

Model DFC and DFO Valve Actuator

Technical Sales Bulletin



Figure 1 Models DFC and DFO Actuators

The Model DFC and DFO series linear output spring and diaphragm actuators are used in all kinds of demanding applications. The large area of the diaphragm allows low-pressure operation, and the spring provides fail safe positioning of a control valve on loss of the pneumatic supply. Both model DFC and DFO are used to automate control valves in both throttling and on/off control of liquids or gases.

When combined with a Dyna-Flo Model DF2000 or 360 valve, the DFC or DFO is part of a rugged control valve assembly, to which a wide variety of controllers and instruments can be attached.

Dyna-Flo's high level of quality specifications used in manufacturing the Model DFC and DFO series linear pneumatic actuators ensures superior performance and customer satisfaction.

Features

Reliable Design

Formed diaphragm has no friction with other moving parts allowing maintenance free operation through years of constant cycling.

Protective Coatings

External surfaces are either epoxy or powder coated for optimum resistance to harsh environments.

Individually Tested

Each actuator receives extensive testing to confirm smooth leak free operation.

Designed for Instrument Mounting

Integrated mounting pads with threaded holes make easy work of mounting instruments to the actuator. The open yoke allows easy access to stems for feed arms.

Travel Indication

Highly visible travel scale is adjustable for precise position indication.



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SPECIFICATIONS

Material Temperature Capabilities

Standard: -40 to 180 °F (-40 to 82 °C)

Construction Materials

See Tables 9 & 10 for construction details. Contact your Dyna-Flo sales office for more information and other options.

Valve Stem Compatibility, inches (mm)

- 1046, 1069 3/8 (9.5)
- 2069, 2105, 2156 1/2 (12.7)
- 3105, 3156, 3220, 3220-4 3/4 (19)

Valve Mounting Connection Sizes, inches (mm)

- 1046, 1069 2-1/8 (54)
- 2069, 2105, 2156 2-13/16 (71)
- 3105, 3156, 3220, 3220-4 3-9/16 (90)

Actuator Weights, lb (kg)

Size	DFC	DFO
1046	34 (15)	36 (16)
1069	48 (22)	40 (18)
2069	50 (23)	51 (23)
2105	90 (41)	82 (37)
2156	121 (55)	107 (49)
3105	94 (43)	92 (42)
3156	122 (55)	116 (53)
3220	254 (115)	235 (107)
3220-4	274 (124)	255 (116)

Line Connection Size

All sizes, 1/4 inch FNPT, other sizes available.

Actuator Mounting

Vertical on valve yoke 360° rotatable for optimum accessory orientation.

Actuator Dimensions

See Figure 2 & 5 for actuator diagram. See Tables 5-8 for actuator dimensions.

Options

- Reduced travel output
- Increased tubing connection size
- Stem connections
- Mechanical Travel stops
- Corrosion resistant materials

Operation

The Model DFC spring return diaphragm actuator (Figure 6) employs time proven reliable technology. As the instrument signal to the sealed lower diaphragm casing is increased, the force generated by that pressure on the diaphragm, and diaphragm plate, force the diaphragm plate and actuator stem up, compressing the spring.

The lifting action is transferred to the valve stem through a secure split and bolted connecting block. On a decrease, or complete loss of pneumatic signal, the actuator spring will force the actuator stem to extend, putting the valve in it's failsafe position. Using a push down to close action valve with a Model DFC will result in a fail closed valve assembly.

The Model DFO spring return diaphragm actuator is also time proven. Refer to Figure 7. As the instrument signal to the sealed upper diaphragm casing is increased, the force generated by that pressure on the diaphragm, and diaphragm plate, force the diaphragm plate and actuator stem down, compressing the spring. The extension action is transferred to the valve stem through a secure split and bolted connecting block. On a decrease, or complete loss of pneumatic signal, the actuator spring will force the actuator stem to retract, putting the valve in it's failsafe position. Using a push down to close action valve with a Model DFO will result in a fail open valve assembly.

Handwheels (Figures 8 & 9)

Top mounted handwheels are the cost effective option available for manual override for DFC and DFO actuators. The top mounted handwheel is a good choice for emergency only positioning of a valve, and it is commonly used as a travel stop. These top mounted handwheels are available in all actuator sizes.

External Travel Stops (Figures 10 & 11)

Top mounted handwheel based travel stops are available to restrict valve opening or closing. Configurations are available with caps to reduce tampering.

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Table 1

Maximum Travel, Thrust and Casing Pressure for a given diaphragm area

Actuator Size	Active Diaphragm Area in ² (cm ²)	Thrust Limit lb (N)	Travel Maximum Inch (mm)	Maximum Casing Pressure			
				DFC		DFO	
				Maximum Pressure for Sizing Psig (kPag)	Safety Psig (kPag)	Maximum Pressure for Sizing Psig (kPag)	Safety Psig (kPag)
1046	46 (297)	2300 (10,231)	0.75 (19)	55 (379)	110 (758)	125 (862)	140 (965)
1069	69 (445)	2300 (10,231)	1.125 (29)	70 (483)	90 (621)	65 (448)	75 (517)
2069	69 (445)	2700 (12,010)	1.5 (38)	70 (483)	90 (621)	65 (448)	75 (5.17)
2105	105 (677)	5600 (25,132)	2.0 (51)	65 (448)	75 (517)	50 (345)	60 (414)
2156	156 (1006)	7500 (33,584)	2.0 (51)	55 (379)	65 (448)	40 (276)	50 (345)
3105	105 (677)	5600 (25,132)	2.0 (51)	65 (448)	75 (517)	50 (345)	60 (414)
3156	156 (1006)	6800 (30,248)	2.0 (51)	55 (379)	65 (448)	40 (276)	50 (345)
3220	220 (1420)	8800 (39,144)	3.0 (76)	50 (345)	60 (414)	55 (379)	65 (448)
3220-4	220 (1420)	8800 (39,144)	4.0 (102)	50 (345)	60 (414)	55 (379)	65 (448)

Table 2

Volumetric Casing Displacement Inch³ (cm³)

