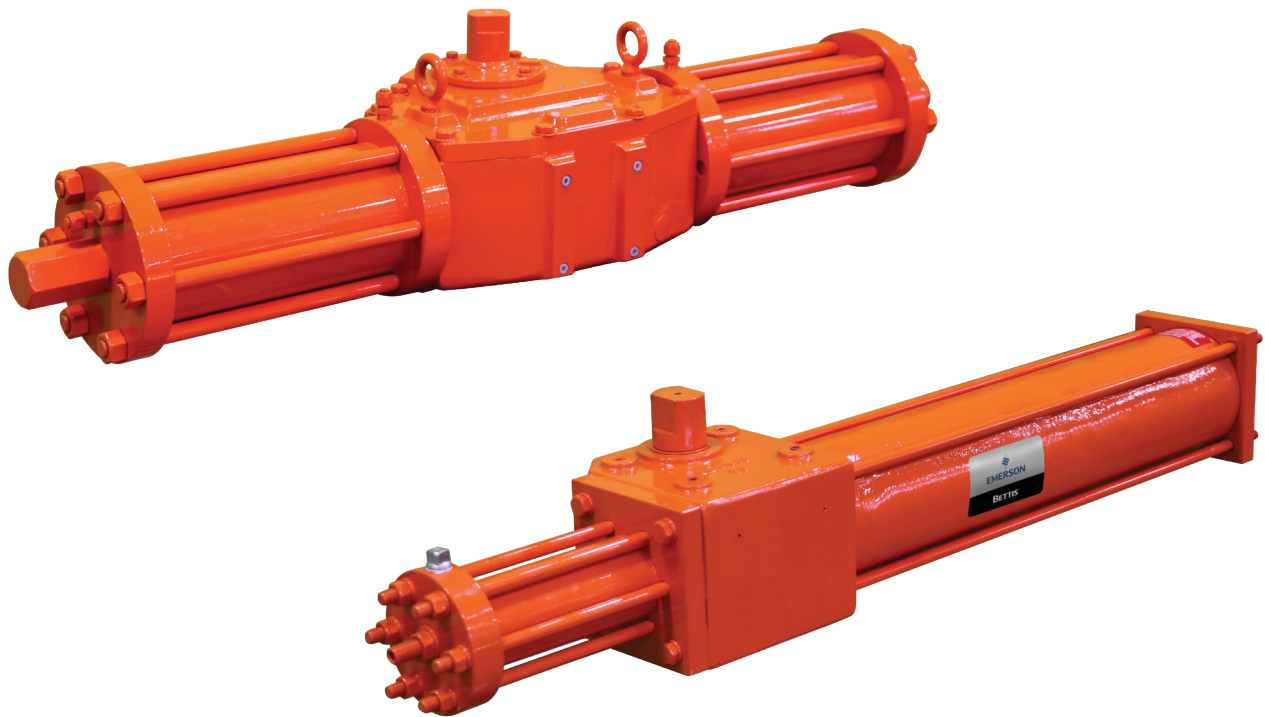


Bettis E-Series

Hydraulic Quarter-Turn Valve Operators



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Introduction

Bettis E-Series offers a comprehensive line of quarter-turn hydraulic operators with torque outputs from 500 lb-in 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.

Basic Features

- Design
 - Scotch yoke mechanism for high breakaway and reseal torque: ideal for quarter-turn valves
- Construction
 - Modular, with basic drive case/cylinder combinations to most economically suit field requirements
 - Piston type for reliable, positive sealing
 - Double-acting or spring-return styles
 - Stabilized drive rods where required by sideload
 - 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
 - Steel hydraulic cylinders
 - Nitrite seals are standard; special low temperature or high temperature fluoroelastomer
 - 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, fail-safe or self-contained hydraulic systems using Bettis components in conjunction with field proven accessories
- Temperature Trim
 - Low temperature trim is standard: -50 °F to +150 °F (Buna/Polyslide)
 - High temperature trim is optional: -20 °F to +225 °F (H-T Fluoroelastomer)

Model Identification

Table 1.

