

Model DFC and DFO Valve Actuator

Technical Sales Bulletin

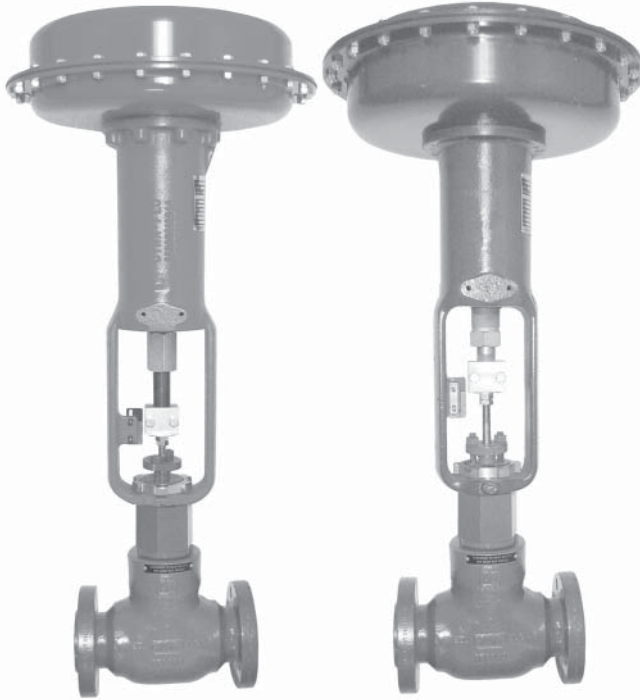


Figure 1 Models DFC and DFO Actuators

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 Table 4 & 5 for construction details. Contact your Dyna-Flo sales office for more information and other options.

Valve Stem Compatibility, inches (mm)

- 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)

- 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
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 & 3 for actuator diagram. See Table 3 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 4) employs time proven reliable technology. As the instrument signal to the sealed lower actuator casing (Key 3) is increased, the force generated by that pressure on the diaphragm (Key 12), and diaphragm plate (Key 10), force the diaphragm plate and actuator stem (Key 20) up, compressing the spring (Key 2). The lifting action is transferred to the valve stem through a secure split and bolted stem connector (Key 23). On a decrease, or complete loss of pneumatic signal, the actuator spring (Key 2) will force the actuator stem (Key 20) 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 5. As the instrument signal to the sealed upper actuator casing (Key 1) is increased, the force generated by that pressure on the diaphragm (Key 2), and diaphragm plate (Key 3), force the diaphragm plate and actuator stem (Key 8) down, compressing the spring (Key 10). The extension action is transferred to the valve stem through a secure split and bolted stem connector (Key 13). On a decrease, or complete loss of pneumatic signal, the actuator spring (Key 10) will force the actuator stem (Key 8) 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

There are two types of manual override available for the DFC and DFO. The simple, cost effective option is the top mounted handwheel, and the more convenient option is the side-mounted handwheel. The top mounted handwheel is a good choice for emergency only positioning of a valve, and it is commonly used as a travel stop. It is available for all sizes of DFC and DFO. The side-mounted handwheel is the right selection for an application that requires frequent manual positioning. The flexibility of the side-mounted handwheel allows it to limit operation in either direction, but only one direction at a time. It is available for sizes 1069 and larger.

External Travel Stops

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 (Bar)	Safety Psig (Bar)	Maximum Pressure for Sizing Psig (Bar)	Safety Psig (Bar)
1069	69 (445)	2300 (10,200)	0.75 (19)	70 (4.83)	90 (6.21)	65 (4.48)	75 (5.17)
2069	69 (445)	2700 (12,000)	1.5 (38)	70 (4.83)	90 (6.21)	65 (4.48)	75 (5.17)
2105	105 (677)	5600 (25,100)	2.0 (51)	65 (4.48)	75 (5.17)	50 (3.45)	60 (4.14)
2156	156 (1006)	7500 (33,500)	2.0 (51)	55 (3.79)	65 (4.48)	40 (2.76)	50 (3.45)
3105	105 (677)	5600 (25,100)	2.0 (51)	65 (4.48)	75 (5.17)	50 (3.45)	60 (4.14)
3156	156 (1006)	6800 (30,200)	2.0 (51)	55 (3.79)	65 (4.48)	40 (2.76)	50 (3.45)
3220 3220-4	220 (1420)	8800 (39,100)	4.0 (102)	50 (3.45)	60 (4.14)	55 (3.79)	65 (4.48)

