:** Compress adjusting spring on Type D pilot. If steam issues from 8B tee, temperature pilot has an obstruction under it's seat or the thermostat is defective.

If temperature pilot is tight, turn up adjusting wheel until steam flows. Release compression on D Pilot adjusting spring to see if pilot closes tight. Open and close several times to wash seat.

Steam blowing back from bleedport means main valve disc is held open by foreign matter.

Steam may wash the obstruction from the seat if the valve is made to open wide. This can be accomplished if the temperature pilot is set well above temperature of liquid in tank heater and if the control pipe of the D Pilot is installed beyond the outlet stop valve. Reassemble bleedport bend and place regulator in operation. Then, slowly open and close outlet stop valve.

- d. Leakage of either valve requires dismantling to correct.

### ERRATIC TEMPERATURE CONTROL

1. Thermostat installed too far from heater outlet.
2. Improper trapping or erratic discharge of trap.
3. Lift of condensate to hot well may require more pressure than that called for by the medium flowing through the heater. Arrange to drain condensate by gravity or lift it with a pump.
4. Sticky check valve in return line.
5. Poor circulation through heater. Constant circulation should be employed.
6. Valve too large for the heater or heater too large for the load.
7. Valve installed too far from heater.

## INSPECTION

Under normal conditions, complete dismantling at regular intervals is not recommended. A valve kept relatively free of dirt will function for years with minimum attention.

After the first few days of operation and twice per year:

- 1 - Inspect for dirt collected at bleedport 4A and restriction elbow 5A.
- 2 - Inspect all joints for leakage. Keep bolts tight. Never allow a leak to persist.

## THERMOSTAT REPLACEMENT

Do not, under any circumstances, loosen the bolts on the diaphragm chamber of the Type T14 Temperature Pilot or attempt to dismantle the thermostat element. The system is filled with volatile fluid which, if lost, will render the pilot inoperative. To replace, proceed as follows:

- 1 - Cool the thermostat bulbs of original and replacement elements below the low end of their temperature range (See range tag on flexible tubing). Maintain bulbs at this temperature during replacement process.
- 2 - Back off temperature adjusting wheel (10) to within a turn or two of the barrel nut (22). This will allow temperature diaphragm plate (4) to remain seated in correct alignment on balls (5) and will release all compression on bellows stem assembly (12).

***Unless pilot is upright, balls will fall out of position.***

- 3 - Remove diaphragm nuts (2) and detach thermostat assembly (11) from pilot. Similarly, detach shipping plate from replacement thermostat.

***When removing diaphragm nuts, be sure cowl assembly (28) does not turn in bonnet (24). If movement is observed, reset position as per instructions for temperature stem position adjustment below.***

- 4 - Install replacement thermostat on pilot and install shipping plate on original thermostat. Tighten bolts evenly.

## BELLOWS SEAL REPLACEMENT

If steam blows out around temperature stem (8) at bonnet (24), the bellows seal is defective and must be replaced. Proceed as follows:

- 1 - Remove set screw (23) and bonnet bolts (18).
- 2 - Remove cowl assembly (28) and bonnet (24) from body (25).
- 3 - Fit 5/8" deep socket wrench on nut at the end of bellows assembly (12) and remove it from bonnet (24).
- 4 - Install new bellows following instructions for replacing seat rings.
- 5 - Be sure bellows stem fits into coupling on temperature stem (8) and tighten set screw (23).

## DISMANTLING

- 1 - Remove bonnet bolts (18) and lift off cowl assembly (28).
- 2 - Remove disc (14) and clean seat (15).
- 3 - Remove blind flange bolts (18) and clean screen (16).

## ASSEMBLY

- 1 - Reassemble the pilot in the reverse of the procedure described above.

## SEAT AND DISC REPLACEMENT

- 1 - Examine the seat and disc sealing surfaces for nicks or other signs of damage by pipeline debris. If sealing surfaces are damaged, they must be replaced.
- 2 - Remove the seat ring (15) from the body with a socket wrench. Clean the body threads of old sealing compound using a wire brush. Apply new sealing compound (Copaltite or equal) sparingly to the threads and shoulder of the new seat ring. Let stand until tacky before assembling into the pilot body.
- 3 - When seat or disc is replaced, the sealing surfaces must be lapped.

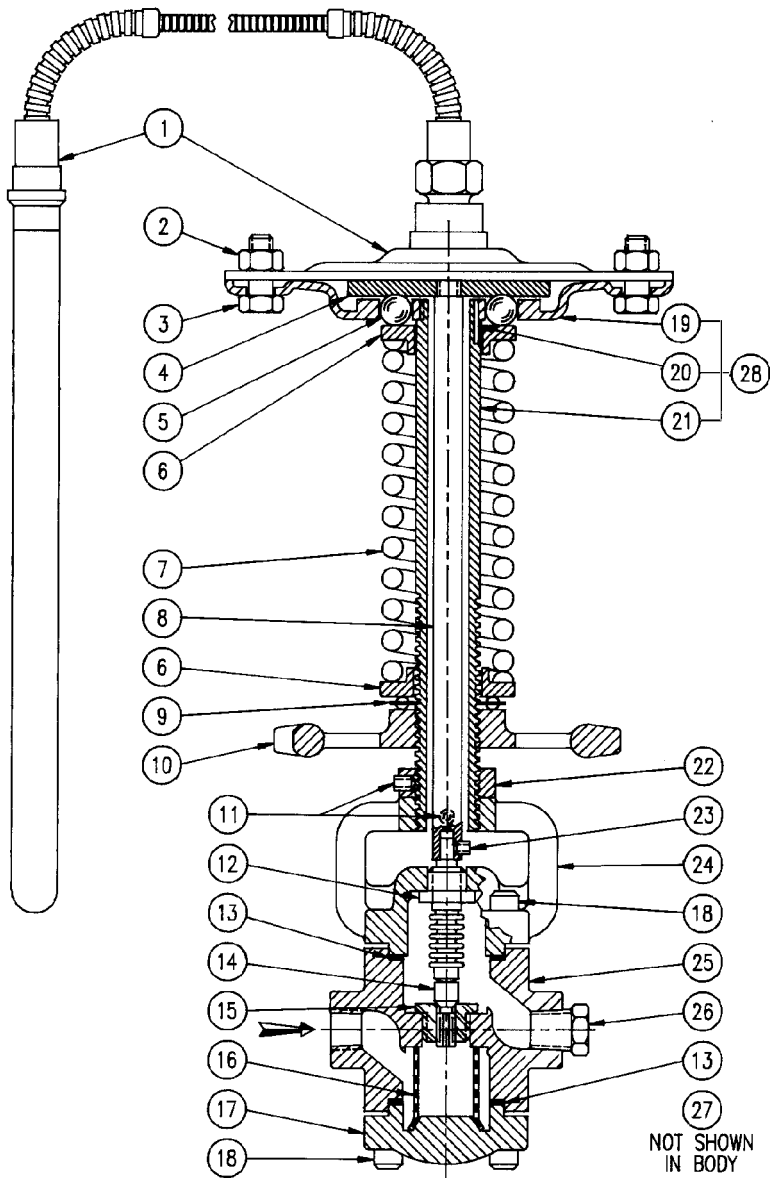
***Lap sparingly using 500 grit lapping compound and light pressure. Heavy grinding may cause galling, wide sealing surfaces and a grooved disc, all of which tend to produce leakage.***

After the sealing surfaces are lapped in, disassemble and clean all parts.

## T14 PILOT SETTING

The temperature stem adjustment is factory set and locked by a barrel nut (2). If the setting is accidentally disturbed, readjust as follows:

- 1 - Leave pilot connected to main valve. Remove thermostat assembly (1).
- 2 - Clamp a steel flat bar to the cowl (19) so that the pressure plate (4) is flush with the diaphragm seat on cowl (19).
- 3 - Disconnect bleedport bend (tubing between tee at pilot outlet and bleedport fitting in outlet end of main valve).
- 4 - Crack inlet stop valve until steam issues from tee fitting on pilot outlet. Should pilot be blocked closed by temperature stem (8), loosen bonnet set screw (11) and stem set screw (23). Rotate cowl assembly (28) upward to raise barrel (21) until steam flows.
- 5 - If barrel nut (22) prevents cowl assembly from turning down far enough or is above bonnet (24) when steam stops flowing, remove sealing wax and loosen set screw (11).
- 6 - Lock this adjustment by tightening set screw (11) in bonnet (24). Turn down barrel nut (22) fast against bonnet and tighten its set screw (11) and the stem set screw (23).
- 7 - Reassemble thermostat (1).



**TYPE T14 PILOT**

ITEM NO.	PART NAME	MATERIAL	PART NO.
1	Thermostat Assembly	—	—
2	Diaphragm Nut	Steel	05-02992-00
3	Diaphragm Bolt	Steel	05-05634-00
4	Pressure Plate	Iron	04-03602-01
5	Pressure Plate Balls	Alloy Steel	05-00553-00
6	Temp. Spring Button	Steel	04-01052-00
7	Temp. Adjusting Spring	Steel	05-05122-00
8	Temperature Stem	Aluminum	04-05654-00
9	Bearing	Steel	05-00550-00
10	Handwheel	Iron	04-02502-00
11	Bonnet Set Screw	Steel	05-04874-00
12	*Bellows Stem Assembly	Bronze Steel	07-60302-00 07-60536-00
13	*Gasket	Non-asbestos Flexitalic	05-02378-00 05-11718-00
14	*Disc	Stainless Steel	04-01776-00
15	*Seat Ring	Stainless Steel	04-04057-90
16	*Screen Steam	Monel	04-04700-00
17	Blind Flange	Iron Bronze Steel	04-02151-00 04-02153-00 04-11678-00
18	Blind Flange & Bonnet Bolt	Steel Steel	05-04803-00 05-11719-00
19	Cowl	Steel	04-01525-00
20	Groove Pin	Stainless Steel	05-03243-00
21	Barrel	Aluminum	04-01247-00
22	Barrel Nut	Steel	04-02908-00
23	Stem Set Screw	Steel	05-04872-00
24	Bonnet	Iron Bronze Steel	04-00976-00 04-00978-00 04-10021-01
25	Body	Iron Bronze Steel	04-00741-00 04-00761-00 04-10912-01
26	Pipe Plug 1/4 NPT	Steel Brass	04-03772-00 04-03771-00
27	Pipe Plug 1/8 NPT	Steel Brass	04-03769-00 0403770-00
28	Cowl Assembly	Steel/Aluminum	07-00334-00
	Repair Kit	Cst Iron/Bronze	07-06606-00
	Repair Kit	Steel	08-09110-01

\*These parts furnished in Repair Kit

When ordering parts, it is essential that the pilot type, service and serial number be stated.

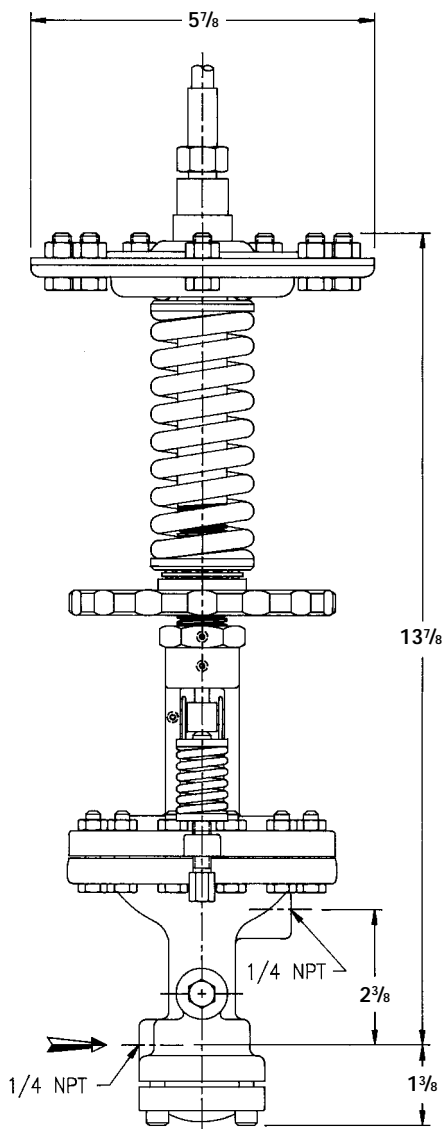
Select part by item number, but order by part number. Specify complete part number when ordering.



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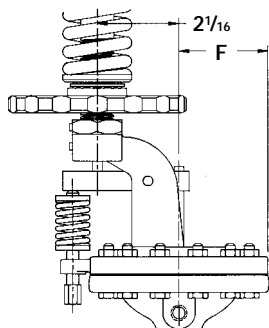
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SD 4512A/0503



**T124/T134 PILOT-FRONT VIEW**

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**T124/T134 PILOT SIDE VIEW**

PILOT TYPE	DIMENSION
	F
T124	1 5/8"
T134	1 1/4"

## TYPE T124 & T134 TEMPERATURE PILOT

The combination of a Spence Type T124 or T134 with a Spence Type E or Type C main valve produces a steam pressure reducing valve and temperature regulator in a single pilot-operated valve. Steam pressure on the heater is modulated in proportion to temperature and load variations. Pressure control provides fast, accurate adjustment of heat transfer rate to demand requirements.

This pilot is primarily intended for use on instantaneous heaters. By combining both temperature and pressure control in one pilot, unusually close regulation of temperature is achieved through the anticipation of fast load changes. An additional benefit of this pilot is that pressure reduction and temperature control can be provided with a single regulator. For pressures not to exceed 20 psi, the T134 should be used. For pressures between 20 and 125 psi, the T124 should be used.

### RATINGS (Maximum Inlet Conditions)

Construction	Pressure	(Temperature)
<input type="checkbox"/> Cast Iron .....	250 PSIG .....	(450°F)
<input type="checkbox"/> Cast Steel (T134 only) .....	600 PSIG .....	(750°F)

### TEMPERATURE RANGES

<input type="checkbox"/> 20° to 120°F	<input type="checkbox"/> 150° to 300°F	<input type="checkbox"/> 300° to 400°F
<input type="checkbox"/> 50° to 150°F	<input type="checkbox"/> 170° to 270°F	<input type="checkbox"/> 330° to 430°F
<input type="checkbox"/> 70° to 170°F	<input type="checkbox"/> 250° to 350°F	<input type="checkbox"/> 400° to 500°F
<input type="checkbox"/> 120° to 220°F	<input type="checkbox"/> 290° to 390°F	<input type="checkbox"/> _____

### THERMOSTAT ASSEMBLY

Standard Thermostat Assemblies and Wells:

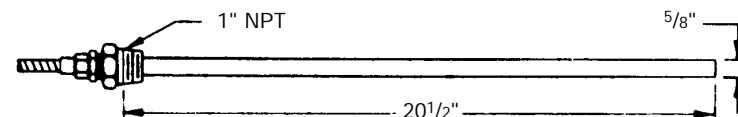
- ☐ Stainless Steel      ☐ Bronze

Flexible tubing and capillary are available to 50 feet.

### THERMOSTAT

#### OPTIONS

- ☐ Thermostat Well      ☐ Adjustment Indicator  
☐ Dial Thermometer      ☐ Integral Mount Body



Style #700 bronze bulb with 10 feet of brass flexible tubing will be furnished unless otherwise specified. For other bulb styles, see SD9501.

## OPERATING PRINCIPLE

The regulator is operated by its initial steam pressure. The main valve is normally closed, being held so by initial pressure on the disc and by an internal main spring. The pilot is opened by compressing the pressure limit spring.

When steam is turned on, it flows to the pilot through the connecting nipple and union (see Fig. 1). At the No. 8B tee on the pilot outlet, the flow divides. One branch is connected to bleedport No. 4A and the other to restriction elbow No. 5A and the underside of the main valve diaphragm. Bleedport No. 4A restricts the flow, builds pressure under the diaphragm and opens the main valve. Restriction No. 5A steadies the operation of the regulator.

Steam flowing to the heater creates a rising delivery pressure which is feed back through the control pipe to the underside of the pilot diaphragm. As the pressure on this diaphragm approaches a balance with the thrust of the pressure limit spring, the pilot throttles. This, in turn, allows the main valve to assume a position where just enough steam flows to maintain the set maximum delivery pressure.

As the temperature of the heated medium rises, vapor pressure is generated in the thermostat bulb and transmitted to the pilot temperature diaphragm. When the vapor pressure becomes sufficient to over-balance the combined thrust of the temperature adjusting and pressure limit springs, the regulator throttles to maintain the set temperature.

## RECOMMENDED INSTALLATION

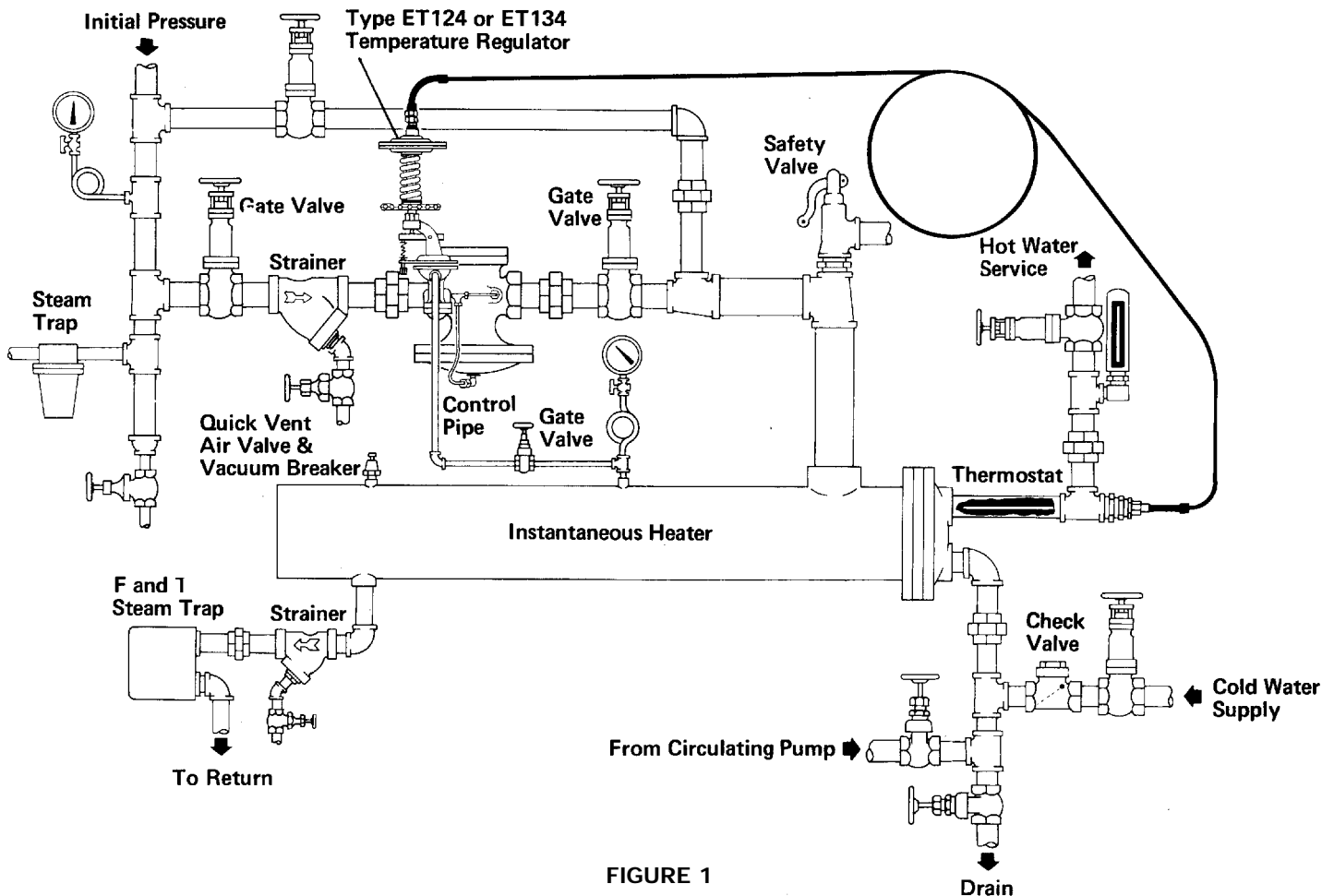


FIGURE 1

# INSTALLATION

## PLANNING

Locate the regulator in a horizontal pipe. Prevent water hammer and erratic operation by providing a trap ahead of the regulator. Avoid damaging effects of scale and dirt in pipelines by using a strainer to protect the regulator. Provide a three valve bypass to facilitate inspection of the regulator without interrupting service.

The preferred thermostat position is horizontal. When vertical or slanting, the tip end of the bulb must point downward. Locate the thermostat as close to the heater outlet as practical. Expose the entire length of the bulb to the active flow leaving the heater. If the pressure rating of the heater or connected equipment is less than the initial steam pressure, provide a safety valve.

Hot water and similar liquid systems require a relief valve to prevent dangerous overpressure due to expansion. Instantaneous heaters, when operated on intermittent demand (as in domestic water heating), require the following conditions for best temperature regulation.

- a. Constant forced recirculation of fluid through the heater.
- b. Omission of thermostat well to reduce temperature lag. Use of a thermostat compatible with the heated medium is preferred over the use of a standard thermostat installed in a well which is compatible with the heated medium. When the use of a well is unavoidable, an appropriate heat transfer medium should be installed between the well and the thermostat.

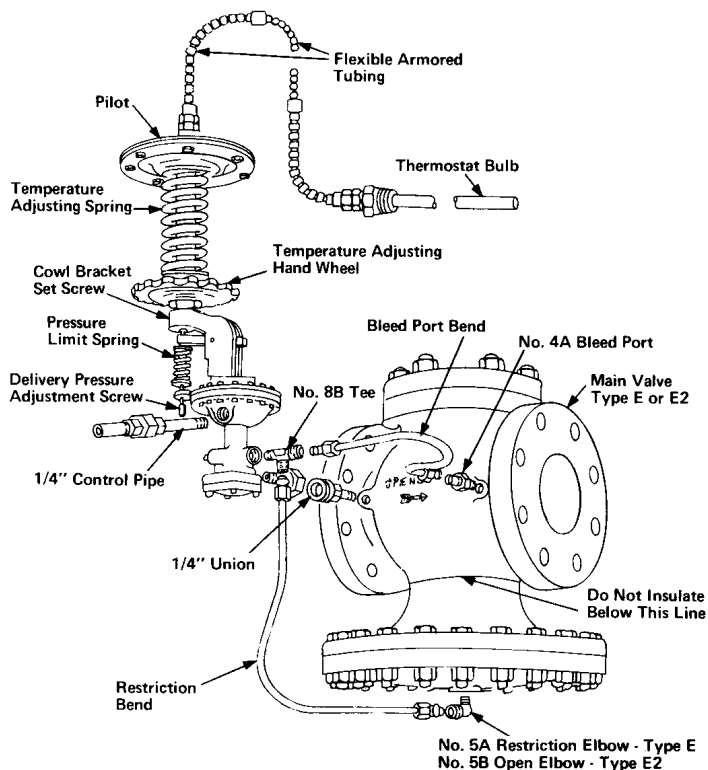


FIGURE 2

## MAIN VALVE

Flush the piping system thoroughly to clear it of welding beads, scale, sand, etc. Mount the main valve with diaphragm chamber down and arrow on body pointing in the direction of flow. Screwed end valves should be mounted in unions.

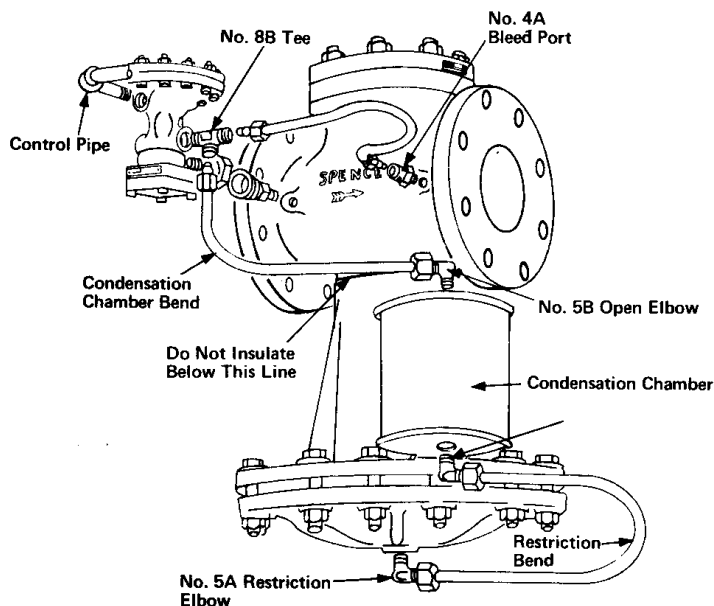


FIGURE 3

## PILOT

Mount the pilot on either side of the main valve by means of 1/4 inch nipple and union provided. Make this connection the the 1/4 inch pipe tap at the inlet side of the main valve as shown in Figure 2.

Screw No. 4A bleedport fitting into the 1/8 inch pipe tap at the outlet side of the main valve body. Note bleed orifice in this fitting – vital to operation of regulator.

Screw No. 8B tee into 1/8 inch pipe tap in pilot. Select tap facing downstream.

Screw No. 5A elbow containing restriction orifice into 1/8 inch pipe tap on underside of main valve diaphragm chamber. If the initial pressure or pressure drop is less than 15 psi, a No. 5B open elbow without orifice.

Connect tubing bends as illustrated in Fig. 2. Valves with condensation chamber are fitted up according to Figure 3.

## CONTROL PIPE (if required)

Use 1/4 inch pipe for this line which connects the pilot pressure diaphragm chamber (Fig. 2) to the desired point of pressure control. On instantaneous heaters with steam in shell (Fig. 1), tap the control pipe into the shell. Otherwise, enter the delivery steam pipe at point of entrance to heater. Pitch the control pipe away from the pilot and avoid water pockets. Insulation may be applied to the upper portion (globe and flanges) of the main valve. Do not insulate the diaphragm chamber or any part of the pilot (Fig. 1).

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## START-UP AND SETTING

Best temperature control will result when the delivery pressure setting is the lowest steam pressure capable of sustaining the desired temperature at maximum load. The following adjustments should be made under full load conditions or as near to such as possible.

Close bypass, open 1/4" control pipe valve and turn up the temperature adjusting wheel (Fig. 1) until 1/2" of thread is exposed. Back off pressure adjusting screw to remove all compression from pressure limit spring.

Crack open the outlet stop valve. Crack open the inlet stop valve, blow down strainer and then slowly open the inlet valve

wide. Slowly turn up the pressure adjustment. When steam begins to flow, gradually open the outlet stop valve.

Continue delivery pressure adjustment until heater output temperature is 5°F above required. If the temperature adjustment made at the beginning of this procedure limits this operation, set the adjusting wheel a little higher. Lower the temperature adjusting wheel until the desired operating temperature is reached.

If the adjustment is made at partial load, the temperature will sag under heavier loads. When maximum load occurs, increase the pressure setting just enough to restore the temperature to normal.

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## TROUBLE SHOOTING

### FAILURE TO OPEN OR SAGGING DELIVERY PRESSURE

1. Adjusting spring on pilot may have been tampered with.
2. Initial pressure may be down due to partially closed supply valve, clogged strainer or other obstruction.
3. Bleedport may have been omitted and an open coupling substituted.
4. Orifice in No. 5A restriction elbow may be plugged.
5. Control pipe may be plugged. Most likely points of obstruction are at shutoff valve and entrance to delivery main.
6. Make sure heater is properly trapped and free of condensate.
7. Pilot or main valve diaphragm may be broken. Check for leakage around stem between lever and diaphragm on pilot. Check the main valve with air pressure in diaphragm chamber before dismantling.
8. Leak in the thermostat bulb may allow heated fluid pressure if sufficiently high to back up into the thermal system to hold pilot closed.

### FAILURE TO CLOSE – OVERHEATING

1. Adjusting spring on pilot may have been tampered with.
2. By-pass may be leaking.
3. Thermostat located too far from instantaneous heater outlet.
4. Thermostat may be kinked or broken or have lost it's fill. Alternately warm and cool thermostat 10°F above and below it's set point. If thermostat is operative, the pin between the lever and pressure diaphragm will become loose and snug as the temperature stem on opposite end of the lever moves up and down.

5. A lift of condensate to a hot well may require more pressure in heater than the heated medium. Arrange drainage of the heater by gravity or install a pump to lift condensate.
6. Main valve or pilot may be held open by foreign matter. To determine which valve leaks:
  - a. Close inlet stop valve and 1/4" control valve.
  - b. Remove bleedport bend so pilot will exhaust to atmosphere.
  - c. Remove all compression from pressure adjusting spring.

If steam issues from the end of the bleedport bend on the pilot, there is an obstruction between it's seat and disc. Steam blowing back from the bleedport on the downstream side of the valve indicates that the main valve disc is held open by foreign matter. Leakage of either valve requires dismantling. See dismantling and valve grinding for instructions.

### ERRATIC TEMPERATURE CONTROL

1. Thermostat installed too far from heater outlet.
2. Improper trapping or erratic discharge of trap.
3. Lift of condensate to hot well may require more pressure than that called for by the medium flowing through the heater. Arrange to drain condensate by gravity or lift it with a pump.
4. Sticky check valve in return line.
5. Poor circulation through heater. Constant circulation should be employed.
6. Valve too large for the heater or heater too large for the load.
7. Valve installed too far from heater.



## MAINTENANCE

(Brackets refer to item number)

### DISMANTLING

- 1 - Remove diaphragm nuts (4) and lift off top works and diaphragms.
- 2 - Remove the blind flange bolts (7) and take off the blind flange (26). Remove the screen (46) and gasket.
- 3 - Hold the pusher plate (41) with a socket wrench and remove stem nuts (25). The disc (24) will drop off. Lift out the stem (22) and valve spring (43).

### ASSEMBLY

- 1 - Reassemble the pilot in the reverse of the procedure described above.
- 2 - Take particular care that diaphragm screw (37) and cowl bracket (19) are centered on diaphragm flange of the pilot body (44). Misalignment can cause erratic performance.
- 3 - When replacing diaphragms, apply sealing compound (Copaltite or equal ) sparingly to the shoulder of the diaphragm screw (37). For steel pilot only, apply sealing compound to the diaphragm flange of the pilot body.

### SEAT, DISC AND STEM REPLACEMENT

- 1 - Examine the seat and disc sealing surfaces for nicks or other signs of damage by pipeline debris. If sealing surfaces are damaged, they must be replaced.
- 2 - When seat, disc or stem is replaced, the sealing surfaces must be lapped.

**Lap sparingly using 500 grit lapping compound and light pressure. Heavy grinding may cause galling, wide sealing surfaces and a grooved disc, all of which tend to produce leakage.**

After the sealing surfaces are lapped in, disassemble and clean all parts.

- 3 - Remove the seat ring (23) from the body with a socket wrench. Clean the body threads of old sealing compound using a wire brush. Apply new sealing compound (Copaltite or equal) sparingly to shoulder of the new seat ring. Let stand until tacky before assembling into the pilot body.
- 4 - Lap in joint between new stem (22) and disc (24).
- 5 - Apply lapping compound to the disc, place it on the stem and secure with a stem nut (25). Slip the stem into it's normal position and lap the disc to seat joint.
- 6 - Screw on the pusher plate (41), omitting the valve spring. Hold the disc on the seat and adjust the pusher plate until dimension (C=11/64") is obtained (Fig. 4).
- 7 - Remove stem nut, being careful not to disturb the pusher plate adjustment and lift stem out the top of the pilot. Grind off stem projection B flush with upper surface of pusher plate.
- 8 - Reinsert stem in the pilot with disc and a stem nut attached. Check dimension c and, if correct, lock the position by prick punching the thread at several points. Work carefully to avoid bending the stem.
- 9 - Scrape away burrs raised by prick punching. Upper surface must be smooth and flat.
- 10 - Check that valve travel is  $A=3/64"$ . This need not be exact. Stem should move smoothly. Binding indicates a bent stem.
- 11 - Remove stem nut a disc and withdraw stem. Install stem with valve spring, disc and both stem nuts in place.

