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# Model 5400 / 5450

## Installation, Operation and Maintenance Instructions

### 1.0 GENERAL

#### 1.1 Model Number Information

**Sample Model Number: 5450 - 2 S 5 - G 73 R B - 1 4 Q**

<b>STYLE</b>	<b>CODE</b>	
Open Yoke	00	
Close-Coupled	50	
<b>BODY SIZE</b>	<b>CODE</b>	
1"	1	
2"	2	
<b>END CONNECTIONS</b>	<b>CODE</b>	
Female NPT	S	
Raised Face (RF) Flange	F	
Ring Type Joint (RTJ) Flange	J	
Other	(special)	
<b>ANSI CLASS (PRESSURE RATING)</b>	<b>CODE</b>	
150 ( 275 psig @ 100°F)	1	
300 ( 740 psig @ 100°F)	3	
600 (1480 psig @ 100°F)	6	
900 (2220 psig @ 100°F)	9	
1500 (3750 psig @ 100°F)	5	
FNPT, Socket Weld, Butt Weld Ends (4000 psig @ 200°F)		
<b>MATERIALS OF CONSTRUCTION</b>	<b>CODE</b>	
WCC Steel – Standard Service	-	
WCC Steel – Marine Service	M	
WCC Steel – NACE MR-01-75	N	
WCC Steel – Marine Service and NACE MR-01-75	P	
Other	(special)	
<b>BODY STYLE</b>	<b>CODE</b>	
Globe	G	
Tee (1") or Angle (2")	T	
Globe with Tapped Pressure Ports	P	
<b>ACTUATOR SELECTION</b>	<b>CODE</b>	
Size 35 Actuator with 3-15 Spring	33	
Size 35 Actuator with 6-30 Spring	36	
Size 70 Actuator with 3-15 Spring	73	
Size 70 Actuator with 6-30 Spring	76	
<b>ACTUATOR TYPE</b>	<b>CODE</b>	
Reverse Acting (fail-close)	R	
Direct Acting (fail-open)	D	
Reverse Acting (fail-close) with Manual Override Handwheel (only available with open yoke style, size 70 actuator with 3-15 spring)	H	
<b>SEAL MATERIAL</b>	<b>CODE</b>	
Buna-N	B	
Viton	V	
Other	(special)	
<b>TRIM MATERIAL</b>	<b>CODE</b>	
17-4PH SST	1	
Tungsten Carbide	2	
Other	(special)	
<b>TRIM SIZE</b>	<b>CODE</b>	
1/4"	2	
3/8"	3	
1/2"	4	
3/4"	6	
1"	8	
<b>TRIM CHARACTERISTIC</b>	<b>CODE</b>	
Quick Opening (On/Off)	Q	
Modified Percent (Throttling)	M	

1.2 Specifications

**Available Configurations**

Open Yoke (Model 5400), fail-open or fail-close  
 Close-coupled (Model 5450), fail-open or fail-close

**Body Styles**

Globe: 1" and 2"  
 Angle: 2" only  
 Tee: 1" only

**End Connections / Pressure Ratings**

FNPT:

- 4000 psig from -20 to 200°F (276 bar from -29 to 93°C)
- 4000 psig at -40°F (276 bar at -40°C)
- 3540 at 500°F (1949 bar at 260°C)

Flanged<sup>1</sup>:

- |             |      |                |
|-------------|------|----------------|
| • 150# RF   | 275  | psig ( 19 bar) |
| • 300# RF   | 740  | psig ( 51 bar) |
| • 600# RF   | 1480 | psig (102 bar) |
| • 600# RTJ  | 1480 | psig (102 bar) |
| • 900# RF   | 2220 | psig (152 bar) |
| • 900# RTJ  | 2220 | psig (152 bar) |
| • 1500# RF  | 3750 | psig (259 bar) |
| • 1500# RTJ | 3750 | psig (259 bar) |

**Available Trim Sizes**

1/4", 3/8", 1/2", 3/4", and 1"

**Flow Characteristic**

Modified Percent (Throttling)  
 Quick Opening (On/Off)

**Flow Coefficients**

See Table 3

**Shutoff Classification**

17-4PH SST or Tungsten Carbide Trim: ANSI Class IV  
 17-4PH SST Trim with Soft-Seat Insert: ANSI Class VI

**Flow Direction**

Either direction, to suit the application  
 Flow up (under the seat) recommended for throttling applications

**Actuator Size (Diaphragm Effective Area)**

Size 35 (35 in<sup>2</sup>)  
 Size 70 (70 in<sup>2</sup>)

**Air Pressure to Actuator**

3–15 Spring: 0 to 20 psig control signal recommended  
 6–30 Spring: 0 to 35 psig control signal recommended  
 Actuator Housing Maximum Pressure:

- Size 35: 50 psig
- Size 70: 35 psig

**Maximum Pressure Drops**

See Tables 1 and 2

Note: For trim with soft-seat insert, maximum pressure drops are equal to values in Tables 1 and 2 or 1000 psi (69 bar), whichever is less.

**Assembled Valve Temperature Limits**

5450 (close-coupled)

- WCC body with Buna-N seals: -20 to 180°F (-29 to 82°C)
- WCC body with Viton seals: -20 to 200°F (-29 to 93°C)
- LCC body with Buna-N seals: -40 to 180°F (-40 to 82°C)

5400 (open yoke)

- WCC body with Buna-N seals: -20 to 180°F (-29 to 82°C)
- WCC body with Viton seals: -20 to 450°F (-29 to 232°C)
- WCC body with Kalrez seals: -20 to 500°F (-29 to 260°C)
- LCC body with Buna-N seals: -40 to 180°F (-40 to 82°C)

**Materials of Construction / Temperature Limits**

See Table 4

1. Pressure ratings at 100°F (38°C).

# Model 5400 / 5450

## Installation, Operation and Maintenance Instructions

Table 1. Maximum Allowable Shutoff Pressure Drops<sup>1</sup>, Reverse-Acting (Fail-Close) Actuator

Actuator Size	Flow Direction	Trim Size	Signal to Actuator							
			3 to 15 psig		0 to 20 psig		6 to 30 psig		0 to 35 psig	
			(3-15 spring)				(6-30 spring)			
Inches	psi	bar	psi	bar	psi	bar	psi	bar		
35	Up	1/4	3800	262	4000	276	4000	276	4000	276
		3/8	2050	141	3280	226	3410	235	4000	276
		1/2	1100	76	1680	116	1830	126	2300	159
		3/4	320	22	560	39	690	48	950	66
		1	110	8	220	15	320	22	490	34
	Down	1/4	4000	276	4000	276	4000	276	4000	276
		3/8	4000	276	4000	276	4000	276	4000	276
		1/2	3350	231	4000	276	4000	276	4000	276
		3/4	1580	109	2300	159	2530	174	3270	226
		1	770	53	1100	76	1240	86	1680	116
70	Up	1/4	4000	276	4000	276	4000	276	4000	276
		3/8	3210	221	4000	276	4000	276	4000	276
		1/2	1650	114	3190	220	4000	276	4000	276
		3/4	530	37	940	65	2020	139	2800	193
		1	230	16	420	29	960	66	1460	101
	Down	1/4	4000	276	4000	276	4000	276	4000	276
		3/8	4000	276	4000	276	4000	276	4000	276
		1/2	4000	276	4000	276	4000	276	4000	276
		3/4	2080	143	2800	193	3780	259	4000	276
		1	970	67	1460	101	2510	173	2950	203

1. For valves with soft-seat inserts, maximum allowable pressure drop is 1000 psi (69 bar) or the values in the table, whichever is less.

Table 2. Maximum Allowable Shutoff Pressure Drops<sup>1</sup>, Direct-Acting (Fail-Open) Actuator

Actuator Size	Flow Direction	Trim Size	Signal to Actuator <sup>2</sup>			
			3 to 15 psig		6 to 30 psig	
			(3-15 spring)		(6-30 spring)	
Inches	psi	bar	psi	bar		
35	Up	1/4	4000	276	4000	276
		3/8	2700	186	4000	276
		1/2	1370	94	2880	199
		3/4	410	28	1080	74
		1	140	10	520	36
	Down	1/4	4000	276	4000	276
		3/8	4000	276	4000	276
		1/2	3800	262	4000	276
		3/4	1750	121	1940	134
		1	860	59	940	65
70	Up	1/4	4000	276	4000	276
		3/8	4000	276	4000	276
		1/2	2540	175	4000	276
		3/4	730	50	2020	139
		1	230	16	960	66
	Down	1/4	4000	276	4000	276
		3/8	4000	276	4000	276
		1/2	4000	276	4000	276
		3/4	4000	276	4000	276
		1	1840	127	2790	192

1. For valves with soft-seat inserts, maximum allowable pressure drop is 1000 psi (69 bar) or the values in the table, whichever is less.

