

Fluoroseal



PNEUMATIC RACK AND PINION ACTUATORS

**DOUBLE ACTING AND
SPRING RETURN**



VALVE ACTUATORS FROM A VALVE MANUFACTURER

FluoroSeal Inc. is a privately held company headquartered in Montréal, QC, Canada who specialize in the design and manufacture of a full range of industrial valves, pneumatic actuators, and automation accessories. FluoroSeal Inc. is a vertically integrated company with design centers, foundries, manufacturing facilities, repair centers, and sales offices strategically located to best serve our global customers.

With a complete line of double acting and spring return pneumatic rack & pinion actuators, solenoid valves, limit switch modules, and positioners, FluoroSeal can supply factory automated valve assemblies. This allows for more economical and single sourced automated valve packages.

FluoroSeal® pneumatic rack and pinion actuators incorporate the latest in technology and materials available on the market today. Thorough product and market research combined with over four decades of design and manufacturing results in the highest quality actuators available in the market today.

FluoroSeal® pneumatic actuators offer increased value by incorporating advanced design features:

- Compact and modern design for industrial and municipal applications
- Multiple bearings and piston guides assure high performance and reliability.
- Engineered plastic bearings ensure reliable service and long life
- Pre-loaded spring cartridges allow for easy installation and safe maintenance
- Universal drive shaft
- Multifunction position indicator and Namur mounting to accept a wide range of accessories

OPTIONS

- Stainless steel drive shafts for corrosive applications
- Viton and HNBR o-rings available for high or low temperature applications. Special grease required
- Customized drive connections including keyed or double "D" available

COMMITMENT TO QUALITY

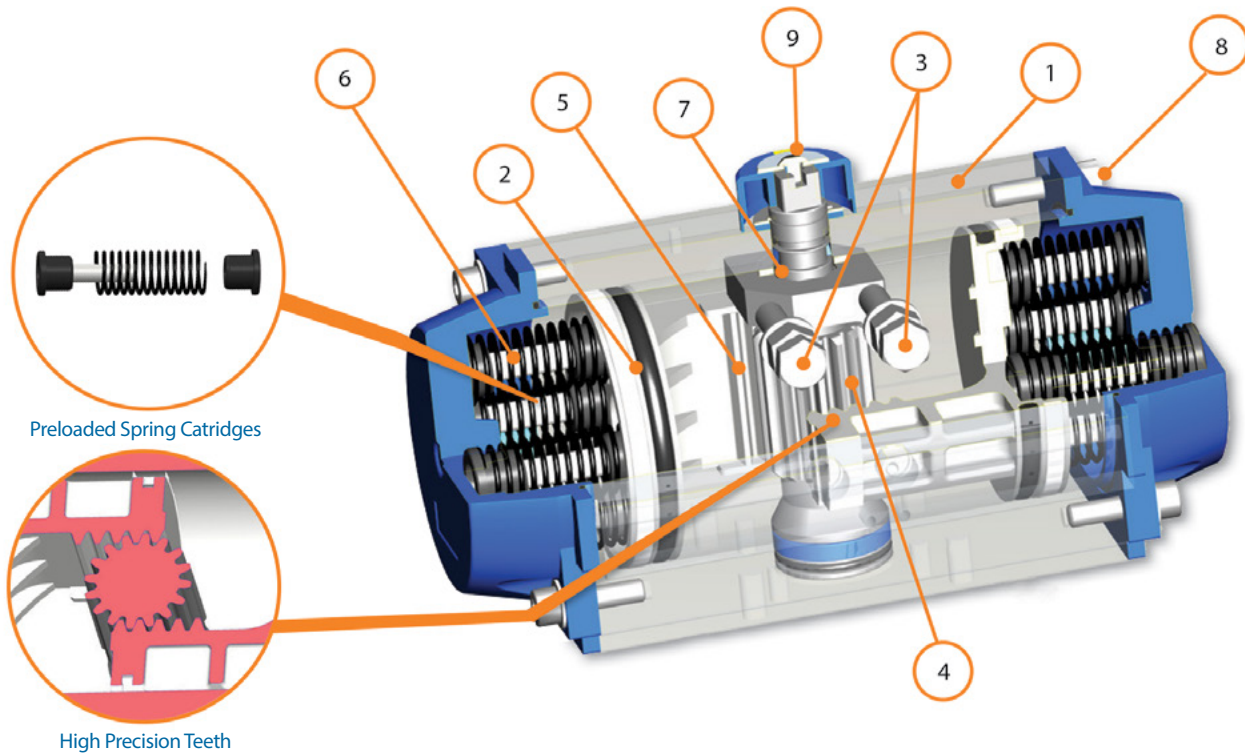
- All actuators conform to ISO 5211, DIN 3337, and VDI/VDE 3845 for product interchangeability and ease of solenoid, limit switch and accessory mounting.
- All actuators produced in ISO 9001 certified facilities
- Each individual actuator is factory tested, inspected, and packaged

AVAILABLE ACCESSORIES

- Mounting Kits
- Solenoid valves
- Limit Switch Modules
- Positioners
- Declutchable manual override gears



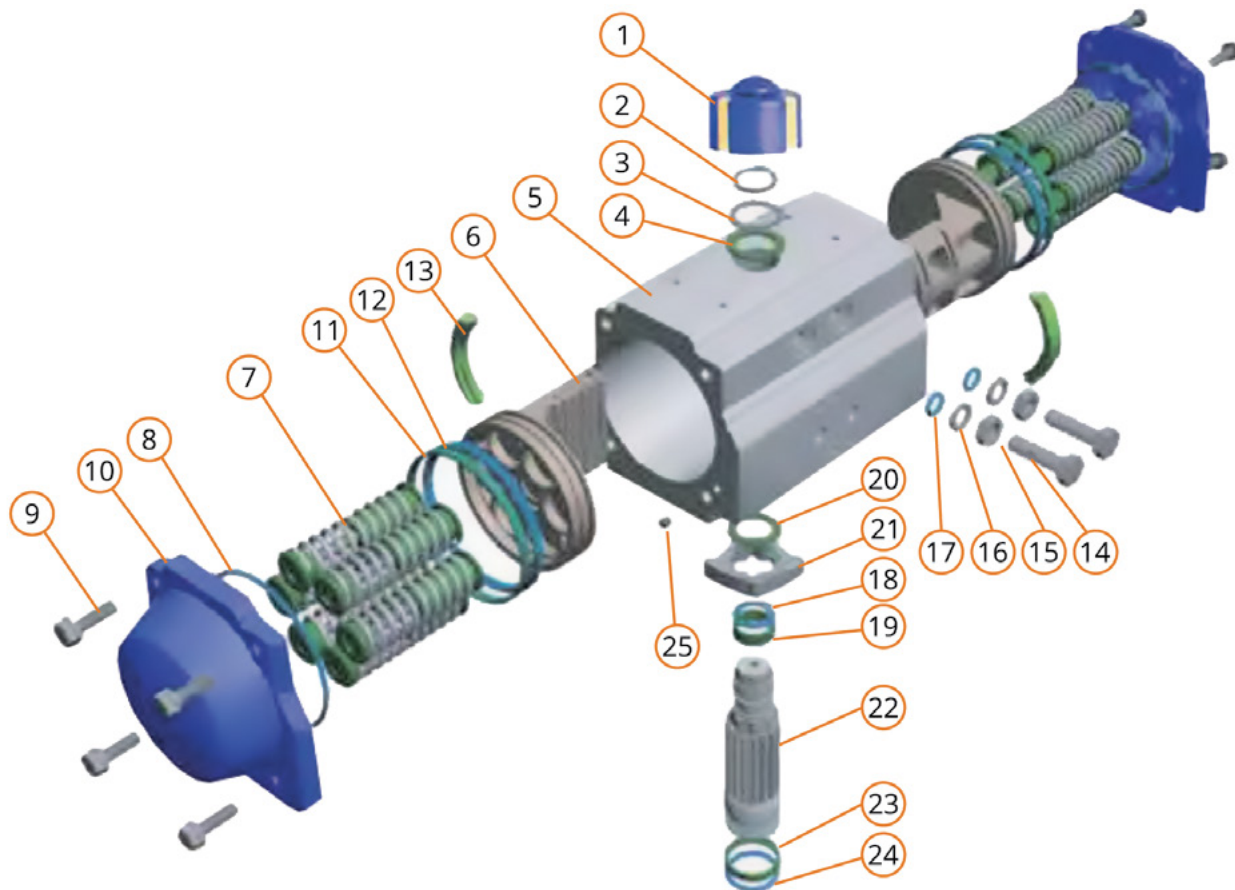
Automated 3" FluoroSeal ASME Class 300
Full Port Sleeved Plug Valve



CONSTRUCTION CHARACTERISTICS

1. A compact and lightweight extruded hard anodized aluminum body.
2. Dual piston rack and pinion design allows for symmetrical mounting, high cycle life and rapid operation. Reverse operation achieved through piston reversal.
3. Two external travel stop adjustments allow for accurate valve open-closed alignment; $\pm 5^\circ$ stroke adjustment in both the open or closed positions
4. One-piece pinion shaft provides blowout protection and maximum cycle life.
5. Accurate positioning is achieved through a high-precision rack and pinion teeth. The design allows for maximum tooth engagement and efficient operation.
6. Preloaded, modular spring cartridges are designed with coated springs offering range versatility, improved safety, and corrosion resistance.
7. High-quality bearings and seals provide a wide operating temperature range, low friction, and high cycle life.
8. Internal and external stainless-steel fasteners for long term corrosion resistance.
9. Colored visual position indication and a direct easy mount for sensors or accessories