### THERMOSTAT REPLACEMENT

- 1 - Cool the thermostat bulbs of original and replacement elements below the low end of their temperature range (See range tag on flexible tubing). Maintain bulbs at this temperature during replacement process.
- 2 - Back off temperature adjusting wheel (14) to within a turn or two of the barrel nut (1). Back off pressure adjusting screw (20) to remove all compression from spring. This will allow temperature diaphragm plate (7) to remain seated in correct alignment on balls (10) after disengagement of thermostat assembly.

**Unless pilot is upright, balls will fall out of position.**

- 3 - Remove diaphragm nuts (8) and detach thermostat assembly from pilot. Similarly, detach shipping plate from replacement thermostat.

**When removing diaphragm nuts, be sure cowl assembly (29) does not turn in threaded joint at barrel nut (1). If movement is observed, reset position as per instructions for temperature stem position adjustment below.**

- 4 - Install replacement thermostat on pilot and install shipping plate on original thermostat. Tighten bolts evenly.

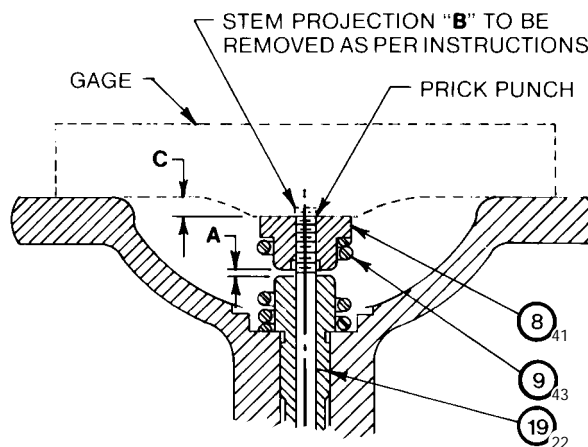
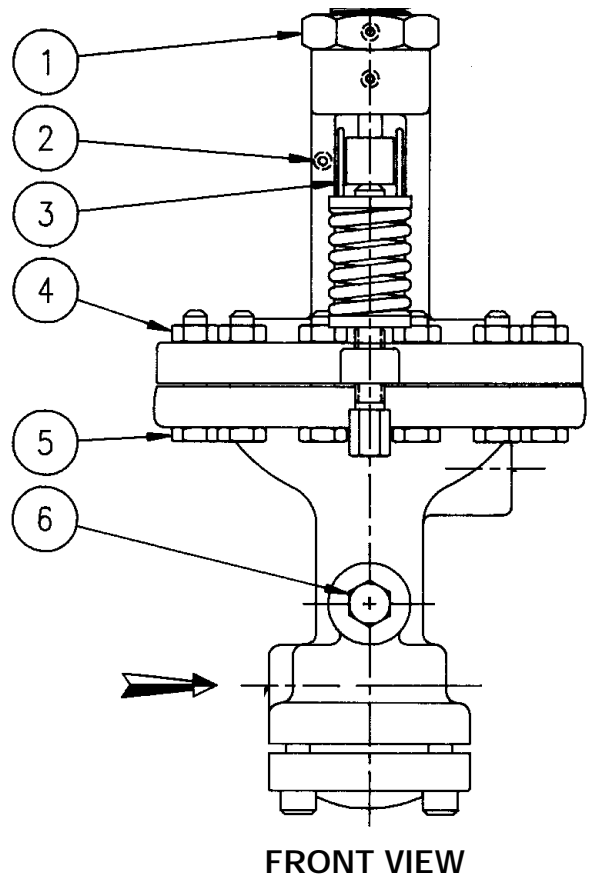
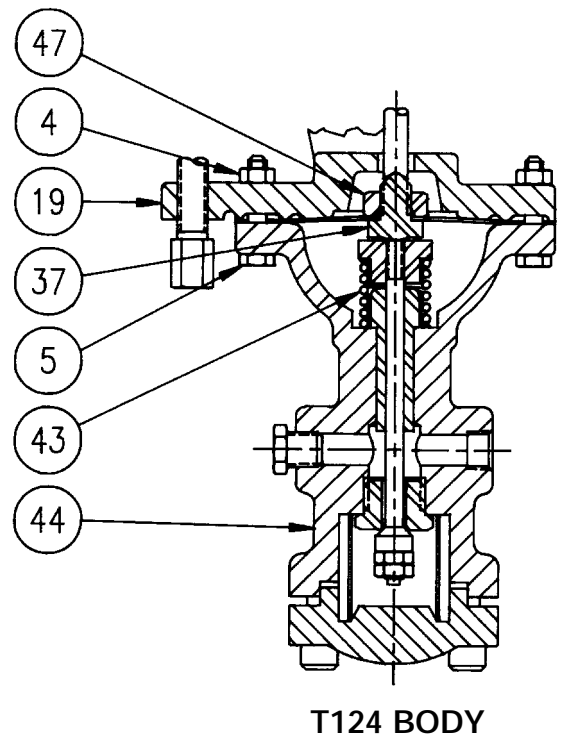
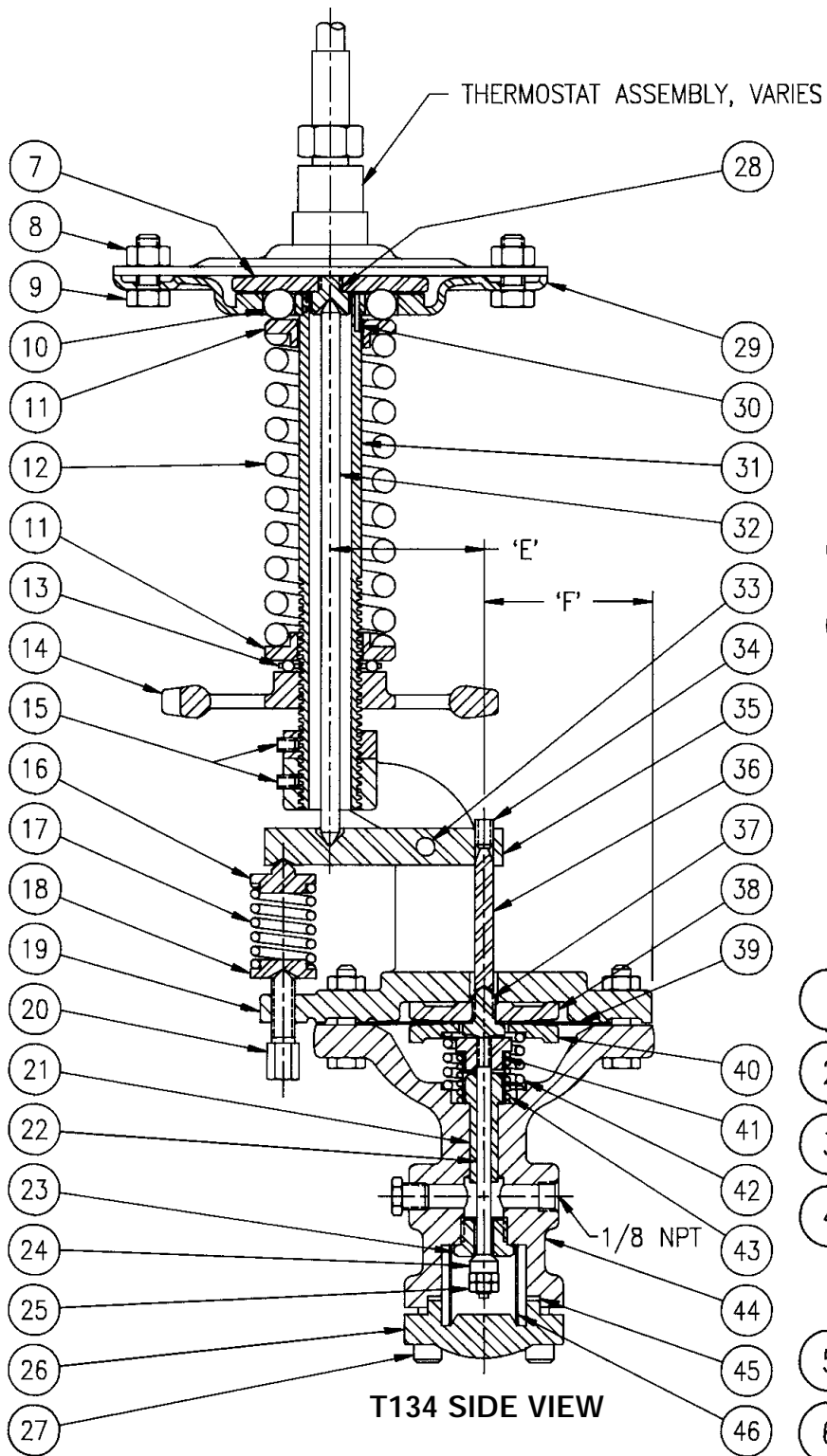


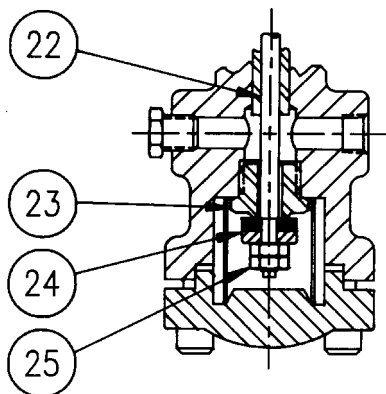
FIGURE 4 - TRAVEL SETTING

### TEMPERATURE STEM ADJUSTMENT

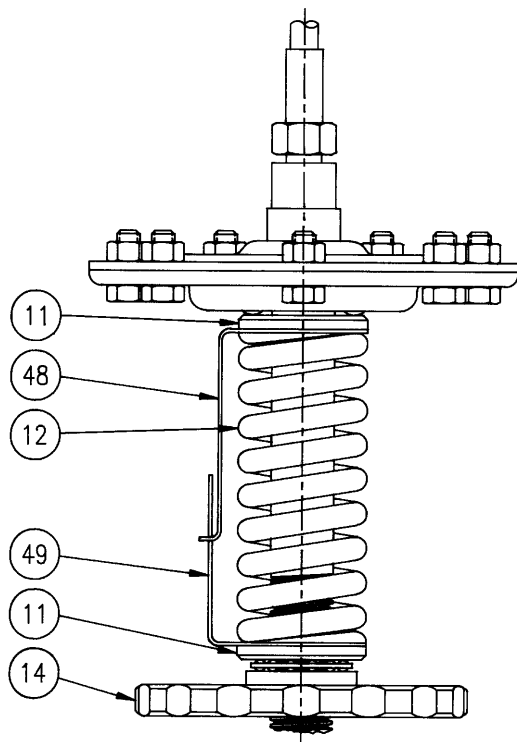
The temperature stem adjustment is factory set and locked by a barrel nut (1). If the setting is accidentally disturbed, readjust as follows:

- 1 - Remove thermostat assembly per instructions above.
- 2 - Clamp a flat bar to the cowl (29) so that the pressure plate (7) is flush with the cowl's pinch ring.
- 3 - Loosen cowl bracket set screw (30) and turn cowl assembly (29) up about one turn. Remove putty from barrel nut set screw (1), loosen set screw and back off barrel nut about one turn.
- 4 - Crack inlet stop valve or apply shop air to the pilot inlet. Turn up pressure adjusting screw (20) until flow issues from pilot outlet tee. Rotate the cowl assembly (29) down until flow stops.
- 5 - Lock this adjustment with the cowl bracket's set screw (30). Turn down the barrel nut (1) to jam against cowl bracket and lock with it's set screw (5).
- 6 - Reinstall the thermostat assembly.





**COMPOSITION DISC**



**ADJUSTMENT INDICATOR**

When ordering parts, it is essential that the pilot type, service and serial number be stated.

Select part by item number, but order by part number. Specify complete part number when ordering.

ITEM NO.	PART NAME	MATERIAL	PART NO.	REMARKS
1	Barrel Nut	Aluminum	04-02908-00	
2	Set Screw, Pivot Pin	Steel	05-04875-00	
3	Cotter Pin	Steel	05-03265-00	
4	Diaphragm Nut	Steel	05-02890-00	T124
	Diaphragm Nut	Steel	05-02871-00	T134
5	Diaphragm Bolt	Steel	05-04879-00	T124
	Diaphragm Bolt	Steel	05-04764-00	T134
6	Pipe Plug	Ledloy	04-03769-00	Iron, Steel
7	Temperature Plate	Ledloy	04-03602-01	
8	Temp. Diaphragm Nut	Steel	05-02992-00	
9	Temp. Diaphragm Bolt	Steel	05-05634-00	
10	Temp. Plate Ball	Steel	05-00553-00	
11	Temp. Spring Button	Ledloy	04-01052-00	
12	Temperature Spring	Oil Temp. Stl.	05-05122-00	
13	Thrust Bearing	Steel	05-00550-00	
14	Handwheel	Cast Iron	04-02502-00	
15	Set Screw, Barrel	Steel	05-04874-00	
16	Spring Button, Upper	Ledloy	04-01039-01	
17	Pressure Spring	Oil Temp. Stl.	05-05076-00	T124
	Pressure Spring	Oil Temp. Stl.	05-04980-00	T134
18	Spring Button, Lower	Ledloy	04-01079-00	
19	Cowl Bracket	Cast Iron	04-01014-00	Iron T124
	Cowl Bracket	Cast Iron	04-01016-00	Iron T134
	Cowl Bracket	Ductile Iron	04-01017-00	Steel T134
20	Adjusting Screw	416 St. Stl.	04-04756-01	
21	Stem Bushing	203 PB	04-01080-00	
22*	Stem	303 St. Stl.	04-05229-00	Standard
	Stem	303 St. Stl.	04-05381-00	Composition Disc
23*	Seat Ring	420 FH St. Stl.	04-04057-90	Standard
	Seat Ring	303 St. Stl.	04-04060-00	Composition Disc
24*	Disc	440 CH	04-01772-90	Standard
	Disc	Brass, Hycar	07-53512-00	Composition
25*	Stem Nut	Steel	05-02888-00	Steam Service
	Stem Nut	Brass	05-02886-00	Water Service
26	Blind Flange	Cast Iron	04-02151-00	Iron
	Blind Flange	Cast Steel	04-11678-00	Steel
27	Blind Flange Bolt	Steel	05-04803-00	Iron
	Blind Flange Bolt	Steel	05-11720-00	Steel
28	Temp. Plate Center	Ledloy	04-03715-00	
29	Cowl	Steel	04-01525-00	
30	Cowl Pin	Steel	05-03243-00	
31	Barrel	Aluminum	04-01247-00	
32	Temperature Stem	Aluminum	04-05653-00	
33	Pivot Pin	416 St. Stl.	04-03273-00	
34	Set Screw, Press. Stem	Steel	05-04850-00	
35	Lever	Steel	04-02758-00	T124
	Lever	Steel	04-02760-00	T134
36	Pressure Stem	416 St. Stl.	04-05426-00	
37*	Diaphragm Screw	Ledloy	04-02926-00	T124
	Diaphragm Screw	Ledloy	04-04822-00	T134
38*	Pressure Plate	Ledloy	04-03679-00	T134
39*	Diaphragm	301 St. Stl.	04-01623-00	
40*	Floating Plate	Iron	04-03710-00	T134
41*	Pusher Plate	Ledloy	04-03718-00	
42*	Vacuum Spring	302 St. Stl.	05-05055-00	T134
43*	Valve Spring	Inconel	05-09353-00	T124
	Valve Spring	Inconel	05-04985-00	T134
44	Body	Cast Iron	04-00950-00	Iron T124
	Body	Cast Iron	04-00630-00	Iron T134
	Body	Cast Steel	04-10439-01	Steel T134
45*	Gasket	Non-asbestos	05-02378-01	Iron
	Gasket	Flexitalic	05-11718-00	Steel
46*	Screen	301 St. Stl.	04-04700-00	Steam Service
	Screen	301 St. Stl.	04-04701-00	Water Service
47*	Diaphragm Nut	Ledloy	04-02925-00	T124
48	Adj. Indicator Plate	Aluminum	05-03512-00	
49	Adj. Indicator Pointer	Aluminum	05-03513-00	

\*These parts furnished in Repair Kit





A division of CIRCOR International, Inc.

**SPENCE ENGINEERING COMPANY, INC.** 150 COLDENHAM ROAD, WALDEN, NY 12586-2035

SD 4522D

# Technical Data

## Airmaster T61, T62, T63 & T64 PNEUMATIC TEMPERATURE CONTROLLER

The T61 Series Temperature Regulator is ideal for wide ranging, fast changing loads on instantaneous heaters and other difficult process applications. The cascade principle, normally used only on instrument type regulators, is the basis for this inexpensive design. The T61, when used with a properly selected A Series Pilot or Control Valve, continuously adjusts a pressure regulator to the required heater pressure. This action, coupled with the fast response of a bimetallic thermostat, gives exceptional results. Added convenience and economy results from the wide (200°F) adjustable range and the low air consumption (.35 cfm). These controllers have adjustable proportional band as well as overtemperature protection.

### SPECIFICATIONS

Max. Air Supply Pressure .....	32 psi
Max. Signal Pressure .....	2 psi below Supply
Mounting .....	1/2" NPT
Air Connections .....	1/8" NPT
Air Consumption, Maximum .....	0.70 SCFM
Air Consumption, Normal .....	0.35 SCFM
Proportional Band (Adjustable) .....	1/4 to 2 psi per 1°F
Weight .....	2 3/4 lb.

### TEMPERATURE RANGES

T61 & T62	50° to 250°F
T63	150° to 300°F

## OPERATING PRINCIPLE

### When used with Regulator

The regulator is operated by its initial steam pressure. It is normally closed, being held so by initial pressure on the disc and by an internal main spring. The pressure pilot is actuated by means of an air signal applied to its diaphragm. This signal is received from the temperature pilot as a result of the temperature bulb sensing a drop in temperature from the control setting.

When steam is turned on, it flows through the pressure pilot (Fig. 2) to the No 8B tee. Bleedport No. 4A restricts the flow, builds pressure under the diaphragm and opens the main valve. Restriction No. 5A steadies the operation of the regulator.

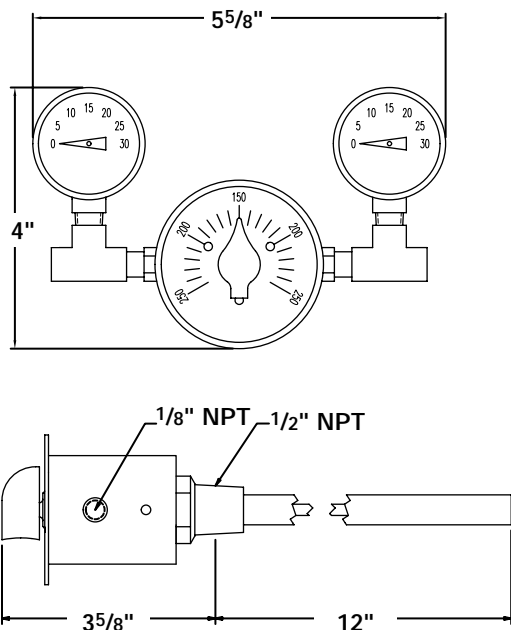
Steam flowing to the heater develops a rising delivery pressure which feeds back through the control pipe to the pressure pilot

diaphragm. As this pressure approached a balance with the air pressure signal supplied by the temperature pilot, the pressure pilot throttles. This, in turn, allows the main valve to assume a position to maintain the set temperature.

As the temperature at the outlet of the heater increases, it causes the T61 Pilot to reduce the loading air pressure and this, in turn, will cause the pressure regulator to modulate the steam flow to the heater.

### When used with Pneumatic Control Valve

The T61 Series Pilot will send a proportional air signal from 0 psi to a maximum of 30 psi (not greater than 2 psi less than the supplied pressure) within a 10 degree span. The Pilot will increase signal as the temperature falls, which will either open or close the control valve, depending upon actuator configuration.



TYPE T61, T62 & T63 PILOT

SD 4522D/0503

PRINTED IN U.S.A.

# INSTALLATION

## PLANNING

Locate the regulator in a horizontal pipe. Prevent water hammer and erratic operation by providing a trap ahead of the regulator. Avoid damaging effects of scale and dirt in pipelines by using a strainer to protect the regulator. Provide a three valve bypass to facilitate inspection of the regulator without interrupting service.

## MAIN VALVE

Flush the main piping system thoroughly to clear it of welding beads, scale, sand, etc. Mount main valve with diaphragm chamber down and arrow on body pointing in the direction of flow. Screwed end valve should be mounted in unions.

## PILOT

Mount the pilot with the bulb projecting entirely into the liquid or air being controlled. If the body is not in a horizontal position with air gages on top, the set screw (5) on bottom of body nearest the bulb may be loosened and body rotated to horizontal position. Retighten the set screw.

Connect a reliable source of clean compressed air (not to exceed 32 psi) to the inlet of the pilot. The supply air should be set at 2 psi above the maximum desired air signal. If air is available at a higher pressure, install a pressure reducing valve. CAUTION: Be sure to blow out all lines before making final connections.

Connect pilot outlet to 1/4" tap on top of pressure pilot.

## START-UP AND SETTING

With supply air shut off, set temperature adjusting knob at the lowest temperature setting. Turn on supply air. The supply air should be set at 2 psi above the maximum desired air signal. If air is available at a higher pressure, install a pressure reducing valve. No more than 1 to 2 pounds should show on the control air gage (supplied with the T61 Pilot).

Gradually turn up temperature adjusting knob until rising loading air pressure causes regulator to open. Continue raising temperature setting in this fashion until desired control temperature is reached.

The T61 Pilot is factory set so that 5 degrees variation above and below the controlled temperature will cause the loading air pressure to vary approximately 8 pounds. The factory setting will usually produce satisfactory control.

If closer control is desired, the sensitivity of the T61 Pilot can be increased by turning the sensitivity screw (7) clockwise. This will cause the control temperatures to move to a position below the set point. This effect must then be corrected by readjusting the temperature adjusting knob (4).

Make these adjustments slowly, turning the sensitivity screw no more than 1/8 turn and allow two or three minutes after each adjustment for the system to settle out. Practical range of adjustment of the sensitivity screw is 1/2 turn from the factory setting.

After final setting is reached, it may be necessary to release the set screw in the temperature adjusting knob and reposition it so that the indicator is aligned with the temperature being controlled. At this point, the set screw is retightened.

If a hunt develops (a steadily swinging temperature) when the sensitivity is increased, the temperature pilot is being called on to function at a setting finer than the installation will permit. At this point, factors such as thermostat location, trapping and valve size should be reexamined.

If the regulator swings immediately on startup and does not settle out and decreasing the sensitivity by turning the sensitivity screw (7) counterclockwise cannot be tolerated, the installation as a whole should be restudied.

## RECOMMENDED INSTALLATION

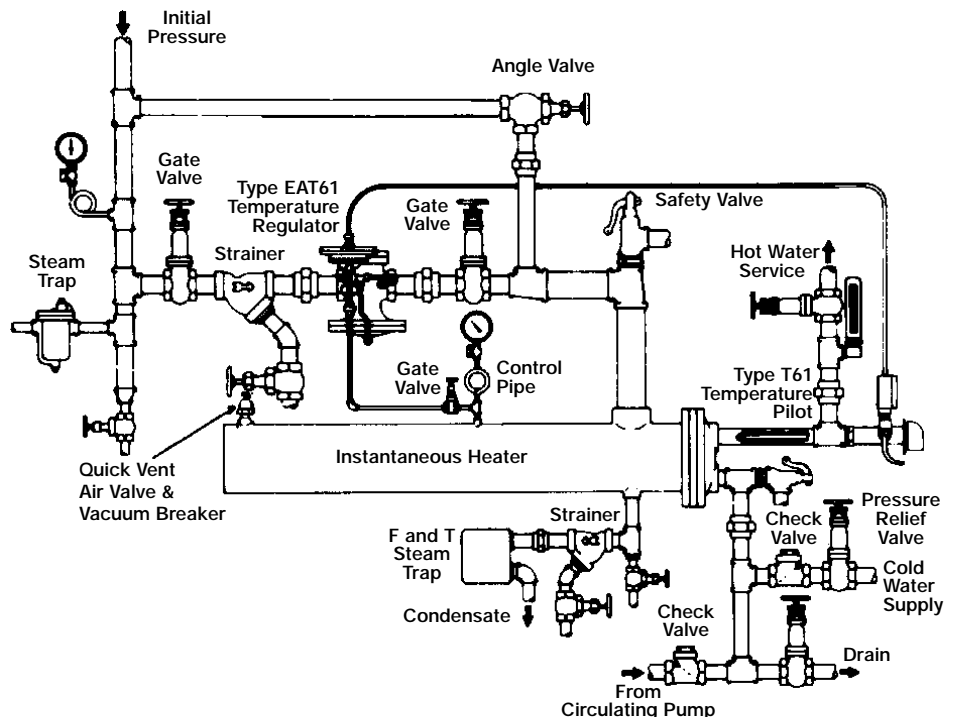


FIGURE 1

## TROUBLE SHOOTING

### FAILURE TO OPEN

1. Check supply gage to be sure it shows 2 psi higher than the required signal pressure.
2. Turn adjusting knob to top of temperature range. Pressure should go to within 2 or 3 pounds of supply pressure. If not, check for dirt in sensitivity screw and ball seating surface.

### FAILURE TO CLOSE OR OVERRIDING DELIVERY PRESSURE

1. Adjusting knob may have been tampered with.
2. If air pressure will not bleed down when adjusting knob is turned to bottom of range, it is likely that vent is plugged. Sensitivity screw (7) improperly adjusted (open too wide).

### ERRATIC CONTROL

1. Hunting
2. Gradual wandering over too wide a spread.
3. Fast over and under rides are the result of fast load changes, usually accentuated by the thermostat being located at a point where it cannot immediately sense a change in conditions.

### INSTALLATION FAULTS

1. Poor circulation through heater. Constant circulation should be employed.
2. Traps on the return may be discharging erratically or may be improperly installed.
3. Sticky check valve.
4. High lift to condensate hot well. Gravity drainage from heater should be arranged or return pump installed.

### DISMANTLING

1. Remove sensitivity screw (7) and clean.
2. Unlock knob set screw. Loosen and move adjusting knob (4) out to clear stop on dial plate and lock to shaft. Unscrew spool (3) from body by rotating adjusting knob counter-clockwise.

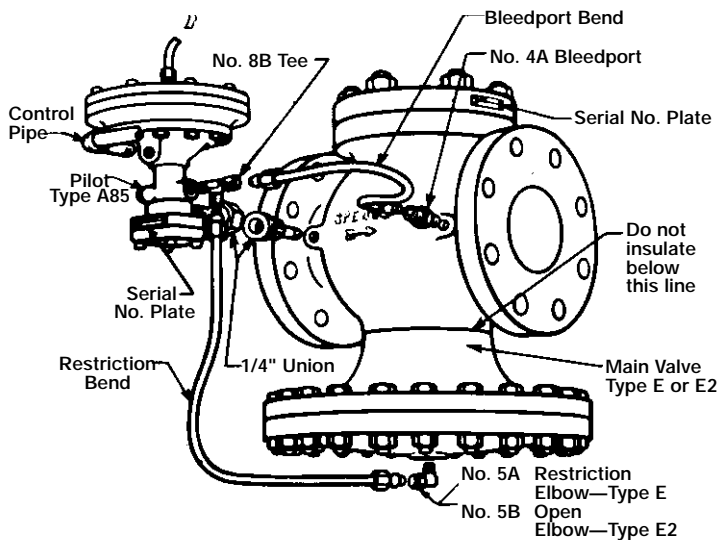


FIGURE 2

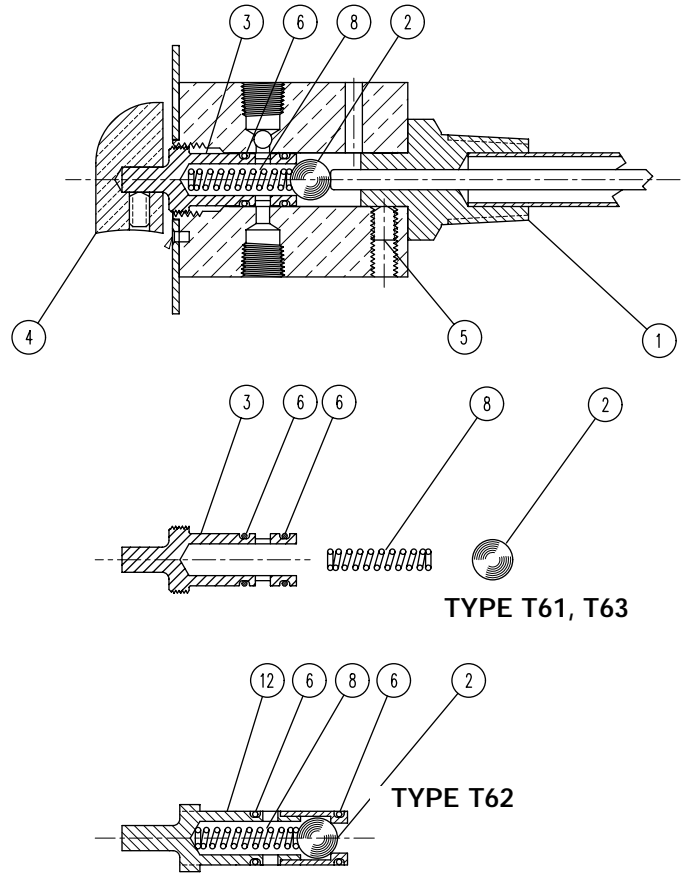


FIGURE 3

3. Care should be taken not to damage O-rings (6). Examine for nicks and other defects.
4. Examine spool (3) and ball (2) for defects.
5. Clean spool and ball with air pressure.
6. Reassemble.

### TESTING & CALIBRATING

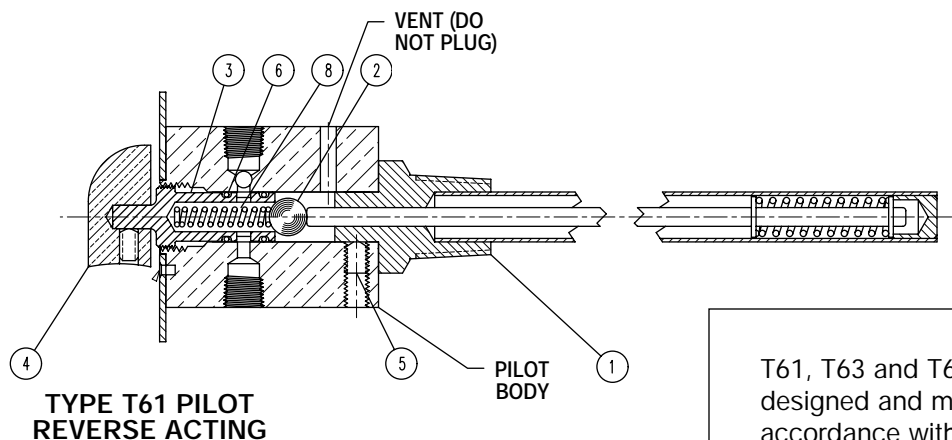
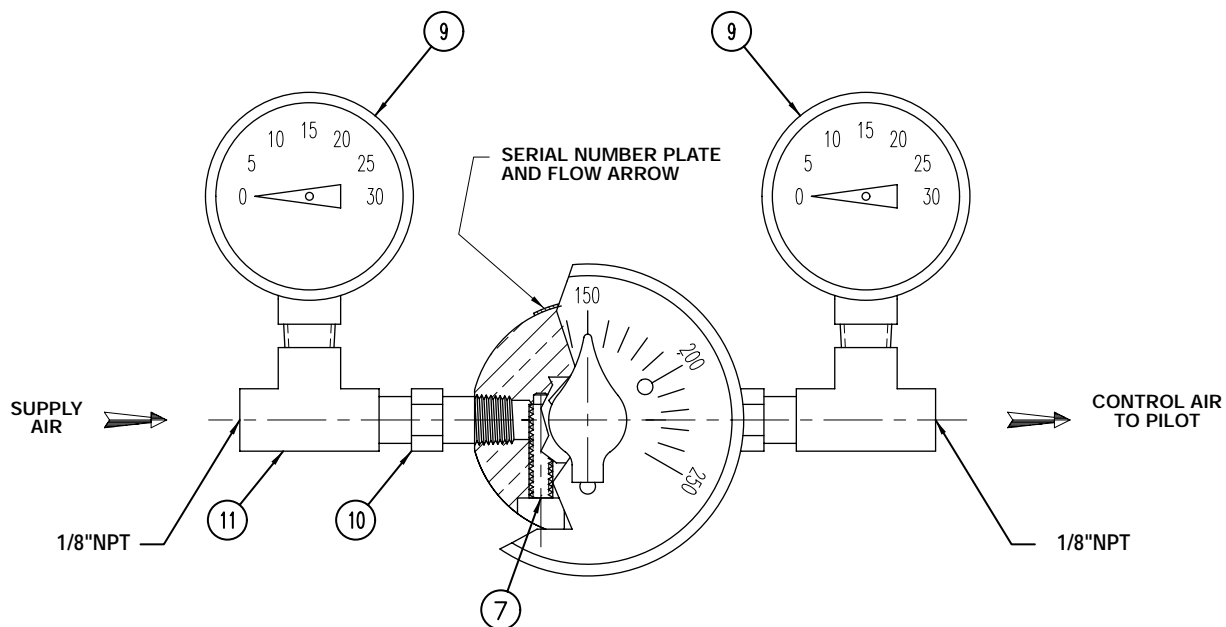
#### Reverse or Direct Acting

1. Plug the pilot control air port and apply supply pressure 2 psi above the control range to the supply air port.
2. Open the sensitivity screw (7) one turn while establishing a steady system temperature.