2. Actual signal pressure to actuator includes an additional 5 psig (0.3 bar) of supply pressure to the controller.

Table 3. Flow Coefficients (C<sub>v</sub>)

Body Size	Orifice Size	Modified Percent										Quick Open		
		Globe Body										Angle Body	Globe Body	Angle Body
		Valve Opening (% Travel)												
		10	20	30	40	50	60	70	80	90	100	100	100	100
1"	0.25	.284	.506	.657	.767	.875	.989	1.10	1.20	1.32	1.40	1.64	1.68	1.92
	0.38	.311	.621	.942	1.28	1.64	2.07	2.51	2.93	3.35	3.70	4.23	3.82	4.34
	0.50	.502	1.05	1.59	2.09	2.61	3.14	3.72	4.27	4.96	5.62	6.61	5.70	6.72
	0.75	.882	1.76	2.76	3.82	4.93	6.17	7.49	8.85	10.0	11.0	15.1	11.6	15.2
	1.00	1.01	2.02	3.44	5.07	6.78	8.42	10.3	12.4	14.3	15.4	20.8	15.5	20.9
2"	0.25	.284	.506	.657	.767	.875	.989	1.10	1.20	1.32	1.40	1.66	1.68	1.98
	0.38	.311	.621	.942	1.28	1.64	2.07	2.51	2.93	3.35	3.70	4.35	3.82	4.47
	0.50	.592	1.17	1.76	2.34	2.95	3.70	4.57	5.50	5.95	6.08	6.90	6.19	7.00
	0.75	.882	1.81	2.98	4.11	5.74	7.03	8.49	10.1	11.5	12.9	15.2	13.0	15.8
	1.00	1.08	2.12	3.58	5.43	7.46	9.27	11.4	13.7	15.8	17.1	21.1	18.0	22.0

Table 4. Materials of Construction

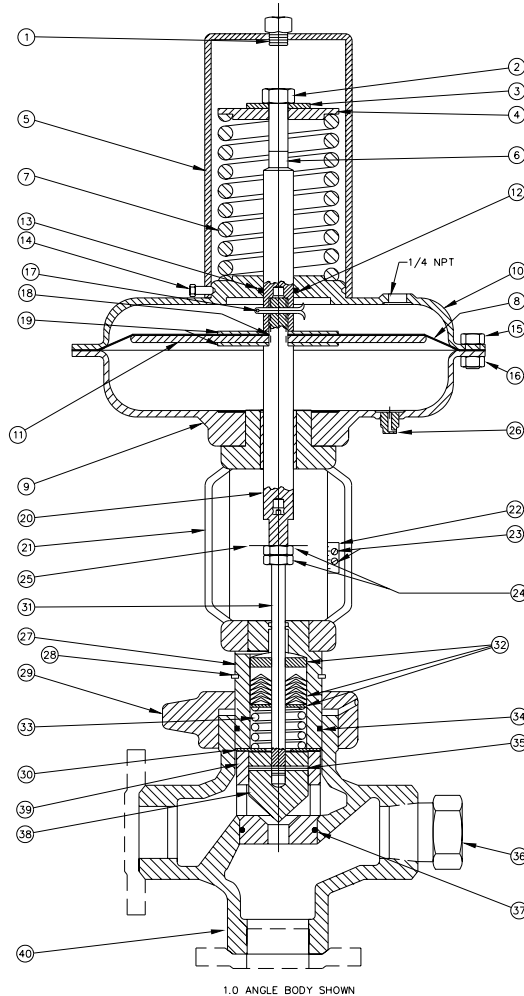
Part	Material	Temperature Limits	
		°F	°C
Body	A216 WCC Steel	-20 to 1000	-29 to 538
	A352 LCC Steel	-50 to 1000	-45 to 538
	316 Stainless Steel	-50 to 1000	-45 to 538
Bonnet (Packing Plug)	1018 Carbon Steel	-20 to 1000	-29 to 538
	316 Stainless Steel	-50 to 1000	-45 to 538
Hammer Nut	A216 WCC Steel	-20 to 1000	-29 to 538
	A350-LF2 LCC Steel	-50 to 1000	-45 to 538
Trim	17-4PH Stainless Steel	-50 to 1000	-45 to 538
	Tungsten Carbide	-50 to 1000	-45 to 538
	17-4PH Stainless Steel with TFE or UHMW soft-seat insert	-50 to 400	-45 to 204
Valve Stem	303 Stainless Steel	-50 to 1000	-45 to 538
	316 Stainless Steel	-50 to 1000	-45 to 538
Packing	PTFE V-Ring	-50 to 450	-45 to 232
	Heavy-Reinforced PTFE V-Ring	-50 to 500	-45 to 260
Actuator Housing	Steel	-20 to 1000	-29 to 538
Actuator Spring	Steel	-20 to 1000	-29 to 538
Seal O-Rings	Buna-N	-40 to 180	-40 to 82
	Viton	-20 to 450	-29 to 232
	Aflas	-20 to 450	-29 to 232
	Kalrez	-20 to 500	-29 to 260
Diaphragm <sup>1</sup>	Nylon-Reinforced Buna-N	-20 to 200	-29 to 93

1. Actual diaphragm upper temperature limit is 180°F. Additional 20°F for heat dissipation is allowed on close-coupled (Model 5450) valves. For open yoke (Model 5400) valves, diaphragm is not a temperature-limiting factor.

# Model 5400 / 5450 Installation, Operation and Maintenance Instructions

## 1.3 Parts List

### 1.3.1 Model 5400 Direct



17-4PH SST TRIM REPAIR KITS

DESCRIPTION	PART NO.		DESCRIPTION	PART NO.	
	BUNA-N	VITON		BUNA-N	VITON
0.25" QO	81505	80093	0.25" THROTTLE	81515	80097
0.38" QO	81507	80094	0.38" THROTTLE	81517	80098
0.50" QO	81509	80095	0.50" THROTTLE	81519	80099
0.75" QO	81511	80096	0.75" THROTTLE	81521	80100
1.00" QO	81513	81514	1.00" THROTTLE	81523	80101

CARBIDE TRIM REPAIR KITS

DESCRIPTION	PART NO.		DESCRIPTION	PART NO.	
	BUNA-N	VITON		BUNA-N	VITON
0.25" QO	83561	80102	0.25" THROTTLE	83571	80107
0.38" QO	83563	80103	0.38" THROTTLE	83573	80108
0.50" QO	83565	80104	0.50" THROTTLE	83575	80109
0.75" QO	83567	80105	0.75" THROTTLE	83577	80110
1.00" QO	83569	80106	1.00" THROTTLE	83579	80111

VALVE REPAIR KITS  
(LESS TRIM)

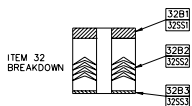
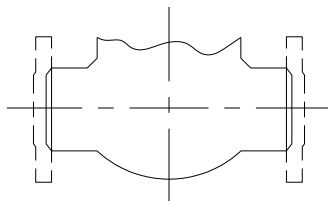
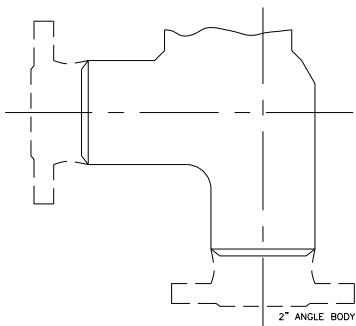
DESCRIPTION	PART NO.	DESCRIPTION	PART NO.
#35 BUNA-N	81501	#70 BUNA-N	82502
#35 VITON	81503	#70 VITON	82504

COMPLETE VALVE TOP WORKS  
(LESS TRIM)

DESCRIPTION	PART NO.	DESCRIPTION	PART NO.
#35 FAIL OPEN	83590	#70 FAIL OPEN	83594
#35 FAIL CLOSED	83592	#70 FAIL CLOSED	83596

MARINE OPTION

ITEM	DESCRIPTION	PART NUMBER	QTY
2	HEX NUT, 0.50-20	51432	1
3	WASHER 0.50 (#70 ACT. ONLY)	51329	1
14	SET SCREW	51353	1
15	DIAPHRAGM HOUSING SCREW	51420	12
16	DIAPHRAGM HOUSING NUT	51422	12
24	HEX NUT	51430	2
26	BREATHER PLUG, 0.25-18 NPT	51434	1
27	PACKING PLUG, 316SST	51262	1
28	SNAP RING	51436	1