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)
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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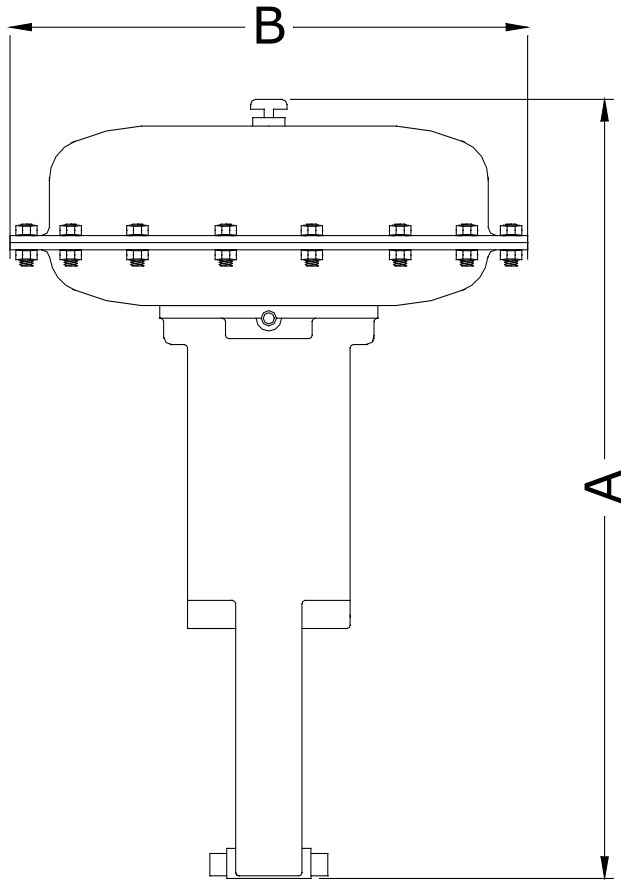


