The INVALCO Series 596 Valve Actuators were designed specifically for use with butterfly valves, ball valves and other applications where powerful reciprocating motion is required. A wide selection of diaphragm sizes and spring rates provide economic automation and control to valves, dampers, louvers and other applications. All sizes of actuators have the same threaded mounting connection and the same stern threads making one standard mounting arrangement possible. The lower stem bushing is designed to serve as the adjustable travel limit stop providing the best stem thrust support possible.

Materials of Construction

Diaphragm Case

Heavy drawn steel. Cadmium plated steel nuts and bolts are used to attach the upper and lower case.

Diaphragm

Chemical resistant Buna-N with nylon reinforcing molded in for strength and durability. Peroxide cured Buna-N and Viton are available, consult factory.

Diaphragm Plates

Cast iron or steel designed to support, protect and align the diaphragm.

Stem

Stainless steel, polished for minimum friction and wear.

Clevis

The Clevis for mating the actuator stem to the valve shaft is steel, zinc plated for corrosion resistance.

Stem Packing

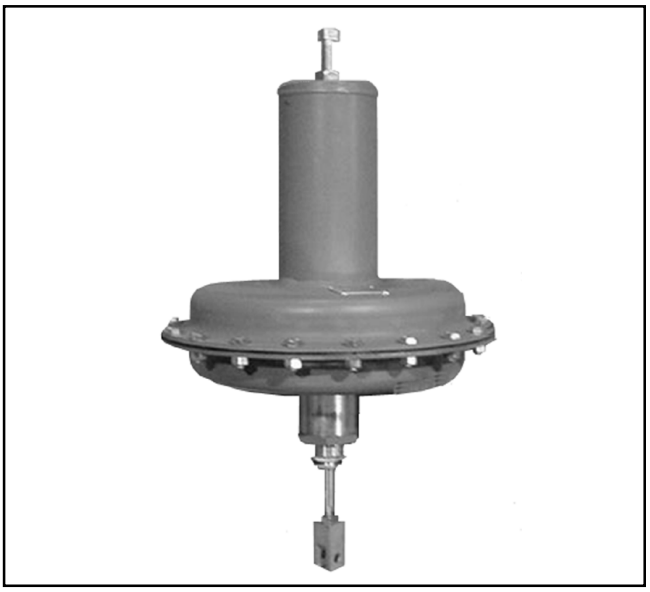
Cotton fiber reinforced Buna-N

Spring

Tempered steel, precision wound to provide the spring rate desired.

Mounting Connection

Steel, zinc plated for corrosion resistance. Brass and stainless steel bearings guide the stem.



Series 596 Valve Actuator

Operating Limits

Temperature

-40°F to 250°F

Containment Pressure

110 psi max.

Stem Load

1/2-20 NF, 4000 lbs max.

3/4-16 NF, 9800 lbs max.

Reaction Load, Diaphragm Case

No. 35 and No. 50 - 9000 lbs. max.

No. 80 - 7000 lbs. max.

No. 160 - 9800 lbs. max.

Operating Media

Air, Natural Gas, and Inert Liquids

Stem Loads

For a fully restrained stem, the stem load is diaphragm pressure times diaphragm effective area, less the then attained spring force. INVALCO does not recommend stem loads which exceed the yield strength of the stem material. Standard stem material is Type 303 stainless with a yield strength of 30,000 psi. The stem load may be limited by the root diameter of the threaded portion or by the reaction force on the lower diaphragm case. (See Operating Limits)

During stem travel, the stem load is the prevailing torque divided by the effective lever length (1.256 in. for IN-VALCO Mounting Kits), plus 20 lbs. packing drag.

Reaction Load

Reaction load is concentrated at the center of the lower diaphragm case and is equal and opposite to the stem load. See illustration at right. Exceeding the reaction load limit (See Operating Limits) will cause permanent deformation of the lower diaphragm case.