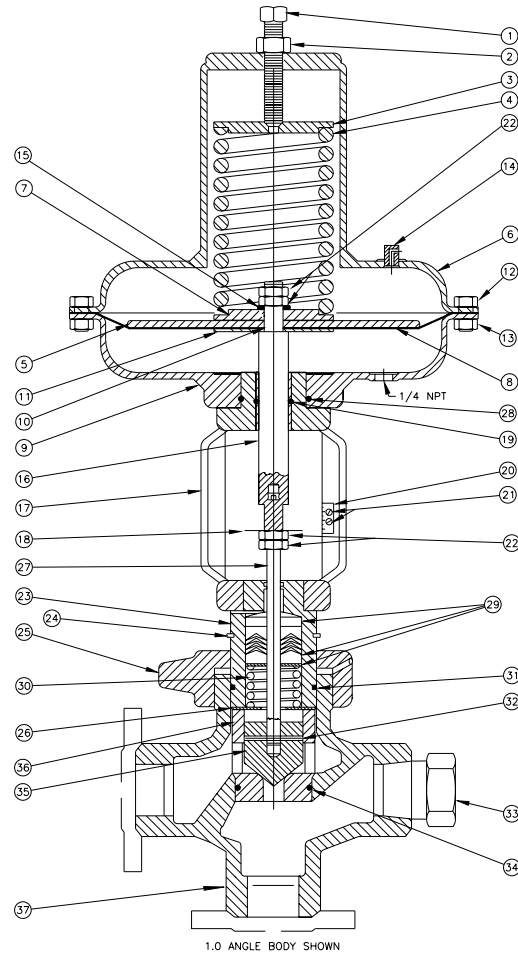
ITEM	DESCRIPTION	PART NUMBER		QTY
1	PIPE PLUG	51324		1
2	HEX NUT, 0.50-20	51326		1
		#35 ACT.	#70 ACT.	
3	WASHER 0.50, 3-15	51328	51328	1
4	UPPER SPRING RETAINER, 3-15 UPPER SPRING RETAINER, 6-30	51330 51332	51332 51333	1
5	SPRING COVER, 3-15 SPRING COVER, 6-30	51334 51412	51412 51413	1
6	UPPER STEM, 3-15, SST UPPER STEM, 6-30, SST	51338 51340	51340 51341	1
7	SPRING, 3-15 SPRING, 6-30	51292 51294	51294 51295	1
* 8	DIAPHRAGM	51276	51278	1
9	LOWER DIAPHRAGM HOUSING	51272	51274	1
10	UPPER DIAPHRAGM HOUSING, 3-15 UPPER DIAPHRAGM HOUSING, 6-30	51342 51343	51344 51344	1
11	DIAPHRAGM PLATE	51284	51286	1
* 12	UPPER STEM O-RING, BUNA-N UPPER STEM O-RING, VITON	51346 51348		1
* 13	BACKUP RING, TFE	51350		1
14	SET SCREW	51352		2
15	DIAPHRAGM HOUSING SCREW	51314		12
16	DIAPHRAGM HOUSING NUT	51316		12
17	COTTER PIN	53084		1
* 18	DIAPHRAGM O-RING, BUNA-N DIAPHRAGM O-RING, VITON	51310 51348		1
19	BEARING WASHER	51306		2
20	LOWER ACTUATOR STEM, SST	51354		1
21	ACTUATOR YOKE	51250		1
22	POSITION INDICATOR SCALE	51255		1
23	MACHINE SCREW	51257		2
24	HEX JAM NUT	51259		2
25	TRAVEL INDICATOR	51251		1
26	BREATHING PLUG, 0.25-18 NPT	51309		1
27	PACKING PLUG, 1018 CS	51260		1
28	SNAP RING	51311		1
29	HAMMER NUT	51195		1
30	PACKING WASHER, 1018 CS	51189		1
31	STEM, 303 SST Ø STEM, 316 SST	51187 51188		1
B	BRASS PACKING KIT - INCLUDES:	83585		
B1	UPPER PACKING RETAINER, BRASS	51203		1
B2	TFE PACKING	51205		1
B3	LOWER PACKING RETAINER, SST	51210		1
* 32	Ø SST PACKING KIT - INCLUDES:	83587		
SS	UPPER PACKING RETAINER, SST	51204		1
SS1	TFE PACKING	51205		1
SS2	LOWER PACKING RETAINER, SST	51210		1
SS3		51210		1
33	PACKING SPRING, 302 SST Ø PACKING SPRING, INCONEL	51198 51197		1
* 34	PACKING PLUG O-RING, BUNA-N Ø PACKING PLUG O-RING, VITON	51191 51193		1
35	ROLL PIN Ø SOLID DRIVE PIN, 316 SST	51185 51186		1
36	1" NPT PLUG (TEE BODY ONLY)	51199		1
* 37	SEAT O-RING, BUNA-N Ø SEAT O-RING, VITON	51181 51183		1
		17-4PH SST	CARBIDE	
38	VALVE PLUG, 0.25"-0.75" OO VALVE PLUG, 1.00" OO VALVE PLUG, 0.25" THROTTLE VALVE PLUG, 0.38" THROTTLE VALVE PLUG, 0.50" THROTTLE VALVE PLUG, 0.75" THROTTLE VALVE PLUG, 1.00" THROTTLE	SEE TRIM REPAIR KIT TABLE		1
		17-4PH SST	CARBIDE	
39	CAGE/SEAT, 0.25" CAGE/SEAT, 0.38" CAGE/SEAT, 0.50" CAGE/SEAT, 0.75" CAGE/SEAT, 1.00"	SEE TRIM REPAIR KIT TABLE		1
		1"	2"	
40	GLOBE VALVE BODY, NPT GLOBE VALVE BODY, 150# RF GLOBE VALVE BODY, 300# RF GLOBE VALVE BODY, 600# RF GLOBE VALVE BODY, 600# RJ GLOBE VALVE BODY, 900# RF GLOBE VALVE BODY, 900# RJ GLOBE VALVE BODY, 1500# RF GLOBE VALVE BODY, 1500# RJ TEE/ANGLE VALVE BODY, NPT TEE/ANGLE VALVE BODY, 150# RF TEE/ANGLE VALVE BODY, 300# RF TEE/ANGLE VALVE BODY, 600# RF TEE/ANGLE VALVE BODY, 600# RJ	51101 51103 51105 51107 51109 51110 51111 51112 51113 51117 51121 51123 51125 51127	52202 52204 52206 52208 52210 52211 52212 52213 52214 52218 52222 52224 52226 52228	1

\* RECOMMENDED SPARE PARTS

Ø MEETS NACE MR-01-75 SPECIFICATIONS

# Model 5400 / 5450 Installation, Operation and Maintenance Instructions

## 1.3.2 Model 5400 Reverse



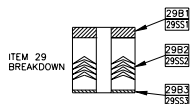
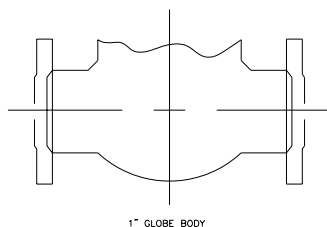
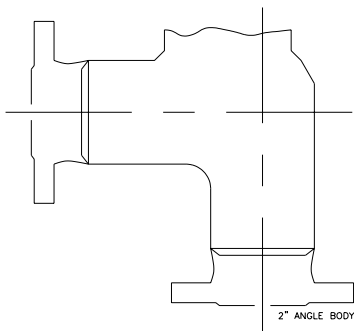
17-4PH SST TRIM REPAIR KITS					
DESCRIPTION	PART NO.		DESCRIPTION	PART NO.	
	BUNA-N	VITON		BUNA-N	VITON
0.25" QO	81505	80093	0.25" THROTTLE	81515	80097
0.38" QO	81507	80094	0.38" THROTTLE	81517	80098
0.50" QO	81509	80095	0.50" THROTTLE	81519	80099
0.75" QO	81511	80096	0.75" THROTTLE	81521	80100
1.00" QO	81513	81514	1.00" THROTTLE	81523	80101

CARBIDE TRIM REPAIR KITS					
DESCRIPTION	PART NO.		DESCRIPTION	PART NO.	
	BUNA-N	VITON		BUNA-N	VITON
0.25" QO	83561	80102	0.25" THROTTLE	83571	80107
0.38" QO	83563	80103	0.38" THROTTLE	83573	80108
0.50" QO	83565	80104	0.50" THROTTLE	83575	80109
0.75" QO	83567	80105	0.75" THROTTLE	83577	80110
1.00" QO	83569	80106	1.00" THROTTLE	83579	80111

VALVE REPAIR KITS (LESS TRIM)			
DESCRIPTION	PART NO.	DESCRIPTION	PART NO.
#35 BUNA-N	81501	#70 BUNA-N	82502
#35 VITON	81503	#70 VITON	82504

COMPLETE VALVE TOP WORKS (LESS TRIM)			
DESCRIPTION	PART NO.	DESCRIPTION	PART NO.
#35 FAIL OPEN	83590	#70 FAIL OPEN	83594
#35 FAIL CLOSED	83592	#70 FAIL CLOSED	83596

MARINE OPTION				
ITEM	DESCRIPTION	PART NUMBER		QTY
		#35 ACT.	#70 ACT.	
1	ADJUSTING SCREW	51424	51426	1
2	JAM NUT	55306	51428	1
12	DIAPHRAGM HOUSING SCREW		51420	12
13	DIAPHRAGM HOUSING NUT		51422	12
15	LOCK WASHER		51323	1
22	HEX NUT		51430	2
23	PACKING PLUG, 316SST		51262	1
24	SNAP RING		51436	1