Figure 2 Model DFC Dimensions Diagram

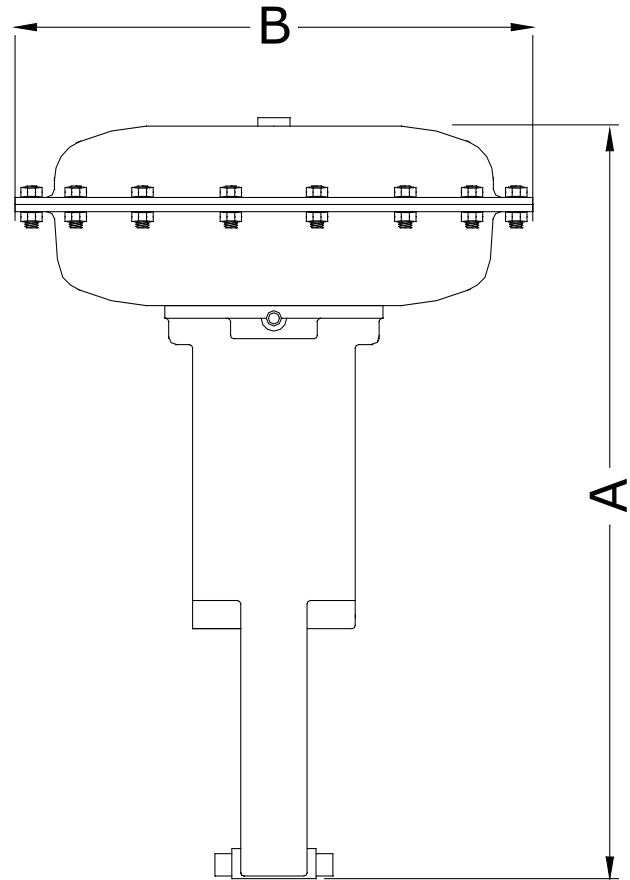


Figure 3 Model DFO Dimensions Diagram

Table 3				
Model DFC and DFO Outline Dimensions (See Figures 2 & 3)				
Actuator Size	Dimension Reference Inch (mm)			
	DFC	A	DFO	B
1069	22.68 (576)		19.25 (489)	13.12 (333)
2069	23.38 (594)		21.20 (538)	13.12 (333)
2105	30.25 (768)		25.72 (653)	16.00 (406)
2156	30.25 (768)		25.72 (653)	18.62 (473)
3105	30.91 (785)		28.10 (714)	16.00 (406)
3156	30.91 (785)		28.10 (714)	18.62 (473)
3220	36.48 (927)		32.69 (830)	21.12 (536)
3220-4	42.85 (1088)		38.90 (988)	21.12 (536)

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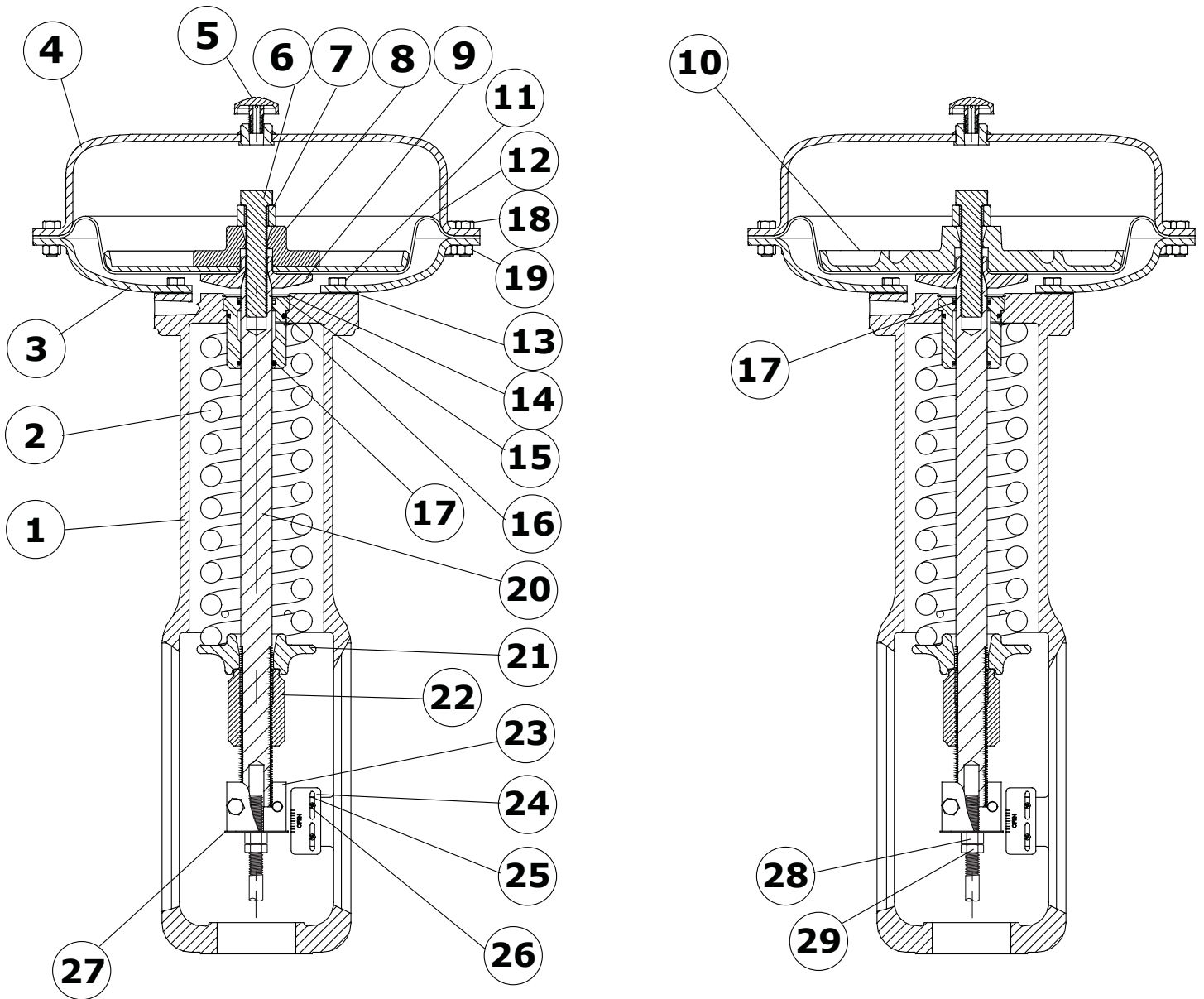