Diaphragm Response

Travel Inches	Effective Areas, Sq. In.			
	No. 35	No. 50	No. 80	No. 160
0.25	59	77	100	185
0.50	54	72	96	175
0.75	52	67	93	168
1.00	50	66	93	162
1.25	49	65	93	160
1.50	49	65	93	162
1.75	49	64	93	165
2.00	47	62	92	170
2.25	46	61	91	170
2.50	45	59	87	165
2.75	44	57	--	167
3.00	42	54	--	167

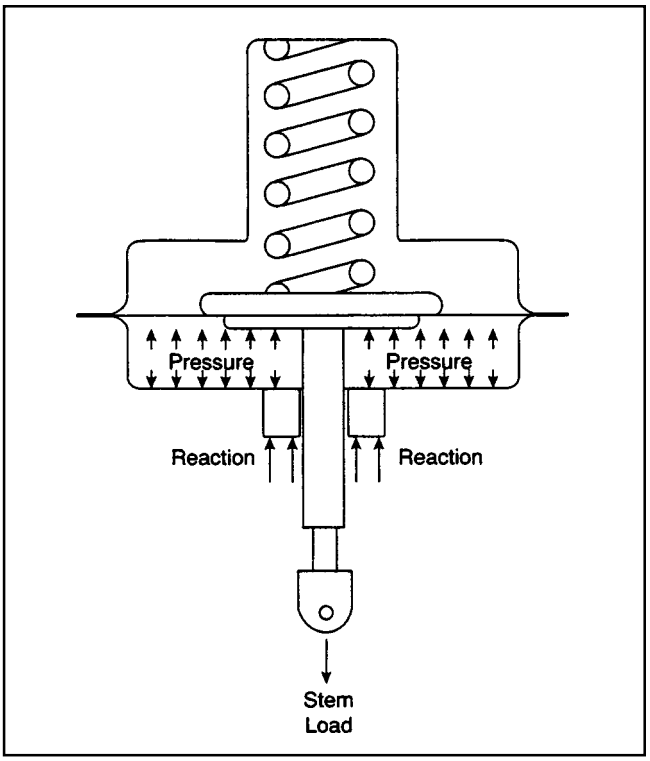


Figure 1.

