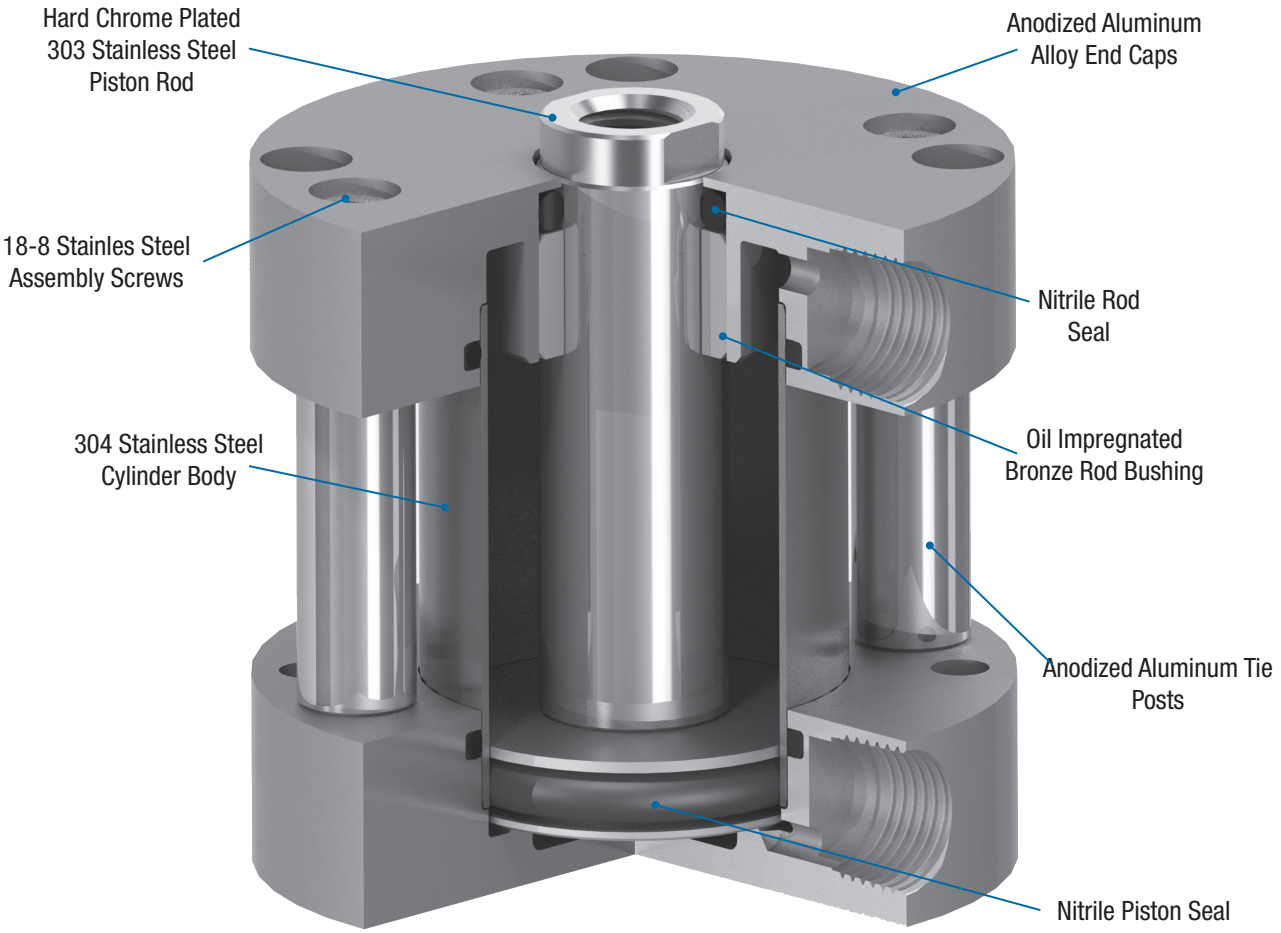
Compact Cylinders

If your application is tight on space, a Bimba compact cylinders is the answer. With a wide variety of model options, including the recently “Blue and Improved” Flat-1®, Bimba has a flat acutator that's right for you. Our array of stroke lengths, bore sizes, mounting styles, and other options, as well as your ability to engineer custom solutions, means a compact answer is never far away.

Contents



Flat-1® Compact Cylinders

- Compact design provides machine designers the ability to use Flat-1® cylinders in tight spaces
- Hard chrome plated piston rod is corrosion resistant and provides a hard, smooth sealing surface extending the life of the cylinder's rod seals
- Body materials are available in standard Stainless Steel and optional Aluminum or Plastic providing design engineers with increased flexibility.
- Single acting spring return cylinders include rod seals to provide for standard fail safe operation
- New switch track options accept either Reed or Hall Effect switches allowing for either AC or DC switch circuitry.
- 3,000 mile life ratings when low frictions seals are specified provides customers the confidence associated with a low maintenance design.
- Mechanically retained bumpers reduce the sound typically associated with high cycle pneumatic cylinder applications.
- New "F Series" mounting options provide drop in interchanges for a competitive manufacturer.
- The addition of NPT rod threads on double rod end models makes it easier for designers to connect air and fluid fittings to the rod ends.
- Optional rod bearing materials are available for applications requiring smoother cylinder rod travel than is provided by the standard oil impregnated bronze rod bushings.

Approximate power factors (for all models except f02, 3, 4)	
9/16" (02) = 0.25	For example, a 3/4" bore model FO-041 will exert a force of approximately 0.4 times the air line pressure.
3/4" (04) = 0.4	
1-1/16" (09) = 0.9	
1-1/2" (17) = 1.7	
2" (31) = 3.1	
2-1/2" (50) = 5.0	
3" (70) = 7.0	
4" (125) = 12.5	

How it Works

Superior Product Breadth in a Compact Design

The compact Flat-1® offers mounting styles to fit most every application!

Pivot Mount

Front Trunnion Mount

Threaded Mounting Holes Both Ends

Clearance Holes Front

Nose Mount

F Series Counterbored Each End

F Series Threaded Both Ends

Basic Mount

Materials of Construction

End Caps: Anodized Aluminum Alloy

Cylinder Body: 304 Stainless Steel

Piston Rod: 303 Hard Chrome Plated Stainless Steel

Lubrication: Semi-Synthetic Grease

Seals: Buna-N Standard; High and Low Temperature (optional)

Engineering Specifications

Temperature*: -20° F to 200° F Standard
-40° F to 200° F (Low Temperature)
0° F to 400° F (High Temperature)

Pressure Rating: 200 PSI

* Cylinders operated for extended time at temperatures below 0° F or above 300° F may require special modifications.

Flat-1® Specifications

Maximum Stroke + Extra Extension Lengths

Model	Bore Sizes	Maximum Stroke	Maximum = Stroke + Ee
FO & FOD	All bore sizes	16"	18"
FOS		4"	
FOR	9/16" (02) through 2-1/2" (50)		
FOR	3" (70) and 4" (125)	3"	

Please note the following:
It is recommended to support and guide the rod throughout the entire stroke.
All maximum lengths are based on tension (puling) loads. Compressive forces must be evaluated for column buckling.

Cylinder Weights

Approximate Cylinder Weights (oz.)

Bore	FO/FOS		FOD			FOR		Nose Mount Option
	Base (0" Stroke)	Adder Per 1/8" Of Stroke	Base	Adder Per 1/8" Of Stroke	Adder Per 1/8" Of Stroke For -H Option	Base	Adder Per 1/8" Of Stroke	Adder To Base Weight
9/16" (02)	1.2	0.08	1.3	0.15	0.1	1.3	0.08	0.1
3/4" (04)	1.9	0.1	2.1	0.2	0.15	2.0	0.1	0.2
1-1/16" (09)	0.28	0.01	4.72	0.34	0.29	5.40	0.11	4.33
1-1/2" (17)	0.43	0.02	8.30	0.58	0.51	8.65	0.23	6.65
2" (31)	0.68	0.03	9.44	0.81	0.68	13.10	0.29	6.94
2-1/2" (50)	1.25	0.04	21.31	0.84	0.71	24.15	0.33	7.54
3" (70)	1.64	0.05	27.64	1.10	0.93	31.14	0.41	7.98
4" (125)	55.7	1.0	71.8	1.3	1.1	61.8	1.0	5.9

Length Adders for Low Friction Seals (L) and Magnetic Piston (M)

Bore	Length Adder			
	Low Friction Seals (L)	Magnetic Position Sensing* (M)		
		FO/FOD	FOS	FOR
9/16" (02)	0.25	0.88	0.63	0.38
3/4" (04)	0.25	0.88	0.88	0.88
1-1/16" (09)	0.38	0.88	0.88	0.88
1-1/2" (17)	0.38	0.88	0.88	0.88
2" (31)	0.38	0.88	0.88	0.88
2-1/2" (50)	0.38	0.88	0.88	0.88
3" (70)	0.50	0.88	0.88	0.88
4" (125)	0.50	0.88	0.88	0.88

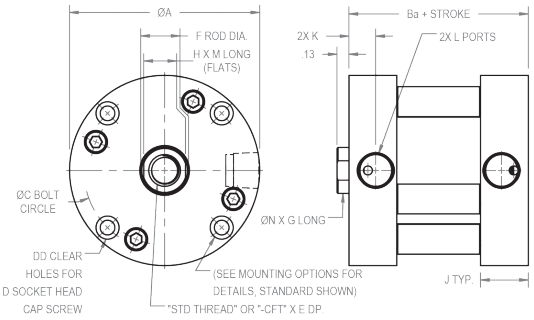
* If L and M are both selected, use the M length adder.

Enclosed Spring Forces

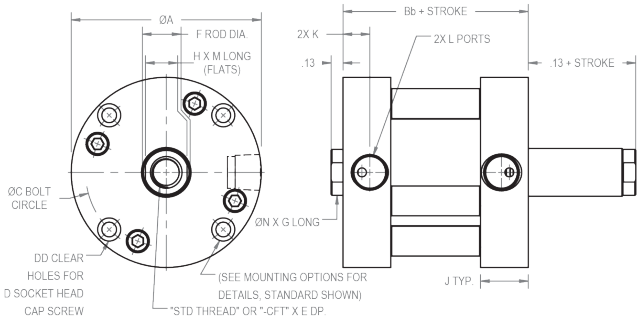
Bore	Maximum Force (Lb)	Spring Rates (Lb/In)			
		0.12 To 1" Stroke (Lb/In)	1.001 To 2" Stroke (Lb/In)	2.001 To 3" Stroke (Lb/In)	3.001 To 4" Stroke (Lb/In)
9/16" (02)	5.90	4.00	1.75	1.24	0.88
3/4" (04)	10.40	6.00	2.70	1.86	1.35
1-1/16" (09)	10.80	6.50	2.70	1.91	1.35
1-1/2" (17)	12.90	6.00	2.30	1.66	1.15
2" (31)	17.50	11.00	2.60	2.10	1.30
2-1/2" (50)	26.00	9.50	5.00	3.28	2.50
3" (70)	35.00	16.00	5.00	3.81	2.50
4" (125)	50.00	22.00	5.50	4.40	2.75

Flat-1® Basic Model Dimensions (in)

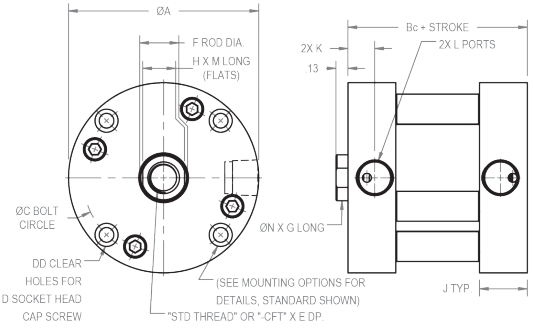
Model FO
(Double Acting Single End Rod)



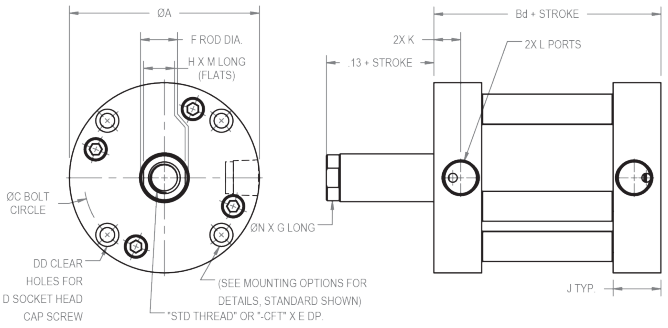
Model FOD
(Double Acting Double End Rod)



Model FOS
(Single Acting Rod Normally Retracted)



Model FOR
(Reverse Single Acting Rod Normally Extended)



Bore	A	Ba	Bb	Bc				Bd				C	D	DD	E*
				0-1"	1.001"-2"	2.001"-3"	3.001"-4"	0-1"	1.001"-2"	2.001"-3"	3.001"-4"				
9/16" (02)	1.11	0.56	0.69	0.81	1.38	1.96	2.52	1.06	1.62	2.14	2.70	0.88	#4	2	0.46
3/4" (04)	1.49	0.56	0.69	0.81	1.38	1.94	2.50	1.06	1.62	2.19	2.75	1.22	#6	4	0.46
1-1/16" (09)	1.99	0.88	0.94	0.88	1.50	2.13	2.75	1.38	2.00	2.63	3.25	1.69	#6	4	0.59
1-1/2" (17)	2.61	0.88	1.00	0.88	1.50	2.13	2.75	1.38	2.00	2.63	3.25	2.19	#10	4	0.59
2" (31)	3.11	0.94	1.06	0.94	1.56	2.19	2.81	1.44	2.06	2.69	3.31	2.69	#10	4	0.59
2-1/2" (50)	3.74	1.19	1.31	1.19	1.81	2.94	3.81	1.94	2.81	3.69	4.56	3.25	1/4	4	0.59
3" (70)	4.24	1.25	1.37	1.25	2.12	3.00	3.87	2.00	2.88	3.75	N/A	3.78	1/4	4	0.57
4" (125)	5.50	1.56	1.69	1.56	2.44	3.31	4.19	2.31	3.19	4.06	N/A	4.94	5/16	4	0.62

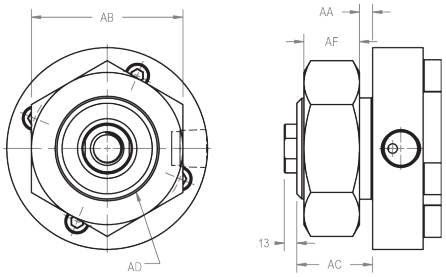
* FOD models with strokes less than or equal to 3/8 have reduced thread depths. Contact Bimba for details. Stroke threshold is 5/8 for 4" bore.

Bore	F	G	H	J	K	L	M	N	STD THREAD	CFT
9/16" (02)	0.25	0.14	0.22	0.34	0.17	#10-32	0.13	0.24	#8-32 UNC-2B	N/A
3/4" (04)	0.31	0.14	0.25	0.34	0.17	#10-32	0.13	0.29	#10-32 UNF-2B	#10-24 UNC-2B
1-1/16" (09)	0.50	0.14	0.44	0.50	0.28	1/8 NPT	0.13	0.48	5/16-24 UNF-2B	5/16-18 UNC-2B
1-1/2" (17)	0.63	0.14	0.50	0.50	0.26	1/8 NPT	0.13	0.59	3/8-24 UNF-2B	3/8-16 UNC-2B
2" (31)	0.75	0.14	0.62	0.53	0.28	1/8 NPT	0.13	0.71	1/2-20 UNF-2B	1/2-13 UNC-2B
2-1/2" (50)	0.75	0.14	0.62	0.66	0.35	1/4 NPT	0.13	0.71	1/2-20 UNF-2B	1/2-13 UNC-2B
3" (70)	0.88	0.14	0.75	0.69	0.35	1/4 NPT	0.13	0.84	5/8-18 UNF-2B	5/8-11 UNC-2B
4" (125)	1.00	0.14	0.87	0.84	0.42	3/8" NPT	0.13	0.96	3/4-16 UNF-2B	3/4-10 UNC-2B

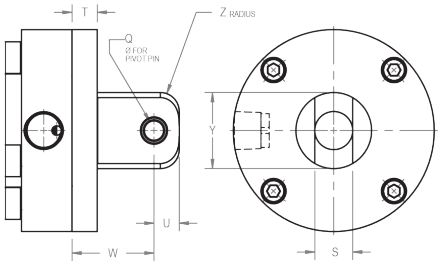
NOTE: Use caution when using a long screw that spans the length of the cylinder. If the endcap experiences flexing, we recommend the -4F or -4R mounting style.

Flat-1® Mounting Options and Dimensions (in)

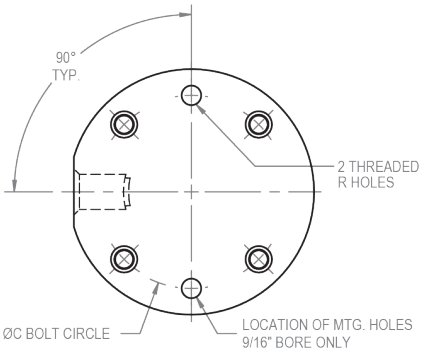
Nose Mount
(Option 5)
Available in FO, FOS, FOR models and includes rod wiper



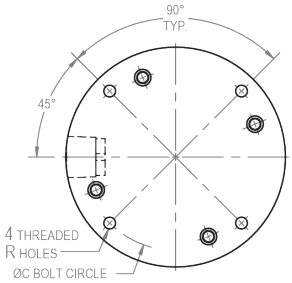
Pivot Mount
(Option 1, 1N)
Available in standard (as shown) or 90º
Includes bronze pivot bushing
Not available as an accessory



Threaded Mounting Holes for 9/16" bore (02)
(Option 3, 3F, 3R)
Available in front, rear, or both end caps
Option 3R shown



Threaded Mounting Holes for 3/4" bore (04) and larger

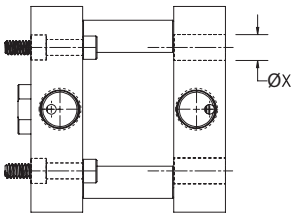


Mounting Option Dimensions

Bore	AA	AB	AC	AD	AF	C	M	N	P	Q	R	S	T	U	W	X	Y	Z
9/16" (02)	0.06	0.75	0.38	1/2-20 UNF-2A	0.31	0.88	N/A	N/A	N/A	0.19	#4-40 UNC-2B	0.38	0.19	0.25	0.75	0.19	0.63	0.19
3/4" (04)	0.06	0.75	0.38	5/8-18 UNF-2A	0.25	1.22	0.31	0.13	0.17	0.19	#6-32 UNC-2B	0.38	0.19	0.25	0.75	0.24	0.75	0.19
1-1/16" (09)	0.13	1.50	0.75	1-14 UNS-2A	0.55	1.69	0.50	0.25	0.25	0.19	#6-32 UNC-2B	0.38	0.25	0.25	0.81	0.25	0.75	0.19
1-1/2" (17)	0.13	1.88	0.75	1-1/4-12 UNF-2A	0.50	2.19	0.50	0.25	0.25	0.38	#10-24 UNC-2B	0.75	0.25	0.44	1.19	0.34	1.38	0.38
2" (31)	0.19	1.88	0.88	1-3/8-12 UNF-2A	0.50	2.69	0.50	0.25	0.25	0.38	#10-24 UNC-2B	0.75	0.31	0.44	1.25	0.34	1.38	0.38
2-1/2" (50)	0.25	1.88	1.00	1-3/8-12 UNF-2A	0.50	3.25	0.63	0.31	0.33	0.38	1/4-20 UNC-2B	0.75	0.38	0.44	1.31	0.41	1.38	0.38
3" (70)	0.25	1.88	1.00	1-3/8-12 UNF-2A	0.50	3.78	0.63	0.31	0.33	0.63	1/4-20 UNC-2B	1.00	0.38	0.56	1.69	0.41	1.88	0.38
4" (125)	0.19	2.63	1.13	1-3/4-12 UN-2A	0.88	4.94	0.75	0.38	0.42	0.63	5/16-18 UNC-2B	1.00	0.44	0.56	1.75	0.50	1.88	0.38

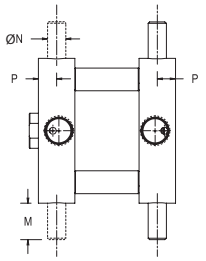
Flat-1® Mounting Options and Dimensions (in)

Screw Clearance Holes
(Option 4R or 4F)
Available in front or rear end cap
Option 4R shown



NOTE: Use caution when using a long screw that spans the length of the cylinder. If the endcap experiences flexing, we recommend the -4F or -4R mounting style.

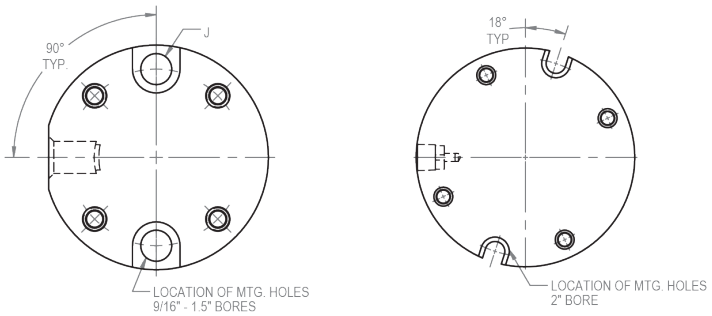
Trunnion Mount
(Option 2, 2F, 2R)
Available in front, rear, or both end caps
Not available in 9/16" (02) bore



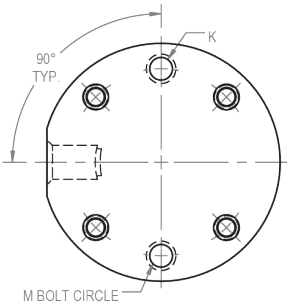
Mounting Option Dimensions

Bore	AA	AB	AC	AD	AF	C	M	N	P	Q	R	S	T	U	W	X	Y	Z
9/16" (02)	0.06	0.75	0.38	1/2-20 UNF-2A	0.31	0.88	N/A	N/A	N/A	0.19	#4-40 UNC-2B	0.38	0.19	0.25	0.75	0.19	0.63	0.19
3/4" (04)	0.06	0.75	0.38	5/8-18 UNF-2A	0.25	1.22	0.31	0.13	0.17	0.19	#6-32 UNC-2B	0.38	0.19	0.25	0.75	0.24	0.75	0.19
1-1/16" (09)	0.13	1.50	0.75	1-14 UNS-2A	0.55	1.69	0.50	0.25	0.25	0.19	#6-32 UNC-2B	0.38	0.25	0.25	0.81	0.25	0.75	0.19
1-1/2" (17)	0.13	1.88	0.75	1-1/4-12 UNF-2A	0.50	2.19	0.50	0.25	0.25	0.38	#10-24 UNC-2B	0.75	0.25	0.44	1.19	0.34	1.38	0.38
2" (31)	0.19	1.88	0.88	1-3/8-12 UNF-2A	0.50	2.69	0.50	0.25	0.25	0.38	#10-24 UNC-2B	0.75	0.31	0.44	1.25	0.34	1.38	0.38
2-1/2" (50)	0.25	1.88	1.00	1-3/8-12 UNF-2A	0.50	3.25	0.63	0.31	0.33	0.38	1/4-20 UNC-2B	0.75	0.38	0.44	1.31	0.41	1.38	0.38
3" (70)	0.25	1.88	1.00	1-3/8-12 UNF-2A	0.50	3.78	0.63	0.31	0.33	0.63	1/4-20 UNC-2B	1.00	0.38	0.56	1.69	0.41	1.88	0.38
4" (125)	0.19	2.63	1.13	1-3/4-12 UN-2A	0.88	4.94	0.75	0.38	0.42	0.63	5/16-18 UNC-2B	1.00	0.44	0.56	1.75	0.50	1.88	0.38

F Series Mounting Holes
(Option -6)



F Series Mounting Holes
(Option -7)

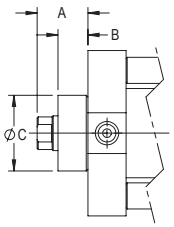


F Series Dimensions

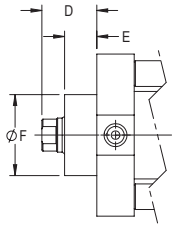
Bore	F Series Interchange					
	H	# Of Holes For Option 6	J	# Of Holes For Option 7	K	M
9/16" (02)	0.875	2	#6	2	#6-32	0.875
3/4" (04)	1.188	2	#6	2	#8-32	1.188
1-1/16" (09)	1.688	2	#10	2	#10-32	1.688
1-1/2" (17)	2.375	2	#10	N/A	N/A	N/A
2" (31)	2.810	2	1/4	N/A	N/A	N/A
2-1/2" (50)	3.250	4	1/4	N/A	N/A	N/A
3" (70)	3.812	4	1/4	N/A	N/A	N/A
4" (125)	5.000	4	1/4	N/A	N/A	N/A

Flat-1® Cylinder Options and Dimensions (in)

Rod Wiper (Option W)



Metallic Rod Scraper (Option Z)

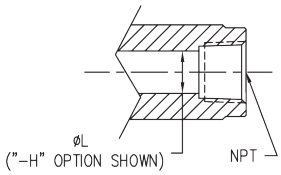


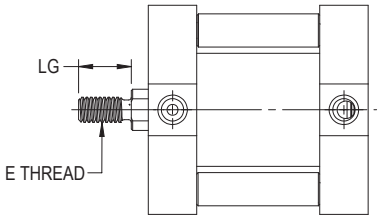
Bore	Wiper/Scraper					
	A	B	C	D	E	F
9/16" (02)	0.46	0.27	0.56	0.50	0.30	0.65
3/4" (04)	0.46	0.27	0.68	0.50	0.30	0.74
1-1/16" (09)	0.46	0.27	0.87	0.58	0.36	0.93
1-1/2" (17)	0.38	0.19	0.99	0.52	0.30	1.06
2" (31)	0.39	0.19	1.12	0.54	0.30	1.18
2-1/2" (50)	0.39	0.19	1.12	0.54	0.30	1.18
3" (70)	0.38	0.19	1.24	0.53	0.30	1.37
4" (125)	0.38	0.19	1.37	0.49	0.30	1.43

Maximum Torque Recommendations for Nose Mount Option

Bore	Maximum Torque
9/16" (02)	1
3/4" (04)	28
1-1/16" (09)	100
1-1/2" (17)	120
2" (31)	130
2-1/2" (50)	130
3" (70)	130
4" (125)	150

Hollow Rod Dimensions for FOD Cylinders and Male Thread Dimensions for All Models

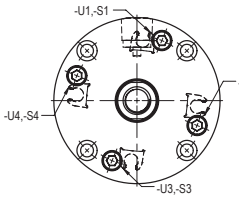




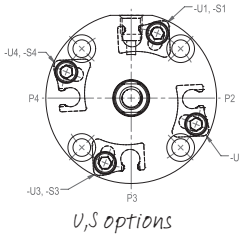
Bore	Rod Thread												
	-H Option	LØ	-CFTH Option	LØ	-HMT Option	LØ	-CMTH Option	LØ	-HNPT Option	LØ	LG	E	
												MT	CMT
9/16" (02)	#8-32 UNC-2B	0.12	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.38	#8-32 UNC	N/A
3/4" (04)	#10-32 UNF-2B	0.14	#10-24 UNC-2B	0.14	#10-32 UNF-2A	0.09	N/A	N/A	N/A	N/A	0.38	#10-32 UNF	#10-24-UNC
1-1/16" (09)	5/16-24 UNF-2B	0.22	5/16-18 UNC-2B	0.22	5/16-24 UNF-2A	0.16	5/16-18 UNC-2A	0.16	1/8 NPT	0.22	0.50	5/16-24 UNF-2A	5/16-18 UNC-2A
1-1/2" (17)	3/8-24 UNF-2B	0.28	3/8-16 UNC-2B	0.28	3/8-24 UNF-2A	0.19	3/8-16 UNC-2A	0.19	1/8 NPT	0.28	0.50	3/8-24 UNF-2A	3/8-16 UNC-2A
2" (31)	1/2-20 UNF-2B	0.38	1/2-13 UNC-2B	0.38	1/2-20 UNF-2A	0.25	1/2-13 UNC-2A	0.25	1/4 NPT	0.38	0.63	1/2-20 UNF-2A	1/2-13 UNC-2A
2-1/2" (50)	1/2-20 UNF-2B	0.38	1/2-13 UNC-2B	0.38	1/2-20 UNF-2A	0.25	1/2-13 UNC-2A	0.25	1/4 NPT	0.38	0.63	1/2-20 UNF-2A	1/2-13 UNC-2A
3" (70)	5/8-18 UNF-2B	0.44	5/8-11 UNC-2B	0.44	5/8-18 UNF-2A	0.31	5/8-18 UNF-2A	0.31	3/8 NPT	0.44	0.75	5/8-18 UNF-2A	5/8-11 UNC-2A
4" (125)	3/4-16 UNF-2B	0.50	3/4-10 UNC-2B	0.50	3/4-16 UNF-2A	0.38	3/4-10 UNC-2A	0.38	3/8 NPT	0.50	0.75	3/4-16 UNF	3/4-10 UNC

Position Sensing Switches and Dimensions

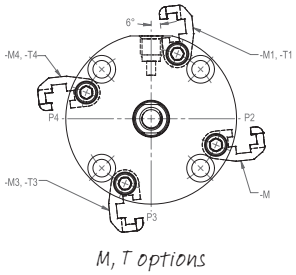
For real ROUND Flat-1 series cylinder -M options, the default switch mounting post location is Position 2. To locate the post to other positions, please specify options M1, M3, or M4. For additional tracks, please specify options T1, T3, or T4 for the appropriate location.



1-1/16" - 4" BORE -AB/-PB & U-TRACK OPTION COMBINATION TRACK LOCATIONS



U,S options



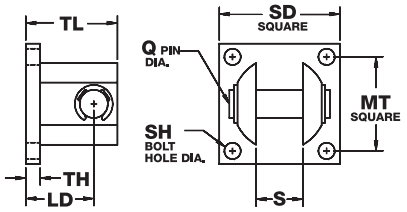
M, T options

Bore	G inch
9/16" (02)	0.29
3/4" (04)	0.25
1-1/16" (09)	0.07
1-1/2" (17)	0.02
2" (31)	0.03
2-1/2" (50)	0.02
3" (70)	0.03
4" (125)	0.00

Flat-1® Accessory Options and Dimensions (in)

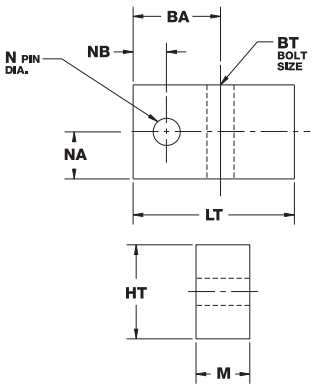
Anodized Aluminum Clevis Bracket complete with Stainless Steel Pin; Designed for use with Pivot Mounted Cylinder (Option 1 or 1N)

Bore	Model	LD	MT	Q	S	SH	SD	TH	TL
9/16" (02)	BC-1	0.56	0.75	0.19	0.39	#6	1.00	0.16	0.78
3/4" (04)	BC-1	0.56	0.75	0.19	0.39	#6	1.00	0.16	0.78
1-1/16" (09)	BC-1	0.56	0.75	0.19	0.39	#6	1.00	0.16	0.78
1-1/2" (17)	BC-2	0.94	1.38	0.38	0.76	#10	1.75	0.22	1.34
2" (31)	BC-2	0.94	1.38	0.38	0.76	#10	1.75	0.22	1.34
2-1/2" (50)	BC-2	0.94	1.38	0.38	0.76	#10	1.75	0.22	1.34
3" (70)	BC-3	1.25	2.00	0.63	1.02	0.25	2.50	0.25	1.81
4" (125)	BC-3	1.25	2.00	0.63	1.02	0.25	2.50	0.25	1.81



Anodized Aluminum Trunnion Bracket (includes bronze pivot bushings; 2 pieces)

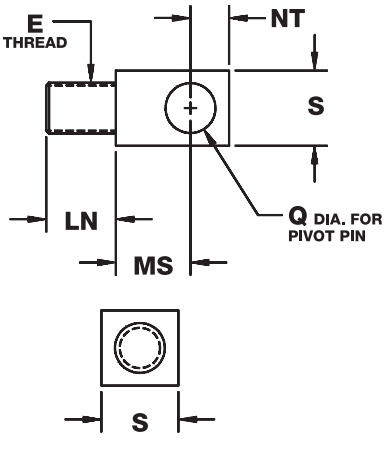
Bore	Model	BA	BT	HT	LT	M	N	NA	NB
3/4" (04)	BT-1	0.56	#10	0.63	1.12	0.31	0.13	0.30	0.22
1-1/16" (09)	BT-2	0.81	0.25	0.88	1.50	0.50	0.25	0.38	0.31
1-1/2" (17)	BT-2	0.81	0.25	0.88	1.50	0.50	0.25	0.38	0.31
2" (31)	BT-2	0.81	0.25	0.88	1.50	0.50	0.25	0.38	0.31
2-1/2" (50)	BT-3	0.94	0.31	1.00	1.63	0.63	0.31	0.45	0.38
3" (70)	BT-3	0.94	0.31	1.00	1.63	0.63	0.31	0.45	0.38
4" (125)	BT-4	1.06	0.38	1.25	1.88	0.75	0.38	0.55	0.44



Rod Pivot

Zinc plated, high strength, heat treated alloy steel, complete with a bronze pivot bushing and nut

Model	Bore	E	LN	MS	NT	Q	S
RP-1/2	9/16" (02)	#8-32 UNC	0.38	0.47	0.25	0.19	0.38
RP-1	3/4" (04)	#10-32 UNF	0.38	0.47	0.25	0.19	0.38
RP-2	1-1/16" (09)	5/16-24 UNF	0.63	0.47	0.25	0.19	0.38
RP-3	1-1/2" (17)	3/8-24 UNF	0.63	0.72	0.44	0.38	0.75
RP-4	2" (31), 2-1/2" (50)	1/2-20 UNF	0.75	0.72	0.44	0.38	0.75
RP-5	3" (70)	5/8-18 UNF	0.88	1.00	0.63	0.63	1.00
RP-6	4" (125)	3/4-16 UNF	0.88	1.00	0.63	0.63	1.00



The Model Number for all Flat-1® cylinders consists of three alphanumeric clusters. These designate type, bore size and stroke length, and mounting and special options. Please refer to the charts below for an example of Model Number FO-170.25-1V. This is a double acting, 1-1/2" bore, 1/4" stroke, pivot mount cylinder with high temperature option.

Type	
FO	Double Acting, Single End Rod
FOD	Double Acting, Double End Rod
FOR	Reverse Acting (Spring Extend)
FOS	Single Acting (Spring Return)

Bore Size	
02	9/16"
04	3/4"
09	1-1/16"
17	1-1/2"
31	2"
50	2-1/2"
70	3"
125	4"

Stroke Length	
0.25	1/4"
0.375	3/8"
0.5	1/2"
ETC.	