Figure 4 DFC Actuator Typical Cross Section



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Table 4

Model DFC Standard Construction Materials

Key	Description	Material	Key	Description	Material
1	Yoke	Cast Iron	15	Bushing	Brass
2	Spring	Steel	16	O-Ring	Buna
3	Lower Casing	Steel	17	O-Ring	Buna
4	Upper Casing	Steel	18	Cap Screw	Steel / Zinc Plated
5	Vent	Plastic	19	Nut	Steel / Zinc Plated
6	Cap Screw	Steel / Zinc Plated	20	Stem	17-4
7	Travel Stop	Steel	21	Spring Seat	Steel Plated
8	Diaphragm Plate Assembly*	Steel / Zinc Plated	22	Spring Adjuster	Steel Plated
9	Lwr Diaphragm Plate	Steel	23	Stem Connector Assembly	Steel Plated
10	Diaphragm Plate*	Cast Iron	24	Travel Scale	SST
11	Cap Screw	Steel / Zinc Plated	25	Speed Nut	SST
12	Diaphragm	Nitrile / Nylon	26	Screw	SST
13	Gasket	Composition	27	Travel Disc	SST
14	Snap Ring	SST	28, 29	Stem Nut , Jam Nut	Steel Plated

* DFC actuators have either a diaphragm plate assembly (Key 8) or a diaphragm plate (Key 10) depending on date of manufacture and model. See instruction manual for details.

Table 5

Model DFO Construction Materials

Key	Description	Material	Key	Description	Material
1	Upper Casing	Steel	12	Spring Adjuster	Steel Plated
2	Diaphragm	Nitrile / Nylon	13	Stem Connector Assembly	Steel Plated
3	Diaphragm Plate Assembly*	Steel	14	Cap Screw	Steel Plated
4	Diaphragm Plate*	Cast Iron	15	Nut	Steel Plated
5	Lower Casing	Steel	16	Travel Scale	SST
6	Socket Cap Screw	Steel	17	Travel Disc	SST
7	Cap Screw	Steel Plated	18	Stem Nut	Steel Plated
8	Stem	Steel / Zinc Plated	19	Jam Nut	Steel Plated
9	Yoke	Cast Iron	20	Machine Screw	Steel Plated
10	Spring	Steel	21	Speed Nut	SST
11	Lower Spring Seat	Steel Plated			

* DFO actuators have either a diaphragm plate assembly (Key 3) or a diaphragm plate (Key 4) depending on date of manufacture and model. See instruction manual for details.

