

The Model 5400 (open yoke) and Model 5450 (close-coupled) control valves are designed to meet the high pressure and erosive applications common to the oil and gas industry. These valves are ideally suited for pressure, level, temperature, and flow control applications on separators, scrubbers, wellheads, and other oilfield equipment. The ease of maintenance, rugged steel construction, flexibility to meet a wide variety of applications, and safety features make the Model 5400 / 5450 control valve the preferred choice of production operators worldwide.

Features:

- **Simple Maintenance** – Valve trim or the complete actuator assembly can be quickly changed by simply removing the hammer nut and lifting the actuator assembly off the valve body. Disassembly of the actuator or removing the valve from the line is not required. No special tools are required.
- **Simple Installation** – Compact, light-weight design enables quick, easy installation with minimum labor requirements.
- **Hardened Trim** – Control valve trim is available in 17-4 PH stainless steel or Tungsten Carbide, to handle the most difficult applications.
- **Bonnet Safety Pressure Relief** – Special design of hammer nut provides warning indication if an attempt is made to remove the actuator while the valve body is still under pressure (see Figure 4).
- **Bi-directional Flow** – Valve can be installed for either “flow up” or “flow down” operation, whichever best suites the application.
- **Marine and/or Sour Gas Service Option** – For harsh marine environments where corrosion and salt build-up are a problem, select “Marine Service” material option in the valve’s model code. Ideal for offshore or coastal production facilities. For sour gas applications, materials are available that comply with NACE MR-01-75 specifications.



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)

Flanged¹:

- 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 in²)
Size 70 (70 in²)

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

Approximate Weights

Model 5400: See Table 5
Model 5450: See Table 6

1. Pressure ratings at 100°F (38°C).

Manual Override Handwheel

For applications requiring an adjustable travel stop, or a ready means of positioning the valve in an emergency, the Model 5400 can be equipped with a top-mounted handwheel. The handwheel, shown in Figure 3, is available only on size 70, reverse-acting (fail-close), open yoke style (Model 5400) actuators.



Figure 3. Model 5400 with Manual Override Handwheel

Table 1. Maximum Allowable Shutoff Pressure Drops¹, 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
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 Drops¹, Direct-Acting (Fail-Open) Actuator

Actuator Size	Flow Direction	Trim Size	Signal to Actuator ²					
			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 (Cv)

Body Size	Orifice Size	Modified Percent										Quick Open		
		Globe Body										Angle Body	Globe Body	Angle Body
		Valve Opening (% Travel)										100	100	100
		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

Useful Conversions for Liquid Flow:

To Convert	Multiply By	To Obtain
Barrels	42	U.S. Gallons
Barrels/Hr	0.7	U.S. gpm
Barrels/Day	0.02917	U.S. gpm
Ft ³ /Sec	448.83	U.S. gpm
M ³ /Hr	4.403	U.S. gpm
Lb/Hr	0.0020	U.S. gpm
Kg/Hr	0.0044	U.S. gpm

Useful Conversions for Gas Flow:

To Convert	Multiply By	To Obtain
scfd	0.04167	scfh
scfs	3600	scfh
scfm	60	scfh
NM ³ /Hr	35.34	scfh
Lb/Hr	19.52	scfh
Kg/Hr	43.04	scfh

Bonnet Safety Pressure Relief

The left picture in Figure 4 shows the hammer nut in the "locked" position during normal operation.

The right picture in Figure 4 illustrates the "Bonnet Safety Pressure Relief". The O-Ring clears the packing plug while the hammer nut is still engaged (threaded) onto the valve body. At this point, if the valve assembly is under pressure, process fluid will escape through the weep hole to indicate a warning to the service person that the valve is still under pressure, thereby prompting him to remove line pressure before proceeding, thus preventing the actuator assembly from "blowing" out.