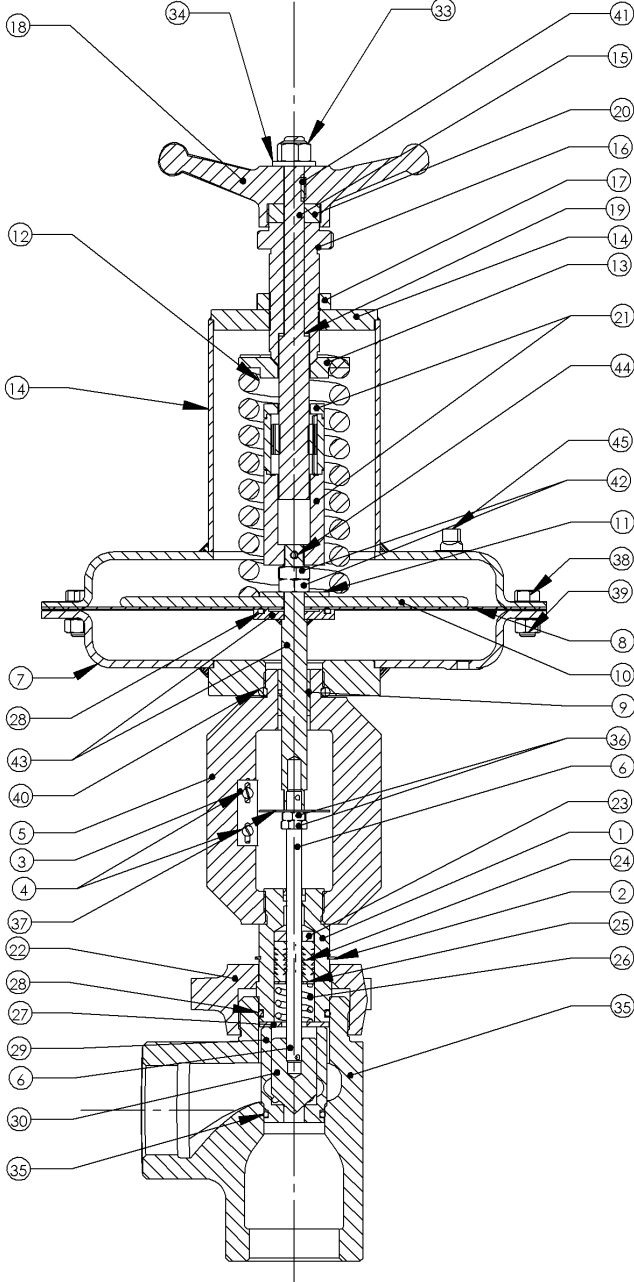
ITEM	DESCRIPTION	PART NUMBER		QTY
		#35 ACT.	#70 ACT.	
1	ADJUSTING SCREW	51300	51302	1
2	JAM NUT	51303	51304	1
3	UPPER SPRING RETAINER, 3-15	51296	51298	1
3	UPPER SPRING RETAINER, 6-30	51298	51299	1
4	SPRING, 3-15	51292	51294	1
4	SPRING, 6-30	51294	51295	1
5	DIAPHRAGM PLATE	51284	51286	1
6	UPPER DIAPHRAGM HOUSING, 3-15	51280	51282	1
6	UPPER DIAPHRAGM HOUSING, 6-30	51281	51283	1
7	LOWER SPRING RETAINER, 3-15	51288	51290	1
7	LOWER SPRING RETAINER, 6-30	51290	51291	1
* 8	DIAPHRAGM	51276	51278	1
9	LOWER DIAPHRAGM HOUSING	51272	51274	1
* 10	DIAPHRAGM O-RING, BUNA-N	51310		1
	DIAPHRAGM O-RING, VITON	51312		1
11	WASHER BEARING	51306		1
12	DIAPHRAGM HOUSING SCREW	51314		12
13	DIAPHRAGM HOUSING NUT	51316		12
14	BREATHER PLUG	51309		1
15	WASHER	51322		1
16	ACTUATOR LOWER STEM, SST	51354		1
17	ACTUATOR YOKE	51250		1
18	TRAVEL INDICATOR	51251		1
* 19	STEM O-RING, BUNA-N	51346		1
	STEM O-RING, VITON	51348		1
20	POSITION INDICATOR SCALE	51255		1
21	MACHINE SCREW	51257		2
22	HEX JAM NUT	51259		4
23	PACKING PLUG, 1018 CS	51260		1
24	SNAP RING	51311		1
25	HAMMER NUT	51195		1
26	PACKING WASHER, 1018 CS	51189		1
14	STEM, 303 SST	51187		1
27	Ø STEM, 316 SST	51188		1
* 28	LOWER HOUSING O-RING, BUNA-N	51264		1
	LOWER HOUSING O-RING, VITON	51266		1
B	BRASS PACKING KIT - INCLUDES:	83585		1
B1	UPPER PACKING RETAINER, BRASS	51203		1
B2	TFE PACKING	51205		1
B3	LOWER PACKING RETAINER, SST	51210		1
* 29	Ø SST PACKING KIT - INCLUDES:	83587		1
SS	UPPER PACKING RETAINER, SST	51204		1
SS1	TFE PACKING	51205		1
SS2	LOWER PACKING RETAINER, SST	51210		1
SS3	LOWER PACKING RETAINER, SST	51210		1
30	PACKING SPRING, 302 SST	51198		1
	Ø PACKING SPRING, INCONEL	51197		1
* 31	PACKING PLUG O-RING, BUNA-N	51191		1
	Ø PACKING PLUG O-RING, VITON	51193		1
32	ROLL PIN	51185		1
	Ø SOLID DRIVE PIN, 316 SST	51186		1
33	1" NPT PLUG (TEE BODY ONLY)	51199		1
* 34	SEAT O-RING, BUNA-N	51181		1
	Ø SEAT O-RING, VITON	51183		1
		17-4PH SST	CARBIDE	
35	VALVE PLUG, 0.25"-0.75" QO			1
	VALVE PLUG, 1.00" QO			1
	VALVE PLUG, 0.25" THROTTLE			1
	VALVE PLUG, 0.38" THROTTLE			1
	VALVE PLUG, 0.50" THROTTLE			1
	VALVE PLUG, 0.75" THROTTLE			1
	VALVE PLUG, 1.00" THROTTLE			1
		17-4PH SST	CARBIDE	
36	CAGE/SEAT, 0.25"			1
	CAGE/SEAT, 0.38"			1
	CAGE/SEAT, 0.50"			1
	CAGE/SEAT, 0.75"			1
	CAGE/SEAT, 1.00"			1
		1"	2"	
37	GLOBE VALVE BODY, NPT	51101	52202	1
	GLOBE VALVE BODY, 150# RF	51103	52204	1
	GLOBE VALVE BODY, 300# RF	51105	52206	1
	GLOBE VALVE BODY, 600# RF	51107	52208	1
	GLOBE VALVE BODY, 600# RJ	51109	52210	1
	GLOBE VALVE BODY, 900# RF	51110	52211	1
	GLOBE VALVE BODY, 900# RJ	51111	52212	1
	GLOBE VALVE BODY, 1500# RF	51112	52213	1
	GLOBE VALVE BODY, 1500# RJ	51113	52214	1
	TEE/ANGLE VALVE BODY, NPT	51117	52218	1
	TEE/ANGLE VALVE BODY, 150# RF	51121	52222	1
	TEE/ANGLE VALVE BODY, 300# RF	51123	52224	1
	TEE/ANGLE VALVE BODY, 600# RF	51125	52226	1
	TEE/ANGLE VALVE BODY, 600# RJ	51127	52228	1

\* RECOMMENDED SPARE PARTS

Ø MEETS NACE MR-01-75 SPECIFICATIONS

# Model 5400 / 5450 Installation, Operation and Maintenance Instructions

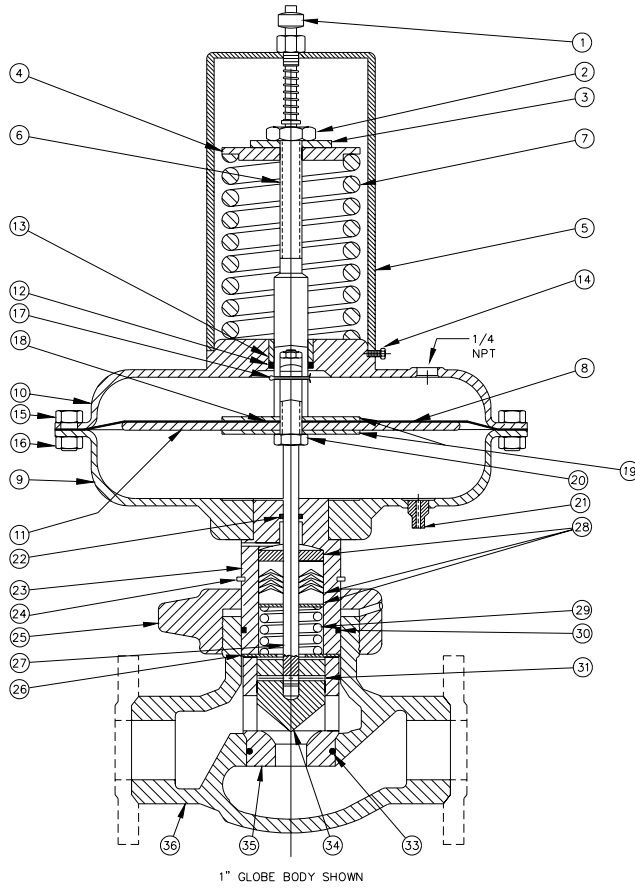
## 1.3.2 Model 5400 Reverse with Manual Override Handwheel



ITEM	PART NO.	DESCRIPTION	QTY.
1	51260	Packing Plug	1
2	51311	Snap Ring	1
3	51255	Position Indicator Scale	1
4	51257	Screw	2
5	51250	Actuator Yoke	1
6	51188	Valve Stem	1
7	51274	Lower Diaphragm Housing, #70	1
8	51556	Diaphragm	1
9	51346	O-Ring	1
10	51554	Diaphragm Plate	1
11	51552	Lower Spring Retainer, #70 3-15	1
12	51294	Actuator Spring, #70 3-15	1
13	51501	Upper Spring Retainer, #70 3-15	1
14	51548	Upper Diaphragm Housing, #70	1
15	51511	Stem	1
16	51516	Spring Tensioner	1
17	51518	Jam Nut	1
18	51522	Handwheel	1
19	51524	Bushing	1
20	51526	Thrust Bearing - Handle	1
21	51540	Slot Assembly	1
22	51195	Hammer Nut	1
23	51203	Packing Retainer, Brass	1
24	51205	Teflon Packing	1
25	51210	Lower Packing Retainer	1
26	51198	Spring Packing Inconel	1
27	51189	Packing Washer	1
28	51191	O-ring	2
29	51147	Cage/Seat	1
30	51131	Plug	1
31	51186	Solid Drive Pin	1
32	51181	O-Ring	1
33	51558	Lock Nut	1
34	51328	Washer	1
35		Valve Body (see other Parts List drawings for part numbers)	1
36	51259	Hex Nut	2
37	51251	Travel Indicator	1
38	51314	Actuator Housing Screw	12
39	51316	Actuator Housing Nut	12
40	51264	O-Ring	1
42	51546	Hex Jam	2
43	51562	Stem Assembly	1
44	55114	Roll Pin	1
45	51309	Breather Plug	1

# Model 5400 / 5450 Installation, Operation and Maintenance Instructions

## 1.3.4 Model 5450 Direct



17-4PH SST TRIM REPAIR KITS

DESCRIPTION	PART NO.		DESCRIPTION	PART NO.	
	BUNA-N	VITON		BUNA-N	VITON
0.25" QO	81505	80093	0.25" THROTTLE	81515	80097
0.38" QO	81507	80094	0.38" THROTTLE	81517	80098
0.50" QO	81509	80095	0.50" THROTTLE	81519	80099
0.75" QO	81511	80096	0.75" THROTTLE	81521	80100
1.00" QO	81513	81514	1.00" THROTTLE	81523	80101