#### Reverse Acting (T61 & T63) Pilots Only

(Control pressure decreases with increasing temperature)

1. Turn the spool (3) clockwise to the point where the invar rod, ball and seat are in contact. The control gauge should show pressure near the top of the control range.
2. Turn the spool counter-clockwise until the control pressure is at the middle of the range.
3. Continue to turn the spool counter-clockwise until the low end of the range is reached. Adjust the sensitivity screw as required so this occurs within a 5° change on the dial. The control pressure should vary from the minimum to the maximum (15 or 30 psi) with a 10° change of the dial setting. When used with an A-pilot the minimum is 3 psi, when used with a control valve the minimum is the lower end of the bench range.



T61, T63 and T64 Pilots are designed and manufactured in accordance with Article 3, Section 3 of the Pressure Equipment Directive 97/23/EC.

ITEM NO.	PART NAME	MATERIAL	PART NO.
1	Bulb Assy. 50-250 (T61,T62 except SS) Bulb Assy. 150-350 (T63 & T61,T62 SS only)	Bronze St. Steel	07-40190-03 07-40191-03
2	*Ball	St. Steel	05-07709-00
3	*Spool Reverse Acting - T61 & T63	Brass	04-07741-00
4	Adjusting Knob	Plastic	05-07927-00
5	Body Set Screw	Steel	05-11134-00
6	*Spool Sealing Rings	Viton	05-04004-00
7	*Sensitivity Screw	Steel	05-07930-0
8	*Valve Spring	St. Steel	05-05175-00
9	Pressure Gauge		05-17460-00
10	1/8 Nipple	Brass	05-17459-00
11	1/8 Tee	Brass	05-17458-00
12	Spool Direct Acting Assy. - T62	Brass	07-43770-00
	Repair Kit - T61, T63, T64 (Reverse Acting)		08-11507-01

\*These parts furnished in Repair Kit

T61-Reverse Acting  
T62-Direct Acting  
T63-High Temperature Reverse Acting  
Reverse Acting-Air control signal decreases as process temperature increases.  
Direct Acting-Air control signal increases as process temperature increases.

When ordering parts, it is essential that the pilot type, service and serial number be stated.

Select part by item number, but order by part number. Specify complete part number when ordering.



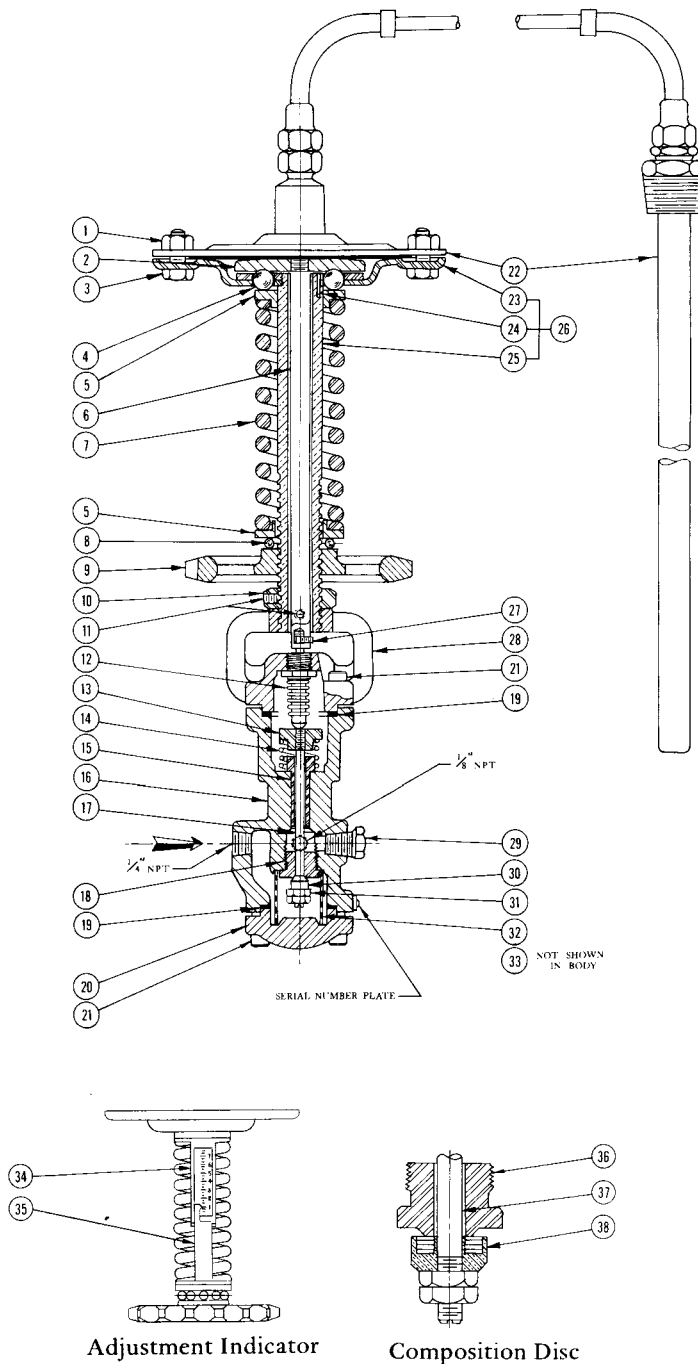


**SPENCE ENGINEERING  
COMPANY**  
Walden, NY 12586

## Parts List TYPE T52 PILOT

When ordering parts it is essential that the pilot type, service and serial number be stated.

Select parts by item number but order by part number. Specify complete part number when ordering.



Item No.	Part Name	Remarks	Material	Part No.
1	Diaphragm Nut		Steel	5-02992-0
2	Pressure Plate		Iron	5-03602-1
3	Diaphragm Bolt		Steel	5-05634-0
4	Bearing Ball		Steel	5-00553-0
5	Spring Button		Steel	4-01052-0
6	Stem		Alum.	4-05654-0
7	Adjusting Spring		Steel	5-05122-0
8	Thrust Bearing		Steel	5-00550-0
9	Handwheel		Iron	4-02502-0
10	Barrel Nut		Steel	4-02908-0
11	Bonnet Set Screw		Steel	5-04874-0
12	Bellows Assembly	A, B	Bronze	7-60302-0
13	Pusher Plate	B	Steel	4-03718-0
14	Valve Spring	A, B	Inconel	5-04985-0
15	Bushing	See Item 16	St. Steel	4-01080-0
16	Body & Bushing		Iron	8-10107-0
	Body & Bushing		Bronze	8-10109-0
17	Valve Stem	B	St. Steel	4-05229-0
18	Seat Ring	B	St. Steel	4-04057-0
19	Gasket	A, B	Asbestos	5-02378-0
20	Blind Flange		Iron	4-02151-0
	Blind Flange		Bronze	4-02153-0
21	Bl. Flg. Bonnet Bolt		Steel	5-04803-0
22	Thermostat Assembly	As Required	—	—
23	Cowl	See Item 26	Steel	4-01525-0
24	Groove Pin	See Item 26	Steel	5-03243-0
25	Barrel	See Item 26	Alum.	4-01247-0
26	Cowl Assembly		Steel	7-00334-0
27	Stem Set Screw		Steel	5-04872-0
28	Bonnet		Iron	4-00976-0
	Bonnet		Bronze	4-00978-0
29	Pipe Plug - 1/4 NPT		Steel	4-03772-0
	Pipe Plug - 1/4 NPT		Brass	4-03771-0
30	Disc	B	St. Stl.	4-01772-0
31	Stem Nut	B	Bronze	5-02886-0
32	Screen - Water	B	Monel	4-04701-0
	Screen - Steam		Monel	4-04700-0
33	Pipe Plug - 1/8 NPT		Steel	4-03769-0
	Pipe Plug - 1/8 NPT		Brass	4-03770-0

A - Recommended Spare Parts

B - Furnished in Repair Kit:

8-09126-0 Stainless Steel Disc - Water Screen

8-09161-0 Composition Disc - Water Screen

Use pilot setting instruction Form S.I.O.I. 86A

### ADJUSTMENT INDICATOR

34	Adj. Indicator Plate	Alum.	5-03512-0
35	Adj. Indicator Pointer	Alum.	5-03513-0

### COMPOSITION DISC

36	Seat Ring	St. Steel	4-04060-0
37	Stem	St. Steel	4-05381-0
38	Comp. Disc Ass'y.	Brass	7-53512-0





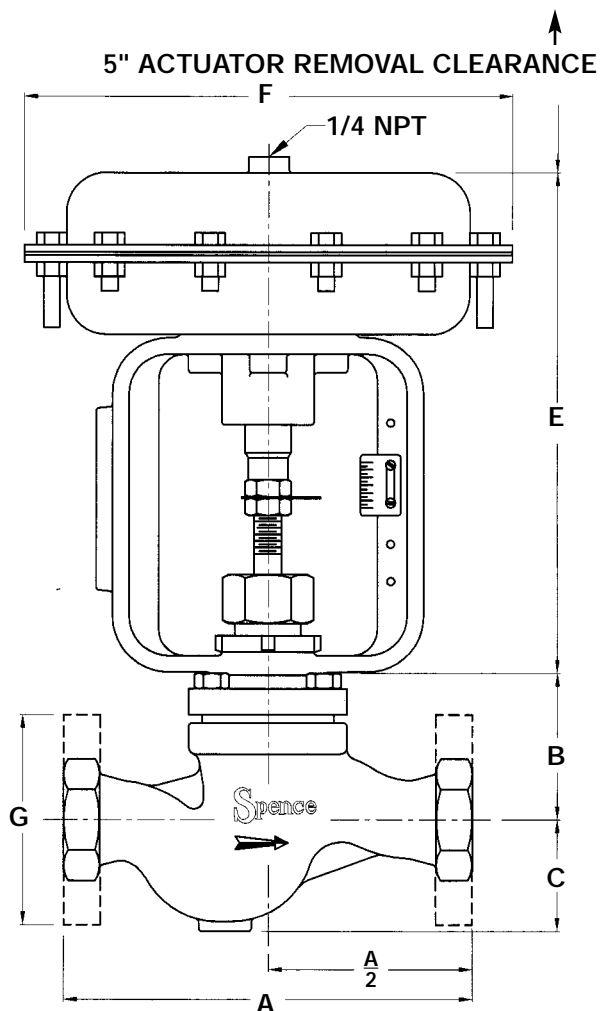
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# Technical Data

SD 8010B

SPENCE ENGINEERING COMPANY, INC. 150 COLDENHAM ROAD, WALDEN, NY 12586-2035

SD 8010B/0905



## INTIMIDATOR TYPE J CONTROL VALVE

### MAXIMUM RATED FLOW COEFFICIENTS\* (Cv)

VALVE SIZE				
1/2	3/4	1	1 1/2	2
5.1	10.3	18.2	37	67

### DIMENSIONS inches AND WEIGHTS pounds

Size	A		B	C	E		F		G (Flange Diameter)		Weights*			
	Scrd.	Flg.**			36 in. <sup>2</sup>	60 in. <sup>2</sup>	36 in. <sup>2</sup>	60 in. <sup>2</sup>	150	300/600	Screwed		Flanged	
											36 in. <sup>2</sup>	60 in. <sup>2</sup>	36 in. <sup>2</sup>	60 in. <sup>2</sup>
1/2	7 5/8	8	2 11/16	1 7/8	9 5/8	11 5/8	9 1/4	11 1/4	3 1/2	3 3/4	20 1/2	36 1/2	23 1/2	39 1/2
3/4	7 5/8	8 1/8	2 11/16	1 7/8	9 5/8	11 5/8	9 1/4	11 1/4	3 7/8	4 5/8	20 1/2	36 1/2	25 3/4	41 3/4
1	7 3/4	8 1/4	2 3/4	2 1/8	9 5/8	11 5/8	9 1/4	11 1/4	4 1/4	4 7/8	22 1/2	38 3/4	29	45 1/4
1 1/2	9 1/4	9 5/8	33/8	2 11/16	9 5/8	11 5/8	9 1/4	11 1/4	5	6 1/8	29 1/4	45 1/2	40 1/4	57 1/2
2	10 1/2	11 1/4	3 9/32	3 5/16	9 5/8	11 5/8	9 1/4	11 1/4	6	6 1/2	38 1/4	54 1/4	50 1/4	68 1/4

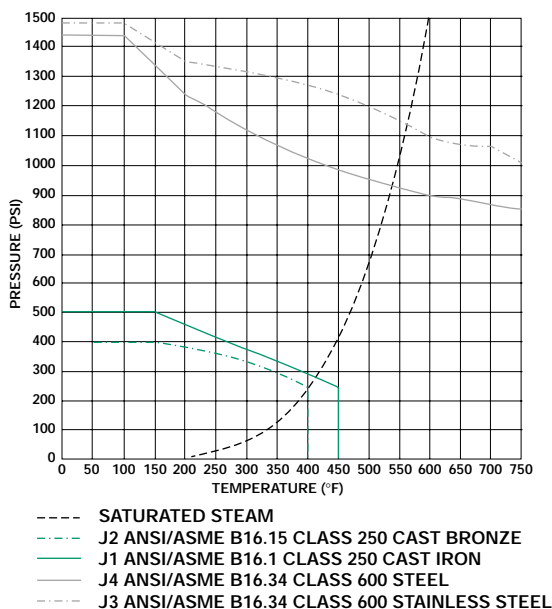
\*Weights are approximate.

\*\* Flanges are 600# face-to-face with 1/4" raised face.

## INTIMIDATOR TYPE J Control Valve Sizes 1/2" through 2"

The Intimidator Type J Valve has been designed for steam, water, gas and process applications in typical institutional, commercial and industrial processes. The Intimidator is available with either a direct or reverse acting actuator and meets most installation requirements.

### PRESSURE/TEMPERATURE CHART



PRINTED IN U.S.A.

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## OPERATING PRINCIPLE

The Intimidator Type J Valve is a flow to open, globe style, pneumatic diaphragm actuated control valve. It can be arranged to operate with either air to close or air to open con-

trol. A controller sensing the controlled variable provides an air signal to the actuator of the control valve to obtain the desired control.

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## RECOMMENDED INSTALLATION

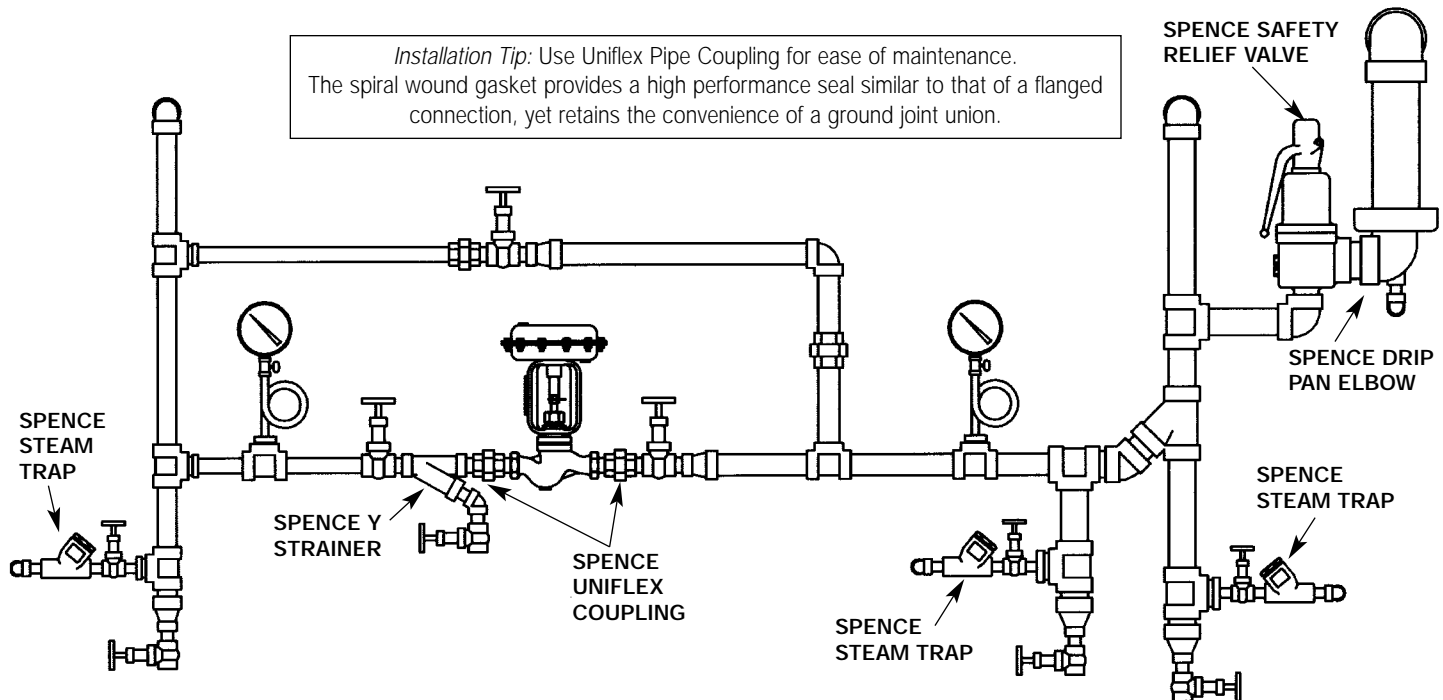


FIGURE 1 - Typical Steam Installation

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## INSTALLATION

Locate the valve in a straight run of horizontal pipe as shown in Figure 1. The valve should be mounted with the actuator in the upright position. Allow room for removal of the actuator. Prevent pipeline hammering in compressible fluid service by providing proper drainage before and after the valve. Avoid damaging effects of scale and dirt in pipelines by using a strainer. A 3-valve by-pass to facilitate inspection and maintenance without interrupting service is recommended. To eliminate excessive

noise with steam and other compressible fluids, enlarge the delivery pipe size to allow a reasonable flow velocity at the reduced pressure. A concentric transition is recommended. If possible, avoid sharp turns close to the valve. Install upstream and downstream pressure gauges to indicate performance. If the rating of the delivery system or connected equipment is less than the initial pressure, provide a safety relief valve.

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## START-UP AND SETTING

Flush the piping system thoroughly to clear it of welding beads, scale, sand, etc. Install the valve with the arrow on the side of the valve body pointing in the direction of fluid flow. Screwed end valves should be mounted between unions. Install controller and accessories in accordance with instructions furnished by the manufacturer of these items. Connect necessary air lines and/or electrical connections to the diaphragm cham-

ber and valve mounted accessories. Use 1/4" O.D. tubing for all air lines. If the length of the air line exceeds 25 ft, use 3/8" O.D. tubing. Insulation, may be applied to the valve body only. Do not insulate the bonnet. Caution: The valve may be handling hazardous fluids. Only qualified personnel, who are familiar with your installation, should be permitted to install, readjust, inspect or maintain the valve.

### ACTUATOR SHUTOFF TABLE

PORT SIZE	ACTUATOR SIZE	BENCH RANGE	REVERSE SHUTOFF		BENCH RANGE	DIRECT SHUTOFF	
			3-15 PSI	0-20 PSI*		3-15 PSI	0-20 PSI
1/8	36	5 - 15	0 - 750	0 - 750	3 - 13	0 - 750	0 - 750
3/16, 1/4	36	5 - 15	0 - 250	0 - 750	3 - 13	0 - 250	0 - 750
5/8	36	5 - 15	—	0 - 50	3 - 10	0 - 300	0 - 750
		8 - 15	0 - 350	50 - 500	3 - 5	300 - 750	300 - 750
		10 - 15	350 - 550	500 - 750	—	—	—
7/8	36	8 - 15	0 - 200	0 - 300	3 - 10	0 - 150	0 - 350
		10 - 15	200 - 300	300 - 450	3 - 5	150 - 400	350 - 650
	60	8 - 15	0 - 500	0 - 700	3 - 11	0 - 300	0 - 600
		10 - 15	500 - 650	700 - 750	3 - 8	300 - 500	600 - 750
		12 - 15	650 - 750	—	—	—	—
1-1/4	36	—	—	—	3 - 10	0 - 150	0 - 300
		10 - 15	0 - 150	0 - 225	3 - 5	150 - 225	300 - 375
	60	8 - 15	0 - 200	0 - 300	3 - 11	0 - 150	0 - 350
		10 - 15	200 - 250	300 - 350	3 - 8	150 - 250	350 - 450
		12 - 15	250 - 300	350 - 400	—	—	—
		20 - 60**	—	0 - 750**	—	—	—
1-3/4	36	10 - 15	0 - 75	0 - 125	3 - 5	0 - 100	0 - 200
	60	8 - 15	0 - 75	0 - 125	3 - 11	0 - 100	0 - 200
		10 - 15	75 - 125	125 - 175	3 - 8	100 - 125	200 - 250
		12 - 15	125 - 175	175 - 225	—	—	—
		20 - 60**	—	0 - 375**	—	—	—
2-1/4	60	11 - 15	0 - 100	0 - 125	3 - 10	0 - 50	0 - 100
		20 - 60**	—	0 - 225**	—	—	—

\* Based on 20 psi air supply w/ EPC or Positioner

\*\* Based on 60 psi air supply w/ EPC or Positioner

#### NOTES:

- 1) For pressures over 750 psi please consult factory
- 2) For direct configured actuators 60 psi air signal will achieve 750 psi shutoff except for 2.25 port which will achieve 650 psi shutoff
- 3) Do not exceed 60 psi air signal to actuator

### ACTUATOR SELECTION

Select Actuator size and bench range that will accommodate require shut off with port size selected. Select reverse for air to open fail close applications, direct for air to close fail open applications.

### Cv TABLE

SIZE	TRAVEL	PORT SIZE	PLUG CONTOUR	PERCENT OF TRAVEL										
				5	10	20	30	40	50	60	70	80	90	100
1/2	3/4	1/8	EP	0.002	0.003	0.006	0.011	0.021	0.032	0.042	0.052	0.062	0.072	0.08
		3/16	EP	0.004	0.008	0.014	0.021	0.03	0.045	0.063	0.095	0.145	0.25	0.5
		1/4	EP	0.03	0.04	0.07	0.12	0.18	0.25	0.36	0.49	0.7	1.1	1.5
		5/8	MEP	0.05	0.1	0.18	0.31	0.49	0.73	1.1	1.6	2.3	3.4	5.1
3/4	3/4	1/8	EP	0.002	0.003	0.006	0.011	0.021	0.032	0.042	0.052	0.062	0.072	0.08
		3/16	EP	0.004	0.008	0.014	0.021	0.03	0.045	0.063	0.095	0.145	0.25	0.5
		1/4	EP	0.03	0.04	0.07	0.12	0.18	0.25	0.36	0.49	0.7	1.1	1.5
		5/8	MEP	0.05	0.07	0.18	0.31	0.47	0.73	1.1	1.6	2.4	3.8	6
		7/8	MEP	0.07	0.19	0.58	1	1.3	1.9	2.5	3.8	5.7	8.7	10.3
1	3/4	5/8	MEP	0.04	0.07	0.16	0.31	0.54	0.79	1.1	1.8	2.2	4	6.2
		7/8	MEP	0.07	0.15	0.42	0.75	1.2	1.9	2.9	4.2	6.7	9.8	12.1
		1-1/4	MEP	0.09	0.27	0.63	1	1.4	3.2	5.3	7.5	11.5	15.6	18.2
1-1/2	3/4	7/8	MEP	0.11	0.21	0.54	0.89	1.4	1.9	2.7	3.9	6.4	10.1	13.2
		1-1/4	MEP	0.14	0.37	0.99	1.5	2.4	3.6	5.3	7.5	12.3	16.8	22
		1-3/4	MEP	0.41	0.85	2.4	4.3	6.4	9.9	15.7	22.7	29	34.2	37
2	3/4	1-1/4	MEP	0.14	0.37	0.99	1.5	2.4	3.6	5.3	7.5	12.3	17.3	23
		1-3/4	MEP	0.41	0.85	2.4	4.3	6.5	10	16	23	31	37	43
	1-1/16	2-1/4	MEP	0.75	1.5	3.5	6.5	10.5	15.5	26	39	50	60	67

# PRODUCT IDENTIFICATION

## ORDERING CODE

MODEL NUMBER (2 Digits)	ORIFICE	SIZE	CONNECTIONS	TRIM	PACKING	—ACTUATOR (2 Digits)	SPRING # (2 Digits)	POSITIONER (2 Digits)	POSIT. SET (2 Digits)	ACCESSORIES (2 Digits)	—INLET PRESSURE (3 Digits)
example: J 1	J	C	9	1	1	—	3 6	R M	M P	0 2	0 1 — 1 2 5
J1 - Cast Iron	F - ⅝	C - ⅜	1 - 150	1 - Metal	1 - V-ring	01 - None	DC - 3-13 Dir 36	AA - None	01 - None	01 - None	
J2 - Bronze	G - ⅜	D - ⅜	3 - 250/300	2 - Soft	2 - Graphite	36 - 36 in²	DD - 3-10 Dir 36	EI - Eckardt I/P	02 - 3-15/4-20mA	02 - Limit Switch-Mechanical	
J3 - Stainless	H - ¼	E - 1	6 - 600#		3 - Hi-Temp	60 - 60 in²	DE - 3-5 Dir 36	EP - Eckardt P	03 - 3-9/4-12mA	03 - Limit Switch-Proximity Switch	
J4 - Cast Steel	J - ⅝	G - 1½	9 - Threaded				DF - 3-10 Dir 60*	MI - Moore I/P	04 - 9-15/12-20mA	04 - Feedback-Potentiometer 1K	
	K - ⅞	H - 2					DG - 3-11 Dir 60	MP - Moore P		05 - Feedback-4-20mA Pos. Trans	
	L - 1¼						DH - 3-8 Dir 60	4P - PMV P4 P			
	M - 1¾						RC - 5-15 Rev 36	5I - PMV P5 I/P			
	N - 2¼						RD - 8-15 Rev 36	5P - PMV P5 P			
							RE - 10-15 Rev 36				
							RG - 8-15 Rev 60				
							RH - 10-15 Rev 60				
							RJ - 11-15 Rev 60*				
							RK - 20-60 Rev 60				
						RL - 20-60 Rev 60*					
						RQ - 12-15 Rev 60					

\* 2 1/4" port only.

USE SUFFIX -1 FOR SUBASSEMBLY (i.e.: J1KE911-1)

## TROUBLESHOOTING

For troubleshooting of the controlling device and accessories, see the instruction furnished by the manufacturer of these items. To troubleshoot the valve and actuator, check for the following: change in operating conditions; pneumatic signal failure; diaphragm failure; foreign matter lodged between seat ring and plug; actuator vent plug may be: plugged, missing, replaced with a solid plug; packing leakage.

### Graphite Packing/Hi Temp Graphite Packing – Fig. 4

If packing (35) / (36) leaks, tighten packing nut as necessary until leakage stops. Over-tightening of packing nut may cause erratic operation. Install additional center packing rings. This

can be accomplished by loosening packing nut (32). Lift packing nut, gland and end packing ring a sufficient height on stem and plug assembly (26) to apply packing ring. Insert one skive cut center packing ring over diameter of stem and plug assembly into packing box. Replace end packing ring and tighten packing nut as necessary to stop leakage. Replace packing.

### Teflon Packing – Figure 4

If the packing (34) leaks, isolate and depressurize the valve. Check the stem for gouges and that the o-ring is properly seated. Install replacement packing, if necessary, then return the valve to service.

## MAINTENANCE

### REMOVAL OF THE ACTUATOR FROM THE VALVE BODY ASSEMBLY

Close inlet and outlet stop valves. Be sure valve body is not under pressure. Remove all accessories from the control valve. Refer to Figure 5.

### Reverse Acting Actuator

Loosen stem nuts (31) and move to approximately 1/3 down valve stem. Re-tighten, being careful not to move valve stem. Energize actuator with air to lift plug off seat. Disengage packing nut (32) and lock nut (33) from bonnet (25). De-energize actuator. Actuator and yoke should move away from bonnet. Lift actuator and yoke assembly along with plug and stem

assembly (27) off seat. With a 1/4" wrench, unthread valve stem from the actuator stem (16) until valve stem is disengaged from actuator stem. Remove stem nuts, indicator, packing nut and lock nut.

### Direct Acting Actuator

Energize actuator with air slightly (in case of back seating). Loosen stem nuts (31) and re-tighten approximately 1/8" away from actuator stem (16). Disengage packing nut (32) and lock nut (33) from bonnet (25). With a 1/4" wrench, unscrew valve stem from actuator stem. When valve stem reaches seat, lift actuator (to prevent galling the seat and plug). Remove stem nuts, indicator, packing nut and lock nut.

## DISASSEMBLY OF THE VALVE BODY

Remove stem nuts (31), indicator (22), packing nut (32) and lock nut (33) as shown in Figure 2. Lift yoke off the bonnet (25). Remove bonnet bolts (23) and lift off bonnet flange (24), bonnet and stem and plug assembly (27). Remove gasket (26). A new gasket should be installed each time the valve body is disassembled. Turn stem and plug assembly out of the bonnet through packing. Replace packing if necessary. All parts should be inspected for wear and cleaned thoroughly before re-assembling the valve body.

## DISASSEMBLY OF THE ACTUATOR

Remove actuator from the valve. Remove regular casing bolts (4) and casing nuts (5). Gradually loosen nuts on the remaining long casing bolts (14) to allow pre-compression of actuator springs. Remove upper casing (2). Pull actuator stem (16), along with diaphragm (15), springs (3) and piston (13), out through bushing (7). Place a wrench on machined flats of the actuator stem and remove stem nut (10), seal washer (12) and stem washer (11). Remove o-ring (8) from the bushing and replace if necessary. Lubricate o-ring after installing.

## RE-ASSEMBLY OF THE ACTUATOR

Refer to Figure 5 for correct orientation of casings, diaphragm (15), piston (13), stem (16) and springs (3) for direct or reverse action. Be sure that piston spring recesses line up between casing ribs as shown in Figure 6B for all springs except 05-13085-00 and 05-13097-00 which are assembled per Figure 6A. Note that seal washer rings and stem washer are below the diaphragm for 8-15 psi on the 36 in<sup>2</sup> actuator as shown in Figure 7. For all other springs, the seal and stem washers are assembled above the diaphragm. Lubricate bushing o-ring (8) and insert actuator stem through the bushing. Re-attach upper casing (2) with long bolts (14) & nuts (5), tightening alternately. Install remaining casing nuts and bolts. Apply air to diaphragm case and check for leakage, full travel and dead band less than .2 psi.

## LAPPING PLUG INTO THE SEAT

Remove old packing from the packing box with a hook type tool or with compressed air in the body. Seats and plugs should never require more than the lightest touch up with very fine (400 grit) grinding compound. Heavy lapping will produce galling, a wider seating surface and a groove in the plug, all of which tend to cause leakage. Reface a damaged surface before attempting to grind it in. Lap sparingly. Replace stem and plug assembly (27) in bonnet (25) through packing. Apply lapping compound to the plug. Place bonnet and bonnet flange (24) on the body and tighten bonnet bolt (23) finger tight. Do not tighten packing nut (32) during the lapping operation. After lapping, disassemble and clean all parts thoroughly.