SPRING RETURN PNEUMATIC ACTUATOR

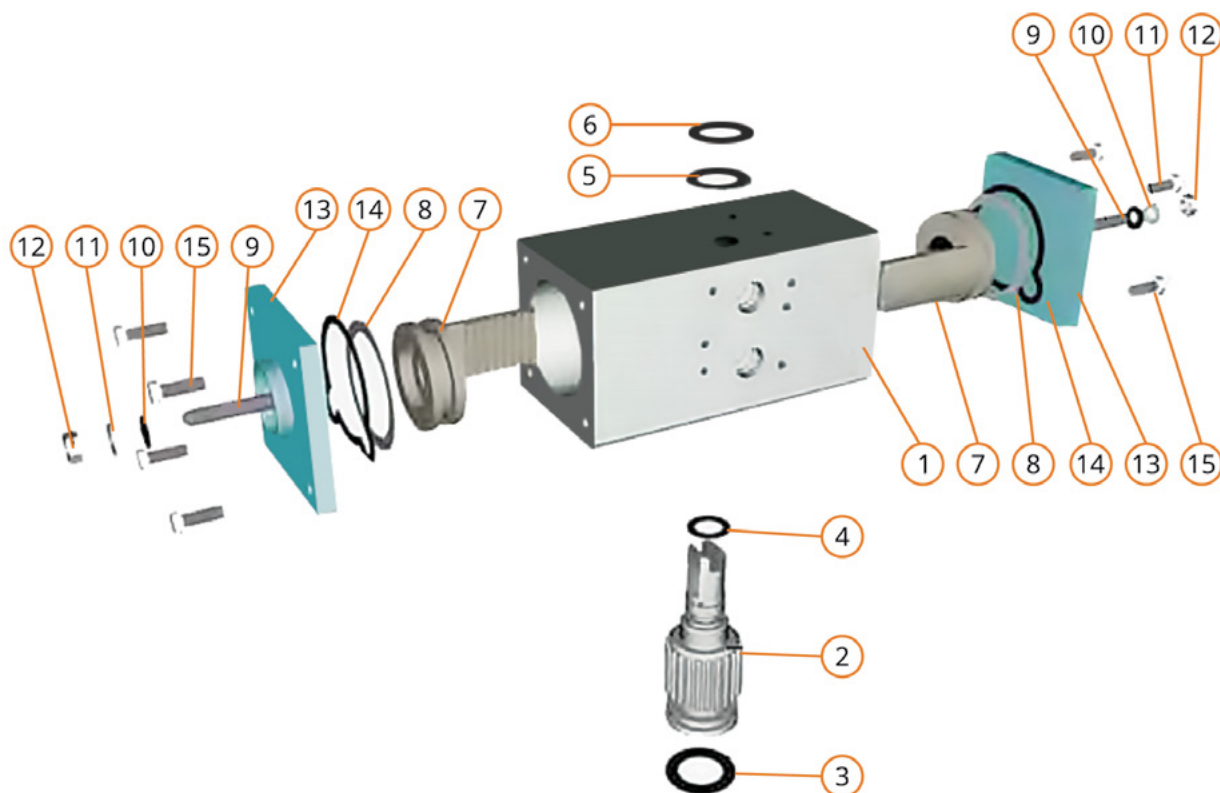


BILL OF MATERIALS

Item	Description	Material
1	Indicator	Plastic
2	Spring Clip	Stainless Steel
3	Thrust Washer(Pinion)	Stainless Steel
4	Thrust Bearing(Pinion)	Nylon 66
5	Actuator Body	Extruded Alluminum Alloy
6	Piston	Die Cast Aluminum Alloy
7	Spring(Cartridge)	High Performance Spring Steel
8	End Cap Seals	NBR
9	End Cap Bolts	Stainless Steel
10	End Cap	Die Cast Aluminum
11	Piston Bearing	Nylon 66
12	Piston Seal	NBR
13	Piston Guide	Nylon 66

Item	Description	Material
14	Stroke Bolt	Stainless Steel
15	Stroke Bolt Retaining Nut	Stainless Steel
16	Stroke Bolt Washer	Stainless Steel
17	Stroke Bolt O-Ring	NBR
18	O-Ring(Top Pinion)	NBR
19	Bearing(Top Pinion)	Nylon 66
20	Thrust Bearing(Pinion)	Nylon 66
21	Stroke Cam	Stainless Steel
22	Pinion	Alloy Steel
23	Bearing(Lower Pinion)	Nylon 66
24	O-Ring(Lower Pinion)	NBR
25	Plug	NBR

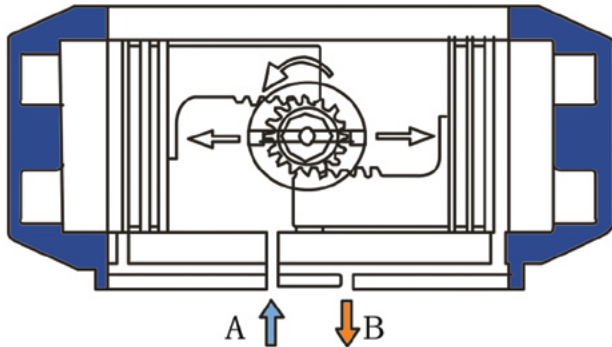
DOUBLE ACTING PNEUMATIC ACTUATOR



BILL OF MATERIALS

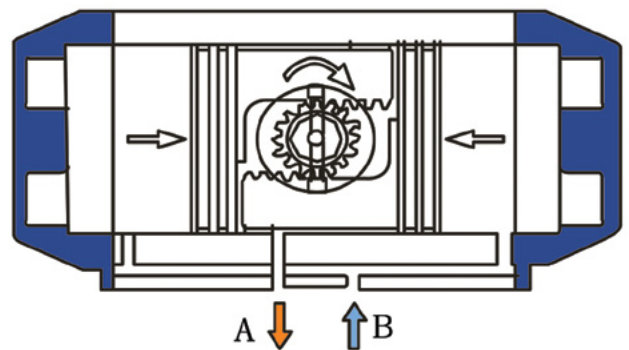
Item	Description	Material
1	Actuator Body	Extruded Alluminum Alloy
2	Pinion	Alloy Steel
3	O-Ring(Lower Pinion)	NBR
4	O-Ring(Top Pinion)	NBR
5	Thrust Bearing(Pinion)	Nylon 66
6	Spring Clip	Stainless Steel
7	Piston	Die Cast Aluminum Alloy
8	Piston Seal	NBR
9	Stroke Bolt	Stainless Steel
10	Stroke Bolt O-Ring	NBR
11	Stroke Bolt Washer	Stainless Steel
12	Stroke Bolt Retaining Nut	Stainless Steel
13	End Cap	Die Cast Aluminum
14	End Cap Seals	NBR
15	End Cap Bolts	Stainless Steel

DOUBLE ACTING ACTUATOR



COUNTERCLOCKWISE

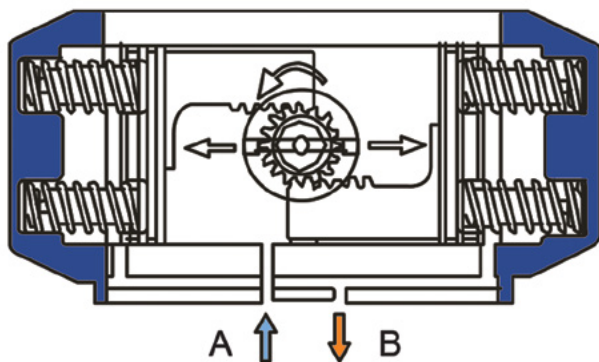
Air to port A forces the pistons outwards, causing the pinion to turn counterclockwise while air is being exhausted from port B.



CLOCKWISE

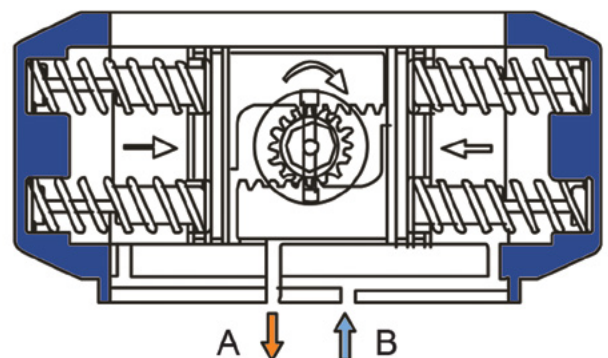
Air to port B forces the pistons inwards, causing the pinion to turn clockwise while air is being exhausted from port A.

SPRING RETURN ACTUATOR



COUNTERCLOCKWISE

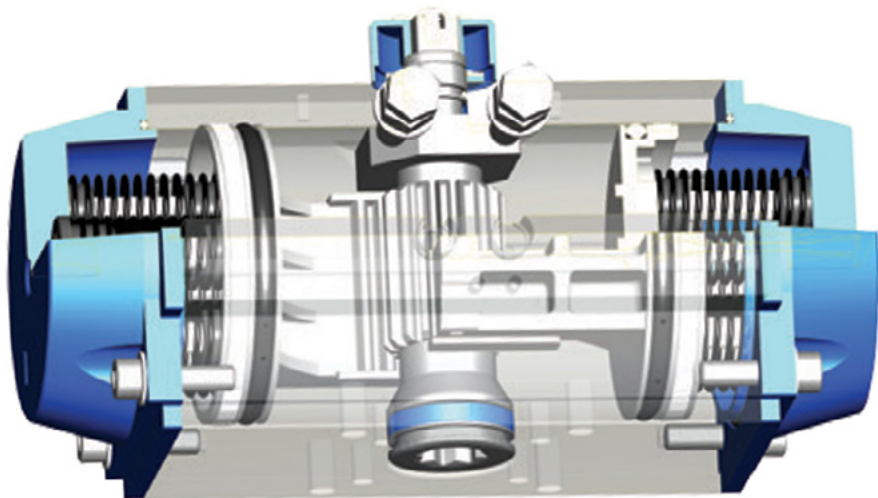
Air to port A forces the pistons outwards, causing the springs to compress. The pinion turns counterclockwise while air is being exhausted through port B.



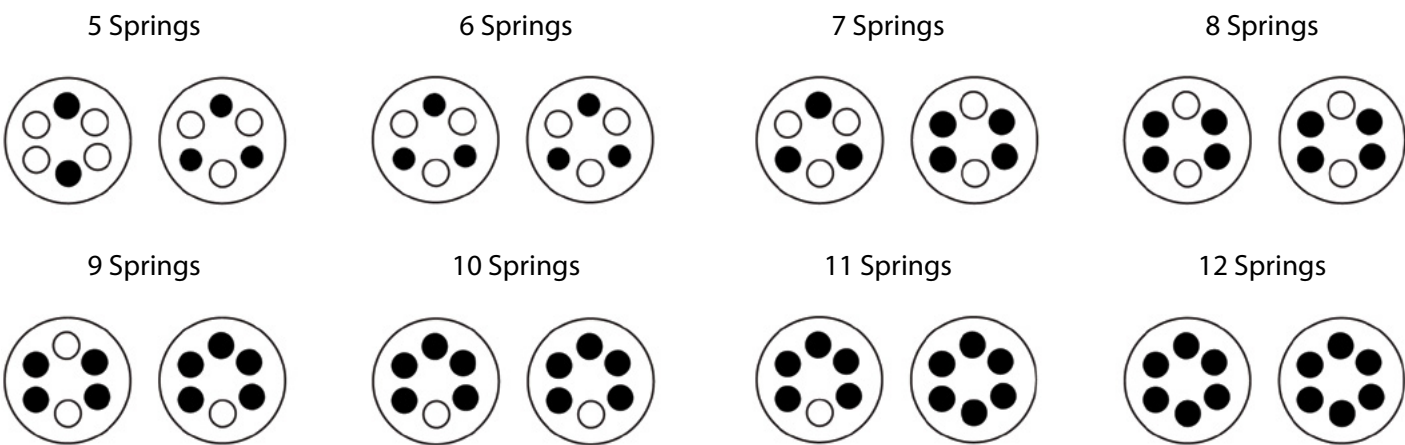
CLOCKWISE

Loss of air pressure through port A allows the stored energy in the springs to force the pistons inwards. The pinion turns clockwise while air is being exhausted through port A.