CARBIDE TRIM REPAIR KITS

DESCRIPTION	PART NO.		DESCRIPTION	PART NO.	
	BUNA-N	VITON		BUNA-N	VITON
0.25" QO	83561	80102	0.25" THROTTLE	83571	80107
0.38" QO	83563	80103	0.38" THROTTLE	83573	80108
0.50" QO	83565	80104	0.50" THROTTLE	83575	80109
0.75" QO	83567	80105	0.75" THROTTLE	83577	80110
1.00" QO	83569	80106	1.00" THROTTLE	83579	80111

VALVE REPAIR KITS  
(LESS TRIM)

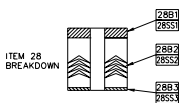
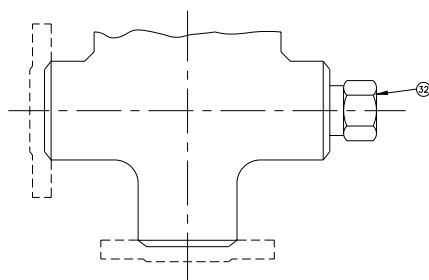
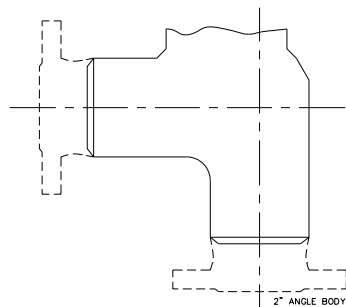
DESCRIPTION	PART NO.	DESCRIPTION	PART NO.
#35 BUNA-N	81501	#70 BUNA-N	82502
#35 VITON	81503	#70 VITON	82504

COMPLETE VALVE TOP WORKS  
(LESS TRIM)

DESCRIPTION	PART NO.	DESCRIPTION	PART NO.
#35 FAIL OPEN	83591	#70 FAIL OPEN	83595
#35 FAIL CLOSED	83593	#70 FAIL CLOSED	83597

MARINE OPTION

ITEM	DESCRIPTION	PART NUMBER	QTY
2	HEX NUT, 0.50-20	51432	1
3	WASHER 0.50 (#70 ACT. ONLY)	51329	1
14	SET SCREW	51353	1
15	DIAPHRAGM HOUSING SCREW	51420	12
16	DIAPHRAGM HOUSING NUT	51422	12
20	HEX NUT	51430	1
21	BREATHING PLUG, 0.25-18 NPT	51434	1
23	PACKING PLUG, 3/16 SST	51262	1
24	SNAP RING	51436	1

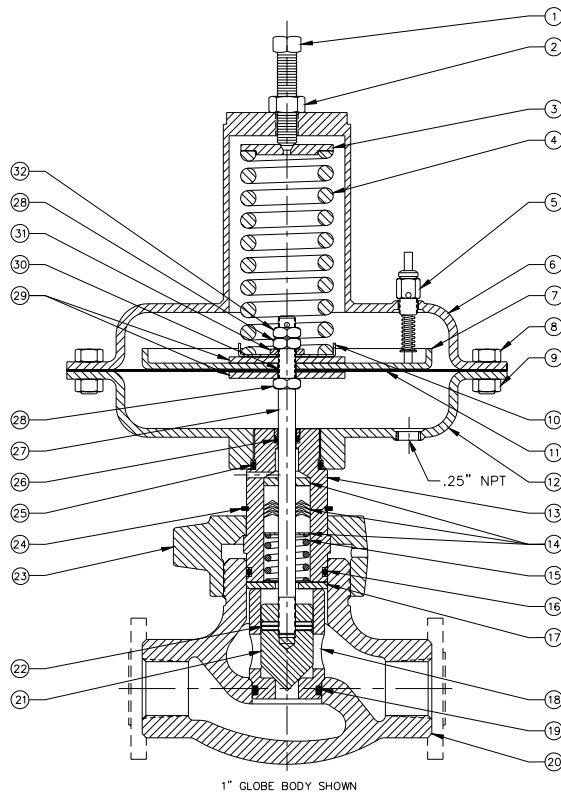


ITEM	DESCRIPTION	PART NUMBER		QTY
1	POSITION INDICATOR ASS'Y, 0.25"-0.75"	51307		1
	POSITION INDICATOR ASS'Y, 0.75"-1.00"	51308		1
2	HEX NUT, 0.50-20	51326		1
		#35 ACT.	#70 ACT.	1
3	WASHER 0.50, 3-15	51328	51328	
		51328	51328	
4	UPPER SPRING RETAINER, 3-15	51330	51332	1
	UPPER SPRING RETAINER, 6-30	51332	51333	
5	SPRING COVER, 3-15	51334	51412	1
	SPRING COVER, 6-30	51412	51413	
6	UPPER STEM, 3-15, SST	51338	51340	1
	UPPER STEM, 6-30, SST	51340	51341	
7	SPRING, 3-15	51292	51294	1
	SPRING, 6-30	51294	51295	
* 8	DIAPHRAGM	51276	51278	1
9	LOWER DIAPHRAGM HOUSING	51272	51274	1
10	UPPER DIAPHRAGM HOUSING, 3-15	51342	51344	1
	UPPER DIAPHRAGM HOUSING, 6-30	51343	51344	
11	DIAPHRAGM PLATE	51284	51286	1
* 12	UPPER STEM O-RING, BUNA-N	51346		1
	UPPER STEM O-RING, VITON	51348		
* 13	BACKUP RING, TFE	51350		1
14	SET SCREW	51352		2
15	DIAPHRAGM HOUSING SCREW	51314		12
16	DIAPHRAGM HOUSING NUT	51316		12
17	COTTER PIN	53084		1
* 18	DIAPHRAGM O-RING, BUNA-N	51310		1
	DIAPHRAGM O-RING, VITON	51312		
19	BEARING WASHER	51306		2
20	HEX NUT, 0.38-24	51360		1
21	BREATHER PLUG, 0.25-18 NPT	51309		1
* 22	STEM O-RING, BUNA-N	51268		1
	STEM O-RING, VITON	51270		
23	PACKING PLUG, 1018 CS	51260		1
24	SNAP RING	51311		1
25	HAMMER NUT	51195		1
26	PACKING WASHER, 1018 CS	51189		1
27	STEM, 303 SST	51187		1
	STEM, 316 SST	51188		
B	BRASS PACKING KIT - INCLUDES:	83585		1
B1	UPPER PACKING RETAINER, BRASS	51203		1
B2	TFE PACKING	51205		1
B3	LOWER PACKING RETAINER, SST	51210		1
* 28	Ø SST PACKING KIT - INCLUDES:	83587		1
SS1	UPPER PACKING RETAINER, SST	51204		1
SS2	TFE PACKING	51205		1
SS3	LOWER PACKING RETAINER, SST	51210		1
29	PACKING SPRING, 302 SST	51198		1
	Ø PACKING SPRING, INCONEL	51197		
* 30	PACKING PLUG O-RING, BUNA-N	51191		1
	PACKING PLUG O-RING, VITON	51193		
31	ROLL PIN	51185		1
32	Ø SOLID DRIVE PIN, 316 SST	51186		1
33	1" NPT PLUG (TEE BODY ONLY)	51199		1
	SEAT O-RING, BUNA-N	51181		1
	Ø SEAT O-RING, VITON	51183		
		17-4PH SST	CARBIDE	
34	VALVE PLUG, 0.25"-0.75" ØØ VALVE PLUG, 1.00" ØØ VALVE PLUG, 0.25" THROTTLE VALVE PLUG, 0.38" THROTTLE VALVE PLUG, 0.50" THROTTLE VALVE PLUG, 0.75" THROTTLE VALVE PLUG, 1.00" THROTTLE	SEE TRIM REPAIR KIT TABLE		1
		17-4PH SST	CARBIDE	
35	CAGE/SEAT, 0.25" CAGE/SEAT, 0.38" CAGE/SEAT, 0.50" CAGE/SEAT, 0.75" CAGE/SEAT, 1.00"	SEE TRIM REPAIR KIT TABLE		1
		1"	2"	
36	GLOBE VALVE BODY, NPT GLOBE VALVE BODY, 150# RF GLOBE VALVE BODY, 300# RF GLOBE VALVE BODY, 600# RF GLOBE VALVE BODY, 900# RF GLOBE VALVE BODY, 1500# RF GLOBE VALVE BODY, 1500# RJ TEE/ANGLE VALVE BODY, NPT TEE/ANGLE VALVE BODY, 150# RF TEE/ANGLE VALVE BODY, 300# RF TEE/ANGLE VALVE BODY, 600# RF TEE/ANGLE VALVE BODY, 900# RJ	51101 51103 51105 51107 51109 51110 51111 51112 51113 51117 51121 51123 51125 51127	52202 52204 52206 52208 52210 52211 52212 52213 52214 52218 52222 52224 52226 52228	1

\* RECOMMENDED SPARE PARTS  
Ø MEETS NACE MR-01-75 SPECIFICATIONS

# Model 5400 / 5450 Installation, Operation and Maintenance Instructions

## 1.3.5 Model 5450 Reverse



1" GLOBE BODY SHOWN

17-4PH SST TRIM REPAIR KITS

DESCRIPTION	PART NO.	DESCRIPTION	PART NO.
BUNA-N	VITON	BUNA-N	VITON
0.25" QO 81505	80093	0.25" THROTTLE 81515	80097
0.38" QO 81507	80094	0.38" THROTTLE 81517	80098
0.50" QO 81509	80095	0.50" THROTTLE 81519	80099
0.75" QO 81511	80096	0.75" THROTTLE 81521	80100
1.00" QO 81513	81514	1.00" THROTTLE 81523	80101