FO-170.25-1 V

Mounting Options (Enter in numeric order)	
No number	Basic model (standard counterbored mounting holes)
1	Pivot mount
1N	Pivot mount 90° from standard
2	Trunnion mount, both ends[1]
2F	Front trunnion mount[1]
2R	Rear trunnion mount[1]
3	Threaded mounting holes, both ends
3F	Threaded mounting holes, front
3R	Threaded mounting holes, rear
4F	Screw clearance holes, front[2]
4R	Screw clearance holes, rear[2]
5	Nose mount[3]
6	F series interchange; counterbored each end
7	F series interchange; threaded, both ends[5]
7F	F series interchange; threaded holes, front[4 5]
7R	F series interchange; threaded holes, rear[4 5]

[1] Not available in 9/16" bore
[2] "Screw clearance" to allow bolt head to pass through; no counter bores (see page 146)
[3] Available in FO, FOR, and FOS models; includes wiper
[4] Opposite endcap will have the standard Bimba hole pattern (see page 146 for dimensions)
[5] Available in 02, 04, and 09 bores only

Options (Enter in alphabetical order, except for EE which is last)	
99	Oil pre-lube
AB	Thick walled aluminum body[6]
B	Bumpers, both ends[1 2]
BF	Bumper, front only[1 2]
BR	Bumper, rear only[1 2]
CFT	Coarse female rod thread (fine thread standard) (see page 144)
CMT	Coarse male rod thread (see page 147)
D	Low pressure hydraulic design (250 PSI max, non-shock)
H	Hollow rod (FOD models only) (see page 147)
J	Failsafe operation; spring return (FOD models only)
K	Composite rod bushing[5]
L	Low friction seals (see table page 143 for length adders)
M, M1, M3, M4	Magnetic position sensing. Switch post designed for HC and HK style Hall Effect switches (see table page 143 and 147 for length adders and envelope dimensions)[2]
MT	Male rod thread (fine thread) (see page 147)
NPT	Female NPT thread, both ends (FOD models only)[4]
NPTF	Female NPT thread, front (FOD models only)[4]
NPTR	Female NPT thread, rear (FOD models only)[4]
NT	Non-threaded rod
PB	Composite body[6]
P2, P3, P4	Front port position (see page 147)
Q	Low temperature operation (-40° F to 200° F)
S1, S3, S4	Additional 90° right angle, 4mm diameter switch post located in position #1 or #3
SR	Stainless steel rod (not compatible with option D or Z)
T1, T3, T4	Additional Hall Effect switch mounting post located in position #1 or #3
U, U1, U3, U4	Magnetic position sensing. Switch post designed for 90° right angle, 4mm diameter magnetic reed switches (see table page 143 and 147 for length adders and envelope dimensions)[2]
V	High temperature option (0° F to 400° F)[2]
W	Rod wiper (see page 147) (-20° F to 200° F)
X	X-ring piston seal[3]
Z	Metallic rod scraper (see page 147) (Buna-N backup [-20° F to 200° F])
EE0.375	3/8" extra rod extension, etc.
EE1	1" extra rod extension, etc.

[1] There is no stroke reduction when the supply pressure is 80 PSI or greater. At 0 PSI, there will be a stroke reduction of approximately .040". Bumper compression is linear for 0 PSI to 80 PSI. FOS models have a rear bumper only. FOR models have a front bumper only.
[2] Bumpers and the piston magnet materials are rated only to 200° F. Magnetic position sensing and bumper operation is not reliable above 200° F and options B and M should only be specified with option V for chemical compatibility.
[3] Optional piston seal which may improve performance in certain short stroke applications where back pressure due to flow controls or reduced exhaust flow may exist.
[4] Must be ordered with Hollow Rod (H) option.
[5] FDA-approved grease lubrication is standard when the K option is specified.
[6] Not available in 9/16" or 3/4" bore.

Flat-1® Repair Kits

Bimba Flat-1® cylinders are repairable. To order repair kits, please provide the correct bore code in the kit part number blank for the desired size repair kit. Optional seals are designated by the suffix option. Repair kits include the standard bronze rod bushing, piston, rod, and body seals. For cylinders with optional composite bushings, please order those bushing as a separate repair part with part number (PF4-__). For cylinders where FKM seals, wipers, or scrapers are required, complete end caps assemblies are provided to allow for easier repair.

Single End Rod Repair Kits

Basic Repair Kits
K-BIF-FO-__
K-BIF-FO-__-L
K-BIF-FO-__-Q
K-BIF-FO-__-V
K-BIF-FO-__-X
K-BIF-FO-__-V-L
K-BIF-FO-__-Q-L
K-BIF-FO-__-D
K-BIF-FO-__-D-V

Nose Mount Repair Kits
K-BIF-FO-N-__
K-BIF-FO-N-__-L
K-BIF-FO-N-__-Q
K-BIF-FO-N-__-V
K-BIF-FO-__-X
K-BIF-FO-N__-V-L
K-BIF-FO-N__-Q-L
K-BIF-FO-N__-D
K-BIF-FO-N__-D-V

Rod Wiper Repair Kits
K-BIF-FO-W-__
K-BIF-FO-W-__-L
K-BIF-FO-W-__-Q
K-BIF-FO-W-__-V
K-BIF-FO-W-__-X
K-BIF-FO-W__-V-L
K-BIF-FO-W-__-Q-L
K-BIF-FO-W-__-D
K-BIF-FO-W-__-D-V

Rod Scraper Repair Kits
K-BIF-FO-Z-__
K-BIF-FO-Z-__-L
K-BIF-FO-Z-__-Q
K-BIF-FO-Z-__-V
K-BIF-FO-Z-__-X
K-BIF-FO-Z-__-V-L
K-BIF-FO-Z-__-Q-L
K-BIF-FO-Z-__-D
K-BIF-FO-Z-__-D-V

Double End Rod Repair Kits

Basic Repair Kits
K-BIF-FOD-__
K-BIF-FOD-__-L
K-BIF-FOD-__-Q
K-BIF-FOD-__-V
K-BIF-FOD-__-X
K-BIF-FOD-__-V-L
K-BIF-FOD-__-Q-L
K-BIF-FOD-__-D
K-BIF-FOD-__-D-V

Rod Wiper Repair Kits
K-BIF-FOD-W-__
K-BIF-FOD-W-__-L
K-BIF-FOD-W-__-Q
K-BIF-FOD-W-__-V
K-BIF-FOD-W-__-X
K-BIF-FOD-W__-V-L
K-BIF-FOD-W-__-Q-L
K-BIF-FOD-W-__-D
K-BIF-FOD-W-__-D-V

Rod Scraper Repair Kits
K-BIF-FOD-Z-__
K-BIF-FOD-Z-__-L
K-BIF-FOD-Z-__-Q
K-BIF-FOD-Z-__-V
K-BIF-FOD-Z-__-X
K-BIF-FOD-Z-__-V-L
K-BIF-FOD-Z-__-Q-L
K-BIF-FOD-Z-__-D-V
K-BIF-FOD-Z-__-Q-L

Option Legend	
(L)	Low Friction Seals
(Q)	Low Temp Seals
(V)	High Temp Seals
(X)	X-Ring Seals
(D)	Low Pressure Hydraulic

Square Flat-1® Compact Cylinders

- Compact design provides machine designers the ability to use Flat-1® cylinders in tight spaces
- Hard chrome plated piston rod is corrosion resistant and provides a hard, smooth sealing surface extending the life of the cylinder's rod seals
- Body materials are available in standard Stainless Steel and optional Aluminum or Plastic providing design engineers with increased flexibility.
- Single acting spring return cylinders include rod seals to provide for standard fail safe operation
- New switch track options accept either Reed or Hall Effect switches allowing for either AC or DC switch circuitry.
- 3,000 mile life ratings when low frictions seals are specified provides customers the confidence associated with a low maintenance design.
- Mechanically retained bumpers reduce the sound typically associated with high cycle pneumatic cylinder applications.
- New "F Series" mounting options provide drop in interchanges for a competitive manufacturer.
- The addition of NPT rod threads on double rod end models makes it easier for designers to connect air and fluid fittings to the rod ends.
- Optional rod bearing materials are available for applications requiring smoother cylinder rod travel than is provided by the standard oil impregnated bronze rod bushings.

Approximate power factors (for all models except f02, 3, 4)	
9/16" (02) = 0.25	For example, a 3/4" bore model FO-041 will exert a force of approximately 0.4 times the air line pressure.
3/4" (04) = 0.4	
1-1/16" (09) = 0.9	
1-1/2" (17) = 1.7	
2" (31) = 3.1	
2-1/2" (50) = 5.0	
3" (70) = 7.0	
4" (125) = 12.5	

Square Flat-1®

Materials of Construction

Cylinder Body: 304 Stainless Steel

Heads: Anodized Aluminum Alloy

Piston Rod: Ground and Polished 303 Stainless Steel

Seals: Buna-N standard (high temperature seals optional)

Rod Bushing: Oil-Impregnated Bronze

Tie Rods: 303 Stainless Steel

Engineering Specifications

Pressure Rating: 200 PSI max., air only (bore sizes 3/4-2")
150 PSI max., air only (bore sizes 2-1/2-4")

Spring Forces: See page 157

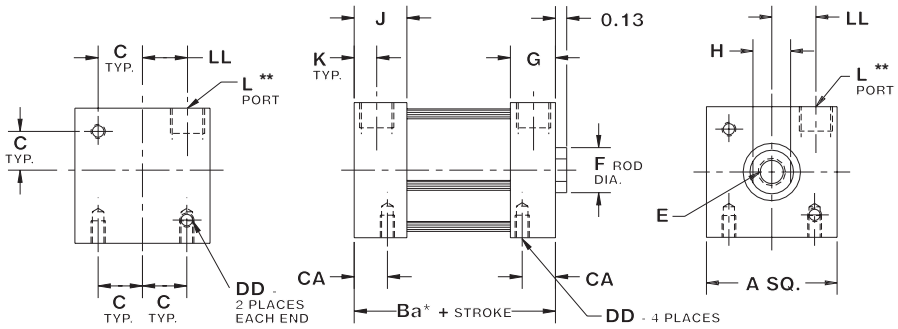
Temperature*: -20° F to 150° F (-35° C to 65° C) Standard

Fluoroelastomer seals rated for higher temperature applications are available. If cylinders are operated below 0° (-18° C) for extended time periods, special modifications may be required. Special seal materials are available upon request.

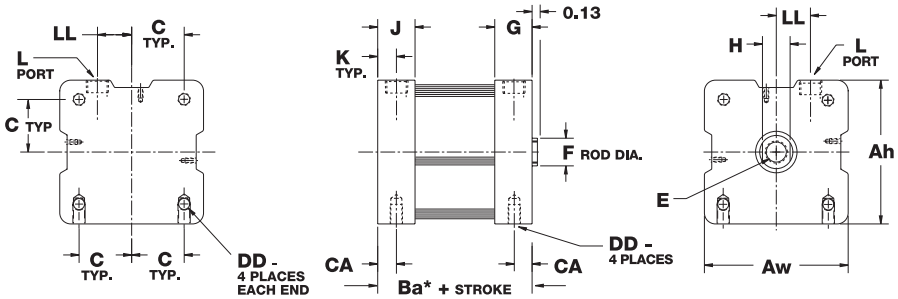
Square Flat-1® Basic Models

Bimba is a JIT manufacturer and we are able to provide FS model cylinders in ANY 0.001" stroke length increment for all option styles within our standard three-day lead time. Longer stroke lengths are also available upon request at standard lead times. Please consult Technical Assistance at 800-44-BIMBA for help.

Model FS
(Double Acting, Single End Rod)



Bore sizes 3/4", 1-1/16", 1-1/2", 2"



Bore sizes 2-1/2", 3", 4"

*Some options affect cylinder length; see page 156.
**Port location is on the same side for M option only.

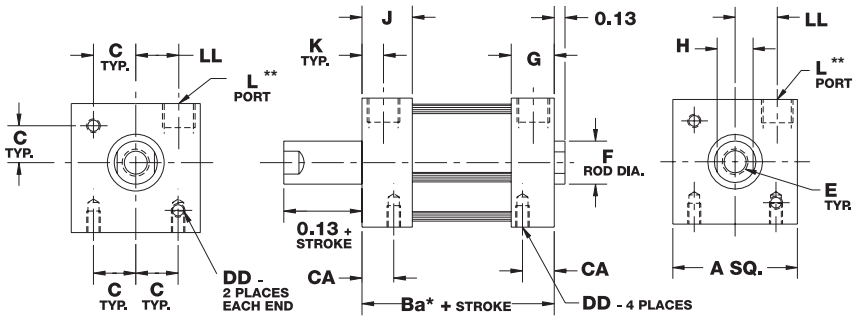
The table below represents our standard stroke lengths.

Nominal Bore Diameter	Bore Code	Standard Stroke Length Availability															
3/4"	04	1/8"	1/4"	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1-1/4"	1-1/2"	1-3/4"	2"	2-1/2"	3"	3-1/2"	4"
1-1/16"	09	1/8"	1/4"	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1-1/4"	1-1/2"	1-3/4"	2"	2-1/2"	3"	3-1/2"	4"
1-1/2"	17	1/8"	1/4"	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1-1/4"	1-1/2"	1-3/4"	2"	2-1/2"	3"	3-1/2"	4"
2"	31	1/8"	1/4"	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1-1/4"	1-1/2"	1-3/4"	2"	2-1/2"	3"	3-1/2"	4"
2-1/2"	50	1/8"	1/4"	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1-1/4"	1-1/2"	1-3/4"	2"	2-1/2"	3"	3-1/2"	4"
3"	70	1/8"	1/4"	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1-1/4"	1-1/2"	1-3/4"	2"	2-1/2"	3"	3-1/2"	4"
4"	125	1/8"	1/4"	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1-1/4"	1-1/2"	1-3/4"	2"	2-1/2"	3"	3-1/2"	4"

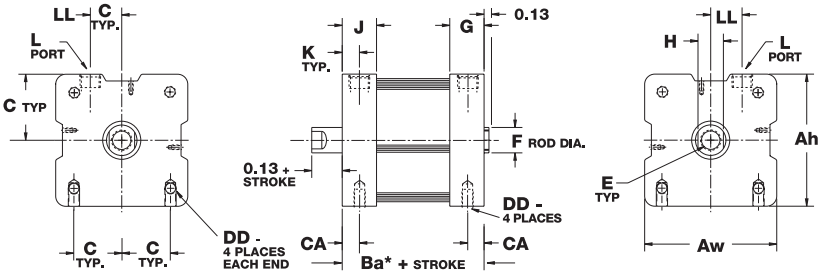
Square Flat-1® Basic Models

Model FSD
(Double Acting, Double End Rod)

Standard Strokes: 1/8", 1/4", 3/8", 1/2", 5/8", 3/4", 7/8", 1", 1-1/4", 1-1/2", 1-3/4", 2", 2-1/2", 3", 3-1/2", 4"



Bore sizes 3/4", 1-1/16", 1-1/2", 2"

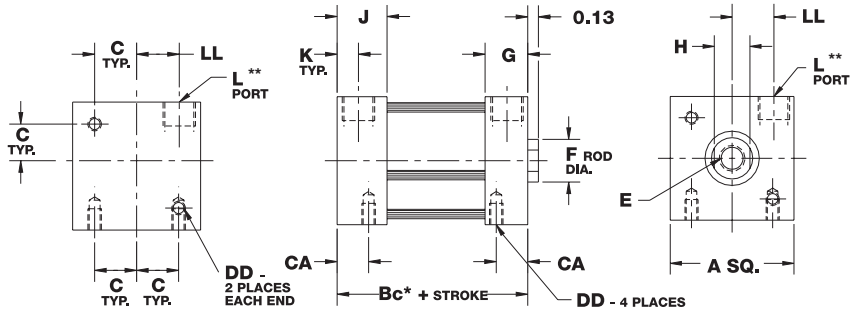


Bore sizes 2-1/2", 3", 4"

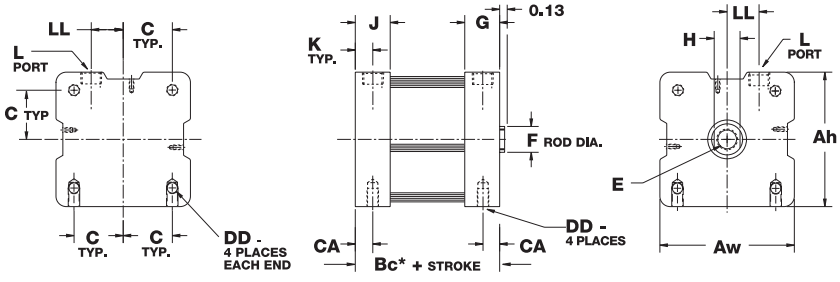
*Some options affect cylinder length; see page 156.
**Port location is on the same side for M option only.

Model FSS
(Single Acting, Spring Return, Rod Normally Retracted)

Standard Strokes: 1/8", 1/4", 3/8", 1/2", 5/8", 3/4", 7/8", 1", 1-1/4", 1-1/2", 1-3/4", 2", 2-1/2", 3", 3-1/2", 4"



Bore sizes 3/4", 1-1/16", 1-1/2", 2"



Bore sizes 2-1/2", 3", 4"

See page 157 for spring forces.
*Some options affect cylinder length; see page 156.
**Port location is on the same side for M option only.

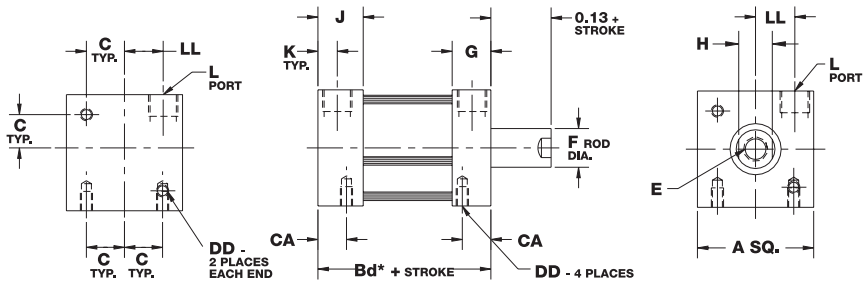
Square Flat-1® Basic Models

Model FSR

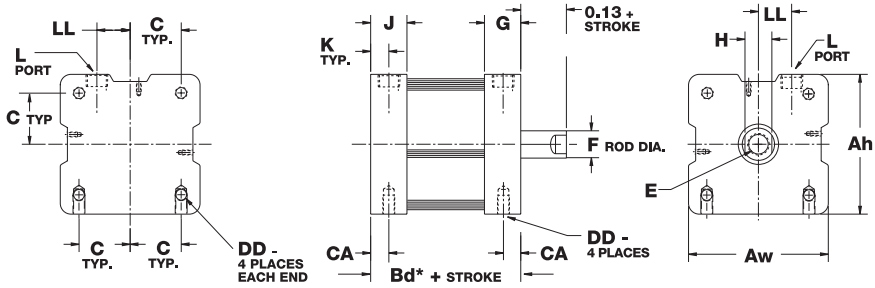
(Reverse Acting, Spring Return, Rod Normally Extended)

Standard Strokes: 1/8", 1/4", 3/8", 1/2", 5/8", 3/4", 7/8", 1", 1-1/4", 1-1/2", 1-3/4", 2", 2-1/2", 3", 3-1/2", 4"

2"-4" Bores: 3" stroke max



Bore sizes 3/4", 1-1/16", 1-1/2", 2"



Bore sizes 2-1/2", 3", 4"

See page 157 for spring forces.

*Some options affect cylinder length; see page 156.

Dimensions (in)

Bore	A	Aw	Ah	Ba*	Bc*				Bd*			
					0-1" Stk	1.001-2" Stk	2.001-3" Stk	3.001-4" Stk	0-1" Stk	1.001-2" Stk	2.001-3" Stk	3.001-4" Stk
3/4" (04)	1.25	N/A	N/A	0.75	1.00	1.56	2.13	2.69	1.25	1.81	2.38	2.94
1-1/16" (09)	1.50	N/A	N/A	1.25	1.25	1.88	2.50	3.13	1.75	2.38	3.00	3.63
1-1/2" (17)	2.00	N/A	N/A	1.25	1.25	1.88	2.50	3.13	1.75	2.38	3.00	3.63
2" (31)	2.5	N/A	N/A	1.31	1.31	1.94	2.56	3.19	1.81	2.44	3.06	N/A
2-1/2" (50)	N/A	3.28	3.25	1.66	1.66	2.54	3.41	4.29	2.39	3.27	3.29	N/A
3" (70)	N/A	3.78	3.75	1.71	1.71	2.58	3.46	4.33	2.44	3.31	3.33	N/A
4" (125)	N/A	5.04	5.00	2.00	2.00	2.88	3.75	4.63	2.75	3.62	3.63	N/A

Bore	C	CA	DD	E Standard	E Coarse	E Depth	F	G	H	J	K	L	LL
3/4" (04)	0.38	0.28	#6-32 UNC	#10-32 UNF	#10-24 UNC	0.46	0.31	0.42	0.25	0.42	0.14	#10-32	0.30
1-1/16" (09)	0.50	0.38	#8-32 UNC	5/16-24 UNF	5/16-18 UNC	0.70	0.50	0.58	0.44	0.50	0.25	1/8 NPT	0.50
1-1/2" (17)	0.69	0.31	#10-24 UNC	3/8-24 UNF	3/8-16 UNC	0.70	0.63	0.58	0.50	0.50	0.25	1/8 NPT	0.69
2" (31)	0.88	0.38	1/4-20 UNC	1/2-20 UNF	1/2-13 UNC	0.70	0.75	0.63	0.63	0.63	0.25	1/8 NPT	0.77
2-1/2" (50)	1.18	0.42	5/16-18	1/2-20 UNF	1/2-13 UNC	0.70	0.75	0.84	0.62	0.84	0.42	1/4 NPT	0.78
3" (70)	1.44	0.44	5/16-18	5/8-18 UNF	5/8-11 UNC	0.73	0.88	0.88	0.75	0.88	0.44	1/4 NPT	0.98
4" (125)	1.81	0.50	7/16-14	3/4-16 UNF	3/4-10 UNC	0.83	1.00	1.00	0.88	1.00	0.50	3/8 NPT	1.25

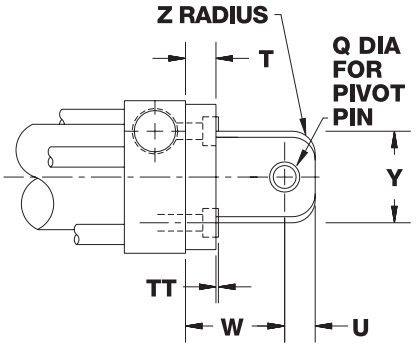
Square Flat-1® Accessory Options and Dimensions (in)

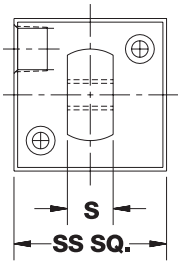
Mounting Options

Pivot Attachment

Anodized aluminum alloy. Complete with mounting screws. Not necessary if ordered as part of complete Square Flat-1® cylinder (1 or 1N option).

Model	Bore	Q	S	SS	T	TT	U	W	Y	Z
PM-1	3/4" (04)	0.19	0.38	1.13	0.19	0.020	0.25	0.75	0.75	–
PM-2	1-1/16" (09)	0.19	0.38	1.25	0.25	0.020	0.25	0.81	0.75	–
PM-3	1-1/2" (17)	0.38	0.75	1.75	0.25	0.025	0.44	1.19	1.38	–
PM-4	2" (31)	0.38	0.75	2.25	0.31	0.080	0.44	1.38	1.38	–
PM-5	2-1/2" (50)	0.38	0.75	3.00	0.38	0.05	0.44	1.31	1.38	0.38
PM-6	3" (70)	0.63	1.00	3.50	0.38	0.05	0.56	1.69	1.88	0.38
PM-7	4" (125)	0.63	1.00	4.50	0.44	0.12	0.56	1.75	1.88	0.38





Length Adder Dimensions for Options
(Dimensional variations from standard as shown)

Bore	Length Adder		
	Low Friction Seals (L)	Magnetic Position Sensing* (M)	Low Friction Seals and Magnetic Position Sensing
3/4" (04)	0.25	0.75	0.75
1-1/16" (09)	0.38	0.50	0.50
1-1/2" (17)	0.38	0.63	0.63
2" (31)	0.38	0.63	0.63
2-1/2" (50)	0.38	0.88	0.88
3" (70)	0.50	0.88	0.88
4" (125)	0.50	0.88	0.88

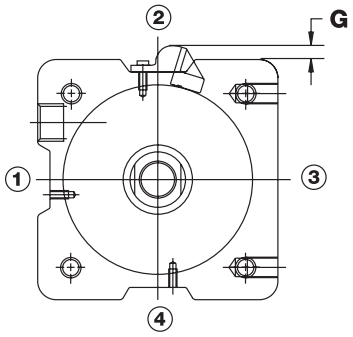
*A minimum stroke of 0.38" is required to sense extending end-of-stroke position. For port locations with Option-M, see below.

Weights

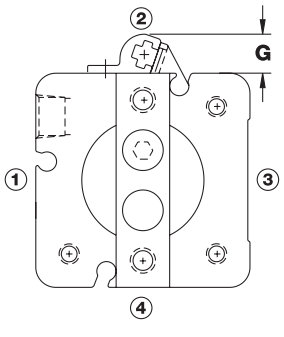
Bore	Approximate Cylinder Weights (oz.)	
	Base	Adder per 1/8" of stroke
3/4" (04)	2.7	0.1
1-1/16" (09)	6.4	0.5
1-1/2" (17)	12.2	0.7
2" (31)	18.4	0.9

MRS Switch Option Dimensions

For all SQUARE Flat-1® Series Cylinder -M option, the default switch mounting post location is Position 2. To locate the post to other positions, please specify options M1 or M4. For additional tracks, please specify options T1 or T4 for the appropriate location.



Square Flat-1®



Square Flat-II®

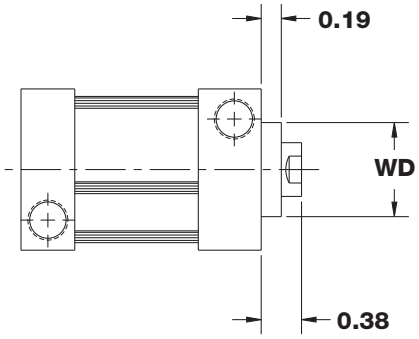
Bore Designator	Bore	G inch (mm)
04*	3/4" (19mm)	0.365 (9.3)
09	1-1/16" (27mm)	0.365 (9.3)
17	1-1/2" (38mm)	0.365 (9.3)
31	2" (50mm)	0.365 (9.3)
50	2-1/2" (63mm)	0.270 (6.9)
70	3" (76mm)	0.300 (7.6)
125	4" (101mm)	0.160 (4.1)

*Note: Option combinations MT1 and M1T4 cannot be ordered in combination due to interference concerns.

Square Flat-1® Accessory Options and Dimensions (in)

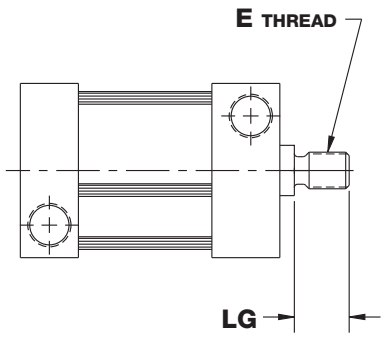
Options

Rod Wiper (Option W)
(Buna N standard, not available in FKM)



Bore	WD
3/4" (04)	0.69
1-1/16" (09)	0.88
1-1/2" (17)	1.00
2" (31)	1.12
2-1/2" (50)	1.13
3" (70)	1.25
4" (125)	1.38

Male Rod Ends (Option MT or CMT)



Bore	E		LG
	MT	CMT	
3/4" (04)	#10-32 UNF	#10-24 UNC	0.38
1-1/16" (09)	5/16-24 UNF	5/16-18 UNC	0.50
1-1/2" (17)	3/8-24 UNF	3/8-16 UNC	0.50
2" (31)	1/2-20 UNF	1/2-13 UNC	0.62
2-1/2" (50)	1/2-20 UNF	1/2-13 UNC	0.63
3" (70)	5/8-18 UNF	5/8-11 UNC	0.75
4" (125)	3/4-16 UNF	3/4-10 UNC	0.75

Enclosed Spring Forces

Bore	Maximum Force (lbs)	Spring Rate			
		0.12 to 1" Stroke (lbs/in)	1.001 to 2" Stroke (lbs/in)	2.001 to 3" Stroke (lbs/in)	3.001 to 4" Stroke (lbs/in)
3/4" (04)	10	6	2.5	1.76	1.25
1-1/16" (09)	11.5	6	2.5	1.76	1.25
1-1/2" (17) 2" (31)	13	5.5	2.25	1.60	1.13
2-1/2" (50) 3" (70) 4" (125)	25	6.5	2.75	1.93	1.38

FSD Hollow Rods (Option H)

Bore	Hole Diameter	
	Female Rod Thread	Male Rod Thread
3/4" (04)	0.14	0.09
1-1/16" (09)	0.22	0.16
1-1/2" (17)	0.28	0.19
2" (31)	0.38	0.25
2-1/2" (50)	0.38	0.25
3" (70)	0.44	0.31
4" (125)	0.50	0.38

Weights

Bore	Approximate Cylinder Weights (oz.)						
	FS, FSS		FSD			FSR	
	Base	Adder per 1/8" of stroke	Base	Adder per 1/8" of stroke	Adder per 1/8" of stroke for -H option	Base	Adder per 1/8" of stroke
3/4" (04)	2.2	0.1	2.4	0.2	0.15	2.2	0.1
1-1/16" (09)	5.1	0.2	5.7	0.4	0.3	5.5	0.2
1-1/2" (17)	10.1	0.3	10.5	0.6	0.5	10.4	0.3
2" (31)	14.2	0.4	16.0	0.8	0.6	15.0	0.4
2-1/2" (50)	28.6	0.4	34.2	0.6	0.5	31.2	0.4
3" (70)	40.2	0.6	49.3	0.9	0.7	43.8	0.6
4" (125)	71.6	0.6	87.7	0.9	0.7	77.7	0.6

How to Order

The Model Number for all Square Flat-1® cylinders consists of alphanumeric clusters. These designate type, bore size, stroke length, and mounting and special options. Please refer to the charts below for an example of a standard Square Flat-1® model. This is a double acting, 1-1/2" bore, 3/8" stroke, pivot mount cylinder with high temperature option.

Type	
FS	Double Acting, Single End Rod
FSD	Double Acting, Double End Rod
FSR	Reverse Acting
FSS	Single Acting

Bore Size	
04	3/4"
09	1-1/16"
17	1-1/2"
31	2"
50	2-1/2"
70	3"
125	4"

Mounting Options	
No number	Basic model
1	Pivot mount
1N	Pivot mount 90° from standard

FS - 17 0.375 - 1 V

Stroke Length	
0.125	1/8"
0.25	1/4"
0.375	3/8"
etc.	

Options (Enter in alphabetical order, except for EE which is last)	
B	Bumpers, both ends[1]
BF	Bumper, front only[1]
BR	Bumper, rear only[1]
CFT	Coarse female rod thread (fine thread standard) (see page 155)
CMT	Coarse male rod thread (see page 157)
G	Magnalube® G
H	Hollow rod (double end models only) (see page 157)
J	Failsafe operation (FSS models)
L	Low friction seals (see table page 156 for length adders)
M, M1, M4	Magnetic position sensing. Switch post designed for HC and HK style Hall Effect switches (see table page 156 for length adders and envelope dimensions)
MT	Male rod end (fine thread) (see page 157)
NT	Non-threaded rod
Q	Low temperature operation (-40° F to 200° F)
T1, T4	Additional Hall Effect switch mounting post located in position #1 or #4
V	High temperature option (0° F to 400° F)
W	Rod wiper (Buna-N, see page 157)[2]
X	X-ring piston seal[3]
Y	Molycoat (MoS_2 I.D. coating)
EE0.375	3/8" extra rod extension, etc.
EE1	1" extra rod extension, etc.

[1] Stroke is reduced by .03" per end (.06" for option B); FSS, BR only; FSR, BF only.
[2] If magnetic position sensing is specified with option V, standard Buna-N based magnet will be provided. Magnetic position sensing is not reliable above 200° F.
[3] Optional piston seal which may improve performance in certain short stroke applications where back pressure due to flow controls or reduced exhaust flow may exist.

Square Flat-1® Repair Kits

Bimba Square Flat-1® cylinders are repairable. To order repair kits, please provide the correct bore code in the kit part number blank for the desired size repair kit. Optional seals are designated by the suffix option. Repair kits include the standard bronze rod bushing, piston, rod, and body seals. For cylinders with optional composite bushings, please order those bushing as a separate repair part with part number (PF4-__). For cylinders where FKM seals, wipers, or scrapers are required, complete end caps assemblies are provided to allow for easier repair.

Single End Rod Repair Kits

Basic Repair Kit (K-B-FS-__)*		
Part No.	**Description**	**Quantity**
PF-1	Rod Seal	1
PF-2	Piston Seal	1
PF-41	Tube Seal	2
PF-4	Bushing	2

Wiper Option Basic Repair Kit (K-B-FS-W-__)*		
Part No.	**Description**	**Quantity**
PF-1	Rod Seal	1
PF-2	Piston Seal	1
PF-41	Tube Seal	2
PF-4	Bushing	1
PF-5	Wiper Bushing	1
PF-6	Wiper	1

Double End Rod Repair Kits

Basic Repair Kit (K-B-FSD-__)*		
Part No.	**Description**	**Quantity**
PF-1	Rod Seal	2
PF-2	Piston Seal	1
PF-41	Tube Seal	2
PF-4**	Bushing	3

Wiper Option Basic Repair Kit (K-B-FSD-W-__)*		
Part No.	**Description**	**Quantity**
PF-1	Rod Seal	2
PF-2	Piston Seal	1
PF-41	Tube Seal	2
PF-4**	Bushing	1
PF-5	Wiper Bushing	2
PF-6	Wiper	2

* Must specify bore size when ordered. Contact your local BIMBA Distributor for pricing on kits and other repair parts.
** On FSD (Double Acting, Double End Rod) models, two bushings are provided on the head end with tie rod nuts. Opposite head end has one bushing.

Product Features

Flat-II® non-rotating, double-acting cylinder provides the answer to applications where rotation cannot be tolerated and space is at a minimum. Non-rotation is achieved with dual piston rods and a rod end block that insures the rods work in tandem. Flat-II® eliminates the need for external alignment devices, such as guides, rods and alignment posts or pins.

Flat-II® Non-Rotating Compact Cylinders

- Ideal for applications where rotation cannot be tolerated
- Unique spin-riveting process securely attaches dual piston rods and rod end block to ensure rods work in tandem
- Twin rod design means the tooling plate stays aligned, eliminating need for external alignment devices
- Provisions for bottom flush or face mounting provide convenient alternative to horizontal and side mounting
- Minimized centerline distances for easier side-by-side cylinder mounting
- Precision-machined anodized aluminum heads
- Optional high temperature seals accommodate greater array of application conditions

Approximate power factors (for all models except f02, 3, 4)	
9/16" (02) = 0.25	For example, a 3/4" bore model FO-041 will exert a force of approximately 0.4 times the air line pressure.
3/4" (04) = 0.4	
1-1/16" (09) = 0.9	
1-1/2" (17) = 1.7	
2" (31) = 3.1	
2-1/2" (50) = 5.0	
3" (70) = 7.0	
4" (125) = 12.5	

Flat-II®

Non-rotation is achieved through the use of dual piston rods incorporated into the body of the Flat-II® cylinder. The rods are securely attached to the piston by our unique spin-riveting process. A rod end block is used to insure the rods work in tandem—as a team. This end block also acts as a useful surface to easily accommodate any mounting attachments required to get the job done. For mounting convenience, the rod end block is provided with threaded mounting holes or optional counterbored holes.

As with any cylinder application, side loading should be avoided. The two smaller rods will have more deflection due to side load than the one standard rod in a comparable Flat-1® model.