SPRING RETURN ACTUATOR



SPRING ARRANGEMENT



MOUNTING VARIATIONS

MV-A



MV-B



MV-C



MV-D



COUNTERCLOCKWISE

CLOCKWISE

TORQUE RATINGS (Nm)								
Model	3.0 barg	4.0 barg	4.5 barg	5.0 barg	5.5 barg	6.0 barg	7.0 barg	8.0 barg
Metric	Nm	Nm	Nm	Nm	Nm	Nm	Nm	Nm
FM-032-D	4.6	6.1	6.9	7.6	8.4	9.2	10.7	12.2
FM-040-D	7.0	10.0	11.0	12.0	13.0	14.0	17.0	19.0
FM-052-D	12.0	16.0	18.0	20.0	21.9	23.9	27.9	31.9
FM-063-D	21.9	29.2	32.8	36.5	40.1	43.8	51.1	58.4
FM-075-D	30.1	40.1	45.1	50.2	55.2	60.2	70.2	80.3
FM-083-D	47.0	62.7	70.5	78.4	86.2	94.1	109.7	125.4
FM-092-D	67.7	90.3	101.6	112.9	124.1	135.4	158.0	180.6
FM-105-D	99.0	132.0	149.0	165.0	182.0	198.0	231.0	265.0
FM-125-D	151.0	201.0	226.0	251.0	276.0	301.0	351.0	401.0
FM-140-D	257.0	342.0	385.0	428.0	470.0	513.0	599.0	684.0
FM-160-D	399.0	532.0	599.0	665.0	732.0	798.0	931.0	1064.0
FM-190-D	638.0	851.0	958.0	1064.0	1170.0	1277.0	1490.0	1702.0
FM-210-D	798.0	1064.0	1197.0	1330.0	1463.0	1596.0	1862.0	2128.0
FM-240-D	1154.0	1539.0	1731.0	1924.0	2116.0	2309.0	2693.0	3078.0
FM-270-D	1755.0	2339.0	2632.0	2924.0	3217.0	3509.0	4094.0	4679.0
FM-300-D	2289.0	3052.0	3434.0	3815.0	4197.0	4578.0	5341.0	6104.0
FM-350-D	3427.0	4570.0	5141.0	5712.0	6283.0	6854.0	7997.0	9139.0
FM-400-D	4884.0	6512.0	7326.0	8140.0	8954.0	9768.0	11396.0	13024.0

TORQUE RATINGS (in.lbs)								
Model	40 psig	50 psig	60 psig	70 psig	80 psig	90 psig	100 psig	115 psig
Imperial	in.lbs	in.lbs	in.lbs	in.lbs	in.lbs	in.lbs	in.lbs	in.lbs
FS-032-D	41	54	61	67	74	81	95	108
FS-040-D	62	89	97	106	115	124	151	168
FS-052-D	106	142	159	177	194	212	247	282
FS-063-D	194	258	290	323	355	388	452	517
FS-075-D	266	355	399	444	489	533	621	711
FS-083-D	416	555	624	694	763	833	971	1110
FS-092-D	599	799	899	999	1098	1198	1398	1598
FS-105-D	878	1170	1317	1463	1609	1756	2048	2341
FS-125-D	1332	1775	1997	2220	2442	2664	3107	3552
FS-140-D	2270	3027	3406	3783	4162	4540	5297	6053
FS-160-D	3531	4708	5297	5885	6474	7062	8239	9416
FS-190-D	5650	7533	8475	9416	10358	11300	13183	15066
FS-210-D	7062	9416	10594	11771	12948	14125	16479	18833
FS-240-D	10216	13620	15323	17026	18728	20430	23836	27240
FS-270-D	15527	20703	23291	25878	28466	31054	36229	41406
FS-300-D	20258	27010	30391	33763	37144	40515	47268	54020
FS-350-D	30329	40445	45498	50551	55605	60658	70774	80880
FS-400-D	43223	57631	64835	72039	79243	86447	100855	115262

SPRING RETURN - TECHNICAL DATA



TORQUE RATINGS (Nm)																
Model	2.5 barg		3.0 barg		4.0 barg		5.0 barg		6.0 barg		7.0 barg		8.0 barg		Spring Stroke	
Metric	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
FM-052-S05	5.7	3.8	7.6	5.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6.2	4.3
FM-052-S06	4.9	2.5	6.9	4.5	10.9	8.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	7.4	5.0
FM-052-S07	4.0	1.3	6.0	3.3	9.8	7.3	14.0	10.4	N/A	N/A	N/A	N/A	N/A	N/A	8.6	5.9
FM-052-S08	N/A	N/A	5.2	2.0	9.2	6.0	13.2	9.1	17.2	14.1	N/A	N/A	N/A	N/A	9.9	6.7
FM-052-S09	N/A	N/A	4.3	0.8	8.3	4.8	12.3	7.9	16.3	12.8	20.3	16.8	N/A	N/A	11.1	7.6
FM-052-S10	N/A	N/A	N/A	N/A	7.4	3.6	11.5	6.7	15.5	11.6	19.5	15.6	N/A	N/A	12.4	8.5
FM-052-S11	N/A	N/A	N/A	N/A	6.6	2.3	10.6	5.4	14.6	10.4	18.6	14.3	22.6	18.3	13.6	9.3
FM-052-S12	N/A	N/A	N/A	N/A	N/A	N/A	9.7	4.2	13.8	9.1	17.8	12.2	21.8	17.1	14.8	10.2
FM-063-S05	14.1	7.7	15.0	11.4	22.3	14.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	10.4	6.8
FM-063-S06	10.1	5.7	13.6	9.3	20.9	16.6	28.3	23.9	N/A	N/A	N/A	N/A	N/A	N/A	12.5	8.2
FM-063-S07	8.6	3.6	12.5	7.2	19.5	14.5	26.8	21.9	N/A	N/A	N/A	N/A	N/A	N/A	14.6	9.6
FM-063-S08	N/A	N/A	10.9	5.1	18.2	12.4	25.5	19.8	32.8	27.0	40.1	34.3	N/A	N/A	16.7	10.9
FM-063-S09	N/A	N/A	N/A	N/A	16.8	10.4	24.1	17.7	31.4	24.9	38.7	32.2	N/A	N/A	18.8	12.3
FM-063-S10	N/A	N/A	N/A	N/A	11.4	8.2	22.8	15.6	30.0	22.8	37.3	30.1	44.7	37.4	20.9	13.7
FM-063-S11	N/A	N/A	N/A	N/A	N/A	N/A	21.5	13.5	28.7	20.7	36.0	28.0	43.3	35.3	22.9	15.0
FM-063-S12	N/A	N/A	N/A	N/A	N/A	N/A	20.0	11.4	27.3	18.6	34.6	25.9	41.9	33.3	25.0	16.4
FM-075-S05	14.5	10.6	19.4	15.5	29.5	25.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	14.5	10.5
FM-075-S06	12.4	7.6	17.3	12.6	27.4	22.7	37.5	32.8	N/A	N/A	N/A	N/A	N/A	N/A	17.4	12.7
FM-075-S07	10.4	4.8	15.2	9.7	25.3	19.9	35.4	29.9	N/A	N/A	N/A	N/A	N/A	N/A	20.3	14.8
FM-075-S08	N/A	N/A	13.1	6.8	23.1	16.9	33.3	27.0	43.2	37.0	53.3	47.0	N/A	N/A	23.2	16.9
FM-075-S09	N/A	N/A	N/A	N/A	21.0	14.1	31.2	24.1	41.1	34.1	51.2	44.2	N/A	N/A	26.1	19.0
FM-075-S10	N/A	N/A	N/A	N/A	19.0	11.1	28.8	21.2	39.0	31.2	49.1	41.2	59.1	51.2	29.0	21.1
FM-075-S11	N/A	N/A	N/A	N/A	N/A	N/A	27.0	18.3	37.0	28.3	47.0	38.4	57.0	48.4	31.9	23.2
FM-075-S12	N/A	N/A	N/A	N/A	N/A	N/A	24.9	15.4	34.9	25.4	44.9	35.4	54.9	45.4	34.7	25.3
FM-083-S05	23.7	16.1	31.1	24.0	46.8	37.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	23.0	15.8
FM-083-S06	20.1	11.5	28.0	19.3	43.7	35.1	59.4	50.7	N/A	N/A	N/A	N/A	N/A	N/A	27.6	19.0
FM-083-S07	17.0	6.9	24.8	14.8	40.5	30.5	56.2	46.2	N/A	N/A	N/A	N/A	N/A	N/A	32.2	22.1
FM-083-S08	N/A	N/A	21.7	10.1	37.4	25.8	53.1	41.5	68.8	57.2	84.5	72.9	N/A	N/A	36.8	25.3
FM-083-S09	N/A	N/A	N/A	N/A	34.2	21.3	49.9	37.0	65.6	52.6	81.2	68.3	N/A	N/A	41.4	28.5
FM-083-S10	N/A	N/A	N/A	N/A	31.0	16.6	46.7	32.3	62.4	48.0	78.1	63.7	93.8	79.3	46.0	31.6
FM-083-S11	N/A	N/A	N/A	N/A	N/A	N/A	43.6	27.7	59.3	43.4	75.0	59.1	90.6	74.8	50.6	34.8
FM-083-S12	N/A	N/A	N/A	N/A	N/A	N/A	40.4	23.2	56.1	38.9	71.7	54.5	87.4	70.2	55.2	38.0