## PACKING REPLACEMENT

For the Teflon V-ring packing, install the spring, washer, and packing onto plug and stem assembly on valve sub-assembly. Install o-ring followed by the packing follower and packing nut. Lubricate o-ring with silicone lubricant.

For the graphite and hi-temp graphite packing, install packing o-ring followed by a washer onto plug and stem assembly on valve sub-assembly. Lubricate o-ring with silicone lubricant. Use a 1/4" schedule 40 pipe to firmly seat the o-ring into the o-

ring groove. Install remaining packing, packing follower, and packing nut referring to Figure 4. Warning – stem should not be stroked without packing nut being tightened or packing o-ring may become dislodged. Forcing stem threads through installed packing will damage packing.

## RE-ASSEMBLY OF THE VALVE BODY

Install a new gasket (26). Attach bonnet (25) and bonnet flange (24) to body with bonnet bolts (23). Be sure to tighten bolts alternately and evenly to insure proper seating of the plug. Replace yoke (9), lock nut (33), packing nut (32), stem nuts (31), travel indicator (22), over plug and stem assembly (27).

## REPLACING THE ACTUATOR ON THE VALVE BODY

Put actuator assembly over the valve stem. Place lock nut (33), packing nut (32) and stem nuts (31) with travel indicator (22) on valve stem. Rest actuator stem (16) on valve stem. Tighten stem nuts approximately 2/3 down valve stem. Lift actuator assembly and engage valve stem with actuator stem (be careful not to gall the plug & seat).

### Reverse Acting

When sufficient engagement is met, actuator can be energized with air to place yoke on the bonnet (25) and lift plug off the seat. Tighten lock nut and packing nut.

### Direct Acting

Engage valve stem with actuator stem so no contact is made between plug and seat when the bottom of the yoke is rested on the bonnet. Tighten lock nut and packing nut.

## ACTUATOR ADJUSTMENT

Close inlet and outlet stop valves. Be sure valve body is not under pressure. Place wrench on machined flats of actuator stem (16). Turn stem nuts (31) approximately halfway down threads of plug & stem assembly (27) and counter the two nuts.

### Reverse Acting

Apply sufficient air pressure to diaphragm case to start moving the valve through its rated travel. This is shown by the travel indicator (22). Engage lower stem nut (31) and turn plug & stem assembly (27) into actuator stem (16) until pre-compression of actuator springs (3) is relieved (plug should not be seating on seat ring when air pressure is removed from actuator case). Apply prescribed setting pressure to actuator. This is determined by specific operating conditions. Turn plug & stem assembly out of actuator stem until plug seats on seat ring (28). To prevent galling, do not turn plug & stem assembly once plug has contacted seat ring. Turn stem nuts up plug & stem assembly and tighten to lock it in position. Reduce air signal to 0 psi and calibrate indicator scale (20). Check that full travel is achieved with a 15 psi signal, except for 20-60 psi springs.

### Direct Acting

Engage lower stem nut (31) and turn plug & stem assembly (27) into actuator stem (16) until plug & stem assembly stops at upper limit of travel and/or a slight downward movement of actuator stem is detected. Turn stem nut up the plug & stem assembly and tighten to lock in position. Calibrate indicator scale (20). Check that full travel is achieved at a 0 psi signal, except for 20-60 psi springs.

When ordering parts, it is essential that the valve type, size, service and serial number be stated.

Select part by item number, but order by part number.

Specify complete part number when ordering.

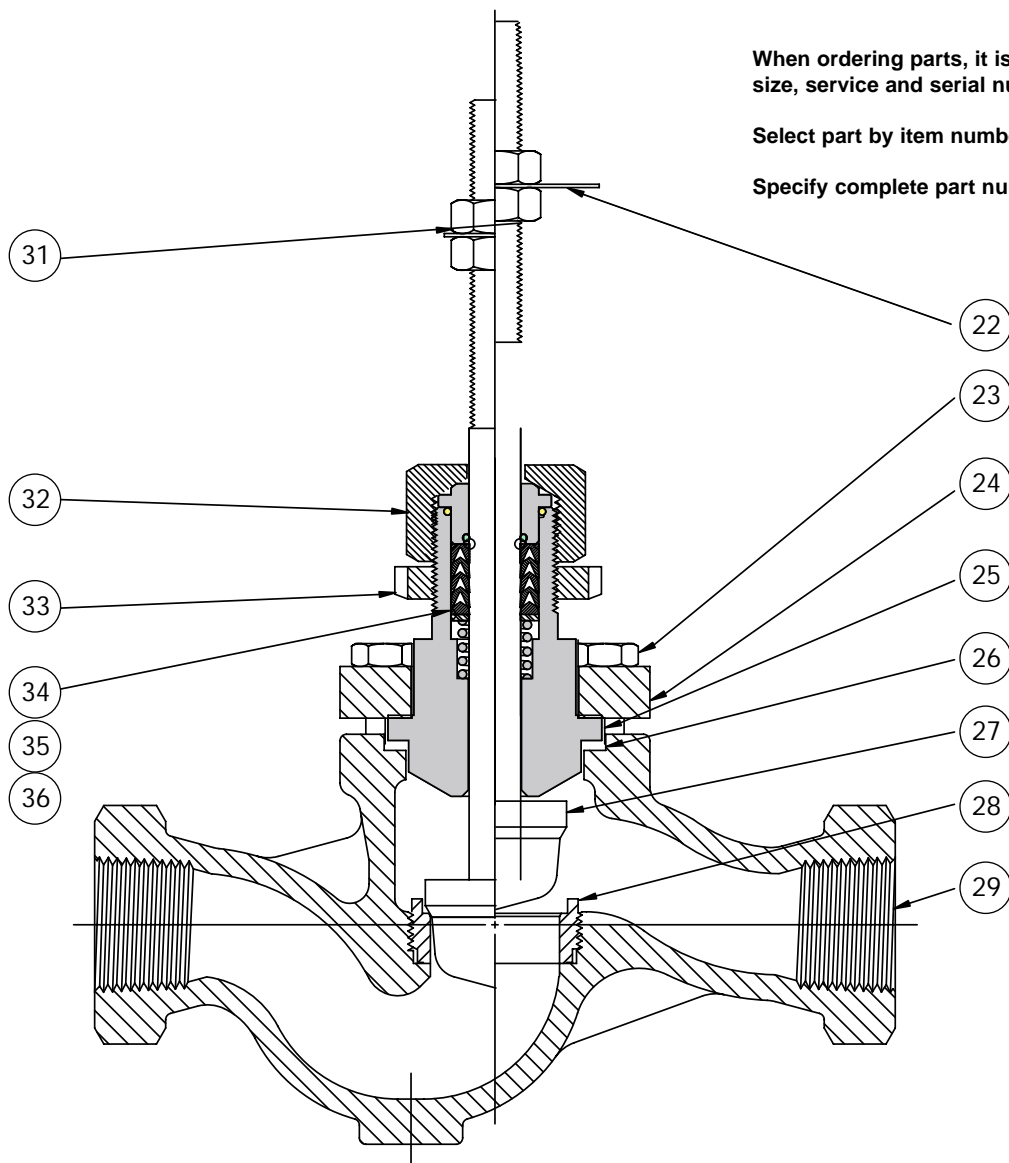


FIGURE 2 - VALVE BODY ASSEMBLY

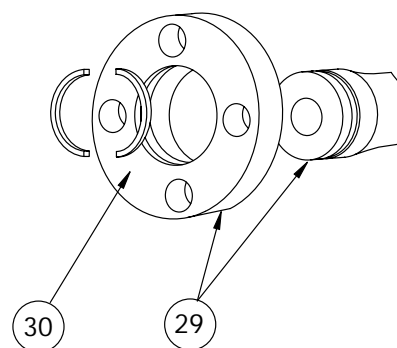


FIGURE 3 -  
SLIP ON FLANGE ASSEMBLY

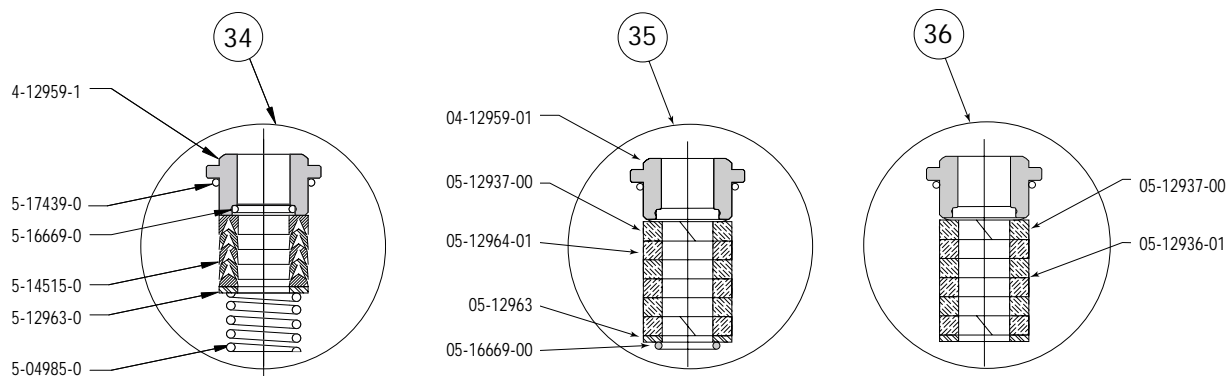


FIGURE 4 - PACKING ASSEMBLY



## VALVE BODY ASSEMBLY PART NUMBERS

ITEM NO.	PART NAME	MATERIAL	VALVE SIZE				
			1/2	3/4	1	1-1/2	2
22	TRAVEL INDICATOR	ALUM	05-12962-00	05-12962-00	05-12962-00	05-12962-00	05-12962-00
23	BONNET BOLT	STL	05-17301-00	05-17301-00	05-17302-00	05-17303-00	05-17304-00
24	BONNET FLANGE	STL	04-13918-00	04-13918-00	04-13919-00	04-13920-00	04-13921-00
25	BONNET 316 SS VALVES	316SS	04-13549-00	04-13549-00	05-13549-00	04-13550-00	04-13551-00
	BONNET CI & STEEL	STL	04-12983-00	04-12983-00	04-12956-00	04-13125-00	04-13189-00
	BONNET BRZ	BRASS	04-13870-00	04-13870-00	04-13871-00	04-13872-00	04-13873-00
26*	GASKET, CI & BZ	GRAPHITE	05-13395-00	05-13395-00	05-13396-00	05-13397-00	05-16398-00
	GASKET, STEEL & SST	GRAPHITE	05-13396-00	05-13396-00	05-13396-00	05-13397-00	05-16398-00
27	PLUG/STEM, EQ% 1/8	316SS	04-13848-00	04-13848-00	—	—	—
	PLUG/STEM, EQ% 3/16	316SS	04-13178-00	04-13178-00	—	—	—
	PLUG/STEM, EQ% 1/4	316SS	04-13564-00	04-13564-00	04-13564-00	—	—
	PLUG/STEM, EQ% 5/8	316SS	04-13565-00	04-13565-00	04-13565-00	—	—
	PLUG/STEM, EQ% 7/8	316SS	—	04-13566-00	04-13566-00	04-13566-00	—
	PLUG/STEM, EQ% 1-1/4	316SS	—	—	04-13567-00	04-13567-00	04-13894-00
	PLUG/STEM, EQ% 1-3/4	316SS	—	—	—	04-13568-00	04-13887-00
	PLUG/STEM, EQ% 2-1/4	316SS	—	—	—	—	04-13569-00
	PLUG/STEM, COMP 1/4	316SS	0@-13412-00	0@-13412-00	0@-13412-00	—	—
	PLUG/STEM, COMP 5/8	316SS/TFE	0@-13413-00	0@-13413-00	0@-13413-00	—	—
	PLUG/STEM, COMP 7/8	316SS/TFE	—	0@-13414-00	0@-13414-00	0@-13414-00	—
	PLUG/STEM, COMP 1-1/4	316SS/TFE	—	—	0@-13415-00	0@-13415-00	0@-13419-00
	PLUG/STEM, COMP 1-3/4	316SS/TFE	—	—	—	0@-13416-00	0@-13418-00
	PLUG/STEM, COMP 2-1/4	316SS/TFE	—	—	—	—	0@-13417-00
28	SEAT RING 1/8 CI/BRZ	17-4 PH	04-13847-00	04-13847-00	—	—	—
	SEAT RING 1/4 CI/BRZ	316SS	04-13173-01	04-13173-01	04-13525-00	—	—
	SEAT RING 5/8 CI/BRZ	316SS	04-12981-00	04-12981-00	04-13526-00	—	—
	SEAT RING 7/8 CI/BRZ	316SS	—	04-12982-00	04-13527-00	—	—
	SEAT RING 1/8 SST/STL	17-4 PH	04-14299-00	04-14299-00	04-14299-00	—	—
	SEAT RING 1/4 SST/STL	316SS	04-13525-00	04-13525-00	04-13525-00	—	—
	SEAT RING 5/8 SST/STL	316SS	04-13526-00	04-13526-00	04-13526-00	—	—
	SEAT RING 7/8 SST/STL	316SS	—	04-13527-00	04-13527-00	04-13529-00	—
	SEAT RING 1-1/4	316SS	—	—	04-13528-00	04-13530-00	04-13532-00
	SEAT RING 1-3/4	316SS	—	—	—	04-13531-00	04-13533-00
	SEAT RING 2-1/4	316SS	—	—	—	—	04-13534-00
	SEAT RING 1/4 COMP CI/BRZ	316SS	04-13399-00	04-13399-00	04-13400-00	—	—
	SEAT RING 5/8 COMP CI/BRZ	316SS	04-13401-00	04-13401-00	04-13402-00	—	—
	SEAT RING 7/8 COMP CI/BRZ	316SS	—	04-13491-00	04-13404-00	—	—
	SEAT RING 1/4 COMP SST/STL	316SS	04-13400-00	04-13400-00	04-13400-00	—	—
	SEAT RING 5/8 COMP SST/STL	316SS	04-13402-00	04-13402-00	04-13402-00	—	—
	SEAT RING 7/8 COMP SST/STL	316SS	—	04-13404-00	04-13404-00	04-13405-00	—
	SEAT RING 1-1/4 COMP	316SS	—	—	04-13406-00	04-13707-00	04-13408-00
	SEAT RING 1-3/4 COMP	316SS	—	—	—	04-13409-00	04-13410-00
	SEAT RING 2-1/4 COMP	316SS	—	—	—	—	04-13411-00
29	BODY NPT ENDS	STL	04-12979-00	04-12980-00	04-13063-00	04-13097-00	04-13196-00
	BODY NPT ENDS	BRZ	04-13849-00	04-13850-00	04-13851-00	04-13852-00	04-13853-00
	BODY NPT ENDS	316SS	04-13576-00	04-13580-00	04-13584-00	04-13588-00	04-13592-00
	BODY NPT ENDS	STL	04-13596-00	04-13600-00	04-13604-00	04-13608-00	04-13612-00
	BODY FLANGED ENDS	316SS	04-13579-00	04-13583-00	04-13587-00	04-13591-00	04-13595-00
	BODY FLANGED ENDS	STL	04-13599-00	04-13603-00	04-13607-00	04-13611-00	04-13617-00
	FLANGE SLIP ON 150#	STL	04-13628-00	04-13631-00	04-13634-00	04-13637-00	04-13640-00
	FLANGE SLIP ON 300#	STL	04-13629-00	04-13632-00	04-13635-00	04-13638-00	04-13641-00
	FLANGE SLIP ON 600#	STL	04-13630-00	04-13633-00	04-13636-00	04-13639-00	04-13642-00
30	RETAINER RING	STL	04-14077-00	04-14078-00	04-14079-00	04-14080-00	04-14081-00
31	STEM NUT	STL	05-12972-00	05-12972-00	05-12972-00	05-12972-00	05-12972-00
32	PACKING NUT	STL	04-12958-00	04-12958-00	04-12958-00	04-12958-00	04-12958-00
33	LOCK NUT	PLTD/STL	04-12961-00	04-12961-00	04-12961-00	04-12961-00	04-12961-00
34*	V RING PACKING SET	—	07-12932-01	07-12932-01	07-12932-01	07-12932-01	07-12932-01
35*	BRAIDED TFE/GRAPH PKG SET	—	07-12933-00	07-12933-00	07-12933-00	07-12933-00	07-12933-00
36*	HIGH TEMP GRAPH PKG SET	—	07-12936-00	07-12936-00	07-12936-00	07-12936-00	07-12936-00

\* Recommended Spare Parts.

## ACTUATOR PARTS

ITEM #	NAME	QTY	MATERIAL
1	VENT PLUG	1	H. D. POLY
2	UPPER CASING	1	STL/POWDER
3	SPRINGS	VARIES	STEEL
3A	SPRING RETAINER	12	STEEL
4	CASING BOLT, REGULAR	10/14	304SS
5	CASING NUT	12/16	316SS
6	LOWER CASING	1	STL/POWDER
7	BUSHING	1	BRONZE
8*	O RING	1	BUNA-N
9	YOKE	1	CI/POWDER
10*	STEM NUT	1	STEEL
11*	STEM WASHER	1	316SS
12*	SEAL WASHER	1	STEEL
13	PISTON	1	316SS
14	CASING BOLT, LONG	2	304SS
14A	CASING BOLT, LONG†	2	STL/ZINC PLATE
15*	DIAPHRAGM	1	NITRILE
16	ACTUATOR STEM	1	303SS
17	MACHINE SCREW	3	STEEL
18	CASING GASKET	1	BUNA-N
19	MACHINE SCREW	2	STEEL
20	INDICATOR SCALE	1	ALUM
21	SPECIFICATION PLATE	1	ALUM

\*These parts furnished in Actuator Repair Kit.

† For spring range 10-15 on 36 sq. in. actuator and 12-15 on 60 sq. in. actuator.

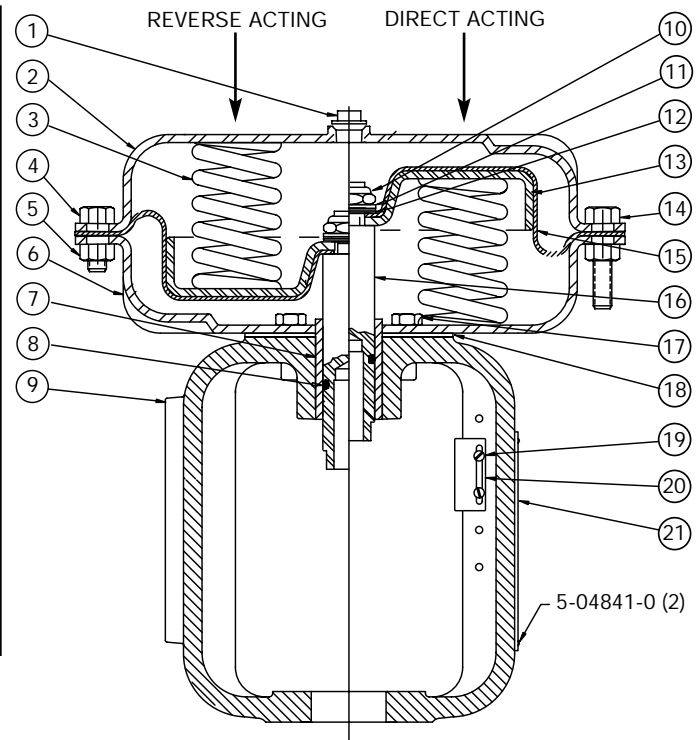


FIGURE 5 - ACTUATOR ASSEMBLY

### ACTUATOR REPAIR KIT PART NUMBERS

36 SQ. IN.	60 SQ. IN.
51447	51448

## ACTUATOR, SPRING KIT & SPRING PART NUMBERS

ACT. ASSY	SPRING KIT PN	Bench Ranges		Springs			Bolt (2)
		Reverse	Direct	Qty	Part #	Color	
36RC-ASM†	36RC	5-15	3-13	6	5-13090-1	RED	—
36RD-ASM†	36RD	8-15	3-10	4	5-13090-1	RED	—
36RE-ASM	36RE	10-15	—	6	5-13085-0	GREEN	5-04889-0
36DE-ASM	36DE	—	3-5	3	5-13087-0	GREEN	—
60RG-ASM†	60RG	8-15	3-11	6	5-13093-1	BROWN	—
60RH-ASM†	60RH	10-15	3-8†/3-10**	4	5-13093-1	BROWN	—
60RJ-ASM	60RJ	12-15†/11-15**	—	6	5-13097-0	BLACK	5-04889-0
60RK-ASM	60RK	20-60	—	6	5-13094-0	GRAY	—
60RL-ASM	60RL	20-60	—	6	5-13095-0	BLUE	—
				6	5-13096-0	BLUE	—

† Includes both J & K Valve travel scales.

\* 3/4" travel

\*\* 1-1/16" travel

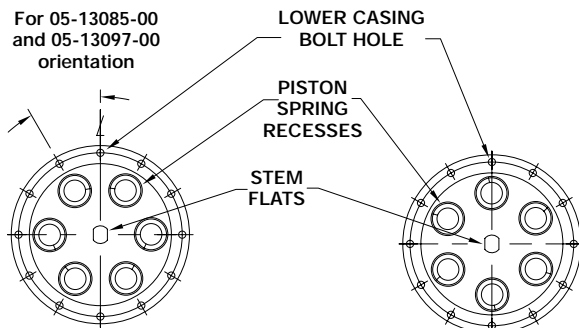


FIGURE 6A

FIGURE 6B

PISTON DIAPHRAGM ASSEMBLY

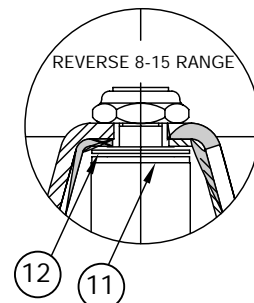


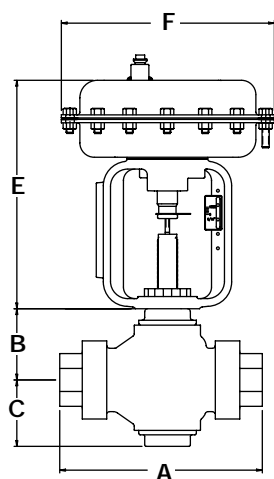
FIGURE 7 - STEM ASSEMBLY  
REVERSE 8-15 SPRING RANGE ONLY



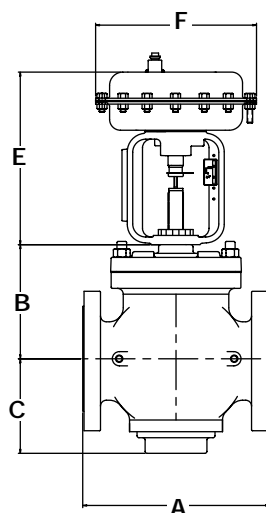
# Technical Data

A Division of CECO International, Inc.

**SPENCE ENGINEERING COMPANY, INC.** 150 GOLDENHAM ROAD, WALDEN, NY 12586-2035



**K1 1/2" - 2"**  
ANSI B16.15



**K4 2 1/2" - 4"**  
ANSI B16.1

## KOMBAT K1 & K4 Control Valve Sizes 1/2" through 4" ANSI CLASS 125/250

The Kombat Series K Control Valve is designed for economical control of steam, water, gas and process applications in typical institutional, commercial and industrial processes. The Kombat Series K is available with either a direct or reverse acting actuator that meets most application requirements.

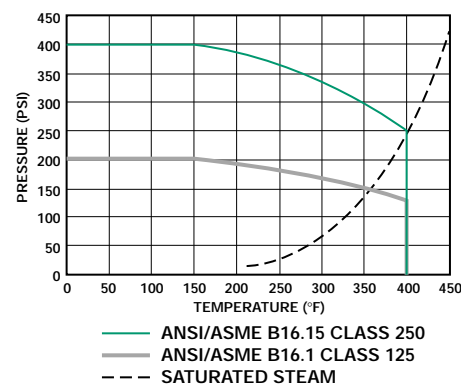
### MAXIMUM RATED FLOW COEFFICIENTS\* (Cv)

VALVE SIZE								
1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4
5.2	7	11	20	25	30	71	94	146

### DIMENSIONS inches (mm) AND WEIGHTS pounds (kg)

Size	A	B	C	E		F		Weight	
				36 in <sup>2</sup>	60 in <sup>2</sup>	36 in <sup>2</sup>	60 in <sup>2</sup>	36 in <sup>2</sup>	60 in <sup>2</sup>
1/2-3/4 (15)-(20)	5 1/2 (140)	1 1/16 (43)	1 3/16 (30)	9 7/8 (251)	—	9 1/4 (235)	—	21 (9.5)	—
1 (25)	7 3/16 (183)	2 1/8 (74)	2 5/16 (58)	9 7/8 (251)	11 1/4 (298)	9 1/4 (235)	11 1/4 (286)	25 1/2 (11.6)	39 (17)
1 1/4-1 1/2 (32)-(40)	8 7/8 (226)	3 3/8 (79)	2 7/8 (74)	9 7/8 (251)	11 1/4 (298)	9 1/4 (235)	11 1/4 (286)	31 1/2 (14.3)	45 (20)
2 (50)	8 7/8 (226)	3 3/8 (79)	2 7/8 (74)	9 7/8 (251)	11 1/4 (298)	9 1/4 (235)	11 1/4 (286)	33 1/2 (15.2)	47 (21)
2 1/2 (65)	9 3/8 (238)	5 1/4 (133)	4 3/8 (118)	—	11 1/8 (302)	—	11 1/4 (286)	—	72 (33)
3 (80)	10 (254)	6 3/8 (155)	5 3/8 (136)	—	11 1/8 (302)	—	11 1/4 (286)	—	84 (39)
4 (100)	11 1/8 (302)	7 7/8 (181)	7 3/8 (187)	—	11 1/8 (302)	—	11 1/4 (286)	—	145 (66)

### PRESSURE/TEMPERATURE CHART



### Cv TABLE

PERCENT OF TRAVEL			5	10	20	30	40	50	60	70	80	90	100
Valve Size	Travel	Orifice	Cv										
1/2	1/4	C	0.1	0.2	0.3	0.36	0.41	0.46	0.51	0.56	0.6	0.65	0.7
		E	0.3	0.5	0.7	0.9	1.1	1.3	1.5	1.7	1.9	2	2.1
		A	0.3	0.6	1.2	1.7	2.2	2.6	2.9	3.1	3.2	3.25	3.3
		B	0.15	0.25	0.65	1.5	2.7	3.3	3.7	3.9	4.1	4.2	4.3
		T	0.7	1.2	2.0	2.7	3.2	3.8	4.3	4.7	4.9	5.1	5.2
3/4	5/16	T	0.7	1.3	2.4	3.3	4.2	4.9	5.5	6.0	6.4	6.8	7.0
1	1/4	T	0.7	1.3	2.4	3.8	5.5	7.4	9.0	10.0	10.6	10.9	11.0
1-1/4	5/16	T	0.8	1.7	4.0	6.5	9.3	12.6	15.3	17.0	18.1	19.1	20.0
1-1/2	5/16	T	1.0	2.0	4.5	7.2	9.9	12.4	15.2	18.2	20.9	23.4	25.0
2	5/16	T	1.0	2.0	4.5	7.4	10.6	15.1	18.8	22.8	26.1	28.3	30.0
2-1/2	3/4	T	5	11	23	36	46	53	59	62.5	65.7	68	71
3	3/4	T	5	11	30	47	61	72	79	85	90	92	94
4	3/4	T	12	23	46	69	89	104	116	127	134	140	146

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## OPERATING PRINCIPLE

The Kombat K1 & K4 Valves are flow to open, globe style, pneumatic diaphragm control valves. The pneumatic actuator can be arranged to operate with either air to close or air to

open control. A controller sensing the controlled variable provides a signal to the actuator of the control valve to obtain the desired control.

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## RECOMMENDED INSTALLATION

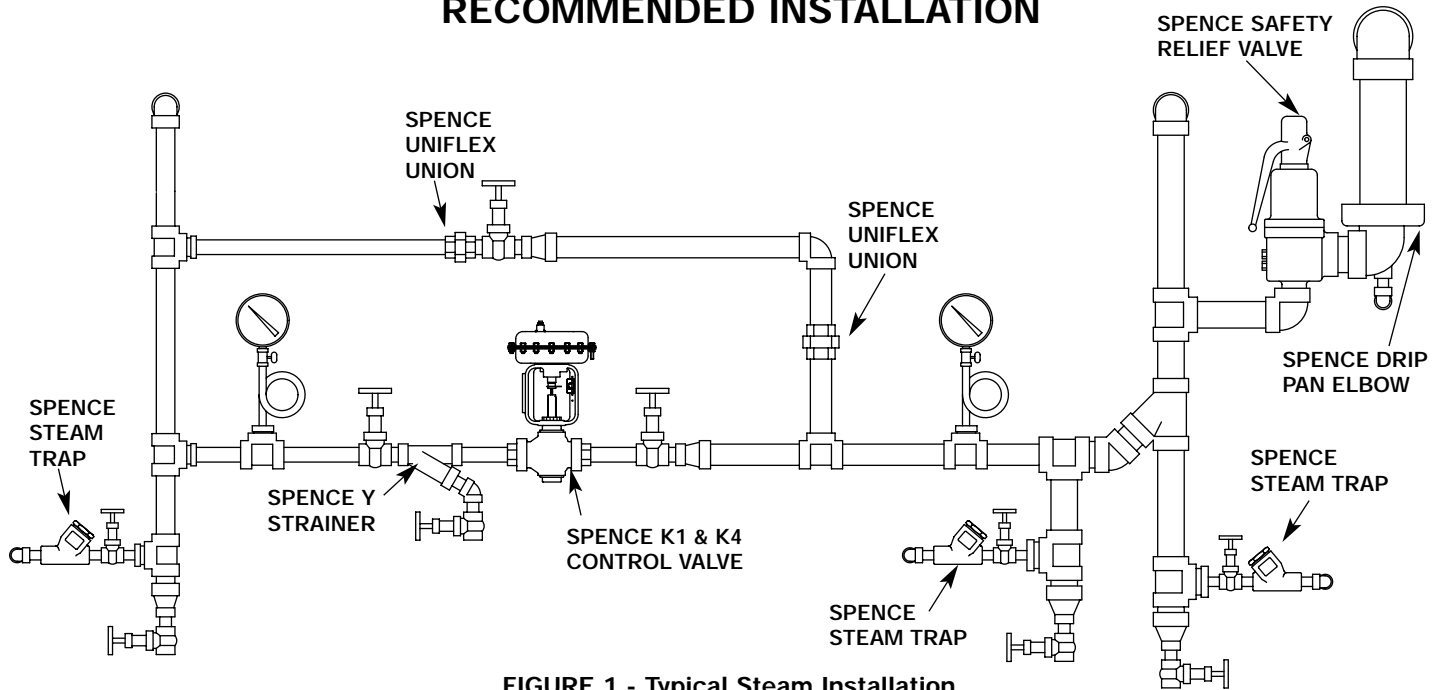


FIGURE 1 - Typical Steam Installation

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## INSTALLATION

### CAUTION!

*The piping system must be adequately designed and supported to prevent extraordinary loads to the pressure equipment.*

Locate the valve in a straight run of horizontal pipe as shown in Figure 1. The valve should be mounted with the actuator in the upright position. Allow room for removal of the actuator. Prevent pipeline hammering in compressible fluid service by providing proper drainage before and after the valve. Avoid damaging effects of scale and dirt in pipelines by using a

strainer. A 3-valve by-pass to facilitate inspection and maintenance without interrupting service is recommended. To eliminate excessive noise with steam and other compressible fluids, enlarge the delivery pipe size to effect a reasonable flow velocity at the reduced pressure. A concentric transition is recommended. If possible, avoid sharp turns close to the valve bull-headed tee connections to a low pressure main. Install initial and delivery pressure gauges to indicate performance. If the rating of the delivery system or connected equipment is less than the initial pressure, provide a safety relief valve.

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## START-UP

Flush piping system thoroughly to clear it of welding beads, scale, sand, etc. Install valve with the arrow on the side of the valve body pointing in the direction of fluid flow. Install controller and accessories in accordance with instructions furnished by the manufacturer of these items. Connect necessary air lines and/or electrical connections to diaphragm chamber and valve mounted accessories. Use 1/4" O.D. tubing for all air

lines. If length of the air line exceeds 25 ft, use 3/8" O.D. tubing. Insulation, if desired, may be applied to the valve body only. Do not insulate bonnet. Caution: Hazardous fluids may be handled by this valve. Only qualified personnel, who are familiar with your installation, should be permitted to install, readjust, inspect or maintain the valve.

