B3 Series, Three Way, Characterized Control Valve
Stainless Steel Ball and Stem

Application

This valve is typically used in air handling units on heating or cooling coils, and fan coil unit heating or cooling coils. Some other common applications include Unit Ventilators, VAV box re-heat coils and bypass loops. This valve is suitable for use in a hydronic system with variable or constant flow.

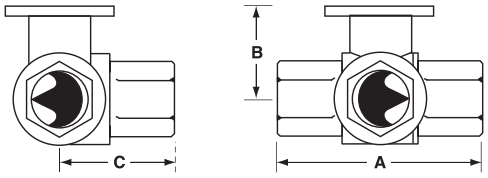
Technical Data	
Service	chilled or hot water, 60% glycol
Flow characteristic	A-port equal percentage B-port modified for constant common port flow
Controllable Flow Range	75°
Sizes	½", ¾", 1", 1¼", 1½", 2"
Type of end fitting	NPT female ends
Materials:	
Body	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
Seats	PTFE
Characterizing disc	Tefzel®
Packing	2 EPDM O-rings, lubricated
Body pressure rating	
600 psi	½" - 1"
400 psi	1¼" - 2"
Media temp. range	0°F to 250°F [-18°C to 120°C]
Close off pressure	
200 psi	½" - 2"
Maximum differential pressure (ΔP)	50 psi for typical applications
Leakage	0% for A to AB <2.0% for B to AB
External leakage	according to EN 12266-1:2003
C_v rating	A-port: see product chart for values B-port: 70% of A to AB C_v

Tefzel® is a registered trademark of DuPont

	Valve Nominal Size		Type	Suitable Actuators				
C_v	Inches	DN [mm]	3-Way NPT	Non-Spring			Spring	
0.3	½	15	B307	TR Series	LR Series	NR...N4 Series	TF Series	LF Series
0.46	½	15	B308					
0.8	½	15	B309					
1.2	½	15	B310					
1.9	½	15	B311					
3	½	15	B312					
4.7	½	15	B313					
10	½	15	B315					
14	½	15	B316					
4.7	¾	20	B317					
7.4	¾	20	B318					
14	¾	20	B320					
24	¾	20	B321					
7.4	1	25	B322					
10	1	25	B323					
30	1	25	B325*					
10	1¼	32	B329		AR Series	AR...N4 Series		AF Series
19	1¼	32	B330					
25	1¼	32	B331					
19	1½	40	B338					
29	1½	40	B339					
37	1½	40	B340					
46	1½	40	B341					
29	2	50	B347					
37	2	50	B348					
46	2	50	B349					
57	2	50	B350					
68	2	50	B351					
83	2	50	B352					

*Models without characterizing disc

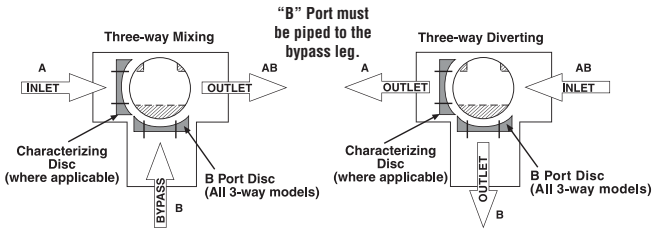
Dimensions



3WayValve-B307-B320

	Valve Nominal Size		Dimensions (Inches [mm])		
Valve Body	Inches	DN [mm]	A	B	C
B307-B311	½"	15	2.41" [61.1]	1.39" [35.2]	1.20" [30.6]
B312-B316	½"	15	2.38" [60.4]	1.78" [45.2]	1.29" [32.8]
B317-B321	¾"	20	2.73" [69.3]	1.87" [47.4]	1.47" [37.3]
B322-B325	1"	25	3.09" [78.4]	1.87" [47.4]	1.59" [40.3]
B329-B331	1¼"	32	3.96" [100.6]	2.27" [57.7]	2.14" [54.3]
B338-B341	1½"	40	4.39" [111.6]	2.51" [63.7]	2.40" [61.1]
B347-B352	2"	50	4.90" [124.5]	2.73" [69.5]	2.74" [69.7]

Flow Patterns



AF24-SR US

Proportional damper actuator, spring return failsafe, 24 V for 2 to 10 VDC and 4 to 20 mA control signal. Output signal of 2 to 10 VDC for position indication

Torque min. 133 in-lb, for control of air dampers

Application

For proportional modulation of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer's specifications.

The actuator is mounted directly to a damper shaft up to 1.05" in diameter by means of its universal clamp. A crankarm and several mounting brackets are available for applications where the actuator cannot be direct coupled to the damper shaft.