TORQUE RATINGS (Nm)																
Model	2.5 barg		3.0 barg		4.0 barg		5.0 barg		6.0 barg		7.0 barg		8.0 barg		Spring Stroke	
Metric	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
FM-092-S05	33.1	22.0	44.2	33.2	66.8	55.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	34.4	23.3
FM-092-S06	28.4	15.2	39.6	26.4	62.2	49.0	84.8	71.6	N/A	N/A	N/A	N/A	N/A	N/A	41.2	28.0
FM-092-S07	23.8	8.2	34.9	19.4	57.5	42.1	80.2	64.7	N/A	N/A	N/A	N/A	N/A	N/A	48.1	32.7
FM-092-S08	N/A	N/A	31.3	12.6	52.9	35.2	75.5	57.9	98.1	80.5	120.7	103.0	N/A	N/A	55.0	37.3
FM-092-S09	N/A	N/A	N/A	N/A	48.2	28.4	70.9	51.0	93.5	73.6	116.0	96.1	N/A	N/A	61.9	42.0
FM-092-S10	N/A	N/A	N/A	N/A	43.6	21.5	66.2	44.1	88.8	66.7	111.3	89.2	134.0	111.8	68.7	46.7
FM-092-S11	N/A	N/A	N/A	N/A	N/A	N/A	61.5	37.2	84.1	59.9	106.6	82.4	129.2	105.0	75.6	51.4
FM-092-S12	N/A	N/A	N/A	N/A	N/A	N/A	56.8	30.4	79.4	53.0	101.9	75.5	124.5	98.1	82.5	56.0
FM-105-S05	51.0	33.4	67.5	49.9	100.6	83.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	49.2	31.6
FM-105-S06	44.7	23.5	61.1	40.0	94.2	73.2	127.3	106.2	N/A	N/A	N/A	N/A	N/A	N/A	59.1	38.0
FM-105-S07	38.4	13.7	54.9	30.3	87.9	63.4	121.0	96.4	N/A	N/A	N/A	N/A	N/A	N/A	68.9	44.3
FM-105-S08	N/A	N/A	48.5	20.4	81.6	53.5	114.7	86.5	147.7	119.6	180.8	152.7	N/A	N/A	78.7	50.6
FM-105-S09	N/A	N/A	N/A	N/A	75.3	43.7	108.4	76.8	141.5	109.8	174.5	142.9	N/A	N/A	88.6	56.9
FM-105-S10	N/A	N/A	N/A	N/A	68.9	33.4	102.0	66.5	135.1	99.6	168.2	132.6	201.2	165.7	98.4	63.3
FM-105-S11	N/A	N/A	N/A	N/A	N/A	N/A	95.7	57.0	128.7	90.1	161.8	123.1	194.8	156.2	108.3	69.6
FM-105-S12	N/A	N/A	N/A	N/A	N/A	N/A	89.4	47.5	122.5	80.6	155.5	113.6	188.6	146.7	118.1	75.9
FM-125-S05	73.0	47.0	98.0	72.0	148.0	122.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	79.0	52.0
FM-125-S06	63.0	31.0	88.0	56.0	138.0	107.0	188.0	157.0	N/A	N/A	N/A	N/A	N/A	N/A	94.0	63.0
FM-125-S07	52.0	15.0	77.0	40.0	127.0	90.0	178.0	141.0	N/A	N/A	N/A	N/A	N/A	N/A	110.0	73.0
FM-125-S08	N/A	N/A	67.0	25.0	117.0	75.0	167.0	125.0	217.0	176.0	268.0	226.0	N/A	N/A	125.0	84.0
FM-125-S09	N/A	N/A	N/A	N/A	107.0	59.0	157.0	109.0	207.0	159.0	257.0	210.0	N/A	N/A	141.0	94.0
FM-125-S10	N/A	N/A	N/A	N/A	96.0	44.0	146.0	94.0	196.0	144.0	247.0	194.0	297.0	245.0	157.0	105.0
FM-125-S11	N/A	N/A	N/A	N/A	N/A	N/A	136.0	78.0	186.0	128.0	236.0	178.0	286.0	228.0	173.0	115.0
FM-125-S12	N/A	N/A	N/A	N/A	N/A	N/A	125.0	63.0	176.0	113.0	226.0	163.0	276.0	213.0	188.0	125.0
FM-140-S05	128.0	85.0	171.0	127.0	256.0	213.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	129.0	86.0
FM-140-S06	111.0	59.0	154.0	102.0	239.0	187.0	325.0	273.0	N/A	N/A	N/A	N/A	N/A	N/A	155.0	103.0
FM-140-S07	94.0	33.0	137.0	76.0	222.0	162.0	308.0	247.0	N/A	N/A	N/A	N/A	N/A	N/A	181.0	120.0
FM-140-S08	N/A	N/A	120.0	50.0	205.0	136.0	291.0	221.0	376.0	307.0	462.0	392.0	N/A	N/A	206.0	137.0
FM-140-S09	N/A	N/A	N/A	N/A	187.0	110.0	273.0	196.0	358.0	281.0	444.0	367.0	N/A	N/A	232.0	155.0
FM-140-S10	N/A	N/A	N/A	N/A	170.0	84.0	256.0	169.0	341.0	255.0	427.0	340.0	512.0	426.0	258.0	172.0
FM-140-S11	N/A	N/A	N/A	N/A	N/A	N/A	238.0	143.0	324.0	229.0	409.0	314.0	495.0	400.0	284.0	189.0
FM-140-S12	N/A	N/A	N/A	N/A	N/A	N/A	221.0	118.0	307.0	203.0	392.0	289.0	478.0	374.0	310.0	206.0

SPRING RETURN - TECHNICAL DATA



TORQUE RATINGS (Nm)																
Model	2.5 barg		3.0 barg		4.0 barg		5.0 barg		6.0 barg		7.0 barg		8.0 barg		Spring Stroke	
Metric	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
FM-160-S05	193	124	259	191	392	324	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	208	140
FM-160-S06	165	83	232	149	365	282	498	415	N/A	N/A	N/A	N/A	N/A	N/A	250	168
FM-160-S07	137	41	203	107	336	240	469	373	N/A	N/A	N/A	N/A	N/A	N/A	292	196
FM-160-S08	0	N/A	176	66	309	199	442	332	575	465	708	598	N/A	N/A	333	223
FM-160-S09	0	N/A	N/A	N/A	280	157	413	290	546	423	679	556	N/A	N/A	375	251
FM-160-S10	0	N/A	N/A	N/A	253	115	386	248	519	381	652	514	785	647	417	279
FM-160-S11	0	N/A	N/A	N/A	N/A	N/A	358	207	491	340	624	473	757	606	458	307
FM-160-S12	0	N/A	N/A	N/A	N/A	N/A	330	165	463	298	596	431	729	564	500	335
FM-190-S05	332	222	438	329	651	542	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	309	200
FM-190-S06	292	161	398	267	611	480	824	693	N/A	N/A	N/A	N/A	N/A	N/A	371	240
FM-190-S07	252	99	358	205	571	418	784	631	N/A	N/A	N/A	N/A	N/A	N/A	433	280
FM-190-S08	0	N/A	318	143	531	356	744	569	957	782	1169	995	N/A	N/A	495	320
FM-190-S09	0	N/A	N/A	N/A	491	295	704	507	917	720	1130	933	N/A	N/A	557	360
FM-190-S10	0	N/A	N/A	N/A	451	233	664	446	877	658	1090	871	1302	1084	618	400
FM-190-S11	0	N/A	N/A	N/A	N/A	N/A	624	384	837	597	1050	809	1263	1022	680	440
FM-190-S12	0	N/A	N/A	N/A	N/A	N/A	584	322	797	535	1010	748	1223	960	742	480
FM-210-S05	390	285	523	418	789	684	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	380	275
FM-210-S06	335	209	468	342	734	608	1000	874	N/A	N/A	N/A	N/A	N/A	N/A	456	330
FM-210-S07	280	133	413	266	679	532	945	798	N/A	N/A	N/A	N/A	N/A	N/A	532	385
FM-210-S08	0	N/A	358	190	624	456	890	722	1156	988	1422	1254	N/A	N/A	608	440
FM-210-S09	0	N/A	N/A	N/A	569	380	835	646	1101	912	1367	1178	N/A	N/A	684	495
FM-210-S10	0	N/A	N/A	N/A	514	304	780	570	1046	836	1312	1102	1578	1368	760	550
FM-210-S11	0	N/A	N/A	N/A	N/A	N/A	725	494	991	760	1257	1026	1523	1292	836	605
FM-210-S12	0	N/A	N/A	N/A	N/A	N/A	670	418	936	684	1202	950	1468	1216	912	660
FM-240-S05	552	409	744	600	1129	985	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	554	410
FM-240-S06	470	297	662	489	1047	874	1432	1259	N/A	N/A	N/A	N/A	N/A	N/A	665	490
FM-240-S07	388	187	580	379	964	764	1349	1149	N/A	N/A	N/A	N/A	N/A	N/A	775	575
FM-240-S08	0	N/A	498	268	883	653	1267	1037	1652	1422	2037	1807	N/A	N/A	886	656
FM-240-S09	0	N/A	N/A	N/A	800	542	1185	926	1569	1311	1954	1696	N/A	N/A	998	739
FM-240-S10	0	N/A	N/A	N/A	718	431	1103	816	1488	1201	1872	1586	2257	1970	1108	821
FM-240-S11	0	N/A	N/A	N/A	N/A	N/A	1021	705	1406	1090	1791	1471	2176	1859	1219	903
FM-240-S12	0	N/A	N/A	N/A	N/A	N/A	939	594	1323	979	1708	1363	2093	1748	1330	985

TORQUE RATINGS (Nm)																
Model	2.5 barg		3.0 barg		4.0 barg		5.0 barg		6.0 barg		7.0 barg		8.0 barg		Spring Stroke	
Metric	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
FM-270-S05	903	675	1195	968	1779	1552	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	787	560
FM-270-S06	790	519	1083	811	1667	1396	2252	1981	N/A	N/A	N/A	N/A	N/A	N/A	943	672
FM-270-S07	679	361	972	654	1556	1238	2141	1823	N/A	N/A	N/A	N/A	N/A	N/A	1101	783
FM-270-S08	0	N/A	860	479	1444	1081	2029	1666	2614	2252	3199	2836	N/A	N/A	1258	895
FM-270-S09	0	N/A	N/A	N/A	1332	923	1917	1509	2502	2094	3087	2678	N/A	N/A	1416	1007
FM-270-S10	0	N/A	N/A	N/A	1220	767	1805	1352	2390	1937	2974	2521	3560	3107	1572	1119
FM-270-S11	0	N/A	N/A	N/A	N/A	N/A	1693	1197	2278	1779	2862	2364	3448	2949	1730	1231
FM-270-S12	0	N/A	N/A	N/A	N/A	N/A	1582	1037	2167	1623	2751	2207	3336	2792	1887	1342
FM-300-S05	1097	729	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1061	730
FM-300-S06	935	494	1316	875	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1273	876
FM-300-S07	772	258	1153	639	1916	1402	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1485	1022
FM-300-S08	0	N/A	991	403	1754	1166	2517	1929	N/A	N/A	N/A	N/A	N/A	N/A	1697	1168
FM-300-S09	0	N/A	N/A	N/A	1592	930	2355	1693	3118	2456	N/A	N/A	N/A	N/A	1909	1314
FM-300-S10	0	N/A	N/A	N/A	1430	695	2193	1458	2956	2221	3719	2984	4482	3747	2122	1460
FM-300-S11	0	N/A	N/A	N/A	N/A	N/A	2030	1222	2793	1985	3556	2748	4319	3511	2334	1606
FM-300-S12	0	N/A	N/A	N/A	N/A	N/A	1868	986	2631	1749	3394	2512	4157	3275	2546	1752
FM-350-S05	1553	964	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1702	1173
FM-350-S06	1292	586	1863	1157	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2043	1408
FM-350-S07	1031	208	1602	779	2745	1922	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2383	1642
FM-350-S08	0	N/A	1341	401	2484	1544	3626	2686	N/A	N/A	N/A	N/A	N/A	N/A	2724	1877
FM-350-S09	0	N/A	N/A	N/A	2224	1165	3336	2307	4508	3449	N/A	N/A	N/A	N/A	3064	2112
FM-350-S10	0	N/A	N/A	N/A	1963	787	3105	1929	4247	3071	5390	4214	6532	5356	3405	2346
FM-350-S11	0	N/A	N/A	N/A	N/A	N/A	2844	1551	3986	2693	5129	3836	6271	4978	3745	2581
FM-350-S12	0	N/A	N/A	N/A	N/A	N/A	2584	1172	3726	2314	4869	3457	6011	4599	4086	2816
FM-400-S05	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
FM-400-S06	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
FM-400-S07	2028	869	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2880	1837
FM-400-S08	1736	411	2550	1225	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3292	2100
FM-400-S09	0	N/A	2259	768	3887	2396	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3703	2362
FM-400-S10	0	N/A	1967	311	3595	1939	5223	3567	N/A	N/A	N/A	N/A	N/A	N/A	4115	2624
FM-400-S11	0	N/A	N/A	N/A	3303	1482	4931	3110	6559	4738	N/A	N/A	N/A	N/A	4526	2887
FM-400-S12	0	N/A	N/A	N/A	3012	1025	4640	2653	6268	4281	7895	5908	9523	7536	4938	3149