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## TROUBLESHOOTING

For troubleshooting of the controlling device and accessories, see instruction furnished by manufacturer of these items. To troubleshoot valve and actuator, check for the following: change in operating conditions; pneumatic signal failure;

diaphragm failure; foreign matter lodged between seat ring and plug; actuator vent plug may be: plugged, missing, replaced with a solid plug; packing leakage.

## K1 & K4 ACTUATOR SHUTOFF TABLE

(Refer to Temperature Limits)

Size (inches)	Orifice	Act. Size	Bench Range	Actuator Code	Reverse Shutoff*			Bench Range	Actuator Code	Direct Shutoff*		
					3-15 psi	0-20 psi†	0-30 psi‡			3-15 psi	0-20 psi†	0-30 psi‡
1/2	A, C, E	36	6-15	RA	400	—	—	3-12	DA	400	—	—
	B	36	6-15	RA	400	—	—	3-12	DA	300	—	—
			—	—	—	—	—	3-9	DB	400	—	—
3/4	T	36	6-15	RA	300	—	—	3-9	DB	400	—	—
			9-15	RB	225	—	—	—	—	—	—	—
			12-15	RC	300	—	—	—	—	—	—	—
1		60	12-15	RC	400	—	—	3-7	DG	400	—	—
	T	36	9-15	RB	150	—	—	3-9	DB	100	—	—
			12-15	RC	250	—	—	—	—	—	—	—
1-1/4			13-15	RE	400	—	—	—	—	—	—	—
		60	—	—	—	—	—	3-7	DG	400	—	—
	T	36	9-15	RB	150	—	—	3-9	DR	150	—	—
1-1/2			12-15	RC	200	—	—	—	—	—	—	—
			13-15	RE	250	—	—	—	—	—	—	—
		60	12-15	RG	0-300	—	—	3-7	DG	300	—	—
2			13-15	RH	400	—	—	—	—	—	—	—
	T	36	12-15	RC	150	—	—	—	—	—	—	—
			13-15	RE	200	—	—	—	—	—	—	—
2-1/2		60	12-15	RG	225	—	—	3-7	DG	200	—	—
			13-15	RH	275	—	—	—	—	—	—	—
	T	36	12-15	RC	50	—	—	—	—	—	—	—
3			13-15	RE	75	—	—	—	—	—	—	—
		60	12-15	RG	125	—	—	3-7	DG	100	—	—
	T	36	12-15	RC	50	—	—	—	—	—	—	—
4			13-15	RH	175	—	—	—	—	—	—	—
	T	60	10-15	RH	75	100	100	3-8	DH	70	110	200
			12-15	RQ	125	125	125	3-8	DH	70	110	200
4			22-30	RT	—	125	125	3-8	DH	70	110	200
		60	10-15	RH	40	60	60	3-8	DH	40	60	100
			12-15	RQ	60	80	80	3-8	DH	40	60	100
4			22-30	RT	—	110	110	3-8	DH	40	60	100
	T	60	12-15	RQ	20	32	32	3-8	DH	10	15	25
			22-30	RT	—	50	50	3-8	DH	10	15	25

\* Shutoff pressures are in conformance with ANSI/FCI 70-2 Class IV

CAUTION: K1 designed for 3-15 psi. Do not exceed 20 psi.

Reverse Acting - Fail Closed/Air to Open (FC/ATO)

Direct Acting - Fail Open/Air to Close (FO/ATC)

† Based on 20 psi air supply with positioner.

‡ Based on 30 psi air supply.

## PRODUCT IDENTIFICATION

### KOMBAT SERIES K VALVE ORDERING CODE

MODEL NUMBER (Must be 2 Digits)	ORIFICE	SIZE	CONNEC- TIONS	TRIM	PACKING	—	ACTUATOR (Must be 2 Digits)	—	SPRING (Must be 2 Digits)	—	POSITIONER (Must be 2 Digits)	POSIT. SET (Must be 2 Digits)	ACCESSORIES (Must be 2 Digits)
example: K1	I	E	8	1	1	—	36	—	R B	—	M P	Q 2	Q 1
K1 - BZ, Single Seat, Pneumatic	A	C - 1/2	2 - 125#	1 - Metal	1 - V-ring		K1, K3, K4 only		K1, K3 only		K4 only	For use with K4 Valves Only	
K3 - BZ, 3-Way, Pneumatic	B	D - 3/4	8 - Unions				36 - 36 in <sup>2</sup>		DA - 3-12 Dir 36		DH - 3 - 8 Dir 60	01 - None	01 - None
K4 - CI, Single Seat, Pneumatic	C	E - 1					60 - 60 in <sup>2</sup>		DB - 3-9 Dir 36		RH - 10-15 Rev 60	02 - 3-15/4-20 mA	02 - Limit Switch, Mechanical
K5 - Z, Single Seat, Electric, (FC)	E	F - 1 1/4					K5, K6, K7 only		DC - 6-12 Dir 36		RQ - 12-15 Rev 60	03 - 3-9/4-12 mA	03 - Limit Switch, Proximity Sw.
K6 - BZ, Single Seat, Electric, (FO)	T-STD	G - 1 1/2					90 - 0-10VDC		DD - 7-11 Dir 60		RT - 22-30 Rev 60	04 - 9-15/12-20 mA	04 - Feedback Potentiometer 1K
K7 - BZ, 3-Way, Electric		H - 2"					91 - 4-20mA		DG - 3-7 Dir 60		K5, K6, K7 only	05 - Feedback Potentiometer 1K	05 - Feedback 4-20mA Posit. Tra
		J - 2 1/2							DM - 7-11 Dir 60		01 - None		
		K - 3							RA - 6-15 Rev 36		4P - PMV P4 P		
		M - 4							RB - 9-15 Rev 36		5P - PMV P5 P		
									RC - 12-15 Rev 36				
									RE - 13-15 Rev 36				
									RG - 12-15 Rev 60				
									RH - 13-15 Rev 60				

## MAINTENANCE

**Warning:** Injury or death can occur due to failure to completely isolate valve from all sources of pressure before beginning disassembly. Do not proceed until valve has been completely isolated from process stream and vented to atmosphere.

### REMOVAL OF ACTUATOR FROM VALVE BODY ASSEMBLY

Close inlet and outlet stop valves. Be sure valve body is not under pressure. Remove all accessories from control valve. Refer to Figure 2.

#### Reverse Acting Pneumatic Actuator

Loosen stem nuts (24) and move to approximately 1/3 down valve stem. Re-tighten being careful not to move valve stem. Energize actuator with air to lift the plug off the seat. Disengage lock nut (26) from bonnet (25). De-energize actuator. The actuator and yoke should move away from bonnet. Lift actuator and yoke assembly along with plug (39) off the seat. With an adjustable wrench, unthread valve stem from actuator stem (Fig. 6, #16) until valve stem is disengaged from actuator stem. Remove stem nuts, indicator, packing nut and lock nut.

#### Direct Acting Pneumatic Actuator

Energize actuator with air slightly (in case of back seating). Loosen stem nuts (24) and re-tighten approximately 1/8" away from actuator stem (Fig. 6, #16). Disengage lock nut (26) from bonnet (25). With an adjustable wrench, unscrew valve stem from actuator stem. When valve stem reaches seat, lift actuator (to prevent galling seat and plug). Remove stem nuts, indicator and lock nut.

### DISASSEMBLY OF VALVE BODY

Remove stem nuts (24), indicator (32) and lock nut (26). Lift yoke off bonnet (25). To complete body disassembly, unscrew bonnet for K1 and cap (42) for K4. For K4 remove bonnet nuts (34) and lift off blind flange (35), bonnet, stem and plug assembly (37). Remove gasket (36). A new gasket should be installed each time valve body is disassembled. Turn stem and plug assembly out of bonnet through packing. Replace packing if necessary. All parts should be inspected for wear and cleaned thoroughly before re-assembling valve body.

### DISASSEMBLY OF ACTUATOR

Remove actuator from valve. Remove regular casing bolts (4) and casing nuts (5). Gradually loosen nuts on remaining long casing bolts (14) to allow pre-compression of actuator springs. Remove upper casing (2). Pull actuator stem (16), along with diaphragm (15), springs (3) and piston (13), out through bushing (7). Place a wrench on the machined flats of actuator stem, and remove stem nut (10) or travel stop (22), seal washer (12) and stem washer (11). Remove o-ring (8) from bushing and replace if necessary. Lubricate o-ring after installing.

### RE-ASSEMBLY OF ACTUATOR

Refer to Figure 6 for correct orientation of casings, diaphragm (15), piston (13), stem (16) and springs (3) for direct or reverse action. Be sure piston spring recesses line up between casing ribs as shown in Figure 8C. Lubricate bushing O-ring (8) and insert actuator stem through bushing. Re-attach upper casing (2) with long bolts (14) & nuts (5), tightening alternately. Install remaining casing nuts and bolts. Apply air to diaphragm case and check for leakage, full travel and dead band less than .2 psi.

### LAPPING PLUG INTO SEAT

Seats and plugs should never require more than the lightest touch up with very fine (400 grit) grinding compound. Heavy lapping will produce galling, a wider seating surface and a groove in the plug, all of which tend to cause leakage. Reface a damaged surface before attempting to grind it in. Lap sparingly. Replace stem and plug (39) in bonnet (25) through packing. Apply lapping compound to plug. Place bonnet and bonnet flange (35 for K4 only) on body. After lapping, disassemble and clean all parts thoroughly.

### PACKING REPLACEMENT

Check stem for gouges if packing leaks. Replacement packing cartridges can be installed.

### RE-ASSEMBLY OF VALVE BODY (K1)

Tighten bonnet (25) to body. Replace yoke (9), lock nut (26), stem nuts (24) and travel indicator (32) over stem (34).

### RE-ASSEMBLY OF VALVE BODY (K4)

Install a new gasket (36). Attach bonnet (26) and bonnet flange (35) to body with bonnet studs and nuts (33, 34). Be sure to tighten bolts alternately and evenly to ensure proper seating of the plug. Replace yoke (9), lock nut (27), stem nuts (31) and travel indicator (23) over stem (30).

### REPLACING ACTUATOR ON VALVE BODY - PNEUMATIC

Put actuator assembly over valve stem. Place lock nut (Fig. 2, #26), and stem nuts (24) with travel indicator (32) on valve stem. Rest actuator stem (16) on valve stem. Tighten stem nuts approximately 2/3 down valve stem. Lift actuator assembly and engage valve stem with actuator stem (be careful not to gall plug & seat).

#### Reverse Acting

When sufficient engagement is met, the actuator can be energized with air to place the yoke on the bonnet (25) and lift the plug off the seat. Tighten lock nut and packing nut.

#### Direct Acting

Engage valve stem with actuator stem so no contact is made between plug and seat when bottom of yoke is rested on bonnet. Tighten lock nut.

## ACTUATOR ADJUSTMENT - PNEUMATIC

Close inlet and outlet stop valves. Be sure valve body is not under pressure. Place a wrench on the machined flats of actuator stem (16). Counter two stem nuts (24) approximately halfway down the threads of the stem (34).

### Reverse Acting

Apply sufficient air pressure to diaphragm case to start moving valve through its rated travel. This is shown by travel indicator (32). Engage lower stem nut (24) and turn body stem (34) into actuator stem (16) until pre-compression of actuator springs (3) is relieved (plug should not be seating on seat ring when air pressure is removed from actuator case). Apply prescribed setting pressure to actuator. This is determined by specific oper-

ating conditions. Turn body stem out of actuator stem until plug seats on seat ring (28). To prevent galling, do not turn body stem after plug has contacted seat ring. Turn stem nuts up plug & stem assembly and tighten to lock them in position. Reduce air signal to 0 psi and calibrate indicator scale (20). Check that full travel is achieved with a 15 psi signal (for 22-30 spring range, use 30 psi signal).

### Direct Acting

Engage lower stem nut (24) and turn body stem (34) into actuator stem (16) until plug & stem assembly stops at upper limit of travel and/or a slight downward movement of actuator stem is detected. Turn stem nuts up body stem and tighten them to lock in position. Calibrate indicator scale (20). Check that full travel is achieved at a 3 psi signal.

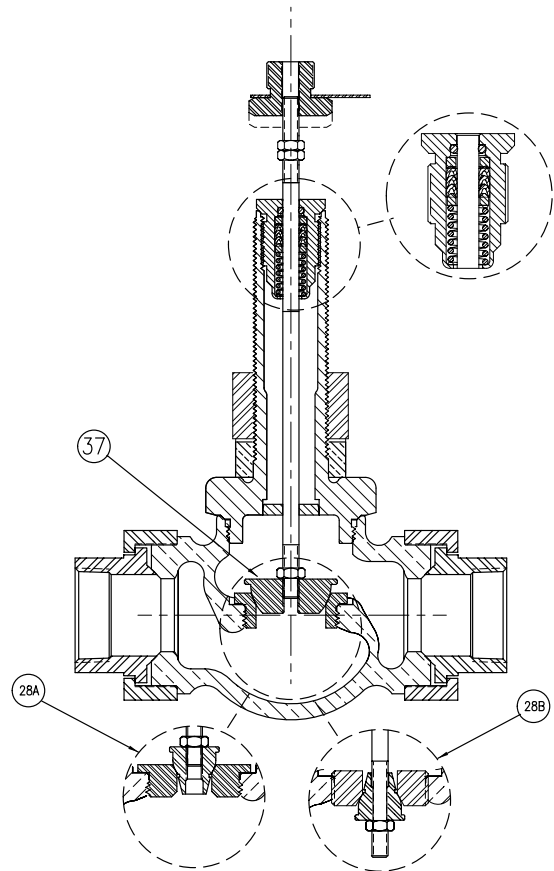
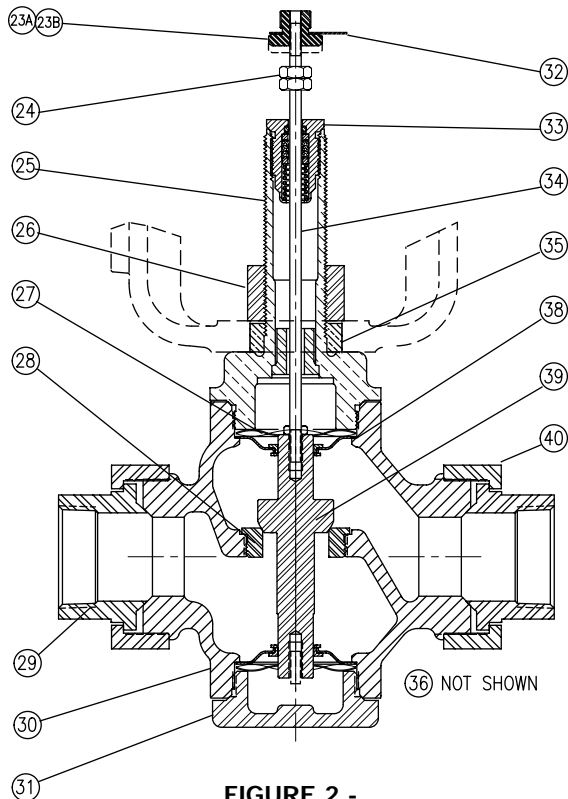
*It is solely the responsibility of the system designer and the user to select products and materials suitable for their specific application requirements and to ensure proper installation, operation and maintenance of these products. Assistance shall be afforded with the selection of the materials based on the technical information supplied to Spence Engineering Company, Inc.; however, the system designer and user retain final responsibility. The designer should consider applicable Codes, material compatibility, product ratings and application details in the selection and application. Improper selection, application or use of the products described herein can cause personal injury or property damage. If the designer or user intends to use the product for an application or use other than originally specified, he must reconfirm that the selection is suitable for the new operating conditions.*

## K1 VALVE BODY ASSEMBLY PART NUMBERS

ITEM NO.	PART NAME	MATERIAL	VALVE SIZE					
			1/2	3/4	1	1-1/4	1-1/2	2
23A*	STEM BOLT - SHORT	BRASS	04-17277-00	04-17277-00	04-17277-00	04-17277-00	04-17277-00	04-17277-00
23B**	STEM BOLT - LONG	BRASS	04-17281-00	04-17281-00	04-17281-00	04-17281-00	04-17281-00	04-17281-00
24	STEM NUT	BRASS	05-17342-00	05-17342-00	05-17342-00	05-17342-00	05-17342-00	05-17342-00
25	BONNET ASSY	BRASS	557B109-01	557B109-01	557B107-02	557B107-02	557B110-02	557B110-02
26	LOCK NUT	ST STL	05-17330-00	05-17330-00	05-17330-00	05-17330-00	05-17330-00	05-17330-00
27	WAVE WASHER	ST STL	—	—	122A155-01	122A155-02	122A155-02	122A155-02
28A	SEAT RING, 1/2A K1	ST STL	SN217	—	—	—	—	—
	SEAT RING, 1/2B K1	ST STL	SUU217	—	—	—	—	—
	SEAT RING, 1/2C K1	ST STL	SN217	—	—	—	—	—
	SEAT RING, 1/2E K1	ST STL	SN217	—	—	—	—	—
	SEAT RING, T K1	ST STL	SX217	SM217	562A114-02	562A114-03	562A114-04	562A114-05
28B	SEAT RING, 1/2A K5	ST STL	562A110-01	—	—	—	—	—
	SEAT RING, 1/2B K5	ST STL	562A110-01	—	—	—	—	—
	SEAT RING, 1/2C K5	ST STL	562A110-01	—	—	—	—	—
	SEAT RING, 1/2E K5	ST STL	562A110-01	—	—	—	—	—
	SEAT RING, T K5	ST STL	562A112-01	562A113-01	562A114-02	562A114-03	562A114-04	562A114-05
29	TAILPIECE	GALV IRON	SX227	SMP462	SMP463	SBB227	SMP465	SMP593
30	BODY	BRONZE	292B110-01	292B110-01	SAM1167B	SAN1167B	SAN1167B	564B116-01
31	CAP	BRASS	—	—	557B101-01	SB312E	SB312E	SB312E
32	TRAVEL INDICATOR	ALUM	05-12962-00	05-12962-00	05-12962-00	05-12962-00	05-12962-00	05-12962-00
33	V RING PACKING SET	TFE/SS/VITON	204A104-01	204A104-01	204A104-01	204A104-01	204A104-01	204A104-01
34	STEM	ST STL	552A117-01	552A117-01	552A115-01	552A115-02	552A115-02	552A115-02
35*	YOKE BUSHING	BRASS	04-17278-00	04-17278-00	04-17278-00	04-17278-00	04-17278-00	04-17278-00
36**	SPACER	BRASS	04-17280-00	04-17280-00	04-17280-00	04-17280-00	04-17280-00	04-17280-00
37	NUT	ST STL	05-17342-00	05-17342-00	—	—	—	—
38	GUIDE	ST STL	—	—	556A111-01	556A111-02	556A111-02	556A111-02
39	PLUG, 1/2A	ST STL	554A154	—	—	—	—	—
	PLUG, 1/2B	ST STL	554A158	—	—	—	—	—
	PLUG, 1/2C	ST STL	554A153	—	—	—	—	—
	PLUG, 1/2D	ST STL	554A156	—	—	—	—	—
	PLUG, 1/2E	ST STL	554A159	—	—	—	—	—
	PLUG, T	ST STL	554A157	554A155	554A146-02	554A146-03	554A146-04	554A146-05
40	UNION NUT	GALV IRON	SMP487	SMP467	SMP468	SMP470	SMP470	SMP592

\* Not included in body assembly; order K-KIT separately.

\*\*Not included in body assembly; order separately.





## K4 VALVE BODY ASSEMBLY PART NUMBERS

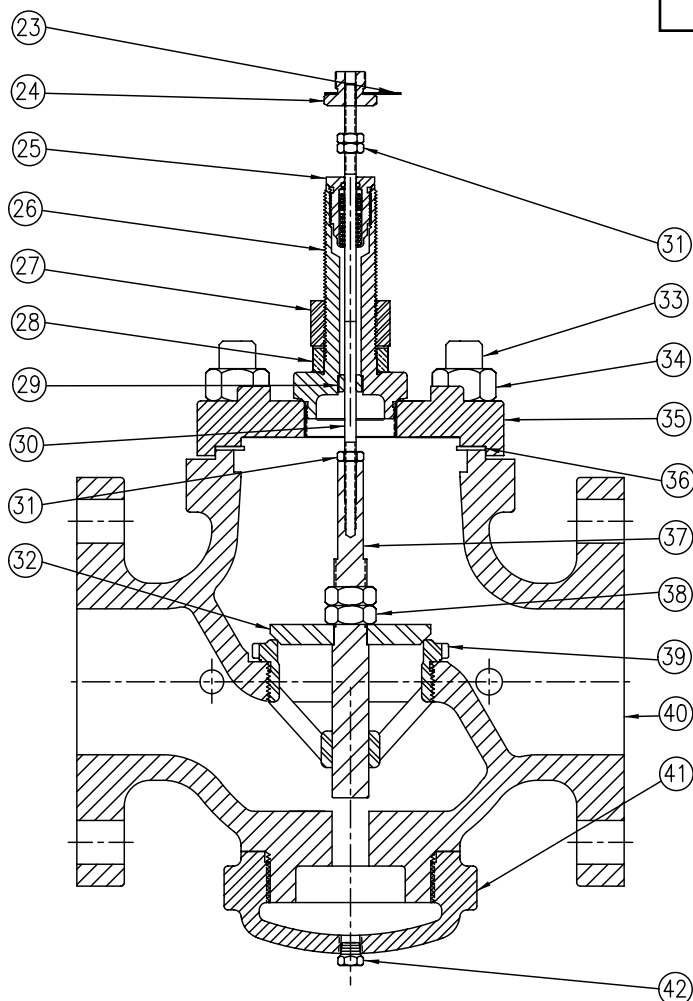
ITEM NO.	PART NAME	MATERIAL	VALVE SIZE		
			2-1/2	3	4
23	Pointer	Aluminum	5-12962-0	5-12962-0	5-12962-0
24	Stem bolt	Brass	4-17277-0	4-17277-0	4-17277-0
25	Packing box	Brass	204A104-01	204A104-01	204A104-01
26	Bonnet	Ductile iron	558B113-02	558B113-02	558B113-02
27	Nut	Stl/zinc pltd	5-17330-0	5-17330-0	5-17330-0
28	Yoke bushing	Brass	4-17278-0	4-17278-0	4-17278-0
29	Stem bearing	303 ss	SU260	SU260	SU260
30	Valve stem	303 ss	552A117-02	552A117-02	552A117-02
31	Nut	316 ss	5-17342-0	5-17342-0	5-17342-0
32	Disc	420 ss	4-08242-0	4-01918-0	4-01931-0
33	Tap stud	Steel	4-10119-0	4-05443-0	4-10119-0
34	Nut	Steel	5-02860-0	5-02856-0	5-02860-0
35	Blind flange	Cast iron	4-17334-0	4-17337-0	4-17334-0
36	Gasket	Graphite	5-02367-1	5-02369-1	5-02371-1
37	Disc stem	304 ss	4-17333-0	4-17340-0	4-17344-0
38	Nut	C1018	5-02973-0	5-02973-0	5-02974-0
39	Seat Ring	420 ss	4-11539-0	4-11484-0	4-11565-0
40	Body	Cast iron	4-00653-0	4-00655-0	4-00659-0
41	Cap	Cast iron	4-01325-0	4-17339-0	4-17346-0
42	Pipe plug	12L14	4-03769-0	4-03769-0	4-03769-0

When ordering parts, it is essential that the valve type, size, service and serial number be stated.

Select part by item number, but order by part number.

Specify complete part number when ordering.

K1 and K4 are designed and manufactured in accordance with Article 3, Section 3 of the Pressure Equipment Directive.



**FIGURE 5 -  
VALVE BODY ASSEMBLY - K4**

## K1 & K4 ACTUATOR PART NUMBERS

ITEM #	PART NAME	MATERIAL	PART #	QTY
1	Vent plug	H.D.poly	—	1
2	Upper casing	Stl/powder coat	—	1
3	Springs	Steel	See Below	See Below
4	Casing bolt standard	304 ss	—	10/14
5	Casing nut	316ss	—	12/16
6	Lower casing	Stl/powder coat	—	1
7	Bushing	Bronze	—	1
*8	O Ring	Buna-n	5-04017-0	1
9	Yoke	Cl/powder coat	—	1
*10	Stem nut	Steel	5-13374-0	1
*11	Stem washer	316 ss	5-12963-0	1/3
*12	Seal washer	Steel	5-13203-0	1
13	Piston	316 ss	—	1
*14	Casing bolt long	304 ss	5-04889-0	2
*15	Diaphragm - 36 sq. in.	Nitrile	0-12968-0	1
	Diaphragm - 60 sq. in.		@-12986-0	1
16	Actuator stem	303 ss	—	1
17	Machine screw	Steel	—	3
18	Casing gasket	Buna-n	—	1
19	Machine screw	Steel	—	2
*20	Indicator scale	Aluminum	5-13190-0	1
*21	Specification plate	Aluminum	5-13199-0	1
**22	Stop 12-15 psi	Brass	5-17360-0	1
	Stop 10-15 & 22-30 psi		5-17362-0	1

\*These parts furnished in Actuator Repair Kit.

\*\* Used in K4 only

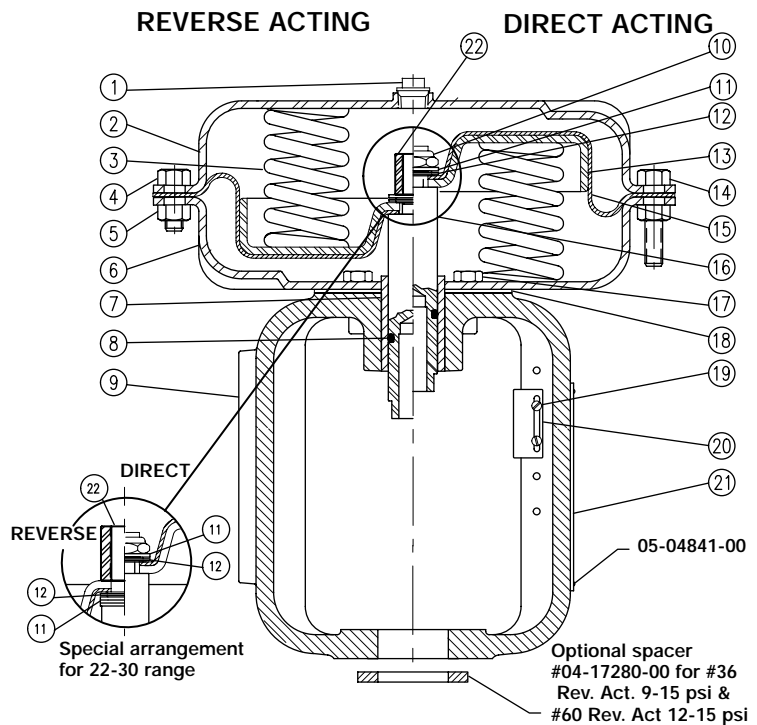


FIGURE 6 - ACTUATOR ASSEMBLY - K1 & K4

## K1 & K4 ACTUATOR SPRING KITS

Part #	Notes	Reverse Shutoff (Air-to-Open) Bench Range				Direct Shutoff† (Air-to-Close) Bench Range				Spring Kit Includes:			
		K1		K4**		K1		K4		Spring		Other	
Part #	Notes	Code	Range	Code	Range	Code	Range	Code	Range	QTY	Color	Part#	
36KIT100	(1)	36RA	6 - 15	-	-	36DA	3 - 12	-	-	6	YELLOW	05-12991-00	-
36KIT102	(3)	36RB	9 - 15	-	-	-	-	-	-	6	YELLOW	05-12992-00	-
36KIT104	(2) (4)	36RC	12 - 15	-	-	-	-	-	-	6	RED	05-13090-01	-
36KIT108	(2) (4)	36RE	13 - 15	-	-	-	-	-	-	6	GREEN	05-13085-00	05-04889-00 (2) Bolts
36KIT110	(1)	-	-	-	-	36DB	3 - 9	-	-	6	METAL	05-05121-00	-
60KIT100	(1) (4)	60RG	12 - 15	-	-	60DG	3 - 7	-	-	6	BROWN	05-13093-01	-
60KIT102	(1) (4)	60RH	13 - 15	60RH	10 - 15	-	-	DH	3 - 8	4	BROWN	05-13093-01	-
60KIT104	(5)	-	-	60RQ	12 - 15	-	-	-	-	6	BLACK	05-13097-00	05-04889-00 (2) Bolts
60KIT110	(1)	-	-	60RT	22 - 30	-	-	-	-	6	BROWN	05-13093-00	See detail in Fig. 6

† For Direct Shutoff - Invert Springs, Piston and Diaphragm from Reverse Shutoff Actuator.

\*\* To convert a K1 actuator to a K4 actuator you must add travel stop (05-17362-00) into the actuator and vice versa.

(1) For K1 & K4 ONLY - Mounts using KKIT-1

(2) For K1 ONLY - Mounts using KKIT-2

(3) For K1 ONLY - Mounts using KKIT-3

(4) Includes J-Valve travel scale

(5) For K4 ONLY - Mounts using KKIT-1 & spacer 04-17280-00

## ACTUATOR REPAIR KIT PART NUMBERS

36 SQ. IN.	60 SQ. IN.
51447	51448

## K1 & K4 ACTUATOR CONNECTOR KITS

PART #	SIZE	ORIFICE	SEAT STYLE	FOR USE WITH		KKIT Includes:		
				K1	K4	Stem Bolt	Bushing	Spacer
KKIT-1	1/2 - 4	All	All	X	X	04-17277-00	04-17278-00	-
KKIT-2	1/2 - 2	All	All	X		04-17281-00	07-17278-00	-
KKIT-3	1/2 - 2	All	All	X		04-17281-00	04-17278-00	04-17280-00

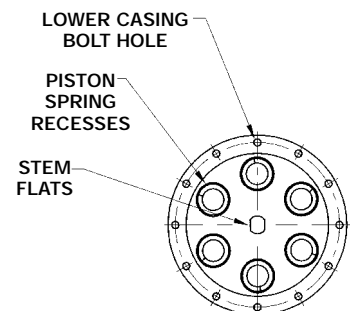


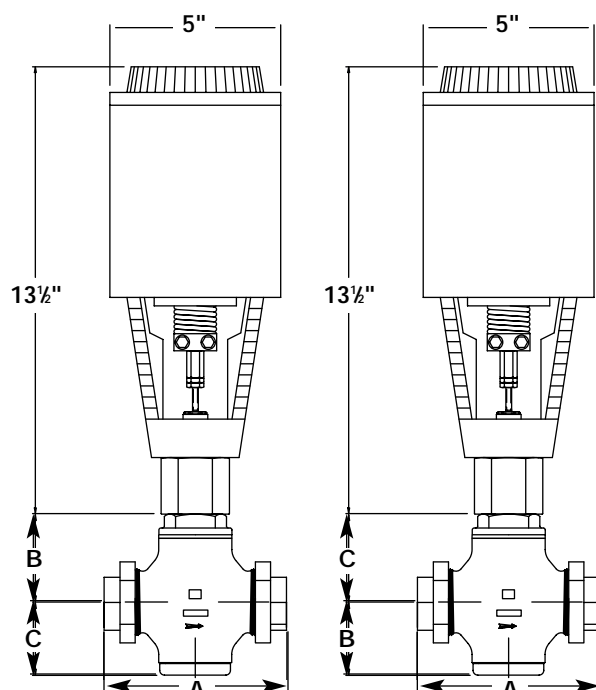
FIGURE 8 - PISTON  
DIAPHRAGM ASSEMBLY



# Technical Data

A division of CIRCOR International, Inc.