Cylinder size	Series number	Cylinders	Model suffixes (omitted if not applicable)			
OO Cylinder Bore Diameter	OO Identifies Series	X Cylinder Arrangement	SR Spring-return Model	OOO Spring Class	Hydraulic	MX Manual Override Options
Omitted here because each cylinder has a unique cylinder bore diameter from 3-1/2" to 7"	35	"S" for one or "D" for two cylinders pressurized per stroke	A spring provides for "fail-safe" operation. Spring Class identifies particular spring.		Hydraulic model	"MJ" - Single Jackscrew and handweel "MJJ" - Dual Jackscrew and handwheel "MH" - Hydraulic override with handpump
	50					
	60	DSRH models are exceptions. They use one single action hydraulic cylinder opposite the designated spring.				
	70					
Power cylinder bore sizes from 2" to 24"	3	"S" for single cylinder construction, one side pressurized per stroke	A spring provides for "fail-safe" operation. Spring Class identifies particular spring.		Hydraulic model	
	6	"D" for dual cylinder construction, two cylinders pressurized per stroke				
	7					
DSRH models are exceptions; identification is by spring cylinder diameter	-	DSRH models are exceptions. They use one single action hydraulic cylinder opposite the designated spring.				

Dimensions Data - Series 3, 6 and 7

Figure 1. Hydraulic Operators

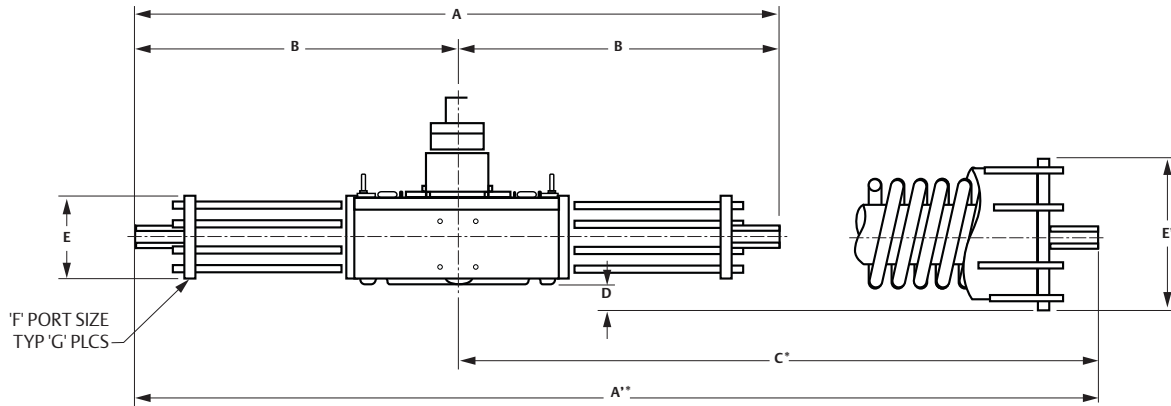


Table 2. Dimensions

Model	Dimensions (in.)									Weight (lb)	Actuator Displacement (cu. in.)	Nominal Stroke (in.)	Cylinder Bore (in.)
	A	A**	B	C*	D	E	E'	F (NPT)	G				
23SH	47	-	23-1/2	-	-	2-7/8	-	1/4	2	140	22	7	2
33DH	51	-	25-1/2	-	-	5-5/8	-	3/8	4	170	77	7	3
43DH	51	-	25-1/2	-	-	6-5/8	-	3/8	4	210	154	7	4
53DH	51	-	25-1/2	-	-	8-5/8	-	3/8	4	280	253	7	5
83D-SRH	-	66	24-1/4	41-3/4	2-1/16	5-5/8	10-3/4	3/8	1	300	50	7	3
103D-SRH	-	73-3/4	24-1/4	49-1/2	1/16	6-5/8	12-3/4	3/8	1	430	88	7	4
