

November 2021

# Spence Type E2 Main Valve



## WARNING

Failure to follow these instructions or to properly install and maintain this equipment could result property damage and personal injury or death.

Type E2 main valve must be installed, operated and maintained in accordance with federal, state and local codes, rules and regulations and Emerson instructions.

If the valve vents gas or a leak develops in the system, service to the unit may be required. Failure to correct issue could result in a hazardous condition.

Installation, operation and maintenance procedures performed by unqualified personnel may result in improper adjustment and unsafe operation. Either condition may result in equipment damage or personal injury. Only a qualified person shall install or service the Type E2 main valve.

## Introduction

### Scope of the Manual

This manual provides instructions for the installation, troubleshooting, maintenance, valve setting and parts ordering for Type E2 main valve regulator.

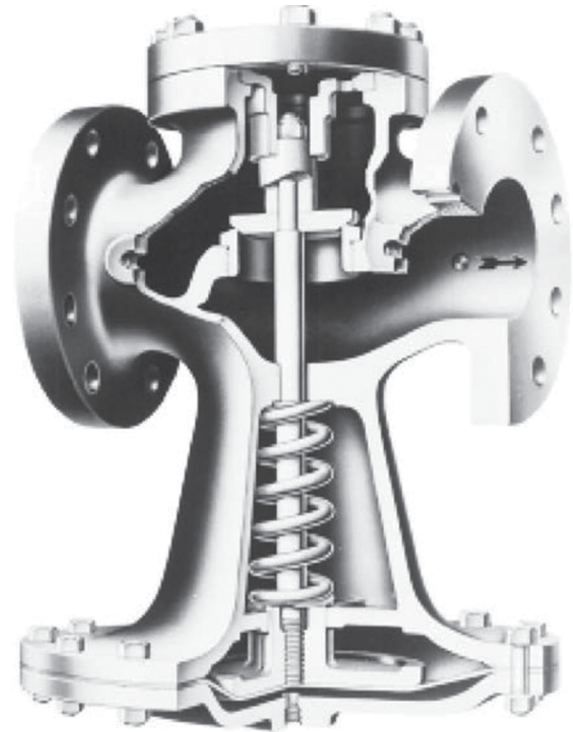


Figure 1. Type E2 Main Valve

## Product Description

The Type E2 Main Valve is pilot-operated normally closed, single seat design featuring packless construction, and protected main spring.

One or more pilot regulators are mounted to Type E2 main valve to fit with the specifications defined by the pressure or temperature regulating system.

# Type E2

## Specifications

This section lists the specifications for the Type E2 main valve. Factory specifications are stamped on the nameplate fastened on the regulator at the factory.

<p><b>Valve Sizes</b> NPS 3/4, 1, 1-1/4, 1-1/2, 2, 2-1/2, 3, 4, 5, 6, 8 and 10 / DN 20, 25, 32, 40, 50, 65, 80, 100, 125, 150, 200 and 250</p> <p><b>End Connection Styles</b> NPT, CL125</p> <p><b>Pressure Rating<sup>(1)</sup></b> 15 psig / 1.03 bar</p>	<p><b>Temperature Rating<sup>(1)</sup></b> 250 °F/ 121 °C</p> <p><b>Rated Flow Coefficient</b> See Table 1</p> <p><b>Main Valve Material</b> Cast Iron</p> <p><b>Approximate Weight</b> See Table 2</p>
--	---

1. The pressure/temperature limits in this Instruction Manual and any applicable standard or code limitation should not be exceeded.