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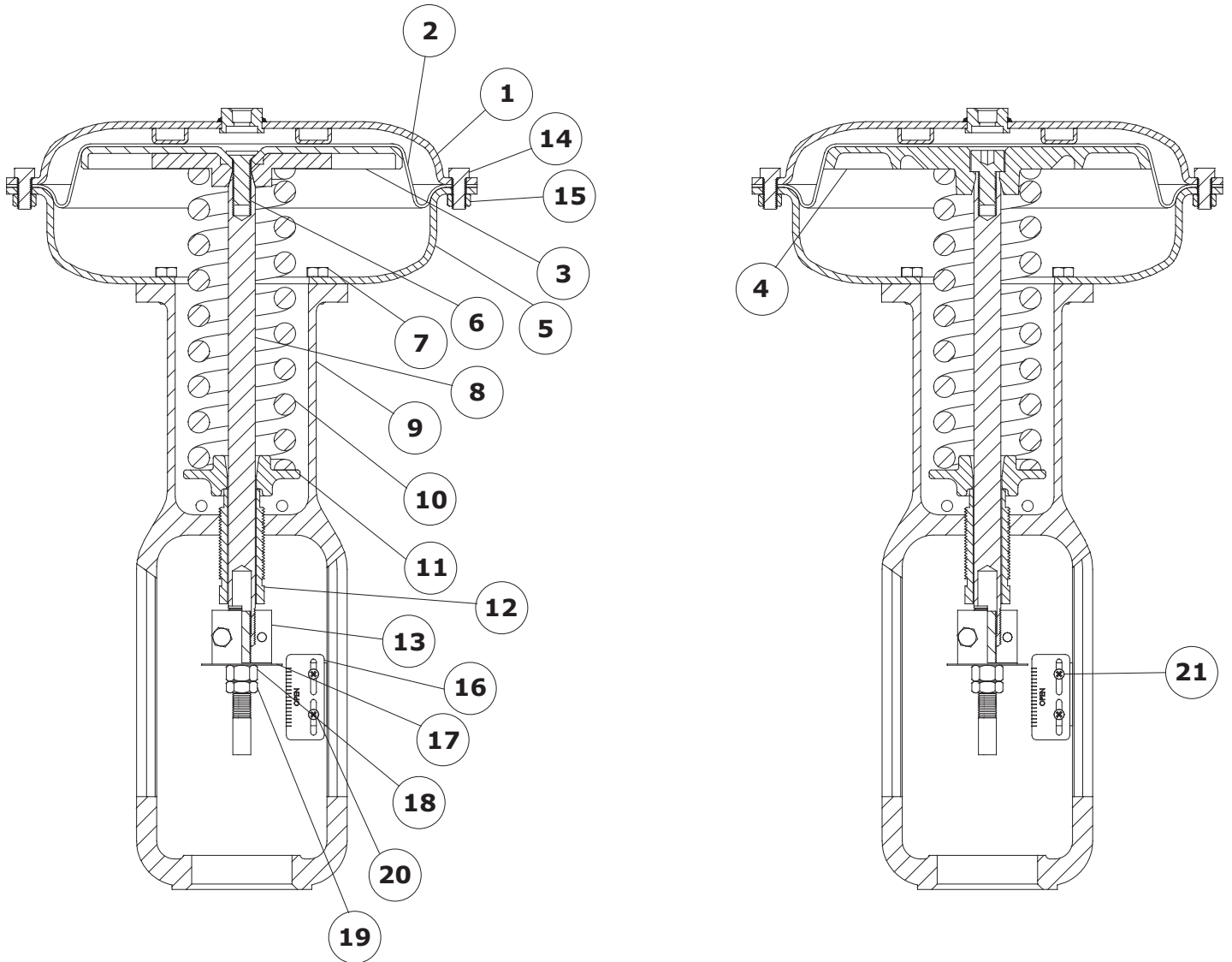


Figure 5 DFO Actuator Typical Cross Section



Model DFC and DFO Valve Actuator

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Table 6

Model DFO Actuator Thrust Available lbf (N)

Actuator Size	Travel Inches (mm)	Bench Range - Psig (Bar)			Bench Range - Psig (Bar)		
		3 - 15 (0.21 - 1.03)	3 - 11 (0.21 - 0.76)	3 - 9 (0.21 - 0.62)	6 - 30 (0.41 - 2.07)	6 - 26 (0.41 - 1.79)	6 - 22 (0.41 - 1.52)
1069^A and 2069	3/4 (19) to 1-1/2 (38)	207 (921)	438 (2148)	621 (2762)	207 (921)	483 (2148)	759 (3376) ^B
2105 and 3105	3/4 (19) to 2 (51)	315 (1401)	630 (2802)	945 (4204)	315 (1401)	735 (3269)	1155 (5138)
2156 and 3156	3/4 (19) to 2 (51)	468 (2082)	1092 (4857)	1404 (6245)	468 (2082)	1092 (4857)	1716 (7633)
3220 and 3220-4	3/4 (19)	880 (3914) ^A	1320 (5872) ^D	1980 (8807)	2640 (11743) ^E	3520 (15658) ^F	Consult Dyna-Flo
	1-1/2 (38) to 2 (51)	660 (2936)	1320 (5872) ^D	1980 (8807)	880 (3914) ^G	1540 (6850) ^H	2640 (11743) ^E