Actuator Size	Clearance Volume (ZeroTravel)	Travel Inch (mm)							
		7/16 (11)	5/8 (16)	3/4 (19)	1-1/8 (29)	1-1/2 (38)	2 (51)	3 (76)	4 (102)
1046	33 (540)	56 (918)	66 (1080)	72 (1180)	---	---	---	---	---
1069	57 (934)	90 (1470)	104 (1700)	113 (1850)	142 (2330)	170 (2790)	---	---	---
2069	57 (934)	90 (1470)	104 (1700)	113 (1850)	142 (2330)	170 (2790)	---	---	---
2105	95 (1560)	---	170 (2790)	183 (3000)	227 (3720)	270 (4420)	330 (5410)	---	---
2156	133 (2180)	---	237 (3880)	257 (4210)	322 (5280)	387 (6340)	472 (7740)	---	---
3105	95 (1560)	---	170 (2790)	183 (3000)	227 (3720)	270 (4420)	330 (5410)	---	---
3156	133 (2180)	---	237 (3880)	257 (4210)	322 (5280)	387 (6340)	472 (7740)	---	---
3220	213 (3490)	320 (5240)	363 (5950)	392 (6420)	478 (7830)	564 (9240)	678 (11110)	980 (14880)	---
3220-4	213 (3490)	320 (5240)	363 (5950)	392 (6420)	478 (7830)	564 (9240)	678 (11110)	980 (14880)	1133 (18570)



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Table 3

DFC Top Mounted Handwheel Specifications

Actuator Size	Handwheel Diameter Inch (mm)	Turns Per Travel		Rim Force ⁽¹⁾		Maximum Handwheel Output Force ⁽²⁾	
		Per Inch	Per mm	lb	N	lb	N
1046	8.75 (222)	8	0.3	34	151	1,500	66,72
1069	8.75 (222)	8	0.3	51	227	2,250	10,009
2069	8.75 (222)	8	0.3	51	227	2,250	10,009
2105	12.00 (305)	6	0.2	113	502	6,000	26,689
2156	12.00 (305)	6	0.2	113	502	6,000	26,689
3105	12.00 (305)	6	0.2	113	502	6,000	26,689
3156	12.00 (305)	6	0.2	113	502	6,000	26,689
3220	14.00 (356)	6	0.2	97	431	6,000	26,689
3220-4	14.00 (356)	6	0.2	97	431	6,000	26,689
NOTES:	1 - Tangential handwheel force required to produce the handwheel output force shown. (Proportional to the handwheel output force).						
	2 - The maximum force available to compress actuator spring.						

Table 4

DFO Top Mounted Handwheel Specifications

Actuator Size	Handwheel Diameter Inch (mm)	Turns Per Travel		Rim Force ⁽¹⁾		Maximum Handwheel Output Force ⁽²⁾	
		Per Inch	Per mm	lb	N	lb	N
1046	8.75 (222)	8	0.3	32	142	1,500	6,672
1069	8.75 (222)	8	0.3	48	214	2,250	10,009
2069	8.75 (222)	8	0.3	48	214	2,250	10,009
2105	12.00 (305)	8	0.3	95	423	3,390	15,079
2156	12.00 (305)	8	0.3	110	489	5,100	22,686
3105	12.00 (305)	8	0.3	95	423	3,390	15,079
3156	12.00 (305)	8	0.3	110	489	5,100	22,686
3220 3220-4	14.00 (356)	5	0.3	136	605	6,600	29,358
NOTES:	1 - Tangential handwheel force required to produce the handwheel output force shown. (Proportional to the handwheel output force).						
	2 - The maximum force available to compress actuator spring.						

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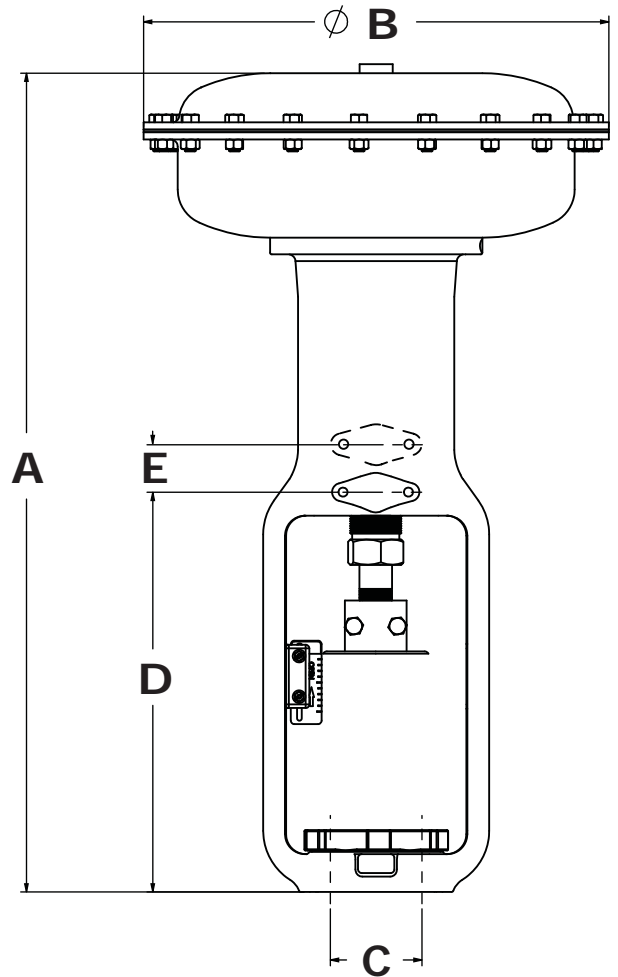
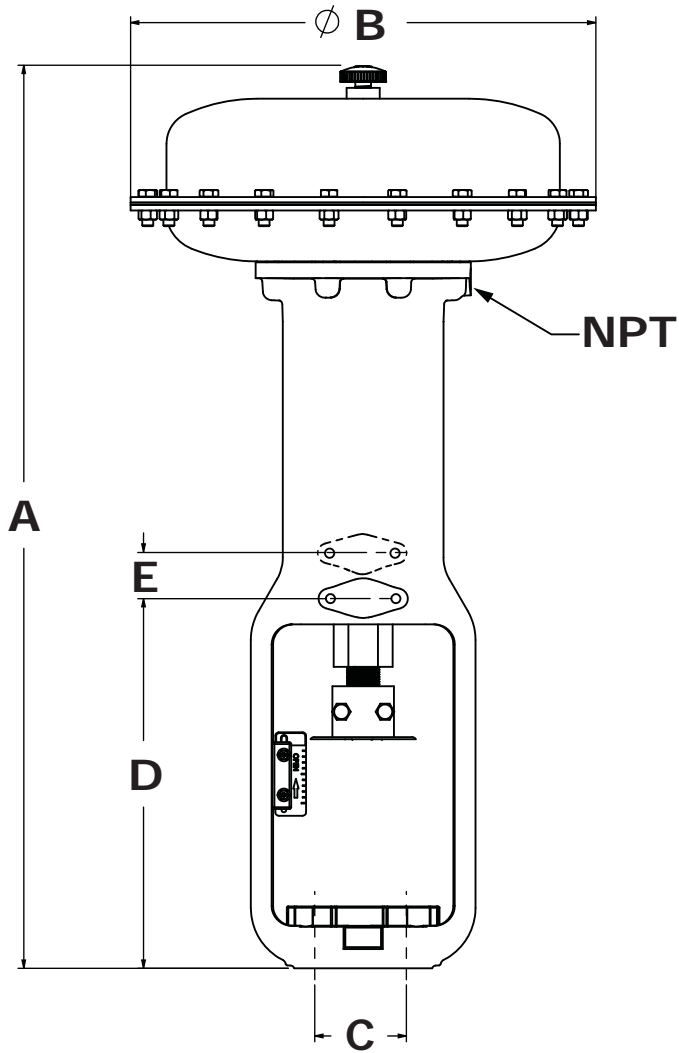


