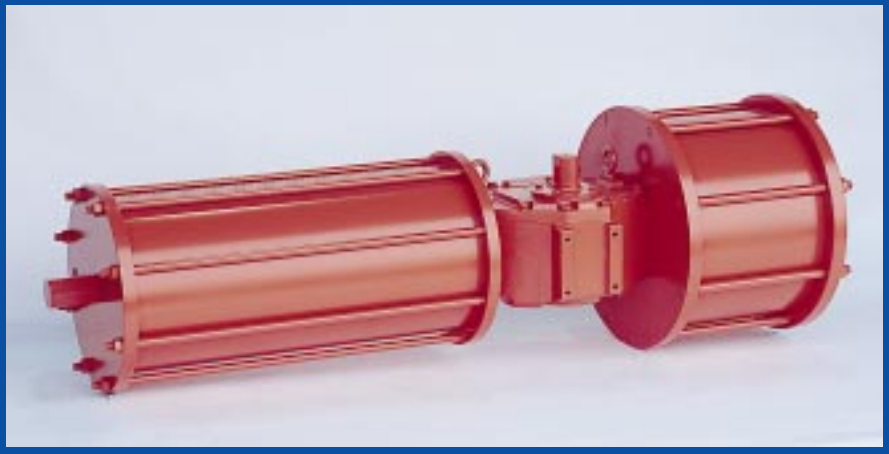
BETTIS
Actuators & Controls
A Daniel Industries Company

E-Series
Pneumatic and Hydraulic
Quarter Turn Valve Operators



Introduction

Bettis Canada Ltd. offers a comprehensive line of quarter turn pneumatic and hydraulic operators with torque outputs from 100 to 1,500,000 lb.in. By incorporating field proven accessories, and being readily adaptable to meet both standard and specialized requirements, an operator and control system package can be custom tailored for each specific application.

Model Identification

<table>
<tr><th>Cylinder Size</th><th>Series Number</th><th>Cylinders</th><th colspan="3">Model Suffixes (Omitted if Not Applicable)</th></tr>
<tr><td>OO
Cylinder Bore Diameter</td><td>OO
Identifies Series</td><td>X
Cylinder Arrangement</td><td>SR
Spring Return Model</td><td>OOO
Spring Class</td><td>Hydraulic</td><td>MXX
Manual Override Options</td></tr>
<tr><td rowspan="2">Omitted here because each cylinder has a unique cylinder bore diameter from 3½” to 7” diameter.</td><td rowspan="2">35
50
60
70</td><td>“S” for one or “D” for two cylinders pressurized per stroke.</td><td colspan="2">A spring provides for “fail safe” operation.

Spring Class identifies particular spring</td><td>Hydraulic model</td><td rowspan="4">“MJ” - single jackscrew and handwheel

“MJJ” - Dual jackscrew and handwheel.

“MH” - Hydraulic override with handpump.</td></tr>
<tr><td colspan="4">DSRH models are exceptions. They use one single acting hydraulic cylinder opposite the designated spring.</td></tr>
<tr><td>Power cylinders bore sizes from 2” to 18”.</td><td rowspan="2">3

5

6

7</td><td>“S” for single cylinder construction, one side pressurized per stroke: “D” for dual cylinder construction two cylinders pressurized per stroke.</td><td colspan="2">A spring provides for “fail safe” operation

Spring Class identifies particular spring.</td><td>Hydraulic model</td></tr>
<tr><td>DSRH models are exceptions: identification is by spring cylinder diameter</td><td colspan="4">DSRH models are exceptions. They use one single acting hydraulic cylinder opposite the designated spring.</td></tr>
</table>

Basic Features

Design: Scotch yoke mechanism for high breakaway and reseat torque: ideal for quarter turn valves

Construction: Modular, with basic drive case/cylinder combinations to most economically suit field requirements
Pistol type for reliable, positive sealing
Double acting or spring return styles
Stabilized drive rods where required by sideloads
Safe, reliable and field removable spring cartridges
Tie rod cylinder construction for simplified maintenance

Material: Durable, lightweight cast aluminum drive cases are standard – ideal for low temperature and sour service conditions
Ductile iron or cast steel drive cases available
Stress relieved cast steel or ductile iron yokes
Filament wound fiberglass pneumatic cylinders (steel cylinders optional); steel hydraulic cylinders
Nitrite seals are standard; special low temperature or fluoroelastomer seals are also available
No brass or bronze components
Special trims and coatings for corrosive applications