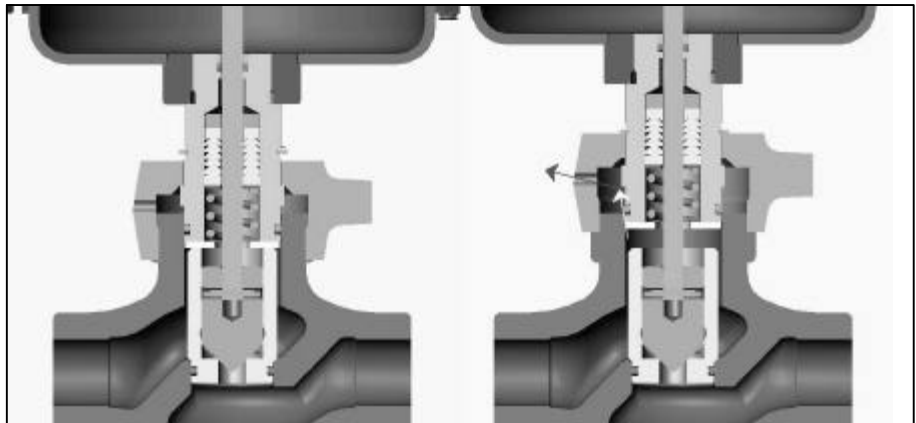


Figure 4. Bonnet Safety Pressure Relief

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 ¹	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.

Table 5. Approximate Weights for Model 5400 Valves, Pounds (Kg)

End Connections	Actuator Size, Body Size, Body Style							
	Size 35				Size 70			
	1"		2"		1"		2"	
	Globe	Tee	Globe	Angle	Globe	Tee	Globe	Angle
NPT	29 (13.2)	32 (14.5)	36 (16.3)	36 (16.3)	44 (20.0)	47 (21.3)	51 (23.1)	51 (23.1)
ANSI 150	34 (15.4)	38 (17.2)	46 (20.9)	46 (20.9)	49 (22.2)	53 (24.0)	61 (27.7)	61 (27.7)
ANSI 300	37 (16.8)	41 (18.6)	50 (22.7)	50 (22.7)	52 (23.6)	56 (25.4)	65 (29.5)	65 (29.5)
ANSI 600	39 (17.7)	43 (19.5)	52 (23.6)	52 (23.6)	54 (24.5)	58 (26.3)	67 (30.4)	67 (30.4)
ANSI 900	46 (20.9)	51 (23.1)	80 (36.3)	80 (36.3)	61 (27.7)	66 (29.9)	95 (43.1)	95 (43.1)
ANSI 1500	46 (20.9)	51 (23.1)	80 (36.3)	80 (36.3)	61 (27.7)	66 (29.9)	95 (43.1)	95 (43.1)

Table 6. Approximate Weights for Model 5450 Valves, Pounds (Kg)