Figure 2 Model DFC Dimensions

Figure 3 Model DFO Dimensions



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Table 5

Model DFC Outline Dimensions (See Figures 2 & 3)

Actuator Size	Dimension Reference Inch (mm)				
	A	B	C (Yoke Boss)	D	E
1046	18.78 (478)	11.38 (289)	2-1/8 (54.0)	7.62 (194)	1.50 (38.1)
1069	22.68 (576)	13.12 (333)	2-1/8 (54.0)	8.83 (224)	1.50 (38.1)
2069	23.38 (594)	13.12 (333)	2-13/16 (71.4)	9.62 (244)	1.50 (38.1)
2105	30.25 (768)	16.00 (406)	2-13/16 (71.4)	12.19 (310)	1.50 (38.1)
2156	30.25 (768)	18.62 (473)	2-13/16 (71.4)	12.19 (310)	1.50 (38.1)
3105	30.91 (785)	16.00 (406)	3-9/16 (90.5)	12.81 (325)	1.50 (38.1)
3156	30.91 (785)	18.62 (473)	3-9/16 (90.5)	12.81 (325)	1.50 (38.1)
3220	36.48 (927)	21.12 (536)	3-9/16 (90.5)	14.75 (375)	1.50 (38.1)
3220-4	42.85 (1088)	21.12 (536)	3-9/16 (90.5)	14.75 (375)	1.50 (38.1)

Table 6

Model DFO Outline Dimensions (See Figures 2 & 3)

Actuator Size	Dimension Reference Inch (mm)				
	A	B	C (Yoke Boss)	D	E
1046	17.31 (440)	11.38 (289)	2-1/8 (54.0)	8.38 (213)	—
1069	19.25 (489)	13.12 (333)	2-1/8 (54.0)	8.75 (222)	1.00 (25.4)
2069	21.20 (538)	13.12 (333)	2-13/16 (71.4)	10.69 (272)	1.00 (25.4)
2105	25.72 (653)	16.00 (406)	2-13/16 (71.4)	11.44 (291)	1.50 (38.1)
2156	25.72 (653)	18.62 (473)	2-13/16 (71.4)	11.44 (291)	1.50 (38.1)
3105	28.10 (714)	16.00 (406)	3-9/16 (90.5)	13.94 (354)	1.50 (38.1)
3156	28.10 (714)	18.62 (473)	3-9/16 (90.5)	13.94 (354)	1.50 (38.1)
3220	32.69 (830)	21.12 (536)	3-9/16 (90.5)	16.00 (406)	1.50 (38.1)
3220-4	38.90 (988)	21.12 (536)	3-9/16 (90.5)	16.00 (406)	1.50 (38.1)

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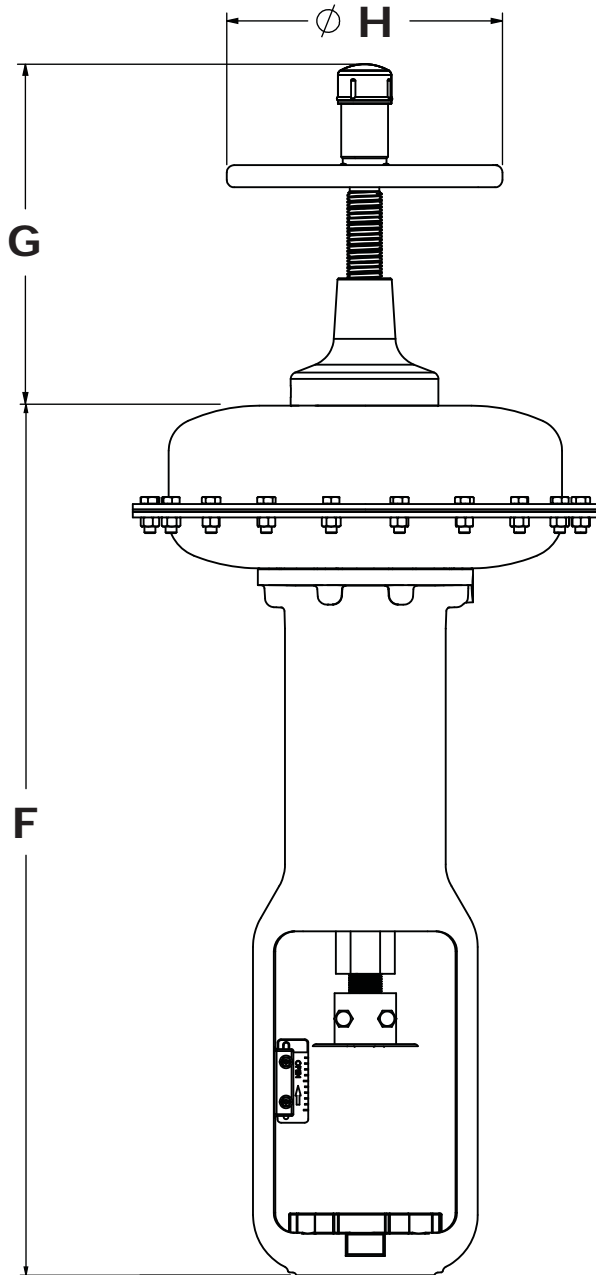