NOTES:

A - 1-1/8" (29 mm) MAX Travel

E - 6-21 psig (0.41 - 1.45 Bar)

B - Consult Dyna-Flo on 2069 thrust value

F - 6-17 psig (0.41 - 1.17 Bar)

C - 3-14 psig (0.21 - 0.97 Bar)

G - 6-19 psig (0.41 - 1.31 Bar)

D - 3-12 psig (0.21 - 0.83 Bar)

H - 2200 lb-f, 6-23 psig (0.41 - 1.59 Bar) at 1-1/2" travel

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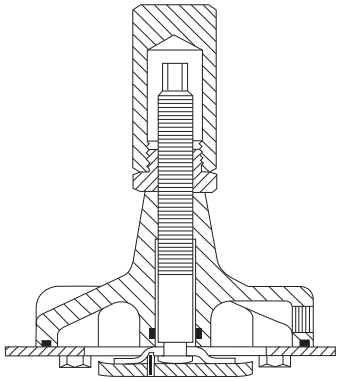
Table 7

Model DFC Actuator Thrust Available lbf (N)

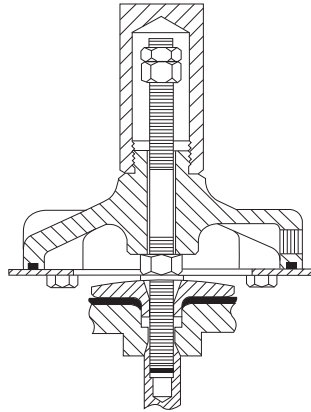
Actuator Size	Travel Inches (mm)	Bench Range - Psig (Bar)			Bench Range - Psig (Bar)		
		3 - 15 (0.21 - 1.03)	6 - 15 (0.41 - 1.03)	8 - 15 (0.55 - 1.03)	6 - 30 (0.41 - 2.07)	10 - 30 (0.69 - 2.07)	14 - 30 (0.97 - 2.07)
1069 and 2069	3/4 (19) to 1-1/2 (38)	207 (921)	414 (1842)	552 (2455)	414 (1842)	690 (3069)	966 (4297)
2105 and 3105	3/4 (19) to 2 (51)	315 (1401)	630 (2802)	966 (4297)	630 (2802)	1050 (4671)	1470 (6530)
2156 and 3156	3/4 (19) to 2 (51)	468 (2082)	936 (4164)	1248 (5551)	936 (4164)	1560 (6939)	2184 (9715)
3220 and 3220-4	3/4 (19) to 2 (51)	660 (2936)	1320 (5872)	1760 (7829)	1320 (5872)	2200 (9786)	3080 (13700)

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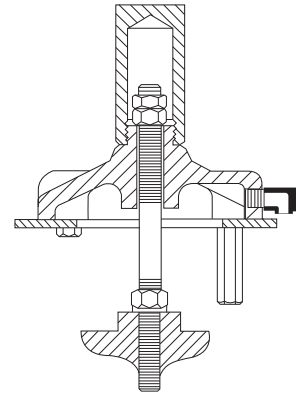
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TYPE 1
UP STOP DFO