Mounting: Easily adaptable to all quarter turn valves

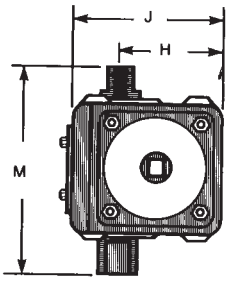
Controls: Complete control packages to suit specific applications
Local, remote, failsafe or self-contained hydraulic systems using Bettis components in conjunction with field proven accessories

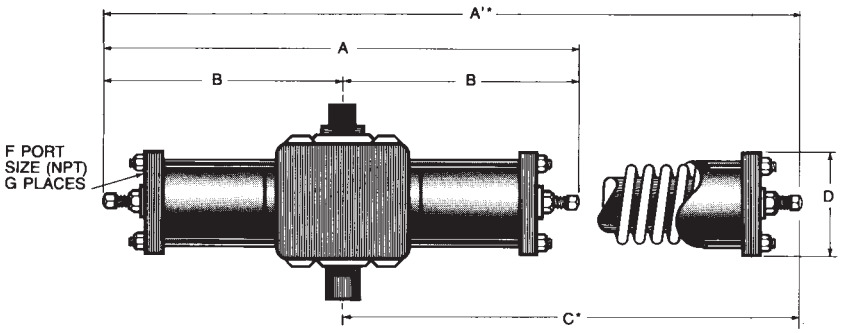
Temperature: Low temperature trim is standard: -50°F to +150°F (Buny/Polyslide)
Trim High temperature trim is optional: -20°F to +200°F (H-T Fluoroelastomer/Steel)
-20°F to +225°F (H-T Fluoroelastomer/Steel)
Extreme low temperature is optional: -65°F to +150°F (Fsi/Polyslide)

Special: Custom design and manufacturing available to meet unique requirements

Series 35 Thru 70 – Dimensions and Data

A. Pneumatic Operators

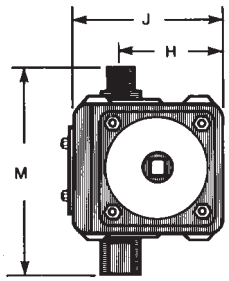


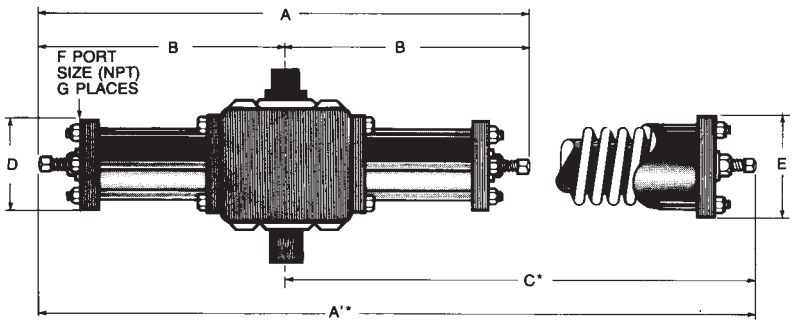


MODEL	Dimensions (in)										Weight (lb.)	Actuator Displacement (in^3)	Nominal Stroke (in)	Cylinder Bore (in)
	A	A' *	B	C *	D	F	G	H	J	M				
35 S	20-1/4	-	10-1/8	-	4-1/4	1/4	2	4-1/4	6	7-3/8	20	33	2-3/4	3-1/2
35 SSR	-	30-3/4	10-1/8	20-5/8	4-1/4	1/4	1	4-1/4	6	7-3/8	30	33	2-3/4	3-1/2
35 D	19	-	9-1/2	-	4-1/4	1/4	2	4-1/4	6	7-3/8	20	51	2-3/4	3-1/2
35 DSR	-	30-7/8	9-1/2	21-3/8	4-1/4	1/4	2	4-1/4	6	7-3/8	35	51	2-3/4	3-1/2
50 S	28	-	14	-	6	1/4	2	5-3/8	7-1/2	10-5/8	50	88	4-1/2	5
50 SSR	-	39-1/2	14	25-1/2	6	1/4	1	5-3/8	7-1/2	10-5/8	80	88	4-1/2	5
50 D	30	-	13-3/4	-	6	1/4	2	5-3/8	7-1/2	10-5/8	55	173	4-1/2	5
50 DSR	-	47	13-3/4	32-1/2	6	1/4	2	5-3/8	7-1/2	10-5/8	90	173	4-1/2	5
60 D	33-1/4	-	16-3/4	-	7	1/4	2	6-1/2	9-3/8	12-9/16	95	304	5-1/2	6
60 DSR	-	52-3/4	16-3/4	36	7	1/4	2	6-1/2	9-3/8	12-9/16	150	304	5-1/2	6
70 D	41	-	20-1/2	-	8-1/4	1/4	2	7-3/4	11	4-1/2	140	508	6-3/4	7
70 DSR	-	75-3/4	31	44-3/4	8-1/4	1/4	2	7-3/4	11	4-1/2	270	508	6-3/4	7