The actuator operates in response to a 2 to 10 VDC, with the addition of a 500Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. A 2 to 10 VDC feedback signal is provided for position indication or master-slave applications.

Operation

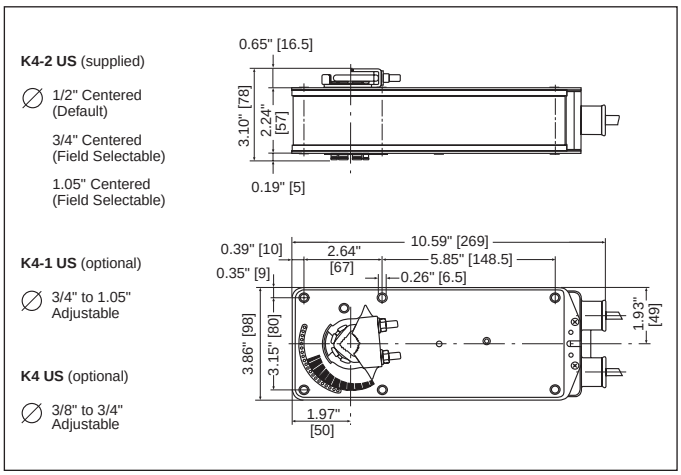
The AF series actuators provide true spring return operation for reliable fail-safe application and positive close-off on air tight dampers. The spring return system provides constant torque to the damper with, and without, power applied to the actuator.

The AF series provides 95° of rotation and is provided with a graduated position indicator showing 0 to 95°. The AF has a unique manual positioning mechanism which allows the setting of any damper position within its 95° of rotation. The actuator is shipped at +5° position (5° from full fail-safe) to provide automatic compression against damper gaskets for tight shut-off. When power is applied, the manual mechanism is released and the actuator drives toward the full fail-safe position. The actuator will memorize the angle where it stops rotating and use this point for its zero position for its normal control operations. The manual override can also be released physically by the use of a crank supplied with the actuator.

The AF uses a brushless DC motor which is controlled by an Application Specific Integrated Circuit (ASIC) and a microprocessor. The microprocessor provides the intelligence to the ASIC to provide a constant rotation rate and to know the actuator's exact zero position. The ASIC monitors and controls the brushless DC motor's rotation and provides a digital rotation sensing function to prevent damage to the actuator in a stall condition. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches.

Technical Data	AF24-SR US
Power supply	24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Power consumption	running: 6 W ; holding: 2 W
Transformer sizing	10 VA (class 2 power source)
Electrical connection	3 ft, 18 GA appliance cable 1/2" conduit connector
Overload protection	electronic throughout 0 to 95° rotation
Operating range Y	2 to 10 VDC, 4 to 20 mA
Input impedance	100 kΩ (0.1 mA), 500Ω
Feedback output U	2 to 10 VDC (max. 0.5 mA) for 95°
Angle of rotation	mechanically limited to 95°
Torque	133 in-lb [15 Nm] constant
Direction of rotation	spring: reversible with cw/ccw mounting motor: reversible with built-in switch
Position indication	visual indicator, 0° to 95° (0° is spring return position)
Manual override	3mm hex crank (shipped w/actuator)
Running time	150 sec. constant, independent of load, spring return < 20 sec
Humidity	5 to 95% RH non-condensing
Ambient temperature	-22°F to +122°F [-30°C to +50°C]
Storage temperature	-40°F to +176°F [-40°C to +80°C]
Housing	NEMA type 2 / IP54
Housing material	zinc coated metal
Agency listings	UL 873 listed, CSA C22.2 No. 24 certified
Noise level	max. 45 dB (A)
Servicing	maintenance free
Quality standard	ISO 9001
Weight	6.0 lbs (2.7 kg.)

Dimensions [All numbers in brackets are in millimeters.]



D001

AF24-SR US

Proportional damper actuator, spring return failsafe, 24 V for 2 to 10 VDC and 4 to 20 mA control signal. Output signal of 2 to 10 VDC for position indication