SPRING RETURN - TECHNICAL DATA



TORQUE RATINGS (In.lbs)																		
Model	30 psig		40 psig		50 psig		70 psig		80 psig		90 psig		100 psig		115 psig		Spring Stroke	
Imperial	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
FS-052-S05	50	34	67	50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	55	38
FS-052-S06	43	22	61	40	97	75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	66	44
FS-052-S07	35	12	53	29	87	65	124	92	143	119	N/A	N/A	N/A	N/A	N/A	N/A	76	52
FS-052-S08	N/A	N/A	46	18	81	53	117	81	135	107	152	125	N/A	N/A	N/A	N/A	88	59
FS-052-S09	N/A	N/A	38	7	74	43	109	70	127	97	144	113	180	149	N/A	N/A	98	67
FS-052-S10	N/A	N/A	N/A	N/A	66	32	102	59	120	85	137	103	173	138	N/A	N/A	110	75
FS-052-S11	N/A	N/A	N/A	N/A	58	20	94	48	112	74	129	92	165	127	200	162	120	82
FS-052-S12	N/A	N/A	N/A	N/A	N/A	N/A	86	37	104	64	122	81	158	108	193	151	131	90
FS-063-S05	125	68	133	101	197	132	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	92	60
FS-063-S06	89	50	120	82	185	147	251	212	278	240	N/A	N/A	N/A	N/A	N/A	N/A	111	73
FS-063-S07	76	32	111	64	173	128	237	194	266	221	N/A	N/A	N/A	N/A	N/A	N/A	129	85
FS-063-S08	N/A	N/A	97	45	161	110	226	175	254	203	290	239	355	304	N/A	N/A	148	97
FS-063-S09	N/A	N/A	N/A	N/A	149	92	213	157	242	184	278	220	343	285	N/A	N/A	166	109
FS-063-S10	N/A	N/A	N/A	N/A	101	73	202	138	229	166	266	202	330	266	396	331	185	121
FS-063-S11	N/A	N/A	N/A	N/A	N/A	N/A	190	120	218	148	254	183	319	248	383	312	203	133
FS-063-S12	N/A	N/A	N/A	N/A	N/A	N/A	177	101	205	129	242	165	306	229	371	295	221	145
FS-075-S05	128	94	172	137	261	227	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	128	93
FS-075-S06	110	67	153	112	243	201	332	290	374	333	N/A	N/A	N/A	N/A	N/A	N/A	154	112
FS-075-S07	92	43	135	86	224	176	313	265	356	307	N/A	N/A	N/A	N/A	N/A	N/A	180	131
FS-075-S08	N/A	N/A	116	60	204	150	295	239	337	281	382	328	472	416	N/A	N/A	205	150
FS-075-S09	N/A	N/A	N/A	N/A	186	125	276	213	319	256	364	302	453	391	N/A	N/A	231	168
FS-075-S10	N/A	N/A	N/A	N/A	168	98	255	188	300	230	345	276	435	365	523	453	257	187
FS-075-S11	N/A	N/A	N/A	N/A	N/A	N/A	239	162	281	204	328	251	416	340	505	428	282	205
FS-075-S12	N/A	N/A	N/A	N/A	N/A	N/A	220	136	263	180	309	225	397	313	486	402	307	224
FS-083-S05	210	143	275	212	414	335	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	204	140
FS-083-S06	178	102	248	171	387	311	526	449	591	515	N/A	N/A	N/A	N/A	N/A	N/A	244	168
FS-083-S07	151	61	220	131	358	270	497	409	564	474	N/A	N/A	N/A	N/A	N/A	N/A	285	196
FS-083-S08	N/A	N/A	192	89	331	228	470	367	535	434	609	506	748	645	N/A	N/A	326	224
FS-083-S09	N/A	N/A	N/A	N/A	303	189	442	328	507	393	581	466	719	605	N/A	N/A	366	252
FS-083-S10	N/A	N/A	N/A	N/A	274	147	413	286	480	352	552	425	691	564	830	702	407	280
FS-083-S11	N/A	N/A	N/A	N/A	N/A	N/A	386	245	451	312	525	384	664	523	802	662	448	308
FS-083-S12	N/A	N/A	N/A	N/A	N/A	N/A	358	205	423	271	497	344	635	482	774	621	489	336

TORQUE RATINGS (In.lbs)																		
Model	30 psig		40 psig		50 psig		70 psig		80 psig		90 psig		100 psig		115 psig		Spring Stroke	
Imperial	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
FS-092-S05	293	195	391	294	591	495	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	304	206
FS-092-S06	251	135	351	234	551	434	751	634	852	735	N/A	N/A	N/A	N/A	N/A	N/A	365	248
FS-092-S07	211	73	309	172	509	373	710	573	811	674	N/A	N/A	N/A	N/A	N/A	N/A	426	289
FS-092-S08	N/A	N/A	277	112	468	312	668	512	770	613	868	712	1068	912	N/A	N/A	487	330
FS-092-S09	N/A	N/A	N/A	N/A	427	251	628	451	728	552	828	651	1027	851	N/A	N/A	548	372
FS-092-S10	N/A	N/A	N/A	N/A	386	190	586	390	687	492	786	590	985	789	1186	989	608	413
FS-092-S11	N/A	N/A	N/A	N/A	N/A	N/A	544	329	645	431	744	530	943	729	1143	929	669	455
FS-092-S12	N/A	N/A	N/A	N/A	N/A	N/A	503	269	605	370	703	469	902	668	1102	868	730	496
FS-105-S05	451	296	597	442	890	735	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	435	280
FS-105-S06	396	208	541	354	834	648	1127	940	1270	1083	N/A	N/A	N/A	N/A	N/A	N/A	523	336
FS-105-S07	340	121	486	268	778	561	1071	853	1214	997	N/A	N/A	N/A	N/A	N/A	N/A	610	392
FS-105-S08	N/A	N/A	429	181	722	474	1015	766	1159	910	1307	1059	1600	1351	N/A	N/A	697	448
FS-105-S09	N/A	N/A	N/A	N/A	666	387	959	680	1103	822	1252	972	1544	1265	N/A	N/A	784	504
FS-105-S10	N/A	N/A	N/A	N/A	610	296	903	589	1046	735	1196	882	1489	1174	1781	1466	871	560
FS-105-S11	N/A	N/A	N/A	N/A	N/A	N/A	847	505	990	648	1139	797	1432	1089	1724	1382	959	616
FS-105-S12	N/A	N/A	N/A	N/A	N/A	N/A	791	420	935	561	1084	713	1376	1005	1669	1298	1045	672
FS-125-S05	646	416	867	637	1310	1080	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	699	460
FS-125-S06	558	274	779	496	1221	947	1664	1390	1885	1611	N/A	N/A	N/A	N/A	N/A	N/A	832	558
FS-125-S07	460	133	682	354	1124	797	1575	1248	1797	1469	N/A	N/A	N/A	N/A	N/A	N/A	974	646
FS-125-S08	N/A	N/A	593	221	1036	664	1478	1106	1699	1336	1921	1558	2372	2000	N/A	N/A	1106	743
FS-125-S09	N/A	N/A	N/A	N/A	947	522	1390	965	1611	1195	1832	1407	2275	1859	N/A	N/A	1248	832
FS-125-S10	N/A	N/A	N/A	N/A	850	389	1292	832	1513	1053	1735	1274	2186	1717	2629	2168	1390	929
FS-125-S11	N/A	N/A	N/A	N/A	N/A	N/A	1204	690	1425	912	1646	1133	2089	1575	2531	2018	1531	1018
FS-125-S12	N/A	N/A	N/A	N/A	N/A	N/A	1106	558	1336	779	1558	1000	2000	1443	2443	1885	1664	1106
FS-140-S05	1133	752	1513	1124	2266	1885	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1142	761
FS-140-S06	982	522	1363	903	2115	1655	2876	2416	3248	2788	N/A	N/A	N/A	N/A	N/A	N/A	1372	912
FS-140-S07	832	292	1213	673	1965	1434	2726	2186	3098	2558	N/A	N/A	N/A	N/A	N/A	N/A	1602	1062
FS-140-S08	N/A	N/A	1062	443	1814	1204	2575	1956	2947	2336	3328	2717	4089	3469	N/A	N/A	1823	1213
FS-140-S09	N/A	N/A	N/A	N/A	1655	974	2416	1735	2788	2106	3168	2487	3929	3248	N/A	N/A	2053	1372
FS-140-S10	N/A	N/A	N/A	N/A	1505	743	2266	1496	2637	1876	3018	2257	3779	3009	4531	3770	2283	1522
FS-140-S11	N/A	N/A	N/A	N/A	N/A	N/A	2106	1266	2487	1646	2867	2027	3620	2779	4381	3540	2513	1673
FS-140-S12	N/A	N/A	N/A	N/A	N/A	N/A	1956	1044	2336	1416	2717	1797	3469	2558	4230	3310	2744	1823

SPRING RETURN - TECHNICAL DATA

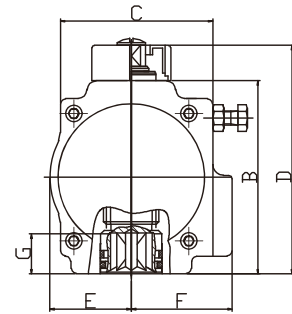
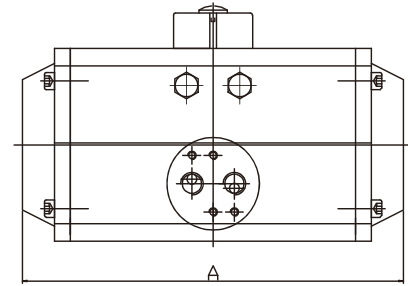
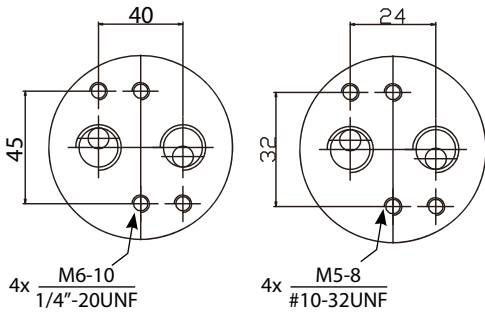
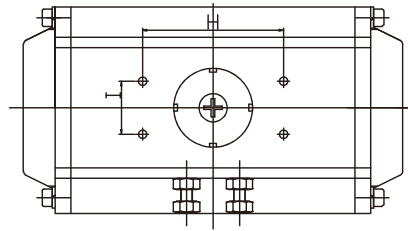