*Note: Dimensions A' and C refer to spring return models.

B. Hydraulic Operators





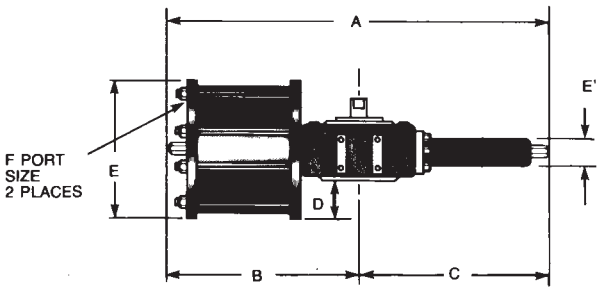
MODEL	Dimensions (in)											Weight (lb.)	Actuator Displacement (in^3)	Nominal Stroke (in)	Cylinder Bore (in)
	A	A' *	B	C *	D	E	F	G	H	J	M				
35 SH	21	-	10-1/2	-	3-1/4	-	1/4	2	4-1/4	6	7-3/8	25	5.7	2-3/4	1-5/8
35 DSRH	-	31-3/4	10-3/8	21-3/8	3-1/4	4-1/4	1/4	1	4-1/4	6	7-3/8	40	5.7	2-3/4	1-5/8
50 SH	30	-	15	-	5	-	1/4	2	5-3/8	7-1/2	10-5/8	70	22.1	4-1/2	2-1/2
50 DSRH	-	48-1/2	16	32-1/2	5	6	1/4	1	5-3/8	7-1/2	10-5/8	90	22.1	4-1/2	2-1/2
60 SH	34	-	17	-	5-1/2	-	1/4	2	6-1/2	9-3/8	12-9/16	90	38.9	5-1/2	3
60 DSRH	-	54	18	36	5-1/2	7	1/4	1	6-1/2	9-3/8	12-9/16	150	38.9	5-1/2	3
70 SH	40	-	20	-	5-5/8	-	1/4	2	7-3/4	11	14-1/2	140	64.9	6-3/4	3-1/2
70 DSRH	-	65-3/4	21	44-3/4	5-5/8	8-1/4	1/4	1	7-3/4	11	14-1/2	260	64.9	6-3/4	3-1/2

*Note: Dimensions A' and C refer to spring return models.

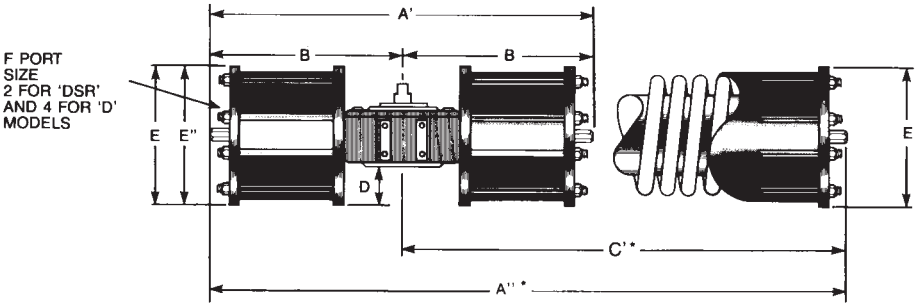
Series 3, 5, 6 and 7 – Dimensions and Data