Figure 4 Model DFC Handwheel Dimensions

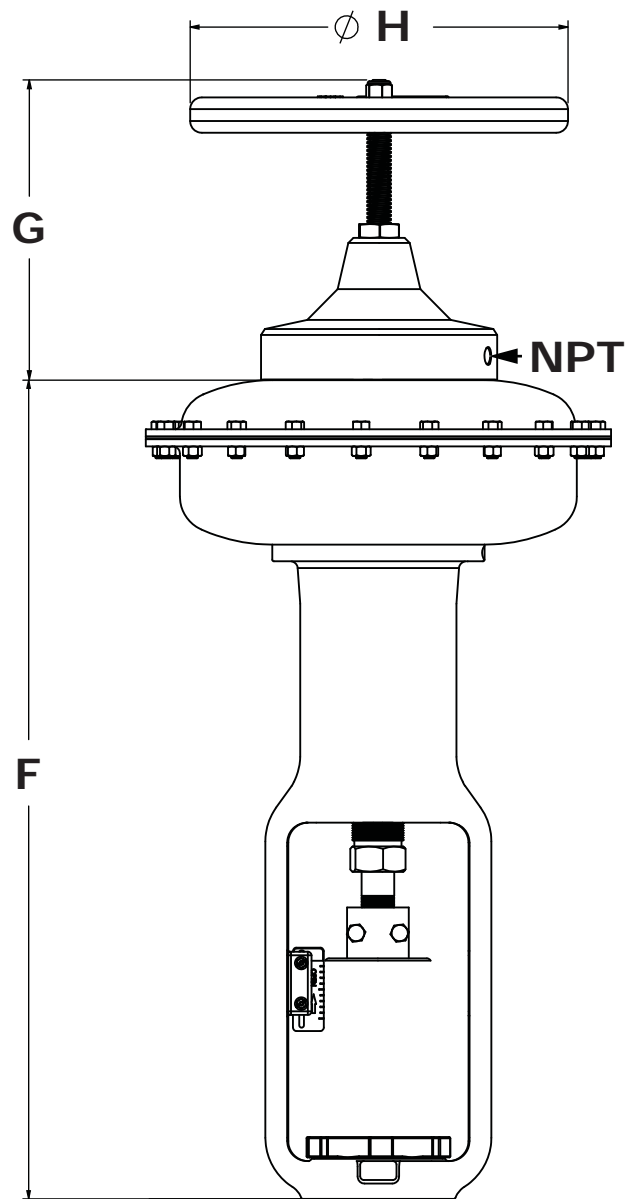


Figure 5 Model DFO Handwheel Dimensions



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Table 7

Model DFC Handwheel Outline Dimensions (See Figures 2 & 3)

Actuator Size	Dimension Reference Inch (mm)			
	TRAVEL	G MAX.	F	H
1046	-	-	17.78 (452)	8.75 (222)
1069	3/4 (19.1)	12.88 (327)	21.68 (551)	8.75 (222)
2069	3/4 (19.1)	12.88 (327)	22.38 (568)	8.75 (222)
2105	1-1/2 (38.1)	14.86 (377)	29.25 (743)	12.00 (305)
	2 (50.8)	15.36 (390)		
2156	1-1/2 (38.1)	14.86 (377)	29.25 (743)	12.00 (305)
	2 (50.8)	15.36 (390)		
3105	1-1/2 (38.1)	14.86 (377)	29.90 (760)	12.00 (305)
	2 (50.8)	15.36 (390)		
3156	1-1/2 (38.1)	14.86 (377)	29.90 (760)	12.00 (305)
	2 (50.8)	15.36 (390)		
3220	2 (50.8)	17.48 (444)	35.47 (901)	14.00 (356)
	3 (76.2)	18.48 (469)		
	3-1/2 (88.9)	20.69 (526)		
3220-4	4 (102)	20.94 (532)	41.85 (1063)	14.00 (356)

Table 8

Model DFO Handwheel Outline Dimensions (See Figures 2 & 3)

Actuator Size	Dimension Reference Inch (mm)		
	F	G	H
1046	16.93 (430)	7.00 (178)	8.75 (222)
1069	19.23 (488)	7.00 (178)	8.75 (222)
2069	21.21 (539)	7.00 (178)	8.75 (222)
2105	25.72 (653)	8.70 (221)	12.00 (305)
2156	25.72 (653)	8.70 (221)	12.00 (305)
3105	28.16 (715)	8.70 (221)	12.00 (305)
3156	28.16 (715)	8.70 (221)	12.00 (305)
3220	32.69 (830)	12.60 (320)	14.00 (356)
3220-4	38.89 (988)	-	14.00 (356)