**SPENCE ENGINEERING COMPANY, INC.** 150 COLDENHAM ROAD, WALDEN, NY 12586-2035



**K5 1/2" - 2"**  
**Fail Closed**  
**ANSI B16.15**

**K6 1/2" - 2"**  
**Fail Open**  
**ANSI B16.15**

**DIMENSIONS** inches (mm)  
**AND WEIGHTS** pounds (kg)

Size	A	B	C	Weight
1/2-3/4 (15)-(20)	5 1/2 (140)	1 11/16 (43)	1 3/16 (30)	13 (6)
1 (25)	7 3/16 (183)	2 7/8 (74)	2 5/16 (58)	17 1/2 (8)
1 1/4-1 1/2 (32)-(40)	8 7/8 (226)	3 3/8 (79)	2 7/8 (74)	23 1/2 (11)
2 (50)	8 7/8 (226)	3 3/8 (79)	2 7/8 (74)	25 1/2 (12)

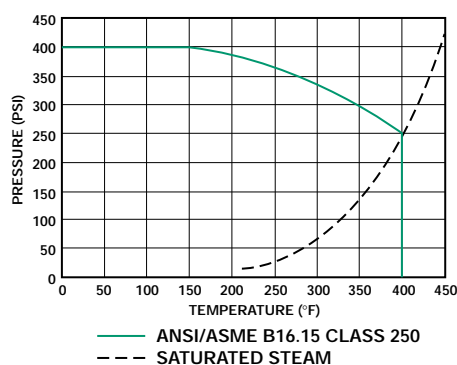
## ACTUATOR SHUTOFF TABLE

VALVE SIZE	ORIFICE	SHUTOFF (PSI)
1/2	A, B, C, E, T	400
3/4	T	375
1	T	300
1-1/4	T	190
1-1/2	T	145
2	T	110

## MAXIMUM RATED FLOW COEFFICIENTS\* (Cv)

VALVE SIZE					
1/2	3/4	1	1 1/4	1 1/2	2
5.2	7	11	20	25	30

## PRESSURE/TEMPERATURE CHART



## Cv TABLE

PERCENT OF TRAVEL			5	10	20	30	40	50	60	70	80	90	100
Valve Size	Travel	Orifice	Cv										
1/2	1/4	C	0.1	0.2	0.3	0.36	0.41	0.46	0.51	0.56	0.6	0.65	0.7
		E	0.3	0.5	0.7	0.9	1.1	1.3	1.5	1.7	1.9	2	2.1
		A	0.3	0.6	1.2	1.7	2.2	2.6	2.9	3.1	3.2	3.25	3.3
		B	0.15	0.25	0.65	1.5	2.7	3.3	3.7	3.9	4.1	4.2	4.3
		T	0.7	1.2	2.0	2.7	3.2	3.8	4.3	4.7	4.9	5.1	5.2
3/4	5/16	T	0.7	1.3	2.4	3.3	4.2	4.9	5.5	6.0	6.4	6.8	7.0
1	1/4	T	0.7	1.3	2.4	3.8	5.5	7.4	9.0	10.0	10.6	10.9	11.0
1-1/4	5/16	T	0.8	1.7	4.0	6.5	9.3	12.6	15.3	17.0	18.1	19.1	20.0
1-1/2	5/16	T	1.0	2.0	4.5	7.2	9.9	12.4	15.2	18.2	20.9	23.4	25.0
2	5/16	T	1.0	2.0	4.5	7.4	10.6	15.1	18.8	22.8	26.1	28.3	30.0

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## OPERATING PRINCIPLE

The Kombat K5 & K6 Valves are a flow to open, globe style, electric actuated control valves. On loss of signal, Kombat K5 is fail closed and Kombat K6 is fail open. A controller sensing

the controlled variable provides a signal to the actuator to obtain the desired control.

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## RECOMMENDED INSTALLATION

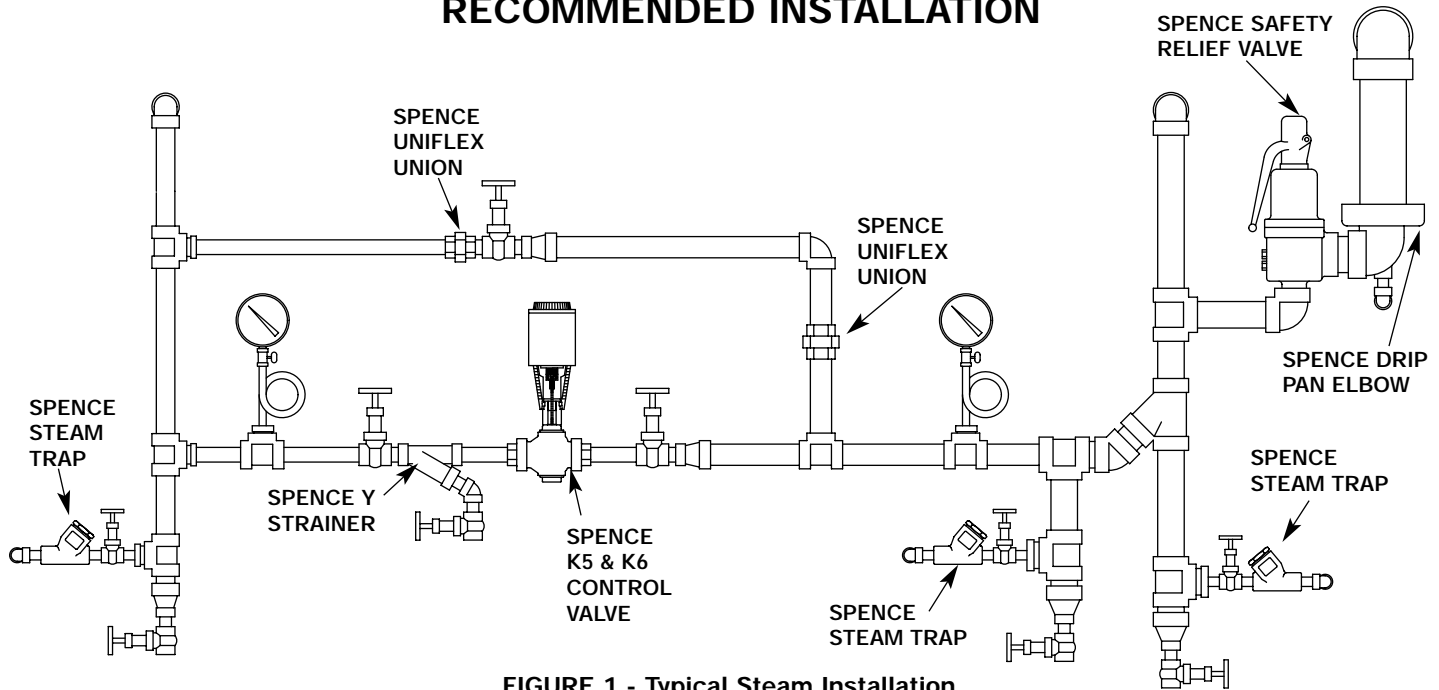


FIGURE 1 - Typical Steam Installation

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## INSTALLATION

Locate the valve in a straight run of horizontal pipe as shown in Figure 1. The valve should be mounted with the actuator in the upright position. Allow room for removal of the actuator. Prevent pipeline hammering in compressible fluid service by providing proper drainage before and after the valve. Avoid damaging effects of scale and dirt in pipelines by using a strainer. A 3-valve by-pass to facilitate inspection and maintenance without interrupting service is recommended. To elimi-

nate excessive noise with steam and other compressible fluids, enlarge the delivery pipe size to effect a reasonable flow velocity at the reduced pressure. A concentric transition is recommended. If possible, avoid sharp turns close to the valve bull-headed tee connections to a low pressure main. Install initial and delivery pressure gauges to indicate performance. If the rating of the delivery system or connected equipment is less than the initial pressure, provide a safety relief valve.

---

## START-UP

Flush the piping system thoroughly to clear it of welding beads, scale, sand, etc. Install the valve with the arrow on the side of the valve body pointing in the direction of fluid flow. Install controller and accessories in accordance with instructions furnished by the manufacturer of these items. Connect necessary electrical connections to the actuator. Insulation, if desired,

may be applied to the valve body only. Do not insulate the bonnet. Caution: Hazardous fluids may be handled by this valve. Only qualified personnel, who are familiar with your installation, should be permitted to install, readjust, inspect or maintain the valve.

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## TROUBLESHOOTING

For troubleshooting of the controlling device and accessories, see the instruction furnished by the manufacturer of these items. To troubleshoot the valve and actuator, check for the fol-

lowing: change in operating conditions; signal failure; power failure; foreign matter lodged between seat ring and plug; packing leakage.

# PRODUCT IDENTIFICATION

## ORDERING CODE

MODEL NUMBER (Must be 2 Digits)	ORIFICE	SIZE	CONNECTIONS	TRIM	PACKING — ACTUATOR (Must be 2 Digits)	SPRING (Must be 2 Digits)
<b>example: K 1</b>	<b>T</b>	<b>E</b>	<b>8</b>	<b>1</b>	<b>1</b>	<b>3 6</b>
K1 - Bronze, Direct	A	C - 1/2	2 - 125 Flg	1 - Metal	1 - V-ring	<b>K1 &amp; K4 only</b>
K4 - Cast Iron	B	D - 3/4	8 - Unions			01 - None
K5 - Bronze, Reverse	C	E - 1				36 - 36 in <sup>2</sup>
K6 - Bronze, Direct	E	F - 1 1/4				60 - 60 in <sup>2</sup>
	T	G - 1 1/2				<b>K5 &amp; K6 only*</b>
		H - 2"				90 - 0-10vDC
		J - 2 1/2				91 - 4-20mA
		K - 3				92 - 0-135 ohm
		M - 4				
						<b>K1 only</b>
						AA - None
						<b>K4 only</b>
						DA - 3-12 Dir 36
						DB - 3-9 Dir 36
						RA - 6-15 Rev 36
						RB - 9-15 Rev 36
						RC - 12-15 Rev 36
						RD - 13-15 Rev 36
						DF - 3-10 Dir 60
						DG - 3-7 Dir 60
						RG - 12-15 Rev 60
						RH - 13-15 Rev 60

\* With electric actuator, use K6 for fail open, K5 for fail closed.

## MAINTENANCE

### REMOVAL OF THE ACTUATOR FROM THE VALVE BODY ASSEMBLY

Close the inlet and outlet stop valves. Be sure the valve body is not under pressure. Remove all the accessories from the control valve. Refer to Figure 3.

Loosen the stem nuts and move them down the valve stem. Retighten being careful not to move the valve stem. Apply 50% signal to energize the actuator. Loosen the actuator stem retainer nuts until the stem adapter groove is disengaged from the stem retainer. De-energize the actuator. The actuator stem retainer should move away from the valve stem. Loosen the actuator yoke nuts and lift the actuator off the locking nut. Care must be taken to prevent the disc from rotating on the seat.

### DISASSEMBLY OF THE VALVE BODY

Remove the stem adapter (p/n 4-17407-0), stem nuts (24), and locking nut (p/n 4-17338-0). To complete body disassembly, unscrew the bonnet (25) for K5 & K6 and the cap (31) with guide (38) for the K5. Turn the stem and plug assembly out of the bonnet through the packing. Replace the packing if necessary. All parts should be inspected for wear and cleaned thoroughly before re-assembling the valve body.

### LAPPING THE PLUG INTO THE SEAT

Seats and plugs should never require more than the lightest touch up with very fine (400 grit) grinding compound. Heavy lapping will produce galling, a wider seating surface and a groove in the plug, all of which tend to cause leakage. Reface a damaged surface before attempting to grind it in. Lap sparingly. Replace stem and plug (39) in the bonnet (25) through the packing. Apply lapping compound to the plug. Place the bonnet and the bonnet flange on the body. After lapping, disassemble and clean all parts thoroughly.

### PACKING REPLACEMENT

Check the stem for gouges if the packing leaks. Replacement packing cartridges can be installed.

### RE-ASSEMBLY OF THE VALVE BODY

Tighten the bonnet (25) to the body. Replace locking nut (p/n 4-17338-0) and stem nuts (24) over the stem (34). Replace the guide (38) and cap (31) for the K5.

### REPLACING THE ACTUATOR ON THE VALVE BODY (Figure 7)

Thread the stem adapter all the way onto the valve stem. Position the electric actuator on the actuator locking nut. Make sure the actuator yoke nuts are loose enough to allow the actuator to slip over the locking nut. Position the actuator so that the control box is facing the front of the valve (with Spence logo). Hold the actuator in place while tightening the yoke nuts. Care must be taken to prevent the disc from rotating on the seat. Turn the stem adapter upward until the groove engages with the actuator stem retainer. While making this adjustment, make sure that the valve stem is all the way up. Tighten the stem retainer nuts.

### ACTUATOR ADJUSTMENT

#### K5 Reverse Acting - Fail Closed

Before calibrating the actuator, check for valve seat leakage to assure conformity to the requirements of ANSI/FCI 70-2 of Class IV with metal-to-metal trim. Test media should be air with an upstream pressure of 50 psi and a downstream pressure of atmospheric. If seat leakage exceeds class IV rating, turn the actuator manual override knob clockwise to lift the disc off the seat. Loosen the stem nuts and turn valve stem upward as required. Retighten the stem nuts against the stem adapter. Turn the actuator manual override knob counterclockwise until the red indicator disappears. Recheck the valve seat leakage. Repeat steps as required until the valve seat leakage is within class IV rating.

#### K6 Direct Acting - Fail Open

After calibrating the actuator, check for valve seat leakage to assure conformity to the requirements of ANSI/FCI 70-2 of Class IV with metal-to-metal trim. Test media should be air with an upstream pressure of 50 psi and a downstream pressure of atmospheric. Apply full signal to the actuator to close the valve and measure the valve seat leakage. If the seat leakage exceeds class IV rating, apply 50% signal to lift the disc off the seat. Loosen the stem nuts and turn the valve stem downward as required. Retighten the stem nuts against the stem adapter. Apply full signal to the actuator to close the valve and recheck valve seat leakage. Repeat steps as required until the valve seat leakage is within Class IV rating.

## K1 & K5 SIGNAL CARD WIRING

### 0 - 10 VDC

For the 0 - 10 VDC option, remove the electric actuator control box cover and install the stroke limiter to terminals 'G', 'Y', and 'M' on the circuit board and tighten the terminal screws. Wiring to be according to Figure 9C. Set the input signal to 10 VDC. Turn the stroke limiter potentiometer counterclockwise to 0 % stroke. Gradually turn the potentiometer clockwise until the total valve travel is within 10% of rated travel.

### 4 - 20 mA

For 4 - 20 mA option, remove the electric actuator control box cover and wire electric actuator and analog scaling module according to Figure 9A. Set the input signal to 20 mA. Adjust the span potentiometer on the analog scaling module until the total valve travel is within 10% of rated travel. Set the input signal to 4 mA. Adjust the zero potentiometer on the analog scaling module until the voltage across the actuator terminals 'Y', and 'G0' measures zero. Set the input signal to 20 mA and recheck the valve travel. Readjust the Zero & Span potentiometers as required. Use (1) mounting screw to secure the analog scaling module to the actuator.

### 0 - 135 Ohm

For 0 - 135 ohm option, remove the electric actuator control box cover and wire electric actuator and analog scaling module according to Figure 9B. Set the signal potentiometer to 135 ohm. Adjust the span potentiometer on the analog scaling module until the total valve travel is within 10% of rated travel. Set the signal potentiometer to zero ohm. Adjust the zero potentiometer on the analog scaling module until the voltage across the actuator terminals 'Y', and 'G0' measures zero. Set the signal potentiometer to 135 ohm and recheck the valve travel. Readjust the Zero & Span potentiometers as required. Use (1) mounting screw to secure the analog scaling module to the actuator.

## CHANGING SIGNAL INPUT

### From 0-10 VDC to 4-20 mA or 0-135 ohm:

Remove the electric actuator control box cover. Loosen terminal screws for terminals 'G', 'Y', and 'M' on the circuit board and remove the stroke limiter card (P/N 05-17401-00). Follow the calibration procedure for the 4-20 mA option (signal card P/N 05-17402-00) or the 0-135 ohm option (signal card P/N 05-17382-00). Secure signal card to actuator using (1) mounting screw supplied with card.

### From 4-20 mA or 0-135 ohm to 0-10 VDC:

Remove the electric actuator control box cover and remove the signal card. Install the stroke limiter card (P/N 05-17401-00) to terminals 'G', 'Y', and 'M' on the circuit board and tighten the terminal screws. Follow the calibration procedure for the 0-10 VDC option.

### From 4-20 mA to 0-135 ohm or 0-135 ohm to 4-20 mA:

Remove the electric actuator control box cover and remove the signal card. Follow the calibration procedure for the 4-20 mA option (signal card P/N 05-17402-00) or the 0-135 ohm option (signal card P/N 05-17382-00). Secure signal card to actuator using (1) mounting screw.

After replacement of signal cards, recheck valve seat leakage according to procedure given in the actuator adjustment section for K5 and K6.

When ordering parts, it is essential that the valve type, size, service and serial number be stated.

Select part by item number, but order by part number.

Specify complete part number when ordering.

K5 and K6 are designed and manufactured in accordance with Article 3, Section 3 of the Pressure Equipment Directive.

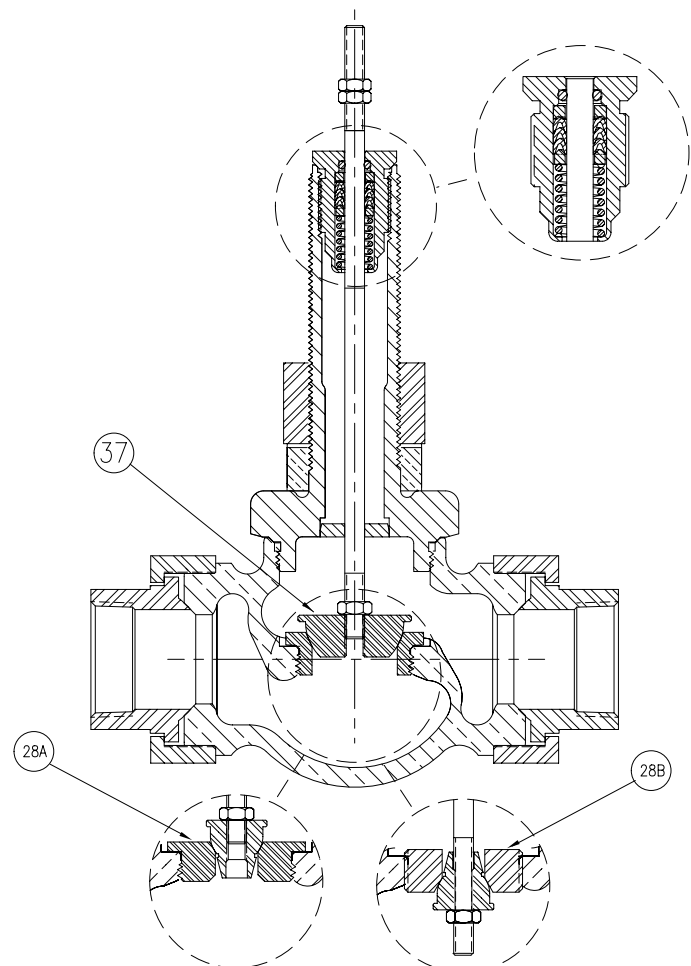


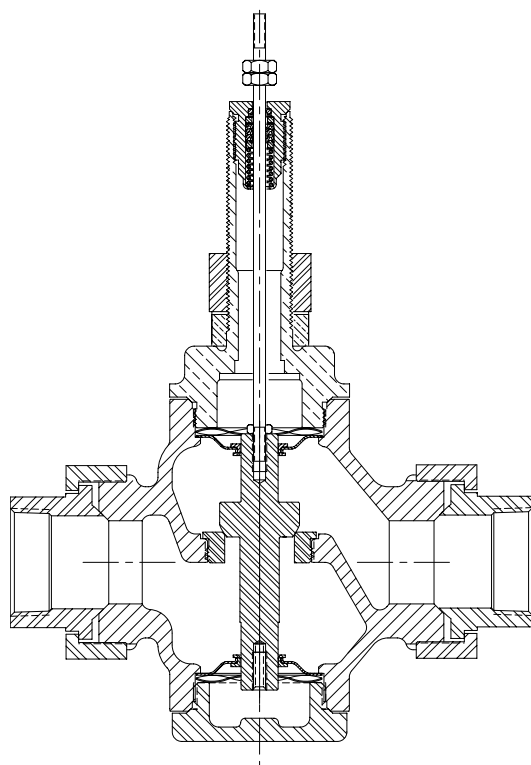
FIGURE 4 -  
VALVE BODY ASSEMBLY - K5 & K6 - 1/2" - 3/4"

## K5 & K6 VALVE BODY ASSEMBLY PART NUMBERS

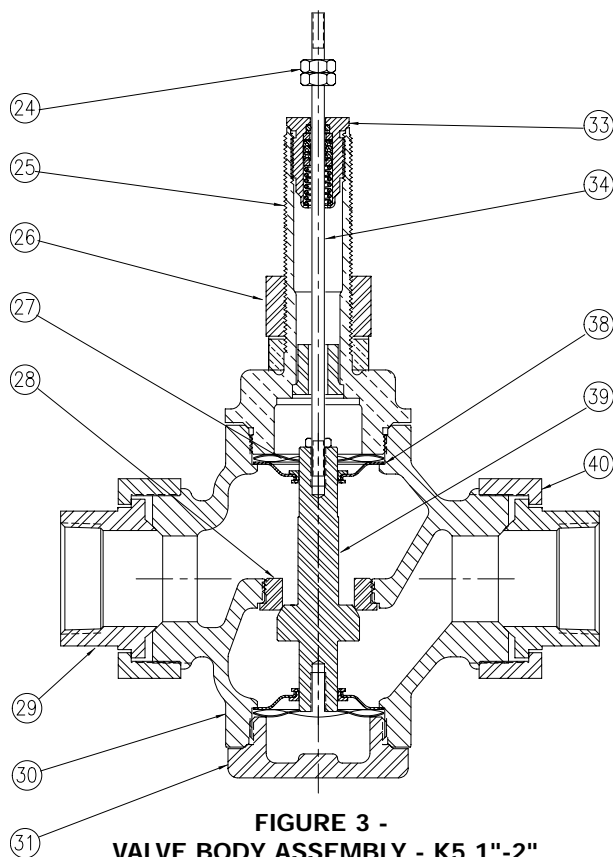
ITEM NO.	PART NAME	MATERIAL	VALVE SIZE					
			1/2	3/4	1	1-1/4	1-1/2	2
24	STEM NUT	BRASS	05-17342-00	05-17342-00	05-17342-00	05-17342-00	05-17342-00	05-17342-00
25	BONNET ASSY	BRASS	557B109-01	557B109-01	557B107-02	557B107-02	557B110-02	557B110-02
27	WAVE WASHER	ST STL	—	—	122A155-01	122A155-02	122A155-02	122A155-02
28A	SEAT RING, 1/2A K1	ST STL	SN217	—	—	—	—	—
	SEAT RING, 1/2B K1	ST STL	SUU217	—	—	—	—	—
	SEAT RING, 1/2C K1	ST STL	—	—	—	—	—	—
	SEAT RING, 1/2E K1	ST STL	SN217	—	—	—	—	—
	SEAT RING, T K1	ST STL	SX217	SM217	562A114-02	562A114-03	562A114-04	562A114-05
28B	SEAT RING, 1/2A K5	ST STL	562A110-01	—	—	—	—	—
	SEAT RING, 1/2B K5	ST STL	562A110-01	—	—	—	—	—
	SEAT RING, 1/2C K5	ST STL	562A110-01	—	—	—	—	—
	SEAT RING, 1/2E K5	ST STL	562A110-01	—	—	—	—	—
	SEAT RING, T K5	ST STL	562A112-01	562A113-01	562A114-02	562A114-03	562A114-04	562A114-05
29	TAILPIECE	GALV IRON	SX227	SMP462	SMP463	SBB227	SMP465	SMP593
30	BODY	BRONZE	292B110-01	292B110-01	SAM1167B	SAN1167B	SAN1167B	564B116-01
31	CAP	BRASS	—	—	557B101-01	SB312E	SB312E	SB312E
33	V RING PACKING SET	TFE/SS/VITON	204A104-01	204A104-01	204A104-01	204A104-01	204A104-01	204A104-01
34	STEM	ST STL	552A117-01	552A117-01	552A115-01	552A115-02	552A115-02	552A115-02
36**	SPACER	BRASS	04-17280-00	04-17280-00	04-17280-00	04-17280-00	04-17280-00	04-17280-00
37	NUT	ST STL	05-17342-00	05-17342-00	—	—	—	—
38	GUIDE	ST STL	—	—	556A111-01	556A111-02	556A111-02	556A111-02
39	PLUG, 1/2A	ST STL	554A154	—	—	—	—	—
	PLUG, 1/2B	ST STL	554A158	—	—	—	—	—
	PLUG, 1/2C	ST STL	554A153	—	—	—	—	—
	PLUG, 1/2D	ST STL	554A156	—	—	—	—	—
	PLUG, 1/2E	ST STL	554A159	—	—	—	—	—
	PLUG, T	ST STL	554A157	554A155	554A146-02	554A146-03	554A146-04	554A146-05
40	UNION NUT	GALV IRON	SMP487	SMP467	SMP468	SMP470	SMP470	SMP592

\* Not included in body assembly; order K-KIT separately.

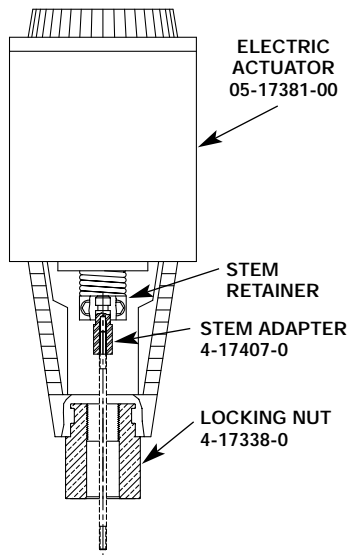
\*\*Not included in body assembly; order separately.



**FIGURE 2 -  
VALVE BODY ASSEMBLY - K6 1" - 2"**



**FIGURE 3 -  
VALVE BODY ASSEMBLY - K5 1"-2"**

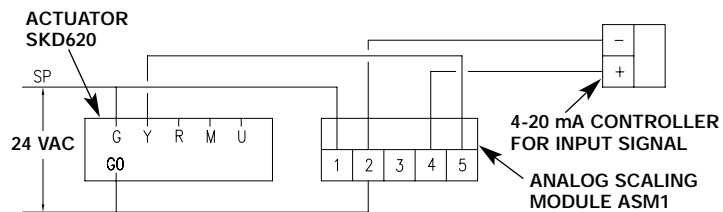


**FIGURE 7 -  
ACTUATOR  
ASSEMBLY  
K5 & K6**

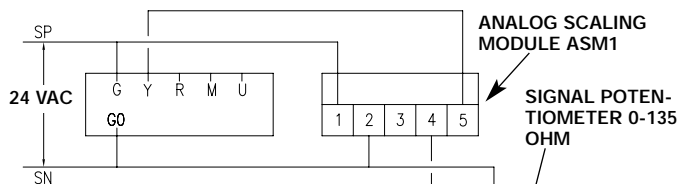
**ELECTRIC ACTUATOR  
SIGNAL CARD PART NUMBERS**

Signal	Part #
0-10vDC	05-17401-00
4-20mA	05-17402-00
0-135 ohm	05-17382-00

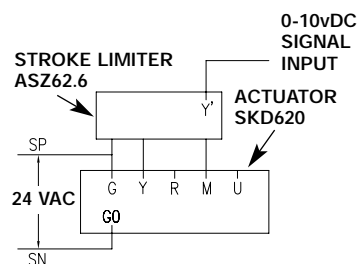
**KEY FOR FIGURE 9**  
Use earth ground isolating step-down Class 2 transformer per Siemens actuator instructions.  
OPERATING VOLTAGE 24 vAC  
G System Potential (SP)  
GO System Neutral (SN)  
Y Control Input 0-10vDC  
R Input for 4-20 mA or 0-1000 ohm Remote Setting Unit  
M Measuring Neutral  
U Output for 0-10 vDC or 4-20 mA Measuring Voltage  
1 System Potential (SP)  
2 Common for Power Supply, Input Signal, Output Signal  
4 Input Signal, 4-20 mA  
5 Output Signal, 0-4 vDC



**FIGURE 9A**

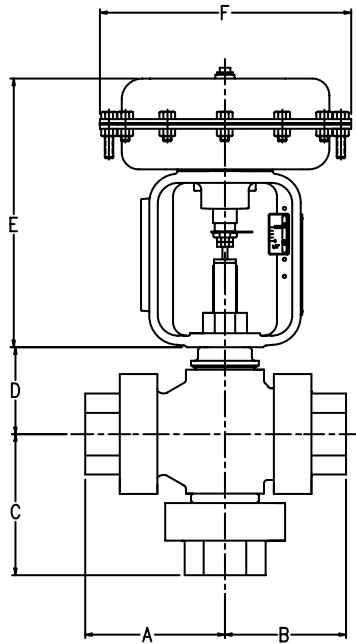


**FIGURE 9B**



**FIGURE 9C**





## KOMBAT K3 Control Valve Sizes 1/2" through 2" ANSI CLASS 250

The Kombat K3 Control Valve is designed for economical control of steam, water, gas and process applications in typical institutional, commercial and industrial processes. The Kombat K3 is a 3-way valve available with either a direct or reverse acting actuator that meets most mixing or diverting application requirements.

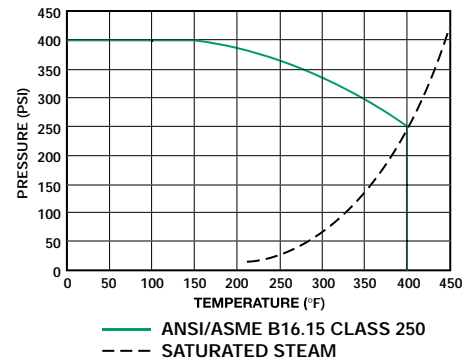
### MAXIMUM RATED FLOW COEFFICIENTS\* (Cv)

VALVE SIZE					
1/2	3/4	1	1 1/4	1 1/2	2
5.6	7.1	9.2	22	28	35

### DIMENSIONS inches (mm) AND WEIGHTS pounds (kg)

Size	A	B	C	D	E		F		Weight	
					36 in <sup>2</sup>	60 in <sup>2</sup>	36 in <sup>2</sup>	60 in <sup>2</sup>	36 in <sup>2</sup>	60 in <sup>2</sup>
1/2 - 3/4 (15)-(20)	3 5/8 (92)	3 5/8 (84)	4 1/8 (105)	2 7/8 (73)	9 7/8 (251)	-	9 1/4 (235)	-	28 (12.7)	41 (18.6)
1 (25)	3 5/8 (92)	3 5/8 (84)	4 1/8 (105)	2 7/8 (73)	9 7/8 (251)	-	9 1/4 (235)	-	27 (12.3)	40 (18.2)
1 1/4 (32)	4 11/16 (119)	4 1/8 (105)	4 22/32 (119)	3 3/32 (79)	9 7/8 (251)	11 3/4 (298)	9 1/4 (235)	11 1/4 (286)	35 (15.9)	48 (21.8)
1 1/2 (40)	4 11/16 (119)	4 1/8 (105)	4 22/32 (119)	3 3/32 (79)	9 7/8 (251)	11 3/4 (298)	9 1/4 (235)	11 1/4 (286)	37 (16.8)	50 (22.7)
2 (50)	4 7/8 (124)	4 3/8 (106)	4 29/32 (125)	3 3/32 (79)	9 7/8 (251)	11 3/4 (298)	9 1/4 (235)	11 1/4 (286)	42 (19.1)	55 (25)

### PRESSURE/TEMPERATURE CHART

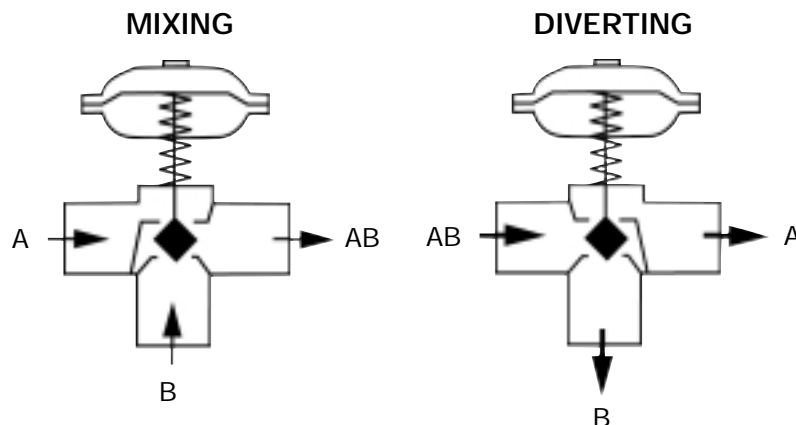


### Cv TABLE

Percent of Travel			0	10	20	30	40	50	60	70	80	90	100
Valve Size	Travel (In)	Port	Cv										
1/2	7/32	Lower	0	0.9	1.9	2.7	3.6	4.3	4.8	5.2	5.3	5.4	5.6
		Upper	5.6	5.55	5.5	5.3	4.9	4.5	3.9	3.1	2.2	1.2	0
3/4	7/32	Lower	0	0.9	2	3	4	4.9	5.5	6	6.2	6.3	6.4
		Upper	7.1	7	6.9	6.5	5.9	5.2	4.4	3.4	2.3	1.2	0
1	7/32	Lower	0	0.8	1.7	2.9	4	5.3	6.2	7.2	7.8	8.4	8.7
		Upper	9.2	8.5	7.9	7.1	6.2	5.3	4.2	3.2	2.1	1.1	0
1 1/4	1/2	Lower	0	2.7	6.2	10.2	15.0	18.8	20	20.8	21.2	21.6	22
		Upper	19.5	19	18.5	17.5	15.5	13.5	11	8	5	2.5	0
1 1/2	1/2	Lower	0	2	6	11	16	20	22.5	24.5	26	27	28
		Upper	24	23	22	20	18	15	12	9	6	2.7	0
2	1/2	Lower	0	2.2	5.7	10.9	16	21	24	27.4	30	32	34
		Upper	35	32.4	30	27	23.5	20	16	12	8	4	0

## OPERATING PRINCIPLE

The Kombat K3 Valve is a three way, universal construction, globe style, pneumatic diaphragm control valve. The pneumatic actuator can be arranged as direct or reverse acting. When selecting a direct acting actuator, upper port is failed closed on air loss. When selecting a reverse acting actuator, the lower port is failed closed on air loss. When used for mixing, the forces developed by the two inlet flows oppose each other and create a balanced environment. Thus, the actuator can control the flow efficiently without power lost to overcome dynamic unbalance. When using the valve for diverting service, simply reverse the valve installation.