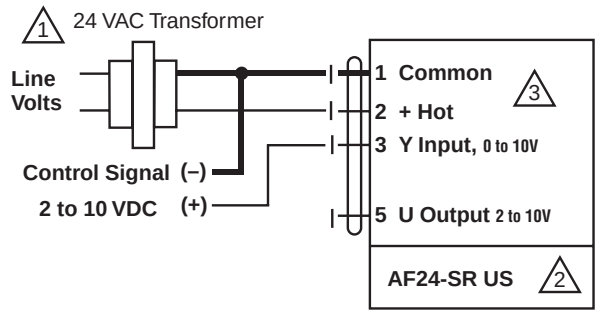
Accessories

AV 10-18	Shaft extension
IND-AF2	Damper position indicator
K4 US	Universal clamp for 3/8” to 3/4” shafts
K4-1 US	Universal clamp for up to 1.05” dia jackshafts
K4-H	Universal clamp for hexshafts 3/8” to 5/8”
KH-AF	Crankarm for up to 3/4” round shaft (Series 2)
KH-AF-1	Crankarm for up to 1.05” jackshaft (Series 2)
KH-AFV	V-bolt kit for KH-AF and KH-AF-1
Tool-06	8mm and 10 mm wrench
SGA24	Min. and/or man. positioner in NEMA 4 housing
SGF24	Min. and/or man. positioner for flush panel mounting
ZG-R01	500Ω resistor for 4 to 20 mA control signal
ZG-HTR	Thermostat/Heater Kit
ZDB-AF2	Angle of rotation limiter
ZG-100	Universal mounting bracket
ZG-101	Universal mounting bracket
ZG-102	Multiple actuator mounting bracket
ZG-103	Universal mounting bracket
ZG-104	Universal mounting bracket
ZG-106	Mounting bracket for Honeywell® Mod IV replacement or new crankarm type installations
ZG-107	Mounting bracket for Honeywell® Mod III or Johnson® Series 100 replacement or new crankarm type installations
ZG-108	Mounting bracket for Barber Colman® MA 3../4.., Honeywell® Mod III or IV or Johnson® Series 100 replacement or new crankarm type installations
ZG-AF US	Crankarm adaptor kit for AF/NF
ZG-AF108	Crankarm adaptor kit for AF/NF
ZS-100	Weather shield (metal)
ZS-150	Weather shield (polycarbonate)
ZS-260	Explosion-proof housing
ZS-300	NEMA 4X housing

Note: When using AF24-SR US actuators, only use accessories listed on this page.

AF24-SR US Typical Specification
Spring return control damper actuators shall be direct coupled type which require no crankarm and linkage and be capable of direct mounting to a jackshaft up to a 1.05” diameter. The actuator must provide proportional damper control in response to a 2 to 10 VDC or, with the addition of a 500Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. The actuators must be designed so that they may be used for either clockwise or counter-clockwise fail-safe operation. Actuators shall have control direction of rotation switch accessible on its cover. Actuators shall use a brushless DC motor controlled by a microprocessor and be protected from overload at all angles of rotation. Run time shall be constant, and independent of torque. A 2 to 10 VDC feedback signal shall be provided for position feedback or master-slave applications. Actuators shall be UL listed and CSA certified, have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.

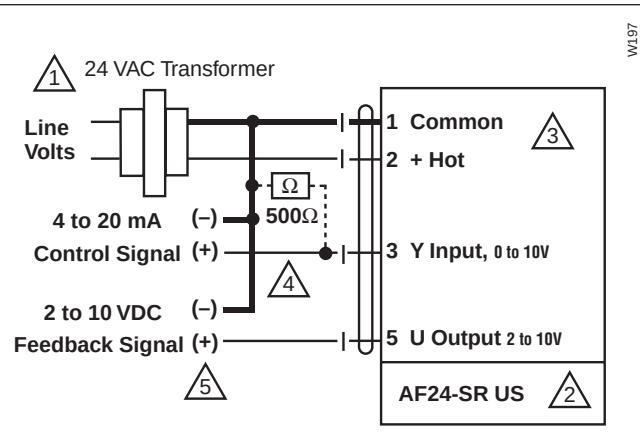
Wiring diagrams



1 Provide overload protection and disconnect as required.

2 Actuators may be connected in parallel. Power consumption and input impedance must be observed.

3 Actuator may also be powered by 24 VDC.



1 Provide overload protection and disconnect as required.

2 Actuators may be connected in parallel. Power consumption and input impedance must be observed.

3 Actuator may also be powered by 24 VDC.

4 The ZG-R01 500Ω resistor converts the 4 to 20 mA control signal to 2 to 10 VDC.

5 Only connect common to neg. (—) leg of control circuits

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Installation & Maintenance Manual M 802 F

PAT. NO. 5,203,496.
PAT. NO. 5,323,960.

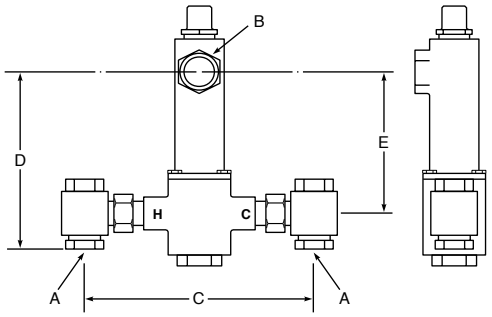
Model 802

ASSE 1017 Approved

Certified to CSA B125.3

NOTICE!