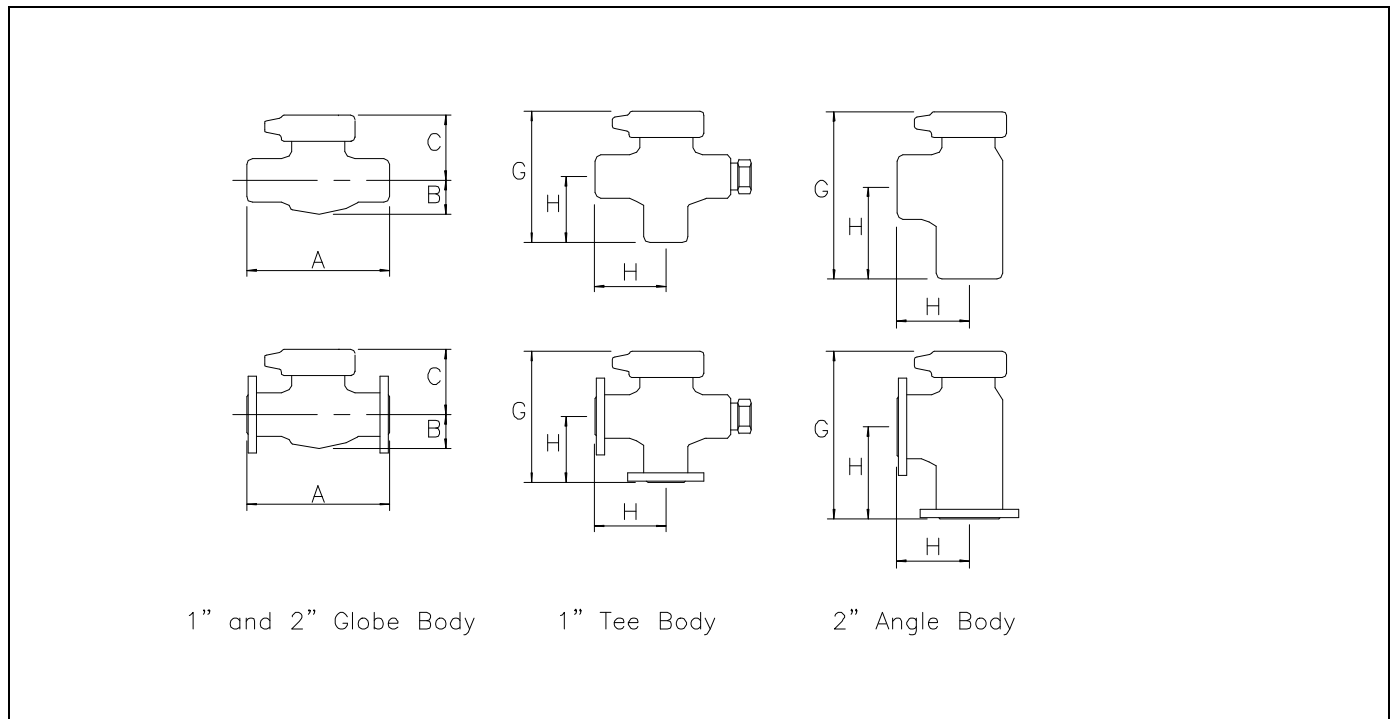
End Connections	Actuator Size, Body Size, Body Style							
	Size 35				Size 70			
	1"		2"		1"		2"	
	Globe	Tee	Globe	Angle	Globe	Tee	Globe	Angle
NPT	25 (11.3)	28 (12.7)	32 (14.5)	32 (14.5)	40 (18.1)	43 (19.6)	47 (21.3)	47 (21.3)
ANSI 150	30 (13.6)	34 (15.4)	42 (19.1)	42 (19.1)	45 (20.4)	49 (22.2)	57 (25.9)	57 (25.9)
ANSI 300	33 (15.0)	37 (16.8)	46 (20.9)	46 (20.9)	48 (21.8)	52 (23.6)	61 (27.7)	61 (27.7)
ANSI 600	35 (15.9)	39 (17.7)	48 (21.8)	48 (21.8)	50 (22.7)	54 (24.5)	63 (28.6)	63 (28.6)
ANSI 900	42 (19.1)	47 (21.3)	76 (34.5)	76 (34.5)	57 (25.9)	62 (28.1)	91 (41.3)	91 (41.3)
ANSI 1500	42 (19.1)	47 (21.3)	76 (34.5)	76 (34.5)	57 (25.9)	62 (28.1)	91 (41.3)	91 (41.3)