CARBIDE TRIM REPAIR KITS

DESCRIPTION	PART NO.	DESCRIPTION	PART NO.
BUNA-N	VITON	BUNA-N	VITON
0.25" QO 83561	80102	0.25" THROTTLE 83571	80107
0.38" QO 83563	80103	0.38" THROTTLE 83573	80108
0.50" QO 83565	80104	0.50" THROTTLE 83575	80109
0.75" QO 83567	80105	0.75" THROTTLE 83577	80110
1.00" QO 83569	80106	1.00" THROTTLE 83579	80111

VALVE REPAIR KITS  
(LESS TRIM)

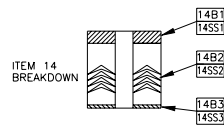
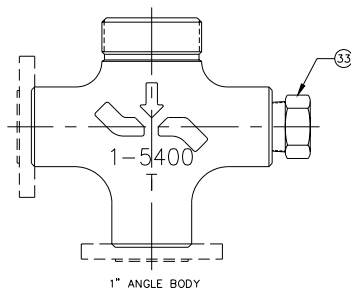
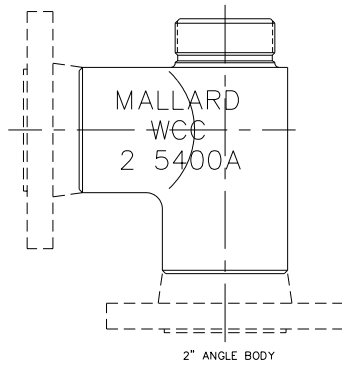
DESCRIPTION	PART NO.	DESCRIPTION	PART NO.
#35 BUNA-N	81501	#70 BUNA-N	82502
#35 VITON	81503	#70 VITON	82504

COMPLETE VALVE TOP WORKS  
(LESS TRIM)

DESCRIPTION	PART NO.	DESCRIPTION	PART NO.
#35 FAIL OPEN	83591	#70 FAIL OPEN	83595
#35 FAIL CLOSED	83593	#70 FAIL CLOSED	83597

MARINE OPTION

ITEM	DESCRIPTION	PART NUMBER		QTY
		#35 ACT.	#70 ACT.	
1	ADJUSTING SCREW	51424	51426	1
2	JAM NUT	55306	51428	1
8	DIAPHRAGM HOUSING SCREW		51420	12
9	DIAPHRAGM HOUSING NUT		51422	12
13	PACKING PLUG, 316SS		51262	1
24	SNAP RING		51436	1
28	HEX NUT		51430	1
31	LOCK WASHER		51323	1
32	HEX JAM NUT		60090	1



ITEM	DESCRIPTION	PART NUMBER		QTY
		#35 ACT.	#70 ACT.	
1	ADJUSTING SCREW	51300	51302	1
2	JAM NUT	51303	51304	1
3	UPPER SPRING RETAINER 3-15	51296	51298	1
4	UPPER SPRING RETAINER 6-30	51298	51299	1
		51292	51294	
5	POSITION INDICATOR ASSY, 0.25"-1.00"	51294	51295	1
		51313		
6	UPPER DIAPHRAGM HOUSING, 3-15	51280	51282	1
7	UPPER DIAPHRAGM HOUSING, 6-30	51281	51283	1
8	DIAPHRAGM PLATE	51284	51286	1
9	DIAPHRAGM HOUSING SCREW	51314		12
10	DIAPHRAGM HOUSING NUT	51316		12
10	LOWER SPRING RETAINER 3-15	51288	51290	1
		51290	51291	
11	LOWER SPRING RETAINER 6-30	51276	51278	1
		51272	51274	
12	DIAPHRAGM			1
13	LOWER DIAPHRAGM HOUSING	51260		1
14	PACKING PLUG, 1018 C.S.	83585		1
14B	BRASS PACKING KIT - INCLUDES:			
14B1	UPPER PACKING RETAINER, BRASS	51203		1
14B2	TFE PACKING	51205		1
14B3	LOWER PACKING RETAINER, SST	51210		1
14SS	Ø SST PACKING KIT - INCLUDES:	83587		1
14SS1	UPPER PACKING RETAINER, SST	51204		1
14SS2	TFE PACKING	51205		1
14SS3	LOWER PACKING RETAINER, SST	51210		1
15	PACKING SPRING, 302 SST	51198		1
16	Ø PACKING SPRING, INCOSEL	51197		1
17	PACKING PLUG O-RING, BUNA-N	51191		1
17	PACKING PLUG O-RING, VITON	51193		1
18	PACKING WASHER, 1018 CS	51189		1
18	CAGE/SEAT, 0.35"			
18	CAGE/SEAT, 0.38"			
18	CAGE/SEAT, 0.50"			
18	CAGE/SEAT, 0.75"			
18	CAGE/SEAT, 1.00"			
19	SEAT O-RING, BUNA-N	51181		1
19	SEAT O-RING, VITON	51183		1
20	GLOBE VALVE BODY, NPT	51101	52202	1
		51103	52204	
		51105	52206	
		51107	52208	
		51109	52210	
		51110	52211	
		51111	52212	
		51112	52213	
		51113	52214	
		51117	52218	
		51121	52222	
		51123	52224	
51125	52226			
51127	52228			
21	VALVE PLUG, 0.25"-0.75" OO			
21	VALVE PLUG, 1.00" OO			
21	VALVE PLUG, 0.25" THROTTLE			
21	VALVE PLUG, 0.38" THROTTLE			
21	VALVE PLUG, 0.50" THROTTLE			
21	VALVE PLUG, 0.75" THROTTLE			
21	VALVE PLUG, 1.00" THROTTLE			
22	ROLL PIN	51185		1
23	Ø SOLID DRIVE PIN, 316 SST	51186		1
24	HAMMER NUT	51195		1
25	SNAP RING	51311		1
25	LOWER HOUSING O-RING, BUNA-N	51264		1
25	LOWER HOUSING O-RING, VITON	51266		1
26	STEM O-RING, BUNA-N	51268		1
26	Ø STEM O-RING, VITON	51270		1
27	STEM, 303 SST	51187		1
27	Ø STEM, 316 SST	51188		1
28	HEX NUT	51360		2
29	BEARING WASHER	51306		2
30	DIAPHRAGM O-RING, BUNA-N	51310		1
30	DIAPHRAGM O-RING, VITON	51312		1
31	LOCK WASHER	51322		1
32	HEX JAM NUT	51259		1
33	1" NPT PLUG (TEE BODY ONLY)	51199		1

\* RECOMMENDED SPARE PARTS  
 Ø MEETS NACE MR-01-75 SPECIFICATIONS

# Model 5400 / 5450

## Installation, Operation and Maintenance Instructions

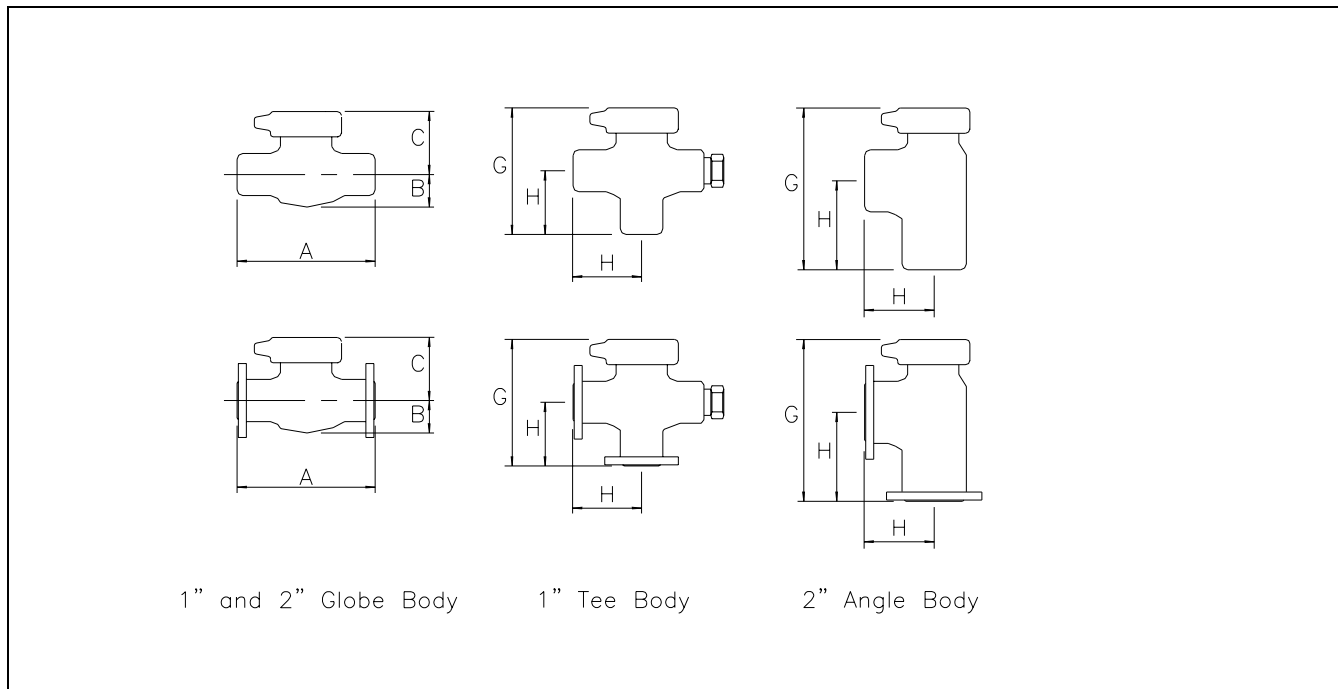
### 1.4 Dimensions

#### Valve Assembly Dimensions (Inches)

End Connection Style	1" Globe Body			2" Globe Body			1" Tee Body		2" Angle Body	
	A	B	C	A	B	C	G	H	G	H
NPT	6.25	1.56	3.69	7.50	1.69	3.69	4.69	3.13	5.44	3.75
150# RF	7.25	1.56	3.69	10.00	1.69	3.69	5.19	3.63	6.69	5.00
300# RF	7.75	1.56	3.69	10.50	1.69	3.69	5.44	3.88	6.94	5.25
600# RF	8.25	1.56	3.69	11.25	1.69	3.69	5.69	4.13	7.31	5.63
600# RTJ	8.25	1.56	3.69	11.38	1.69	3.69	5.69	4.13	7.38	5.69
900# RF	9.38	1.56	3.69	12.88	1.69	3.69	6.25	4.69	8.13	6.44
900# RTJ	9.38	1.56	3.69	13.00	1.69	3.69	6.25	4.69	8.19	6.50
1500# RF	9.38	1.56	3.69	12.88	1.69	3.69	6.25	4.69	8.13	6.44
1500 RTJ	9.38	1.56	3.69	13.00	1.69	3.69	6.25	4.69	8.19	6.50