Thermostatic Water Controllers will not work satisfactorily if improperly installed. Read these instructions carefully before installing and follow directions as outlined.



DIMENSIONS:

Valve Number	A N.P.T.	B N.P.T.	C	D	E
802	1″	1¼″	11″	12″	10½″

CAPACITIES – MODEL 802

Pressure Drop PSI	5	10	20	30	45	60	80
Valve Number	Capacity						
802-GPM	28	39	54	66	80	91	103
802-LPM	106	148	208	247	303	341	388

General Description

The Model 802 water temperature controller is carefully assembled and tested at the factory to mix hot and cold water to any desired temperature within range. The temperature of the hot water should be at least 20°F higher than the maximum valve setting. The major safety features are:

1. Failure of cold water supply causes the hot water ports to reduce hot water flow.
2. Failure of hot water supply causes the cold water ports to reduce cold water flow.
3. Failure of the thermostat allows both ports to reduce flow of hot and cold water.

At each inlet of the controller is a union end stop and check valve with removable strainer. Stop and check valves are to prevent water from bypassing between hot and cold water supply lines. These valves should be fully open when in operation.

Maximum Inlet Conditions
Pressure: 125 psi
Temperature: 200°F

Maintenance

The controller should be checked periodically and, if needed, cleaned as outlined in “INSPECTING and CLEANING VALVE.” To test for proper setting and operation - proceed as follows:

1. Turn on full hot and cold water supply to the valve. The mixing valve should deliver water at the outlet temperature stamped on the label. Standard setting is 110°F. If the outlet temperature is different than that shown on the label, readjust valve according to “TEMPERATURE ADJUSTMENT” procedure on page 2.
2. If after adjusting the outlet temperature the water stays below the set temperature, see “CHECKING COLD WATER SHUT-OFF.” If the temperature stays above the set temperature, see “CHECKING HOT WATER SHUT-OFF.”

Caution: When maintaining and adjusting the mixing valve, all fixtures should be isolated from use. Lawler Manufacturing Co., Inc. recommends that you work safely at all times and in a manner consistent with the OSHA Lock/Tagout standard, 29 CFR 1910.147 and other applicable standards.

Checking Cold Water Shut-Off

Turn on full hot and cold water supply to the valve and let it run for one minute. Then shut off the hot water stop and check valve only. Cold water should flow through the controller momentarily then be reduced to a negligible amount.

Failure to do so indicates that:

a. Plunger is sticking and requires cleaning or replacement.

Checking Cold Water Shut-Off (Cont.)

b. Spring #13 has lost its strength and should be replaced.

Note: Lack of water flow can be normal on the first test if the temperature of the cold water is below 75°F. A quick test is to momentarily turn on the hot water to warm the thermostat. If flow then starts, the thermostat is good; failure to obtain flow when first starting, or when valve is cold, is a normal reaction.

Checking Hot Water Shut-Off

Allow full hot and cold water to flow through the valve for one minute. Shut off the cold water stop and check valve only. The hot water should be reduced to a negligible amount.

Failure to do so will indicate:

a. The hot water supply is not 20°F above the required maximum temperature setting.

b. The plunger is sticking and requires cleaning or replacement.

Inspection and Cleaning Valve

Shut off the hot and cold water supply to the controller. Remove bonnet #19. To replace pusher O-ring #18, remove pusher #21 from bonnet #19 and replace O-ring. Reassemble in reverse order.

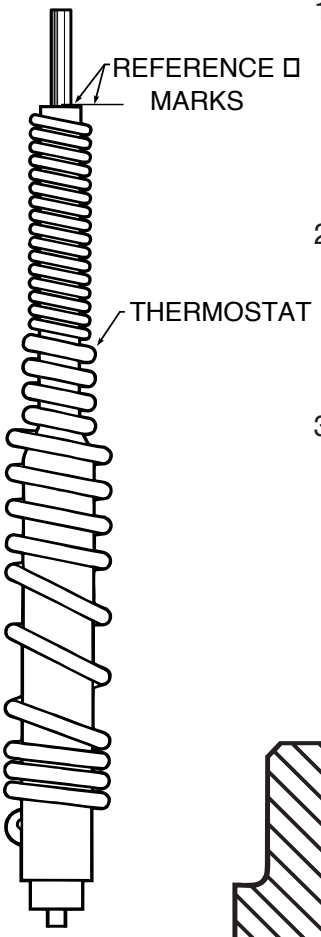
With the bonnet assembly off the valve, remove thermostat #22 and check and clean (see fig. A). Unscrew bottom plug #14 and remove valve spring #13 and plunger #12 (see fig. C). If the assembly does not slide out, remove the plunger with liner #11 and gently tap plunger until it becomes free. Clean and polish the liner and plunger with very fine emery cloth until the plunger moves freely in the liner.