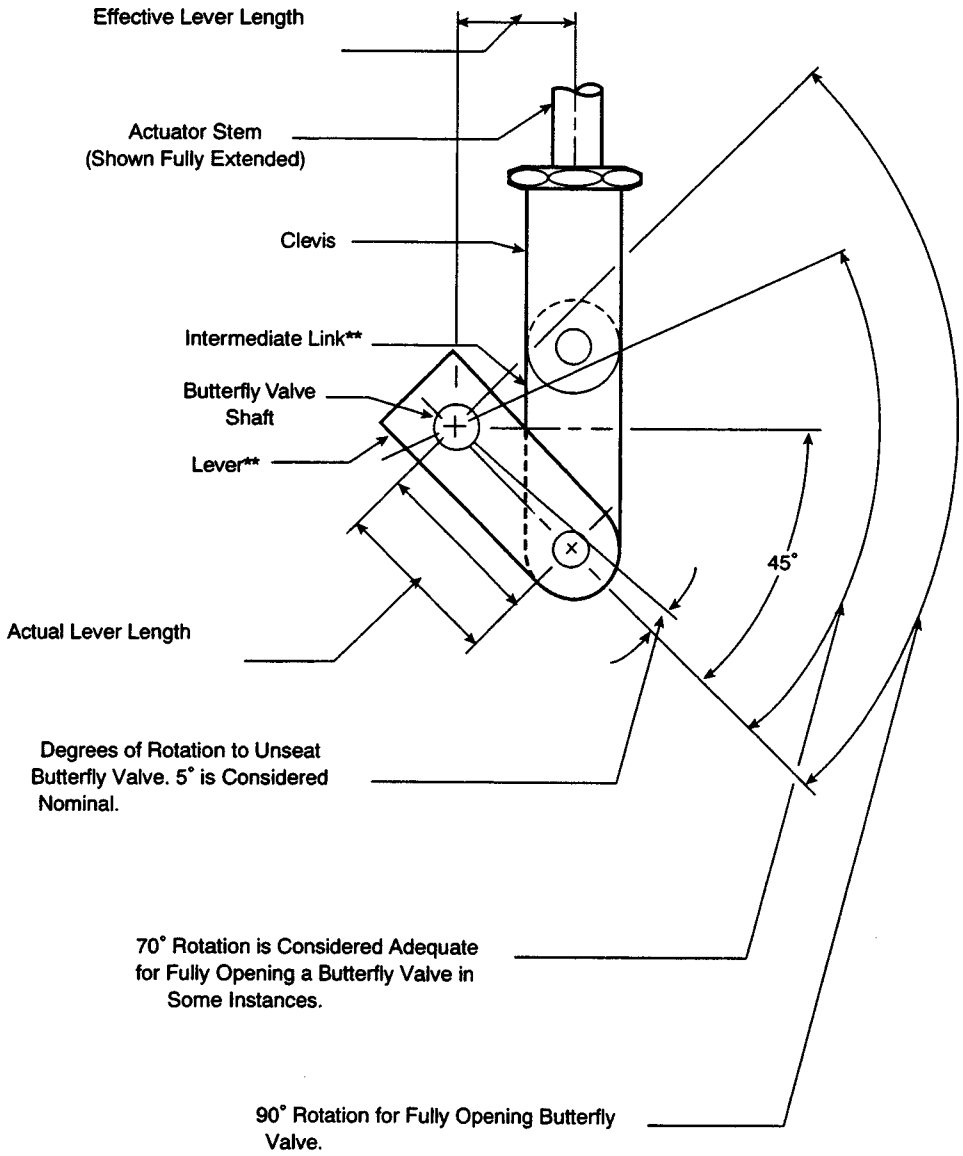
Effective Areas

The effective area of a diaphragm changes during travel as the diaphragm turns upon itself. These areas are shown in the Diaphragm Response Chart to the left. Zero travel is defined at zero diaphragm pressure with the diaphragm at its extreme position toward the diaphragm case into which pressure will be injected.

Topworks/Diaphragm Selection

Topworks Size	Diaphragm Effective Area
35	45 Sq. In.
50	59 Sq. In.
80	87 Sq. In.
160	165 Sq. In.

Nominal Spring Rate	Actual* Spring Rate	85% of Ultimate Spring Load	Available with Actuator			
160	157	677	D-35	D-50	D-80	--
210	208	811	D-35	D-50	D-80	--
280	276	995	D-35	D-50	D-80	--
360	362	1195	D-35	D-50	D-80	--
440	433	1564	D-35	D-50	D-80	--
600	602	2473	--	--	D-80A	D-160A
1000	1002	4357	--	--	--	D-160B
1660	1661	7158	--	--	--	D-160B



***Not furnished with basic actuator.*

Quick Selector Chart, Spring-Loaded Diaphragm Actuator for Normally-Closed Butterfly Valve Service

Maximum Torque - Variable Pressure

Nominal Spring Rate	Maximum Valve Seating Torque (In. lbs.) (85% Spring Deflection)		Diaphragm Pressure (psig) Required to Stroke Actuator with Spring Loaded for Maximum Torque							
			70° Rotation				90° Rotation			
	70° Rotation	90° Rotation	D-35	D-50	D-80 D-80A	D-160A D-160B	D-35	D-50	D-80 D-80A	D-160A D-160B
160	454	355	15	11	7	*	15	12	8	*
210	494	361	17	13	9	*	18	14	9	*
280	554	378	21	16	11	*	22	17	12	*
360	588	356	26	19	13	*	27	20	14	*
440	872	597	33	25	17	*	35	27	18	*
600	1589	1205	*	*	27	15	*	*	29	15
1000	2947	2309	*	*	*	26	*	*	*	27
1660	4804	3746	*	*	*	43	*	*	*	43