TORQUE RATINGS (In.lbs)																		
Model	30 psig		40 psig		50 psig		70 psig		80 psig		90 psig		100 psig		115 psig		Spring Stroke	
Imperial	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
FS-160-S05	1708	1097	2292	1690	3469	2867	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1841	1239
FS-160-S06	1460	735	2053	1319	3230	2496	4407	3673	4991	4266	N/A	N/A	N/A	N/A	N/A	N/A	2213	1487
FS-160-S07	1213	363	1797	947	2974	2124	4151	3301	4744	3894	N/A	N/A	N/A	N/A	N/A	N/A	2584	1735
FS-160-S08	N/A	N/A	1558	584	2735	1761	3912	2938	4505	3531	5089	4115	6266	5292	N/A	N/A	2947	1974
FS-160-S09	N/A	N/A	N/A	N/A	2478	1390	3655	2567	4257	3160	4832	3744	6009	4921	N/A	N/A	3319	2221
FS-160-S10	N/A	N/A	N/A	N/A	2239	1018	3416	2195	4009	2788	4593	3372	5770	4549	6947	5726	3691	2469
FS-160-S11	N/A	N/A	N/A	N/A	N/A	N/A	3168	1832	3761	2425	4345	3009	5522	4186	6700	5363	4053	2717
FS-160-S12	N/A	N/A	N/A	N/A	N/A	N/A	2921	1460	3514	2053	4098	2637	5275	3814	6452	4991	4425	2965
FS-190-S05	2938	1965	3876	2912	5761	4797	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2735	1770
FS-190-S06	2584	1425	3522	2363	5407	4248	7292	6133	8231	7071	N/A	N/A	N/A	N/A	N/A	N/A	3283	2124
FS-190-S07	2230	876	3168	1814	5053	3699	6938	5584	7877	6523	N/A	N/A	N/A	N/A	N/A	N/A	3832	2478
FS-190-S08	N/A	N/A	2814	1266	4699	3151	6584	5036	7523	5974	8470	6921	10346	8806	N/A	N/A	4381	2832
FS-190-S09	N/A	N/A	N/A	N/A	4345	2611	6230	4487	7169	5425	8116	6372	10001	8257	N/A	N/A	4930	3186
FS-190-S10	N/A	N/A	N/A	N/A	3991	2062	5876	3947	6815	4885	7762	5823	9647	7708	11523	9593	5469	3540
FS-190-S11	N/A	N/A	N/A	N/A	N/A	N/A	5522	3398	6461	4337	7408	5284	9293	7160	11178	9045	6018	3894
FS-190-S12	N/A	N/A	N/A	N/A	N/A	N/A	5168	2850	6107	3788	7054	4735	8939	6620	10824	8496	6567	4248
FS-210-S05	3452	2522	4629	3699	6983	6053	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3363	2434
FS-210-S06	2965	1850	4142	3027	6496	5381	8850	7735	10027	8912	N/A	N/A	N/A	N/A	N/A	N/A	4036	2921
FS-210-S07	2478	1177	3655	2354	6009	4708	8363	7062	9540	8239	N/A	N/A	N/A	N/A	N/A	N/A	4708	3407
FS-210-S08	N/A	N/A	3168	1682	5522	4036	7877	6390	9054	7567	10231	8744	12585	11098	N/A	N/A	5381	3894
FS-210-S09	N/A	N/A	N/A	N/A	5036	3363	7390	5717	8567	6894	9744	8071	12098	10425	N/A	N/A	6053	4381
FS-210-S10	N/A	N/A	N/A	N/A	4549	2690	6903	5045	8080	6222	9257	7399	11611	9753	13965	12107	6726	4868
FS-210-S11	N/A	N/A	N/A	N/A	N/A	N/A	6416	4372	7593	5549	8770	6726	11125	9080	13479	11434	7399	5354
FS-210-S12	N/A	N/A	N/A	N/A	N/A	N/A	5930	3699	7107	4876	8284	6053	10638	8408	12992	10762	8071	5841
FS-240-S05	4885	3620	6584	5310	9992	8717	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4903	3629
FS-240-S06	4160	2629	5859	4328	9266	7735	12673	11142	14372	12841	N/A	N/A	N/A	N/A	N/A	N/A	5885	4337
FS-240-S07	3434	1655	5133	3354	8531	6761	11939	10169	13638	11868	N/A	N/A	N/A	N/A	N/A	N/A	6859	5089
FS-240-S08	N/A	N/A	4407	2372	7815	5779	11213	9178	12921	10886	14620	12585	18028	15992	N/A	N/A	7841	5806
FS-240-S09	N/A	N/A	N/A	N/A	7080	4797	10487	8195	12187	9894	13886	11602	17293	15010	N/A	N/A	8832	6540
FS-240-S10	N/A	N/A	N/A	N/A	6354	3814	9762	7222	11461	8921	13169	10629	16567	14036	19975	17435	9806	7266
FS-240-S11	N/A	N/A	N/A	N/A	N/A	N/A	9036	6239	10735	7939	12443	9647	15850	13018	19258	16452	10788	7992
FS-240-S12	N/A	N/A	N/A	N/A	N/A	N/A	8310	5257	10009	6956	11709	8664	15116	12063	18523	15470	11771	8717

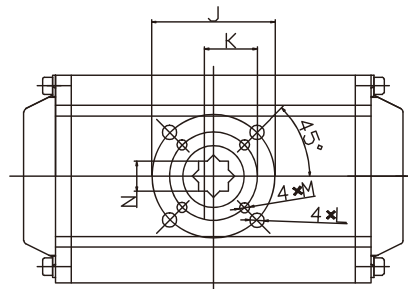
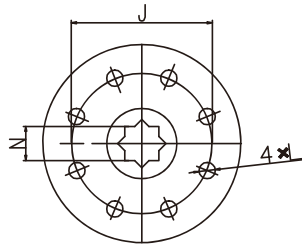
TORQUE RATINGS (In.lbs)																		
Model	30 psig		40 psig		50 psig		70 psig		80 psig		90 psig		100 psig		115 psig		Spring Stroke	
Imperial	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
FS-270-S05	7992	5974	10576	8567	15744	13735	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6965	4956
FS-270-S06	6992	4593	9585	7177	14753	12355	19930	17532	22514	20116	N/A	N/A	N/A	N/A	N/A	N/A	8346	5947
FS-270-S07	6009	3195	8602	5788	13771	10956	18948	16134	21532	18718	N/A	N/A	N/A	N/A	N/A	N/A	9744	6930
FS-270-S08	N/A	N/A	7611	4239	12779	9567	17957	14744	20541	17328	23134	19930	28311	25099	N/A	N/A	11133	7921
FS-270-S09	N/A	N/A	N/A	N/A	11788	8169	16966	13355	19550	15930	22143	18532	27320	23700	N/A	N/A	12532	8912
FS-270-S10	N/A	N/A	N/A	N/A	10797	6788	15974	11965	18559	14549	21152	17143	26320	22311	31506	27497	13912	9903
FS-270-S11	N/A	N/A	N/A	N/A	N/A	N/A	14983	10594	17567	13151	20160	15744	25329	20921	30515	26099	15311	10894
FS-270-S12	N/A	N/A	N/A	N/A	N/A	N/A	14001	9178	16585	11762	19178	14364	24346	19532	29524	24709	16700	11877
FS-300-S05	9709	6452	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	9390	6461
FS-300-S06	8275	4372	11647	7744	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	11266	7753
FS-300-S07	6832	2283	10204	5655	16957	12408	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	13142	9045
FS-300-S08	N/A	N/A	8770	3567	15523	10319	22276	17072	26807	22125	N/A	N/A	N/A	N/A	N/A	N/A	15019	10337
FS-300-S09	N/A	N/A	N/A	N/A	14089	8231	20842	14983	25515	20249	27594	21736	N/A	N/A	N/A	N/A	16895	11629
FS-300-S10	N/A	N/A	N/A	N/A	12656	6151	19408	12903	24223	18364	26161	19656	32913	26408	39666	33161	18780	12921
FS-300-S11	N/A	N/A	N/A	N/A	N/A	N/A	17966	10815	22930	16488	24718	17567	31471	24320	38223	31072	20656	14213
FS-300-S12	N/A	N/A	N/A	N/A	N/A	N/A	16532	8726	21638	14611	23284	15479	30037	22231	36790	28984	22532	15505
FS-350-S05	13744	8531	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	15063	10381
FS-350-S06	11434	5186	16488	10240	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	18081	12461
FS-350-S07	9124	1841	14178	6894	24293	17010	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	21090	14532
FS-350-S08	N/A	N/A	11868	3549	21983	13664	32090	23771	38993	31497	N/A	N/A	N/A	N/A	N/A	N/A	24107	16612
FS-350-S09	N/A	N/A	N/A	N/A	19682	10310	29524	20417	36913	28488	39896	30524	N/A	N/A	N/A	N/A	27116	18691
FS-350-S10	N/A	N/A	N/A	N/A	17373	6965	27479	17072	34843	25470	37586	27178	47702	37294	57808	47401	30134	20762
FS-350-S11	N/A	N/A	N/A	N/A	N/A	N/A	25169	13726	32763	22461	35276	23833	45392	33949	55498	44055	33143	22842
FS-350-S12	N/A	N/A	N/A	N/A	N/A	N/A	22868	10372	30683	19444	32975	20479	43091	30595	53197	40701	36161	24922
FS-400-S05	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
FS-400-S06	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
FS-400-S07	17948	7691	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	25488	16258
FS-400-S08	15364	3637	22568	10841	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	29134	18585
FS-400-S09	N/A	N/A	19992	6797	34400	21205	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	32772	20904
FS-400-S10	N/A	N/A	17408	2752	31816	17160	46224	31568	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	36418	23222
FS-400-S11	N/A	N/A	N/A	N/A	29232	13116	43639	27524	53693	39188	58047	41931	N/A	N/A	N/A	N/A	40055	25550
FS-400-S12	N/A	N/A	N/A	N/A	26656	9071	41064	23479	51374	35542	55472	37887	69871	52286	84279	66694	43701	27869