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



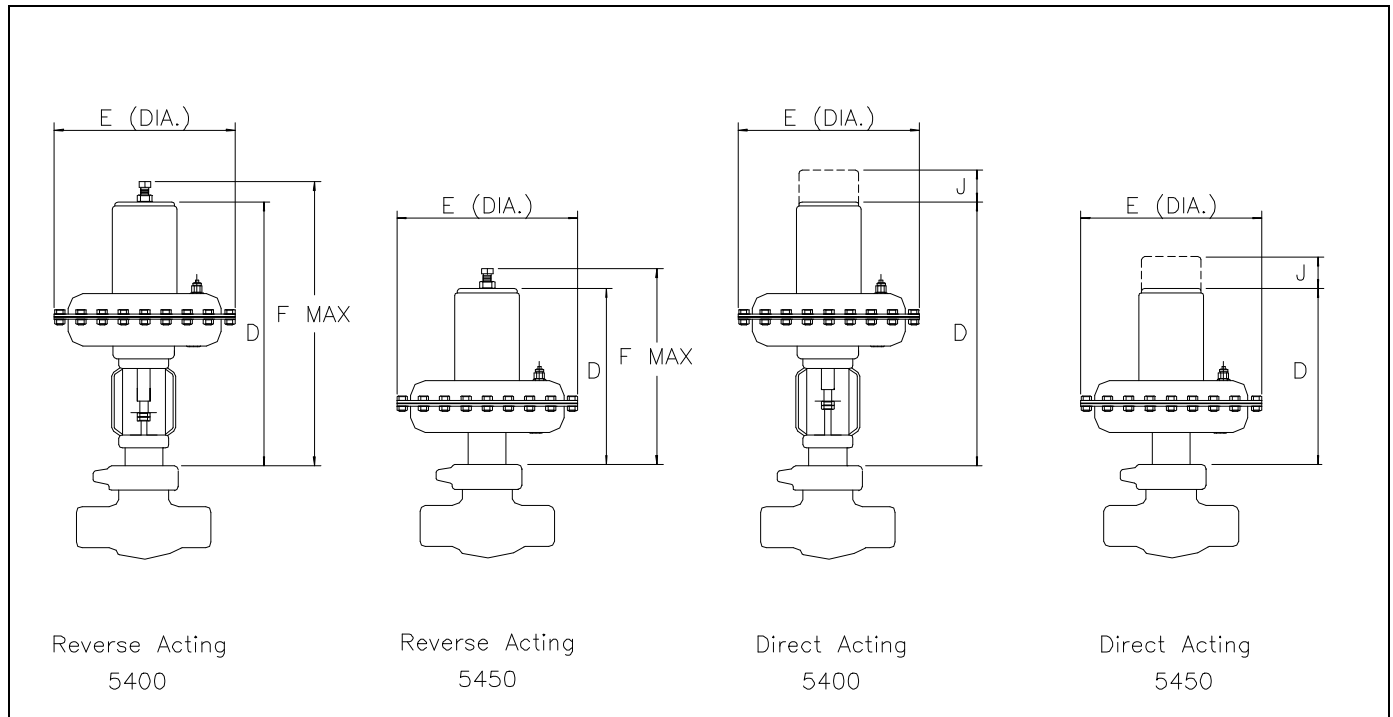
Actuator Assembly Dimensions (Inches)

Actuator Size	5400						5450					
	Direct			Reverse			Direct			Reverse		
	D	E	J ¹	D	E	F	D	E	J ¹	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 ¹	D	E	F	D	E	J ¹	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 Number Information

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

STYLE	CODE
Open Yoke	00
Close-Coupled	50
BODY SIZE	CODE
1"	1
2"	2
END CONNECTIONS	CODE
Female NPT	S
Raised Face (RF) Flange	F
Ring Type Joint (RTJ) Flange	J
Other	(special)
ANSI CLASS (PRESSURE RATING)	CODE
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)	
MATERIALS OF CONSTRUCTION	CODE
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)
BODY STYLE	CODE
Globe	G
Tee (1") or Angle (2")	T
Globe with Tapped Pressure Ports	P
ACTUATOR SELECTION	CODE
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
ACTUATOR TYPE	CODE
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
SEAL MATERIAL	CODE
Buna-N	B
Viton	V
Other	(special)
TRIM MATERIAL	CODE
17-4PH SST	1
Tungsten Carbide	2
Other	(special)
TRIM SIZE	CODE
1/4"	2
3/8"	3
1/2"	4
3/4"	6
1"	8
TRIM CHARACTERISTIC	CODE
Quick Opening (On/Off)	Q
Modified Percent (Throttling)	M

While this information is presented in good faith and believed to be accurate, Mallard Control Company does not guarantee results based upon such information. Mallard Control Company reserves the right to change the design or specifications of these products without notice.

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