A. Pneumatic Operators

'S' TYPE OPERATOR



'D'/'SSR' TYPE OPERATOR

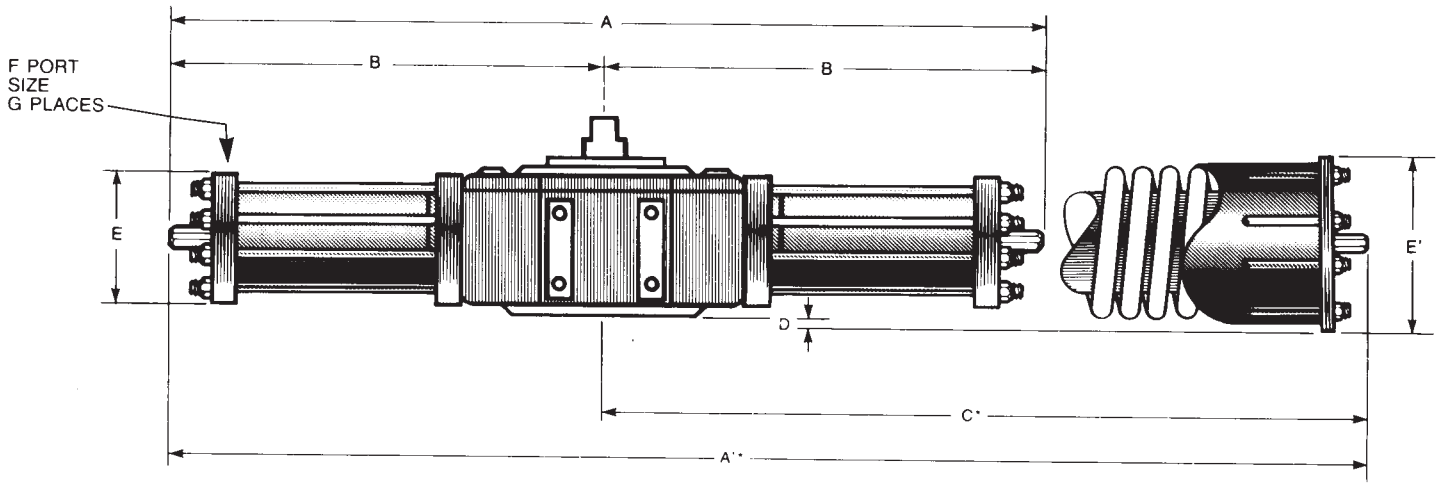


MODEL	Dimensions (in)											Weight (lb.)	Actuator Displacement (in^3)	Nominal Stroke (in)	Air Cylinder Bore (in)
	A	A' *	A" *	B	C	C'*	D	E	E'	E"	F (NPT)				
123S-SR	-	-	66-1/4	24-1/2	-	41-3/4	1-7/16	10-3/4	-	14-3/4	3/8	340	682	7	12
103 S	48	-	-	24-1/2	23-1/2	-	2-7/16	12-3/4	2-3/4	-	3/8	240	553	7	10
143S-SR	-	-	74	24-1/2	-	49-1/2	2-7/16	12-3/4	-	17	3/8	500	1080	7	14
123 S	48	-	-	24-1/2	23-1/2	-	3-7/16	14-3/4	2-3/4	-	3/8	270	795	7	12
163S-SR	-	-	64-1/4	24-1/2	-	39-3/4	3-7/16	14-3/4	-	18-3/4	3/8	550	1560	7	16
143 S	48	-	-	24-1/2	23-1/2	-	4-9/16	17	2-3/4	-	1/2	370	1070	7	14
163 S	48	-	-	24-1/2	23-1/2	-	5-9/16	19	2-1/2	-	1/2	420	1400	7	16
105 S	65-3/8	-	-	32	33-3/8	-	1-3/4	12-3/4	4	-	3/8	400	795	10	10
145S-SR	-	-	86-1/2	33-3/4	-	52-3/4	1-3/4	12-3/4	-	16-3/4	3/8	710	1500	10	14
125 S	65-3/8	-	-	32	33-3/8	-	2-3/4	14-3/4	4	-	3/8	440	1120	10	12
165S-SR	-	-	86-1/2	33-3/4	-	52-3/4	2-3/4	14-3/4	-	18-3/4	3/8	860	2190	10	16
145-S	65-7/8	-	-	33-1/2	33-3/8	-	3-3/4	16-3/4	4	-	3/8	530	1540	10	14
145-D	-	67-1/2	-	33-3/4	-	-	3-3/4	16-3/4	-	-	3/8	740	3010	10	14
185S-SR	-	-	87-3/4	33-3/4	-	54	3-3/4	16-3/4	-	20-3/4	3/8	1330	3010	10	18
165 S	66-3/8	-	-	33	33-3/8	-	4-3/4	18-3/4	4	-	1/2	590	2010	10	16
165 D	-	67-1/2	-	33-3/4	-	-	4-3/4	18-3/4	-	-	1/2	860	3950	10	16
185 S	66-3/8	-	-	33	33-3/8	-	5-3/4	20-3/4	4	-	1/2	660	2540	10	18
185 D	-	67-1/2	-	33-3/4	-	-	5-3/4	20-3/4	-	-	1/2	990	5020	10	18
147 D	-	97-1/4	-	48-5/8	-	-	1-3/4	16-3/4	-	-	1/2	1600	4130	14	14
207S-SR	-	-	132-1/4	48-5/8	-	83-5/8	1-3/4	16-3/4	-	24	1/2	2380	4130	14	20
167 S	94	-	-	48-5/8	45-3/8	-	2-3/4	18-3/4	5-1/4	-	1/2	1380	2820	14	14
167 D	-	97-1/4	-	48-5/8	-	-	2-3/4	18-3/4	-	-	1/2	1730	5450	14	16