METRIC DIMENSIONS

Top View

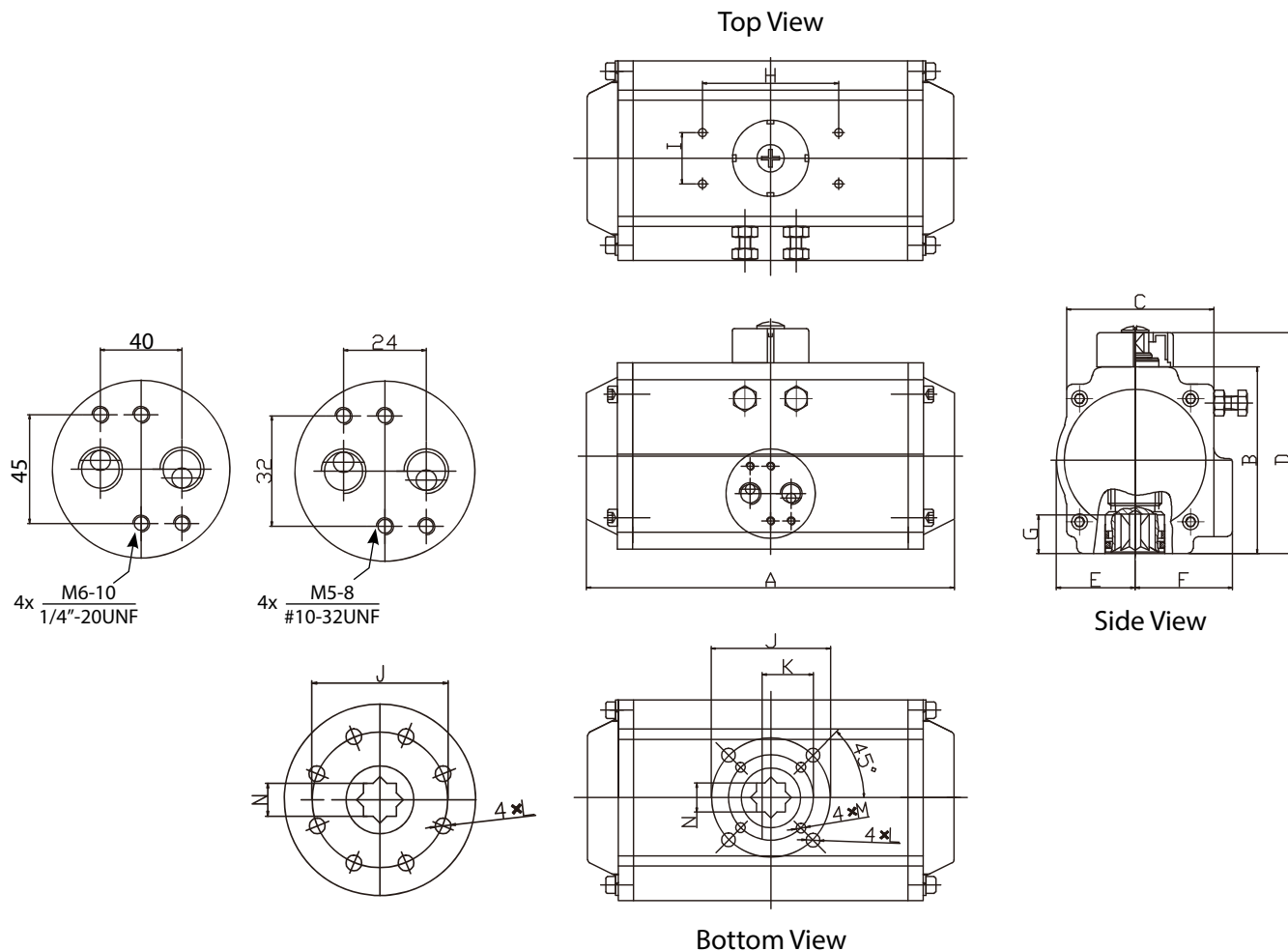


Side View



Bottom View

Model	A	B	C	D	E	F	G	H	I	N	J	K	L	M	Air Connection
Metric	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	ISO 5211	ISO 5211	UNC	UNC	mm
FM032	110.0	45.0	45.0	65.0	22.5	22.5	11.0	50.0	25.0	9.0	F03	---	M5*8	---	1/8"
FM040	122.0	60.0	52.0	80.0	28.5	36.5	14.0	80.0	30.0	11.0	F05	F03	M6*10	M5*8	1/4"
FM052	146.0	72.0	60.0	92.0	26.0	41.5	14.0	80.0	30.0	11.0	F05	F03	M6*10	M5*8	1/8" or 1/4"(std)
FM063	169.0	88.0	69.5	108.0	33.5	47.0	17.0	80.0	30.0	14.0	F07	F05	M8*13	M6*10	1/8" or 1/4"(std)
FM075	186.0	100.0	78.0	120.0	39.0	53.0	17.0	80.0	30.0	14.0	F07	F05	M8*13	M6*10	1/8" or 1/4"(std)
FM083	210.0	109.0	86.0	129.0	40.0	57.0	20.0	80.0	30.0	17.0	F07	F05	M8*13	M6*10	1/8" or 1/4"(std)
FM092	264.0	117.0	90.5	137.0	44.5	58.5	20.0	80.0	30.0	17.0	F07	F05	M8*13	M6*10	1/8" or 1/4"(std)
FM105	272.0	133.0	104.0	153.0	52.0	64.0	26.0	80.0	30.0	22.0	F10	F07	M10*16	M8*13	1/4"
FM125	302.0	155.0	120.0	185.0	60.0	74.5	25.0	130.0	30.0	22.0	F10	F07	M10*16	M8*13	1/4"
FM140	398.0	172.0	125.0	202.0	65.0	77.0	30.0	130.0	30.0	27.0	F12	F10	M12*20	M10*16	1/4"
FM160	456.0	197.0	142.0	227.0	74.0	87.0	30.0	130.0	30.0	27.0	F12	F10	M12*20	M10*16	1/4"
FM190	534.0	230.0	172.0	260.0	86.0	103.0	40.0	130.0	30.0	36.0	F14	---	M16*23	---	1/4"
FM210	536.0	255.0	194.0	285.0	97.0	113.0	43.0	130.0	30.0	36.0	F14	---	M16*23	---	1/4"
FM240	612.0	290.0	230.0	320.0	115.0	130.0	50.0	130.0	30.0	46.0	F16	---	M20*25	---	1/4" or 3/8"(std)
FM270	718.0	330.0	252.0	360.0	126.0	147.0	50.0	130.0	30.0	46.0	F16	---	M20*25	---	1/2"
FM300	784.0	354.0	335.0	384.0	162.0	173.0	50.0	130.0	30.0	46.0	F16	---	M20*25	---	1/2"
FM350	845.0	410.0	385.0	440.0	190.0	195.0	50.0	130.0	30.0	46.0	F16	F25	M20*25	8*M16*25	1/2"
FM400	956.0	466.0	520.0	496.0	260.0	260.0	60.0	130.0	30.0	55.0	F16	F25	M20*25	8*M16*25	1/2"



Model	A	B	C	D	E	F	G	H	I	N	J	K	L	M	Air Connection
Imperial	in	in	in	in	in	in	in	in	in	in	ISO 5211	ISO 5211	UNC	UNC	in
FS032	4.3	1.8	1.8	2.7	0.9	0.9	0.9	2.0	1.0	0.4	F03	---	#10-24UNF		1/8"
FS040	4.8	2.4	2.1	3.2	1.1	1.4	0.6	3.2	1.2	0.4	F05	F03	1/4"-20UNC	#10-24UNF	1/4"
FS052	5.7	2.8	2.4	3.6	1.0	16.3	0.6	3.2	1.2	0.4	F05	F03	1/4"-20UNC	#10-24UNF	1/8" or 1/4"(std)
FS063	6.7	3.5	27.4	2.3	1.3	1.9	0.7	3.2	1.2	0.6	F07	F05	5/16"-20UNC	1/4"-20UNC	1/8" or 1/4"(std)
FS075	7.3	3.9	3.1	4.7	1.5	2.1	0.7	3.2	1.2	0.6	F07	F05	5/16"-20UNC	1/4"-20UNC	1/8" or 1/4"(std)
FS083	8.3	4.3	3.4	5.1	1.6	2.2	0.8	3.2	1.2	0.7	F07	F05	5/16"-20UNC	1/4"-20UNC	1/8" or 1/4"(std)
FS092	10.4	4.6	3.6	5.4	1.8	2.3	0.8	3.2	1.2	0.7	F07	F05	5/16"-20UNC	1/4"-20UNC	1/8" or 1/4"(std)
FS105	10.7	5.2	4.1	6.0	2.0	2.5	1.0	3.2	1.2	0.9	F10	F07	3/8"-20UNC	5/16"-20UNC	1/4"
FS125	11.9	6.1	4.7	7.3	2.4	2.9	1.0	5.1	1.2	0.9	F10	F07	3/8"-20UNC	5/16"-20UNC	1/4"
FS140	15.7	6.8	4.9	8.0	2.6	3.0	1.2	5.1	1.2	1.1	F12	F10	1/2"-20UNC	3/8"-20UNC	1/4"
FS160	18.0	7.8	5.6	8.9	2.9	3.4	1.2	5.1	1.2	1.1	F12	F10	1/2"-20UNC	3/8"-20UNC	1/4"
FS190	21.0	9.1	6.8	10.2	3.4	4.1	1.6	5.1	1.2	1.4	F14	---	5/8"-20UNC		1/4"
FS210	21.1	10.0	7.6	1.1	3.8	4.4	1.7	5.1	1.2	1.4	F14	---	5/8"-20UNC		1/4"
FS240	24.1	11.4	9.1	12.6	4.5	5.1	2.0	5.1	1.2	1.8	F16	---	3/4"-20UNC		1/4" or 3/8"(std)
FS270	28.3	13.0	9.9	14.2	5.0	5.8	2.0	5.1	1.2	1.8	F16	---	3/4"-20UNC		1/2"
FS300	30.9	13.9	13.2	15.1	6.4	6.8	2.0	5.1	1.2	1.8	F16	---	3/4"-20UNC		1/2"
FS350	33.3	16.1	15.2	17.3	7.5	7.7	2.0	5.1	1.2	1.8	F16	F25	3/4"-20UNC	5/8"-20UNC	1/2"
FS400	37.6	18.3	20.5	19.5	10.2	10.2	2.4	5.1	1.2	2.2	F16	F25	3/4"-20UNC	5/8"-20UNC	1/2"