Constant Pressure (15 psi) Variable Torque

Nominal Spring Rate	Maximum Valve Seating Torque (In. lbs.) with 15 psig Available Air							
	70° Rotation				90° Rotation			
	D-35	D-50	D-80 D-80A	D-160A D-160B	D-35	D-50	D-80 D-80A	D-160A D-160B
160	454	454	454	*	352	355	355	*
210	361	494	494	*	190	361	361	*
280	188	472	554	*	**	239	378	*
360	**	254	588	*	**	**	356	*
440	**	74	641	*	**	**	270	*
600	*	*	212	1589	*	*	**	1205
1000	*	*	*	635	*	*	*	**
1660	*	*	*	**	*	*	*	**

Constant Pressure (25 psi) Variable Torque

Nominal Spring Rate	Maximum Valve Seating Torque (In. lbs.) with 25 psig Available Air							
	70° Rotation				90° Rotation			
	D-35	D-50	D-80 D-80A	D-160A D-160B	D-35	D-50	D-80 D-80A	D-160A D-160B
160	454	454	454	*	355	355	355	*
210	494	494	494	*	361	361	361	*
280	554	554	554	*	378	378	378	*
360	562	588	588	*	269	356	356	*
440	382	855	872	*	44	484	597	*
600	*	*	1371	1589	*	*	830	1205
1000	*	*	*	2750	*	*	*	2017
1660	*	*	*	1080	*	*	*	**

Based on 1.259" effective lever length (standard for INVALCO Butterfly Valve Kits).

*Actuator/Spring Combination not available.

**Cannot stroke Actuator/Spring Combination with Available Air.

Quick Selection Chart, Spring-Loaded Diaphragm Actuator

Nominal Spring Rate	Maximum Valve Unseating Torque Produced by Spring (In. Lbs.)	Diaphragm Pressure Required to Seat Valve with Spring Loaded for Maximum Torque (psig)				Unseating Torque Produced with Spring Set at Minimum for 90° Rotation	Diaphragm Pressure Required toSeat Valve with Spring Loaded for Minimum Torque (psig) 90° Rotation				Unseating Torque Produced with Spring Set at Minimum for 70° Rotation	Diaphragm Pressure Required toSeat Valve with Spring Loaded for Minimum Torque (psig) 70° Rotation			
		D-35	D-50	D-80 D-80A	D-160A D-160B		D-35	D-50	D-80 D-80A	D-160A D-160B		D-35	D-50	D-80 D-80A	D-160A D-160B
160	830	30	23	15	*	475	18	13	9	*	375	13	10	7	*
210	991	36	27	18	*	629	23	18	12	*	497	18	13	9	*
280	1213	44	33	23	*	835	31	24	16	*	659	24	18	12	*
360	1452	52	40	27	*	1095	41	31	21	*	865	31	25	16	*
440	1907	68	52	35	*	1310	48	37	25	*	1034	37	28	19	*
600	3027	*	*	56	30	1822	*	*	35	18	1438	*	*	26	14
1000	5392	*	*	*	52	3032	*	*	*	31	2394	*	*	*	24
1660	8773	*	*	*	86	5027	*	*	*	51	3669	*	*	*	39

Based on 1.259" effective lever length (standard for INVALCO Butterfly Valve Kits).

*Actuator/Spring Combination not available.

Quick Selection Chart, Balanced Diaphragm Actuator for Butterfly Valve Service*

Diaphragm Actuator Model Number	Torque (In. lbs.) Produced with Available Air Pressure		
	15 psi	25 psi	50 psi
DD-35-S-596	850	1416	2833
DD-50-S 596	1114	1857	3714
DD-80-S-596	1643	2738	5477
DD-160-S-596	3116	5193	10387

Figures based on 1.259" effective lever length (standard for INVALCO Butterfly Mounting Kits).