The Flat-II® is intended to work satisfactorily against pure torsional loads. The maximum torsional load per bore size is shown in the following table:

Bore	3/4" (04)	1-1/16" (09)	1-1/2" (17)	2" (31)
Torque (in-lb)	0.3	1	5	10
K	5.21	26.61	238.85	1344.63

The amount of angular deflection, in degrees, can be approximated by the following formula:

$$\text{Ø} = \frac{TL^3}{K}$$

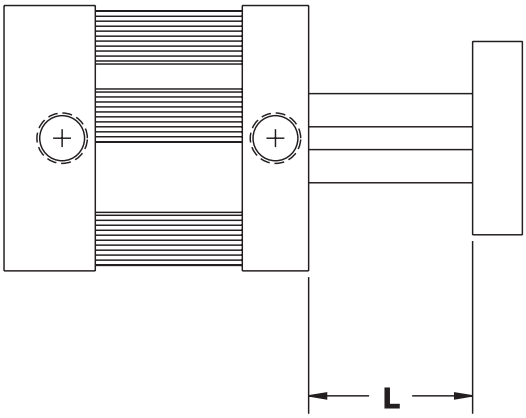
Where
- T = Torque (in-lb)
- L = Length (see sketch below)
- K = Per chart above
- Ø = Angular deflection

NOTE: To prevent rod distortion, the rod end block must be fastened securely.

Rotational Tolerance

Bore	Maximum Rotation
3/4" (04)	±1°
1-1/16" (09)	±3/4°
1-1/2" (17)	±1/2°
2" (31)	±1/2°

Deflection L Value



Materials of Construction

Cylinder Body: 304 Stainless Steel

Heads: Anodized Aluminum Alloy

Piston Rod: Ground and Polished 303 Stainless Steel

Piston Seals: Buna-N standard (high temperature seals optional)

Rod Bushing: Oil-Impregnated Bronze

Rod Seals: Buna-N O-Ring (high temperature seals optional)

Rod End Block: Anodized Aluminum Alloy

Engineering Specifications

Pressure Rating: 200 PSI max., air only (bore sizes 3/4-2")

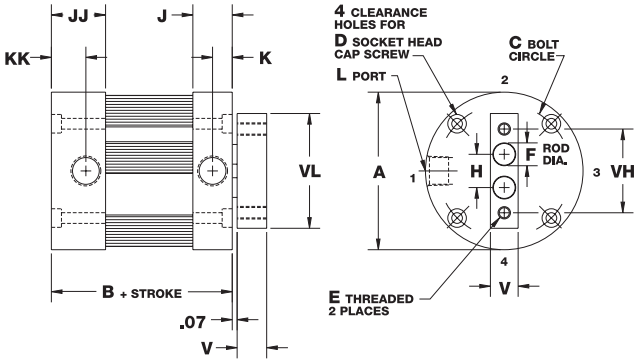
Temperature*: -20° F to 150° F (-35° C to 65° C) Standard

Fluoroelastomer seals rated for higher temperature applications are available. If cylinders are operated below 0° (-18° C) for extended time periods, special modifications may be required. Special seal materials are available upon request.

Flat-II® Basic Models

Bimba is a JIT manufacturer and we are able to provide FT model cylinders in ANY 0.001" stroke length increment for all option styles within our standard three-day lead time. Longer stroke lengths are also available upon request at standard lead times. Please consult Technical Assistance at 800-44-BIMBA for help.

Model FT
(Non-rotating, double acting)

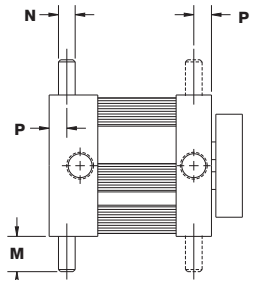


The table below represents our standard stroke lengths.

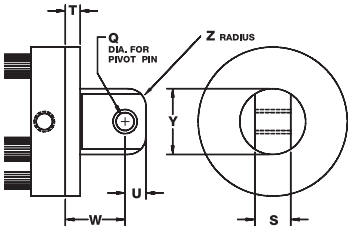
Nominal Bore Diameter	Bore Code	Standard Stroke Length Availability															
3/4"	04	1/8"	1/4"	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1-1/4"	1-1/2"	1-3/4"	2"	2-1/2"	3"	3-1/2"	4"
1-1/16"	09	1/8"	1/4"	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1-1/4"	1-1/2"	1-3/4"	2"	2-1/2"	3"	3-1/2"	4"
1-1/2"	17	1/8"	1/4"	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1-1/4"	1-1/2"	1-3/4"	2"	2-1/2"	3"	3-1/2"	4"
2"	31	1/8"	1/4"	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1-1/4"	1-1/2"	1-3/4"	2"	2-1/2"	3"	3-1/2"	4"

Mounting Options

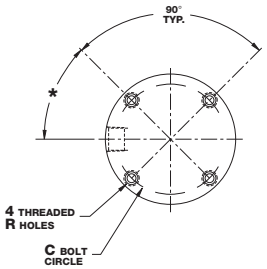
Trunnion Mount
(rear, front or both) (-2R shown)



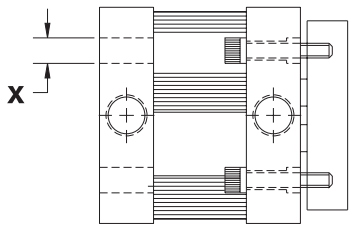
Pivot Mount
(complete with bronze bushing) (-1 shown)



Threaded Mounting Holes
(available either or both ends) (-3R shown)

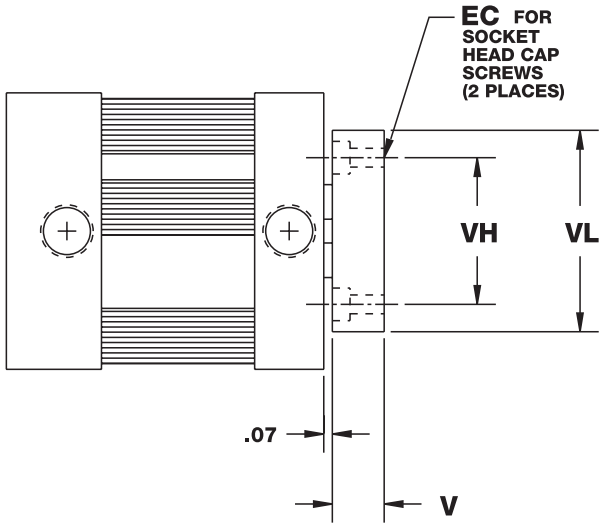


Screw Clearance Holes
(available either or both ends) (-4R shown)



Flat-II® Dimensions (in)

Counterbored Rod End Block



Bore	A	B*	C	D	E	EC	F	H
3/4" (04)	1.50	0.94	1.22	#6	#6-32 UNC	#6	0.19	0.332
1-1/16" (09)	2.00	1.31	1.69	#6	#8-32 UNC	#8	0.25	0.422
1-1/2" (17)	2.63	1.31	2.19	#10	1/4-20 UNC	1/4	0.38	0.562
2" (31)	3.13	1.38	2.69	#10	5/16-18 UNC	5/16	0.50	0.750

Bore	J	JJ	K	KK	L	M	N	P	Q	R
3/4" (04)	0.34	0.47	0.14	0.27	#10-32	0.31	0.13	0.17	0.19	#6-32 UNC
1-1/16" (09)	0.50	0.69	0.25	0.44	1/8 NPT	0.50	0.25	0.25	0.19	#6-32 UNC
1-1/2" (17)	0.50	0.69	0.25	0.44	1/8 NPT	0.50	0.25	0.25	0.38	#10-24 UNC
2" (31)	0.53	0.72	0.25	0.44	1/8 NPT	0.50	0.25	0.25	0.38	#10-24 UNC

Bore	S	T	U	V	VL	VH	W	X	Y	Z
3/4" (04)	0.38	0.19	0.25	0.38	1.25	0.88	0.75	0.23	0.75	0.19
1-1/16" (09)	0.38	0.25	0.25	0.38	1.44	1.06	0.81	0.25	0.75	0.19
1-1/2" (17)	0.75	0.25	0.44	0.50	2.00	1.50	1.19	0.34	1.38	0.38
2" (31)	0.75	0.31	0.44	0.63	2.50	1.88	1.25	0.34	1.38	0.38

*Magnetic Position Sensing Length Adder: 0.63. A minimum stroke of 0.38" is required to sense extending end-of-stroke position.

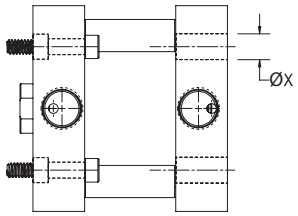
Flat-II® Accessory Options and Dimensions (in)

Weights

Bore	Approximate Cylinder Weights (oz)	
	Base	Adder per 1/8" of stroke
3/4" (04)	2.7	0.1
1-1/16" (09)	6.4	0.5
1-1/2" (17)	12.2	0.7
2" (31)	18.4	0.9

Screw Clearance Holes

(Option 4R or 4F)
Available in front or rear end cap
Option 4R shown



NOTE: Use caution when using a long screw that spans the length of the cylinder. If the endcap experiences flexing, we recommend the -4F or -4R mounting style.

The Model Number for all Flat-II® cylinders consists of alphanumeric clusters. These designate type, bore size, stroke length, mounting, and special options. Please refer to the charts below for an example of Model Number FT-040.375-1CE. This is a non-rotating, double acting, 3/4" bore, 3/8" stroke, pivot mount cylinder with counterbored mounting holes in the rod end block.

Type	
FT	Non-Rotating, Double Acting

Bore Size	
04	3/4"
09	1-1/16"
17	1-1/2"
31	2"

Stroke Length	
0.125	1/8"
0.25	1/4"
0.375	3/8"
ETC.	

FT - 04 0.375 - 1 CE

Mounting Options (Enter in numeric order)	
No number	Basic model (standard counterbored mounting holes)
1	Pivot mount
1N	Pivot mount 90° from standard
2	Trunnion mount, both ends
2F	Front trunnion mount
2R	Rear trunnion mount
3	Threaded mounting holes, both ends
3F	Threaded mounting holes, front
3R	Threaded mounting holes, rear
4	Screw clearance holes, both ends[1]
4F	Screw clearance holes, front[1]
4R	Screw clearance holes, rear[1]
7R	F series interchange; threaded holes, rear[4 5]

[1] "Screw clearance" to allow bolt head to pass through; no counter bores (see page 146).

Options (Enter in alphabetical order, except for EE which is last)	
CE	Counterbored rod end block (see page 158)
G	Magnalube® G
K	End block rotated 90°
M, M1, M3, M4	Magnetic position sensing. Switch post designed for HC and HK style Hall Effect switches (see table pages 143 and 147 for length adders and envelope dimensions)[1]
P3	Front port position (see page 162)
Q	Low temperature operation (-40° F to 200° F)
S	Stainless steel fasteners (125 PSI maximum pressure rating - air only)
T1, T3, T4	Additional switch mounting post located in position #1, #3, or #4
V	High temperature option (0° F to 400° F)[2]
Y	Moly-coat (MoS_2, I.D. coating)
EE0.375	3/8" extra rod extension, etc.
EE1	1" extra rod extension, etc.

[1] If magnetic position sensing is specified with option V, standard Buna-N based magnet will be provided. Magnetic position sensing is not reliable above 200°F. Overall cylinder length increases with the magnet option.

Flat-II® Repair Kits

Bimba Flat-II® cylinders are repairable. To order repair kits, please provide the correct bore code in the kit part number blank for the desired size repair kit. Optional seals are designated by the suffix option. Repair kits include the standard bronze rod bushing, piston, rod, and body seals. For cylinders with optional composite bushings, please order those bushing as a separate repair part with part number (PF4-__). For cylinders where FKM seals, wipers, or scrapers are required, complete end caps assemblies are provided to allow for easier repair.

Basic Repair Kit (K-B-FT-__)*		
Part No.	**Description**	**Quantity**
PF-29	Rod Seal	2
PF-30	Piston Seal	2
PF-3	Tube Seal	2
PF-31	Bushing	4

*Must specify bore size when ordered. Contact your local BIMBA Distributor for pricing on kits and other repair parts.

Square Flat-II® Non-Rotating Cylinders

- > Ideal for applications where rotation cannot be tolerated
- > Unique spin-riveting process securely attaches dual piston rods and rod end block to ensure rods work in tandem
- > Twin rod design means the tooling plate stays aligned, eliminating need for external alignment devices
- > Provisions for bottom flush or face mounting provide convenient alternative to horizontal and side mounting
- > Minimized centerline distances for easier side-by-side cylinder mounting
- > Precision-machined anodized aluminum heads
- > Optional high temperature seals accommodate greater array of application conditions

Approximate power factors (for all models except f02, 3, 4)	
9/16" (02) = 0.25	For example, a 3/4" bore model FO-041 will exert a force of approximately 0.4 times the air line pressure.
3/4" (04) = 0.4	
1-1/16" (09) = 0.9	
1-1/2" (17) = 1.7	
2" (31) = 3.1	
2-1/2" (50) = 5.0	
3" (70) = 7.0	
4" (125) = 12.5	

How it Works

Materials of Construction

Cylinder Body: 304 Stainless Steel

Heads: Anodized Aluminum Alloy

Piston Rod: Ground and Polished 303 Stainless Steel

Piston Seals: Buna-N standard (high temperature seals optional)

Rod Bushing: Bronze

Rod Seals: Buna-N Block V (high temperature seals optional)

Tie Rods: 303 Stainless Steel

Rod End Block: Anodized Aluminum Alloy

Engineering Specifications

Temperature*: -20° F to 150° F (-35° C to 65° C) Standard

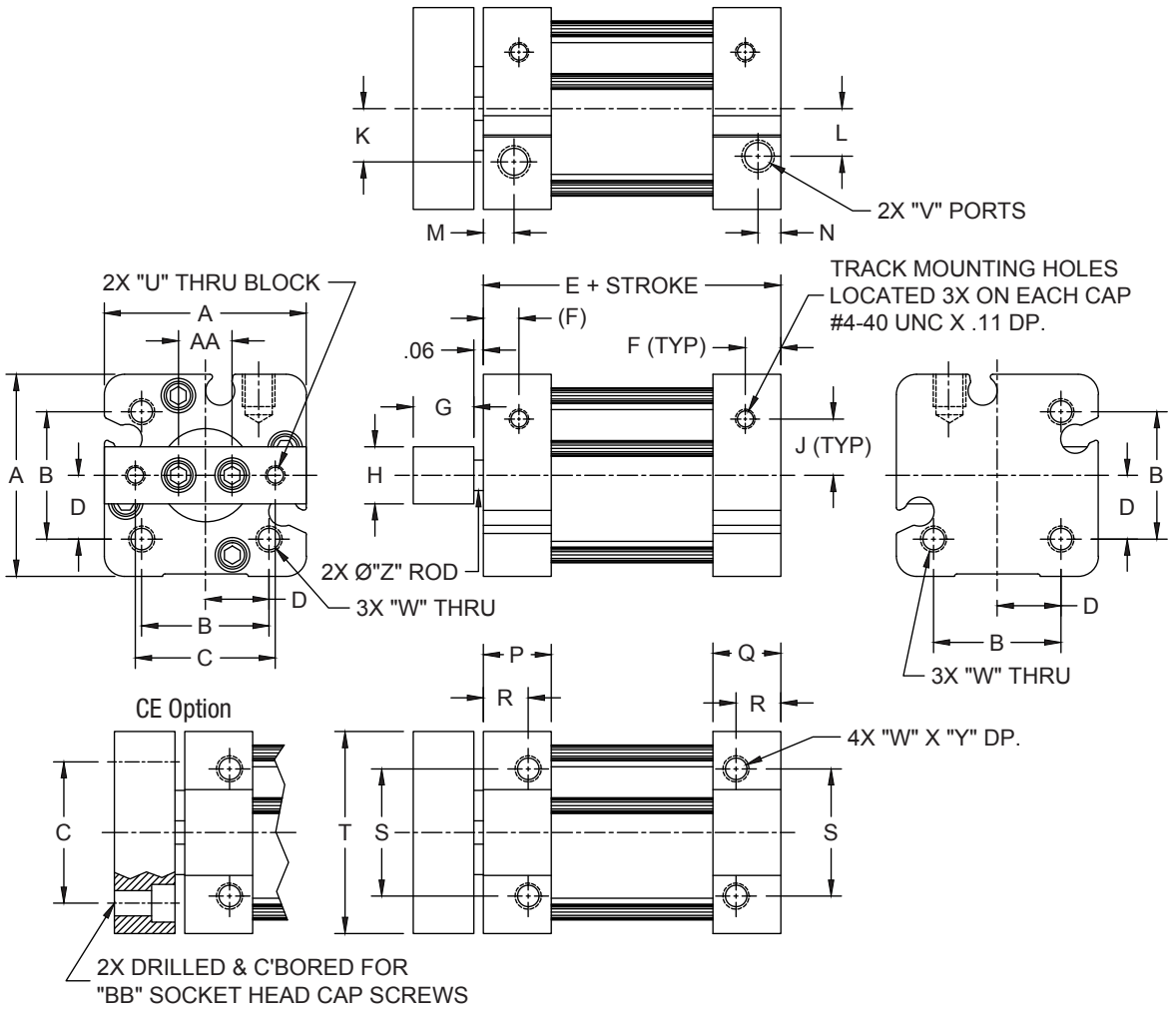
Fluoroelastomer seals rated for higher temperature applications are available. If cylinders are operated below 0° (-18° C) for extended time periods, special modifications may be required. Special seal materials are available upon request.

Square Flat-II® Basic Models

Model FST

(Non-rotating, double acting)

Standard Strokes: 1/8", 1/4", 3/8", 1/2", 5/8", 3/4", 7/8", 1", 1-1/4", 1-1/2", 1-3/4", 2", 2-1/2", 3", 3-1/2", 4"



*Some options affect cylinder length; see page 156

Dimensions (in)

Bore	A	B	C	D	E	F	G	H	I	K	L	M	N
3/4" (04)	1.25	0.750	0.875	0.375	0.75	0.22	0.38	0.38	0.35	0.33	0.30	0.19	0.14
1-1/16" (09)	1.50	1.000	1.062	0.500	1.25	0.22	0.38	0.38	0.34	0.45	0.45	0.25	0.24
1-1/2" (17)	2.00	1.375	1.500	0.688	1.25	0.22	0.50	0.50	0.20	0.61	0.61	0.25	0.24
2" (31)	2.50	1.750	1.875	0.875	1.31	0.22	0.63	0.63	0.19	0.76	0.76	0.25	0.25

Bore	P	Q	R	S	T	U	V	W	Y	Z	AA	BB
3/4" (04)	0.42	0.42	0.281	0.750	1.25	#6-32 UNC-2B	#10-32	#6-32 UNC-2B	0.22	0.188	0.33	#6
1-1/16" (09)	0.58	0.50	0.368	1.000	1.44	#8-32 UNC-2B	1/8 NPT	#8-32 UNC-2B	0.25	0.250	0.42	#8
1-1/2" (17)	0.58	0.50	0.310	1.375	2.00	1/4-20 UNC-2B	1/8 NPT	#10-24 UNC-2B	0.30	0.375	0.56	1/4
2" (31)	0.62	0.62	0.380	1.750	2.50	5/16-18 UNC-2B	1/8 NPT	1/4-20 UNC-2B	0.38	0.500	0.75	5/16

Square Flat-II® Accessory Options and Dimensions (in)

Weights

Bore	Approximate Cylinder Weights (oz)	
	Base	Adder per 1/8" of stroke
3/4" (04)	2.7	0.1
1-1/16" (09)	6.4	0.5
1-1/2" (17)	12.2	0.7
2" (31)	18.4	0.9

Length Adder Dimensions for Options

Bore	Length Adder		
	Low Friction Seals (L)	Magnetic Position Sensing* (M)	Low Friction Seals and Magnetic Position Sensing
3/4" (04)	0.25	0.75	0.75
1-1/16" (09)	0.25	0.50	0.50
1-1/2" (17)	0.25	0.63	0.63
2" (31)	0.25	0.63	0.63

Non-rotation is achieved through the use of dual piston rods incorporated into the body of the Flat-II® cylinder. The rods are securely attached to the piston by our unique spin-riveting process. A rod end block is used to insure the rods work in tandem—as a team. This end block also acts as a useful surface to easily accommodate any mounting attachments required to get the job done. For mounting convenience, the rod end block is provided with threaded mounting holes or optional counterbored holes.

As with any cylinder application, side loading should be avoided (see option K below). The two smaller rods will have more deflection due to side load than the one standard rod in a comparable Flat-1® model.

The Flat-II® is intended to work satisfactorily against pure torsional loads. The maximum torsional load per bore size is shown in the following table:

Bore	3/4" (04)	1-1/16" (09)	1-1/2" (17)	2" (31)
Torque (in-lb)	0.3	1	5	10
K	5.21	26.61	238.85	1344.63

The amount of angular deflection, in degrees, can be approximated by the following formula:

$$\text{Ø} = \frac{TL^3}{K}$$

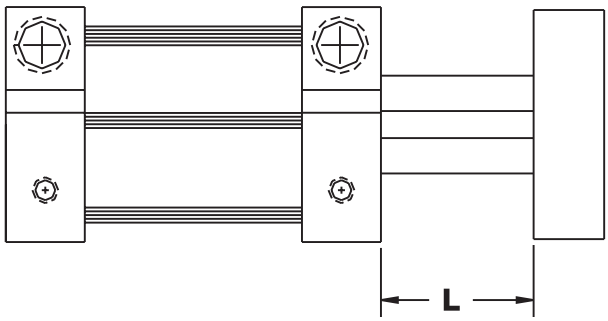
Where
T = Torque (in.-lb.)
L = Length (see sketch below)
K = Per chart above
Ø = Angular deflection

Note: To prevent rod distortion, the rod end block must be fastened securely.

Rotational Tolerance

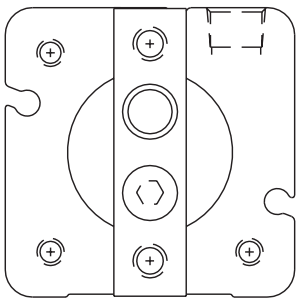
Bore	Maximum Rotation
3/4" (04)	±1°
1-1/16" (09)	±3/4°
1-1/2" (17)	±1/2°
2" (31)	±1/2°

Deflection L Value



L = .062 + STROKE

Option K - Endblock Rotated 90°



How to Order

The Model Number for all Square Flat-II® cylinders consists of alphanumeric clusters. These designate type, bore size, stroke length, mounting, and special options. Please refer to the charts below for an example of a standard Square Flat-II® model. This is a non-rotating, double acting, 1-1/2" bore, 1/8" stroke, pivot mount cylinder with high temperature seals.

Type	
FST	Non-Rotating, Double Acting

Bore Size	
04	3/4"
09	1-1/16"
17	1-1/2"
31	2"

Mounting Options	
No number	Basic model
1	Pivot mount
1N	Pivot mount 90° from standard

FST - 17 0.125 - 1 V

Stroke Length	
0.125	1/8"
0.25	1/4"
0.375	3/8"
ETC.	

Options (Enter in alphabetical order, except for EE which is last)	
CE	Counterbored end block
G	Magnalube® G
K	End block rotated 90° (see page 169)
L	Low friction seals (see table page 156)
M, M1, M4	Magnetic position sensing (see table page 156)
Q	Low temperature operation (-40° F to 200° F)
T1, T4	Additional switch mounting post located in position #1 or #4
V	High temperature option (0° F to 400° F)[1]
Y	Molycoat (MoS_2 I.D. coating)
EE0.375	3/8" extra rod extension, etc.
EE1	1" extra rod extension, etc.

[1] If magnetic position sensing is specified with option V, standard Buna-N based magnet will be provided. Magnetic position sensing is not reliable above 200° F. Overall cylinder length increases with the magnet option.

Square Flat-II® Repair Kits

Bimba Square Flat-II® cylinders are repairable. To order repair kits, please provide the correct bore code in the kit part number blank for the desired size repair kit. Optional seals are designated by the suffix option. Repair kits include the standard bronze rod bushing, piston, rod, and body seals. For cylinders with optional composite bushings, please order those bushing as a separate repair part with part number (PF4-__). For cylinders where FKM seals, wipers, or scrapers are required, complete end caps assemblies are provided to allow for easier repair.

Basic Repair Kit (K-B-FST-__)*		
Part No.	**Description**	**Quantity**
PF-29-FST	Rod Seal	2
PF-30-FST	Piston Seal	1
PF-3-FST	Tube Seal	2

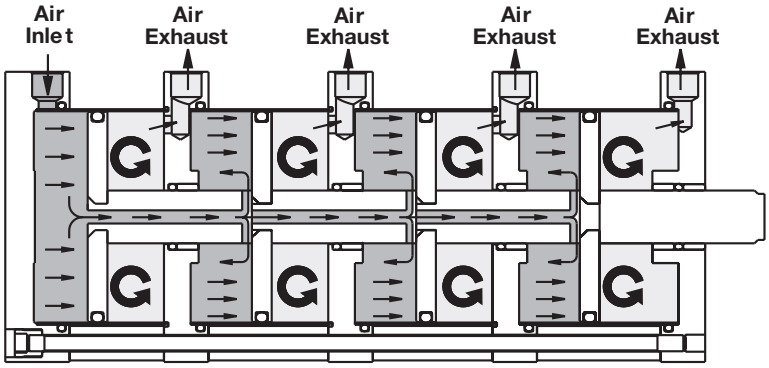
*Must specify bore size to order.

The Bimba FO2, FO3, FO4 Series Flat-1® are double-acting, single end rod cylinders that multiply the force output by supplying air to multiple pistons on extension. They save space and eliminate the need for a higher pressure system. Only one piston is powered on the return stroke, saving air volume and operating costs.

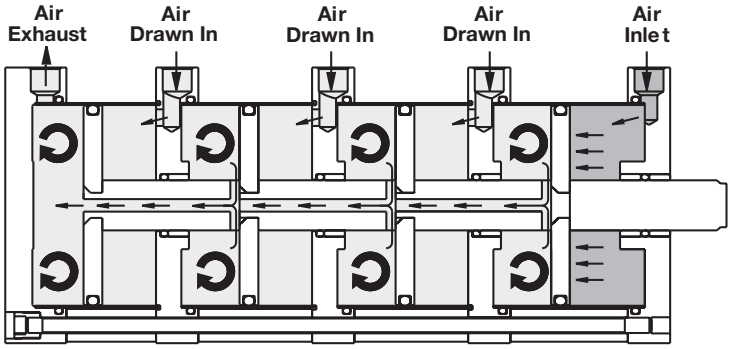
FO2/FO3/FO4 Flat-1® Compact Cylinders

> Bore sizes: 2-1/2", 3", 4"
> 304 stainless steel body prevents corrosion
> Standard oil impregnated bronze rod bushing
> Stainless piston rod
> Precision machined anodized aluminum heads
> Maximum Pressure: 100 PSI (air only)

How it Works



Extension–air supplied to multiple pistons



Retraction–air supplied to one piston only

Technical Specifications

Materials of Construction

Cylinder Body: 304 Stainless Steel

Heads: Anodized Aluminum Alloy

Piston Rod: Ground and Polished 303 Stainless Steel

Seals: Buna-N (high temperature seals optional)

Rod Bushing: Oil-Impregnated Bronze

Engineering Specifications

Pressure Rating: 100 PSI maximum (air only)

Temperature: -20° F to 150° F (-35° C to 65° C) Standard

Fluoroelastomer seals rated for higher temperature applications are available. If cylinders are operated below 0° (-18° C) for extended time periods, special modifications may be required. Special seal materials are available upon request.

FO2, FO3, and FO4 Specifications (in)

Weights

Bore	Approximate Cylinder Weights (oz)					
	Base			Adder per 1/8" of stroke		
	FO2	FO3	FO4	FO2	FO3	FO4
2-1/2" (50)	37.2	53.3	69.4	1.2	1.8	2.4
3" (70)	49.9	71.0	92.1	1.6	2.4	3.2
4" (125)	93.1	133.8	174.5	2.0	3.0	4.0

Dimensions (in)

Bore	A	B**			C	D	E Standard	E Coarse	E Depth	F	H
		FO2	FO3	FO4							
2-1/2" (50)	3.75	2.29	3.15	4.02	3.25	1/4	1/2-20 UNF	1/2-13 UNC	0.70	0.75	0.63
3" (70)	4.25	2.39	3.28	4.18	3.78	1/4	5/8-18 UNF	5/8-11 UNC	0.73	0.88	0.75
4" (125)	5.50	3.04	4.15	5.27	4.94	5/16	3/4-16 UNF	3/4-10 UNC	0.80	1.00	0.88

Bore	J	K	L	R	T	V	X	Z	AA	BB	CC
2-1/2" (50)	0.66	0.33	1/4 NPT	1/4-20 UNC	0.91	0.58	0.41	N/A	1.00	1.79	2.65
3" (70)	0.69	0.33	1/4 NPT	1/4-20 UNC	0.94	0.58	0.39	0.28	1.03	1.85	2.75
4" (125)	0.84	0.42	3/8 NPT	5/16-18 UNC	1.22	0.80	0.50	0.34	1.43	2.47	3.58

** For Strokes .125, .188, and .250

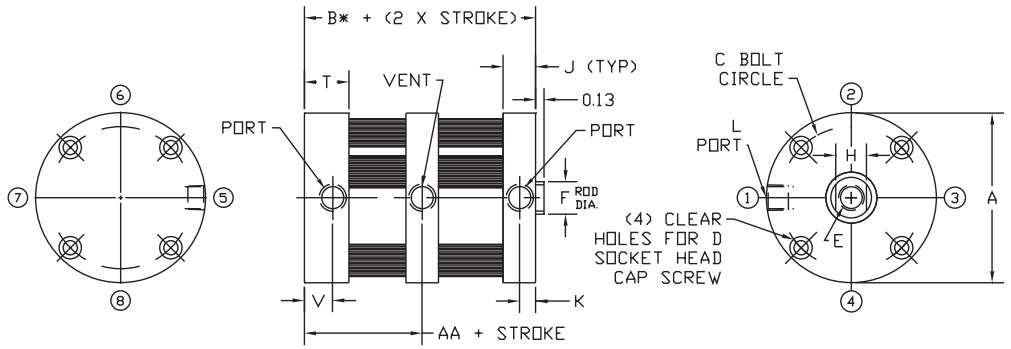
Bore	Type	Final Overall Cylinder Length*		
		Stroke		
		.125	.188	.250
2-1/2" (50)	FO2	2.65	2.71	2.77
	FO3	3.64	3.76	3.87
	FO4	4.63	4.81	4.97
3" (70)	FO2	2.75	2.81	2.88
	FO3	3.77	3.90	4.01
	FO4	4.79	4.98	5.15
4" (125)	FO2	3.38	3.44	3.53
	FO3	4.61	4.74	4.89
	FO4	5.85	6.04	6.24

*See page 176 for length adders for options.

FO2, FO3, and FO4 Basic Models

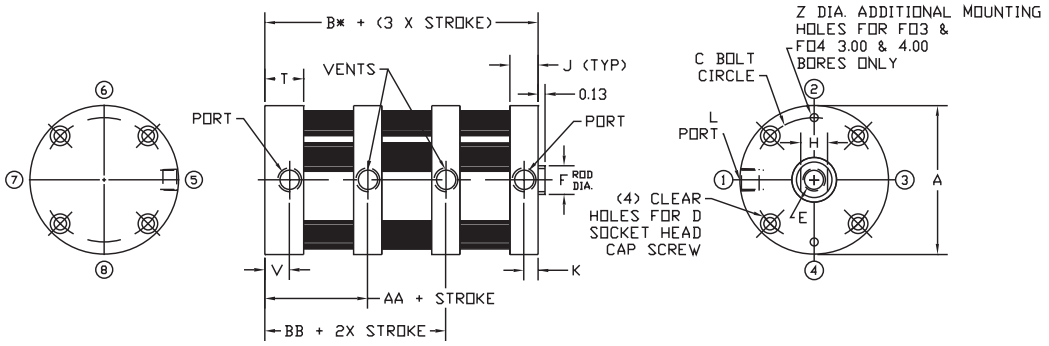
Standard Strokes: 1/8", 1/4", 3/8", 1/2", 5/8", 3/4", 1", 1-1/4", 1-1/2", 1-3/4", 2", 2-1/2", 3", 3-1/2", 4". Special strokes available on request.

Model FO2



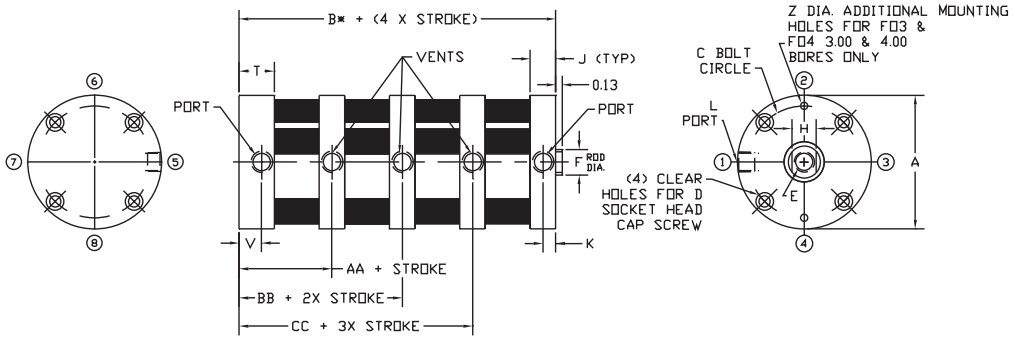
*Some options affect cylinder length, see page 176

Model FO3



*Some options affect cylinder length, see page 176

Model FO4



*Some options affect cylinder length, see page 176

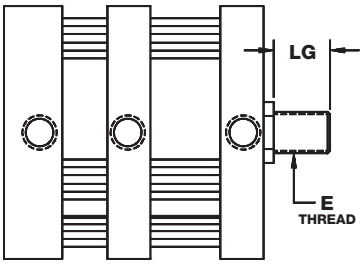
FO2, FO3, and FO4 Basic Models

Options

Bore	Type	Length Adder		
		Low Friction Seal (L)	Magnetic Position Sensing (M)	Low Friction Seals and Magnetic Position Sensing (LM)
2-1/2" (50)	F02	0.75	.88	1.25
	F03	1.13		1.63
	F04	1.50		2.00
3" (70)	F02	1.00	.88	1.38
	F03	1.50		1.88
	F04	2.00		2.38
4" (125)	F02	1.00	.88	1.38
	F03	1.50		1.88
	F04	2.00		2.38

Male Rod Ends (Option MT or CMT)

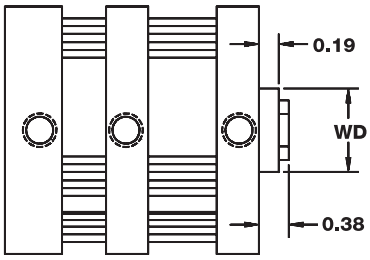
(Model FO2 shown)



Bore	E		LG
	MT	CMT	
2-1/2" (50)	1/2-20	1/2-13	0.63
3" (70)	5/8-18	5/8-11	0.75
4" (125)	3/4-16	3/4-10	0.75

Rod Wiper (Option W)

(Buna N standard, not available in high temperature option) (Model FO2 shown).

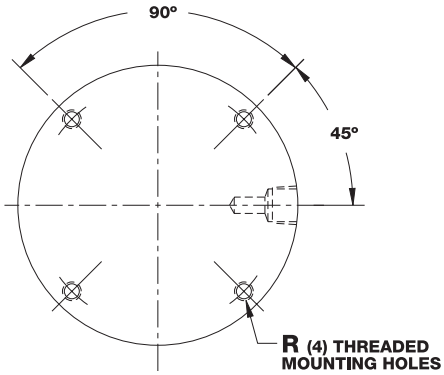


Bore	WD
2-1/2" (50)	1.13
3" (70)	1.25
4" (125)	1.38

Mounting Options

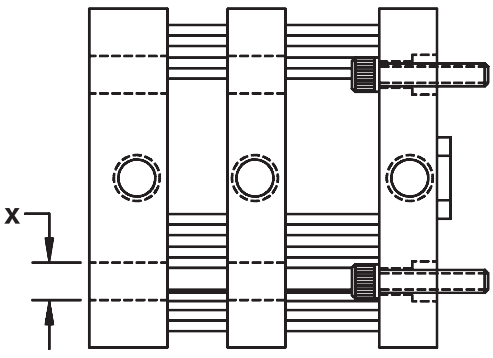
Threaded Mounting Holes

(available either or both ends) (-3R shown)



Screw Clearance Holes

(available either or both ends) (-4R shown) Screw clearance holes standard on all center sections



How to Order

The Model Number for all FO2, FO3, and FO4 Series Flat-1® cylinders consists of alphanumeric clusters. These designate type, bore size, stroke length, mounting, and special options. Please refer to the charts below for an example of a standard FO2 model. This is a 2-1/2" bore, 1" stroke, threaded mounting holes on both ends, and magnetic position sensing.