With the liner out of the valve, replace liner O-ring #10.

Note: If the piston or liner is nicked or shows signs of excessive wear, it should be replaced.

Caution: The liner and plunger cannot be dropped please handle carefully. The liner must be inserted correctly. Carefully examining the outside of the liner will reveal a very small difference in diameter between the upper half and the lower half. On reassembly, the smaller diameter must be inserted first through bottom plug opening.

Figure A



1. Place a 3/8″ wooden dowel rod into center of thermostat then place in 85° F water. Make a reference mark on the rod as shown in fig. A.

2. Now insert thermostat into hot water that is at least 20°F higher than the set temperature stamped on label.

3. The rod should move out of the thermostat approximately 1/8″. If the rod shows no movement or can be pushed inward, a new thermostat is required.

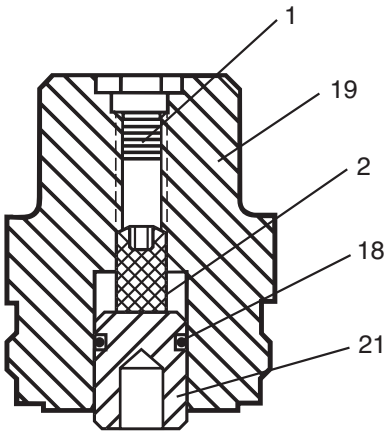


Figure B

Temperature Adjustment

Valves are normally factory set for a maximum 110°F outlet temperature, or that stamped on the label. If it is desired to change this setting, proceed as follows:

While allowing water to flow through the controller:

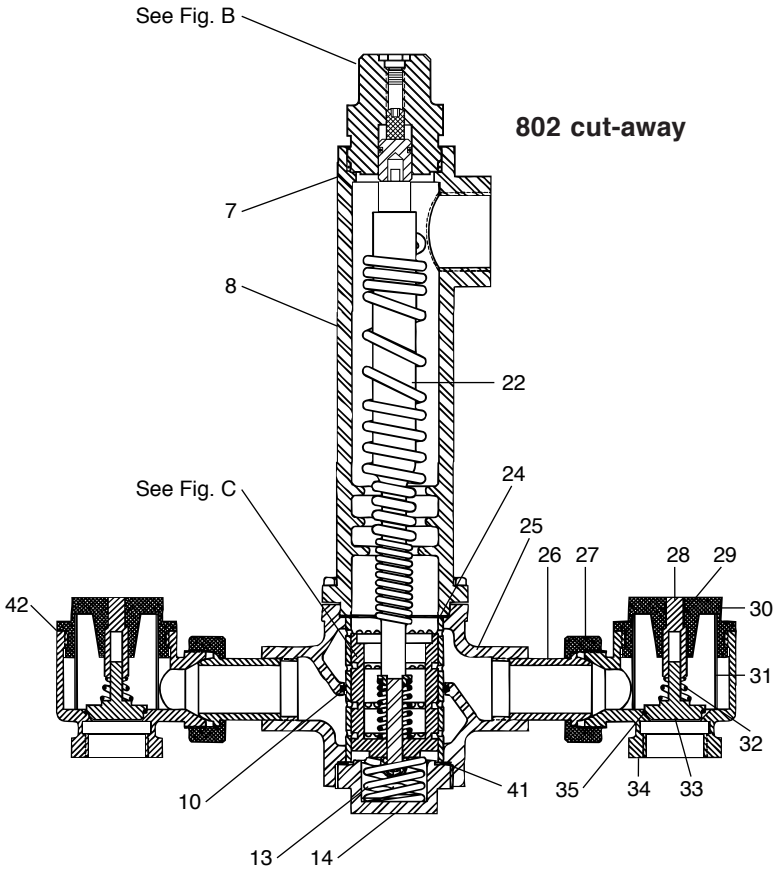
1. Remove screw #1.

2. With a 5/32 allen key, turn adjusting screw #2 counterclockwise to increase temperature or clockwise to decrease temperature.

3. When temperature is correct, replace screw #1.

Note: If outlet temperature desired is 15°F or more higher than that stamped on the label, contact the factory or a representative for a special thermostat.