**Table 1. Type E2 Main Valve Rated Flow Coefficients**

SEAT FACTOR	REGULATOR SIZE, NPS / DN											
	3/4 / 20	1 / 25	1-1/4 / 32	1-1/2 / 40	2 / 50	2-1/2 / 65	3 / 80	4 / 100	5 / 125	6 / 150	8 / 200	10 / 250
Full	7.6	11.7	18.9	27.4	44	68	96	143	202	255	465	748
70 to 75%	----	8.8	13.2	19.2	30.8	47.6	67.2	100	141	178	----	----
46%	----	----	----	12.3	----	30.6	----	64.4	----	115	----	336

**Table 2. Type E2 Main Valve Approximate Weight**

VALVE SIZE		END CONNECTION STYLE			
		NPT		FLANGE	
NPS	DN	lbs	kg	lbs	kg
3/4	20	18	8.16	----	----
1	25	19	8.62	21	
1-1/4	32	30	13.6	33	
1-1/2	40	36	16.3	40	
2	50	50	22.7	57	
2-1/2	65	----	----	70	
3	80	----	----	98	
4	100	----	----	135	
5	125	----	----	185	
6	150	----	----	250	
8	200	----	----	415	
10	250	----	----	690	

## Principle of Operation

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, see Figure 3. When the pilot is opened (see pilot instructions), initial pressure flows through the pilot to the 8B tee. 4A bleed port 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.

## Installation



### WARNING

**Personal injury or system damage may result if this regulator is installed, without appropriate overpressure protection, where service conditions could exceed the limits given in the Specifications section and/or regulator nameplate.**

**Additionally, physical damage to the regulator may result in personal injury or property damage due to escaping of accumulated gas. To avoid such injury and damage, install the regulator in a safe location.**

**Under enclosed conditions or indoors, escaping gas may accumulate and be an explosion hazard. In this case, the vent should be piped outdoors.**

**For regulator constructions with a spring case vent, the vent should be kept open to permit free flow of gas to the atmosphere. Protect openings against entrance of rain, snow, insects or any other foreign material that may plug the spring case vent or vent line.**

**All pressure equipment should be installed in a non-seismic area; should not be exposed to fire; and should be protected from thunderbolt (lightning) strikes.**

## 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 pressure relief valve or control valve.
- Avoid damaging effects of scale and dirt in the pipe lines by using a strainer as shown in Figure 2.
- 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