Type	
FO2	2 Stage Extend, Single Stage Retract
FO2	3 Stage Extend, Single Stage Retract
FO4	4 Stage Extend, Single Stage Retract

Bore Size	
50	2-1/2"
70	3"
125	4"

Stroke Length	
0.25	1/4"
1	1"
ETC.	

FO2 - 50 1 - 3 M

Mounting Options (Enter in numeric order)	
No number	Basic model (standard counterbored mounting holes)
3	Threaded mounting holes, both ends
3F	Threaded mounting holes, front
3R	Threaded mounting holes, rear
4	Screw clearance holes, both ends[1]
4F	Screw clearance holes, front[1]
4R	Screw clearance holes, rear[1]

[1] "Screw clearance" to allow bolt head to pass through; no counter bores (see page 176).

Options (Enter in alphabetical order, except for EE which is last)	
CFT	Coarse female thread (fine thread standard) (see page 174)
CMT	Male rod end (coarse thread) (see page 176)
G	Magnalube® G
L	Low friction seals (see page 176)
M, M1, M3, M4	Magnetic position sensing[1]
P2, P3, P4	Front port position #2, #3, or #4 (see page 175)
P6, P7, P8	Rear port position #6, #7, or #8 (see page 175)
Q	Low temperature operation (-40° F to 200° F)
T1, T3, T4	Additional switch mounting post located in position #1, #3, or #4
V	High temperature option (0° F to 400° F)[2]
W	Rod wiper (Buna-N only) (see page 176)
Y	Moly-coat (MoS_2, I.D. coating)
EE0.375	3/8" extra rod extension, etc.
EE1	1" extra rod extension, etc.

[1] If magnetic position sensing is specified with option V, standard Buna-N based magnet will be provided. Magnetic position sensing is not reliable above 200°F. Overall cylinder length increases with the magnet option.

Approximate Power Factors					
Bore	Bore Model Designator	Power Factor Extension			Power Factor Retraction
		F02	F03	F04	
2-1/2" (50)	50	9.4	13.8	18.3	4.5
3" (70)	70	13.5	20.0	26.5	6.5
4" (125)	125	24.3	36.1	47.9	11.8

Multiply the air line pressure by the power factor to get the approximate force. For example, an FO2-501-3 operated at 80 PSI will exert a force of 752lbs on extension, and 360lbs on retraction.

FO2, FO3, and FO4 Repair Kits

Bimba FO2, FO3, and FO4 cylinders are repairable. To order repair kits, please provide the correct bore code in the kit part number blank for the desired size repair kit. Optional seals are designated by the suffix option. Repair kits include the standard bronze rod bushing, piston, rod, and body seals. For cylinders with optional composite bushings, please order those bushing as a separate repair part with part number (PF4-__). For cylinders where FKM seals, wipers, or scrapers are required, complete end caps assemblies are provided to allow for easier repair.

Basic Repair Kit (K-B-FO-__)*		
Part No.	**Description**	**Quantity****
PF-1	Rod Seal	2, 3 or 4
PF-2	Piston Seal	2, 3 or 4
PF-3	Tube Seal	3, 4 or 5
PF-4	Bushing	3, 4 or 5

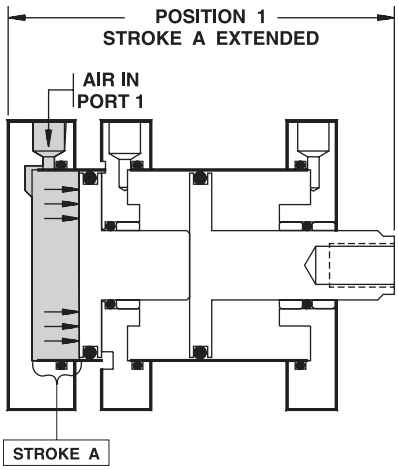
*Must specify model and bore size when ordered.
**Quantities listed correspond with FO2, FO3 or FO4.

Wiper Option Repair Kit (K-B-FO-__-W)*		
Part No.	**Description**	**Quantity****
PF-1	Rod Seal	2, 3 or 4
PF-2	Piston Seal	2, 3 or 4
PF-3	Tube Seal	3, 4 or 5
PF-4	Bushing	3, 4 or 5
PF-5	Wiper Bushing	1
PF-6	Wiper	1

Product Features

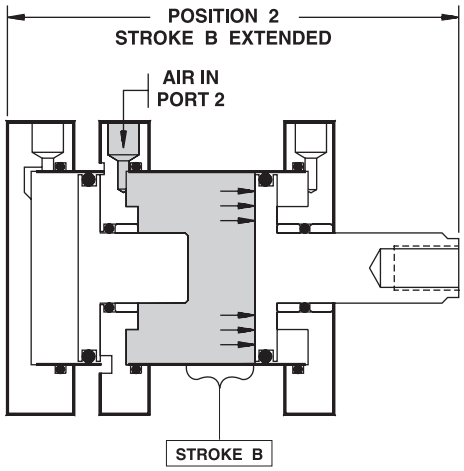
Multiple Position FOP Flat-1® Compact Cylinders

- Bore sizes: 9/16", 3/4", 1-1/16", 1-1/2", 2", 2-1/2", 3", 4"
- 304 stainless steel body prevents corrosion
- Standard oil impregnated bronze rod bushing
- Stainless piston rod
- Maximum Pressure: 200 PSI (air only)
- Other positions (4, 5, etc.) are available as specials. Contact your local distributor for info.



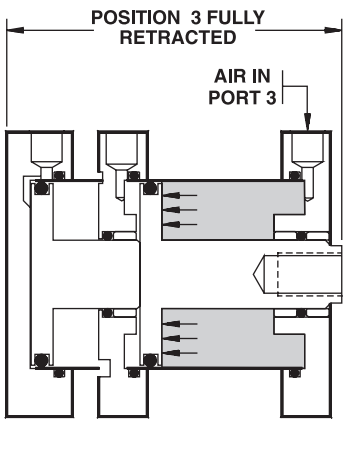
Position 1

Air is supplied to Port 1, cylinder extends stroke length A.



Position 2

Air is supplied to Port 2, cylinder extends stroke length B.



Position 3

Cylinder is fully retracted by supplying air to Port 3.

NOTE: For Magnetic Position Sensing option, magnet is mounted only on the piston of the Stroke B side.

Technical Specifications

Materials of Construction

Cylinder Body: 304 Stainless Steel

Heads: Anodized Aluminum Alloy

Piston Rod: Ground and Polished 303 Stainless Steel

Seals: Buna-N (high temperature seals optional)

Rod Bushing: Oil-Impregnated Bronze

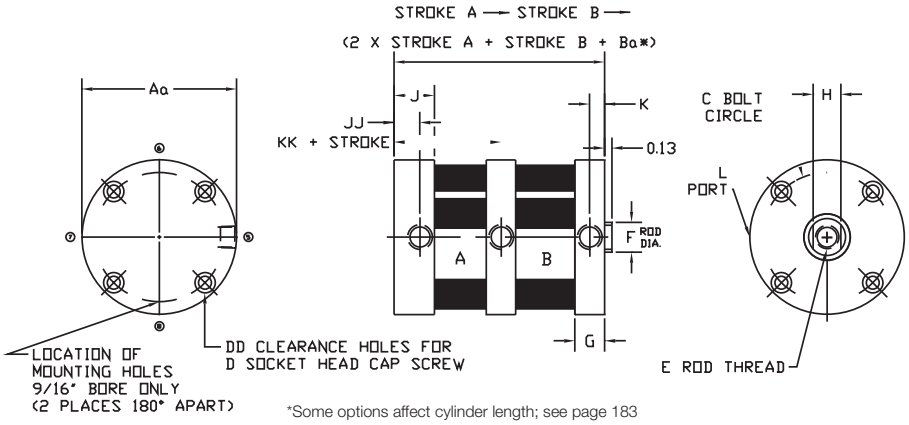
Engineering Specifications

Pressure Rating: 200 PSI maximum (air only)

Temperature: -20° F to 150° F (-25° C to 65° C) Standard

Fluoroelastomer seals rated for higher temperature applications are available. If cylinders are operated below 0° (-18° C) for extended time periods, special modifications may be required. Special seal materials are available upon request.

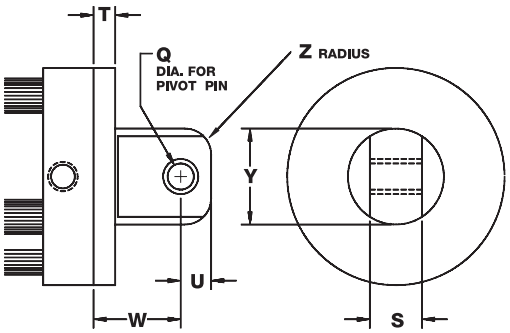
Multiple Position FOP Flat-1® Basic Models



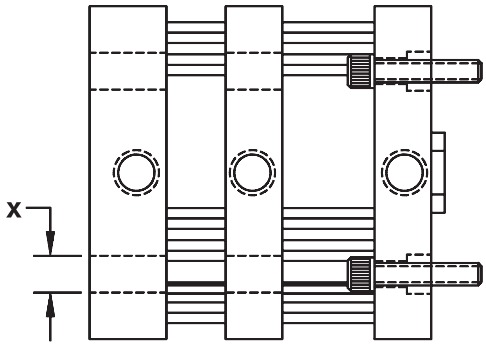
*Some options affect cylinder length; see page 183

Mounting Options

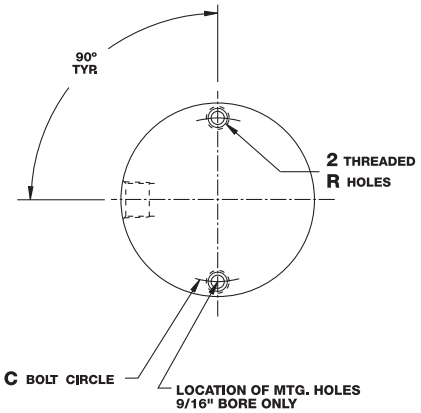
Pivot Mount
(-1 shown) Complete with bronze pivot bushing
(Not available as an accessory)



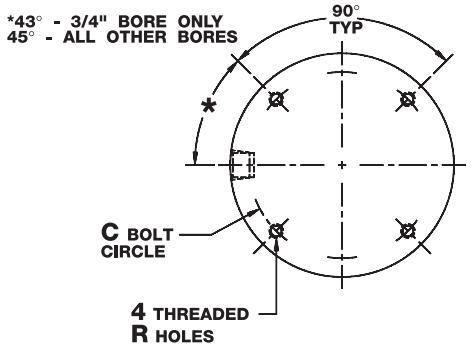
Screw Clearance Holes
(available either or both ends) (-4R shown) Screw clearance holes standard on all center sections



Threaded Mounting Holes
(available either or both ends) (3, -3F or -3R shown)
9/16" Bore



3/4" Bore and larger



Multiple Position FOP Flat-1® Dimensions (in)

Bore	Aa	Ba*	C	DD	D	E Standard	E Coarse	E Depth	F
9/16" (02)	1.13	1.14	0.88	2	#4	#8-32 UNC	N/A	0.46	0.25
3/4" (04)	1.50	1.14	1.22	4	#6	#10-32 UNF	#10-24 UNC	0.46	0.31
1-1/16" (09)	2.00	1.67	1.69	4	#6	5/16-24 UNF	5/16-18 UNC	0.70	0.50
1-1/2" (17)	2.63	1.70	2.19	4	#10	3/8-24 UNF	3/8-16 UNC	0.70	0.63
2" (31)	3.13	1.80	2.69	4	#10	1/2-20 UNF	1/2-13 UNC	0.70	0.75
2-1/2" (50)	3.75	2.25	3.25	4	1/4	1/2-20 UNF	1/2-13 UNC	0.70	0.75
3" (70)	4.25	2.34	3.78	4	1/4	5/8-18 UNF	5/8-11 UNC	0.73	0.88
4" (125)	5.50	3.00	4.94	4	5/16	3/4-16 UNF	3/4-10 UNC	0.80	1.00

Bore	G	H	J	JJ	K	KK	L
9/16" (02)	0.34	0.22	0.47	0.27	0.14	0.49	#10-32
3/4" (04)	0.34	0.25	0.47	0.27	0.14	0.49	#10-32
1-1/16" (09)	0.50	0.44	0.69	0.44	0.25	0.73	1/8 NPT
1-1/2" (17)	0.50	0.50	0.69	0.44	0.25	0.74	1/8 NPT
2" (31)	0.53	0.63	0.72	0.44	0.25	0.78	1/8 NPT
2-1/2" (50)	0.66	0.63	0.91	0.58	0.33	0.93	1/4 NPT
3" (70)	0.69	0.75	0.94	0.58	0.33	0.95	1/4 NPT
4" (125)	0.84	0.88	1.22	0.80	0.42	1.36	3/8 NPT

Bore	R	LG	WD	Q	S	T	U	W	X	Y	Z
9/16" (02)	#4-40 UNC	0.38	0.56	0.19	0.38	0.19	0.25	0.75	0.20	0.63	0.19
3/4" (04)	#6-32 UNC	0.38	0.69	0.19	0.38	0.19	0.25	0.75	0.23	0.75	0.19
1-1/16" (09)	#6-32 UNC	0.50	0.88	0.19	0.38	0.25	0.25	0.81	0.25	0.75	0.19
1-1/2" (17)	#10-24 UNC	0.50	1.00	0.38	0.75	0.25	0.44	1.19	0.34	1.38	0.38
2" (31)	#10-24-UNC	0.63	1.12	0.38	0.75	0.31	0.44	1.25	0.34	1.38	0.38
2-1/2" (50)	1/4-20 UNC	0.63	1.12	0.38	0.75	0.38	0.44	1.31	0.41	1.38	0.38
3" (70)	1/4-20 UNC	0.75	1.25	0.63	1.00	0.38	0.56	1.69	0.41	1.88	0.38
4" (125)	5/16-18 UNC	0.75	1.38	0.63	1.00	0.44	0.56	1.75	0.50	1.88	0.38

*See page 183 for length adders for options.

Multiple Position FOP Flat-1® Accessory Options and Dimensions (in)

Length Adder Dimensions for Options
(Dimensional variations from standard as shown)

Bore	Length Adder		
	Low Friction Seals (L)	Magnetic Position Sensing* (M)	Low Friction Seals and Magnetic Position Sensing
9/16" (02), 3/4" (04)	0.50	0.88	1.12
1-1/16" (09), 1-1/2" (17), 2" (31), 2-1/2" (50)	0.75	0.88	1.25
3" (70), 4" (125)	1.00	0.88	1.38

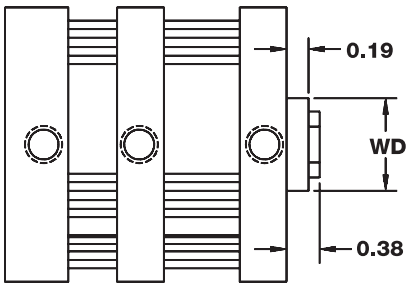
*A minimum total stroke of 0.38" is required to sense extending end-of-stroke position.

Minimum Stroke

Model	Bore							
	9/16" (02)	3/4" (04)	1-1/16" (09)	1-1/2" (17)	2" (31)	2-1/2" (50)	3" (70)	4" (125)
Base Model Stroke A	0.19	0.19	0.25	0.25	0.25	0.38	0.38	0.34

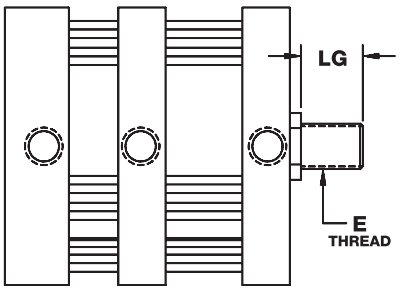
No minimum for stroke B. No minimum for stroke A or B with low friction seal option.

Rod Wiper (Option W)
(Buna N standard, not available in high temperature option)



Bore	WD
9/16" (02)	0.56
3/4" (04)	0.69
1-1/16" (09)	0.88
1-1/2" (17)	1.00
2" (31), 2-1/2" (50)	1.13
3" (70)	1.25
4" (125)	1.38

Male Rod Ends (Option MT or CMT)



Bore	E		LG
	MT	CMT	
9/16" (02)	#8-32	N/A	0.38
3/4" (04)	#10-32	#10-24	0.38
1-1/16" (09)	5/16-24	5/16-18	0.50
1-1/2" (17)	3/8-24	3/8-16	0.50
2" (31), 2-1/2" (50)	1/2-20	1/2-13	0.63
3" (70)	5/8-18	5/8-11	0.75
4" (125)	3/4-16	3/4-10	0.75

Multiple Position FOP Flat-1® Accessory Options and Dimensions (in)

Weights

Bore	Approximate Cylinder Weights (oz)	
	Base	Adder per 1/8" of stroke
9/16" (02)	3.3	0.16
3/4" (04)	4.5	0.2
1-1/16" (09)	9.9	0.6
1-1/2" (17)	18.7	0.8
2" (31)	24.5	1
2-1/2" (50)	41.3	1.2
3" (70)	52.9	1.6
4" (125)	102.7	2

Flat-1® Accessory Selection Guide (All Models)

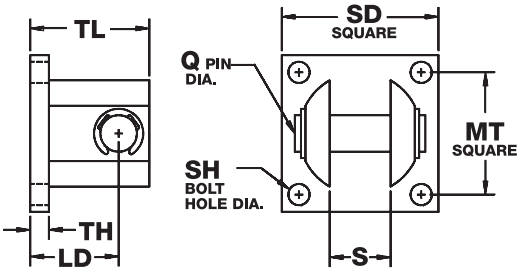
Accessory	Flat-1®	Square Flat-1®	Square Flat-II®	Flat-II®	F02	F0P
Clevis Bracket	X	X	X	X	N/A	X
Trunnion Bracket	X	N/A	N/A	X	N/A	N/A
Rod Pivot	X	X	N/A	N/A	X	X
Pivot Attachment	N/A	X	X	N/A	N/A	N/A

Clevis Bracket

Anodized aluminum alloy, complete with stainless steel pin

Model	Bore	LD	MT	Q	S	SH	SD	TH	TL
BC-1	9/16" (02), 3/4" (04), 1-1/16" (09)	0.56	0.75	0.19	0.39	#6	1.00	0.16	0.78
BC-2	1-1/2" (17), 2" (31), 2-1/2" (50)	0.94	1.38	0.38	0.75	#10	1.75	0.22	1.34
BC-3	3" (70), 4" (125)	1.25	2.00	0.63	1.00	0.25	2.50	0.25	1.81

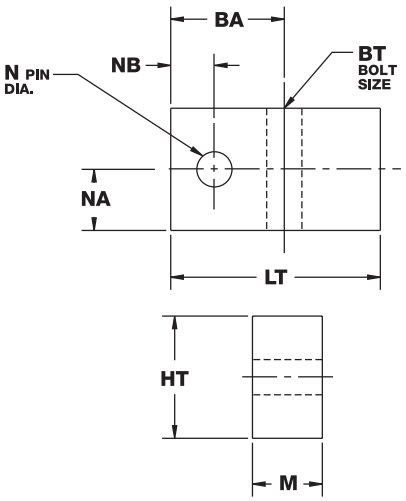
Bracket intended to mount with either rod pivot or pivot mount, not directly to the cylinder rear head.



Trunnion Bracket (pair)

Anodized aluminum alloy, complete with bronze pivot bushings

Model	Bore	BA	BT	HT	LT	M	N	NA	NB
BT-1	3/4" (04)	0.56	#10	0.63	1.12	0.31	0.13	0.30	0.22
BT-2	1-1/16" (09), 1-1/2" (17), 2" (31)	0.81	0.25	0.88	1.50	0.50	0.25	0.38	0.31
BT-3	2-1/2" (50), 3" (70)	0.94	0.31	1.00	1.63	0.63	0.31	0.45	0.38
BT-4	4" (125)	1.06	0.38	1.25	1.88	0.75	0.38	0.55	0.44



How to Order

The Model Number for all Multiple Position FOP Flat-1® cylinders consists of alphanumeric clusters. These designate type, bore size, stroke lengths, mounting, and special options. Please refer to the charts below for an example of a standard FOP Flat-1® model. This is a multiple position 1-1/2" bore, 3/8" stroke for position A, 1/4" stroke for position B, rear head pivot mount cylinder with high temperature seals.

Type	
FOP	Double Acting Multiple Position, Single End Rod

Bore Size	
02	9/16"
04	3/4"
09	1-1/16"
17	1-1/2"
31	2"
50	2-1/2"
70	3"
125	4"

Stroke Length A	
0.25	1/4"
0.375	3/8"
0.625	5/8"
ETC.	

Stroke Length B	
0.25	1/4"
0.375	3/8"
0.625	5/8"
ETC.	

FOP - 17 0.375 / 0.25 - 1 V

Mounting Options	
No number	Basic model (standard counter-bored mounting holes)
1	Pivot mount
1N	Pivot mount 90° from standard
3	Threaded mounting holes, both ends
3F	Threaded mounting holes, front
3R	Threaded mounting holes, rear
4	Screw clearance holes, both ends[1]
4F	Screw clearance holes, front[1]
4R	Screw clearance holes, rear[1]

Options (Enter in alphabetical order, except for EE which is last)	
CFT	Coarse female rod thread (fine thread standard) (see page 182)
CMT	Male rod thread end (coarse thread) (see page 183)
G	Magnalube® G
L	Low friction seals (see table page 183)
M, M1, M3, M4	Magnetic position sensing (see table page 183)
MT	Male rod thread end (fine thread) (see page 183)
NT	Non-threaded rod
P2, P3, P4	Front port position #2, #3, or #4 (see page 181)[1]
P6, P7, P8	Rear port position #6, #7, or #8 (see page 181)[1]
Q	Low temperature operation (-40° F to 200° F)
T1, T3, T4	Additional switch mounting post located in position #1, #3, or #4
V	High temperature option (0° F to 400° F)[2]
W	Rod wiper (Buna-N only) (see page 183)
Y	Moly-coat (MoS_2 I.D. coating)
EE0.375	3/8" extra rod extension, etc.
EE1	1" extra rod extension, etc.

[1] Not available in 9/16" bore.
[2] If magnetic position sensing is specified with option V, standard Buna-N based magnet will be provided. Magnetic position sensing is not reliable above 200° F. Overall cylinder length increases with the magnet option.

Multiple Position FOP Repair Kits

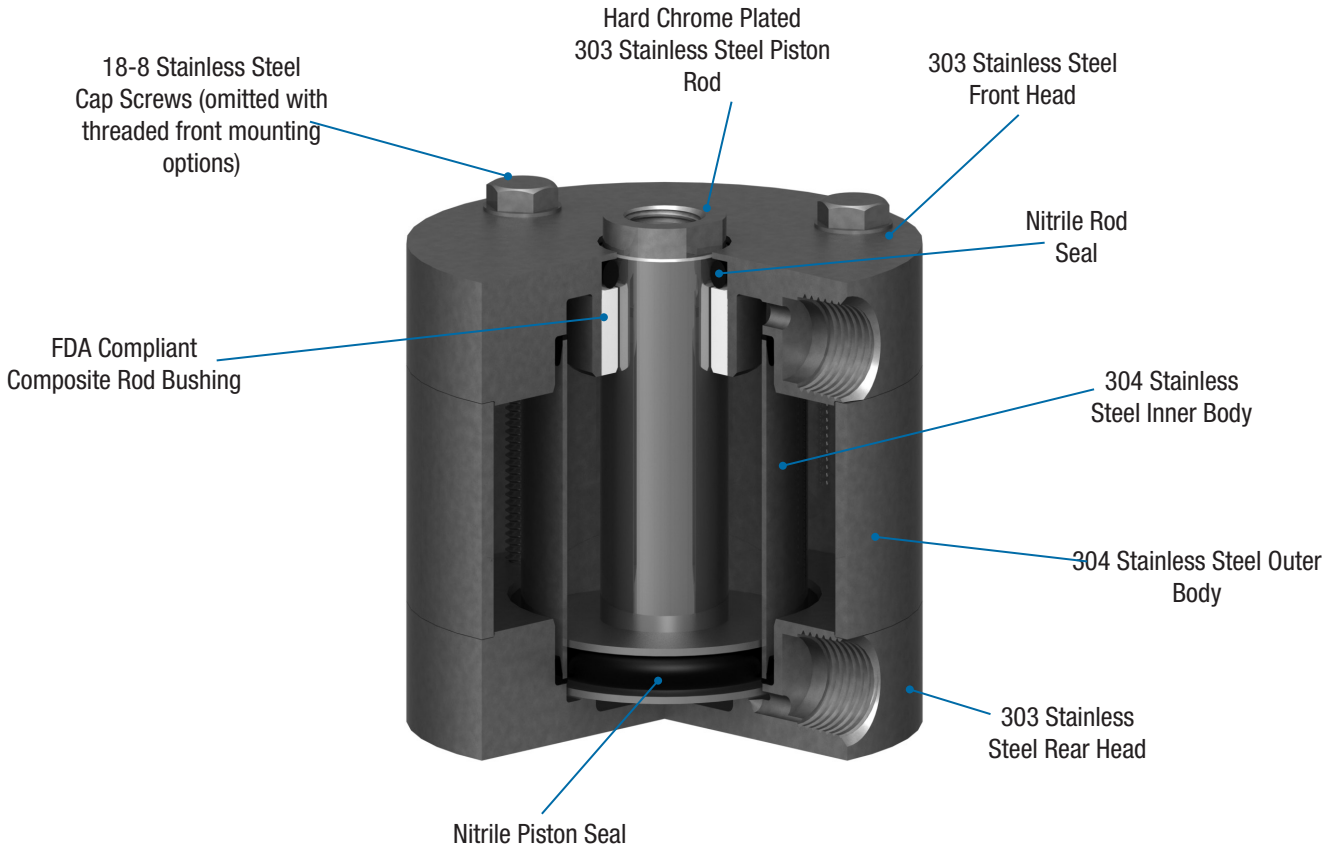
Bimba Multiple Position FOP cylinders are repairable. To order repair kits, please provide the correct bore code in the kit part number blank for the desired size repair kit. Optional seals are designated by the suffix option. Repair kits include the standard bronze rod bushing, piston, rod, and body seals. For cylinders with optional composite bushings, please order those bushing as a separate repair part with part number (PF4-__). For cylinders where FKM seals, wipers, or scrapers are required, complete end caps assemblies are provided to allow for easier repair.

Basic Repair Kit (K-B-FOP)*		
Part No.	**Description**	**Quantity**
PF-1	Rod Seal	2
PF-2	Piston Seal	2
PF-3	Tube Seal	3
PF-4	Bushing	3

Wiper Option Repair Kit (K-B-FOP-W)*		
Part No.	**Description**	**Quantity**
PF-1	Rod Seal	2
PF-2	Piston Seal	2
PF-3	Tube Seal	3
PF-4	Bushing	2
PF-5	Wiper Bushing	1
PF-6	Wiper	1

*Must specify bore size when ordered. Contact your local Bimba distributor for pricing on kits and other repair parts.

Product Features



Stainless Steel Flat-1® Features and Benefits

> Hygienic design is easy to clean and eliminates holes and crevices that can propagate bacterial growth.
> All stainless steel construction provides superior corrosion resistance.
> Hard chrome plated piston rod reduces wear on the rod seal.
> IP69K rated design features a sealed outer body which prevents the ingress of washdown chemicals and application matter.
> Food grade plastic rod bushing and food grade grease lubricant is ideal for food processing and packaging applications.

The Ideal Solution for Washdown and Other Corrosive Environments!

The compact Stainless Steel Flat-1® offers mounting styles to fit most every application!


Pivot Mount


Front Trunnion


Rear Trunnion


Threaded Front


Threaded Rear


F Series Front


F Series Rear


Basic

- Minimal mounting holes present only where specified reduces catch points
- Sealed outer body prevents outside contamination from penetrating cylinder body
- F Series provides a mounting interchange to competitive designs

Technical Specifications

Materials of Construction

End Caps: 303 Stainless Steel
Inner and Outer Body: 304 Stainless Steel
Piston Rod: 303 Hard Chrome Plated Stainless Steel
Lubrication: Food Grade Grease
Seals: Buna-N Standard; High and Low Temperature (optional)

Engineering Specifications

Temperature: -20° F to 200° F Standard
-40° F to 200° F (Low Temperature)
0° F to 400° F (High Temperature)
Pressure Rating: 250 PSI
Ingress Protection Rating: IP69K

* Cylinders operated for extended time at temperatures below 0° F or above 300° F may require special modifications.

Stainless Steel Flat-1® Specifications

Maximum Stroke + Extra Extension Lengths

Model	Bore Sizes	Maximum Stroke
SSFO (Standard Seals)	02 and 04	9"
SSFO (Standard Seals)	09 through 125	15"
SSFO (Low Friction Seals)	02 and 04	9"
SSFO (Low Friction Seals)	09 through 125	15"
SSFOD	All bore sizes	16"
SSFOS	All bore sizes	4"
SSFOR	02 through 50	4"
SSFOR	70 and 125	3"

Cylinder Weights

Approximate Cylinder Weights (lbs)

Bore	SSFO		SSFOD		SSFOR/SSFOS				
	0" Stroke	Adder Per 1/8" of Stroke	0" Stroke	Adder Per 1/8" of Stroke	0" Stroke (Up To 1")	1" Stroke (Up To 2")	2" Stroke (Up To 3")	3" Stroke (Up To 4")	Adder Per 1/8" of Stroke
9/16" (02)	0.15	0.01	0.17	0.01	0.20	0.36	0.52	0.68	0.01
3/4" (04)	0.27	0.02	0.31	0.02	0.34	0.56	0.78	1.00	0.02
1-1/16" (09)	0.70	0.03	0.76	0.03	0.78	1.14	1.47	1.85	0.02
1-1/2" (17)	1.20	0.04	1.35	0.05	1.34	1.88	2.43	2.97	0.03
2" (31)	1.63	0.05	1.82	0.06	1.81	2.45	3.02	3.72	0.04
2-1/2" (50)	3.13	0.05	3.44	0.07	3.42	4.58	5.63	6.79	0.04
3" (70)	3.97	0.07	4.35	0.09	4.35	5.58	7.00	8.19	0.05
4" (125)	6.20	0.09	8.17	0.12	8.49	9.96	11.63	13.08	0.07

Length Adders for Low Friction Seals

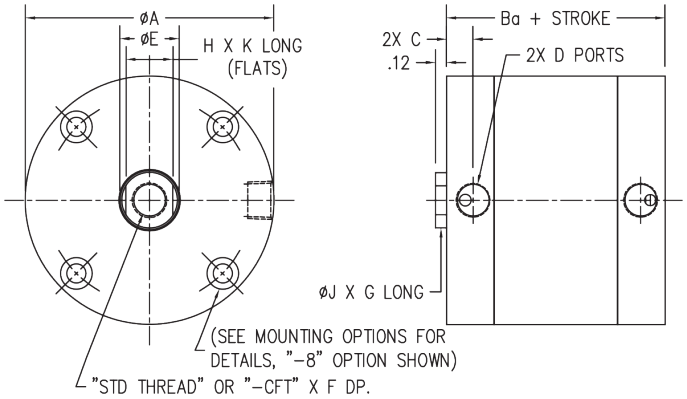
	Bore Size							
	9/16" (02)	3/4" (04)	1-1/16" (09)	1-1/2" (17)	2" (31)	2-1/2" (50)	3" (70)	4" (125)
Length adder (in)	0.25	0.25	0.38	0.38	0.38	0.38	0.50	0.50

Enclosed Spring Forces

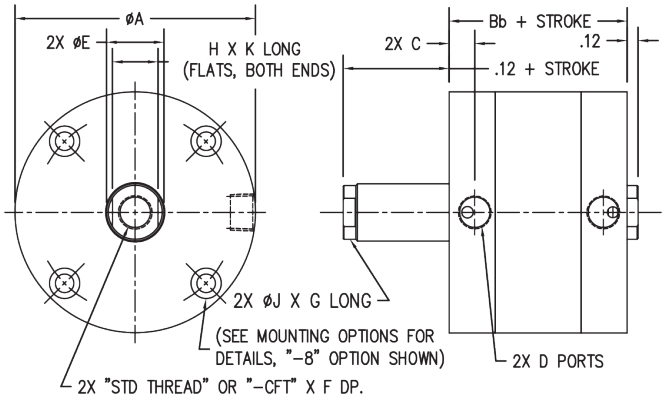
Bore	Maximum Force (lb)	Spring Rates (Lb/In)			
		0.12 To 1" Stroke (lb/in)	1.001 To 2" Stroke (lb/in)	2.001 To 3" Stroke (lb/in)	3.001 To 4" Stroke (lb/in)
9/16" (02)	5.90	4.00	1.75	1.24	0.88
3/4" (04)	10.40	6.00	2.70	1.86	1.35
1-1/16" (09)	10.80	6.50	2.70	1.91	1.35
1-1/2" (17)	12.90	6.00	2.30	1.66	1.15
2" (31)	17.50	11.00	2.60	2.10	1.30
2-1/2" (50)	26.00	9.50	5.00	3.28	2.50
3" (70)	35.00	16.00	5.00	3.81	2.50
4" (125)	50.00	22.00	5.50	4.40	2.75

Stainless Steel Flat-1® Basic Model Dimensions (in)

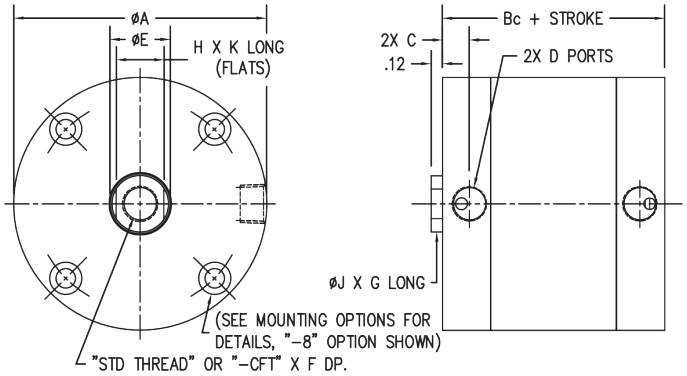
Model SSFO
(Double Acting Single End Rod)



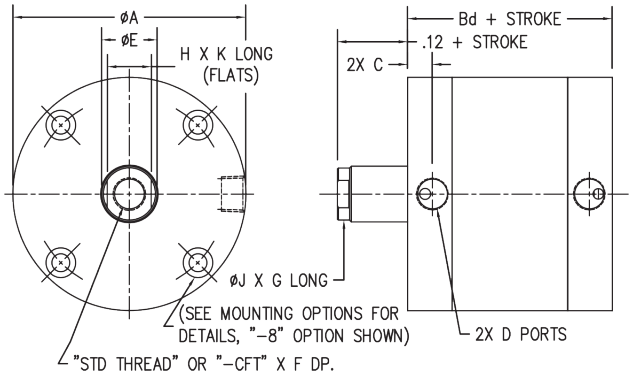
Model SSFOD
(Double Acting Double End Rod)