Model 802 Repair Parts



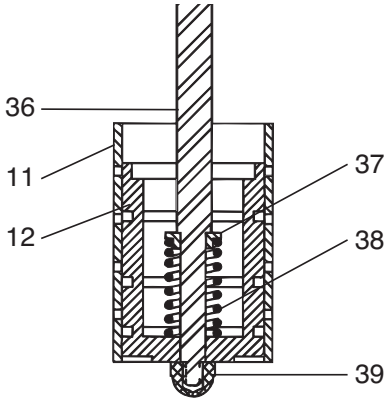


Figure C

Item	Description	Part No.
1	Screw	7628-00
2	Adjusting Screw	8237-00
7	Bonnet Gasket	
8	Dome	—
10	Liner O-Ring	
11	Liner	
12	Plunger	
12a	Piston Liner Assembly	Figure C
13	Valve Spring	—
14	Bottom Plug	—
18	Pusher O-Ring	
19	Bonnet	
21	Pusher	
22	Thermostat	
23	Body Screw (NS)	
24	Liner Gasket, Upper	
25	Valve Body	—
26	Tailpiece	—
27	Union Nut	
28	Stop & Check Stem	
29	S & C Stem O-Ring	
30	S & C Bonnet	—
31	Strainer	—
32	S & C Spring	—
33	Shutoff Disc Assembly	—
34	S & C Body	—
35	Seat O-Ring	—
36	Pushrod	—
37	Spring Retainer	—
38	Relief Spring	—
39	Acorn Nut	
40	Nameplate (NS)	—
41	Liner Gasket, Lower	—
42	S & C Gasket	—

(NS) - Not Shown

Note: Item 42 not applicable

12a Only available in assembly

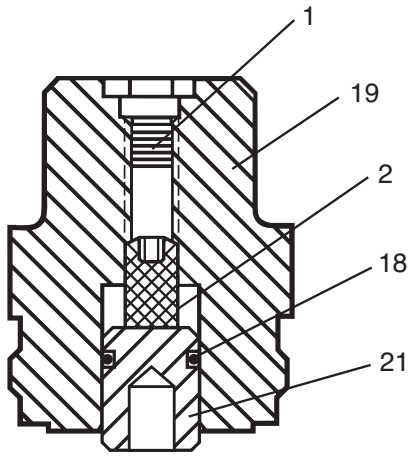


Figure B

Repair Kits and Assemblies

Kit #	Description	Contains	Part No.
1	Complete Repair Kit	7-10-12a-13-18-22-24-31-32-35	79978-01
2	Piston and Liner Assy.	11-12a	71945-16
3	Stop and Check Repair Kit	28-29-31-32-33-35	79908-02
4	Thermostat Repair Kit	7-22	72911-11
5	Bonnet Assy.	1-2-18-19-21	71965-10
6	O-Ring and Gasket	7-10-18-24-29-35-41	79830-02

Typical Installation

Install the mixing valve below the hot water tank or heater. If this is not possible, pipe in a heat trap as shown in Figure 1 with an approximate 2′ drop.

Connect a tempered water return line as shown in Figure 1. This allows flow through both ports of the mixing valve during periods of no draw.

If a dual temperature system is used, a separate recirculating loop and pump are required to return high temperature hot water to the water heater. See Figure 2.

Install an aquastat at the tempered water return pump.

Install the water heater per manufacturer's instructions.

Setting The Mixing Valve To The System

1. After installations be sure to flush the system thoroughly.
2. Make sure the hot water supply is heated to normal design temperature.
3. Close and tag all fixtures to ensure they are not used during this procedure.
4. Turn off the recirculating pump.
5. Create a draw on the system greater than the minimum flow rating of the mixing valve. All open fixtures must be tagged to ensure they are not tampered with or used during this procedure.
6. Allow water to flow through the mixing valve until the water temperature is stable. If necessary, readjust the mixing valve in accordance with the TEMPERATURE ADJUSTMENT section of the installation manual.
7. Once the temperature is set, start the recirculating pump and allow the system to reach set temperature.
8. Measure the water temperature at the return pump and adjust the aquastat to shut off the pump should the return water exceed the set point by 2 degrees F. Set the low limit switch to restart the return pump when return water drops 5 degrees F below the set temperature.
9. Set the balancing valve in the full open position.
10. Shut off all fixtures and ensure there is no draw on the system. The cold inlet to the mixing valve should be warm.
11. Allow the system to run in this condition for at least 30 minutes.
12. In some cases, an increase in water temperature may occur during a no draw period. If this occurs, slowly close the balancing valve until the water temperature is back to the original set temperature.