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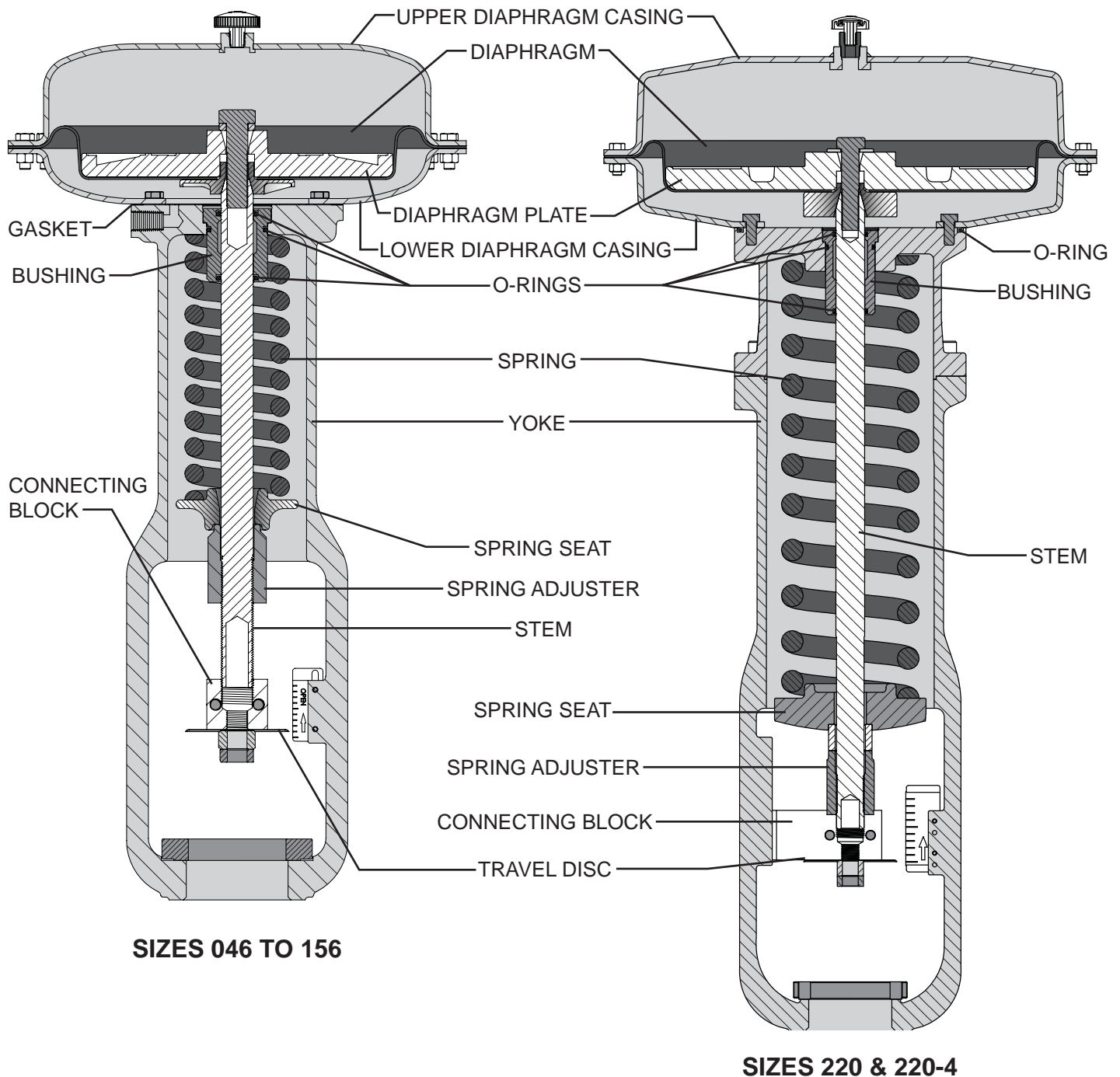


Figure 6 DFC Standard Actuator Cross Section



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Table 9

Model DFC Standard Construction Materials

Description	Material
ACTUATOR STEM	S17400
BUSHING	BRASS
CONNECTING BLOCK	ZINC PLATED STEEL
DIAPHRAGM	NITRILE/NYLON
DIAPHRAGM PLATE	ALUMINUM OR CAST IRON
GASKET	COMPOSITION
LOWER DIAPHRAGM CASING	STEEL
O-RINGS	NITRILE
SPRING	STEEL
SPRING ADJUSTER	ZINC PLATED STEEL
SPRING SEAT	ZINC PLATED STEEL
TRAVEL DISC	S30400
UPPER DIAPHRAGM CASING	STEEL
YOKE	CAST IRON