Model SSFOS
(Single Acting Rod Normally Retracted)



Model SSFOR
(Reverse Single Acting Rod Normally Extended)



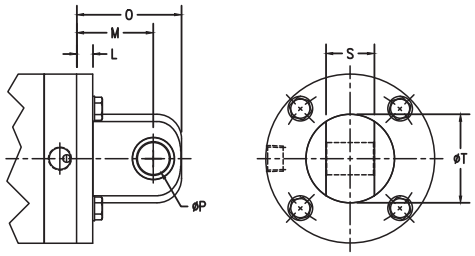
Bore	A	Ba	Bb	Bc				Bd				C	D	E
				0-1"	1.01"-2"	2.01"-3"	3.01"-4"	0-1"	1.01"-2"	2.01"-3"	3.01"-4"			
9/16" (02)	1.13	0.56	0.69	0.81	1.38	1.96	2.52	1.06	1.63	2.14	2.70	0.17	#10-32	0.25
3/4" (04)	1.50	0.56	0.69	0.81	1.38	1.94	2.50	1.06	1.62	2.19	2.75	0.17	#10-32	0.31
1-1/16" (09)	2.00	0.88	0.94	0.88	1.50	2.13	2.75	1.38	2.00	2.63	3.25	0.28	1/8 NPT	0.50
1-1/2" (17)	2.63	0.88	1.00	0.88	1.50	2.13	2.75	1.38	2.00	2.63	3.25	0.28	1/8 NPT	0.63
2" (31)	3.13	0.94	1.06	0.94	1.56	2.19	2.81	1.44	2.06	2.69	3.31	0.28	1/8 NPT	0.75
2-1/2" (50)	3.75	1.19	1.31	1.19	2.06	2.94	3.81	1.94	2.81	3.69	4.56	0.35	1/4 NPT	0.75
3" (70)	4.25	1.25	1.37	1.25	2.12	3.00	3.87	2.00	2.88	3.75	N/A	0.35	1/4 NPT	0.88
4" (125)	5.50	1.56	1.69	1.57	2.45	3.32	4.20	2.32	3.20	4.07	N/A	0.42	3/8 NPT	1.00

Bore	Std Thread	CFT	F	G	H	J	K
9/16" (02)	#8-32 UNC-2B	N/A	0.46	0.14	0.22	0.24	0.13
3/4" (04)	#10-32 UNF-2B	#10-24 UNC-2B	0.46	0.14	0.25	0.29	0.13
1-1/16" (09)	5/16-24 UNF-2B	5/16-18 UNC-2B	0.70	0.14	0.44	0.48	0.13
1-1/2" (17)	3/8-24 UNF-2B	3/8-16 UNC-2B	0.70	0.14	0.50	0.59	0.13
2" (31)	1/2-20 UNF-2B	1/2-13 UNC-2B	0.70	0.14	0.62	0.71	0.13
2-1/2" (50)	1/2-20 UNF-2B	1/2-13 UNC-2B	0.70	0.14	0.62	0.71	0.13
3" (70)	5/8-18 UNF-2B	5/8-11 UNC-2B	0.73	0.14	0.75	0.84	0.13
4" (125)	3/4-16 UNF-2B	3/4-10 UNC-2B	0.80	0.14	0.87	0.96	0.13

Stainless Steel Flat-1® Mounting Options and Dimensions (in)

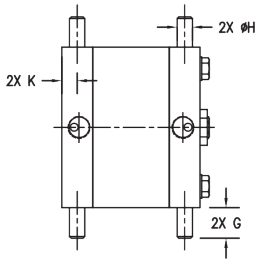
Pivot Mount (Option 1 or 1N)

Available in standard or 90˚
Complete with FDA compliant Pivot Bushing
Option 1 is shown; not available as an accessory



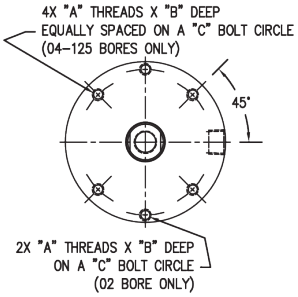
Trunnion Mount (Option 2, 2F, or 2R)

Available in Front, Rear, or Both Locations
Not available in 9/16" bore



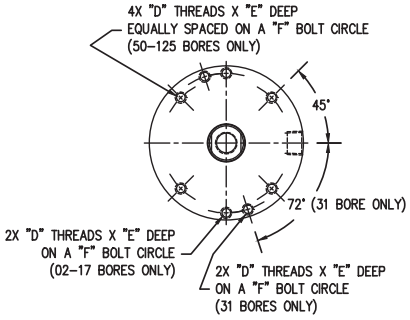
Threaded Mounting Holes (Option 3F and 3R)

Available in Front or Rear Locations



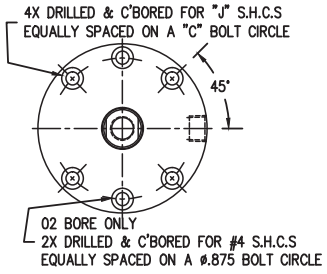
F Series Interchange Threaded Mounting Holes

(Option 7F and 7R) Available in Front or Rear Locations



Basic Model (Option 8)

Counterbored Mounting Holes Both Ends



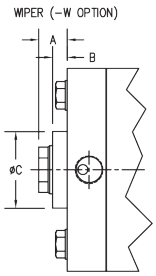
Mounting Option Dimensions

Bore	Front/Rear Mount															
	A	B	C	D	E	F	G	H	J	K	L	M	O	P	S	T
9/16" (02)*	#4-40 UNC-2B	0.22	0.88	#6-32 UNC-2B	0.20	0.88	N/A	N/A	#4	N/A	0.19	0.75	1.00	0.19	0.38	0.63
3/4" (04)	#6-32 UNC-2B	0.20	1.22	#8-32 UNC-2B	0.20	1.19	0.31	0.13	#6	0.17	0.19	0.75	1.00	0.19	0.38	0.75
1-1/16" (09)	#6-32 UNC-2B	0.36	1.69	#10-32 UNF-2B	0.30	1.69	0.50	0.25	#6	0.25	0.25	0.81	1.06	0.19	0.38	0.75
1-1/2" (17)	#10-24 UNC-2B	0.30	2.19	#10-32 UNF-2B	0.30	2.38	0.50	0.25	#10	0.25	0.25	1.19	1.63	0.38	0.75	1.38
2" (31)	#10-24 UNC-2B	0.33	2.69	1/4-20 UNC-2B	0.31	2.81	0.50	0.25	#10	0.25	0.31	1.25	1.69	0.38	0.75	1.38
2-1/2" (50)	1/4-20 UNC-2B	0.42	3.25	1/4-20 UNC-2B	0.42	3.25	0.63	0.31	1/4	0.33	0.38	1.31	1.75	0.38	0.75	1.38
3" (70)	1/4-20 UNC-2B	0.44	3.78	1/4-20 UNC-2B	0.44	3.81	0.63	0.31	1/4	0.33	0.38	1.69	2.25	0.63	1.00	1.88
4" (125)	5/16-18 UNC-2B	0.57	4.94	1/4-20 UNC-2B	0.59	5.00	0.75	0.38	5/16	0.42	0.44	1.75	2.31	0.63	1.00	1.88

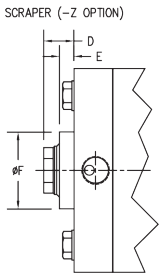
*=only 2 holes

Stainless Steel Flat-1® Cylinder Options and Dimensions (in)

Rod Wiper
(Option W)

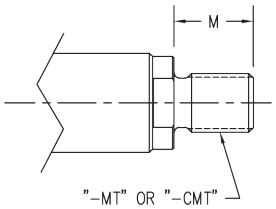


Metallic Rod Scraper
(Option Z)

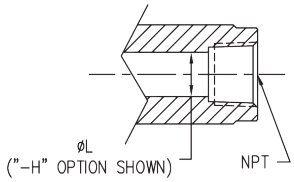


Bore	Wiper			Scraper		
	A	B	C	D	E	F
9/16" (02)	0.46	0.27	0.56	0.51	0.32	0.65
3/4" (04)	0.46	0.27	0.68	0.51	0.32	0.75
1-1/16" (09)	0.46	0.27	0.87	0.54	0.36	0.93
1-1/2" (17)	0.39	0.19	0.99	0.51	0.30	1.06
2" (31)	0.39	0.19	1.12	0.51	0.30	1.18
2-1/2" (50)	0.39	0.19	1.12	0.51	0.30	1.18
3" (70)	0.39	0.19	1.24	0.51	0.30	1.37
4" (125)	0.39	0.19	1.37	0.51	0.30	1.43

Male Rod End Dimension for MT or CMT Options



NPT Thread Dimensions for FOD Cylinders

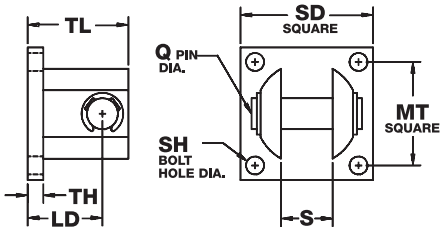


Bore	Rod Thread				
	Mt	Cmt	Npt	L	M
9/16" (02)	#8-32 UNC-2A	N/A	N/A	0.14	0.38
3/4" (04)	#10-32 UNF-2A	#10-24 UNC-2A	N/A	0.14	0.38
1-1/16" (09)	5/16-24 UNF-2A	5/16-18 UNC-2A	1/8 NPT	0.22	0.50
1-1/2" (17)	3/8-24 UNF-2A	3/8-16 UNC-2A	1/8 NPT	0.28	0.50
2" (31)	1/2-20 UNF-2A	1/2-13 UNC-2A	1/8 NPT	0.38	0.63
2-1/2" (50)	1/2-20 UNF-2A	1/2-13 UNC-2A	1/4 NPT	0.38	0.63
3" (70)	5/8-18 UNF-2A	5/8-11 UNC-2A	3/8 NPT	0.44	0.75
4" (125)	3/4-16 UNF-2A	3/4-10 UNC-2A	1/2 NPT	0.50	0.75

Stainless Steel Flat-1® Accessory Options and Dimensions (in)

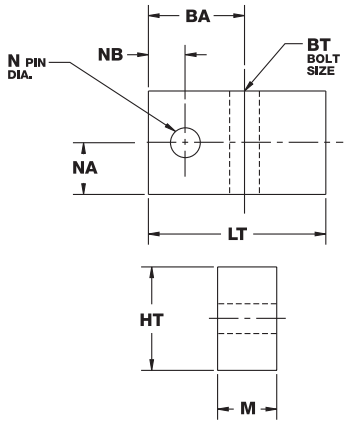
Stainless Steel Clevis Bracket complete with Stainless Steel Pin; Designed for use with Pivot Mounted Cylinder (Option 1 or 1N)

Bore	Model	LD	MT	Q	S	SH	SD	TH	TL
9/16" (02)	BC-1-SS	0.56	0.75	0.19	0.39	0.16	1.00	0.16	0.78
3/4" (04)	BC-1-SS	0.56	0.75	0.19	0.39	0.16	1.00	0.16	0.78
1-1/16" (09)	BC-1-SS	0.56	0.75	0.19	0.39	0.16	1.00	0.16	0.78
1-1/2" (17)	BC-2-SS	0.94	1.38	0.38	0.77	0.22	1.75	0.22	1.34
2" (31)	BC-2-SS	0.94	1.38	0.38	0.77	0.22	1.75	0.22	1.34
2-1/2" (50)	BC-2-SS	0.94	1.38	0.38	0.77	0.22	1.75	0.22	1.34
3" (70)	BC-3-SS	1.25	2.00	0.63	1.02	0.25	2.50	0.25	1.81
4" (125)	BC-3-SS	1.25	2.00	0.63	1.02	0.25	2.50	0.25	1.81



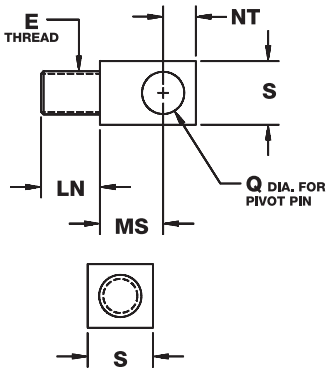
Stainless Steel Trunnion Bracket (2 pieces)

Bore	Model	BA	BT	HT	LT	M	N	NA	NB
3/4" (04)	BT-1-SS	0.56	0.22	0.62	1.13	0.31	0.13	0.30	0.22
1-1/16" (09)	BT-2-SS	0.81	0.28	0.87	1.50	0.50	0.25	0.38	0.31
1-1/2" (17)	BT-2-SS	0.81	0.28	0.87	1.50	0.50	0.25	0.38	0.31
2" (31)	BT-2-SS	0.81	0.28	0.87	1.50	0.50	0.25	0.38	0.31
2-1/2" (50)	BT-3-SS	0.94	0.34	0.98	1.63	0.63	0.32	0.45	0.38
3" (70)	BT-3-SS	0.94	0.34	0.98	1.63	0.63	0.32	0.45	0.38
4" (125)	BT-4-SS	1.06	0.41	1.23	1.88	0.75	0.38	0.55	0.44



Stainless Steel Rod Pivot; complete with Stainless Steel Nut

Bore	Model	E	LN	MS	NT	Q	S
9/16" (02)	RP-1/2-SS	#8-32 UNC	0.38	0.47	0.25	0.19	0.38
3/4" (04)	RP-1-SS	#10-32 UNF	0.38	0.47	0.25	0.19	0.38
1-1/16" (09)	RP-2-SS	5/16-24 UNF	0.63	0.47	0.25	0.19	0.38
1-1/2" (17)	RP-3-SS	3/8-24 UNF	0.63	0.72	0.44	0.38	0.75
2" (31)	RP-4-SS	1/2-20 UNF	0.75	0.72	0.44	0.38	0.75
2-1/2" (50)	RP-4-SS	1/2-20 UNF	0.75	0.72	0.44	0.38	0.75
3" (70)	RP-5-SS	5/8-18 UNF	0.88	1.00	0.63	0.63	1.00
4" (125)	RP-6-SS	3/4-16 UNF	0.88	1.00	0.63	0.63	1.00



The Model Number for all Stainless Steel Flat-1® cylinders consists of three alphanumeric clusters. These designate type, bore size, stroke length, and mounting and special options. Please refer to the charts below for an example of Model Number SSFO-170.25-1V. This is a stainless steel, double acting, 1-1/2" bore, 1/4" stroke, pivot mount cylinder with high temperature option.

Type	
SSFO	Stainless Steel Double Acting
SSFOD	Stainless Steel Double End Rod
SSFOR	Stainless Steel Reverse Acting
SSFOS	Stainless Steel Single Acting

Bore Size			
02	9/16"	31	2"
04	3/4"	50	2-1/2"
09	1-1/16"	70	3"
17	1-1/2"	125	4"

Stroke Length	
0.25	1/4"
0.375"	3/8"
ETC.	

SSFO - 17 0.25 - 1 V

Mounting Options	
Enter in numerical order	
1	Pivot mount
1N	Pivot mount 90° from standard
2	Trunnion both ends[1]
2F	Front trunnion mount[1]
2R	Rear trunnion[1]
3F	Threaded mounting holes, front
3R	Threaded mounting holes, rear
7F	F series interchange, threaded holes, front[2]
7R	F series interchange, threaded holes, rear[2]
8	Basic model (standard counterbored mounting holes, both ends)

[1] Not available in 9/16" bore
[2] Available in 02, 04, and 09 bores only

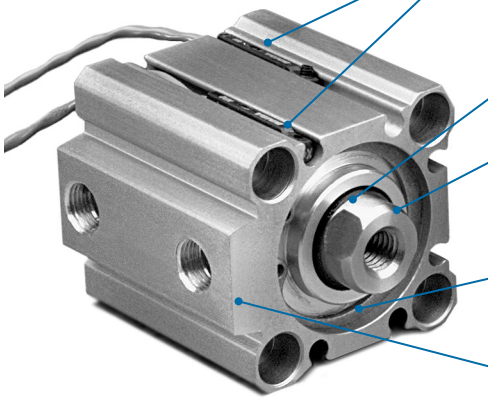
NOTE: To minimize catchpoints where application debris and bacteria may collect, mounting holes are present only where specified by part number. For example, when ordering the -3R option, you will receive threaded mounting holes on the rear cap. There will be NO mounting holes on the front cap.

Options	
Enter in numerical order, except for EE, which is last	
99	Oil pre-lube
B	Bumpers, both ends[1 2]
BF	Bumper, front only[1 2]
BR	Bumper, rear only[1 2]
CFT	Coarse female thread (fine thread standard) (see page 190)
CMT	Male rod end (coarse thread) (see page 192)
D	Low pressure hydraulic design (250 PSI maximum)
H	Hollow rod (FOD models only) (see page 192)
J	Failsafe operation, spring retract (FOD models)
L	Low friction seals (see table page 185 for length adders)
MT	Male rod end (fine thread) (see page 192)
NPT	Female NPT thread, both ends (FOD models only)[4]
NPTF	Female NPT thread, front (FOD models only) (see page 192)[4]
NPTR	Female NPT thread, rear (FOD models only) (see page 192)[4]
NT	Non-threaded rod
Q	Low temperature design (-40° F to 200° F)
SR	Stainless steel rod (no chrome plating)
V	High temperature option (0° F to 400° F)[2]
W	Rod wiper (Buna N only) (see page 192)
X	X-ring pistion seal[3]
Z	Metallic rod scraper (see page 192)
EE0.375	3/8" extra rod extension, etc.
EE1	1" extra rod extension, etc.

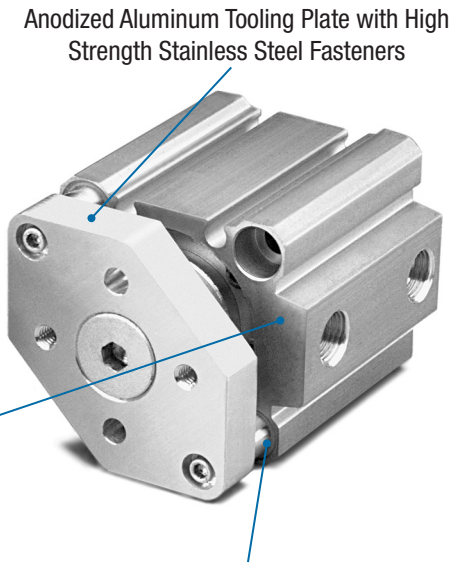
[1] There is no stroke reduction when the supply pressure is 80 PSI or greater. At 0 PSI, there will be a stroke reduction of approximately .040". Bumper compression is linear from 0 PSI to 80 PSI. FOS models have a rear bumper only, FOR models a front bumper only.
[2] Bumper material is rated to 200° F.
[3] Optional piston seal which may improve performance in certain short stroke applications where back pressure due to flow controls or reduced exhaust flow may exist.
[4] Must be ordered with Hollow Rod (H) option.

Product Features

EF Cylinder



EFT Cylinder



Not Pictured:

- Bronze Bushing (12-20mm); Self-lubricating Nylon (25-100mm)
- Bronze Rod Guide (12-20mm); Anodized Aluminum (25-100mm)
- Nitrile Rod Guide Seal
- Nitrile Piston Seal
- High Strength Aluminum Alloy Piston

The Bimba EF Series is a compact, aluminum-extruded body air cylinder designed for international machine requirements. The body is anodized in a special PTFE-impregnation process that provides superior wear characteristics. With its streamlined look, low cost and low-profile switch, it is an excellent choice for space-saving machine design.

Features and Benefits

- PTFE-impregnated, hard anodized aluminum body provides superior wear resistance. Expected service life is 2500 kilometers.
- Very compact; dimensionally-interchangeable with similar compact extruded aluminum body cylinders.
- Very low profile, compact switch slides into groove within cylinder geometry.
- EF1 cylinders are available in four models: double acting, single or double rod end; and single acting, spring return or extend, and EF2 cylinders are available in double acting, non-rotating.
- EFDT cylinders are available as a double acting, double ended, non-rotating rod cylinder to provide an additional operation feature from the cylinder rear.
- Both models are available in ten bore sizes from 12mm to 100mm.
- Wide variety of standard stroke lengths in 5mm increments; additional stroke lengths available.
- Standard cylinder is completely metric in design; with Option -E, threaded mounting options, rod threads and ports are in U.S. customary units (inch).
- Mounting options include threaded bottom mounting and threaded front/rear mounting option.
- Options include bumpers, ports and threaded mounting option and rod threads in U.S. customary units, magnetic position sensing, and high temperature seals.
- X option for EFT and EFDT cylinders only. This option increases stability by at least two times and up to 23 times depending on bore size. In addition, the X option more than doubles the maximum cylinder side load and moment!

EF1 Cylinder Options and Dimensions (in)

Bimba is a JIT manufacturer and we are able to provide EF model cylinders in *ANY 1mm of stroke length increment for all option styles within our standard three-day lead time. Longer stroke lengths are also available upon request at standard lead times. Please consult Technical Assistance at 800-44-BIMBA for help.

The table below represents our standard stroke lengths.

Stroke Length Availability

Nominal Bore Diameter	Double Acting		Single Acting	
	EF Single Rod End (mm)	EFD Double Rod End (mm)	EFS Single Acting Spring Retract (mm)	EFR* Reverse Acting Spring Extend (mm)
12mm (1/2")	5, 10, 15, 20, 25, 30	5, 10, 15, 20, 25, 30	5, 10	5, 10
16mm (5/8")	5, 10, 15, 20, 25, 30	5, 10, 15, 20, 25, 30	5, 10	5, 10
20mm (3/4")	5, 10, 15, 20, 25, 30, 35, 40, 45, 50	5, 10, 15, 20, 25, 30, 35, 40, 45, 50	5, 10	5, 10
25mm (1")	5, 10, 15, 20, 25, 30, 35, 40, 45, 50	5, 10, 15, 20, 25, 30, 35, 40, 45, 50	5, 10	5, 10
32mm (1-1/4")	5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100	5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100	5, 10	5, 10
40mm (1-1/2")	5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100	5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100	5, 10, 15, 20	5, 10
50mm (2")	10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100	10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100	10, 15, 20	10, 20
63mm (2-1/2")	10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100	10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100	10, 15, 20, 25	20, 25
80mm (3-1/4")	10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100	10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100	10, 15, 20, 25	20, 25
100mm (4")	10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100	10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100	N/A	N/A

*EFR style is only available as a standard with the strokes listed in the table above. Any other stroke length must be ordered as a special.

Engineering Specifications

Operating Medium:	Air
Maximum Operating Pressure:	10 bar (140 PSI)
Ambient and Fluid Temperature:	-10° C to 70° C (15° F to 160° F)
Lubrication:	PTFE impregnated grease
Standard Rod End:	Female
Stroke Tolerance:	12-50mm bore: ± .6mm (.025 inch)
	63-100mm bore: ± .8mm (.030 inch)
Cylinder Mounting (Standard):	Through hole with counterbores both ends
Cylinder Mounting (Optional):	Front and Rear threaded
	Side mount threaded
	Rear Clevis
Expected Service Life:	2500 kilometers (1500 miles)*

*For filtered, lubricated air, no-load conditions; if unlubricated, life is approximately 1/3.

EF1 Cylinder Options and Dimensions (in)

Maximum Side Loads kg-Force (lb)

Bore	Stroke Length					
	5mm	10mm	15mm	20mm	25mm	30mm
12mm (1/2")	0.27 (0.60)	0.22 (0.49)	0.19 (0.41)	0.16 (0.35)	0.14 (0.31)	0.12 (0.27)
16mm (5/8")	0.33 (0.73)	0.27 (0.59)	0.23 (0.50)	0.20 (0.43)	0.17 (0.38)	0.15 (0.34)
20mm (3/4")	0.34 (0.74)	0.27 (0.60)	0.23 (0.51)	0.20 (0.44)	0.18 (0.39)	0.16 (0.35)
25mm (1")	0.54 (1.18)	0.45 (0.99)	0.38 (0.85)	0.34 (0.74)	0.30 (0.66)	0.27 (0.59)
32mm (1-1/4")	1.28 (2.81)	1.08 (2.38)	0.94 (2.07)	0.83 (1.83)	0.74 (1.64)	0.67 (1.48)
40mm (1-1/2")	2.27 (4.99)	1.97 (4.34)	1.75 (3.84)	1.57 (3.44)	1.42 (3.12)	1.30 (2.85)
50mm (2")	N/A	2.40 (5.29)	2.13 (4.69)	1.92 (4.22)	1.74 (3.83)	1.60 (3.51)
63mm (2-1/2")	N/A	3.18 (6.99)	2.85 (6.27)	2.58 (5.69)	2.36 (5.20)	2.18 (4.80)
80mm (3-1/4")	N/A	5.94 (13.06)	5.41 (11.91)	4.97 (10.94)	4.60 (10.12)	4.28 (9.41)
100mm (4")	N/A	9.14 (20.10)	8.45 (18.58)	7.85 (17.28)	7.34 (16.14)	6.88 (15.15)

Bore	Stroke Length					
	35mm	40mm	45mm	50mm	75mm	100mm
12mm (1/2")	0.11 (0.25)	0.10 (0.23)	N/A	N/A	N/A	N/A
16mm (5/8")	0.14 (0.30)	0.13 (0.28)	N/A	N/A	N/A	N/A
20mm (3/4")	0.14 (0.32)	0.13 (0.29)	0.12 (0.27)	0.11 (0.25)	N/A	N/A
25mm (1")	0.24 (0.54)	0.22 (0.49)	0.21 (0.46)	0.19 (0.42)	N/A	N/A
32mm (1-1/4")	0.61 (1.35)	0.57 (1.25)	0.52 (1.15)	0.49 (1.07)	0.36 (0.80)	0.29 (0.64)
40mm (1-1/2")	1.19 (2.63)	1.11 (2.44)	1.03 (2.27)	0.97 (2.12)	0.73 (1.61)	0.59 (1.30)
50mm (2")	1.47 (3.24)	1.37 (3.01)	1.27 (2.80)	1.19 (2.63)	0.91 (2.00)	0.73 (1.61)
63mm (2-1/2")	2.02 (4.45)	1.88 (4.15)	1.76 (3.88)	1.66 (3.65)	1.28 (2.81)	1.04 (2.29)
80mm (3-1/4")	4.00 (8.79)	3.75 (8.25)	3.53 (7.78)	3.34 (7.35)	2.62 (5.77)	2.16 (4.75)
100mm (4")	6.48 (14.27)	6.13 (13.48)	5.81 (12.78)	5.52 (12.15)	4.43 (9.74)	3.69 (8.13)

EF1 Cylinder Options and Dimensions (in)

Theoretical Cylinder Forces

FORCE = Power Factor x Input Pressure

Bore	Direction	Power Factor* (When input pressure in bar)	Power Factor** (When input pressure in psi)
12mm (1/2")	Extend	1.1	(0.2)
	Retract	0.8	(0.1)
16mm (5/8")	Extend	2.0	(0.3)
	Retract	1.5	(0.2)
20mm (3/4")	Extend	3.1	(0.5)
	Retract	2.4	(0.4)
25mm (1")	Extend	4.9	(0.8)
	Retract	3.8	(0.6)
32mm (1-1/4")	Extend	8.0	(1.2)
	Retract	6.0	(0.9)
40mm (1-1/2")	Extend	12.6	(1.9)
	Retract	10.6	(1.6)
50mm (2")	Extend	19.6	(3.0)
	Retract	16.5	(2.6)
63mm (2-1/2")	Extend	31.2	(4.8)
	Retract	28.0	(4.3)
80mm (3-1/4")	Extend	50.3	(7.8)
	Retract	45.4	(7.0)
100mm (4")	Extend	78.5	(12.2)
	Retract	71.5	(11.1)

EF1 Cylinder Options and Dimensions (in)

Enclosed Spring Forces

Action	Bore	Compressed Spring Force N (lb)	Spring Rate N/mm (lb/in)
Spring Acting Spring Return	12mm (1/2")	12.8 (2.9)	0.8 (4.8)
	16mm (5/8")	16.0 (3.6)	1.0 (5.7)
	20mm (3/4")	18.1 (4.1)	1.2 (6.9)
	25mm (1")	21.4 (4.8)	1.1 (6.4)
	32mm (1-1/4")	22.2 (5.0)	0.8 (4.3)
	40mm (1-1/2")	33.1 (7.4)	0.9 (5.1)
	50mm (2")	53.8 (12.1)	1.2 (6.7)
	63mm (2-1/2")	89.0 (20.0)	2.1 (11.8)
	80mm (3-1/4")	106.8 (24.0)	2.3 (13.2)
	100mm (4")	N/A (N/A)	N/A (N/A)
Reverse Acting Spring Extend	12mm; 5mm stroke	10.9 (2.5)	1.6 (9.1)
	12mm; 10mm stroke	11.0 (2.5)	0.8 (4.6)
	16mm; 5mm stroke	20.7 (4.7)	3.4 (19.5)
	16mm; 10mm stroke	20.9 (4.7)	1.8 (10.3)
	20mm	27.3 (6.1)	2.3 (12.9)
	25mm	29.1 (6.5)	2.0 (11.2)
	32mm	26.6 (6.0)	0.9 (5.1)
	40mm	30.1 (6.8)	1.2 (7.1)
	50mm	81.9 (18.4)	2.9 (16.7)
	63mm; 20mm stroke	95.3 (21.4)	3.0 (16.7)
	63mm; 25mm stroke	95.3 (21.4)	2.4 (13.3)
	80mm; 20mm stroke	110.8 (24.9)	3.2 (17.8)
	80mm; 25mm stroke	110.9 (24.9)	2.5 (14.2)
	100mm	N/A (N/A)	N/A (N/A)

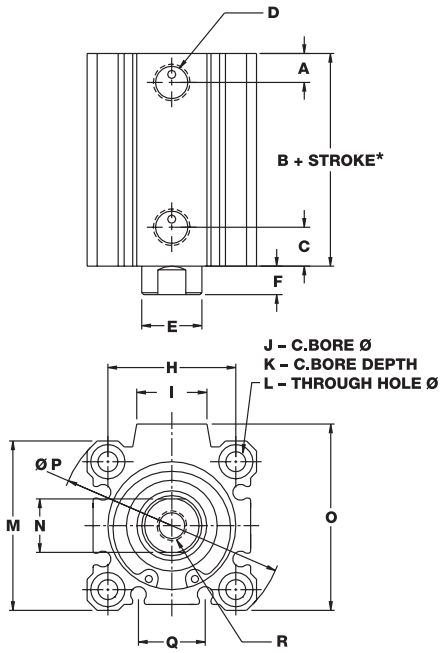
EF1 Cylinder Options and Dimensions (mm [in])

Double Acting/Single Rod

Bore	A	B	C	D	E	F	H
12mm (1/2")	3.8 (0.15)	17.0 (0.67)	8.9 (0.35)	M5 x 0.8 (#10-32)	6.0 (0.24)	3.5 (0.14)	15.5 (0.61)
16mm (5/8")	4.6 (0.18)	18.5 (0.73)	9.4 (0.37)	M5 x 0.8 (#10-32)	8.0 (0.31)	3.5 (0.14)	20.0 (0.79)
20mm (3/4")	4.8 (0.19)	19.5 (0.77)	9.4 (0.37)	M5 x 0.8 (#10-32)	10.0 (0.39)	4.5 (0.18)	25.5 (1.00)
25mm (1")	5.1 (0.20)	22.5 (0.89)	10.9 (0.43)	M5 x 0.8 (#10-32)	12.0 (0.47)	5.0 (0.20)	28.0 (1.10)
32mm (1-1/4")	7.1 (0.28)	23.0 (0.91)	10.4 (0.41)	G - 1/8 (NPT 1/8)	16.0 (0.63)	7.0 (0.28)	34.0 (1.34)
40mm (1-1/2")	7.4 (0.29)	29.5 (1.16)	13.2 (0.52)	G - 1/8 (NPT 1/8)	16.0 (0.63)	7.0 (0.28)	40.0 (1.57)
50mm (2")	9.4 (0.37)	30.5 (1.20)	13.7 (0.54)	G - 1/4 (NPT 1/4)	20.0 (0.79)	8.0 (0.31)	50.0 (1.97)
63mm (2-1/2")	9.7 (0.38)	36.0 (1.42)	15.7 (0.62)	G - 1/4 (NPT 1/4)	20.0 (0.79)	8.0 (0.31)	60.0 (2.36)
80mm (3-1/4")	11.7 (0.46)	43.5 (1.71)	17.8 (0.70)	G - 3/8 (NPT 3/8)	25.0 (0.98)	10.0 (0.39)	77.0 (3.03)
100mm (4")	12.2 (0.48)	53.0 (2.09)	24.4 (0.96)	G - 3/8 (NPT 3/8)	30.0 (1.18)	12.0 (0.47)	94.0 (3.70)

Bore	I	J	K	L	M	N	O
12mm (1/2")	N/A	6.1 (0.24)	3.5 (0.14)	3.5 (0.14)	25.0 (0.98)	5.0 (0.19)	25.0 (0.98)
16mm (5/8")	8.7 (0.34)	6.5 (0.26)	3.5 (0.14)	3.5 (0.14)	29.0 (1.14)	6.0 (0.25)	29.0 (1.14)
20mm (3/4")	9.5 (0.37)	9.0 (0.35)	7.0 (0.28)	5.5 (0.22)	36.0 (1.42)	8.0 (0.31)	36.0 (1.42)
25mm (1")	10.3 (0.41)	9.0 (0.35)	7.0 (0.28)	5.5 (0.22)	40.0 (1.57)	10.0 (0.38)	40.0 (1.57)
32mm (1-1/4")	18.5 (0.73)	9.0 (0.35)	7.0 (0.28)	5.5 (0.22)	45.0 (1.77)	14.0 (0.56)	49.5 (1.95)
40mm (1-1/2")	17.3 (0.68)	9.0 (0.35)	7.0 (0.28)	5.5 (0.22)	52.0 (2.05)	14.0 (0.56)	57.0 (2.24)
50mm (2")	20.0 (0.79)	11.1 (0.44)	8.0 (0.31)	6.9 (0.27)	64.0 (2.52)	17.0 (0.69)	71.0 (2.80)
63mm (2-1/2")	20.0 (0.79)	14.1 (0.56)	10.5 (0.41)	8.8 (0.35)	77.0 (3.03)	17.0 (0.69)	84.0 (3.31)
80mm (3-1/4")	26.0 (1.02)	17.5 (0.69)	13.5 (0.53)	11.0 (0.43)	98.0 (3.86)	22.0 (0.88)	104.0 (4.09)
100mm (4")	26.0 (1.02)	17.5 (0.69)	13.5 (0.53)	11.0 (0.43)	117.0 (4.61)	27.0 (1.06)	123.5 (4.86)

Bore	P	Q	R
12mm (1/2")	32.0 (1.26)	5.3 (0.21)	M3 x 0.5 6H (#8-32 UNC-2B)
16mm (5/8")	38.0 (1.50)	7.8 (0.31)	M4 x 0.7 6H (#8-32 UNC-2B)
20mm (3/4")	47.0 (1.85)	10.5 (0.41)	M5 x 0.8 6H (#10-32 UNF-2B)
25mm (1")	52.0 (2.05)	11.5 (0.45)	M6 x 1.0 6H (1/4-28 UNF-2B)
32mm (1-1/4")	60.0 (2.36)	17.7 (0.70)	M8 x 1.25 6H (5/16-24 UNF-2B)
40mm (1-1/2")	69.0 (2.72)	24.5 (0.96)	M8 x 1.25 6H (3/8-24 UNF-2B)
50mm (2")	86.0 (3.39)	29.3 (1.16)	M10 x 1.5 6H (1/2-20 UNF-2B)
63mm (2-1/2")	103.0 (4.06)	29.1 (1.15)	M10 x 1.5 6H (1/2-20 UNF-2B)
80mm (3-1/4")	132.0 (5.20)	28.1 (1.11)	M16 x 2.0 6H (5/8-18 UNF-2B)
100mm (4")	156.0 (6.14)	32.3 (1.27)	M20 x 2.5 6H (3/4-16 UNF-2B)



*See page 205 for overall body length with MRS option.