#### Valve Assembly Dimensions (mm)

End Connection Style	1" Globe Body			2" Globe Body			1" Tee Body		2" Angle Body	
	A	B	C	A	B	C	G	H	G	H
NPT	159	40	94	190	43	94	119	79	138	95
150# RF	184	40	94	254	43	94	132	92	170	127
300# RF	197	40	94	267	43	94	138	98	176	133
600# RF	210	40	94	286	43	94	144	105	186	143
600# RTJ	210	40	94	289	43	94	144	105	187	144
900# RF	238	40	94	327	43	94	159	119	206	163
900# RTJ	238	40	94	330	43	94	159	119	208	165
1500# RF	238	40	94	327	43	94	159	119	206	163
1500 RTJ	238	40	94	330	43	94	159	119	208	165



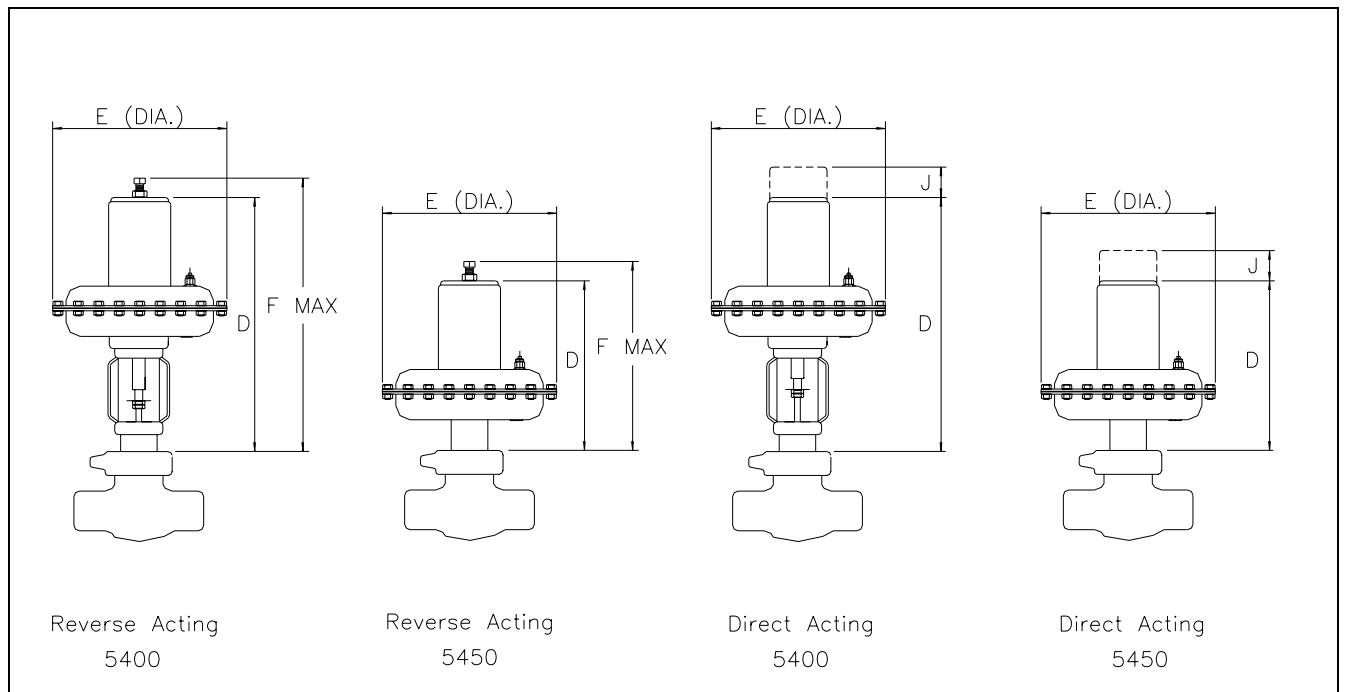
**Actuator Assembly Dimensions (Inches)**

Actuator Size	5400						5450					
	Direct			Reverse			Direct			Reverse		
	D	E	J <sup>1</sup>	D	E	F	D	E	J <sup>1</sup>	D	E	F
Size 35	17.06	9.50	5.50	14.31	9.50	16.31	11.44	9.50	5.50	8.69	9.50	10.69
Size 70	18.56	12.50	7.00	15.44	12.50	17.44	12.94	12.50	7.00	9.81	12.50	11.81

**Actuator Assembly Dimensions (mm)**

Actuator Size	5400						5450					
	Direct			Reverse			Direct			Reverse		
	D	E	J <sup>1</sup>	D	E	F	D	E	J <sup>1</sup>	D	E	F
Size 35	433	241	140	363	241	414	290	241	140	221	241	271
Size 70	471	317	178	392	317	443	328	317	178	249	317	300

1. Clearance required for spring cover removal.

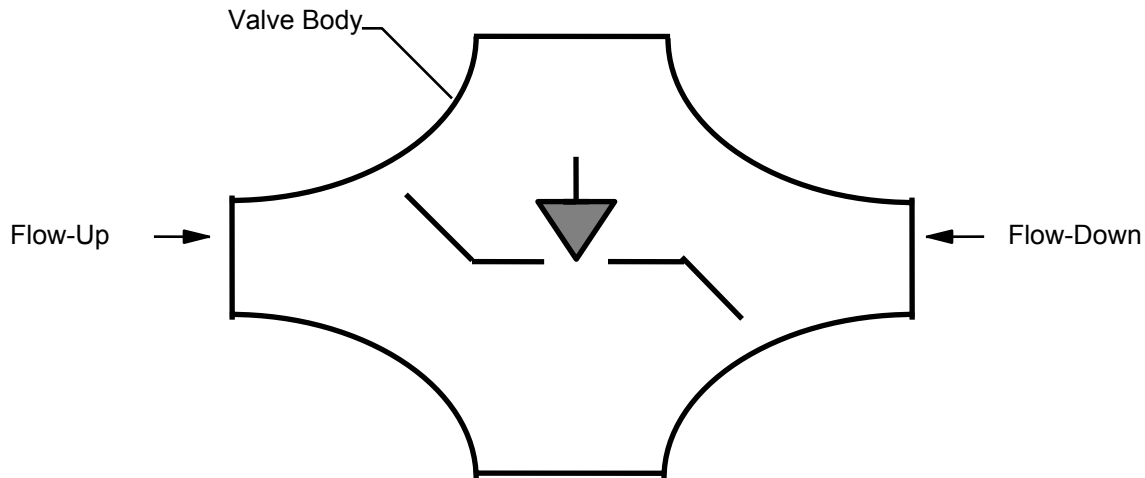


# Model 5400 / 5450

## Installation, Operation and Maintenance Instructions

### 2.0 INSTALLATION

1. Prior to valve installation, inspect the unit for damages which might have occurred during shipment and handling. Remove any items covering the process connections of the valve. Inspect the inlet and outlet connections to assure that no debris has become lodged inside the valve.
2. When installing the valve into the pipeline, consult the engineering specifications to ensure that the valve is installed according to the intended flow pattern (Flow-Up or Flow-Down). As a general rule of thumb, the flow pattern (direction) is “Flow-Up” for throttling applications, and “Flow-Down” for snap (on/off) applications. The following symbol is cast into the valve body to help you determine the correct flow pattern.



3. Install valve using good piping practices.

**WARNING:** Working pressure of control valve body does not necessarily reflect the shut-off pressure of which the actuator is capable. Check actuator shut-off charts or call the factory.

4. Connect instrument air to the actuator.
5. Adjust actuator spring as follows:

Reverse (Fail Close) Actuators: To increase shut-off capability, increase spring pre-load by turning spring adjusting screw clockwise. To decrease spring pre-load, turn spring adjusting screw counter-clockwise.

Direct (Fail Open) Actuators: To increase opening capability, increase spring pre-load by turning spring adjusting nut clockwise. To decrease spring pre-load, turn spring adjusting nut counter-clockwise.

Reverse (Fail Close) Actuators with Manual Override Handwheel: To increase shut-off capability, increase spring pre-load by turning spring adjustment screw clockwise. To decrease spring pre-load, turn spring adjustment screw counter-clockwise. NOTE: As you adjust the spring pre-load, you must make offsetting adjustments with the handwheel (clockwise spring adjustment should be offset with counter-clockwise handwheel adjustment) to account for stem movement.

**Caution:** If you feel the spring adjustment screw “bottom out” while adjusting, STOP – do not attempt to continue adjusting with increasing force. **TO PREVENT INTERNAL DAMAGE,** adjust the handwheel in the counter direction to provide the spring adjustment screw with more adjustment room.

### 3.0 MAINTENANCE

**WARNING:** System pressure must be bled off to 0 psig or the valve must be isolated with the pressure bled off prior to any maintenance involving disassembly of the valve or valve actuator.