123D-SRH	-	64	24-1/4	39-3/4	4-1/16	8	14-3/4	3/8	1	490	140	7	5
46DH	72	-	36	-	-	6-5/8	-	3/8	4	390	181	11	4
56DH	72	-	36	-	-	8	-	3/8	4	450	322	11	5
66DH	72	-	36	-	-	9-1/4	-	3/8	4	530	495	11	6
166S-SRH	-	92-3/4	36-1/4	56-1/2	3-1/8	8	16-7/8	3/8	1	1,250	216	11	5
186S-SRH	-	101-5/8	36-5/8	65	5-1/8	9-1/4	20-7/8	3/8	1	1,400	311	11	6
57DH	100	-	50	-	-	8-3/4	-	1/2	4	1,300	374	14	5
67DH	100	-	50	-	-	9-3/4	-	1/2	4	1,450	616	14	6
77DH	100	-	50	-	-	11-1/4	-	1/2	4	1,610	902	14	7
87DH	100	-	50	-	-	12-5/8	-	1/2	4	1,880	1,230	14	8
97DH	100	-	50	-	-	13-1/4	-	1/2	4	2,060	1,605	14	9
107DH	100	-	50	-	-	14-1/4	-	1/2	4	2,320	2,023	14	10
107DH-8B	112	-	50	62	-	14-1/4	-	1/2	4	2,500	2,230	14	10
147D-SRH	-	133-1/4	48-7/8	84-3/8	1-3/4	9-1/4	16-3/4	1/2	1	2,300	396	14	6
167D-SRH	Consult Factory for Sizing										539	14	7
187D-SRH	Consult Factory for Sizing										703	14	8

Note:

Dimensions A' and C refer to spring-return models.

Dimensions Data - Series 35 to 70

Figure 2. Hydraulic Operators

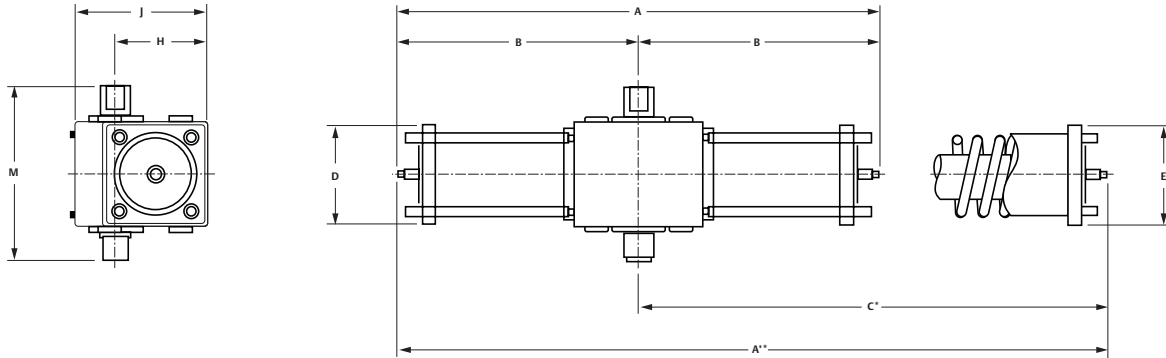


Table 3. Dimensions

Model	Dimensions (in.)											Weight (lb)	Actuator Displacement (cu. in.)	Nominal Stroke (in.)	Cylinder Bore (in.)
	A	A*	B	C*	D	E	F	G	H	J	M				
35SH	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
35D-SRH	-	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
35D-SRM	-	31-3/4	10-3/8	21-3/8	4-1/4	4-1/4	1/4	1	4-1/4	6	7-3/8	35	33	2-3/4	3-1/2
50SH	30	-	15	-	5	-	1/4	2	5-3/8	7-1/2	10-5/8	70	22.1	4-1/2	2-1/2
50D-SRH	-	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
60SH	34	-	17	-	5-1/2	-	1/4	2	6-1/2	9-3/8	12-9/16	90	38.9	5-1/2	3
60D-SRH	-	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
70SH	40	-	20	-	5-5/8	-	1/4	2	7-3/4	11	14-1/2	140	64.9	6-3/4	3-1/2
70D-SRH	-	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.