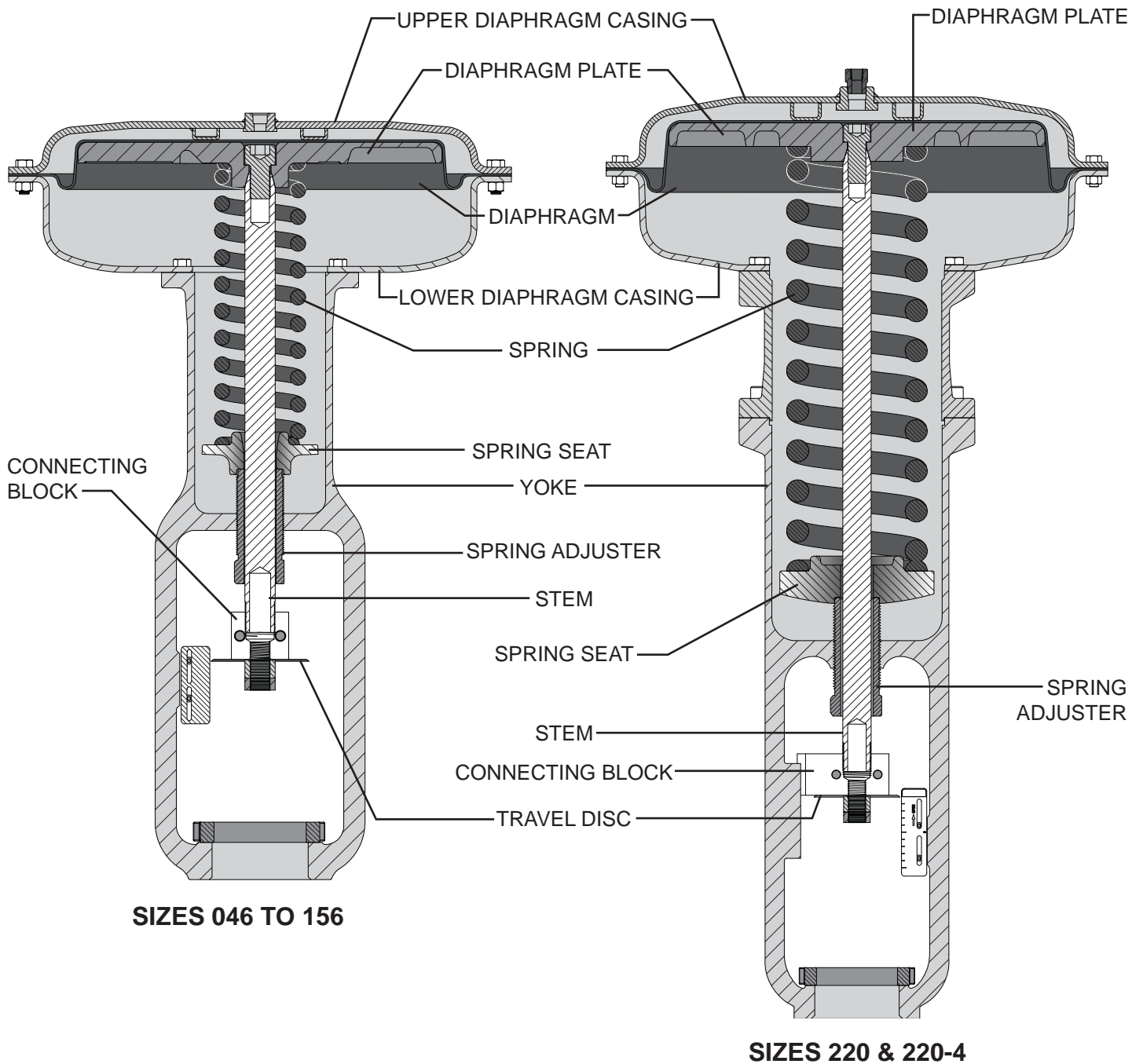
Table 10

Model DFO Construction Materials

Description	Material
ACTUATOR STEM	ZINC PLATED STEEL
CONNECTING BLOCK	ZINC PLATED STEEL
DIAPHRAGM	NITRILE/NYLON
DIAPHRAGM PLATE	ALUMINUM OR CAST IRON
LOWER DIAPHRAGM CASING	STEEL
SPRING	STEEL
SPRING ADJUSTER	ZINC PLATED STEEL
SPRING SEAT	ZINC PLATED STEEL
TRAVEL INDICATOR	S30400
UPPER DIAPHRAGM CASING	STEEL
YOKE	CAST IRON

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SIZES 046 TO 156

SIZES 220 & 220-4

Figure 7 DFO Standard Actuator Cross Section

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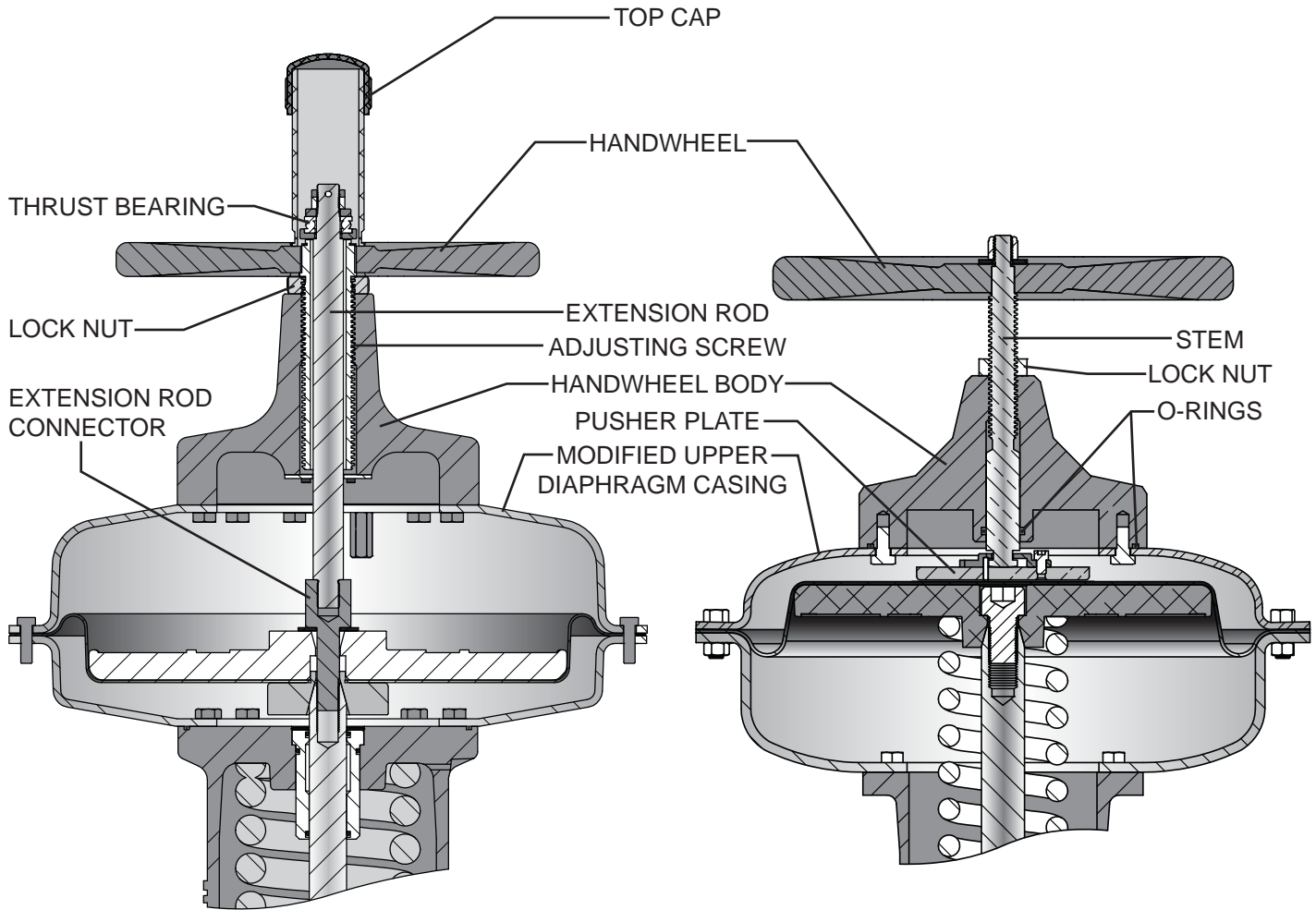
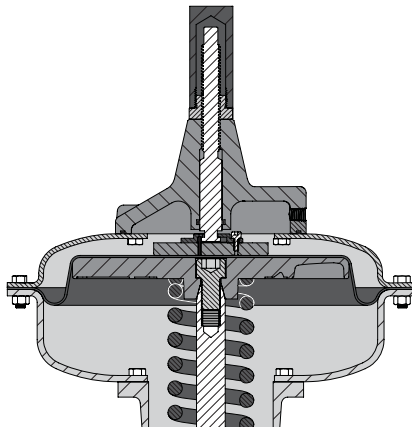