Figure 1

Typical Installation

When used in a single temperature recirculating system

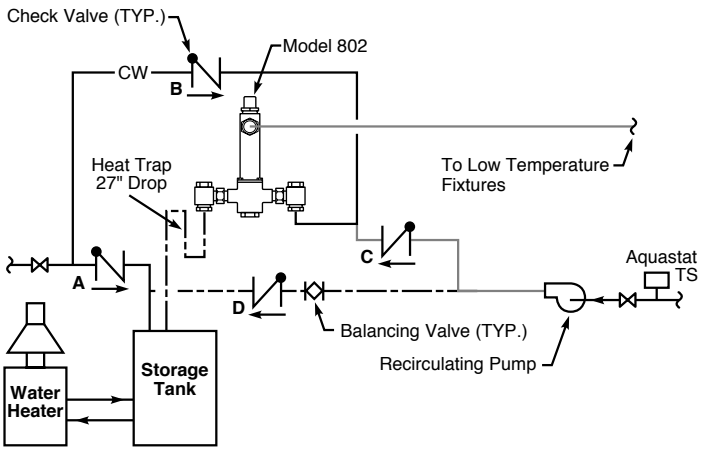
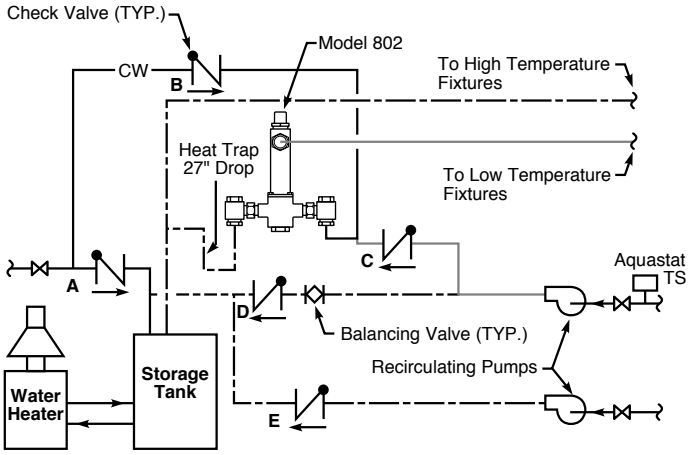


Figure 2

Typical Installation

When used in a dual temperature recirculating system



GUARANTEE

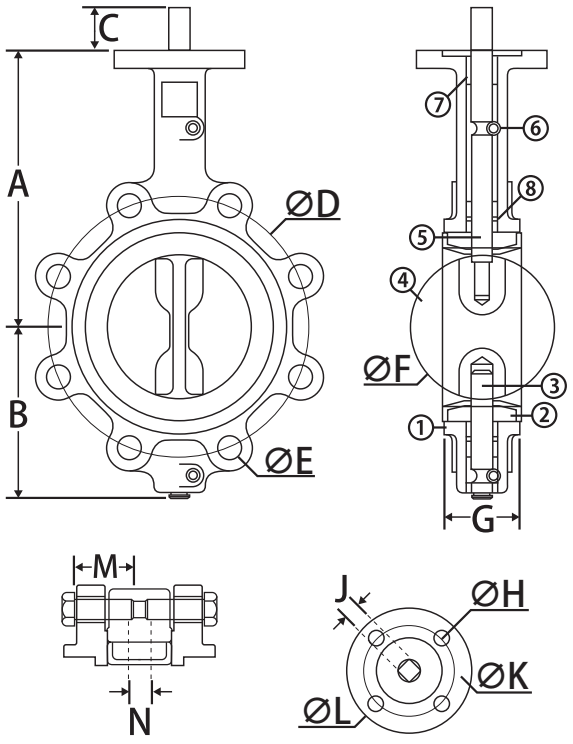
We guarantee the Lawler Mixing Valve to be free from defects in workmanship and material, and for a period of one year from date of purchase, will replace any parts found by us to be defective. We will not be held responsible, however, for any labor incidental to, or for any damages caused by defective material. Each mixing valve is thoroughly inspected and tested under actual conditions at our factory.