- 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

### *For Side Mount Construction*

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

# Type E2

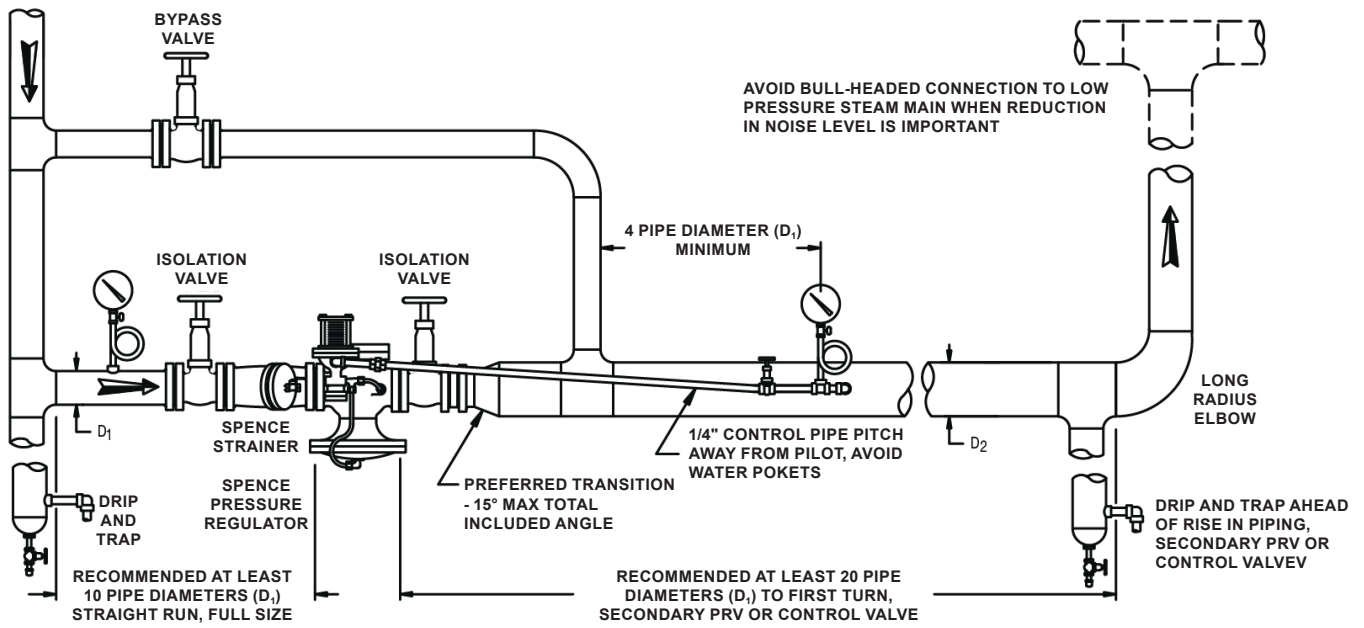
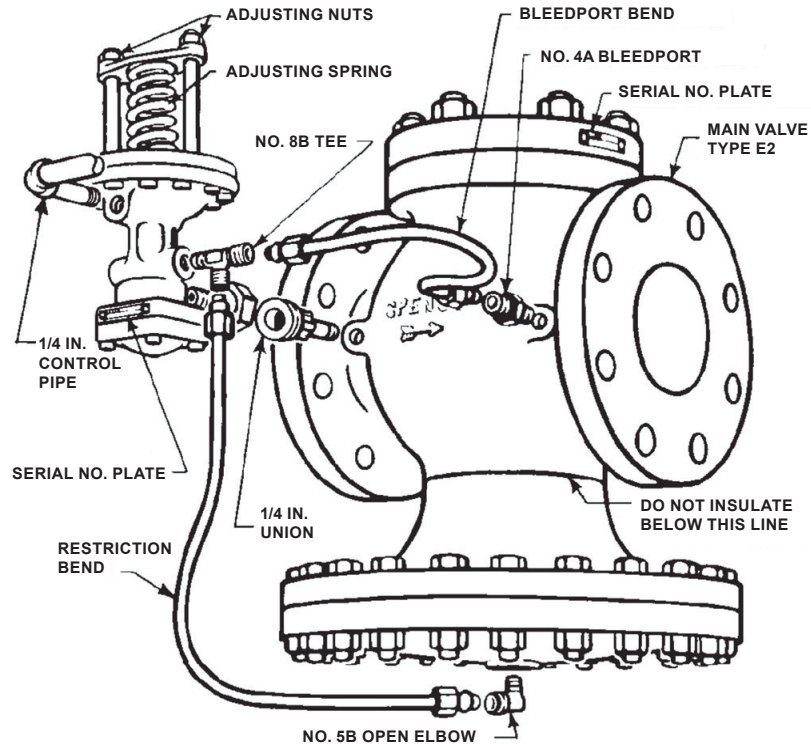


Figure 2. Type E2 Main Valve Installation



**Figure 3.** Mounting Pilot on Type E2 Main Valve

### *For Integral Mount Construction*

1. Remove blind flange on pilot and mount on blind flange of main valve using provided bolt.
2. Screw 4A bleed port fitting into the 1/8 in. pipe tap at the outlet of the main valve body. Note bleed orifice in this fitting is vital to operation of regulator.
3. Screw 8B tee into 1/8 in. pipe tap in pilot. Select tap facing downstream.
4. Screw No. 5B elbow into 1/8 in. pipe tap on underside of main valve diaphragm chamber.
5. Connect tubing bends as illustrated in Figure 3.