227S-SR	-	-	135-1/4	48-5/8	-	86-5/8	2-3/4	18-3/4	-	25	1/2	2740	5450	14	22
187 D	-	97-1/4	-	48-5/8	-	-	3-3/4	20-3/4	-	-	1/2	1880	6950	14	18
267S-SR	-	-	135-1/4	48-5/8	-	86-5/8	3-3/4	20-3/4	-	30	1/2	3170	6950	14	26
207 D	-	97-1/4	-	48-5/8	-	-	4-3/4	22-3/4	-	-		4000	8620	14	20
247 D	CONSULT FACTORY FOR SIZING														

*Note: Dimensions A" and C' refer to spring return models. Dimension E" refers to SSR models.

Series 3, 5, 6 and 7 – Dimensions and Data

B. Hydraulic Operators



MODEL	Dimensions (in)									Weight (lb.)	Actuator Displacement (in^3)	Nominal Stroke (in)	Cylinder Bore (in)
	A	A'*	B	C*	D	E	E'	F (NPT)	G				
23 SH	47	-	23-1/2	-	-	2-7/8	-	1/4	2	140	22	7	2
33 DH	51	-	25-1/2	-	-	5-5/8	-	3/8	4	170	77	7	3
43 DH	51	-	25-1/2	-	-	6-5/8	-	3/8	4	210	154	7	4
53 DH	51	-	25-1/2	-	-	8	-	3/8	4	280	253	7	5
83 DSRH	-	66	25-1/4	41-3/4	2-1/16	5-5/8	10-3/4	3/8	1	300	50	7	3
103 DSRH	-	73-3/4	25-1/4	49-1/2	3-1/16	6-5/8	12-3/4	3/8	1	430	88	7	4
123 DSRH	-	64	25-1/4	39-3/4	4-1/16	8	14-3/4	3/8	1	490	140	7	5
46 DH	72	-	36	-	-	6-5/8	-	3/8	4	390	181	10	4
56 DH	72	-	36	-	-	8	-	3/8	4	450	322	10	5
66 DH	72	-	36	-	-	9-1/4	-	3/8	4	530	495	10	6
125 DSRH	-	87-1/2	34-3/4	52-3/4	2-3/4	8	14-3/4	3/8	1	790	196	10	5
145 DSRH	-	99	34-3/4	64-1/4	3-1/4	9-1/4	16-3/4	3/8	1	1100	283	10	6
57 DH	100	-	50	-	-	8-3/4	-	1/2	4	1300	374	14	5
67 DH	100	-	50	-	-	9-3/4	-	1/2	4	1450	616	14	6
77 DH	100	-	50	-	-	11-1/4	-	1/2	4	1610	902	14	7
87 DH	100	-	50	-	-	12-5/8	-	1/2	4	1880	1230	14	8
97 DH	100	-	50	-	-	13-1/4	-	1/2	4	2060	1605	14	9
107 DH	100	-	50	-	-	14-1/4	-	1/2	4	2320	2020	14	10
107 DH-8B	112	-	50	62	-	14-1/4	-	1/2	4	2500	2230	14	10
147 DSRH	-	133-1/4	48-7/8	84-3/8	1-3/4	9-1/4	16-3/4	1/2	1	2300	396	14	6
167 DSRH	CONSULT FACTORY FOR SIZING										396	14	6
187 DSRH											539	14	7