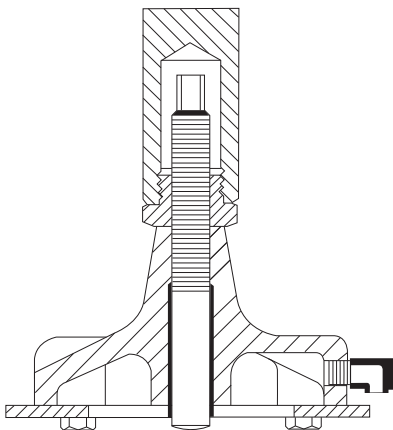
TYPE 2
DOWN STOP DFO



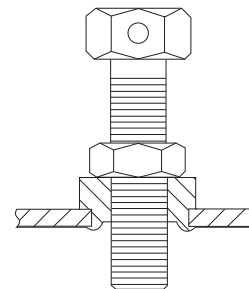
TYPE 3
DOWN STOP DFC



Figure 6 *Optional Adjustable Travel Stops*



TYPE 4
UP STOP DFC



TYPE 5
UP STOP DFC



Figure 7 *Optional Adjustable Travel Stops Continued*

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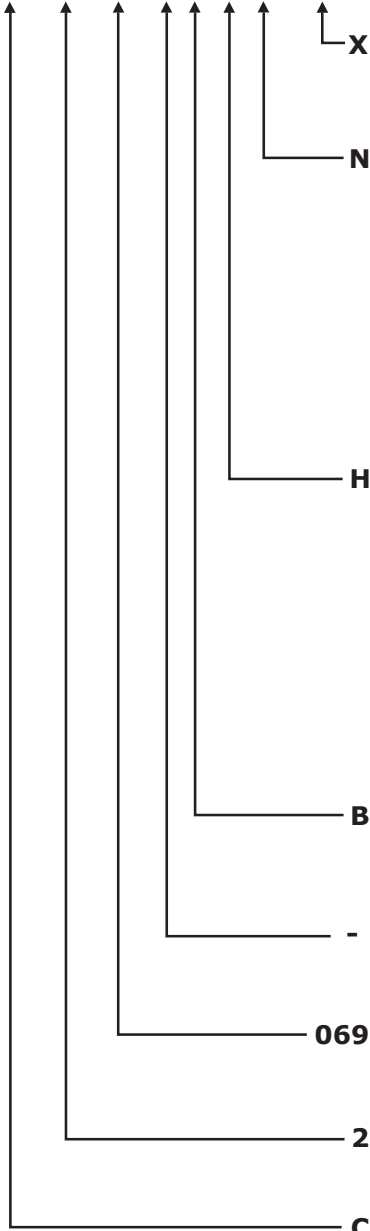


Ordering Guide

Dyna-Flo DFC / DFO Series Actuators | Model Numbering System

Sample Part Number

DFC - 2 069 - B H N - X



X	Denotes Special Construction	
	Special (Consult Dyna-Flo Sales Office)	
Options		
N	None (Standard)	2 Type 2 Down Stop - DFO
S	Side Mounted Handwheel	3 Type 3 Down Stop - DFC
T	Top Mounted Handwheel	4 Type 4 Up Stop - DFC
I	Type 1 Up Stop - DFO	5 Type 5 Up Stop - DFC
Bench Range, psig		
FAIL CLOSED		FAIL OPEN
A	3 - 15	H 6 - 30
B	4 - 15	Y 8 - 30
C	5 - 15	I 9 - 30
D	6 - 15	J 10 - 30
E	7 - 15	K 12 - 30
F	8 - 15	L 14 - 30
U	9 - 15	M 15 - 30
G	10 - 15	N 16 - 30
V	11 - 15	O 17 - 30
X	Special	Q 18 - 30
		R 19 - 30
		S 20 - 30
		T 21 - 30
		W 22 - 30
		U 14 - 26
		X Special
		P 3 - 15
		B 3 - 14
		C 3 - 13
		D 3 - 12
		E 3 - 11
		F 3 - 10
		G 3 - 8
		H 6 - 30
		I 6 - 28
		J 6 - 27
		K 6 - 26
		L 6 - 24
		M 6 - 22
		N 6 - 21
		O 6 - 20
		P 6 - 19
		Q 6 - 18
		R 6 - 17
		S 6 - 16
		T 6 - 15
		U 6 - 23
Travel, Inch		
A	3/4	D 2
B	1-1/8	E 2-1/2
C	1-1/2	F 3
		G 3-1/2
		X Special Travel
Paint		
-	Standard Dyna-Flo Paint	H Helix Spec. Paint
W	International Paint - Willow Grey Color No. 80898	
Actuator Size, in²		
069	69	156 156
105	105	220 220
Valve Yoke, Inch		
1	2-1/8	3 3-9/16
2	2-13/16	
Action		
C	Fail Closed	O Fail Open