TECHNICAL DATA (Metric Units)																						
Model Type	FM032		FM040		FM052		FM063		FM075		FM083		FM092		FM105		FM125		FM140		FM160	
	D	S	D	S	D	S	D	S	D	S	D	S	D	S	D	S	D	S	D	S	D	S
Diameter (mm)	32		40		52		63		75		83		92		105		125		140		160	
Air Volume Opening (L)	0.0		0.1		0.1		0.2		0.3		0.4		0.6		1.0		1.6		2.5		3.7	
Air Volume Closing (L)	0.0		0.1		0.2		0.2		0.3		0.5		0.7		0.9		1.4		2.2		3.2	
Weight (kg)	0.5	N/A	1.0	N/A	1.4	1.5	2.0	2.1	2.7	2.9	3.1	3.6	4.6	5.2	6.8	6.9	8.9	10.1	13.3	15.6	20.1	24.0

TECHNICAL DATA (Metric Units)														
Model Type	FM190		FM210		FM240		FM270		FM300		FM350		FM400	
	D	S	D	S	D	S	D	S	D	S	D	S	D	S
Diameter (mm)	190		210		240		270		300		350		400	
Air Volume Opening (L)	5.9		7.5		11.0		17.0		19.1		27.7		42.8	
Air Volume Closing (L)	5.4		7.5		9.0		14.0		28.2		44.1		62.1	
Weight (kg)	31.3	35.3	46.8	54.8	67.3	80.2	96.9	118.0	108.0	135.6	146.7	188.1	220.5	283.5

TECHNICAL DATA (Imperial Units)																						
Model Type	FM032		FM040		FM052		FM063		FM075		FM083		FM092		FM105		FM125		FM140		FM160	
	D	S	D	S	D	S	D	S	D	S	D	S	D	S	D	S	D	S	D	S	D	S
Diameter (in)	1.3		1.6		2.0		2.5		3.0		3.3		3.6		4.1		4.9		5.5		6.3	
Air Volume Opening (in^3)	1.8		4.9		7.3		12.8		18.3		26.2		39.1		58.0		86.0		107.4		174.0	
Air Volume Closing (in^3)	2.4		6.7		9.8		14.0		30.5		28.7		44.5		53.7		129.9		165.9		249.0	
Weight (lbs)	1.0	N/A	2.2	N/A	3.0	3.2	4.5	4.5	6.0	6.4	6.9	7.9	10.1	11.5	14.9	15.1	19.6	22.3	29.2	34.3	44.4	52.9

TECHNICAL DATA (Imperial Units)														
Model Type	FM190		FM210		FM240		FM270		FM300		FM350		FM400	
	D	S	D	S	D	S	D	S	D	S	D	S	D	S
Diameter (in)	7.5		8.3		9.4		10.6		11.8		13.8		15.7	
Air Volume Opening (in^3)	290.0		403.0		695.0		964.0		1164.0		1687.0		2611.0	
Air Volume Closing (in^3)	439.0		628.0		921.0		1147.0		1722.0		2690.0		3785.0	
Weight (lbs)	69.0	77.7	103.2	120.8	148.3	176.8	213.6	260.1	238.1	298.9	323.4	414.7	486.1	625.0

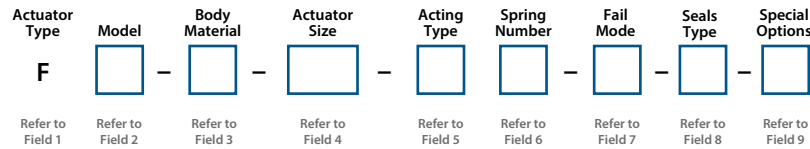
OPERATNG TIMES (sec)																											
Model Type	Spring Number	Start	End	FM-032		FM-040		FM-052		FM-063		FM-075		FM-083		FM-092		FM-105		FM-125		FM-125		FM-140		FM-160	
				S	M	S	M	S	M	S	M	S	M	S	M	S	M	S	M	S	M	S	M	S	M	S	M
D	0	0°	90°	0.3		0.5		0.6		0.7		0.7		0.8		1.0		1.4		2.4		2.4		2.5		3.9	
D	0	90°	0°	0.4		0.5		0.5		0.6		0.6		0.7		0.9		1.3		1.8		1.8		2.1		2.6	
S	6	0°	90°	N/A		N/A		2.5		2.5		2.6		2.7		2.9		3.1		4.2		4.2		4.4		4.7	
S	6	90°	0°	N/A		N/A		0.5		0.6		0.6		0.7		0.9		0.9		1.2		1.2		1.4		1.8	
S	7	0°	90°	N/A		N/A		2.5		2.6		2.6		2.7		2.9		3.2		4.3		4.3		4.4		4.8	
S	7	90°	0°	N/A		N/A		0.5		0.5		0.6		0.7		0.8		0.9		1.2		1.2		1.3		1.8	
S	8	0°	90°	N/A		N/A		2.5		2.6		2.7		2.8		2.9		3.2		4.3		4.3		4.6		4.8	
S	8	90°	0°	N/A		N/A		0.4		0.5		0.6		0.7		0.8		0.9		1.2		1.2		1.3		1.7	
S	9	0°	90°	N/A		N/A		2.5		2.6		2.7		2.8		3.0		3.2		4.3		4.3		4.6		4.8	
S	9	90°	0°	N/A		N/A		0.4		0.5		0.6		0.7		0.8		0.9		1.1		1.1		1.3		1.7	
S	10	0°	90°	N/A		N/A		2.5		2.6		2.7		2.8		3.0		3.2		4.3		4.3		4.7		4.8	
S	10	90°	0°	N/A		N/A		0.4		0.5		0.6		0.7		0.8		0.8		1.1		1.1		1.3		1.7	
S	11	0°	90°	N/A		N/A		2.6		2.6		2.7		2.8		3.0		3.2		4.3		4.3		4.7		4.8	
S	11	90°	0°	N/A		N/A		0.4		0.5		0.5		0.6		0.8		0.8		1.1		1.1		1.3		1.7	
S	12	0°	90°	N/A		N/A		2.6		2.7		2.7		2.8		3.0		3.3		4.4		4.4		4.7		4.8	
S	12	90°	0°	N/A		N/A		0.4		0.4		0.5		0.6		0.7		0.8		1.1		1.1		1.2		1.7	

OPERATING TIMES (sec)																	
Model Type	Spring Number	Start	End	FM-190		FM-210		FM-240		FM-270		FM-300		FM-350		FM-400	
				S	M	S	M	S	M	S	M	S	M	S	M	S	M
D	0	0°	90°	4.6		5.5		8.4		10.9		5.0		6.2		7.5	
D	0	90°	0°	3.5		4.4		8.3		8.5		6.0		7.2		8.5	
S	6	0°	90°	5.8		8.3		16.2		17.6		Contact Us for Further Information					
S	6	90°	0°	3.7		4.8		5.1		6.3							
S	7	0°	90°	5.8		8.4		16.4		17.8							
S	7	90°	0°	3.5		4.6		5.1		6.3							
S	8	0°	90°	5.8		8.4		16.4		17.6							
S	8	90°	0°	3.5		4.6		5.1		6.2							
S	9	0°	90°	5.8		8.4		16.4		17.8							
S	9	90°	0°	3.5		4.6		4.9		6.2							
S	10	0°	90°	5.8		8.5		16.6		18.0							
S	10	90°	0°	3.4		4.5		5.0		6.2							
S	11	0°	90°	5.8		8.5		16.8		18.2							
S	11	90°	0°	3.4		4.5		4.9		6.2							
S	12	0°	90°	5.8		8.5		17.0		18.4							
S	12	90°	0°	3.4		4.5		4.8		6.1							

NOTES:

- The information in this catalog is provided for general informational purposes only.
- For all technical parameters of the product please contact your local FluoroSeal sales office or authorized representative.
- Field applications, where one or more of the parameters above differ from the test conditions, may result in a stroke time difference

ORDERING INSTRUCTIONS



Field 1 - Actuator Type	
Code	Type
F	Rack and Pinion Pneumatic Actuator

Field 2 - Model	
Code	M S
Type	Metric (standard) Imperial

Field 3 - Body Material			
Code	P	S	T
Type	Aluminum (standard)	Stainless Steel	Teflon Coated Aluminum

Field 4 - Actuator Size	
Refer to Table 1 - Actuator Sizes	

Field 5 - Acting Type	
Code	D S
Type	Double Acting Spring Return

Field 6 - Spring Number									
Code	0	5	6	7	8	9	10	11	12
Type	Double Acting	5	6	7	8	9	10	11	12

Field 7 - Fail Mode			
Code	FL	FO	FC
Type	Fail Last	Fail Open	Fail Close

Field 8 - Seal Temperature Rating		
Code	S	L H
Type	Standard (-20~+80 C°)	Low Temp (-40~+80 C°) High Temp (-15~+150 C°)

Field 9 - Special Options	
Code	00 01
Type	No Special -45 C° Service Temperature

Table 1 - Actuator Sizes			
Code	Description	Code	Description
032	032	240	240
040	040	270	270
052	052	300	300
063	063	350	350
083	083	400	400
092	092		
105	105		
125	125		
140	140		
160	160		
190	190		
210	210		

MODEL SELECTION EXAMPLE

Example: FS-P-052-S11-FC-S-00

Description: Imperial FluoroSeal Rack and Pinion Pneumatic Actuator with aluminum body, size 052, single acting type with 11 springs, Fail Close with Standard Temperature Seals, and no special options.

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SHIPMENTS

All products sent out will be carefully examined, counted and packed. The cost of any special packing or special handling caused by Buyer's requirements or requests shall be added to the amount of the order. No claim for shortages will be allowed unless made in writing within ten (10) days of receipt of a shipment. Claims for products damaged or lost in transit should be made to the carrier, as FluoroSeal Inc.'s responsibility ceases, and title passes, on delivery to the carrier.

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Orders covering special or non-standard products are not subject to cancellation except on such terms as FluoroSeal Inc. may specify on application.

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Prices and designs are subject to change without notice. All prices are F.O.B. Point of Shipment, unless otherwise stated.

TAXES

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Where the products, engineering design or fabrication is for nuclear plant applications, Buyer agrees (a) to take all necessary steps to add FluoroSeal Inc. as an insured supplier under the American Nuclear Insurers (ANI) pool and under the Mutual Atomic Energy Reinsurance Pool (MAERP) for property damage and liability insurance and if necessary steps could have been taken, but are not taken, Buyer shall hold FluoroSeal Inc. harmless against all such losses which could have been thus covered; (b) Buyer agrees to hold FluoroSeal Inc. harmless with respect to any personal injury or death, property damage or any other loss in a nuclear incident which is caused directly or indirectly by defective design, material, or workmanship, furnished by FluoroSeal Inc. and which is covered by insurance maintained by Buyer (or which could be so covered but with respect to which Buyer has elected to self-insure), and further agrees to waive subrogation by its carriers of such insurance against FluoroSeal Inc.; (c) as to nuclear hazards for which Buyer cannot obtain insurance coverage, the liability of FluoroSeal Inc. for any personal injury or death, property damage or any other loss directly caused by defective design, material, or workmanship furnished by FluoroSeal Inc. shall not exceed the value of the material furnished by FluoroSeal Inc. at the time of the loss occurrence.



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