*Note: Dimensions A' and C refer to spring return models.

Torques

A. Double Acting Operators

MODEL	Max. Oper. Pressure (PSIG)	End Position Output Torque at Operating Pressure of *						
		60 PSIG	80 PSIG	100 PSIG	120 PSIG	140 PSIG	750 PSIG	1000 PSIG
PNEUMATIC								
35S	150	1,270	1,690	2,110	2,530	2,950	-	-
35D	150	2,460	3,280	4,100	4,920	5,740	-	-
50S	150	4,240	5,660	7,070	8,480	9,900	-	-
50D	150	8,280	11,000	13,800	16,600	19,300	-	-
60D	150	14,600	19,400	24,300	29,200	34,000	-	-
70D	150	24,400	32,500	40,600	48,700	56,800	-	-
103S	150	26,400	35,200	44,000	52,800	61,600	-	-
123S	150	38,000	50,600	63,300	76,000	88,600	-	-
143S	150	51,700	69,000	86,200	100,000	100,000	-	-
163S	150	67,800	90,400	100,000	100,000	100,000	-	-
105S	150	37,700	50,200	62,800	75,400	87,900	-	-
125S	150	54,300	72,400	90,500	109,000	127,000	-	-
145S	140	73,800	98,400	123,000	148,000	172,000	-	-
145D	140	145,000	193,000	241,000	289,000	337,000	-	-
165S	140	96,600	129,000	161,000	193,000	225,000	-	-
165D	140	190,000	253,000	316,000	379,000	442,000	-	-
185S	120	122,000	163,000	204,000	245,000	-	-	-
185D	120	241,000	322,000	402,000	482,000	-	-	-
147D	140	199,000	265,000	331,000	397,000	463,000	-	-
167S	140	135,000	180,000	225,000	270,000	315,000	-	-
167D	140	262,000	349,000	436,000	523,000	610,000	-	-
187D	120	334,000	445,000	556,000	667,000	-	-	-
207D	120	414,000	552,000	690,000	828,000	-	-	-
247D	120	599,400	799,200	999,000	1,200,000	-	-	-
HYDRAULIC								
35 SH	2,000						3,420	4,560
50 SH	2,000						13,300	17,700
60 SH	2,000						23,200	31,000
70 SH	2,000						39,000	52,000
23 SH	1,500						13,500	18,000
33 DH	1,500						48,700	65,000
43 DH	1,500						97,500	130,000
53 DH	1,440						112,000	150,000
46 DH	1,500						115,000	153,000
56 DH	1,500						205,000	273,000
66 DH	1,500						315,000	400,000
57 DH	1,500						238,000	317,000
67 DH	1,500						392,000	523,000
77 DH	1,500						574,000	766,000
87 DH	1,500						780,000	1,040,000
97 DH	1,500						1,020,000	1,360,000
107 DH	1,440						1,290,000	1,500,000
107 DH-8B	1,440						1,500,000	1,500,000

*Note: All torques in lb.in. Minimum torque is 1/2 End Torque.