When option E is specified, user interface threads are designated U.S. customary (inch).
This includes ports, rod threads and threaded mounting options (as applicable).

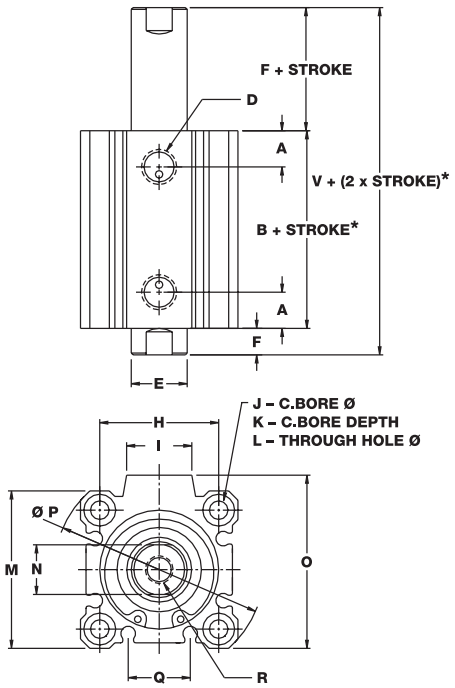
EF1 Cylinder Options and Dimensions (mm [in])

Double Acting/Double Rod

Bore	A	B	D	E	F	H	I
12mm (1/2")	10.6 (0.42)	25.2 (0.99)	M5 x 0.8 (#10-32)	6.0 (0.24)	3.5 (0.14)	15.5 (0.61)	N/A
16mm (5/8")	10.7 (0.42)	26.0 (1.03)	M5 x 0.8 (#10-32)	8.0 (0.31)	3.5 (0.14)	20.0 (0.79)	8.7 (0.34)
20mm (3/4")	10.1 (0.40)	26.0 (1.03)	M5 x 0.8 (#10-32)	10.0 (0.39)	4.5 (0.18)	25.5 (1.00)	9.5 (0.37)
25mm (1")	11.2 (0.44)	29.0 (1.14)	M5 x 0.8 (#10-32)	12.0 (0.47)	5.0 (0.20)	28.0 (1.10)	10.3 (0.41)
32mm (1-1/4")	8.9 (0.35)	30.5 (1.20)	G - 1/8 (NPT 1/8)	16.0 (0.63)	7.0 (0.28)	34.0 (1.34)	18.5 (0.73)
40mm (1-1/2")	13.1 (0.52)	40.0 (1.58)	G - 1/8 (NPT 1/8)	16.0 (0.63)	7.0 (0.28)	40.0 (1.57)	17.3 (0.68)
50mm (2")	12.2 (0.48)	40.5 (1.60)	G - 1/4 (NPT 1/4)	20.0 (0.79)	8.0 (0.31)	50.0 (1.97)	20.0 (0.79)
63mm (2-1/2")	12.8 (0.50)	42.0 (1.66)	G - 1/4 (NPT 1/4)	20.0 (0.79)	8.0 (0.31)	60.0 (2.36)	20.0 (0.79)
80mm (3-1/4")	14.4 (0.57)	51.0 (2.01)	G - 3/8 (NPT 3/8)	25.0 (0.98)	10.0 (0.39)	77.0 (3.03)	26.0 (1.02)
100mm (4")	18.3 (0.72)	60.5 (2.32)	G - 3/8 (NPT 3/8)	30.0 (1.18)	12.0 (0.47)	94.0 (3.70)	26.0 (1.02)

Bore	J	K	L	M	N	O	P
12mm (1/2")	6.1 (0.24)	3.5 (0.14)	3.5 (0.14)	25.0 (0.98)	5.0 (0.19)	25.0 (0.98)	32.0 (1.26)
16mm (5/8")	6.5 (0.26)	3.5 (0.14)	3.5 (0.14)	29.0 (1.14)	6.0 (0.25)	29.0 (1.14)	38.0 (1.50)
20mm (3/4")	9.0 (0.35)	7.0 (0.28)	5.5 (0.22)	36.0 (1.42)	8.0 (0.31)	36.0 (1.42)	47.0 (1.85)
25mm (1")	9.0 (0.35)	7.0 (0.28)	5.5 (0.22)	40.0 (1.57)	10.0 (0.38)	40.0 (1.57)	52.0 (2.05)
32mm (1-1/4")	9.0 (0.35)	7.0 (0.28)	5.5 (0.22)	45.0 (1.77)	14.0 (0.56)	49.5 (1.95)	60.0 (2.36)
40mm (1-1/2")	9.0 (0.35)	7.0 (0.28)	5.5 (0.22)	52.0 (2.05)	14.0 (0.56)	57.0 (2.24)	69.0 (2.72)
50mm (2")	11.1 (0.44)	8.0 (0.31)	6.9 (0.27)	64.0 (2.52)	17.0 (0.69)	71.0 (2.80)	86.0 (3.39)
63mm (2-1/2")	14.1 (0.56)	10.5 (0.41)	8.8 (0.35)	77.0 (3.03)	17.0 (0.69)	84.0 (3.31)	103.0 (4.06)
80mm (3-1/4")	17.5 (0.69)	13.5 (0.53)	11.0 (0.43)	98.0 (3.86)	22.0 (0.88)	104.0 (4.09)	132.0 (5.20)
100mm (4")	17.5 (0.69)	13.5 (0.53)	11.0 (0.43)	117.0 (4.61)	27.0 (1.06)	123.5 (4.86)	156.0 (6.14)

Bore	Q	R	V
12mm (1/2")	5.3 (0.21)	M3 x 0.5 6H (#8-32 UNC-2B)	32.4 (1.27)
16mm (5/8")	7.8 (0.31)	M4 x 0.7 6H (#8-32 UNC-2B)	33.2 (1.31)
20mm (3/4")	10.5 (0.41)	M5 x 0.8 6H (#10-32 UNF-2B)	35.2 (1.39)
25mm (1")	11.5 (0.45)	M6 x 1.0 6H (1/4-28 UNF-2B)	39.2 (1.54)
32mm (1-1/4")	17.7 (0.70)	M8 x 1.25 6H (5/16-24 UNF-2B)	44.7 (1.76)
40mm (1-1/2")	24.5 (0.96)	M8 x 1.25 6H (3/8-24 UNF-2B)	54.2 (2.14)
50mm (2")	29.3 (1.16)	M10 x 1.5 6H (1/2-20 UNF-2B)	56.3 (2.22)
63mm (2-1/2")	29.1 (1.15)	M10 x 1.5 6H (1/2-20 UNF-2B)	57.8 (2.28)
80mm (3-1/4")	28.1 (1.11)	M16 x 2.0 6H (5/8-18 UNF-2B)	70.8 (2.79)
100mm (4")	32.3 (1.27)	M20 x 2.5 6H (3/4-16 UNF-2B)	84.3 (3.26)



*See page 205 for overall body length with MRS option.

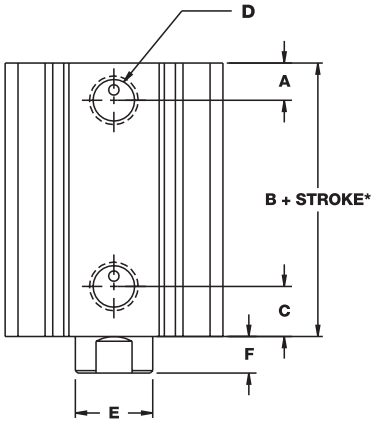
When option E is specified, user interface threads are designated U.S. customary (inch). This includes ports, rod threads and threaded mounting options (as applicable).

EF1 Cylinder Options and Dimensions (mm [in])

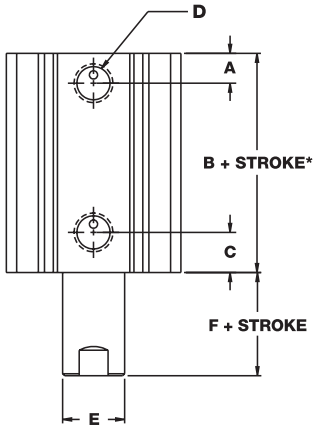
Spring Retract/Spring Extend

Bore	A	B	C	D	E	F
12mm (1/2")	3.8 (0.15)	17.0 (0.67)	8.9 (0.35)	M5 x 0.8 (#10-32)	6.0 (0.24)	3.5 (0.14)
16mm (5/8")	4.6 (0.18)	18.5 (0.73)	9.4 (0.37)	M5 x 0.8 (#10-32)	8.0 (0.31)	3.5 (0.14)
20mm (3/4")	4.8 (0.19)	19.5 (0.77)	9.4 (0.37)	M5 x 0.8 (#10-32)	10.0 (0.39)	4.5 (0.18)
25mm (1")	5.1 (0.20)	22.5 (0.89)	10.9 (0.43)	M5 x 0.8 (#10-32)	12.0 (0.47)	5.0 (0.20)
32mm (1-1/4")	7.1 (0.28)	23.0 (0.91)	10.4 (0.41)	G - 1/8 (NPT 1/8)	16.0 (0.63)	7.0 (0.28)
40mm (1-1/2")	7.4 (0.29)	29.5 (1.16)	13.2 (0.52)	G - 1/8 (NPT 1/8)	16.0 (0.63)	7.0 (0.28)
50mm (2")	9.4 (0.37)	30.5 (1.20)	13.7 (0.54)	G - 1/4 (NPT 1/4)	20.0 (0.79)	8.0 (0.31)
63mm (2-1/2")	9.7 (0.38)	36.0 (1.42)	15.7 (0.62)	G - 1/4 (NPT 1/4)	20.0 (0.79)	8.0 (0.31)
80mm (3-1/4")	11.7 (0.46)	43.5 (1.71)	17.8 (0.70)	G - 3/8 (NPT 3/8)	25.0 (0.98)	10.0 (0.39)

Spring Retract
(Model EFS)



Spring Extend
(Model EFR)



*See page 205 for overall body length with MRS option.

When option E is specified, user interface threads are designated U.S. customary (inch). This includes ports, rod threads and threaded mounting options (as applicable).

Weights

Bore	Approximate Base Weight of Cylinder gram-force (oz)	Weight Adder per 5mm of Stroke gram-force (oz)
12mm (1/2")	21.8 (0.77)	5.6 (0.20)
16mm (5/8")	38.7 (1.36)	8.0 (0.28)
20mm (3/4")	46.4 (1.64)	11.5 (0.41)
25mm (1")	73.1 (2.58)	14.6 (0.52)
32mm (1-1/4")	113.3 (4.00)	20.9 (0.74)
40mm (1-1/2")	181.4 (6.40)	21.3 (0.75)
50mm (2")	294.0 (10.37)	33.6 (1.19)
63mm (2-1/2")	484.5 (17.09)	40.7 (1.44)
80mm (3-1/4")	885.2 (31.23)	62.6 (2.21)
100mm (4")	1885.9 (66.52)	110.1 (3.89)

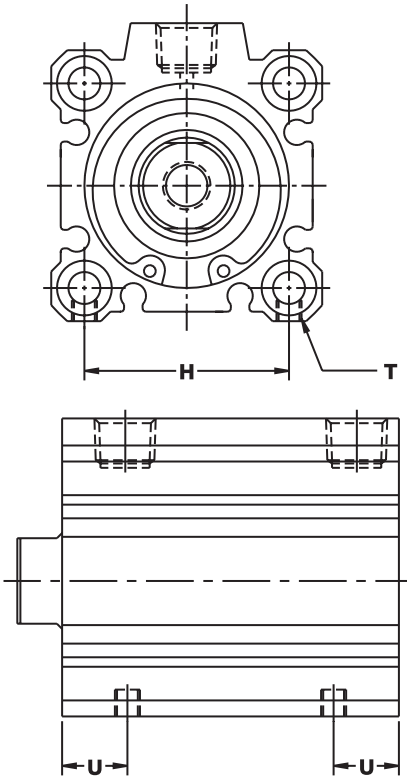
EF1 Cylinder Options and Dimensions (mm [in])

Mounting Options

Threaded Bottom Mount (-1) (EF1 models only)

Bore	H	T	U
12mm (1/2")	15.5 (0.61)	M4 x 0.7 6H (8-32 UNC-2B)	6.6 (0.26)
16mm (5/8")	20.0 (0.79)	M4 x 0.7 6H (8-32 UNC-2B)	6.6 (0.26)
20mm (3/4")	25.5 (1.00)	M6 x 1.0 6H (1/4-20 UNC-2B)	11.2 (0.44)
25mm (1")	28.0 (1.10)	M6 x 1.0 6H (1/4-20 UNC-2B)	11.2 (0.44)
32mm (1-1/4")	34.0 (1.34)	M6 x 1.0 6H (1/4-20 UNC-2B)	11.2 (0.44)
40mm (1-1/2")	40.0 (1.57)	M6 x 1.0 6H (1/4-20 UNC-2B)	11.2 (0.44)
50mm (2")	50.0 (1.97)	M8 x 1.25 6H (5/16-18 UNC-2B)	13.0 (0.51)
63mm (2-1/2")	60.0 (2.36)	M10 x 1.5 6H (7/16-14 UNC-2B)	16.8 (0.66)
80mm (3-1/4")	77.0 (3.03)	M12 x 1.75 6H (1/2-13 UNC-2B)	20.8 (0.82)
100mm (4")	94.0 (3.70)	M12 x 1.75 6H (1/2-13 UNC-2B)	20.8 (0.82)

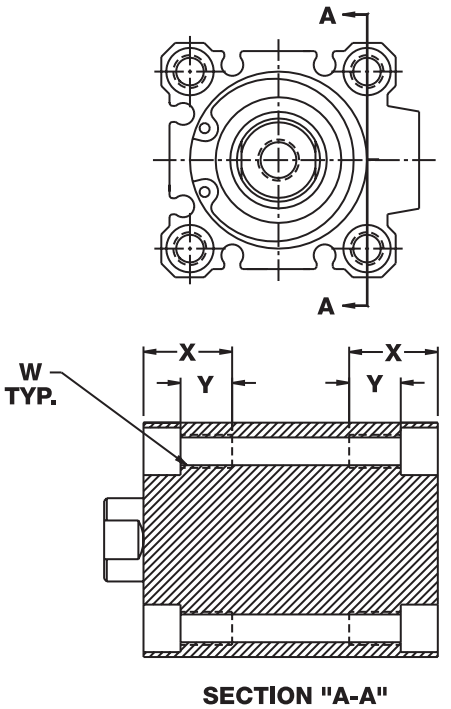
NOTE: On the following models, only the front set of threaded bottom mounting holes is provided; EF-205, EF-2010, EF-255, EF-325, EF-8010.



Threaded Front/Rear Mount (-3)

Bore	W	X	Y
12mm (1/2")	M4 x 0.7 (8-32 UNC)	10.5 (0.41)	7.0 (0.28)
16mm (5/8")	M4 x 0.7 (8-32 UNC)	10.5 (0.41)	7.0 (0.28)
20mm (3/4")	M6 x 1.0 (1/4-20 UNC)	17.0 (0.67)	10.0 (0.39)
25mm (1")	M6 x 1.0 (1/4-20 UNC)	17.0 (0.67)	10.0 (0.39)
32mm (1-1/4")	M6 x 1.0 (1/4-20 UNC)	17.0 (0.67)	10.0 (0.39)
40mm (1-1/2")	M6 x 1.0 (1/4-20 UNC)	17.0 (0.67)	10.0 (0.39)
50mm (2")	M8 x 1.25 (5/16-18 UNC)	22.0 (0.87)	14.0 (0.55)
63mm (2-1/2")	M10 x 1.5 (7/16-14 UNC)	28.5 (1.12)	18.0 (0.71)
80mm (3-1/4")	M12 x 1.75 (1/2-13 UNC)	35.6 (1.40)	22.0 (0.87)
100mm (4")	M12 x 1.75 (1/2-13 UNC)	35.6 (1.40)	22.0 (0.87)

NOTE: On EFT models, there are two threaded holes per end, not four.



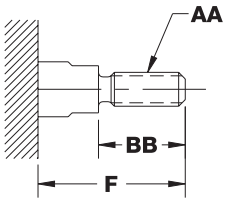
SECTION "A-A"

EF1 Cylinder Options and Dimensions (mm [in])

Options

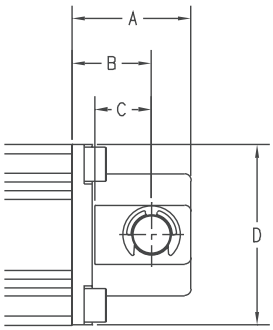
Male Rod End (MT)

Bore	Standard			With Option E		
	AA	BB	F	AA	BB	F
12mm (1/2")	M5 x 0.80	10.5 (0.41)	14.0 (0.55)	#8-32 UNC	8.0 (0.31)	11.5 (0.45)
16mm (5/8")	M6 x 1.00	12.0 (0.47)	15.5 (0.61)	#8-32 UNC	8.0 (0.31)	11.5 (0.45)
20mm (3/4")	M8 x 1.25	14.0 (0.55)	18.5 (0.73)	#10-32 UNF	8.0 (0.31)	12.5 (0.49)
25mm (1")	M10 x 1.25	17.5 (0.69)	22.5 (0.89)	1/4-28 UNF	9.5 (0.37)	14.5 (0.57)
32mm (1-1/4")	M14 x 1.5	23.5 (0.93)	28.5 (1.12)	5/16-24 UNF	12.7 (0.50)	19.7 (0.78)
40mm (1-1/2")	M14 x 1.5	23.5 (0.93)	28.5 (1.12)	3/8-24 UNF	16.0 (0.63)	23.0 (0.91)
50mm (2")	M18 x 1.5	28.5 (1.12)	33.5 (1.32)	1/2-20 UNF	19.5 (0.77)	27.5 (1.08)
63mm (2-1/2")	M18 x 1.5	28.5 (1.12)	33.5 (1.32)	1/2-20 UNF	19.5 (0.77)	27.5 (1.08)
80mm (3-1/4")	M22 x 1.5	35.5 (1.40)	43.5 (1.71)	5/8-18 UNF	25.5 (1.00)	35.5 (1.40)
100mm (4")	M26 x 1.5	32.5 (1.28)	43.5 (1.71)	3/4-16 UNF	28.5 (1.12)	40.5 (1.59)

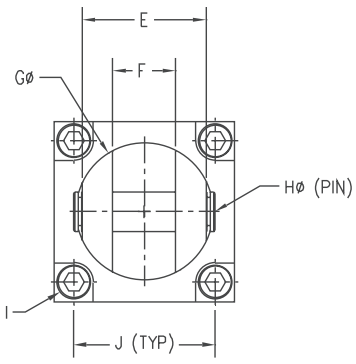


Rear Clevis Mount (6, 6N)

Stroke	A	B	C	D	E	F
12m	20 (0.79)	14 (0.55)	7 (0.28)	25 (0.98)	10 (0.39)	5 (0.21)
16m	21 (0.83)	15 (0.59)	10 (0.39)	29 (1.14)	12 (0.47)	7 (0.27)
20m	27 (1.06)	18 (0.71)	12 (0.47)	36 (1.41)	16 (0.62)	8 (0.33)
25m	30 (1.18)	20 (0.79)	14 (0.55)	40 (1.57)	20 (0.78)	10 (0.41)
32m	30 (1.18)	20 (0.79)	14 (0.55)	45 (1.77)	36 (1.41)	18 (0.72)
40m	32 (1.26)	22 (0.87)	14 (0.55)	52 (2.04)	36 (1.41)	18 (0.72)
50m	42 (1.65)	28 (1.10)	20 (0.79)	64 (2.52)	44 (1.72)	22 (0.87)
63m	44 (1.73)	30 (1.18)	20 (0.79)	77 (3.03)	44 (1.72)	22 (0.87)
80m	56 (2.21)	38 (1.50)	27 (1.06)	98 (3.85)	56 (2.20)	28 (1.11)
100m	67 (2.64)	45 (1.77)	31 (1.22)	117 (4.60)	64 (2.51)	32 (1.27)



Bore	G	HØ (PIN)	I	J
12mm	13 (0.51)	5 (0.197)	M4x0.7 (#8-32 UNC)	15.5 (0.61)
16mm	15 (0.58)	5 (0.197)	M4x0.7 (#8-32 UNC)	20 (0.79)
20mm	21 (0.82)	8 (0.315)	M6x1.0 (1/4-20 UNC)	25.5 (1.00)
25mm	22 (0.85)	10 (0.394)	M6x1.0 (1/4-20 UNC)	28 (1.10)
32mm	39 (1.53)	10 (0.394)	M6x1.0 (1/4-20 UNC)	34 (1.34)
40mm	39 (1.53)	10 (0.394)	M6x1.0 (1/4-20 UNC)	40 (1.58)
50mm	49 (1.91)	14 (0.551)	M8x1.25 (5/16-18 UNC)	50 (1.97)
63mm	49 (1.91)	14 (0.551)	M10x1.5 (7/16-14 UNC)	60 (2.36)
80mm	62 (2.44)	18 (0.709)	M12x1.75 (1/2-13 UNC)	77 (3.03)
100mm	72 (2.84)	22 (0.866)	M12x1.75 (1/2-13 UNC)	94 (3.70)

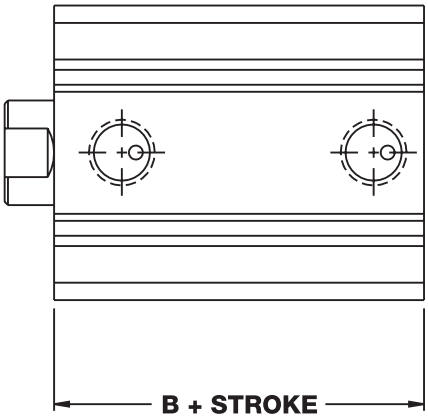


EF1 Cylinder Options and Dimensions (mm [in])

Options

Magnetic Position Sensing (M)
(Body Lengths With MRS Option)

Bore	B	
	Double Acting Single Rod	Double Acting Double Rod
12mm (1/2")	27.0 (1.06)	32.4 (1.28)
16mm (5/8")	28.5 (1.12)	36.0 (1.42)
20mm (3/4")	29.5 (1.16)	36.0 (1.42)
25mm (1")	32.5 (1.28)	39.0 (1.54)
32mm (1-1/4")	33.0 (1.30)	40.5 (1.59)
40mm (1-1/2")	39.5 (1.56)	50.0 (1.97)
50mm (2")	40.5 (1.59)	50.5 (1.99)
63mm (2-1/2")	46.0 (1.81)	52.0 (2.05)
80mm (3-1/4")	53.5 (2.11)	61.0 (2.40)
100mm (4")	63.0 (2.48)	70.5 (2.78)



Bumpers
(Stroke reduction by model for all bores)

Model	Stroke Reduction mm (in)
Double Acting Single Rod End Double Acting Double Rod End	3.0 (.12)
Single Acting Spring Retract Reverse Acting Spring Extend	1.5 (.06)

EF2 Cylinder Stroke Length Availability

Bimba is a JIT manufacturer and we are able to provide EFT model cylinders in ANY 1mm or stroke length increment for all option styles within our standard three-day lead time. Longer stroke lengths are also available upon request at standard lead times. Please consult Technical Assistance at 800-44-BIMBA for help.

Nominal Bore Diameter	EFT Single Rod End (mm)
12mm (1/2")	5, 10, 15, 20, 25, 30
16mm (5/8")	5, 10, 15, 20, 25, 30
20mm (3/4")	5, 10, 15, 20, 25, 30, 35, 40, 45, 50
25mm (1")	5, 10, 15, 20, 25, 30, 35, 40, 45, 50
32mm (1-1/4")	5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100
40mm (1-1/2")	5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100
50mm (2")	10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100
63mm (2-1/2")	10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100
80mm (3-1/4")	10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100
100mm (4")	10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100

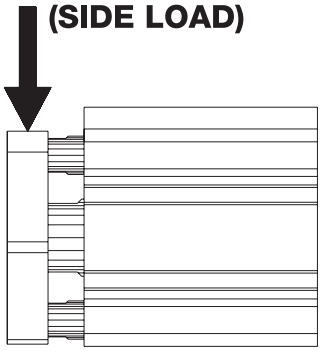
EF2 Cylinder Options and Dimensions

EFT Cylinders

Maximum Side Loads kg-Force (lb)

Bore	Stroke Length						
	5mm	10mm	15mm	20mm	25mm	30mm	35mm
12mm (1/2")	1.79 (3.94)	1.47 (3.24)	1.25 (2.75)	1.08 (2.39)	0.96 (2.11)	0.86 (1.89)	N/A
16mm (5/8")	2.60 (5.72)	2.16 (4.76)	1.85 (4.08)	1.62 (3.57)	1.44 (3.17)	1.30 (2.86)	N/A
20mm (3/4")	5.09 (11.23)	4.36 (9.62)	3.82 (8.42)	3.39 (7.48)	3.06 (6.74)	2.78 (6.13)	2.55 (5.62)
25mm (1")	5.22 (11.50)	4.48 (9.88)	3.93 (8.66)	3.50 (7.71)	3.15 (6.94)	2.86 (6.32)	2.63 (5.80)
32mm (1-1/4")	5.54 (12.22)	4.80 (10.59)	4.24 (9.35)	3.80 (8.37)	3.44 (7.58)	3.14 (6.91)	2.89 (6.36)
40mm (1-1/2")	6.53 (14.40)	5.69 (12.55)	5.04 (11.12)	4.53 (9.98)	4.11 (9.06)	3.76 (8.28)	3.47 (7.64)
50mm (2")	N/A	8.94 (19.71)	8.03 (17.71)	7.30 (16.09)	6.68 (14.74)	6.17 (13.60)	5.73 (12.62)
63mm (2-1/2")	N/A	14.49 (31.95)	13.16 (29.01)	12.06 (26.58)	11.12 (24.51)	10.32 (22.76)	9.63 (21.23)
80mm (3-1/4")	N/A	23.59 (52.02)	21.70 (47.85)	20.09 (44.30)	18.71 (41.24)	17.50 (38.58)	16.43 (36.23)
100mm (4")	N/A	26.22 (57.80)	24.24 (53.45)	22.55 (49.71)	21.07 (46.46)	19.78 (43.61)	18.64 (41.08)

Bore	Stroke Length				
	40mm	45mm	50mm	75mm	100mm
12mm (1/2")	N/A	N/A	N/A	N/A	N/A
16mm (5/8")	N/A	N/A	N/A	N/A	N/A
20mm (3/4")	2.35 (5.19)	2.19 (4.82)	2.04 (4.50)	N/A	N/A
25mm (1")	2.43 (5.35)	2.26 (4.98)	2.11 (4.64)	N/A	N/A
32mm (1-1/4")	2.68 (5.90)	2.49 (5.48)	2.33 (5.13)	1.76 (3.89)	1.42 (3.13)
40mm (1-1/2")	3.22 (7.09)	3.00 (6.60)	2.80 (6.18)	2.13 (4.70)	1.72 (3.79)
50mm (2")	5.34 (11.78)	5.01 (11.03)	4.71 (10.39)	3.64 (8.02)	2.96 (6.53)
63mm (2-1/2")	9.03 (19.90)	8.49 (18.72)	8.02 (17.67)	6.27 (13.82)	5.15 (11.35)
80mm (3-1/4")	15.49 (34.16)	14.66 (32.32)	13.91 (30.66)	11.07 (24.40)	9.19 (20.27)
100mm (4")	17.61 (38.83)	16.70 (36.82)	15.88 (35.00)	12.74 (28.08)	10.63 (23.44)



Maximum Moments N-m (in-lb)

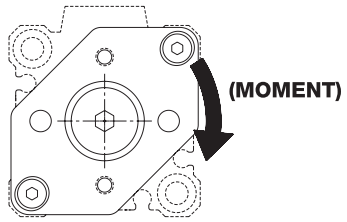
Bore	Stroke Length						
	5mm	10mm	15mm	20mm	25mm	30mm	35mm
12mm (1/2")	0.08 (0.72)	0.07 (0.59)	0.06 (0.50)	0.05 (0.44)	0.04 (0.39)	0.04 (0.35)	N/A
16mm (5/8")	0.16 (1.39)	0.13 (1.16)	0.11 (1.00)	0.10 (0.87)	0.09 (0.78)	0.08 (0.70)	N/A
20mm (3/4")	0.42 (3.72)	0.36 (3.20)	0.32 (2.81)	0.28 (2.50)	0.25 (2.25)	0.23 (2.05)	0.21 (1.88)
25mm (1")	0.45 (4.02)	0.39 (3.46)	0.34 (3.04)	0.31 (2.71)	0.28 (2.45)	0.25 (2.23)	0.23 (2.05)
32mm (1-1/4")	0.50 (4.45)	0.44 (3.88)	0.39 (3.44)	0.35 (3.09)	0.32 (2.81)	0.29 (2.57)	0.27 (2.37)
40mm (1-1/2")	0.59 (5.24)	0.52 (4.57)	0.46 (4.05)	0.41 (3.64)	0.37 (3.31)	0.34 (3.03)	0.32 (2.79)
50mm (2")	N/A	1.13 (10.04)	1.02 (9.06)	0.93 (8.26)	0.86 (7.59)	0.79 (7.02)	0.74 (6.53)
63mm (2-1/2")	N/A	2.35 (20.84)	2.15 (18.99)	1.97 (17.44)	1.82 (16.13)	1.69 (15.00)	1.58 (14.01)
80mm (3-1/4")	N/A	4.72 (41.75)	4.35 (38.51)	4.04 (35.75)	3.77 (33.35)	3.53 (31.25)	3.32 (29.41)
100mm (4")	N/A	5.57 (49.33)	5.16 (45.63)	4.79 (42.44)	4.48 (39.67)	4.21 (37.24)	3.96 (35.09)

EF2 Cylinder Options and Dimensions

EFT Cylinders

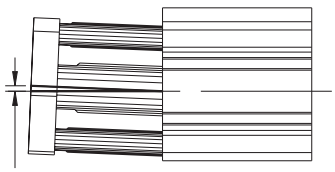
Maximum Moments N-m (in-lb)

Bore	Stroke Length				
	40mm	45mm	50mm	75mm	100mm
12mm (1/2")	N/A	N/A	N/A	N/A	N/A
16mm (5/8")	N/A	N/A	N/A	N/	N/A
20mm 3/4")	0.20 (1.74)	0.18 (1.62)	0.17 (1.51)	N/A	N/A
25mm (1")	0.21 (1.89)	0.20 (1.76)	0.19 (1.64)	N/A	N/A
32mm (1-1/4")	0.25 (2.20)	0.23 (2.05)	0.22 (1.92)	0.16 (1.46)	0.13 (1.18)
40mm (1-1/2")	0.29 (2.59)	0.27 (2.41)	0.26 (2.26)	0.19 (1.72)	0.16 (1.39)
50mm (2")	0.69 (6.11)	0.65 (5.73)	0.61 (5.40)	0.47 (4.19)	0.39 (3.42)
63mm (2-1/2")	1.49 (13.15)	1.40 (12.39)	1.32 (11.71)	1.04 (9.19)	0.85 (7.57)
80mm (3-1/4")	3.14 (27.77)	2.97 (26.30)	2.82 (24.98)	2.26 (19.96)	1.88 (16.63)
100mm (4")	3.75 (33.17)	3.55 (31.45)	3.38 (29.90)	2.71 (24.00)	2.26 (20.04)



Tooling Plate End Play mm (in)

Bore	Stroke Length						
	5mm	10mm	15mm	20mm	25mm	30mm	35mm
12mm (1/2")	0.17 (.007)	0.21 (.008)	0.25 (.010)	0.29 (.012)	0.34 (.013)	0.38 (.015)	N/A
16mm (5/8")	0.18 (.007)	0.23 (.009)	0.27 (.011)	0.32 (.012)	0.36 (.014)	0.41 (.016)	N/A
20mm (3/4")	0.15 (.006)	0.18 (.007)	0.20 (.008)	0.23 (.009)	0.26 (.010)	0.29 (.011)	0.32 (.013)
25mm (1")	0.16 (.006)	0.19 (.007)	0.22 (.008)	0.24 (.010)	0.27 (.011)	0.30 (.012)	0.33 (.013)
32mm (1-1/4")	0.17 (.007)	0.20 (.008)	0.23 (.009)	0.26 (.010)	0.28 (.011)	0.31 (.012)	0.34 (.013)
40mm (1-1/2")	0.17 (.007)	0.20 (.008)	0.23 (.009)	0.26 (.010)	0.28 (.011)	0.31 (.012)	0.34 (.013)
50mm (2")	N/A	0.26 (.010)	0.30 (.012)	0.33 (.013)	0.36 (.014)	0.40 (.016)	0.43 (.017)
63mm (2-1/2")	N/A	0.18 (.007)	0.20 (.008)	0.22 (.009)	0.24 (.010)	0.26 (.010)	0.28 (.011)
80mm (3-1/4")	N/A	0.20 (.008)	0.23 (.009)	0.25 (.010)	0.27 (.011)	0.29 (.011)	0.31 (.012)
100mm (4")	N/A	0.21 (.008)	0.23 (.009)	0.26 (.010)	0.28 (.011)	0.30 (.012)	0.32 (.013)



Bore	Stroke Length				
	40mm	45mm	50mm	75mm	100mm
12mm (1/2")	N/A	N/A	N/A	N/A	N/A
16mm (5/8")	N/A	N/A	N/A	N/A	N/A
20mm (3/4")	0.35 (.014)	0.38 (.015)	0.40 (.016)	N/A	N/A
25mm (1")	0.36 (.014)	0.39 (.015)	0.42 (.016)	N/A	N/A
32mm (1-1/4")	0.37 (.015)	0.40 (.016)	0.43 (.017)	0.57 (.022)	0.71 (.028)
40mm (1-1/2")	0.37 (.015)	0.40 (.016)	0.43 (.017)	0.57 (.022)	0.71 (.028)
50mm (2")	0.46 (.018)	0.50 (.020)	0.53 (.021)	0.70 (.027)	0.86 (.034)
63mm (2-1/2")	0.30 (.012)	0.32 (.013)	0.35 (.014)	0.45 (.018)	0.55 (.022)
80mm (3-1/4")	0.33 (.013)	0.36 (.014)	0.38 (.015)	0.49 (.019)	0.60 (.023)
100mm (4")	0.34 (.014)	0.36 (.014)	0.39 (.015)	0.50 (.020)	0.61 (.024)

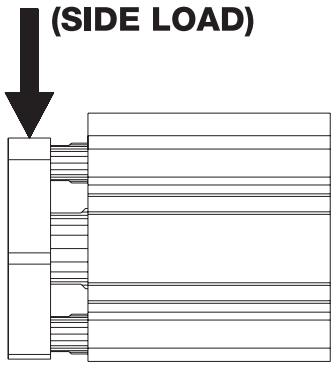
EF2 Cylinder Options and Dimensions

EFT Cylinders with X Option

Maximum Side Loads kg-Force (lb)