*Air to open, air to close

Ordering Information

Model	Part Number
D-35-S-160-596	80007531
D-35-S-210-596	80007532
D-35-S-280-596	80007533
D-35-S-360-596	80007534
D-35-S-440-596	80007535
D-50-S-160-596	80007536
D-50-S-210-596	80007537
D-50-S-280-596	80007538
D-50-S-360-596	80007539
D-50-S-440-596	80007540
D-80-S-160-596	80007541
D-80-S-210-596	80007542
D-80-S-280-596	80007543
D-80-S-360-596	80007544
D-80-S-440-596	80007545
D-80A-S-600-596	80007546
D-160A-S-600-596	80007547
D-160B-S-1000-596	80007548

Model	Part Number
DD-35-S-596	80007549
DD-50-S-596	80007550
DD-80-S-596	80007551
DD-160-S-596	80007552

Modeling

Series 596 Valve Actuators ___ — ___ — ___ — ___ — **596**

Actuator Type

D - Spring-Loaded Diaphragm Actuator
DD - Balanced Diaphragm Actuator
(Air to Open, Air to Close)

Nominal Topworks - Diaphragm Size

35 - 45 Sq. In.
50 - 59 Sq. In.
80 - 87 Sq. In.
160 - 165 Sq. In.

Actuator Type

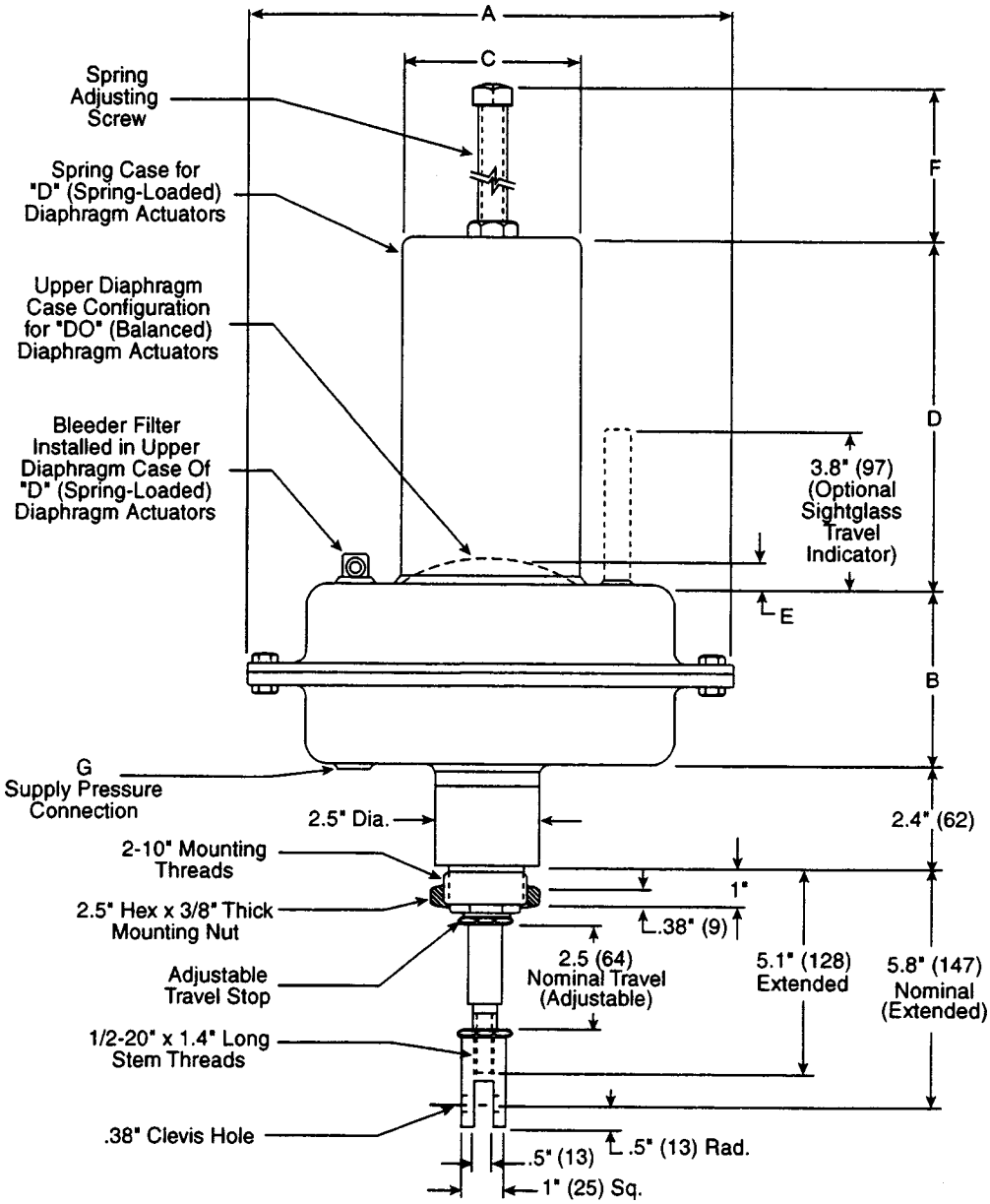
S - Threaded

Nominal Spring Rate

160 - 157 Actual Pounds Per Inch of Deflection
210 - 208 Actual Pounds Per Inch of Deflection
280 - 276 Actual Pounds Per Inch of Deflection
360 - 362 Actual Pounds Per Inch of Deflection
440 - 433 Actual Pounds Per Inch of Deflection
600 - 602 Actual Pounds Per Inch of Deflection
1000 - 1002 Actual Pounds Per Inch of Deflection
1660 - 1661 Actual Pounds Per Inch of Deflection

Dimensions