Mounting and Drive Case Dimensions

Figure 3. Series 35 - 70

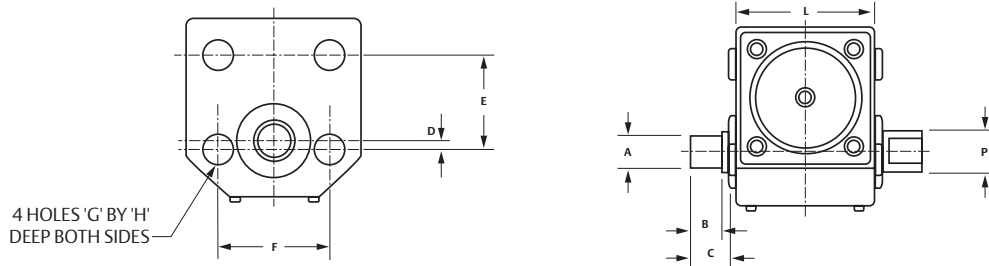


Table 4. Dimensions

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

Figure 4. Series 3, 6 and 7

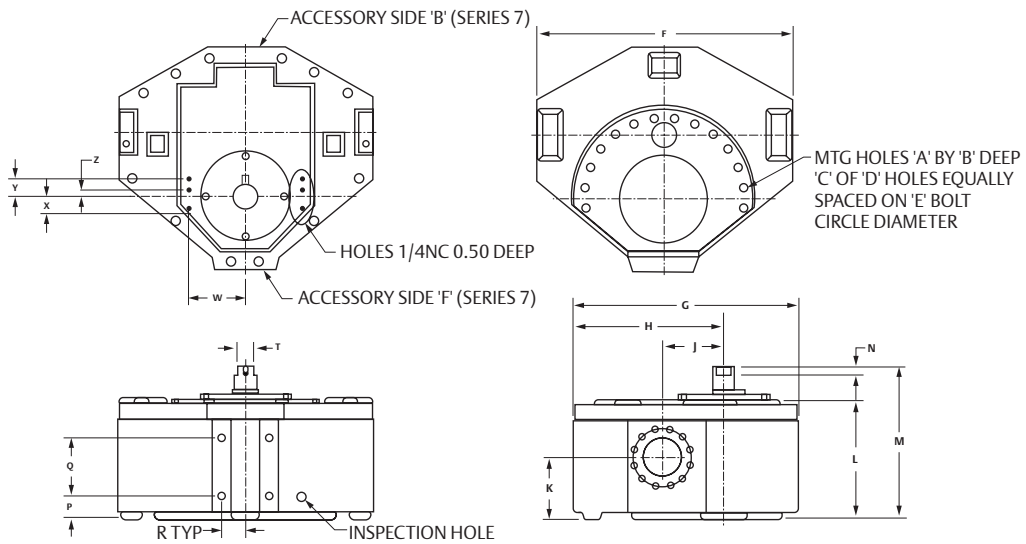


Table 5. Dimensions

Series	Dimensions (in.)																				
	A	B	C	D	E	F	G	H	J	K	L	M	N	P (F,B)	Q (F,B)	R (F,B)	T	W	X	Y	Z
3	5/8-11NC	1	8	16	9	14.5	12.63	8.5	3.5	3.94	8	11	0.75	1.38, 1.38	4, 4	2, 2	1.5	3.63	N/A	0.38	N/A
6	3/4-10NC	THRU	14	24	14	22.5	19.75	13.75	5.5	5.38	10.25	13.25	0.75	2, 2	5, 5	2, 2	1.5	4.19	1.5	1.5	0.5
7	1-8NC	1.5	14	24	19	31.75	26.25	18.25	7	6.63	13.75	16.75	0.75	3, 3.5	6.5, 6	3.25, 2	1.5	6.88	1.5	1.5	N/A