Bore	Stroke Length						
	5mm	10mm	15mm	20mm	25mm	30mm	35mm
12mm (1/2")	N/A	2.99 (6.58)	2.85 (6.28)	2.76 (6.07)	2.69 (5.92)	2.63 (5.80)	N/A
16mm (5/8")	N/A	4.21 (9.27)	4.02 (8.84)	3.88 (8.54)	3.78 (8.32)	3.70 (8.15)	N/A
20mm (3/4")	N/A	8.13 (17.90)	7.84 (17.25)	7.63 (16.79)	7.47 (16.45)	7.35 (16.18)	7.26 (15.97)
25mm (1")	N/A	8.52 (18.76)	8.18 (18.01)	7.94 (17.47)	7.75 (17.06)	7.60 (16.74)	7.49 (16.48)
32mm (1-1/4")	N/A	8.75 (19.27)	8.42 (18.53)	8.16 (17.97)	7.96 (17.53)	7.80 (17.18)	7.68 (16.90)
40mm (1-1/2")	N/A	10.18 (22.40)	9.69 (21.34)	9.32 (20.52)	9.03 (19.87)	8.78 (19.33)	8.58 (18.89)
50mm (2")	N/A	15.11 (33.26)	14.49 (31.90)	14.01 (30.84)	13.63 (30.00)	13.31 (29.30)	13.05 (28.72)
63mm (2-1/2")	N/A	24.31 (53.50)	23.36 (51.41)	22.61 (49.76)	22.00 (48.42)	21.50 (47.32)	21.07 (46.38)
80mm (3-1/4")	N/A	38.19 (84.06)	36.78 (80.96)	35.64 (78.44)	34.68 (76.34)	33.76 (74.32)	33.19 (73.06)
100mm (4")	N/A	42.40 (93.34)	40.83 (89.88)	39.52 (86.98)	38.39 (84.51)	37.43 (82.38)	36.58 (80.53)

Bore	Stroke Length				
	40mm	45mm	50mm	75mm	100mm
12mm (1/2")	N/A	N/A	N/A	N/A	N/A
16mm (5/8")	N/A	N/A	N/A	N/A	N/A
20mm (3/4")	7.17 (15.79)	7.11 (15.65)	7.05 (15.52)	N/A	N/A
25mm (1")	7.39 (16.27)	7.31 (16.09)	7.24 (15.94)	N/A	N/A
32mm (1-1/4")	7.57 (16.66)	7.48 (16.46)	7.40 (16.29)	7.14 (15.71)	6.98 (15.36)
40mm (1-1/2")	8.41 (18.52)	8.27 (18.20)	8.14 (17.92)	7.70 (16.96)	7.44 (16.38)
50mm (2")	12.82 (28.23)	12.63 (27.81)	12.47 (27.44)	11.88 (26.16)	11.53 (25.39)
63mm (2-1/2")	20.71 (45.59)	20.40 (44.90)	20.13 (44.30)	19.16 (42.18)	18.57 (40.88)
80mm (3-1/4")	32.60 (71.75)	32.07 (70.60)	31.61 (69.59)	29.95 (65.92)	28.90 (63.61)
100mm (4")	35.84 (78.90)	35.19 (77.46)	34.61 (76.18)	32.43 (71.38)	31.01 (68.26)



Maximum Moments N-m (in-lb)

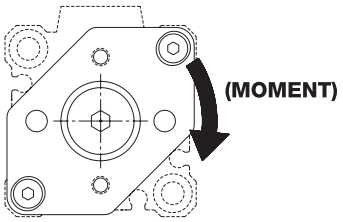
Bore	Stroke Length						
	5mm	10mm	15mm	20mm	25mm	30mm	35mm
12mm (1/2")	N/A	0.15 (1.31)	0.14 (1.27)	0.14 (1.23)	0.13 (1.21)	0.13 (1.19)	N/A
16mm (5/8")	N/A	0.27 (2.42)	0.26 (2.32)	0.25 (2.26)	0.25 (2.21)	0.24 (2.18)	N/A
20mm (3/4")	N/A	0.68 (6.14)	0.66 (5.94)	0.64 (5.80)	0.63 (5.70)	0.62 (5.62)	0.62 (5.56)
25mm (1")	N/A	0.77 (6.93)	0.74 (6.70)	0.72 (6.53)	0.71 (6.40)	0.70 (6.30)	0.69 (6.22)
32mm (1-1/4")	N/A	0.89 (7.99)	0.86 (7.79)	0.85 (7.63)	0.83 (7.52)	0.82 (7.43)	0.82 (7.35)
40mm (1-1/2")	N/A	1.11 (10.02)	1.08 (9.71)	1.05 (9.48)	1.03 (9.29)	1.02 (9.15)	1.00 (9.03)
50mm (2")	N/A	2.16 (19.48)	2.10 (18.95)	2.06 (18.54)	2.02 (18.22)	1.99 (17.96)	1.97 (17.75)
63mm (2-1/2")	N/A	4.31 (38.84)	4.18 (37.70)	4.08 (36.80)	4.01 (36.09)	3.94 (35.51)	3.89 (35.02)
80mm (3-1/4")	N/A	8.44 (76.07)	8.21 (73.99)	8.03 (72.32)	7.88 (70.96)	7.75 (69.82)	7.64 (68.86)
100mm (4")	N/A	10.63 (95.78)	10.35 (93.25)	10.12 (91.16)	9.93 (89.42)	9.76 (87.94)	9.62 (86.67)

EF2 Cylinder Options and Dimensions

EFT Cylinders with X Option

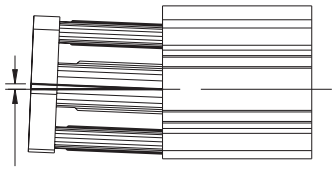
Maximum Moments N-m (in-lb)

Bore	Stroke Length				
	40mm	45mm	50mm	75mm	100mm
12mm (1/2")	N/A	N/A	N/A	N/A	N/A
16mm (5/8")	N/A	N/A	N/A	N/A	N/A
20mm (3/4")	0.61 (5.50)	0.61 (5.46)	0.60 (5.42)	N/A	N/A
25mm (1")	0.68 (6.15)	0.68 (6.10)	0.67 (6.05)	N/A	N/A
32mm (1-1/4")	0.81 (7.29)	0.80 (7.24)	0.80 (7.20)	0.76 (6.84)	0.75 (6.77)
40mm (1-1/2")	0.99 (8.93)	0.98 (8.84)	0.97 (8.77)	0.90 (8.15)	0.89 (8.02)
50mm (2")	1.95 (17.57)	1.93 (17.42)	1.92 (17.28)	1.79 (16.16)	1.77 (15.91)
63mm (2-1/2")	3.84 (34.61)	3.80 (34.25)	3.77 (33.95)	3.47 (31.26)	3.40 (30.64)
80mm (3-1/4")	7.55 (68.03)	7.47 (67.32)	7.40 (66.69)	6.77 (60.95)	6.61 (59.55)
100mm (4")	9.50 (85.57)	9.39 (84.60)	9.30 (83.75)	8.95 (80.63)	8.73 (78.66)



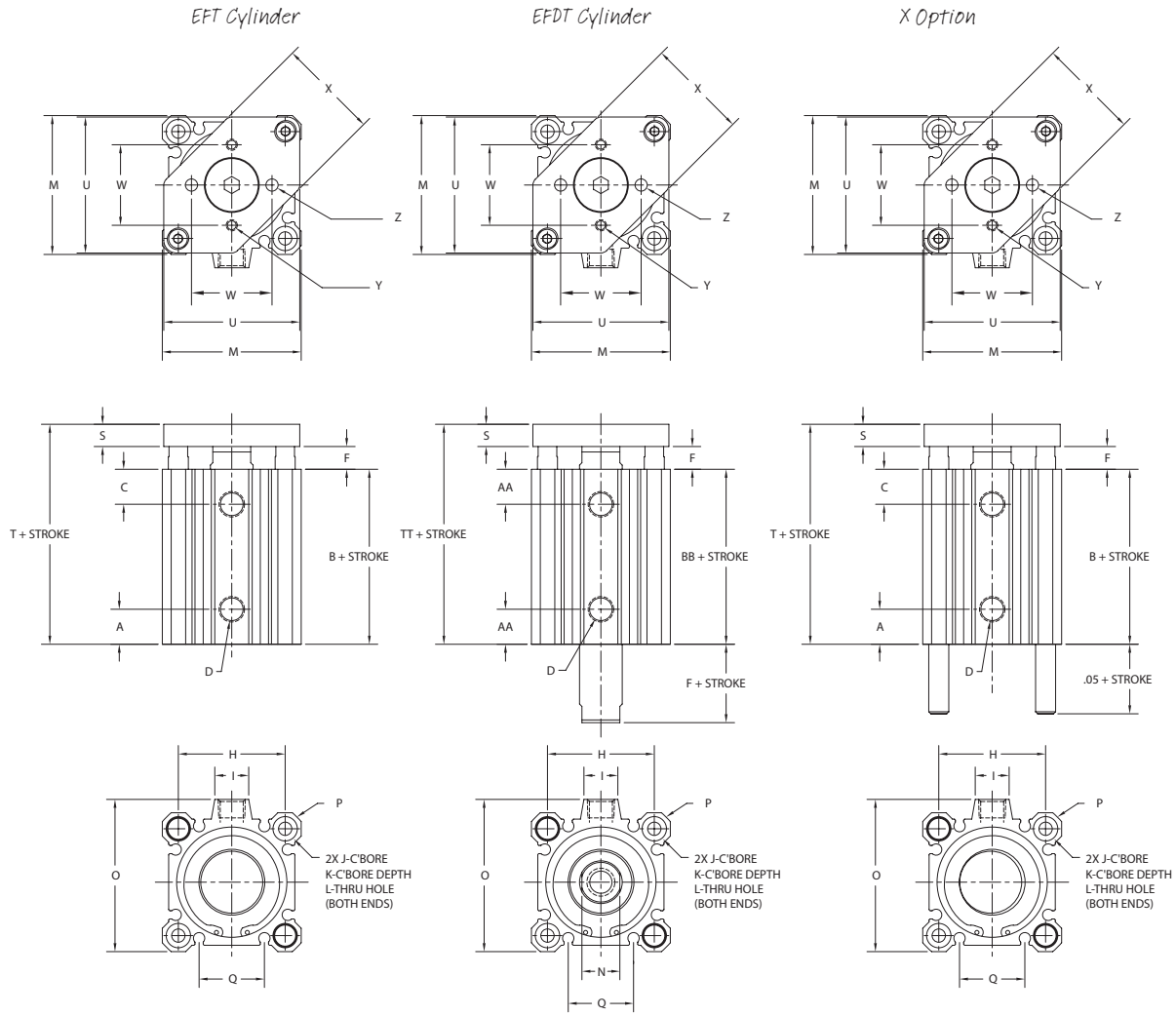
Tooling Plate End Play mm (in)

Bore	Stroke Length						
	5mm	10mm	15mm	20mm	25mm	30mm	35mm
12mm (1/2")	N/A	0.10 (.004)	0.08 (.003)	0.08 (.003)	0.05 (.002)	0.05 (.002)	N/A
16mm (5/8")	N/A	0.10 (.004)	0.08 (.003)	0.08 (.003)	0.08 (.003)	0.05 (.002)	N/A
20mm (3/4")	N/A	0.10 (.004)	0.08 (.003)	0.08 (.003)	0.05 (.002)	0.05 (.002)	0.05 (.002)
25mm (1")	N/A	0.08 (.003)	0.08 (.003)	0.08 (.003)	0.05 (.002)	0.05 (.002)	0.05 (.002)
32mm (1-1/4")	N/A	0.08 (.003)	0.08 (.003)	0.05 (.002)	0.05 (.002)	0.05 (.002)	0.05 (.002)
40mm (1-1/2")	N/A	0.08 (.003)	0.05 (.002)	0.05 (.002)	0.05 (.002)	0.05 (.002)	0.05 (.002)
50mm (2")	N/A	0.08 (.003)	0.08 (.003)	0.05 (.002)	0.05 (.002)	0.05 (.002)	0.05 (.002)
63mm (2-1/2")	N/A	0.05 (.002)	0.05 (.002)	0.05 (.002)	0.05 (.002)	0.05 (.002)	0.03 (.001)
80mm (3-1/4")	N/A	0.05 (.002)	0.05 (.002)	0.05 (.002)	0.05 (.002)	0.03 (.001)	0.03 (.001)
100mm (4")	N/A	0.05 (.002)	0.05 (.002)	0.03 (.001)	0.03 (.001)	0.03 (.001)	0.03 (.001)



Bore	Stroke Length				
	40mm	45mm	50mm	75mm	100mm
12mm (1/2")	N/A	N/A	N/A	N/A	N/A
16mm (5/8")	N/A	N/A	N/A	N/A	N/A
20mm (3/4")	0.05 (.002)	0.05 (.002)	0.05 (.002)	N/A	N/A
25mm (1")	0.05 (.002)	0.05 (.002)	0.03 (.001)	N/A	N/A
32mm (1-1/4")	0.05 (.002)	0.05 (.002)	0.03 (.001)	0.03 (.001)	0.03 (.001)
40mm (1-1/2")	0.05 (.002)	0.03 (.001)	0.03 (.001)	0.03 (.001)	0.13 (.005)
50mm (2")	0.05 (.002)	0.05 (.002)	0.05 (.002)	0.03 (.001)	0.13 (.005)
63mm (2-1/2")	0.03 (.001)	0.03 (.001)	0.03 (.001)	0.03 (.001)	0.13 (.005)
80mm (3-1/4")	0.03 (.001)	0.03 (.001)	0.03 (.001)	0.03 (.001)	0.13 (.005)
100mm (4")	0.03 (.001)	0.03 (.001)	0.03 (.001)	0.03 (.001)	0.13 (.005)

EF2 Cylinder Options and Dimensions (mm [in])



Double Acting/Non-Rotating

Bore	A	AA	B	BB	C	D	F	H	I	J
12mm (1/2")	3.8 (0.15)	10.6 (0.42)	17.0 (0.67)	25.2 (0.99)	8.9 (0.35)	M5 x 0.8 (#10-32)	3.5 (0.14)	15.5 (0.61)	N/A	6.1 (0.24)
16mm (5/8")	4.5 (0.18)	10.7 (0.42)	18.5 (0.73)	26.0 (1.03)	9.4 (0.37)	M5 x 0.8 (#10-32)	3.5 (0.14)	20.0 (0.79)	8.7 (0.34)	6.5 (0.26)
20mm (3/4")	4.8 (0.19)	10.1 (0.40)	19.5 (0.77)	26.0 (1.03)	9.4 (0.37)	M5 x 0.8 (#10-32)	4.5 (0.18)	25.5 (1.00)	9.5 (0.38)	9.0 (0.36)
25mm (1")	5.1 (0.20)	11.2 (0.44)	22.5 (0.89)	29.0 (1.14)	10.9 (0.43)	M5 x 0.8 (#10-32)	5.0 (0.20)	28.0 (1.10)	10.3 (0.41)	9.0 (0.36)
32mm (1-1/4")	7.0 (0.28)	8.9 (0.35)	23.0 (0.91)	30.5 (1.20)	10.4 (0.41)	G - 1/8 (NPT 1/8)	7.0 (0.28)	34.0 (1.34)	18.6 (0.73)	9.0 (0.36)
40mm (1-1/2")	7.4 (0.29)	13.1 (0.52)	29.5 (1.16)	40.0 (1.58)	13.2 (0.52)	G - 1/8 (NPT 1/8)	7.0 (0.28)	40.0 (1.58)	17.3 (0.68)	9.0 (0.36)
50mm (2")	9.4 (0.37)	12.2 (0.48)	30.5 (1.20)	40.5 (1.60)	13.7 (0.54)	G - 1/4 (NPT 1/4)	8.0 (0.32)	50.0 (1.97)	20.0 (0.79)	11.1 (0.44)
63mm (2-1/2")	9.7 (0.38)	12.8 (0.50)	36.0 (1.42)	42.0 (1.66)	15.7 (0.62)	G - 1/4 (NPT 1/4)	8.0 (0.32)	60.0 (2.36)	20.0 (0.79)	14.1 (0.56)
80mm (3-1/4")	11.6 (0.46)	14.4 (0.57)	43.5 (1.71)	51.0 (2.01)	17.8 (0.70)	G - 3/8 (NPT 3/8)	10.0 (0.39)	77.0 (3.03)	26.0 (1.02)	17.5 (0.69)
100mm (4")	12.2 (0.48)	18.3 (0.72)	53.0 (2.09)	60.5 (2.32)	24.4 (0.96)	G - 3/8 (NPT 3/8)	12.0 (0.47)	94.0 (3.70)	26.0 (1.02)	17.5 (0.69)

EF2 Cylinder Options and Dimensions (mm [in])

Bore	K	L	M	N	O	P	Q	S
12mm (1/2")	3.5 (0.14)	3.5 (0.14)	25.0 (0.98)	5.0 (0.19)	25.0 (0.98)	32.0 (1.26)	5.3 (0.21)	6.0 (0.24)
16mm (5/8")	3.5 (0.14)	3.5 (0.14)	29.0 (1.14)	6.0 (0.25)	29.0 (1.14)	38.0 (1.50)	7.8 (0.31)	6.0 (0.24)
20mm (3/4")	7.0 (0.28)	5.5 (0.22)	36.0 (1.42)	8.0 (0.31)	36.0 (1.42)	47.0 (1.85)	10.5 (0.41)	6.9 (0.27)
25mm (1")	7.0 (0.28)	5.5 (0.22)	40.0 (1.58)	10.0 (0.38)	40.0 (1.58)	52.0 (2.05)	11.5 (0.45)	8.3 (0.33)
32mm (1-1/4")	7.0 (0.28)	5.5 (0.22)	45.0 (1.77)	14.0 (0.56)	49.5 (1.95)	60.0 (2.36)	17.7 (0.70)	8.3 (0.33)
40mm (1-1/2")	7.0 (0.28)	5.5 (0.22)	52.0 (2.05)	14.0 (0.56)	57.0 (2.24)	69.0 (2.72)	24.5 (0.96)	8.3 (0.33)
50mm (2")	8.0 (0.31)	6.9 (0.27)	64.0 (2.52)	17.0 (0.69)	71.0 (2.80)	86.0 (3.39)	29.3 (1.16)	12.1 (0.48)
63mm (2-1/2")	10.5 (0.41)	8.8 (0.35)	77.0 (3.03)	17.0 (0.69)	84.0 (3.31)	103.0 (4.06)	29.1 (1.15)	12.5 (0.49)
80mm (3-1/4")	13.5 (0.53)	11.0 (0.43)	98.0 (3.86)	22.0 (0.88)	104.0 (4.09)	132.0 (5.20)	28.1 (1.11)	14.0 (0.55)
100mm (4")	13.5 (0.53)	11.0 (0.43)	117.0 (4.61)	27.0 (1.06)	123.5 (4.86)	156.0 (6.14)	32.3 (1.27)	14.0 (0.55)

Bore	T	TT	U	W	X	Y		Z	
						Standard	With Option E	Standard	With Option E
12mm (1/2")	26.5 (1.04)	34.7 (1.37)	24.3 (0.96)	14.0 (0.55)	20.8 (0.82)	M3 x 0.5 6H	#4-40 UNC-2B	4.1 (0.16)	3.6 (0.14)
16mm (5/8")	28.0 (1.10)	35.5 (1.40)	28.0 (1.10)	20.0 (0.79)	25.0 (0.98)	M3 x 0.5 6H	#4-40 UNC-2B	4.1 (0.16)	3.6 (0.14)
20mm (3/4")	30.8 (1.21)	37.4 (1.47)	35.0 (1.38)	27.0 (1.06)	26.5 (1.04)	M4 x 0.7 6H	#6-32 UNC-2B	5.2 (0.20)	4.3 (0.17)
25mm (1")	35.8 (1.41)	42.3 (1.67)	39.0 (1.54)	27.0 (1.06)	30.0 (1.18)	M4 x 0.7 6H	#6-32 UNC-2B	5.2 (0.20)	4.3 (0.17)
32mm (1-1/4")	38.3 (1.52)	45.8 (1.80)	44.0 (1.73)	30.0 (1.18)	34.3 (1.35)	M4 x 0.7 6H	#8-32 UNC-2B	5.2 (0.20)	4.7 (0.18)
40mm (1-1/2")	44.8 (1.76)	55.3 (2.18)	51.0 (2.01)	30.0 (1.18)	38.0 (1.50)	M4 x 0.7 6H	#8-32 UNC-2B	5.2 (0.20)	4.7 (0.18)
50mm (2")	50.6 (1.99)	60.6 (2.39)	63.0 (2.48)	42.8 (1.69)	48.0 (1.89)	M5 x 0.8 6H	#10-32 UNF-2B	6.4 (0.25)	5.6 (0.22)
63mm (2-1/2")	56.5 (2.22)	62.5 (2.46)	75.8 (2.98)	42.8 (1.69)	53.7 (2.11)	M5 x 0.8 6H	#10-32 UNF-2B	6.4 (0.25)	5.6 (0.22)
80mm (3-1/4")	67.5 (2.66)	75.0 (2.95)	97.0 (3.82)	50.8 (2.00)	74.8 (2.94)	M6 x 1.0 6H	#1/4-20 UNC-2B	7.1 (0.28)	7.2 (0.29)
100mm (4")	79.0 (3.11)	86.5 (3.41)	115.5 (4.55)	50.8 (2.00)	93.3 (3.67)	M6 x 1.0 6H	#1/4-20 UNC-2B	7.1 (0.28)	7.2 (0.29)

*See page 212 for overall body length with MRS option.

When option E is specified, user interface threads are designated U.S. customary (inch). This includes ports, rod threads and threaded mounting options (as applicable).

EF2 Cylinder Options and Dimensions

Weights

Bore	Approximate Base Weight of Cylinder gram-force (oz)	Weight Adder per 5mm of Stroke gram-force (oz)
12mm (1/2")	32.3 (1.14)	6.1 (0.22)
16mm (5/8")	53.4 (1.89)	8.6 (0.30)
20mm (3/4")	74.4 (2.62)	13.3 (0.47)
25mm (1")	114.6 (4.04)	16.3 (0.58)
32mm (1-1/4")	166.9 (5.89)	22.6 (0.80)
40mm (1-1/2")	250.7 (8.84)	23.0 (0.81)
50mm (2")	440.4 (15.53)	35.8 (1.26)
63mm (2-1/2")	697.3 (24.60)	45.2 (1.59)
80mm (3-1/4")	1309.6 (46.20)	70.0 (2.47)
100mm (4")	2464.6 (86.94)	117.5 (4.15)

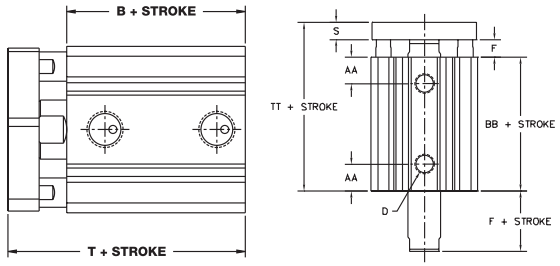
Options

Magnetic Position Sensing (M)

(Overall Length Adders)

Model Type and Size	Body Length	Total Length
EFT	**B***	**T***
12mm – 100mm	10.0 (0.39)	10.0 (0.39)
EFDT	**BB***	**TT***
12mm	7.2 (0.28)	7.2 (0.28)
16mm – 100mm	10.0 (0.39)	10.0 (0.39)

*Add the following lengths to the overall length dimension for EFT and EFDT cylinders when specifying a magnet option.



Bumpers (B)

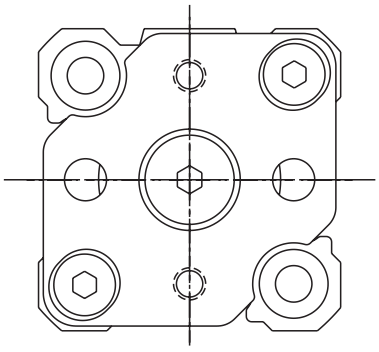
(Stroke reduction by model for all bores)

Model	Stroke Reduction mm (in)
Double Acting, Non-Rotating	3.0 (.12)

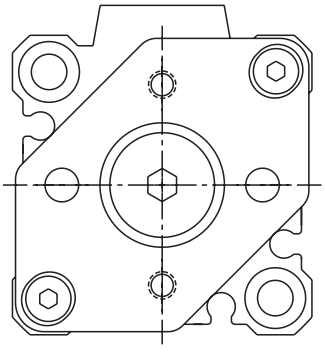
EF2 Accessory Options and Dimensions

Tooling Plate Styles

12mm TO 16mm Bore

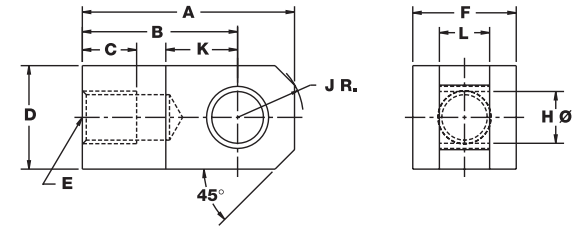


20mm TO 100mm Bore

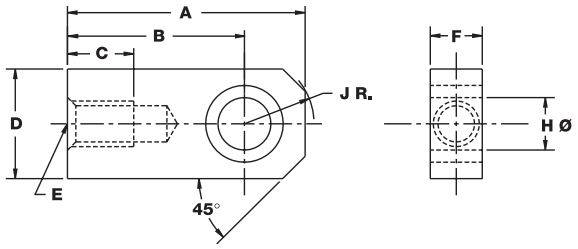


EF1 Accessory Options and Dimensions

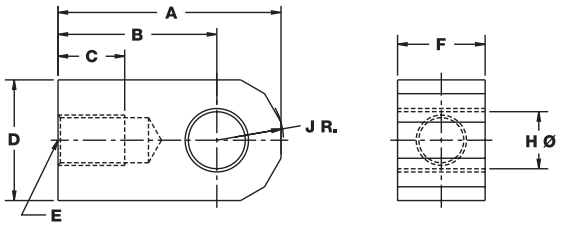
Rod Pivot



Metric Small Bore Rod Pivot (for 12mm to 63mm bore cylinders)
RPMK-12, RPMK-16, RPMK-20, RPMK-25, RPMK-32, RPMK-40, RPMK-50



U.S. Customary Small Bore Rod Pivot (for 12mm to 63mm bore cylinders)
RPEK-12, RPEK-16, RPEK-20, RPEK-25, RPEK-32, RPEK-40, RPEK-50



Metric and U.S. Customary Large Bore Rod Pivot (for 80mm and 100mm bore cylinders)
RPMK-80, RPEK-80, RPMK-100, RPEK-100

NOTE: To use Rod Pivot, cylinder must be specified with male thread option (MT). For inch series Rod Pivot Kits, change the third digit from an M to an E. For example: RPMK-32 is a metric size / RPEK-32 is a U.S. customary size.

Rod Pivot Dimensions

Model Number	Bore	A	B	C	D	E
RP(M,E)K-12	12mm (1/2")	21.5 (0.85)	16.0 (0.63)	6.0 (0.24)	10.0 (0.39)	M5 x 0.8 (# 8-32 UNC)
RP(M,E)K-16	16mm (5/8")	32.0 (1.26)	25.0 (0.98)	8.0 (0.24)	12.0 (0.47)	M6 x 1.0 (# 8-32 UNC)
RP(M,E)K-20	20mm (3/4")	34.0 (1.34)	25.0 (0.98)	8.5 (0.24)	15.9 (0.63)	M8 x 1.25 (# 10-32 UNF)
RP(M,E)K-25	25mm (1")	41.0 (1.61)	30.0 (1.18)	10.5 (0.32)	20.0 (0.79)	M10 x 1.25 (1/4-28 UNF)
RP(M,E)K-32	32mm (1-1/4")	40.5 (1.59)	30.0 (1.18)	14.0 (0.35)	22.0 (0.87)	M14 x 1.5 (5/16-24 UNF)
RP(M,E)K-40	40mm (1-1/2")	40.5 (1.59)	30.0 (1.18)	14.0 (0.43)	22.0 (0.87)	M14 x 1.5 (3/8-24 UNF)
RP(M,E)K-50	50mm (2") 63mm (2-1/2")	53.8 (2.12)	40.0 (1.58)	18.0 (0.71)	28.0 (1.10)	M18 x 1.5 (1/2-20 UNF)
RP(M,E)K-80	80mm (3-1/4")	70.2 (2.77)	50.0 (1.97)	21.0 (0.83)	38.0 (1.50)	M22 x 1.5 (5/8-18 UNF)
RP(M,E)K-100	100mm (4")	77.9 (3.07)	55.0 (2.17)	21.0 (0.83)	44.0 (1.73)	M26 x 1.5 (3/4-16 UNF)

Model Number	Bore Size	F	H	J	K	L
RP(M,E)K-12	12mm (1/2")	10.0 (0.19)	5.0 (0.188)	6.2 (0.25)	6.9 N/A	4.7 N/A
RP(M,E)K-16	16mm (5/8")	12.0 (0.24)	5.0 (0.188)	7.8 (0.31)	13.9 N/A	6.2 N/A
RP(M,E)K-20	20mm (3/4")	15.9 (0.30)	8.0 (0.313)	10.2 (0.41)	11.4 N/A	7.7 N/A
RP(M,E)K-25	25mm (1")	20.0 (0.38)	10.0 (0.375)	12.6 (0.50)	13.9 N/A	9.7 N/A
RP(M,E)K-32	32mm (1-1/4")	22.0 (0.69)	10.0 (0.375)	11.9 (0.47)	13.9 N/A	17.6 N/A
RP(M,E)K-40	40mm (1-1/2")	22.0 (0.69)	10.0 (0.375)	11.9 (0.47)	13.9 N/A	17.6 N/A
RP(M,E)K-50	50mm (2") 63mm (2-/2")	28.0 (0.85)	14.0 (0.500)	15.9 (0.63)	19.9 N/A	21.6 N/A
RP(M,E)K-80	80mm (3-1/4")	27.6 (1.09)	18.0 (0.750)	21.0 (0.83)	N/A	N/A
RP(M,E)K-100	100mm (4")	31.6 (1.24)	22.0 (0.875)	24.0 (0.94)	N/A	N/A

The Model Number for all EF1 cylinders consists of alphanumeric clusters. These designate type, bore size, stroke lengths, and special options. Please refer to the charts below for an example of a standard EF1 model. This is a 25mm bore, 10mm stroke, double acting, single end rod cylinder with additional options.

Type	
EF	Double Acting, Single End Rod
EFD	Double Acting, Double End Rod
EFS	Single Acting, Spring Retract
EFR	Single Acting, Spring Extend

Bore Size	
12	12mm (1/2")
16	16mm (5/8")
20	20mm (3/4")
25	25mm (1")
32	32mm (1-1/4")
40	40mm (1-1/2")
50	50mm (2")
63	63mm (2-1/2")
80	80mm (3-1/4")
100	100mm (4")

Stroke Length
See table - page 196

EF - 25 10 - 3 MMTV

Mounting Options	
No number	Basic model (standard counter-bored mounting holes)
1	Threaded bottom mounting option
3	Threaded front/rear mounting option
6	Rear clevis
6N	Rear clevis 90°

Options (Enter in alphabetical order, except for EE which is last)	
B	Bumpers (see page 212)[1]
C	Stainless steel retaining ring
E	U.S. customary units (inch)[2]
F	Full-flow port orifice[5]
M	Magnetic position sensing (see table page 205)[3]
MT	Male rod thread end (fine thread) (see page 213)[4]
NT	Non-threaded rod
V	High temperature option 15° F to 225° F (-10° C to 110° C)
EE	Extra rod extension in 1mm increments

[1] Bumpers reduce stroke length by 3mm. When bumper is specified with option V, standard bumper material is supplied. Operating temperature remains -10° to 70°C (15° to 160°F).
[2] When option E is specified, user interface threads are designated U.S. customary (inch). This includes ports, rod threads and threaded mounting options (as applicable).
[3] When magnetic position sensing is specified with option V, operating temperature remains -10° to 70°C (15° to 160°F). This combination is recommended when fluoroelastomer is specified for compatibility.
[4] MT option must be specified to use rod pivot.
[5] Automatically includes bumpers, so stroke is reduced by 3mm.

Please note that throughout all catalog charts, metric measurements are shown first and U.S. customary units (inches) are in parentheses.

*NOTE: Numbers in parentheses are the equivalent bore size in inches and listed FOR REFERENCE ONLY. DO NOT use for model designation.

**When stroke length exceeds 30mm, a threaded mounting option should be considered. Mounting bolts that span the entire cylinder length may not be readily available.

How to Order

The Model Number for all EF2 cylinders consists of alphanumeric clusters. These designate type, bore size, stroke lengths, and special options. Please refer to the charts below for an example of a standard EF2 model. This is a double acting, guided cylinder with 32mm bore, 25mm stroke, and additional options.

Type	
EFT	Double Acting, Non-Rotating
EFDT	Double Acting, Double End Rod, Non-Rotating

Bore Size	
12	12mm (1/2")
16	16mm (5/8")
20	20mm (3/4")
25	25mm (1")
32	32mm (1-1/4")
40	40mm (1-1/2")
50	50mm (2")
63	63mm (2-1/2")
80	80mm (3-1/4")
100	100mm (4")

Stroke Length
See table - page 205

EFT - 32 25 - 3 M

Mounting Options	
No number	Basic model
3	Threaded front/rear mounting option*
6	Rear clevis mount*
6N	Rear clevis 90°

*For dimensions, see page 202.

Options (Enter in alphabetical order, except for EE which is last)	
B	Bumpers (see page 212)[1]
C	Stainless steel retaining ring
E	U.S. customary units (inch)[2]
F	Full-flow port orifice[4]
M	Magnetic position sensing (see table page 212)[3]
P	Blank tooling plate
V	High temperature option 15° F to 225° F (-10° C to 110° C)
X	Rear guide sahft extension (see page 210)[5]
EE	Extra rod extension in 1mm increments[6]

[1] Bumpers reduce stroke length by 3mm. When bumper is specified with option V, standard bumper material is supplied. Operating temperature remains -10° to 70°C (15° to 160°F).
[2] When option E is specified, user interface threads are designated U.S. customary (inch). This includes ports, rod threads and threaded mounting options (as applicable).
[3] When magnetic position sensing is specified with option V, operating temperature remains -10° to 70°C (15° to 160°F). This combination is recommended when fluoroelastomer is specified for compatibility.
[4] Automatically includes bumpers, so stroke is reduced by 3mm.
[5] Available stroke lengths starting at 10mm.
[6] In EFDT models, extra extension dimension is added to both tooling plate and rod ends.

Please note that throughout all catalog charts, metric measurements are shown first and U.S. customary units (inches) are in parentheses.

*NOTE: Numbers in parentheses are the equivalent bore size in inches and listed FOR REFERENCE ONLY. DO NOT use for model designation.

**When stroke length exceeds 30mm, a threaded mounting option should be considered. Mounting bolts that span the entire cylinder length may not be readily available.