### **Control Pipe (Not required with Type T14)**

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

## Start-up and Setting



**Never open a reducing valve without positive indication that the high side is clear of condensate.**

1. On pressure reducing valves like Type E2, use by-pass to fill the delivery system and raise pressure to slightly below normal required.
2. Close pilot by releasing compression on adjusting spring. See Figure 3.
3. Open 1/4 in. control pipe valve.
4. Crack outlet stop valve.
5. Crack inlet stop valve.
6. Blow down strainer.
7. Open inlet stop valve and gradually compress adjusting spring until the valve opens and takes control at desired pressure.
8. 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.

## Valve Setting

Valve setting is gaged at K to establish correct stem length and diaphragm position. Dimension K is supplied with each replacement stem. See Table 5 for K values.

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

## Troubleshooting

### Failure to Open

If the main valve failed to open check the following possible causes to properly correct the problem.

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

### Failure to Close

If the main valve failed to close check the following possible causes to properly correct the problem.

- Adjusting spring on pilot may have been tampered with.
- Orifice in bleed port No. 4A may be plugged.
- By-pass valve may be leaking.
- On pressure regulators like Type E2, the main valve or pilot may be held open by foreign matter in seat.

To determine which valve leaks, follow these steps. Close stop valve and 1/4 in. control pipe valve.

1. Remove bleed port bend so pilot will exhaust to atmosphere.
2. Crack inlet stop valve. Steam will issue from 8B tee.
3. Release compression on adjusting spring to see if pilot closes tight.
4. Open and close several times to wash seat. Steam blowing back from bleed port 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.
5. Reassemble bleed port bend and place regulator in operation.
6. Slowly open and close outlet stop valve.

## Maintenance



### WARNING

To avoid personal injury or property damage from sudden release of pressure, isolate the regulator from the pressure system and release all pressure from the pilot and main valve before performing maintenance operations.

## Inspection

Under normal conditions, complete dismantling is not recommended.

Check the following after operation. Then, schedule an inspection as required.

1. Inspect for dirt collected at 4A bleed port.
2. Inspect all joints for leakage. Keep bolts tight to avoid any leaks

## Main Valve Maintenance

1. Connect a source of air or water pressure which can be adjusted by hand to the No. 5B elbow.
2. Apply 30 psi / 2.07 bar to jack valve open and prevent stem from turning while removing stem nuts.
3. Use penetrating oil on the threads.

## Seat Ring Maintenance

### Note

**These joints should be made up with high temperature gasket compound.**

1. Remove old compound from body and seat ring with a wire brush.
2. Apply new compound sparingly to both parts, threads and shoulders. Let stand until tacky before assembling.

## Grinding In



### CAUTION

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.

3. Reface a damaged surface before attempting to grind it in.
4. Grind sparingly.
5. Main stem (key 13, Figure 4) is slotted for rotation with a screwdriver, valve spring (key 14) is omitted from the assembly during grinding.
6. Slip the stem into its normal position.
7. Apply compound to the disc. Place it on the stem and guide plug, tighten with stem nut.
8. After grinding, disassemble and clean all parts.

## Parts Ordering

When corresponding with your local Sales Office about Type E2 Main Valve, always reference the assembly number. When ordering replacement parts, specify the complete character part number from the following parts list.

## Parts List

Key	Description	Part Number
	Repair Parts Kit	
	NPS 3/4 / DN 20	WAL08-07940-00
	NPS 1 / DN 25	WAL08-07941-00
	NPS 1-1/4 / DN 32	WAL08-07942-00
	NPS 1-1/2 / DN 40	WAL08-07943-00
	NPS 2 / DN 50	WAL08-07944-01
	NPS 2-1/2 / DN 65	WAL08-07945-01
	NPS 3 / DN 80	WAL08-07946-01
	NPS 4 / DN 100	WAL08-09587-01
	NPS 5 / DN 125	WAL08-10980-00
	NPS 6 / DN 150	WAL08-10995-00
	NPS 8 / DN 200	-----
	NPS 10 / DN 250	-----
	Type E2	
	NPS 3/4 to 3 / DN 20 to 80	See Table 3
	NPS 4 to 10 / DN 100 to 250	See Table 4