Torques

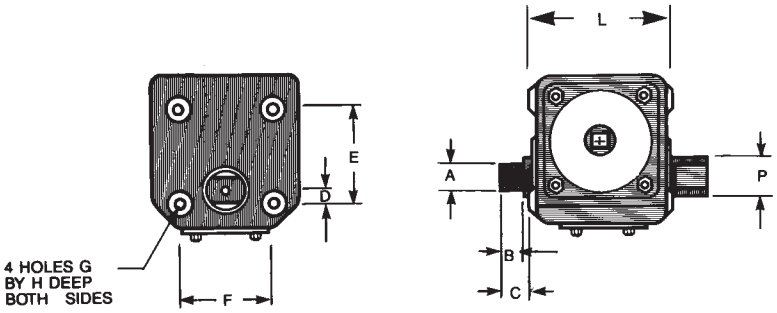
B. Spring Return Operators

MODEL	Min. Oper. Pres. (PSI)	Max. Oper. Pres. (PSI)	Calculated Spring Unloading Torque (lb.in.)			Calc. Air Loading Torque at Min Oper Pres (lb.in.)*		
			Starting	Mid-Stroke	Ending	Starting	Mid-Stroke	Ending
PNEUMATIC								
35S-SR60	60	150	880	350	516	754	285	386
35S-SR80	80	150	1200	476	702	991	370	491
35D-SR40	40	150	1040	397	544	1100	423	596
35D-SR60	60	150	1800	686	940	1520	544	657
35D-SR80	80	150	2320	924	1370	1910	717	960
35D-SR100	100	150	2730	1060	1530	2570	986	1370
35D-SR120	120	150	3610	1440	2140	2780	1020	1310
50S-SR60	60	150	3050	1200	1770	2480	916	1190
50S-SR80	80	150	4090	1620	2370	3290	1210	1560
50S-SR100	100	150	5290	2060	2950	4120	1470	1780
50D-SR40	40	150	4140	1640	2420	3100	1120	1370
50D-SR60	60	150	5630	2230	3280	4990	1910	2640
50D-SR80	80	150	8140	3220	4750	6280	2290	2890
50D-SR100	100	150	9770	3870	5700	8080	3020	4010
60D-SR40	40	150	6730	2650	3890	5830	2200	2990
60D-SR60	60	150	11600	4850	7820	6750	2440	3010
60D-SR80	80	150	12200	4810	7050	12400	4900	7230
60D-SR100	100	150	16300	6440	9420	14900	5710	7970
60D-SR120	120	150	19600	7750	11300	17800	6830	9500
70D-SR40	40	150	10500	4170	6170	10100	3950	5740
70D-SR60	60	150	16600	6590	9750	14600	5590	7760
70D-SR80	80	150	23200	9200	13600	18900	7040	9300
70D-SR100	100	150	27700	10900	15800	24800	9430	12900
70D-SR120	120	150	33400	13300	19600	29100	11100	15300
70D3-SR80	80	150	33400	13300	19600	28700	10900	14900
70D3-SR120	120	150	41800	16900	25800	46700	19400	30700
123S-SR60	60	150	20900	8150	11700	26300	10800	17100
123S-SR80	80	150	28600	11300	16400	34200	14100	22000
123S-SR100	100	150	35600	14000	20400	43000	17700	27700
143S-SR60	60	150	34900	14200	21800	29900	11700	16900
143S-SR80	80	150	43800	17100	24600	44400	17400	25100
143S-SR100	100	150	55200	21100	29400	56900	22000	31000
163S-SR60	60	150	43400	17000	24600	42900	16800	24100
163S-SR80	80	150	56900	22300	32200	57900	22800	33200
163S-SR100	100	150	78700	30700	44100	68500	25600	33900
145S-SR80	80	140	60700	23700	34000	64500	25600	37900
145S-SR100	100	140	75900	29600	42600	80600	32000	47300
165S-SR60	60	140	67500	26500	38300	58200	21800	29000
165S-SR80	80	140	90000	35300	51100	77600	29100	38700
165S-SR100	100	140	112000	44000	63600	97200	36500	48600
185S-SR80	80	120	127000	50000	72900	90000	31400	35700
185S-SR90	90	120	140000	54300	77000	106000	37300	43000
207S-SR60	60	120	129000	50400	73100	138000	55100	82600
207S-SR80	80	120	166000	65700	96600	185000	75100	115000
207S-SR100	100	120	214000	84100	122000	230000	91800	137000
227S-SR80	80	120	173000	67700	97800	243000	103000	168000
227S-SR100	100	120	284000	111000	161000	264000	102000	142000
267S-SR80	80	120	258000	98000	134000	342000	140000	218000
HYDRAULIC						Calc. Hyd Loading Torque at Min Oper Pres (lb.in.)*		
35 DSRM-100	200	275	2730	1060	1530	2710	1050	1500
50 DSRH-100	800	2000**	9770	3870	5700	8440	3200	4370
60 DSRH-100	1000	2000**	16300	6440	9420	12200	4630	5280
70 DSRH-100	800	2000**	27700	10900	15800	25800	9910	13800
83 DSRH-100	1000	1500	35600	14000	20400	50000	21200	34800
103 DSRH-100	1250	1500	55200	21100	29400	58600	22800	32700
123 DRSH-100	1150	1500	78700	30700	44100	82300	32500	47800
125 DSRH-100	1150	1450	112000	44000	63600	117000	46400	68400
145 DSRH-90	1150	1200	140000	54300	77000	103700	36000	40400
147 DSRH-100	1100	1500	214000	84100	122000	226000	90100	13400
167 DSRH-100	1100	1500	FIGURES AVAILABLE ON REQUEST					
187 DSRH-100	1100	1500						