Inches (mm)



Model Number	A	B	C	D	E	F*	G
D-35-S	11.8" (298)	4.4" (112)	4.3" (108)	8.4" (212)	--	7.1" (180)	1/4" NPT
D-50-S	12.5" (317)	4.4" (112)	4.3" (108)	8.4" (212)	--	7.1" (180)	1/4" NPT
D-80-S	14.3" (361)	3.9" (100)	4.3" (108)	8.4" (212)	--	7.1" (180)	1/4" NPT
D-80A-S	14.3" (361)	3.9" (100)	4.3" (108)	13.4" (339)	--	7.1" (180)	1/4" NPT
D-160A-S	18.6" (472)	7.3" (185)	4.3" (108)	12.8" (325)	--	7.1" (180)	1/2" NPT
D-160B-S	18.6" (472)	7.3" (185)	6" (152)	13.1" (332)	--	6.3" (158)	1/2" NPT
DD-35-S	11.8" (298)	4.4" (112)	--	--	.5" (13)	--	1/4" NPT
DD-50-S	12.5" (317)	4.4" (112)	--	--	.6" (16)	--	1/4" NPT
DD-80-S	14.3" (361)	3.9" (100)	--	--	.6" (16)	--	1/4" NPT
DD-160-S	18.6" (472)	7.3" (185)	--	--	--	--	1/2" NPT

**Allowance for removal of spring adjustment screw.*

Note: Dimensions -- Inches to the nearest tenth (millimeters to the nearest whole mm), each independently dimensioned from respective engineering drawings.

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The specifications contained herein are subject to change without notice and any user of said specifications should verify from the manufacturer that the specifications are currently in effect. Otherwise, the manufacturer assumes no responsibility for the use of specifications which may have been changed and are no longer in effect.

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