# Type E2

**Table 3. Type E2, NPS 3/4 to 3 / DN 20 to 80 Parts List**

ITEM NUMBER	PART NAME	MATERIAL	VALVE SIZE, NPS / DN						
			3/4 / 20	1 / 25	1-1/4 / 32	1-1/2 / 40	2 / 50	2-1/2 / 65	3 / 80
1	Blind Flange Stud	Steel	WAL05-05518-00	WAL04-10118-00	WAL05-05507-00	WAL04-05543-00	WAL04-10119-00	WAL04-10119-00	WAL04-05443-00
2	Blind Flange Nut	Steel	WAL05-02847-00	WAL05-02851-00	WAL05-02854-00	WAL05-02856-00	WAL05-02860-00	WAL04-02860-00	WAL05-02856-00
3	Blind Flange	Cast Iron	WAL04-02171-00	WAL04-02173-00	WAL04-02176-00	WAL04-02178-00	WAL04-02180-00	WAL04-02185-00	WAL04-02157-00
4	Gasket	Non-Asbestos	WAL05-02381-01	WAL05-02362-01	WAL05-02382-01	WAL05-02365-01	WAL05-02366-01	WAL05-02367-01	WAL05-02369-01
5	Stem Nut	Steel	WAL05-02969-00	WAL05-02970-00	WAL05-02970-00	WAL05-02971-00	WAL05-02971-00	WAL05-02972-00	WAL05-02973-00
6	Disk Guide Plate	Cast Iron	WAL04-03576-00	WAL04-03479-00	WAL04-03480-00	WAL04-03478-00	WAL04-03500-00	WAL04-03509-00	WAL04-03496-00
7	Guide Plug	Stainless Steel	----	----	----	WAL04-03751-01	WAL04-03750-00	WAL04-03754-00	WAL04-03755-00
8	Integral Disk	Stainless Steel	WAL04-01813-02	WAL04-01832-02	WAL04-01850-02	WAL04-01870-02	WAL04-01888-02	WAL04-01906-01	WAL04-01918-00
9	Seat Ring	Stainless Steel	WAL04-04075-01	WAL04-04084-01	WAL04-04092-01	WAL04-04496-01	WAL04-11593-00	WAL04-11650-00	WAL04-11549-00
10	Pipe Plug 1/4"	Steel	WAL04-03772-00	WAL04-03772-00	WAL04-03772-00	WAL04-03772-00	WAL04-03772-00	WAL04-03772-00	WAL04-03772-00
11	NPT Body	Cast Iron	----	----	----	----	----	----	----
	125 Body	Cast Iron	----	----	----	----	----	----	----
12	Pipe Plug 1/8"	Steel	WAL04-03769-00	WAL04-03769-00	WAL04-03769-00	WAL04-03769-00	WAL04-03769-00	WAL04-03769-00	WAL04-03769-00
13	Stem	Stainless Steel	WAL04-05241-02	WAL04-05254-02	WAL04-05254-02	WAL04-05325-01	WAL04-05247-02	WAL04-05324-02	WAL04-05394-03
14	Main Spring	Steel	WAL05-05093-02	WAL05-05093-02	WAL05-05094-01	WAL05-05095-01	WAL05-05096-01	WAL05-05097-01	WAL05-05098-01
15	Groove Pin	Steel	WAL05-03247-00	WAL05-03247-00	WAL05-03247-00	WAL05-03251-00	WAL05-03251-00	WAL05-03253-00	WAL05-03254-00
16	Pressure Plate	Cast Iron	WAL04-03621-00	WAL04-03700-00	WAL04-03622-00	WAL04-03623-01	WAL04-03624-00	WAL04-03625-00	WAL04-03626-00
17	Diaphragm Bolt	Steel	WAL05-04770-00	WAL05-04770-00	WAL05-04773-00	WAL05-04773-00	WAL05-04773-00	WAL04-04773-00	WAL05-04774-00
18	Base	Cast Iron	----	----	----	----	----	----	----
19	Diaphragm	Hycar	WAL05-01668-00	WAL05-01668-00	WAL05-01669-00	WAL05-01671-00	WAL05-01671-00	WAL05-01672-00	WAL05-01673-00
20	Hood	Cast Iron	WAL04-02571-00	WAL04-02571-00	WAL04-02605-00	WAL04-02606-00	WAL04-02607-00	WAL04-02608-00	WAL04-02648-00
21	Diaphragm Nut	Steel	WAL05-02872-00	WAL05-02872-00	WAL05-02874-00	WAL05-02874-00	WAL05-02874-00	WAL05-02874-00	WAL05-02874-00
22	Stem Washer	Stainless Steel	WAL04-06130-00	WAL04-06131-00	WAL04-10048-00	WAL04-06132-00	WAL04-12291-00	WAL04-06248-00	WAL05-06249-00
23	Retainer Ring	Stainless Steel	WAL05-09382-00	WAL05-09383-00	WAL05-09383-00	WAL05-09384-00	WAL05-09392-00	WAL05-09385-00	WAL05-09386-00
24	Top Flange	Cast Iron	WAL04-02246-00	WAL04-02248-00	WAL04-02250-00	WAL04-02252-00	WAL04-02233-00	WAL04-02259-00	WAL04-02261-00