## RECOMMENDED INSTALLATION

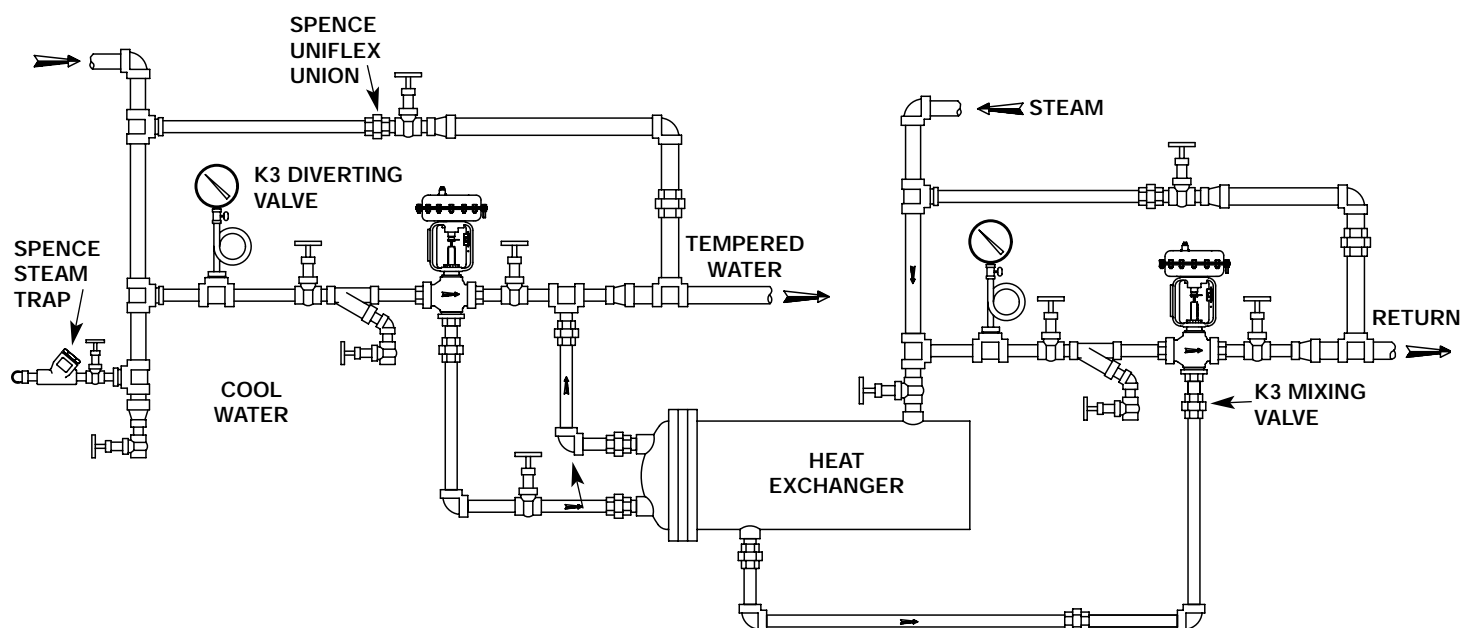


FIGURE 1 - Typical Steam Installation

## INSTALLATION

### CAUTION!

*The piping system must be adequately designed and supported to prevent extraordinary loads to the pressure equipment.*

Locate the valve in a straight run of horizontal pipe as shown in Figure 1. The valve should be mounted with the actuator in the upright position. Allow room for removal of the actuator. Prevent pipeline hammering in compressible fluid service by providing proper drainage before and after the valve. Avoid damaging effects of scale and dirt in pipelines by using a strainer. A 3-valve

by-pass to facilitate inspection and maintenance without interrupting service is recommended. To eliminate excessive noise with steam and other compressible fluids, enlarge the delivery pipe size to effect a reasonable flow velocity at the reduced pressure. A concentric transition is recommended. If possible, avoid sharp turns close to the valve and bullheaded tee connections to a low pressure main. Install initial and delivery pressure gauges to indicate performance. If the rating of the delivery system or connected equipment is less than the initial pressure, provide a safety relief valve.

## START-UP

Flush piping system thoroughly to clear it of welding beads, scale, sand, etc. Install valve with the arrow on the side of the valve body pointing in the direction of fluid flow. Install controller and accessories in accordance with instructions furnished by the manufacturer of these items. Connect necessary air lines and/or electrical connections to diaphragm chamber and valve mounted

accessories. Use 1/4" O.D. tubing for all air lines. If length of the air line exceeds 25 ft, use 3/8" O.D. tubing. Insulation, if desired, may be applied to the valve body only. Do not insulate bonnet. Caution: Hazardous fluids may be handled by this valve. Only qualified personnel, who are familiar with your installation, should be permitted to install, readjust, inspect or maintain the valve.

## TROUBLESHOOTING

For troubleshooting of the controlling device and accessories, see instruction furnished by manufacturer of these items. To troubleshoot valve and actuator, check for the following: change in operating conditions; pneumatic signal failure; diaphragm failure;

foreign matter lodged between seat ring and plug; actuator vent plug may be: plugged, missing, replaced with a solid plug; packing leakage.

## K3 ACTUATOR SHUTOFF TABLE

(Refer to Temperature Limits)

Size	Travel	Cv	Act. Size	Bench Range	Reverse Shutoff*		Bench Range	Direct Shutoff**	
					3-15 psi	0-20 psi		3-15 psi	0-20 psi
1/2	7/32	5.6	36	5.5 - 12.5	125	300	4.5 - 13.5	85	400
				6.5 - 11.5	175	375	6 - 12	175	400
				8 - 11	250	400	-	-	-
3/4	7/32	7.1	36	5.5 - 12.5	125	300	4.5 - 13.5	85	400
				6.5 - 11.5	175	375	6 - 12	175	400
				8 - 11	250	400	-	-	-
1	7/32	9.2	36	5.5 - 12.5	75	200	4.5 - 13.5	60	250
				6.5 - 11.5	125	250	6 - 12	125	300
				8 - 11	200	300	-	-	-
1-1/4	1/2	22.0	36	5.5 - 12.5	60	125	6 - 12	80	200
				7.5 - 10.5	110	200	7 - 11	100	225
			60	7.5 - 12	200	300	7 - 11	175	XX
				8 - 11	225	350	-	-	-
1-1/2	1/2	28.0	36	5.5 - 12.5	50	100	6 - 12	60	150
				7.5 - 10.5	85	150	7 - 11	75	175
			60	7.5 - 12	125	250	7 - 11	135	XX
				8 - 11	175	275	-	-	-
2	1/2	35.0	36	5.5 - 12.5	35	75	6 - 12	45	100
				7.5 - 10.5	70	100	7 - 11	60	135
			60	7.5-12	75	175	7-11	100	XX
				8 - 11	125	200	-	-	-

\*Lower Port Normally Closed

XX- Not Allowed

\*\*Upper Port Normally Closed

Shutoff pressures are in conformance with ANSI/FCI 70-2 Class III

### CAUTION!

*K3 is designed for 3-15 psi. Do not exceed 20 psi.*

## PRODUCT IDENTIFICATION

### KOMBAT SERIES K VALVE CODE SELECTION CHART

Model		Orifice Size	Valve Size	Connections	Trim Material	Packing	Actuator		Spring		Positioner		Posit. Set		Accessories	
K	1	T	E	8	1	1 - 3	6	R	B	M - P	0	2	0	1		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

#### Model -

Position 1 & 2  
 K1 = Bronze, Pneumatic  
 K3 = Bronze, 3 Way, Pneumatic  
 K4 = Cast Iron, Pneumatic  
 K5 = Bronze, Electric, FC  
 K6 = Bronze, Electric, FO  
 K7 = Bronze, 3 Way, Electric

#### Orifice Size -

Position 3  
 A  
 B  
 C  
 E  
 T

#### Valve Size -

Position 4  
 C = 1/2  
 D = 3/4  
 E = 1  
 F = 1 1/4  
 G = 1 1/2  
 H = 2  
 J = 2 1/2  
 K = 3  
 M = 4

#### Connections -

Position 5  
 2 = 125 Flg  
 8 = Unions

#### Trim Material -

Position 6  
 1 = Metal

#### Packing -

Position 7  
 1 = V-ring

#### Actuator -

Position 8 & 9  
**K1, K3, K4 only**  
 01 = None  
 36 = 36 sq. in.  
 60 = 60 sq. in.  
**K5, K6, K7 only**  
 90 = 0-10VDC  
 91 = 4-20mA  
 92 = 0-135ohm

#### Spring -

Position 10 & 11  
**All except K4**  
 DA = Dir 36  
 DC = Dir 36  
 DD = Dir 36  
 DG = Dir 60  
 FM = Dir 36  
 RA = Rev 36  
 RB = Rev 36  
 RC = Rev 36  
 RD = Rev 36  
 RE = Rev 36  
 DF = Dir 60  
 DG = Dir 60  
 RG = Rev 60  
**K4 only**  
 DH = Dir 60  
 RH = Rev 60  
 RQ = Rev 60  
 RT = Rev 60

#### Positioner -

Position 12 & 13  
 A = None  
 MI = Moore I/P  
 MP = Moore P  
 4P = PMV P4 P  
 5I = PMV P5 I/P  
 5P = PMV P5 P

#### Positioner Set

Position 14 & 15  
 01 = None  
 02 = 8-15/4-20 mA  
 03 = 3-9/4-12 mA  
 04 = 9-15/12-20 mA

#### Accessories -

Position 16 & 17  
 01 = None  
 02 = Limit Switch, Mechanical  
 03 = Limit Switch, Proximity Sw.  
 04 = Feedback Potentiometer 1K  
 05 = Feedback 4-20mA Posit. Tra

## MAINTENANCE

**Warning:** Injury or death can occur due to failure to completely isolate valve from all sources of pressure before beginning disassembly. Do not proceed until valve has been completely isolated from process stream and vented to atmosphere.

### REMOVAL OF ACTUATOR FROM VALVE BODY ASSEMBLY

Close inlet and outlet stop valves. Be sure valve body is not under pressure. Remove all accessories from control valve. Refer to Figure 2.

#### Reverse Acting Pneumatic Actuator

Loosen stem nuts (24) and move to approximately 1/3 down valve stem. Re-tighten being careful not to move valve stem. Energize actuator with air to lift the plug off the seat. Disengage lock nut (26) from bonnet (25). De-energize actuator. The actuator and yoke should move away from bonnet. Lift actuator and yoke assembly along with plug (39) off the seat. With an adjustable wrench, unthread valve stem from actuator stem (Fig. 3, #16) until valve stem is disengaged from actuator stem. Remove stem nuts, indicator, packing nut and lock nut.

#### Direct Acting Pneumatic Actuator

Energize actuator with air slightly (in case of back seating). Loosen stem nuts (24) and re-tighten approximately 1/8" away from actuator stem. Disengage lock nut (26) from bonnet (25). With an adjustable wrench, unscrew valve stem from actuator stem. When valve stem reaches seat, lift actuator (to prevent galling seat and plug). Remove stem nuts, indicator and lock nut.

### DISASSEMBLY OF VALVE BODY

Remove stem nuts (24), indicator (32) and lock nut (26). Lift yoke off bonnet (25). To complete body disassembly, unscrew bonnet for K3. Turn stem and plug assembly out of bonnet through packing. Replace packing if necessary. All parts should be inspected for wear and cleaned thoroughly before re-assembling valve body.

### DISASSEMBLY OF ACTUATOR

Remove actuator from valve. Remove regular casing bolts (4) and casing nuts (5). Gradually loosen nuts on remaining long casing bolts (14) to allow pre-compression of actuator springs. Remove upper casing (2). Pull actuator stem (16), along with diaphragm (15), springs (3) and piston (13), out through bushing (7). Place a wrench on the machined flats of actuator stem, and remove stem nut (10), seal washer (12) and stem washer (11). Remove o-ring (8) from bushing and replace if necessary. Lubricate o-ring after installing.

## RE-ASSEMBLY OF ACTUATOR

Refer to Figure 4 for correct orientation of casings, diaphragm (15), piston (13), stem (16) and springs (3) for direct or reverse action. Be sure piston spring recesses line up between casing ribs as shown in Figure 4. Lubricate bushing O-ring (8) and insert actuator stem through bushing. Re-attach upper casing (2) with long bolts (14) & nuts (5), tightening alternately. Install remaining casing nuts and bolts. Apply air to diaphragm case and check for leakage, full travel and dead band less than .2 psi.

## LAPPING PLUG INTO SEAT

Seats and plugs should never require more than the lightest touch up with very fine (400 grit) grinding compound. Heavy lapping will produce galling, a wider seating surface and a groove in the plug, all of which tend to cause leakage. Reface a damaged surface before attempting to grind it in. Lap sparingly. Replace stem and plug (39) in bonnet (25) through packing. Apply lapping compound to plug. Place bonnet on body. After lapping, disassemble and clean all parts thoroughly.

## PACKING REPLACEMENT

Check stem for gouges if packing leaks. Replacement packing cartridges can be installed.

## RE-ASSEMBLY OF VALVE BODY

Insert plug and then tighten bonnet (25) to body. Note that "R" on body must be up for sizes 1/2" - 1" and the "D" up for sizes 1-1/4" - 2". Install Inlet (42). Replace yoke (9), lock nut (26), stem nuts (24) and travel indicator (32) over stem (34).

## REPLACING ACTUATOR ON VALVE BODY - PNEUMATIC

Put actuator assembly over valve stem. Place lock nut (Fig. 2, #26), and stem nuts (24) with travel indicator (32) on valve stem. Rest actuator stem (16) on valve stem. Tighten stem nuts approximately 2/3 down valve stem. Lift actuator assembly and engage valve stem with actuator stem (be careful not to gall plug & seat).

## Reverse Acting

When sufficient engagement is met, the actuator can be energized with air to place the yoke on the bonnet (25) and lift the plug off the seat. Tighten lock nut and packing nut.

## Direct Acting

Engage valve stem with actuator stem so no contact is made between plug and seat when bottom of yoke is rested on bonnet. Tighten lock nut.

## ACTUATOR ADJUSTMENT - PNEUMATIC

Close inlet and outlet stop valves. Be sure valve body is not under pressure. Place a wrench on the machined flats of actuator stem (16). Counter two stem nuts (24) approximately halfway down the threads of the stem (34).

## Reverse Acting

Apply sufficient air pressure to diaphragm case to start moving valve through its rated travel. This is shown by travel indicator (32). Engage lower stem nut (24) and turn body stem (34) into actuator stem (16) until pre-compression of actuator springs (3) is relieved (plug should not be seating on seat ring when air pressure is removed from actuator case). Apply prescribed setting pressure to actuator. This is determined by specific operating conditions. Turn body stem out of actuator stem until plug seats on seat ring (28). To prevent galling, do not turn body stem after plug has contacted seat ring. Turn stem nuts up plug & stem assembly and tighten to lock them in position. Reduce air signal to 0 psi and calibrate indicator scale (20). Check that full travel is achieved with a 15 psi signal.

## Direct Acting

Engage lower stem nut (24) and turn body stem (34) into actuator stem (16) until plug & stem assembly stops at upper limit of travel and/or a slight downward movement of actuator stem is detected. Turn stem nuts up body stem and tighten them to lock in position. Calibrate indicator scale (20). Check that full travel is achieved at a 3 psi signal.

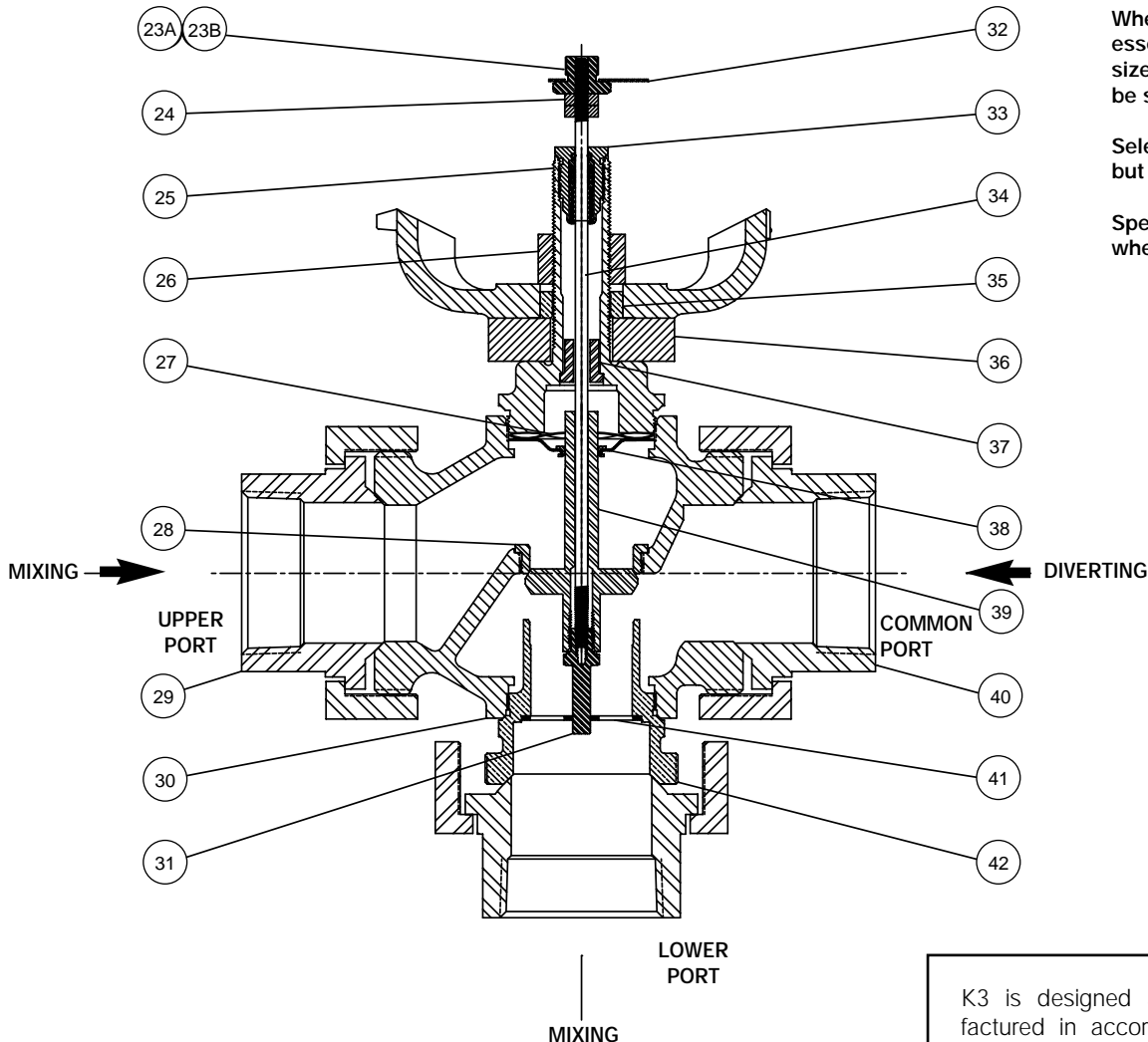
*It is solely the responsibility of the system designer and the user to select products and materials suitable for their specific application requirements and to ensure proper installation, operation and maintenance of these products. Assistance shall be afforded with the selection of the materials based on the technical information supplied to Spence Engineering Company, Inc.; however, the system designer and user retain final responsibility. The designer should consider applicable Codes, material compatibility, product ratings and application details in the selection and application. Improper selection, application or use of the products described herein can cause personal injury or property damage. If the designer or user intends to use the product for an application or use other than originally specified, he must reconfirm that the selection is suitable for the new operating conditions.*

## VALVE BODY ASSEMBLY PART NUMBERS

ITEM	PART NAME	QTY	MATERIAL	½"	¾"	1"	1¼"	1½"	2"
23A*	STEM BOLT - SHORT	1	BRASS	4-17277-0	4-17277-0	4-17277-0	4-17277-0	4-17277-0	4-17277-0
23B**	STEM BOLT - LONG	1	BRASS	4-17281-00	4-17281-00	4-17281-00	4-17281-00	4-17281-00	4-17281-00
24	STEM NUT	2	BRASS	05-17342-00	05-17342-00	05-17342-00	05-17342-00	05-17342-00	05-17342-00
25	BONNET	1	BRASS	558B107-02	558B107-02	558B107-02	558B110-02	558B110-02	558B110-02
26	LOCK NUT	1	ST STL	05-17330-00	05-17330-00	05-17330-00	05-17330-00	05-17330-00	05-17330-00
27	WAVE WASHER	1	ST STL	122A155-01	122A155-01	122A155-01	122A155-02	122A155-02	122A155-02
28	SEAT	1	ST STL	562A114-01	562A114-01	562A114-02	562A114-03	562A114-04	562A114-05
29	UNION TAILPIECE	3	GALV IRON	SZ227	SAA227	SMP463	SBB227	SMP465	SMP593
30	BODY	1	BRONZE	SAM1167B	SAM1167B	SAM1167B	SAN1167B	SAN1167B	564B116-01
31	ADAPTER	1	ST STL	141A166	141A166	141A166	141A166	141A166	141A166
32	TRAVEL INDICATOR	1	ALUM	05-12962-00	05-12962-00	05-12962-00	05-12962-00	05-12962-00	05-12962-00
33	V RING PACKING SET	1	TFE/SS/VITON	204A104-01	204A104-01	204A104-01	204A104-01	204A104-01	204A104-01
34	STEM	1	ST STL	552A110-03	552A110-03	552A110-03	552A114-03	552A114-03	552A114-03
35	YOKE BUSHING	1	BRASS	04-17278-00	04-17278-00	04-17278-00	04-17278-00	04-17278-00	04-17278-00
36	SPACER	1	BRASS	04-17280-00	04-17280-00	04-17280-00	04-17280-00	04-17280-00	04-17280-00
37	BONNET GUIDE	1	BRASS	556A113-01	556A113-01	556A113-01	556A113-01	556A113-01	556A113-01
38	GUIDE	1	ST STL	556A111-01	556A111-01	556A111-01	556A111-02	556A111-02	556A111-02
39	PLUG	1	ST STL	554A151-01	554A151-01	554A151-02	554A151-03	554A151-04	554A151-05
40	UNION NUT	3	GALV IRON	SMP468	SMP468	SMP468	SMP470	SMP470	SMP592
41	GUIDE	1	BRASS	SK832	SK832	SK832	SL832	SL832	SM832
42	INLET	1	BRONZE	562B105-01	562B105-01	562B105-02	562B106-01	562B106-02	562B106-03

\* Not included in body assembly; order K-KIT separately.

\*\*Not included in body assembly; order separately.



When ordering parts, it is essential that the valve type, size, service and serial number be stated.

Select part by item number, but order by part number.

Specify complete part number when ordering.

**FIGURE 2  
VALVE BODY ASSEMBLY**

K3 is designed and manufactured in accordance with Article 3, Section 3 of the Pressure Equipment Directive.

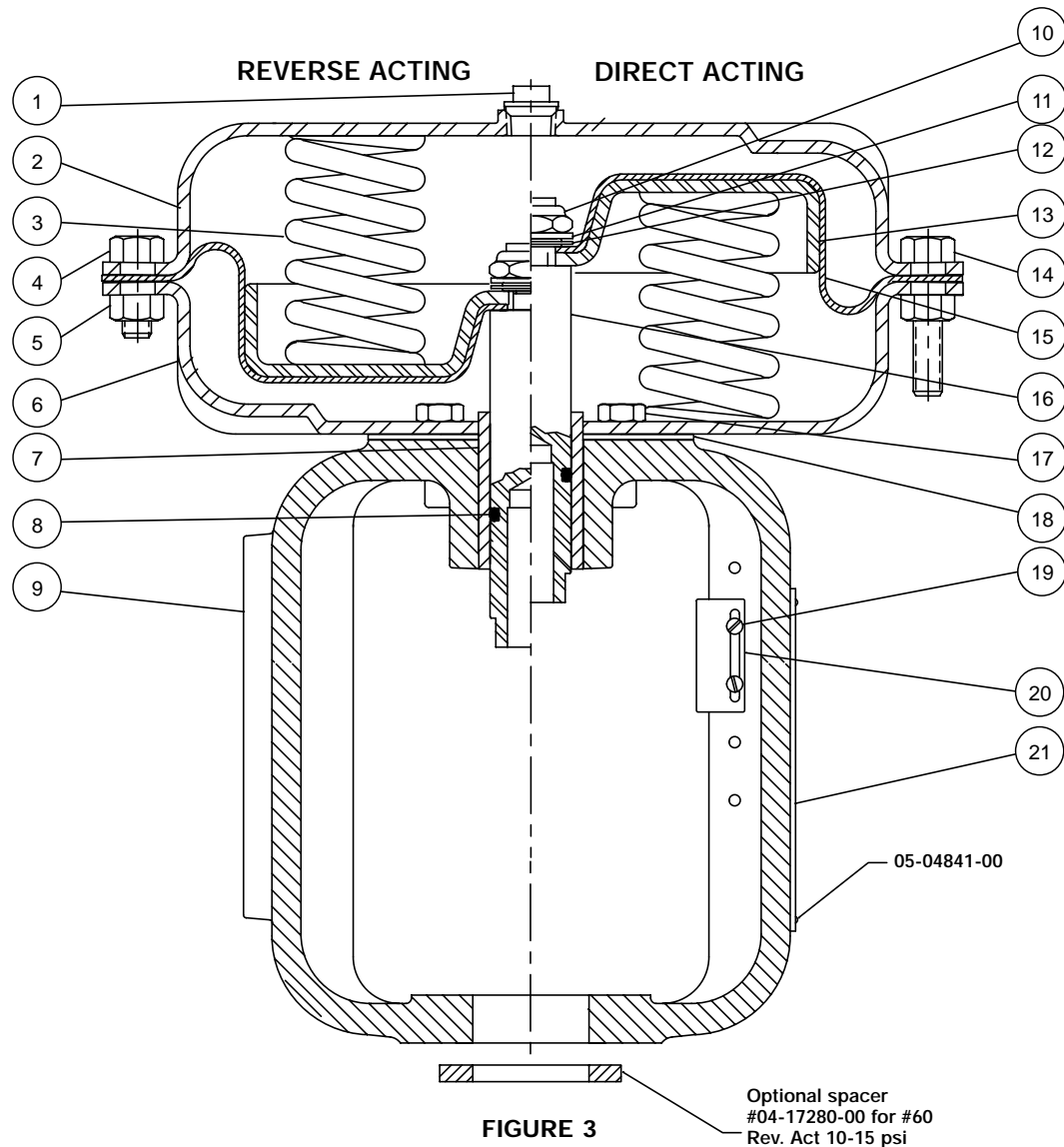
## ACTUATOR PART NUMBERS

ITEM #	PART NAME	MATERIAL	PART #	QTY
1	Vent plug	H.D.poly	—	1
2	Upper casing	Stl/powder coat	—	1
3	Springs	Steel	See Below	See Below
4	Casing bolt standard	304 ss	—	10/14
5	Casing nut	316ss	—	12/16
6	Lower casing	Stl/powder coat	—	1
7	Bushing	Bronze	—	1
*8	O Ring	Buna-n	05-04017-00	1
9	Yoke	Cl/powder coat	—	1
*10	Stem nut	Steel	05-13374-00	1
*11	Stem washer	316 ss	05-12963-00	1/3
*12	Seal washer	Steel	05-13203-00	1
13	Piston	316 ss	—	1
14	Casing bolt long	304 ss	05-04889-00	2
*15	Diaphragm - 36 sq. in.	Nitrile	0@-12968-00	1
	Diaphragm - 60 sq. in.		0@-12986-00	1
16	Actuator stem	303 ss	—	1
17	Machine screw	Steel	—	3
*18	Casing gasket	Buna-n	05-12566-00	1
19	Machine screw	Steel	—	2
20	Indicator scale	Aluminum	05-17470-00	1
21	Specification plate	Aluminum	05-13199-00	1

\*These parts furnished in Actuator Repair Kit.

## ACTUATOR REPAIR KIT PART NUMBERS

36 SQ. IN.	60 SQ. IN.
51447	51448



**FIGURE 3**  
**ACTUATOR ASSEMBLY**

## ACTUATOR SPRING KITS

Part #		Reverse-Lower Port Normally Closed				Direct-Upper Port Normally Closed				Spring Kit Includes:			
		7/32" Travel		1/2" Travel		7/32" Travel		1/2" Travel		Spring			Other
Part #	Notes	Code	Range	Code	Range	Code	Range	Code	Range	QTY	Color	Part #	
36KIT098	(1)	-	-	-	-	36DM	4.5-13.5	-	-	6	SILVER	05-05007-00	-
36KIT100	(1)	36RA	5.5-12.5	-	-	36DA	6-12	-	-	6	YELLOW	05-12991-00	-
36KIT102	(1)	36RB	6.5-11.5	-	-	-	-	-	-	6	YELLOW	05-12992-00	-
36KIT104	(2)	36RC	8-11	36RC	5.5-12.5	-	-	36DC	6-12	6	RED	05-13090-01	-
36KIT106	(1)	-	-	-	-	-	-	36DD	7-11	4	RED	05-13090-01	-
36KIT108	(2)	-	-	36RE	7.5-10.5	-	-	-	-	6	GREEN	05-13085-00	05-04889-00 (2) Bolts
60KIT100	(3)	-	-	60RG	7.5-12	-	-	60DG	7-11	6	BROWN	05-13093-01	-
60KIT102	(2)	-	-	60RH	8-11	-	-	-	-	4	BROWN	05-13093-01	-

<sup>1</sup> For Direct Shutoff - Invert Springs, Piston and Diaphragm from Reverse Shutoff Actuator.