Figure 8 Model DFC Handwheel Cross Section

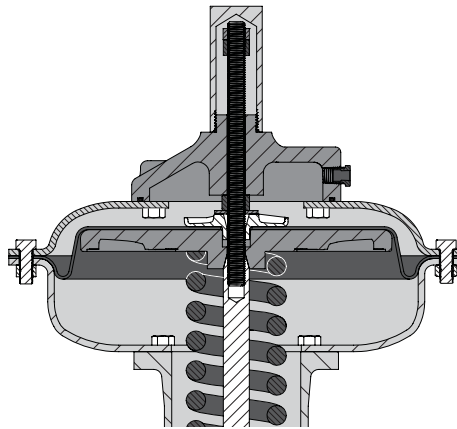
Figure 9 Model DFO Handwheel Cross Section

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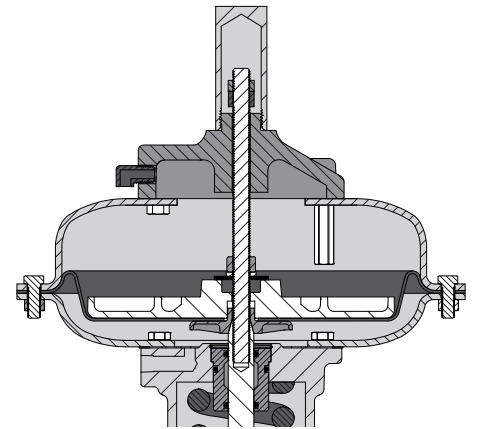
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**TYPE 1
UP STOP DFO**

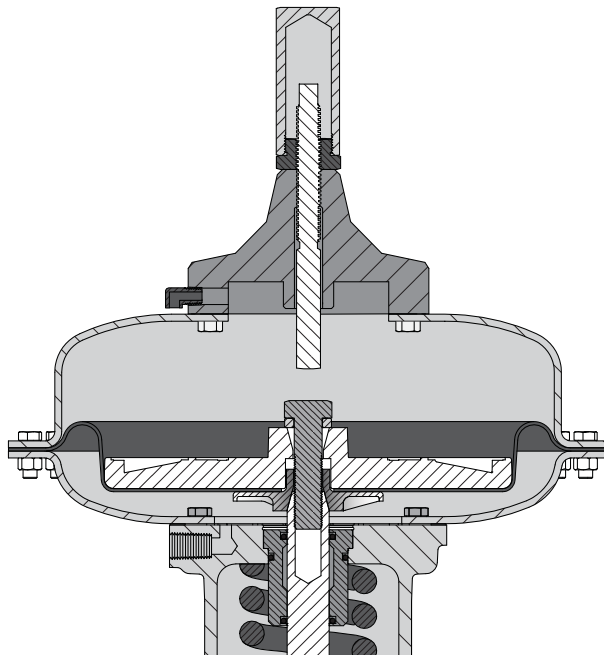


**TYPE 2
DOWN STOP DFO**

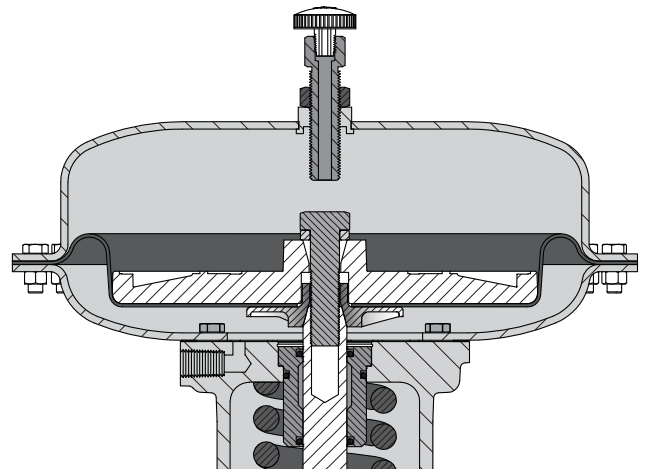


**TYPE 3
DOWN STOP DFC**

Figure 10 *Optional Adjustable Travel Stops*



**TYPE 4
UP STOP DFC**



**TYPE 5
UP STOP DFC**

Figure 11 *Optional Adjustable Travel Stops Continued*



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Table 11

Model DFO Actuator Thrust Available lbf (N)

Actuator Size	Travel Inches (mm)	Bench Range - Psig (kPag) (Based on 0-18 Psig Supply)			Bench Range - Psig (kPag) (Based on 0-33 Psig Supply)		
		3 - 15 (21 - 103)	3 - 11 (21 - 76)	3 - 9 (21 - 62)	6 - 30 (41 - 207)	6 - 26 (41 - 179)	6 - 22 (41 - 152)
1046	3/4 (19)	138 (614)	322(1432)	414 (1,842)	138 (614)	322 (1,432)	506 (2,251)
1069 ^A and 2069	3/4 (19) to 1-1/2 (38)	207 (921)	438 (2,148)	621 (2762)	207 (921)	483 (2,148)	759 (3,376) ^B
2105 and 3105	3/4 (19) to 2 (51)	315 (1,401)	630 (2,802)	945 (4,204)	315 (1,401)	735 (3,269)	1,155 (5,138)
2156 and 3156	3/4 (19) to 2 (51)	468 (2,082)	10,92 (4,857)	1,404 (6,245)	468 (2,082)	1,092 (4,857)	1,716 (7,633)
3220	3/4 (19)	880 (3,914) ^A	1,320 (5,872) ^D	1,980 (8,807)	2,640 (11,743) ^E	3,520 (15,658) ^F	Consult Dyna-Flo
	1-1/2 (38) to 2 (51)	660 (2,936)	1,320 (5,872) ^D	1,980 (8,807)	880 (3914) ^G	1,540 (6,850) ^H	2,640 (11,743) ^E
3220-4	3 (76)	N/A	N/A	N/A	3,300 (22,753) ^J	N/A	N/A
	4 (102)	N/A	N/A	N/A	N/A	2,420 (16,685) ^K	N/A