Table 4. Type E2, NPS 4 to 10 / DN 100 to 250 Parts List

ITEM NUMBER	PART NAME	MATERIAL	VALVE SIZE, NPS / DN				
			4 / 100	5 / 125	6 / 150	8 / 200	10 / 250
1	Blind Flange Stud	Steel	WAL04-05443-00	WAL04-10119-00	WAL04-10120-00	WAL04-10120-00	WAL04-10120-00
2	Blind Flange Nut	Steel	WAL05-2856-00	WAL05-02860-00	WAL05-02860-00	WAL05-02860-00	WAL05-02860-00
3	Blind Flange	Cast Iron	WAL04-02157-00	WAL04-2158-00	WAL04-02162-00	WAL04-02165-00	WAL04-02167-00
4	Gasket	Non-Asbestos	WAL05-02369-01	WAL05-02371-01	WAL05-02397-01	WAL05-02374-01	WAL05-02375-01
5	Stem Nut	Steel	WAL05-02973-00	WAL05-02947-00	WAL04-02975-00	WAL04-02976-00	WAL04-02977-00
6	Disk Guide Plate	Cast Iron	WAL04-03496-00	WAL04-03504-00	WAL04-03473-00	WAL04-03474-00	WAL04-03497-00
7	Guide Plug	Stainless Steel	WAL04-03756-00	WAL04-03757-00	WAL04-03742-00	WAL04-03743-00	WAL04-03744-00
8	Integral Disk	Stainless Steel	WAL04-01922-00	WAL04-01931-00	WAL04-01940-00	WAL04-01994-00	WAL04-01951-00
9	Seat Ring	Stainless Steel	WAL04-11759-00	WAL04-11666-00	WAL04-15802-00	WAL07-43794-00	WAL04-15803-00
10	Pipe Plug 1/4"	Steel	WAL04-03772-00	WAL04-03772-00	WAL04-03772-00	WAL04-03772-00	WAL04-03772-00
11	125 Body	Cast Iron	----	----	----	----	----
12	Pipe Plug 1/8"	Steel	WAL0403769-00	WAL04-03769-00	WAL04-03769-00	WAL04-03769-00	WAL04-03769-00
13	Stem	Stainless Steel	WAL04-05266-02	WAL04-05268-02	WAL04-05269-02	WAL04-05273-02	WAL04-05272-01
14	Main Spring	Steel	WAL05-05099-01	WAL05-05100-01	WAL05-05101-01	WAL05-05102-01	WAL05-05103-01
15	Groove Pin	Steel	WAL05-03256-00	WAL05-03257-00	WAL05-03259-00	WAL05-03260-00	WAL05-03262-00
16	Pressure Plate	Cast Iron	WAL04-03627-00	WAL04-03628-00	WAL04-03629-00	WAL04-03630-00	WAL04-03631-00
17	Diaphragm Bolt	Steel	WAL05-04774-00	WAL05-04775-00	WAL05-04780-00	WAL05-04780-00	WAL05-04782-00
18	Base	Cast Iron	----	----	----	----	----
19	Diaphragm	Hycar	WAL05-01674-00	WAL05-01675-00	WAL05-01676-00	WAL05-01677-00	WAL04-01678-00
20	Hood	Cast Iron	WAL04-02609-00	WAL04-02618-00	WAL04-02610-00	WAL04-02611-00	WAL04-02612-00
21	Diaphragm Nut	Steel	WAL05-02874-00	WAL05-02874-00	WAL05-02877-00	WAL05-02877-00	WAL05-02877-00
22	Stem Washer	Stainless Steel	WAL04-06249-00	WAL04-06270-00	WAL04-06250-00	WAL04-06251-00	WAL04-06271-00
23	Retainer Ring	Stainless Steel	WAL05-09386-00	WAL05-09387-00	WAL05-09388-00	WAL05-09389-00	WAL05-09390-00
24	Top Flange	Cast Iron	WAL04-02261-00	WAL04-02263-00	WAL04-02268-00	WAL04-02266-00	----