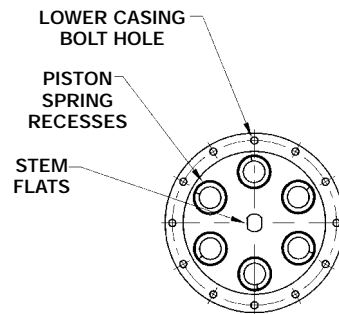
(1) Mounts using KKIT-1

(2) Mounts using KKIT-2

(3) Mounts using KKIT-4

## K3 ACTUATOR CONNECTOR KITS

PART #	SIZE	KKIT Includes:		
		Stem Bolt	Bushing	Spacer
KKIT-1	1/2 - 2	04-17277-00	04-17278-00	-
KKIT-2	1/2 - 2	04-17281-00	04-17278-00	-
KKIT-4	1/2 - 2	04-17277-00	04-17278-00	04-17280-00



**FIGURE 4**  
**PISTON DIAPHRAGM ASSEMBLY**



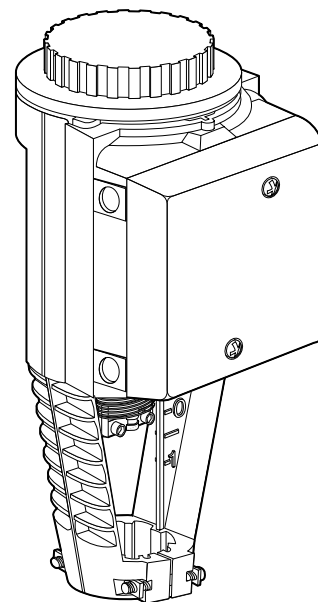
# Electronic Valve Actuator

## SEA 62U 24 Vac Proportional control

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EA0379R1



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### Description

The Spence Electronic Valve Actuator requires a 24 Vac supply and receives a 0 to 10 Vdc, 4 to 20 mA or 0 to 135 Ohm control signal to proportionally control a valve. This actuator is designed to work with Spence Engineering Kombat K5 & K6 Control Valves.

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### Features

- Direct-coupled installation requires no special tools or adjustments
- Visual and electronic stroke indication
- Die-cast aluminum housing
- Manual override
- Spring return to fail safe position
- Maintenance-free

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### Application

These electronic actuators are designed to be used with Spence Series K valves in liquid service and steam service applications.



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### Product Number

SEA62U

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## Warning/Caution Notations

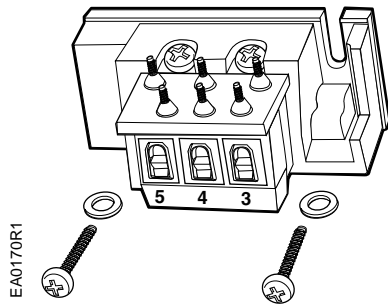
<b>WARNING</b>		Personal injury/loss of life may occur if a procedure is not performed as specified.
<b>CAUTION</b>		Equipment damage, or loss of data may occur if the user does not follow procedure as specified.

## Specifications

<b>Power supply</b>	Operating voltage	24 Vac $\pm$ 20%	
	Frequency	50/60 Hz	
	Power consumption	18 VA	
<b>Control signals</b>	Control input (Y)		
	Voltage	0 to 10 Vdc	
	Current	0.1 mA max.	
	Control input (R)		
	Resistance	0 to 1000 ohms	
	Voltage	0 to 1.6 V	
	Control input (R)		
	Current	4 to 20 mA	
	Maximum impedance	250 ohms	
	Control output (U)		
	Voltage	0 to 10 Vdc	
	Current	0.5 mA max	
<b>Function</b>	Control output (U)		
	Current	4 to 20 mA	
	Maximum impedance	250 ohms	
	Nominal stroke	3/4-inch (20 mm)	
	Run time with control operation (full stroke)		
	Power stroke, 0 to 100%	30 seconds	
	Return stroke, 100 to 0%	15 seconds	
	Nominal Force		
	NC and 3-Way upper	<b>Stroke</b> 0%	<b>Force</b> 225 lbs. (1000 N)
	NO and 3-way by-pass	100%	258 lbs. (1150 N)
<b>Agency Certification</b>		UL listed to UL873	
		C-UL certified to Canadian standard	
		C22.2 No. 24-93	
<b>Ambient conditions</b>	Ambient temperature	5 to 130 °F (-15°C to 55°C)	
	Media temperature	14 to 300 °F (-10 to 150°C)	
<b>Miscellaneous</b>	Dimensions	See <i>Figure 20</i> .	
	Conduit opening	1/2-inch NPSM	
	Weight	7.5 lbs. (3.4 kg)	
	Housing Enclosure	NEMA 1	

**Accessories**

**NOTE:** Installation instructions are included with each accessory.



**Figure 1. Auxiliary Switch.**

**ASC1.6** Auxiliary switch.

The switch sends a signal to indicate that the valve is in the 0% stroke position. The switching point is fixed at the 0% stroke position.

Switching capacity      24 Vac  
                                    4 A resistive  
                                    2 A inductive

Lowest recommended  
current                      10 mA

**Service Kits**

The only field serviceable part is the circuit board.

Circuit board replacement	4 668 5638 8
Plastic wiring compartment cover	4 104 5643 8
Manual Override Kit for SEA	4 268 5504 8



**WARNING:**

This product contains a spring under high compression. Do not attempt to disassemble the actuator.

SEA Details

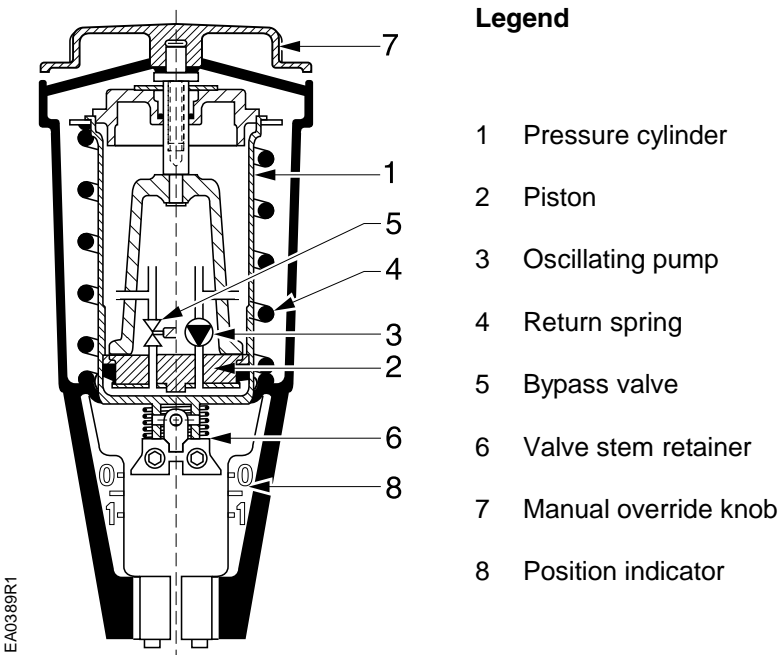


Figure 4. SEA Details.

Operation

The actuator accepts a 0 to 10 Vdc, 0 to 135 or a 4 to 20 mA control signal. The actuator, mounted on a valve, produces a stroke proportional to the input signal. When power is turned off or in the event of a power failure, the actuator spring returns the valve to its normal position.

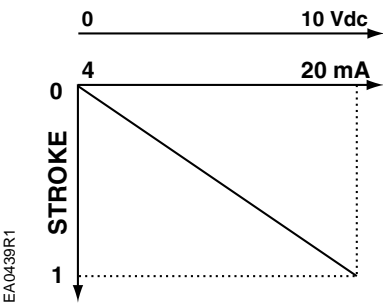


Figure 5.

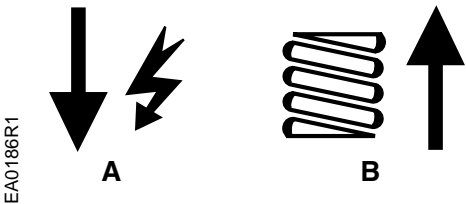
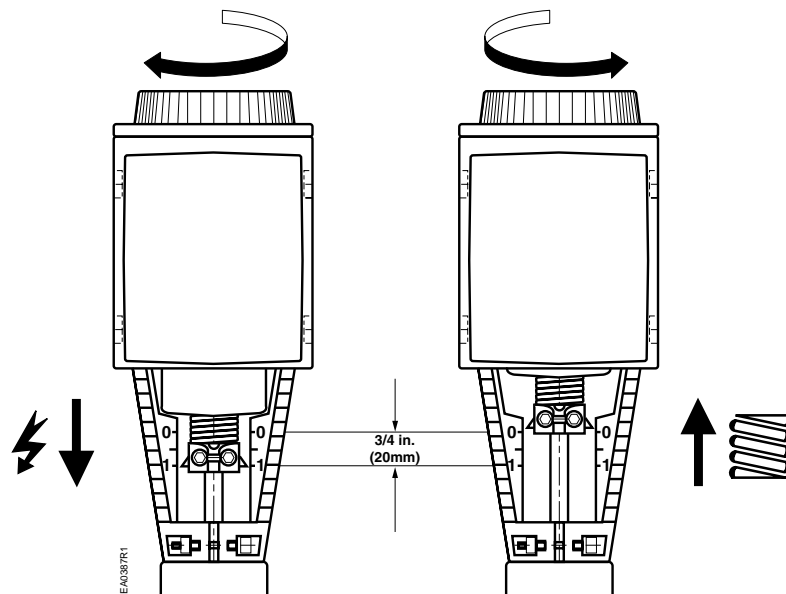


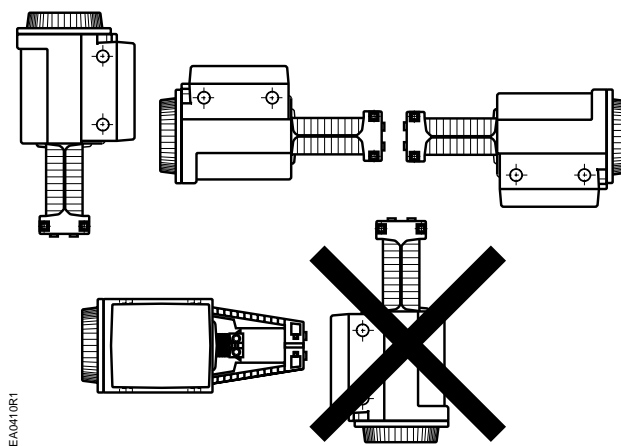
Figure 6.

## Operation, continued



**Figure 7. Valve Stem Travel Indication.**

## Mounting and Installation



**Figure 8. Acceptable Mounting Positions.**

The vertical position is the recommended position for mounting. The acceptable mounting positions are shown in *Figure 8*.

Allow four inches (100 mm) around the sides and back of the actuator and eight inches (200 mm) above and to the front of the actuator.

See *Dimensions* in *Figure 20*.

Detailed installation instructions for field mounting are shipped with the actuator.

---

**Start-Up**

Check the wiring for proper connections.

**NOTE:** The valve body assembly determines the complete assembly action.

**Normally Closed Valve**

Actuator pressure cylinder moves outward (0 to 1): Valve opens.

Actuator pressure cylinder moves inward (1 to 0): Valve closes.

**Normally Open Valve**

Actuator pressure cylinder moves outward (0 to 1): Valve closes.

Actuator pressure cylinder moves inward (1 to 0): Valve opens.

**Three Way Valve**

Actuator pressure cylinder moves outward (0 to 1): Valve opens between port NC and C.

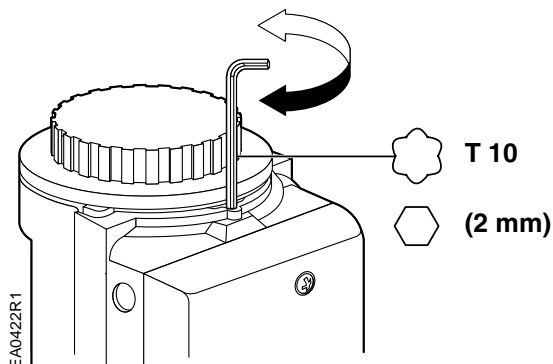
Actuator pressure cylinder moves inward (1 to 0): Valve opens between ports NO and C.

The measuring voltage at terminal U provides valve stem position feedback to an indicating instrument or building automation system.

**Position feedback signal**

It may be necessary to adjust the start point of the feedback signal. The amount of adjustment possible ranges from a minimum of 0.18 Vdc to a maximum of 0.33 Vdc.

You may make the adjustment without removing the cover to the wiring compartment.



**Figure 9. Adjusting the Position Feedback Signal.**

For NC and three-way valves

- Make sure the manual override knob is in the automatic position.
  - Electronically command the valve to 0% position and read the output signal.
  - Using a T10 Torx wrench or a 2 mm hex Allen key, turn the adjustment key until the position output signal also indicates 0% position. See *Figure 9*.
-

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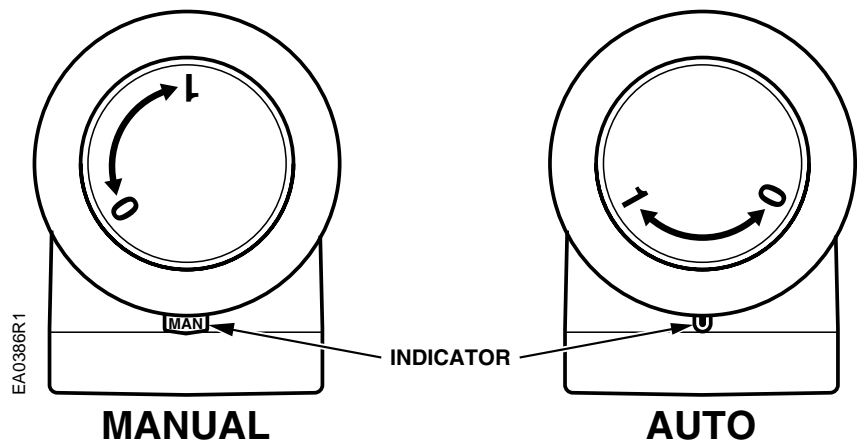
## Start-Up, continued

### Position feedback signal

For NO valves:

- Make sure the manual override knob is in the automatic position.
  - Electronically command the valve to 100% and read the output signal.
  - Using a T10 Torx wrench or a 2 mm hex Allen key, turn the adjustment key until the position output signal also indicates 10 Vdc or 20 mA. See *Figure 9*.
- 

### Manual operation



**Figure 10. The Manual Setting Knob in Manual and Automatic Position.**

Turn the manual setting knob clockwise for manual operation. As you begin to turn, a red indicator becomes visible. Each complete revolution (360°) is equal to 3/32-inch (2.5 mm) stroke.

If a signal is sent to the actuator while it is in manual operation, the actuator will move but the control will not be accurate. The valve cannot be commanded to its 0% position while in manual operation.

---

### Automatic operation

For automatic operation the manual override knob must be in the fully closed position.

Turn the manual override knob counterclockwise until the red indicator disappears.

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### Wiring

Do not use auto transformers. Use earth ground isolating step-down Class 2 power supplies.

Determine supply transformer rating by summing total VA of all actuators used.

The maximum rating for Class 2 step-down transformer is 100 VA. Since SEA62U actuator requires ≈20 VA, a maximum of four actuators can be powered by one transformer (80% of transformer VA). Operating more than four SEA 62U actuators requires additional transformers or separate 100 VA power supplies.

The position output signal U will automatically switch from 0 to 10 Vdc to 4 to 20 mA when a 4 to 20 mA input signal is used on the R terminal.

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Wiring, continued

If the circuit board jumper R—M is cut, you cannot wire the R and M terminals on the terminal block to re-establish the connection.

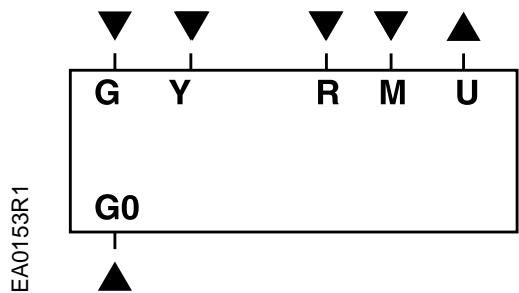


Figure 11. Connecting Terminals.

- |       |  |
|-------|--|
| G, G0 | Operating voltage 24 Vac   |
| G     | System Potential (SP)  |
| G0    | System Neutral (SN)  |
| Y     | Control input 0 to 10 Vdc  |
| R     | Input for 4 to 20 mA or 0 to 1000 Ohm remote setting unit                                    |
| M     | Measuring neutral  |
| U     | Output for 0 to 10 Vdc or 4 to 20 mA measuring voltage. It will match the input signal type. |

Wiring Diagrams

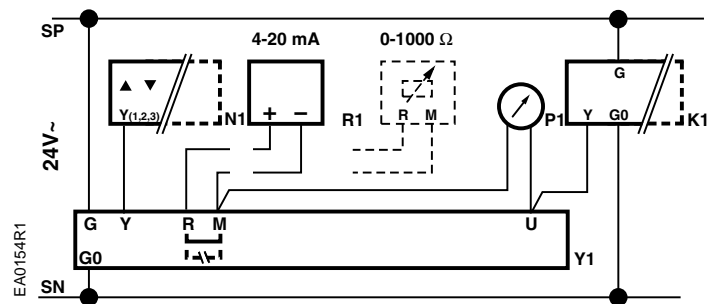


Figure 12. Wiring for Applications.

- |    |               |    |                     |
|----|---------------|----|---------------------|
| K1 | On/Off switch | P1 | Indicating unit     |
| N1 | Controller    | R1 | Remote setting unit |
| Y1 | Actuator      |    | 4 to 20 mA or       |
|    |               |    | 0 to 1000 Ohm       |

The diagram shows all possible connections. The application determines which connections are used.



## Wiring Diagrams, continued

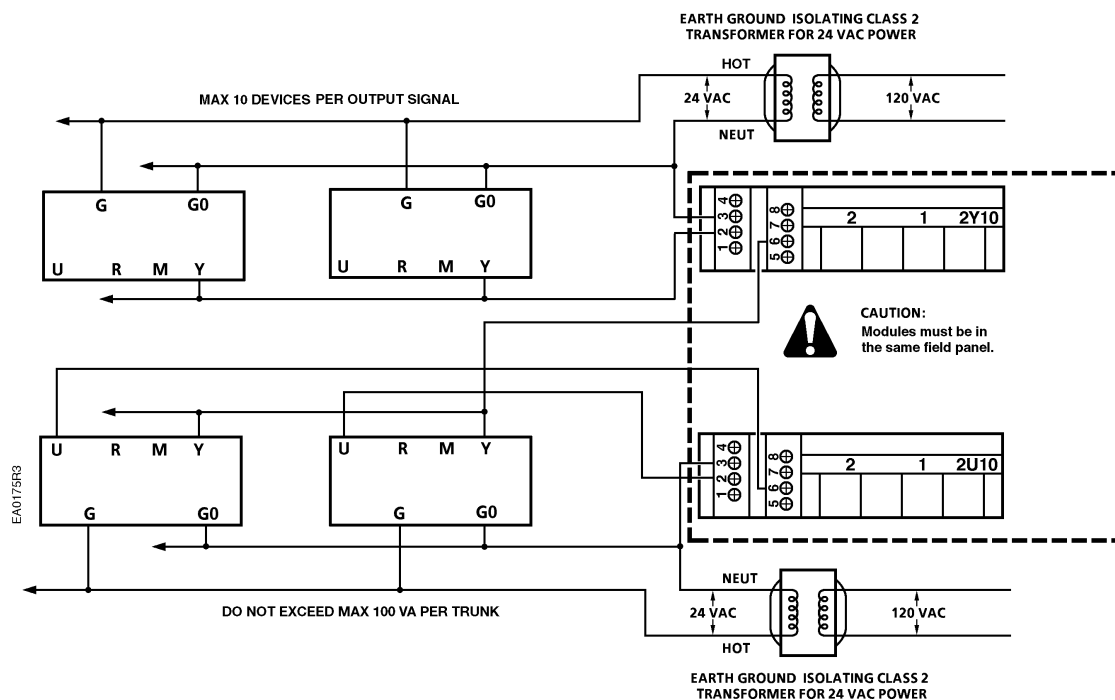


Figure 13. Wiring to Point Termination Modules PTM6.2Y10S and PTM6.2U10 with 0 to 10 Vdc Signal.

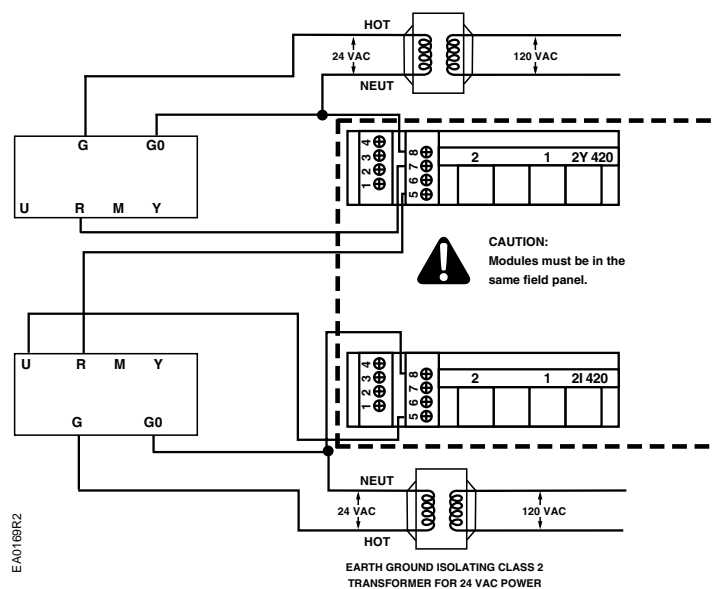
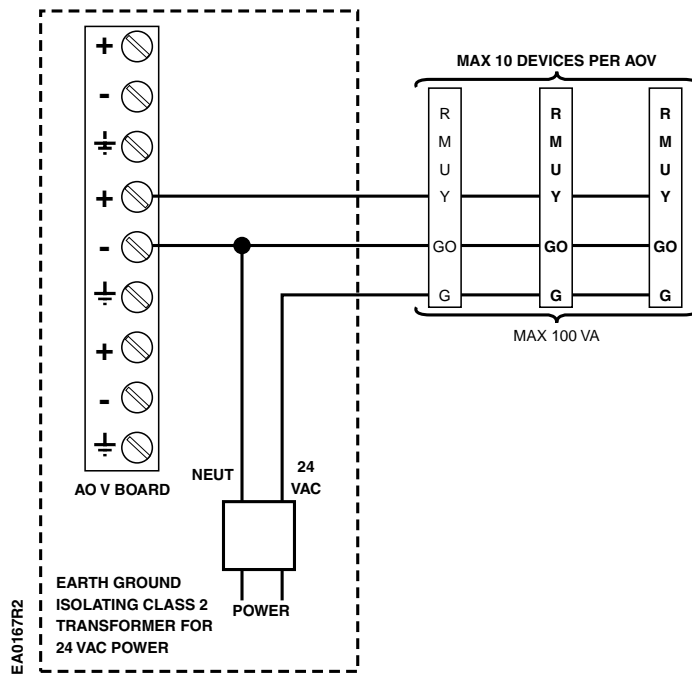
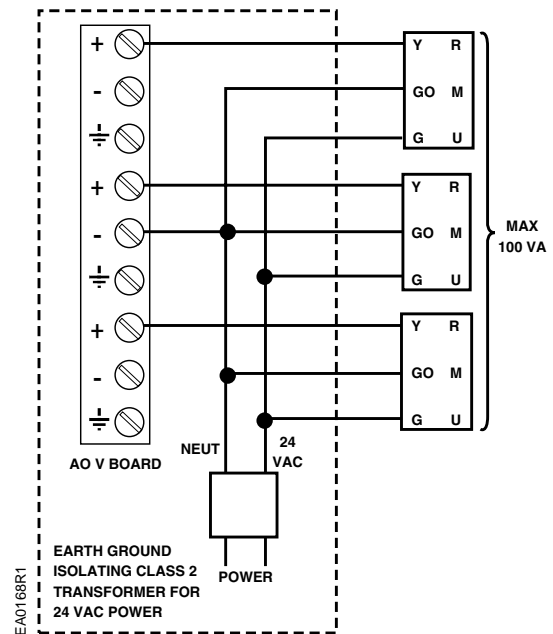


Figure 14. Wiring to Point Termination Modules PTM6.2Y420 and PTM6.2I420 with 4 to 20 mA Signal.

## Wiring Diagrams, continued

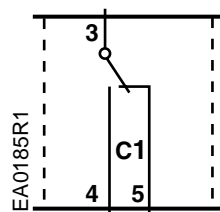


**Figure 15. SCU Wiring Diagram for SEA in Series with 0 to 10 Vdc signal.**



**Figure 16. SCU Wiring Diagram for SEA in Parallel with 0 to 10 Vdc signal**

## Accessories



**Figure 17. Auxiliary Switch ASC1.6.**

## Troubleshooting

Check that the wires are connected correctly and attached securely.

Check for adequate power supply.

Check that the actuator is set for automatic operation. See the *Start-Up* section.



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## INSTALLATION, OPERATING AND MAINTENANCE INSTRUCTIONS AIR OPERATED SWITCHOVER STATION

### A. SCOPE

To provide installation, operation and maintenance instructions for an air operated switchover station using pneumatic control valves.

### B. INTENDED PURPOSE

Spence Air Operated Switchover Stations are designed for use when the system rangeability exceeds 10:1. This system permits the larger of two parallel valves to operate from one quarter to full valve capacity.

### C. OPERATION

The station consists of two Spence 'J' Control Valves with Positioners installed in parallel. The smaller Control Valve is sized for some fraction of the design load (typically one quarter or one third). The larger Control Valve is sized for full design load. Both Valves are controlled by a single Spence P60 P. I. Controller. An interlocking system of pneumatic relays provide the logic to sequence the operation of the system.

Under low flow conditions, the smaller valve will handle the demand on the station. The larger valve will be shut. As demand increases, the smaller valve will gradually open until it reaches it's full open position. Upon further increase in demand, the larger valve will open and, simultaneously, the small valve will shut in a "bumpless" load transfer. The larger

valve will now carry the load. Should demand drop, this sequence reverses and control of flow is transferred back to the smaller valve.

The Spence 'J' Valve with a pneumatic positioner will fully open with an input signal of 6 psi (3-9) (9-15). The Type P60 Controller has a standard output of 3-15 psig. Sequencing of control is obtained by splitting the P60 output signal into two 6 psig span portions; 3 to 9 psig and 9 to 15 psig. The output signal from the P60 controller is directed to a 61L relay and a 67R relay to sequence the valve's opening.

The larger valve is isolated from the low flow conditions by its setting and/or its pneumatic positioner. The small valve is isolated from high flow conditions by a reversing relay. The relay passes the 3 to 9 psi controller signal to the small valve and, at 9 psig, starts to close the small valve while the large valve is opening.

### D. PLANNING THE INSTALLATION

1. Locate each control valve in a straight run of horizontal pipe. Provide a three-valve bypass to facilitate inspection without interrupting service.
2. Install adequate traps before and after the control valves and before a secondary control valve, if

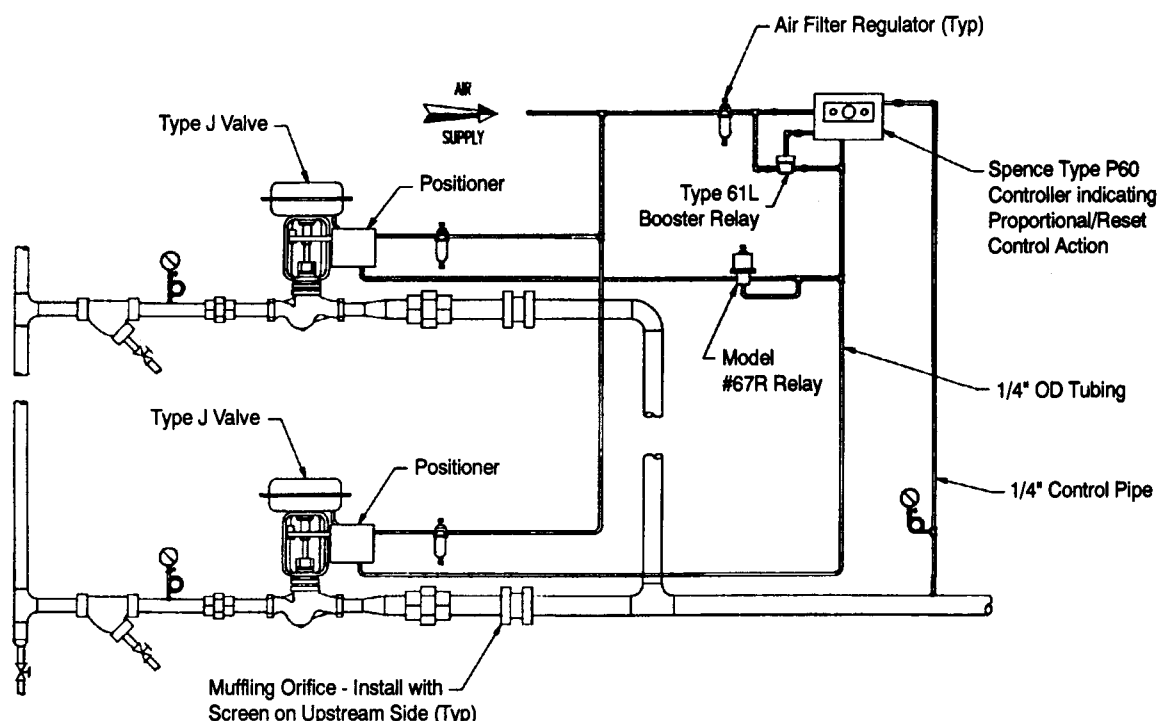


FIG. 1 — RECOMMENDED INSTALLATION

used. This will prevent water hammer and erratic operation from entrained condensate.

3. Install a strainer ahead of each control valve to avoid damage from pipeline scale and debris.
4. Enlarge the downstream piping to maintain reasonable flow velocities. A tapered expansion is recommended. Avoid a sharp turn close to the control valve outlet.
5. Install inlet and outlet pressure gages to indicate control valve performance. If the pressure rating of any downstream component is less than initial pressure, provide a properly sized safety valve.

#### **P60 PILOT INSTALLATION**

1. Mount the P60 Pilot vertically on a panel or wall where it is reasonable free of vibration and wide temperature fluctuations.
2. Confirm that the P60 is set for reverse action (nozzle in up position and green pointer in the correct zone (Refer to SD4121)).
3. Use 1/4" pipe, hand valve and pigtail syphon to connect the P60 "process" connection to the desired point of pressure control.
4. This sensing pipe should be located at a point of minimum turbulence. The sensing point should be a minimum of 4 pipe diameters beyond the downstream pipe expansion. Never locate the sensing line immediately downstream of a control valve outlet or a turn.
5. Connect instrument air supply to an air filter regulator and to supply connection on P60.
6. Connect the P60's output to the 61L relay's input.
7. Connect the 61L relay's output to the 67R relay's input and to the large J Valve Positioner's input.
8. Connect the output of the 67R relay to the small J Valve Positioner's input.
9. Connect instrument air supply of 60 psig maximum to the positioner.

#### **F. STARTUP AND ADJUSTMENT**

1. Confirm that P60 pilot is adjusted for reverse action. Set the proportional band at approximately 50% and the reset at 0.5 repeats per minute (See SD 4121).
2. Adjust air filter regulator to provide 20 psig supply air to the P60 pilot. Move setpoint indicator (red pointer) to obtain 9 psig on its output gauge.
3. Adjust the positioner on the small valve so that it starts to open the valve at 3 psig and is fully open at 9 psig. Adjust the #67R relay so that it vents the actuator on the small valve at 9 psig. Adjust the positioner on the large valve so the valve starts to open at 8 psig and is fully open at 15 psig (See instruction for positioner adjustment).
4. Use air filter regulator to shut off supply air to the P60. Move setpoint indicator to the desired delivery pressure setpoint.
5. Warm up the downstream piping by cracking the bypass valve. Then gradually open the bypass until the delivery pressure is just below the desired setpoint.
6. Crack open the inlet stop valves of both control valves. *Blow down strainers.* Then open both inlet and outlet valves wide.
7. Gradually provide supply air to the P60 pilot until the station comes on the line and brings the delivered pressure to the desired setpoint. Note that the smaller control valve will open first. Depending on demand, the larger control valve may or may not open.
8. Gradually close down the bypass and increase P60 supply pressure to 20 psig.
9. The station is now under the control of the P60 pilot. Observe the delivery pressure for proper control. If the station cycles or is sluggish, the P60 Controller must be tuned to the process (Refer to Instruction SD 4121).