*Note: Calculated torques based on efficiency of 80%, as applied to spring force and piston force
** Higher pressures may be available - consult factory

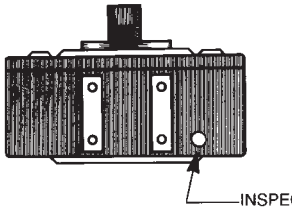
Mounting and Drivecase Dimensions

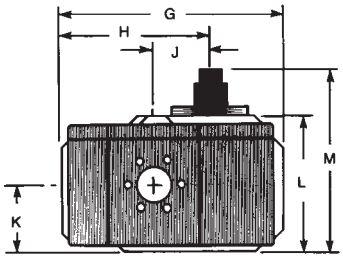
A. Series 35 Thru 70



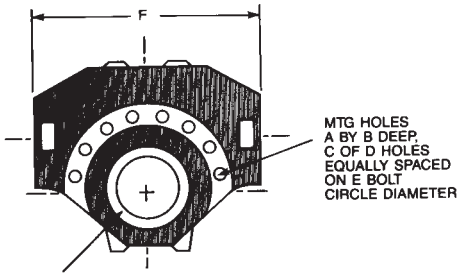
Operator Series	Dimensions (in)									
	A	B	C	D	E	F	G	H	P	L
35	7/8	1	1-3/8	7/8	4-1/4	3	3/8-16NC	1-1/4	1-1/4	4-5/8
50	1-1/2	1-1/4	2	1/2	4	5	1/2-13NC	1-1/2	2	4-5/8
60	1-3/4	1-3/4	1-1/4	1/2	5-3/8	5-3/4	5/8-11NC	1	2-1/4	8-1/16
70	2	2	2-1/2	1/2	6	7	3/4-10NC	1-1/4	2-1/2	9-1/2

B. Series 3, 5, 6 and 7





MAXIMUM ALLOWABLE
STEM DIAMETER, P



Operator Series	Dimensions (in)												
	A	B	C	D	E	F	G	H	J	K	L	M	P
3	5/8-11NC	1	8	16	9	14-12	12-5/8	8-1/2	3-1/2	3-15/16	8	11-1/4	3-1/2
5	5/8-11NC	1	13	24	13	23-3/8	19	13-1/8	5	4-5/8	9-1/4	12-1/2	4
6	3/4-10NC	THRU	14	24	14	22-1/2	19-3/4	13-3/4	5-1/2	5-3/8	10-1/4	13-1/4	4-3/4
7	1-8NC	1-1/2	14	24	19	31-3/4	26-1/4	18-1/4	7	6-5/8	13-3/4	16-3/4	6-1/2

Headquarters
P.O. Box 508
Waller, TX77484
U.S.A.
Tel: 281/463-5100
Fax: 281/463-5103

Bettis Canada Ltd.
4112-91A Street
Edmonton, Alberta, T6E 5V2
Canada
Tel: 780/450-3600
Fax: 780/450-1400

Bettis Canada Ltd.
620, 400-5th Avenue S.W.
Calgary, Alberta, T2P 0L6
Canada
Tel: 403/266-1422
Fax: 403/266-1602

Quality Certification Bureau Inc.

Cert. Num. 93-13

Bettis Canada Ltd.
Edmonton, Alberta

Accredited by
the Dutch Council
for certification

Important: Due to Bettis' continuing commitment to engineered product advancement, data presented herein is subject to change.

5M 02/99 QCP