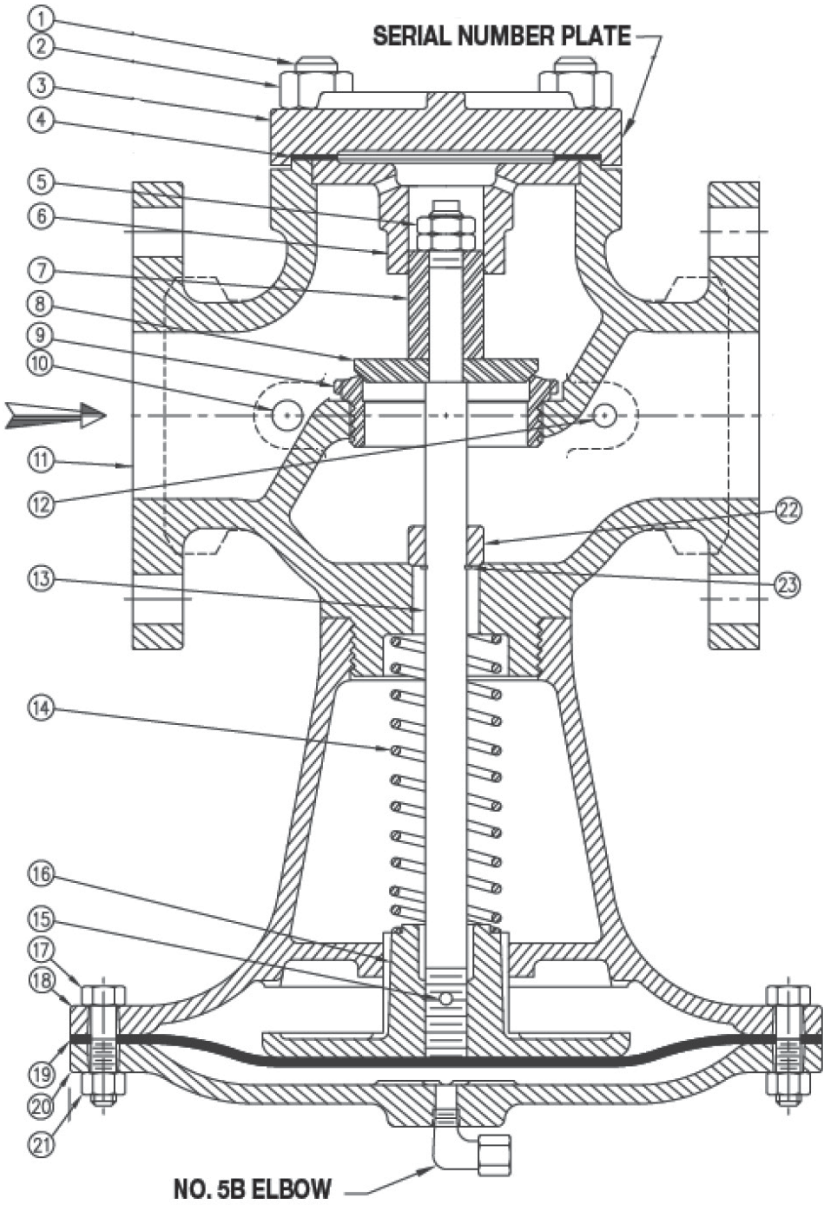


Figure 4. Type E2 Assembly Drawing

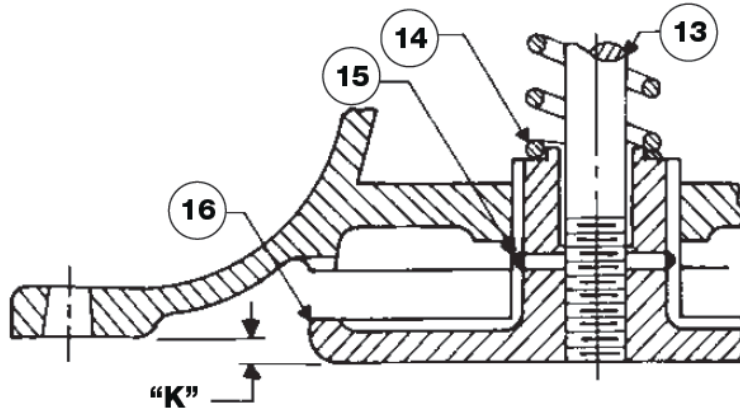


Figure 4. Type E2 Assembly Drawing (continued)

Table 5. Type E2 Main Valve K Values

VALVE SIZE		TYPE E2	
NPS	DN	Hood (K)	Total
3/4	20	1/8	1/4
1	25	3/16	5/16
1-1/4	32	7/32	3/8
1-1/2	40	1/4	7/16
2	50	9/32	9/16
2-1/2	65	11/32	11/16
3	80	13/32	13/16
4	100	15/32	15/16
5	125	17/32	1-1/16
6	150	19/32	1-3/16
8	200	25/32	1-9/16
10	250	31/32	1-15/16

# Type E2

---

 [SpenceValve.com](http://SpenceValve.com)

## Emerson Automation Solutions

### Americas

McKinney, Texas 75070 USA  
T +1 800 558 5853  
+1 972 548 3574

### Europe

Bologna 40013, Italy  
T +39 051 419 0611

### Asia Pacific

Singapore 128461, Singapore  
T +65 6777 8211

### Middle East and Africa

Dubai, United Arab Emirates  
T +971 4 811 8100

VCIMD-14935 © 2021 Emerson Electric Co. All rights reserved 11/21.  
Spence is a mark owned by one of the companies in the Emerson Automation Solutions business unit of Emerson Electric Co. The Emerson logo is a trademark and service mark of Emerson Electric Co. All other marks are property of their prospective owners.

The contents of this publication are presented for informational purposes only, and while every effort has been made to ensure their accuracy, they are not to be construed as warranties or guarantees, express or implied, regarding the products or services described herein or their use or applicability. All sales are governed by our terms and conditions, which are available upon request. We reserve the right to modify or improve the designs or specifications of such products at any time without notice.

Emerson Electric Co. does not assume responsibility for the selection, use or maintenance of any product. Responsibility for proper selection, use and maintenance of any Emerson Electric Co. product remains solely with the purchaser.