NOTES:

A - 3/4" (19 mm) MAX Travel

F - 6 - 17 Psig (41 - 117 kPag) Bench Range

B - Consult Dyna-Flo on 2069 thrust value

G - 6 - 19 Psig (41 - 131 kPag) Bench Range

C - 3 - 14 Psig (21 - 97 kPag) Bench Range

H - 2200 lb-f, 6 - 23 Psig (41 - 159 kPag) at 1-1/2" travel

D - 3 - 12 Psig (21 - 83 kPag) Bench Range

J - 6 - 18 Psig (41 - 124 kPag) Bench Range

E - 6 - 21 Psig (41 - 145 kPag) Bench Range

K - 6 - 22 Psig (41 - 152 kPag) Bench Range

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Table 12

Model DFC Actuator Thrust Available lbf (N)

Actuator Size	Travel Inches (mm)	Bench Range - Psig (kPag) (Based on 0-18 Psig Supply)			Bench Range - Psig (kPag) (Based on 0-33 Psig Supply)		
		3 - 15 (21 - 103)	6 - 15 (41 - 103)	8 - 15 (55 - 103)	6 - 30 (41 - 207)	10 - 30 (69 - 207)	14 - 30 (97 - 207)
1046	3/4 (19) ^A	138 (614)	322 (1,432) ^A	368 (1,637)	276 (1,228)	460 (2,046)	644 (2,865)
1069 and 2069	3/4 (19) to 1-1/2 (38)	207 (921)	414 (1,842)	552 (2,455)	414 (1,842)	690 (3,069)	966 (4,297)
2105 and 3105	3/4 (19) to 2 (51)	315 (1,401)	630 (2,802)	966 (4,297)	630 (2,802)	1,050 (4,671)	1,470 (6,530)
2156 and 3156	3/4 (19) to 2 (51)	468 (2,082)	936 (4,164)	1,248 (5,551)	936 (4,164)	1,560 (6,939)	2,184 (9,715)
3220	3/4 (19) to 2 (51)	660 (2,936)	1,320 (5,872)	1,760 (7,829)	1,320 (5,872)	2,200 (9,786)	3,080 (13,700)
3220-4	3 (76)	N/A	N/A	N/A	N/A	3,080 (21,236) ^C	N/A
	4 (102)	N/A	N/A	N/A	2,420 (16,685) ^B	N/A	N/A

NOTES:

A - 7 - 15 Psig (48 - 103 kPag) Bench Range

B - 11 - 26 Psig (76 - 176 kPag) Bench Range

C - 14 - 26 Psig (97 - 176 kPag) Bench Range



Model DFC and DFO Valve Actuator

MODEL NUMBERING SYSTEM

SAMPLE PART NUMBER: DFC-2105-A0630IN-NY

ACTION						DFC	
DFC	FAIL CLOSED			DFO	FAIL OPEN		
DFC4	FAIL CLOSED (EXTENDED TRAVEL)			DFO4	FAIL OPEN (EXTENDED TRAVEL)		
VALVE YOKE							2
1	2-1/8 INCH		2	2-13/16 INCH			
3	3-9/16 INCH						
ACTUATOR SIZE						069	
046	46 INCH ²		069	69 INCH ²			
105	105 INCH ²		156	156 INCH ²			
220	220 INCH ²					-	
PAINT							
-	DFPS-01 (STANDARD)			2	DFPS-02 (SEVERE SERVICE)		
3	DFPS-03 (HIGH TEMPERATURE)						A
TRAVEL							
P	3/8 INCH		L	7/16 INCH			
A	3/4 INCH		M	7/8 INCH			
R	1-1/4 INCH		C	1-1/2 INCH			
N	2-1/8 INCH		S	2-1/4 INCH			
Q	3-3/8 INCH		G	3-1/2 INCH			
K	1/2 INCH		J	5/8 INCH			
I	1 INCH		B	1-1/8 INCH			
T	1-5/8 INCH		D	2 INCH			
E	2-1/2 INCH		F	3 INCH			
H	4 INCH					06	
LOWER BENCH SET							
ACTUAL VALUE (PSI)			EXAMPLE: 03, 06, 17, 21, ETC.				
UPPER BENCH SET						30	
ACTUAL VALUE (PSI)			EXAMPLE: 27, 09, 15, 30, ETC.				
INPUT SIGNAL (AIR TO DIAPHRAGM)							
	0 - 18 PSIG			0 - 33 PSIG		I	
I	3 - 15 PSIG		I	6 - 30 PSIG			
HANDWHEEL AND TRAVEL STOPS						N	
N	NONE (STANDARD)			S	SIDE MOUNTED HANDWHEEL		
T	TOP MOUNTED HANDWHEEL			1	TYPE 1 UP STOP - DFO		
2	TYPE 2 DOWN STOP - DFO			3	TYPE 3 DOWN STOP - DFC		
4	TYPE 4 UP STOP - DFC			5	TYPE 5 UP STOP - DFC		
CONNECTING BLOCK OPTIONS						-	
-	NONE			T	TAPPED 1/4" - 20 UNC		
B	TAPPED 3/8" - 16 UNC			F	TAPPED 5/8" - 18 UNC		
CONSTRUCTION OPTIONS						N	
N	NONE			S	STAINLESS STEEL FASTENERS		
YOKE OPTIONS						Y	
	NONE			Y	TAPPED 5/16" - 18 UNC		

Our Commitment to Quality

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