Torques – Double-Acting Operators

Table 6. Hydraulic

Model	Max. Operating Pressure (psig)	End Position Output Torque at Operating Pressure of *					
		500 (psig)	750 (psig)	1000 (psig)	1250 (psig)	1500 (psig)	2000 (psig)
35SH	2,000	2,250	3,420	4,560	5,600	5,600	5,600
50SH	2,000	8,850	13,300	17,700	22,000	22,000	22,000
60SH	2,000	15,500	23,200	31,000	38,000	38,000	38,000
70SH	2,000	26,000	39,000	52,000	65,000	65,000	65,000
23SH	1,500	9,350	13,500	18,700	23,375	28,050	-
33DH	1,500	32,500	48,700	65,000	81,250	97,500	-
43DH	1,500	65,500	97,500	131,000	150,000	150,000	-
53DH	1,440	107,000	112,500	150,000	150,000	-	-
46DH	1,500	84,500	115,000	169,000	211,250	253,500	-
56DH	1,500	150,500	205,000	301,000	376,250	400,000	-
66DH	1,500	231,500	315,000	400,000	400,000	400,000	-
57DH	1,500	159,000	238,000	318,000	397,500	477,000	-
67DH	1,500	261,500	392,000	523,000	653,750	784,500	-
77DH	1,500	383,000	574,500	766,000	957,500	1,149,000	-
87DH	1,500	522,500	780,000	1,045,000	1,306,250	1,500,000	-
97DH	1,500	682,000	1,020,000	1,364,000	1,500,000	1,500,000	-
107DH	1,440	860,000	1,290,000	1,500,000	1,500,000	-	-
107DH-8B	1,440	1,160,000	1,500,000	1,500,000	1,500,000	-	-

Note:

All torques are in lb-in. Minimum torque is 1/2 End Torque.

Torques – Spring-Return Operators

Table 7. Hydraulic

Model	Min. Operating Pressure (psig)	Max. Operating Pressure (psig)	Calculated Spring Unloading Torque (lb-in)			Calculated Air Loading Torque at MOP (lb-in)		
			Starting	Mid-stroke	Ending	Starting	Mid-stroke	Ending
35D-SRM100	200	275	2,730	1,060	1,530	2,710	1,050	1,500
35D-SRH100	950	2,000 **	2,480	960	1,390	2,810	1,100	1,600
50D-SRH100	800	2,000 **	9,770	3,870	5,700	8,440	3,200	4,370
60D-SRH100	1,000	2,000 *	16,300	6,440	9,420	12,200	4,630	5,280
70D-SRH100	800	2,000 **	27,700	10,900	15,800	25,800	9,910	13,800
70D-SRH120	960	2,000 *	33,400	13,300	19,600	30,200	11,600	16,200
83D-SRH100	1,500	1,500	35,600	14,000	20,400	50,000	21,200	34,800
103D-SRH100	1,250	1,500	55,200	21,100	29,400	58,600	22,800	32,700
123D-SRH100	1,150	1,500	78,700	30,700	44,100	82,300	32,500	47,800
146S-SRH100	900	1,500	94,800	37,400	54,800	101,000	40,400	60,700
166S-SRH100	1,050	1,500	111,000	44,700	67,400	114,000	46,000	70,100
186S-SRH100	900	1,500	136,000	55,900	87,300	137,000	56,100	87,800
207S-SRH100	1,100	1,500	214,000	84,100	122,000	226,000	90,100	134,000
227S-SRH100	1050	1,500	284,000	111,000	161,000	291,000	115,000	169,000

Note:

* Calculated torques based on efficiency of 80%, as applied to spring force and piston force.

** Higher pressures may be available - consult factory.

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