Butterfly Valve

Lug Style • Epoxy-Coated Ductile Iron Body

BFV-Lug

CRN# 0C09891.2



Features

- Designed for commercial and industrial applications up to 225 PSI. Easily accepts actuator with ISO 5211 mounting flange
- Available in EPDM, PTFE, Buna, or Viton seats
- Meets API 609 & MSS SP-67
- Seat to flange seal eliminates the need for flange gaskets
- Series 600 Lug bodies are bidirectional for dead end service
- With downstream flange, pressure ratings are 2" - 12" = 175PSI, 14"- 24" = 150PSI
- With no downstream flange, bidirectional, dead end service rating are 2" - 12" = 75PSI, 14" - 24" = 50PSI
- Epoxy coated finish
- Ideal for mounting pneumatic/electrical actuators
- Square stem for direct mount

Material Specifications

No.	Part	Materials
1	Body	Ductile Iron - Epoxy Coated
2	Seat	*Varies*
3	Lower Shaft*	410 Stainless Steel
4	Disc	CF8M Stainless Steel
5	Upper Shaft	410 Stainless Steel
6	Locating Pin (2)	Carbon Steel
7	Bushing (3)	PTFE
8	O-ring (2)	EPDM

Note: 2" - 12" Only, 14" - 36" are pin through shaft style

Seat Temperature Ranges

Material	Temp °F	Temp °C
Buna-N (NBR)	+10 to 180	-12 to 82
EPDM	-30 to 250	-35 to 121
Viton	+10 to 275	-12 to 135
PTFE over EPDM	-20 to 250	-29 to 121
Buna-N, Food Grade	+10 to 180	-12 to 82
EPDM, Food Grade	-30 to 225	-35 to 107
EPDM, Heat-Resistant	+3 to 300	-2 to 150
Viton, High Temp	+10 to 400	-12 to 204
Neoprene	+20 to 200	-7 to 93
Hypalon	0 to 275	-18 to 135
Silicon	-70 to 425	-57 to 218
Pure PTFE	-100 to 400	-74 to 204

When ordering butterfly valves please specify the seat in the _ space with the following letter designations. E = EPDM P = PTFE V = VITON B = BUNA

Dimensions

Part No.	Size	A	B	C	D	E	F	G	H	J	K	L	M	N	Weight
600-02DS_L	2"	6.34	3.15	1.26	4.74	4 : 5/8"	2.07	1.65	1.97	0.35	4 : 0.28	3.03	1.50	5/8-11UNC	8.38
600-212DS_L	2-1/2"	6.89	3.50	1.26	5.50	4 : 5/8"	2.54	1.76	1.97	0.35	4 : 0.28	3.03	1.50	5/8-11UNC	9.26
600-03DS_L	3"	7.13	3.74	1.26	6.00	4 : 5/8"	3.10	1.78	1.97	0.35	4 : 0.28	3.03	1.50	5/8-11UNC	10.36
600-04DS_L	4"	7.87	4.49	1.26	7.50	8 : 5/8"	4.09	2.05	2.76	0.43	4 : 0.35	3.54	1.75	5/8-11UNC	19.84
600-05DS_L	5"	8.39	5.00	1.26	8.50	8 : 3/4"	4.85	2.14	2.76	0.55	4 : 0.35	3.54	1.75	3/4-11UNC	24.03
600-06DS_L	6"	8.90	5.47	1.26	9.51	8 : 3/4"	6.13	2.20	2.76	0.55	4 : 0.35	3.54	2.00	3/4-11UNC	31.31
600-08DS_B	8"	10.24	6.89	1.61	11.75	8 : 3/4"	7.97	2.39	4.02	0.67	4 : 0.47	4.92	2.00	3/4-11UNC	40.12
600-10DS_B	10"	11.50	7.99	1.61	14.25	12 : 7/8"	9.86	2.58	4.02	0.87	4 : 0.47	4.92	2.25	7/8-11UNC	59.08
600-12DS_B	12"	13.27	9.53	1.61	17.01	12 : 7/8"	11.87	3.03	4.02	0.87	4 : 0.47	5.51	2.50	7/8-11UNC	88.18
600-14DS_B	14"	14.49	10.55	1.77	18.74	12 : 1"	13.12	3.01	4.02	0.87	4 : 0.47	5.51			123.46
600-16DS_B	16"	15.75	12.17	2.02	21.26	16 : 1"	15.34	3.41	5.51	0.94	4 : 0.71	7.76			211.64
600-18DS_B	18"	16.54	12.91	2.02	22.76	16 : 1-1/8"	17.34	4.16	5.51	1.06	4 : 0.71	7.76			268.96
600-20DS_B	20"	18.90	14.21	2.53	25.00	20 : 1-1/8"	19.35	5.19	5.51	1.42	4 : 0.71	7.76			445.33
600-24DS_B	24"	22.13	18.07	2.76	29.51	20 : 1-1/4"	23.33	5.98	6.50	1.42	4 : 0.91	10.87			595.25
600-30DS_B*	30"	25.98	21.22				29.30	6.50							939.17
600-36DS_B*	36"	28.35	25.83				34.04	7.99							1604.96

*U-type Butterfly Valve, dimensions and drawings available upon request.

Note: Information subject to change without notice.