**Caution:** TO PREVENT DAMAGE TO TRIM SEATING SURFACES, always ensure that the valve plug is in the “up” position (lifted off the seat) prior to disassembly or reassembly.

#### 3.1 Trim Replacement

1. Prior to unscrewing the hammer nut:
  - A. For Reverse (fail close) actuators, apply air supply to the actuator so that the plug is lifted off the seat.
  - B. For Direct (fail open) actuators, remove air supply pressure from the actuator so that the plug is lifted off the seat.
  - C. For Reverse (fail close) actuators with manual override handwheel, follow procedure in 1A or optionally turn handwheel counter-clockwise to lift the plug off the seat.
2. Unscrew hammer nut (counter-clockwise) from valve body.
3. Lift actuator straight up and off valve body and set down. Valve plug will be attached to the end of the valve stem.
4. Pull seat/cage out of seat pocket and lift out of valve body. A seat-pulling tool may be required.
5. Clean seat pocket in valve body as required.
6. Place new seat/cage into seat pocket in valve body and push down until it “pops” into place. Be sure o-ring is in place around bottom of seat/cage prior to installation.
7. Take actuator assembly and drive retaining pin out of valve plug and unscrew the plug from the valve stem.
8. Screw new plug onto the valve stem until pinning holes line up and drive new retaining pin into place.
9. To prevent damage to seating surfaces, make sure the plug is in the “up” position prior to re-assembling the valve body, as described in 1A, 1B, or 1C (as applicable).
10. Place actuator assembly with new valve plug onto valve body sliding the plug into the new seat / cage carefully until it “drops” into place.
11. Screw hammer nut onto valve body until tight.
12. Reconnect instrument air supply to actuator as required.
13. Adjust actuator spring, if necessary, as outlined in Step 5 of Section 2.0, “Installation”.

#### 3.2 Packing Replacement

1. Prior to unscrewing the hammer nut:
  - A. For Reverse (fail close) actuators, apply air supply to the actuator so that the plug is lifted off the seat.
  - B. For Direct (fail open) actuators, remove air supply pressure from the actuator so that the plug is lifted off the seat.
  - C. For Reverse (fail close) actuators with manual override handwheel, follow procedure in 1A or optionally turn handwheel counter-clockwise to lift the plug off the seat.
2. Unscrew hammer nut (counter-clockwise) from valve body.
3. Lift actuator straight up and off valve body and set down. Valve plug will be attached to the end of the valve stem.
4. Proceed as follows:
  - A. 5400 (Open Yoke):
    - a. Disconnect lower stem from upper stem and pull lower stem out of packing plug.
    - b. Remove packing washer and packing load spring.
    - c. Remove the old packing and packing retainers from packing plug.
    - d. Slide the upper “thick” packing retainer into the packing gland.
    - e. Slide the new packing set into the packing gland. (Note: the packing V-rings must be oriented so that they are pointed toward the pressure.)
    - f. Slide the lower “thin” packing retainer into the packing gland.
    - g. Slide lower stem back into place.
    - h. Reconnect lower stem to upper stem.

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- B. 5450 (Close-Coupled):
  - a. Drive retaining pin out of valve plug and unscrew plug from the valve stem.
  - b. Remove packing washer and packing load spring.
  - c. Place actuator assembly back onto valve body and screw hammer nut onto valve body until tight (as a means of "holding" the packing plug to remove the upper actuator).
  - d. Unscrew lower housing from packing plug and remove.
  - e. Unscrew hammer nut (counter-clockwise) from valve body.
  - f. Remove the old packing and packing retainers from the packing plug.
  - g. Place actuator assembly back onto valve body and screw hammer nut onto valve body until tight (as a means of "holding" the packing plug for re-assembly of the upper actuator).
  - h. Slide valve stem into packing plug and screw lower housing onto packing plug.
  - i. Unscrew hammer nut (counter-clockwise) from valve body.
  - j. Slide the upper "thick" packing retainer over the valve stem and into the packing gland.
  - k. Slide the new packing set over the valve stem and into the packing gland. (Note: the packing V-rings must be oriented so that they are pointed toward the pressure.)
  - l. Slide the lower "thin" packing retainer over the valve stem and into the packing gland.
- 5. Replace the packing load spring and packing washer onto the valve stem.
- 6. Screw the valve plug onto the valve stem until the retaining pin holes align and install retaining pin.
- 7. To prevent damage to seating surfaces, make sure the plug is in the "up" position prior to re-assembling the valve body, as described in 1A, 1B, or 1C (as applicable).
- 8. Place actuator assembly with new valve plug onto valve body sliding the plug into the new seat / cage carefully until it "drops" into place.
- 9. Screw hammer nut onto valve body until tight.
- 10. Reconnect instrument air supply to actuator as required.
- 11. Adjust actuator spring, if necessary, as outlined in Step 5 of Section 2.0, "Installation".

### 3.3 Actuator Diaphragm Replacement

#### 3.3.1 Direct (Fail Open) Actuators:

- 1. Prior to unscrewing the hammer nut, remove air supply pressure from the actuator so that the plug is lifted off the seat.
- 2. Unscrew hammer nut (counter-clockwise) from valve body.
- 3. Lift actuator straight up and off valve body and set down. Valve plug will be attached to the end of the valve stem.
- 4. Remove spring cover and remove all actuator spring pre-load by unscrewing adjusting nut.
- 5. Remove flat washer, upper spring retainer, and actuator spring.
- 6. Remove screws and nuts around diaphragm housing.
- 7. Slide upper diaphragm housing up and off of the upper actuator stem.
- 8. Remove retaining pin from the upper actuator stem and unscrew upper actuator stem from lower actuator stem. (Note: If using a tool to unscrew the stem, care should be taken not to damage the outside diameter of the stem as it is an o-ring sealing surface)
- 9. Remove upper bearing washer.
- 10. Remove actuator diaphragm and replace with new diaphragm. If required, replace o-ring seal in upper actuator housing prior to reassembling actuator.
- 11. Reassemble by reversing steps 1-9. NOTE: If you experience difficulty reconnecting upper actuator stem to lower actuator stem, remove breather plug from lower diaphragm housing and apply air supply to lower diaphragm housing, to lift the lower actuator stem for easier access.

#### 3.3.2 Reverse (Fail Close) Actuators:

- 1. Prior to unscrewing the hammer nut, apply air supply to the actuator so that the plug is lifted off the seat. For Reverse (fail close) actuators with manual override handwheel, follow same procedure or optionally turn handwheel counter-clockwise to lift the plug off the seat.
- 2. Unscrew hammer nut (counter-clockwise) from valve body.
- 3. Lift actuator straight up and off valve body and set down. Valve plug will be attached to the end of the valve stem.
- 4. Remove air supply from actuator.
- 5. Remove spring pre-load by unscrewing adjusting screw.
- 6. Remove screws and nuts around diaphragm housing.
- 7. Remove the two (2) retaining nuts and lock washer.

8. Remove upper spring retainer, actuator spring, lower spring retainer, and diaphragm plate.
9. Remove actuator diaphragm and replace with new diaphragm.
10. Reassemble actuator by reversing steps 1-9

## 3.4 Preventive Maintenance

The following preventative maintenance should be performed periodically as dictated by the severity of the application or by maintenance schedule.

### 3.4.1 Valve Body

The internal valve body should be inspected every time trim is replaced, packing is changed, or the actuator is worked on. Under normal operating conditions the valve body should show no signs of wear. If wear is noticed within the valve body from high pressure drops, abrasive flows, or chemical corrosion, the valve body should be replaced to assure safety during valve operation.

### 3.4.2 Valve Trim

Check the valve plug and seat for wear that might be caused by high pressure drops, abrasives in the media, or corrosion. If signs of wear are present, then trim replacement is recommended for optimum valve performance.

### 3.4.3 Packing

Check the “weep” hole in the packing plug for discharge. Discharge is a sign of packing leakage. If discharge is present then packing replacement is recommended.

### 3.4.4 Actuator Assembly

Visually inspect the actuator operation of the valve by observing the travel indicator assembly (5450 Model) or the stem connector (5400 Model) while the valve is stroking for a smooth, consistent movement. Jerking type movements may indicate a problem within the valve. Depressurize the valve and inspect it internally.

Listen for a “hissing” sound during operation. This may indicate a worn seal or diaphragm. Replace any worn seal or diaphragm.

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### 3.5 Troubleshooting

Problem	Possible Cause	Fix
Valve leaks when closed	<p><u>Reverse Acting:</u> Actuator spring load not sufficient.</p> <p><u>Direct Acting:</u> Inadequate air supply pressure.</p> <p>Debris between the plug and seat preventing tight shut-off.</p> <p>Plug and seat are not sealing.</p> <p>Plug and seat are worn out.</p> <p>Actuator force not enough for shut-off (actuator too small).</p>	<p><u>Reverse Actuator:</u> Increase actuator spring pre-load.</p> <p><u>Direct Acting:</u> Increase air supply pressure but do not exceed maximum rating on nameplate.</p> <p>Remove debris.</p> <p>Re-lap trim.</p> <p>Replace trim.</p> <p>Consult factory or local representative for proper actuator sizing.</p>
Valve will not open	<p><u>Reverse Acting:</u> Not receiving air supply.</p> <p><u>Reverse Acting:</u> Too much spring pre-load.</p> <p><u>Direct Acting:</u> Inadequate spring pre-load.</p> <p>Debris lodged behind valve plug.</p>	<p>Check air supply source and tubing to the actuator connection.</p> <p>Decrease spring pre-load by turning adjusting screw counter-clockwise.</p> <p>Increase spring pre-load by turning adjusting nut clockwise.</p> <p>Remove debris.</p>
Discharge evident from packing plug "weep" hole.	Packing is worn.	Replace packing.
Supply air leaking out of breather plug during operation	Diaphragm is worn out or torn.	Replace diaphragm