EF1 Repair Parts

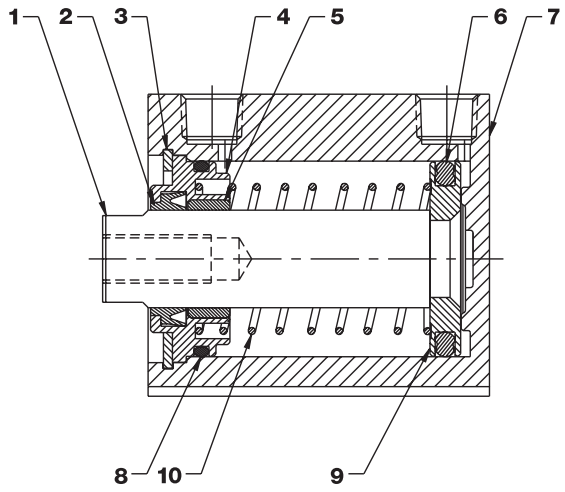
Bimba EF1 cylinders are repairable. To order repair kits, please provide the correct bore code in the kit part number blank for the desired size repair kit. Optional seals are designated by the suffix option. Repair kits include the standard bronze rod bushing, piston, rod, and body seals.*

Part #	Description	Material
1	Rod	4301 (303) Stainless Steel
2	Rod Seal/Wiper	Nitrile (Standard) or Fluoroelastomer (High Temperature Option)
3	Retaining Ring	Zinc Plated Carbon Steel or Stainless Steel (optional)
4	Rod Guide	12-20mm: Bronze / 25-100mm: Anodized Aluminum
5	Bushing	12-20mm: Bronze / 25-100mm: Self Lubricating Nylon
6	Piston Seal	Nitrile (Standard) or Fluoroelastomer (High Temperature Option)
7	Cylinder Body	Polytetrafluoroethylene (PTFE) Impregnated Hard Anodized Aluminum
8	Rod Guide Seal	Nitrile (Standard) or Fluoroelastomer (High Temperature Option)
9	Piston	High Strength Aluminum Alloy
10	Spring	Corrosion Protected Music Wire

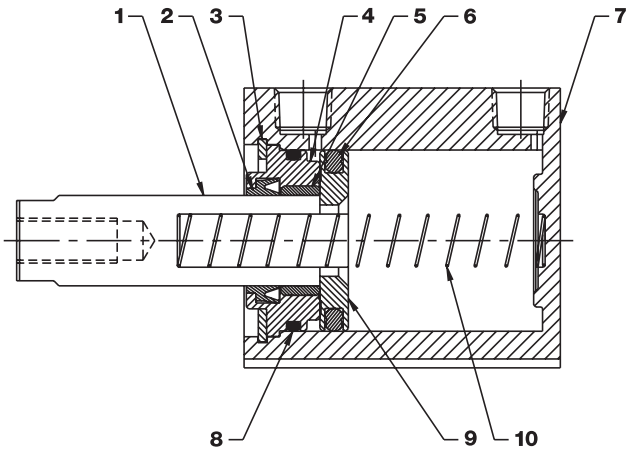
Part #	Description
K-B-EF-[Bore]	EF Series Repair Kit
K-B-EFD-[Bore]	EFD Series Repair Kit
K-B-EF-[Bore]-V	EF Series Repair Kit with FKM High Temperature Seals

NOTE: Replace [Bore] in the part number with the appropriate bore size indicator.

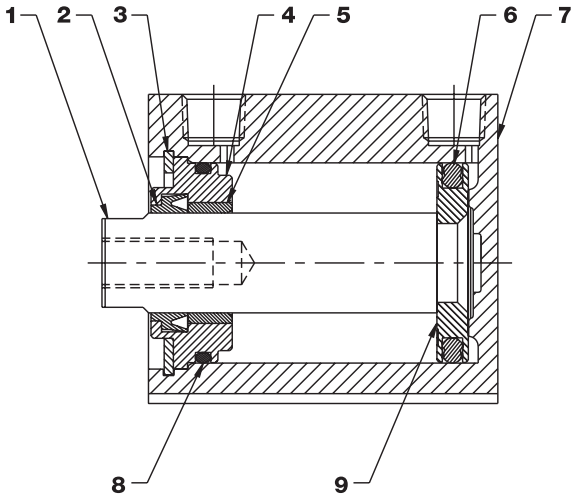
Single Acting/Spring Retract



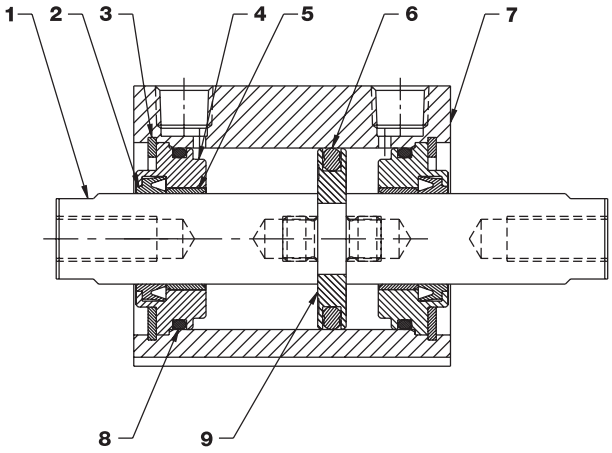
Single Acting/Spring Extend



Double Acting/Single Rod



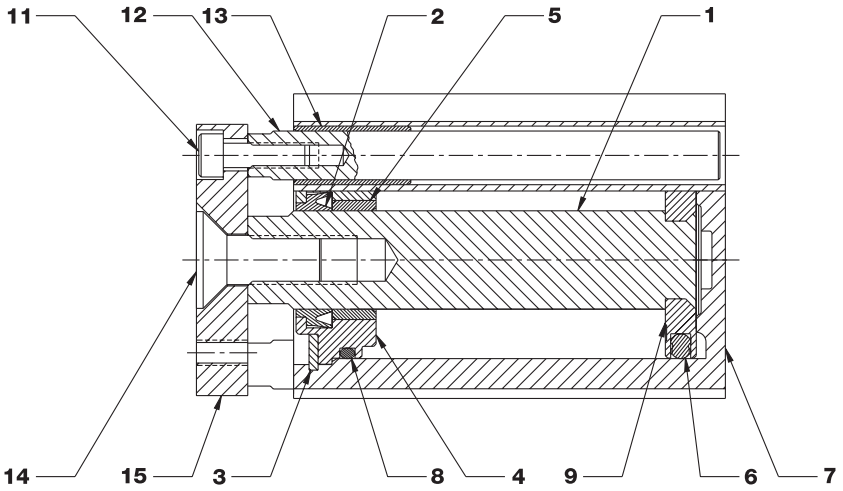
Double Acting/Double Rod



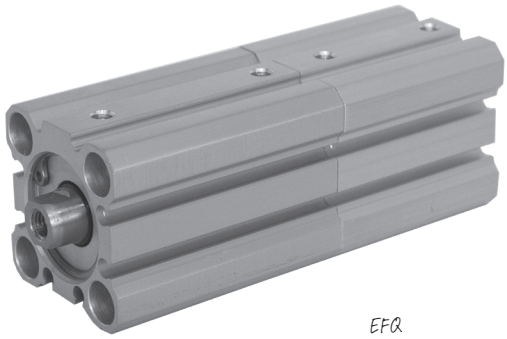
EF2 Repair Parts

EF2 cylinders use the same basic repair kits as EF1 cylinders. For additional part not included in these kits, contact your local Bimba distributor to request a quote.

Part #	Description	Material
1	Rod	4301 (303) Stainless Steel
2	Rod Seal/Wiper	Nitrile (Standard) or Fluoroelastomer (High Temperature Option)
3	Retaining Ring	Zinc Plated Carbon Steel or Stainless Steel (Optional)
4	Rod Guide	12-20mm: Bronze / 25-100mm: Anodized Aluminum
5	Bushing	12-20mm: Bronze / 25-100mm: Self Lubricating Nylon
6	Piston Seal	Nitrile (Standard) or Fluoroelastomer (High Temperature Option)
7	Cylinder Body	Polytetrafluoroethylene (PTFE) Impregnated Hard Anodized Aluminum
8	Rod Guide Seal	Nitrile (Standard) or Fluoroelastomer (High Temperature Option)
9	Piston	High Strength Aluminum Alloy
11	Cap Screw	Stainless Steel
12	Guide Rod	Chrome Plated Stainless Steel
13	Guide Bushing	Delrin
14	Flat Screw	Stainless Steel
15	Plate	Clear Coat Anodized Aluminum



EFP



EFQ

The Bimba EFP Extruded Flat Multi-Position cylinder is a double-acting, single rod end cylinder that provides three positions in one cylinder package. This cylinder is a two piston design that saves space using the existing EF footprint and eliminates the need for an additional cylinder. This unit can help simplify machine changeovers and there-by saving costs.

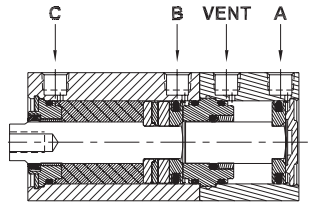
The Bimba EFQ Extruded Flat MultiForce cylinder is a double-acting, single end rod cylinder that DOUBLES the resultant force on extension. This cylinder is a two piston design that saves space using the existing EF footprint and eliminates the need for higher pressure systems or unique configurations. Only one piston is pressurized on the return stroke to save air volume and operating costs.

Extruded Flat Multi-Position (EFP) and Multi-Force (EFQ) Compact Cylinders

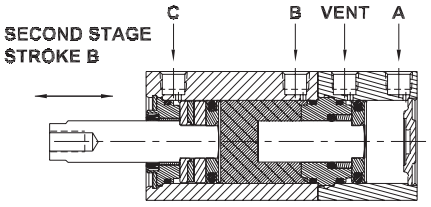
- EFP models provide three position output on extension using the same EF bore footprint to save space
- EFQ models double the force output on extension using the same EF bore footprint to save space
- Easily interchangeable to other compact extruded cylinders of the same bore size
- Available in 10 bore sizes from 12mm to 100mm for greater application versatility
- Versatile to easily connect and operate your application's pneumatic logic
- Standard with threaded front/rear mounting holes, English customary units, and magnetic positioning sensing (MRS) at no extra charge as compared to the competition.
- Standard options include bumpers, full flow ports, rod threads, rod extensions, and high temperature seals.
- All units are made to order and available to ship in three days
- CAD drawings (2D and 3D) can be downloaded at bimba.com/cad
- Shares the same popular standard features as EF product line:
  - PTFE impregnated, hard anodized aluminum body for superior wear resistance
  - 4301 (303) Stainless Steel Rod
  - High Strength Aluminum Alloy Piston with Nitrile Piston Seal
  - Bronze Bushing (12-20mm); Self-Lubricating Nylon Bushing (25-100mm)
  - Bronze Rod Guide (12-20mm); Anodized Aluminum (25-100mm)
  - Nitrile Rod Seal and Wiper
  - Zinc Plated Carbon Steel Retaining Ring
  - Repairable and easy to maintain

How it Works

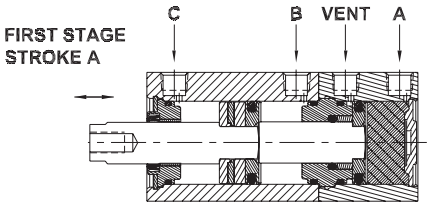
EFP Multi-Position Cylinders



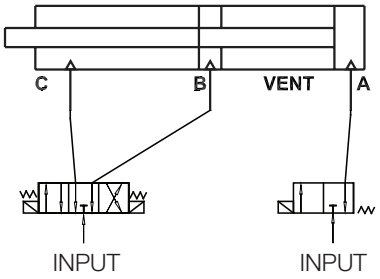
PRESSURE AT PORT C GIVES THE RETRACTED POSITION



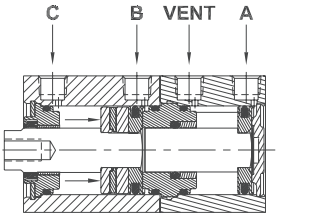
PRESSURE AT PORT B GIVES THE SECOND STAGE STROKE B



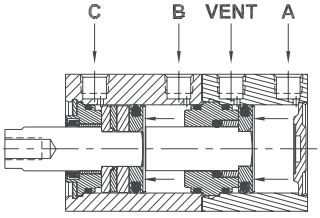
PRESSURE AT PORT A GIVES THE FIRST STAGE STROKE A



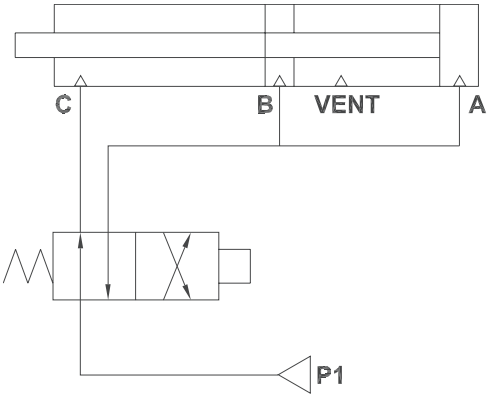
EFQ MultiForce Cylinders



PRESSURE AT PORT C RETRACTS THE THE PISTON RODS



PRESSURE AT PORTS A & B CREATE A MULTI-FORCE STROKE



EFP Cylinder Options and Dimensions

Stroke Length Availability

The table below represents our standard stroke lengths for each stage. Please note that the total combined strokes (A + B) may not be greater than the maximum stroke as listed in the table. Bimba is a JIT manufacturer and we are able to provide EFP cylinders in ANY stage to 1mm stroke length increment for all option styles within our standard three (3) day lead time. Longer stroke lengths, other options are available upon request. Please consult Technical Assistance at 800-44-BIMBA for help.

Nominal Bore Diameter	Double Acting EF Single Rod End		
	Standard Single Stage Stroke A or B (mm)	Minimum Single Stage Stroke A or B (mm)	Maximum Total Combining Stroke A + B (mm)
12mm (1/2")	5, 10, 15, 20, 25, 30	5	40
16mm (5/8")	5, 10, 15, 20, 25, 30	5	70
20mm (3/4")	5, 10, 15, 20, 25, 30, 35, 40, 45, 50	5	80
25mm (1")	5, 10, 15, 20, 25, 30, 35, 40, 45, 50	5	90
32mm (1-1/4")	5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100	5	100
40mm (1-1/2")	5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100	5	120
50mm (2")	10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100	10	120
63mm (2-1/2")	10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100	10	240
80mm (3-1/4")	10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100	10	230
100mm (4")	10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100	10	220

Cylinder Weights

Bore Size	Approximate Base Weight of Cylinder		Approximate Weight added per 5mm of stroke	
	gf	oz	gf	oz
12mm (1/2")	56.7	2.00	5.6	0.20
16mm (5/8")	100.6	3.54	8.0	0.28
20mm (3/4")	120.6	4.26	11.5	0.41
25mm (1")	190.1	6.71	14.6	0.52
32mm (1-1/4")	294.6	10.40	20.9	0.74
40mm (1-1/2")	471.6	16.64	21.3	0.75
50mm (2")	764.4	26.96	33.6	1.19
63mm (2-1/2")	1259.7	44.43	40.7	1.44
80mm (3-1/4")	2301.5	81.20	62.6	2.21
100mm (4")	4903.3	172.95	110.1	3.89

EFQ Cylinder Options and Dimensions

Stroke Length Availability

The table to right represents our standard stroke lengths. Please note that the combination of stroke and extra rod extension may not be greater than the maximum stroke length as listed in the table. Bimba is a JIT manufacturer and we are able to provide EFQ cylinders in ANY 1mm stroke length increment for all option styles within our standard three (3) day lead time. Longer stroke lengths other options are available upon request. Please consult Technical Assistance at 800-44-BIMBA for help.

Nominal Bore Diameter	Double Acting EFQ Single Rod End		
	Standard Single Length (mm)	Minimum Stroke Length (mm)	Maximum Stroke Length (mm)
12mm (1/2")	5, 10, 15, 20, 25, 30	5	40
16mm (5/8")	5, 10, 15, 20, 25, 30	5	70
20mm (3/4")	5, 10, 15, 20, 25, 30, 35, 40, 45, 50	5	90
25mm (1")	5, 10, 15, 20, 25, 30, 35, 40, 45, 50	5	100
32mm (1-1/4")	5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100	5	160
40mm (1-1/2")	5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100	5	120
50mm (2")	10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100	10	150
63mm (2-1/2")	10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100	10	110
80mm (3-1/4")	10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100	10	140
100mm (4")	10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100	10	160

Cylinder Weights

Bore Size	Approximate Base Weight of Cylinder		Approximate Weight added per 5mm of stroke	
	gf	oz	gf	oz
12mm (1/2")	56.7	2.00	5.6	0.20
16mm (5/8")	100.6	3.54	8.0	0.28
20mm (3/4")	120.6	4.26	11.5	0.41
25mm (1")	190.1	6.71	14.6	0.52
32mm (1-1/4")	294.6	10.40	20.9	0.74
40mm (1-1/2")	471.6	16.64	21.3	0.75
50mm (2")	764.4	26.96	33.6	1.19
63mm (2-1/2")	1259.7	44.43	40.7	1.44
80mm (3-1/4")	2301.5	81.20	62.6	2.21
100mm (4")	4903.3	172.95	110.1	3.89

EFP and EFQ Cylinder Options and Dimensions

Engineering Specifications

Operating Medium:	Air
Maximum Operating Pressure:	10.0 bar (140 PSI)
Ambient and Fluid Temperature:	-10° C to 70° C (15° F to 160° F)
Lubrication:	PTFE impregnated grease
Standard Rod End:	Female
Stroke Tolerance:	12-50mm bore: ± .6mm (.025 inch)
	63-100mm bore: ± .8mm (.030 inch)
Cylinder Mounting (Standard):	Through hole with counterbores both ends
	Front and Rear threaded
Maximum Sideload:	Refer to page 197 for specific bore size and stroke length
Expected Service Life:	2500 kilometers (1500 miles)*

*For filtered, lubricated air, no-load conditions; if unlubricated, life is approximately 1/3.

Theoretical Cylindrical Forces

To determine the estimated force generated by the EFQ cylinder on extend or retract, use the appropriate power factor below and multiply it to the input working pressure to cylinder. Forces generated by EFP cylinders are found on page 198.

Force (kg or lb) = Power Factor X Pressure (bar or PSI)

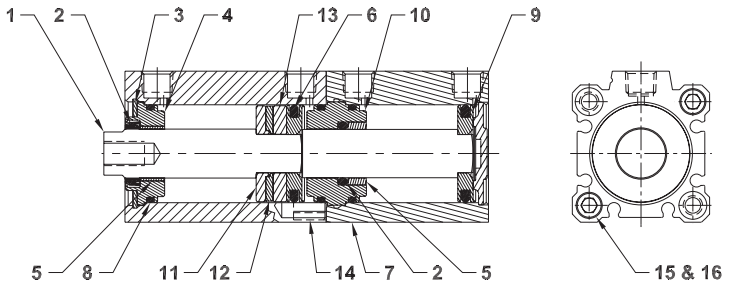
Bore	Direction	Power Factor (kg/bar)	Power Factor (lb/psi)
12mm (1/2")	Extend	1.9	0.30
	Retract	0.8	0.10
16mm (5/8")	Extend	3.5	0.55
	Retract	1.5	0.20
20mm (3/4")	Extend	5.5	0.86
	Retract	2.4	0.40
25mm (1")	Extend	8.4	1.33
	Retract	3.8	0.60
32mm (1-1/4")	Extend	13.8	2.19
	Retract	6.0	0.90
40mm (1-1/2")	Extend	22.7	3.59
	Retract	10.6	1.60
50mm (2")	Extend	35.7	5.65
	Retract	16.5	2.60
63mm (2-1/2")	Extend	58.3	9.22
	Retract	28.0	4.30
80mm (3-1/4")	Extend	93.6	14.80
	Retract	45.4	7.0
100mm (4")	Extend	149.0	23.56
	Retract	71.5	11.1

EFP and EFQ Cylinder Options and Dimensions

Engineering Specifications

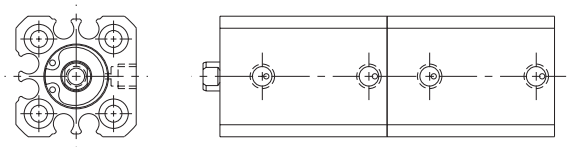
Components

#	Description	Material
1	Rod	4301 (303) Stainless Steel
2	Rod Seal/Wiper	Nitrile (Standard) or Fluoroelastomer (High Temperature option)
3	Retaining Ring	Zinc Plated Carbon Steel (standard) or Stainless Steel (optional)
4	Rod Guide	12-20mm bore – Bronze 25-100mm bore – Anodized Aluminum
5	Bushing	12-20mm bore – Bronze 25-100mm bore – Self Lubricating Nylon
6	Piston Seal	Nitrile (standard) or Fluoroelastomer (High Temperature option)
7	Cylinder Body	Polytetrafluoroethylene (PFTE) Impregnated Hard Anodized Aluminum
8	Rod Guide Seal	Nitrile (standard) or Fluoroelastomer (High Temperature option)
9	Piston	High Strength Aluminum Alloy
10	Center Section	12-20mm bore – Bronze 25-100mm bores – High Strength Aluminum Alloy
11	Front Magnet Plate	High Strength Aluminum Alloy
12	Magnet	Ferrite Nylon
13	Rear Magnet Plate	High Strength Aluminum Alloy
14	Threaded Insert	High Strength Steel
15	Tie Rod	High Strength Steel
16	Tie Nut	High Strength Steel

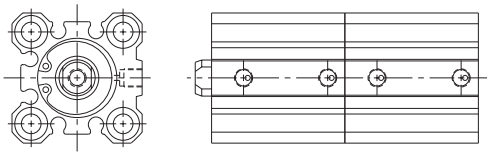


Body Styles

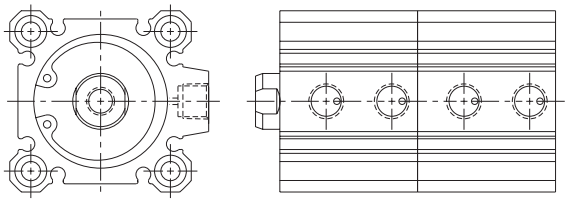
12mm Bore



16mm to 32mm Bore



40mm to 100mm Bore



EFP and EFQ Cylinder Options and Dimensions

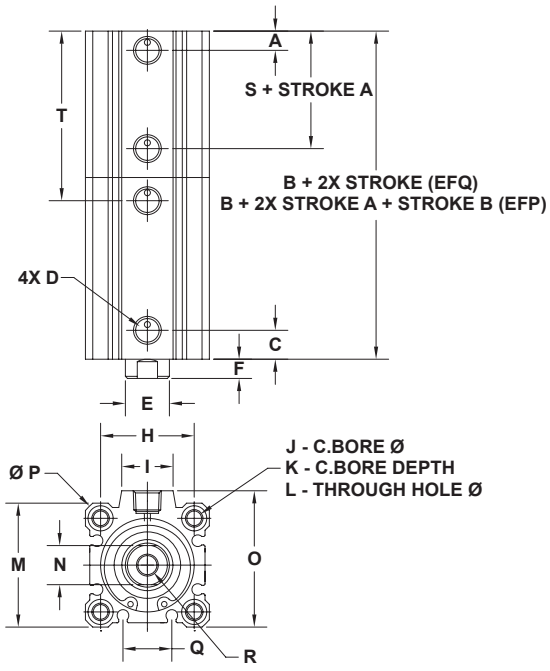
Dimensions (mm [in])

Double Acting/Single Rod

Bore	A	B	C	D	E	F	H	I
12mm (1/2")	3.8 (0.15)	43.7 (1.72)	8.9 (0.35)	(#10-32)	6.0 (0.24)	3.5 (0.14)	15.5 (0.61)	N/A
16mm (5/8")	4.6 (0.18)	47.0 (1.85)	9.4 (0.37)	(#10-32)	8.0 (0.31)	3.5 (0.14)	20.0 (0.79)	8.7 (0.34)
20mm (3/4")	4.8 (0.19)	51.1 (2.01)	9.4 (0.37)	(#10-32)	10.0 (0.39)	4.5 (0.18)	25.5 (1.00)	9.5 (0.37)
25mm (1")	5.1 (0.20)	56.4 (2.22)	10.9 (0.43)	(#10-32)	12.0 (0.47)	5.0 (0.20)	28.0 (1.10)	10.3 (0.41)
32mm (1-1/4")	7.1 (0.28)	57.7 (2.27)	10.4 (0.41)	(NPT 1/8)	16.0 (0.63)	7.0 (0.28)	34.0 (1.34)	18.5 (0.73)
40mm (1-1/2")	7.4 (0.29)	71.6 (2.82)	13.2 (0.52)	(NPT 1/8)	16.0 (0.63)	7.0 (0.28)	40.0 (1.57)	17.3 (0.68)
50mm (2")	9.4 (0.37)	74.4 (2.93)	13.7 (0.54)	(NPT 1/4)	20.0 (0.79)	8.0 (0.31)	50.0 (1.97)	20.0 (0.79)
63mm (2-1/2")	9.7 (0.38)	84.2 (3.31)	15.7 (0.62)	(NPT 1/4)	20.0 (0.79)	8.0 (0.31)	60.0 (2.36)	20.0 (0.79)
80mm (3-1/4")	11.7 (0.46)	100.6 (3.96)	17.8 (0.70)	(NPT 3/8)	25.0 (0.98)	10.0 (0.39)	77.0 (3.03)	26.0 (1.02)
100mm (4")	12.2 (0.48)	121.4 (4.78)	24.4 (0.96)	(NPT 3/8)	30.0 (1.18)	12.0 (0.47)	94.0 (3.70)	26.0 (1.02)

Bore	J	K	L	M	N	O	P	Q
12mm (1/2")	6.1 (0.24)	3.5 (0.14)	3.5 (0.14)	25.0 (0.98)	5.0 (0.19)	25.0 (0.98)	32.0 (1.26)	5.3 (0.21)
16mm (5/8")	6.5 (0.26)	3.5 (0.14)	3.5 (0.14)	29.0 (1.14)	6.0 (0.25)	29.0 (1.14)	38.0 (1.50)	7.8 (0.31)
20mm (3/4")	9.0 (0.35)	7.0 (0.28)	5.5 (0.22)	36.0 (1.42)	8.0 (0.31)	36.0 (1.42)	47.0 (1.85)	10.5 (0.41)
25mm (1")	9.0 (0.35)	7.0 (0.28)	5.5 (0.22)	40.0 (1.57)	10.0 (0.38)	40.0 (1.57)	52.0 (2.05)	11.5 (0.45)
32mm (1-1/4")	9.0 (0.35)	7.0 (0.28)	5.5 (0.22)	45.0 (1.77)	14.0 (0.56)	49.5 (1.95)	60.0 (2.36)	17.7 (0.70)
40mm (1-1/2")	9.0 (0.35)	7.0 (0.28)	5.5 (0.22)	52.0 (2.05)	14.0 (0.56)	57.0 (2.24)	69.0 (2.72)	24.5 (0.96)
50mm (2")	11.1 (0.44)	8.0 (0.31)	6.9 (0.27)	64.0 (2.52)	17.0 (0.69)	71.0 (2.80)	86.0 (3.39)	29.3 (1.16)
63mm (2-1/2")	14.1 (0.56)	10.5 (0.41)	8.8 (0.35)	77.0 (3.03)	17.0 (0.69)	84.0 (3.31)	103.0 (4.06)	29.1 (1.15)
80mm (3-1/4")	17.5 (0.69)	13.5 (0.53)	11.0 (0.43)	98.0 (3.86)	22.0 (0.88)	104.0 (4.09)	132.0 (5.20)	28.1 (1.11)
100mm (4")	17.5 (0.69)	13.5 (0.53)	11.0 (0.43)	117.0 (4.61)	27.0 (1.06)	123.5 (4.86)	156.0 (6.14)	32.3 (1.27)

Bore	R	S	T
12mm (1/2")	(#8-32 UNC-2B)	8.1 (0.32)	20.8 (0.82)
16mm (5/8")	(#8-32 UNC-2B)	9.1 (0.36)	23.1 (0.91)
20mm (3/4")	(#10-32 UNF-2B)	10.2 (0.40)	26.4 (1.04)
25mm (1")	(1/4-28 UNF-2B)	11.7 (0.46)	29.2 (1.15)
32mm (1-1/4")	(5/16-24 UNF-2B)	0.7 (0.50)	31.5 (1.24)
40mm (1-1/2")	(3/8-24 UNF-2B)	16.3 (0.64)	40.3 (1.59)
50mm (2")	(1/2-20 UNF-2B)	16.8 (0.66)	41.9 (1.65)
63mm (2-1/2")	(1/2-20 UNF-2B)	20.3 (0.80)	47.2 (1.86)
80mm (3-1/4")	(5/8-18 UNF-2B)	25.7 (1.01)	57.5 (2.26)
100mm (4")	(3/4-16 UNF-2B)	28.7 (1.13)	69.7 (2.74)

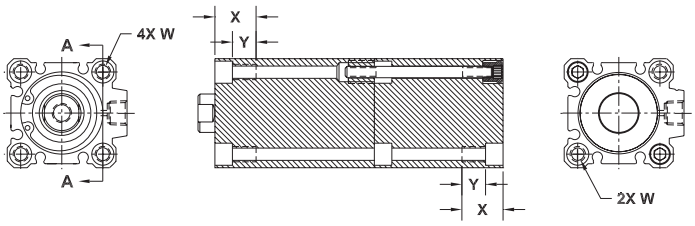


EFP and EFQ Accessory Options and Dimensions

Threaded Front/Rear Mount (-3)
(Standard)

Bore	W*	X	Y
12mm (1/2")	8-32 UNC	10.5 (0.41)	7.0 (0.28)
16mm (5/8")	8-32 UNC	10.5 (0.41)	7.0 (0.28)
20mm (3/4")	1/4-20 UNC	17.0 (0.67)	10.0 (0.39)
25mm (1")	1/4-20 UNC	17.0 (0.67)	10.0 (0.39)
32mm (1-1/4")	1/4-20 UNC	17.0 (0.67)	10.0 (0.39)
40mm (1-1/2")	1/4-20 UNC	17.0 (0.67)	10.0 (0.39)
50mm (2")	5/16-18 UNC	22.0 (0.87)	14.0 (0.55)
63mm (2-1/2")	7/16-14 UNC	28.5 (1.12)	18.0 (0.71)
80mm (3-1/4")	1/2-13 UNC	35.8 (1.40)	22.0 (0.87)
100mm (4")	1/2-13 UNC	35.8 (1.40)	22.0 (0.87)

*All four bolt holes are recommended to be used for front mounting.

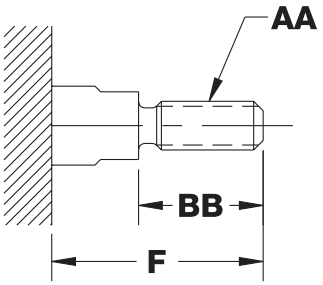


Bumpers (-B)
Stroke Reduction for all EFP/EFQ Bore Sizes

Model	Stroke Reduction mm (in)
Double Acting Single Rod End	3.0 (1.2)

Male Rod End (-MT)

Bore	AA	BB	F
12mm (1/2")	8-32 UNC	8.0 (0.31)	11.5 (0.45)
16mm (5/8")	8-32 UNC	8.0 (0.31)	11.5 (0.45)
20mm (3/4")	10-32 UNC	8.0 (0.31)	12.5 (0.49)
25mm (1")	1/4-28 UNC	9.5 (0.37)	14.5 (0.57)
32mm (1-1/4")	5/16-24 UNC	12.7 (0.50)	19.7 (0.78)
40mm (1-1/2")	3/8-24 UNC	16.0 (0.63)	23.0 (0.91)
50mm (2")	1/2-20 UNC	19.5 (0.77)	27.5 (1.08)
63mm (2-1/2")	1/2-20 UNC	19.5 (0.77)	27.5 (1.08)
80mm (3-1/4")	5/8-18 UNC	25.5 (1.00)	35.5 (1.40)
100mm (4")	5/8-18 UNC	28.5 (1.12)	40.5 (1.59)



The Model Number for all EFP cylinders consists of alphanumeric clusters. These designate type, bore size, stroke lengths, and special options. Please refer to the charts below for an example of a standard EFP model. This is a 25mm bore, 10mm stroke, double acting, single end rod cylinder with additional options.

Type	
EFP	Double Acting, Single End Rod

Bore Size	
12	12mm (1/2")
16	16mm (5/8")
20	20mm (3/4")
25	25mm (1")
32	32mm (1-1/4")
40	40mm (1-1/2")
50	50mm (2")
63	63mm (2-1/2")
80	80mm (3-1/4")
100	100mm (4")

Stroke Length A
See table - page 221

Stroke Length B
See table - page 221

EFP - 25 50 / 25 - 3 EMV

Mounting Options	
3	Threaded front/rear mounting option (standard)*

* For dimensions, see page 213.

Options (Enter in alphabetical order, except for EE which is last)	
B	Bumpers[1]
C	Stainless steel retaining ring
E	U.S. customary units (inch)[2] (standard)
F	Full-flow port orifice[5]
M	Magnetic position sensing (see table page 205)[3] (standard)
MT	Male rod thread end (fine thread) (see page 213)[4]
NT	Non-threaded rod
V	High temperature option 15° F to 225° F (-10° C to 110° C)
EE	Extra rod extension in 1mm increments

[1] Bumpers reduce stroke length by 3mm. When bumper is specified with option V, standard bumper material is supplied. Operating temperature remains -10° to 70°C (15° to 160°F).
[2] When option E is specified, user interface threads are designated U.S. customary (inch). This includes ports, rod threads and threaded mounting options (as applicable).
[3] When magnetic position sensing is specified with option V, operating temperature remains -10° to 70°C (15° to 160°F). This combination is recommended when fluoroelastomer is specified for compatibility.
[4] MT option must be specified to use rod pivot.
[5] Automatically includes bumpers, so stroke is reduced by 3mm.

Please note that throughout all catalog charts, metric measurements are shown first and U.S. customary units (inches) are in parentheses.

*NOTE: Number in parentheses are the equivalent bore size in inches and listed FOR REFERENCE ONLY. DO NOT use for model designation.

How to Order

The Model Number for all EFQ MultiForce cylinders consists of alphanumeric clusters. These designate type, bore size, stroke length, and special options. Please refer to the charts below for an example of a standard EFQ model with 25mm bore, 10mm stroke, and additional options.

Please note that all models come standard with threaded front/rear mounting holes (3), English customary units for interface threads (E), and magnetic position sensing (M) options.

Type	
EFQ	Double Acting, Single End Rod

Bore Size	
12	12mm (1/2")
16	16mm (5/8")
20	20mm (3/4")
25	25mm (1")
32	32mm (1-1/4")
40	40mm (1-1/2")
50	50mm (2")
63	63mm (2-1/2")
80	80mm (3-1/4")
100	100mm (4")

Stroke Length
See table - page 222

EFQ - 25 10 - 3 EMMTV

Mounting Options	
3	Threaded front/rear mounting option (standard)*

*For dimensions, see page 213

Options (Enter in alphabetical order, except for EE which is last)	
B	Bumpers[1]
C	Stainless steel retaining ring
E	U.S. customary units (inch)[2] (standard)
F	Full-flow port orifice[5]
M	Magnetic position sensing (see table page 205)[3] (standard)
MT	Male rod end (fine thread) (see page 213)[4]
NT	Non-threaded rod
V	High temperature option 15° F to 225° F (-10° C to 110° C)
EE	Extra rod extension in 1mm increments

[1] Bumpers reduce stroke length by 3mm. When bumper is specified with option V, standard bumper material is supplied. Operating temperature remains -10° to 70°C (15° to 160°F).
[2] When option E is specified, user interface threads are designated U.S. customary (inch). This includes ports, rod threads and threaded mounting options (as applicable).
[3] When magnetic position sensing is specified with option V, operating temperature remains -10° to 70°C (15° to 160°F). This combination is recommended when fluoroelastomer is specified for compatibility.
[4] MT option must be specified to use rod pivot.
[5] Automatically includes bumpers, so stroke is reduced by 3mm.

Please note that throughout all catalog charts, metric measurements are shown first and U.S. customary units (inches) are in parentheses.

*NOTE: Number in parentheses are the equivalent bore size in inches and listed FOR REFERENCE ONLY. DO NOT use for model designation.

The Bimba Twist Clamp Cylinder combines linear and 90° rotary motion with an internal pin/cam mechanism. The rotary action moves a clamping arm away from the workpiece, allowing for easy loading and unloading of parts.

Twist Clamp Compact Cylinders

Materials of Construction

End Caps: Anodized Aluminum Alloy

Cylinder Body: 304 Stainless Steel

Piston Rod: 303 Hard Chrome Plated Stainless Steel

Lubrication: Semi-Synthetic Grease

Seals: Buna-N Standard; High and Low Temperature (optional)

Engineering Specifications

Operating Medium: Air

Maximum Operating Pressure: 140 PSI

Ambient and Fluid Temperature: 15° F to 160° F

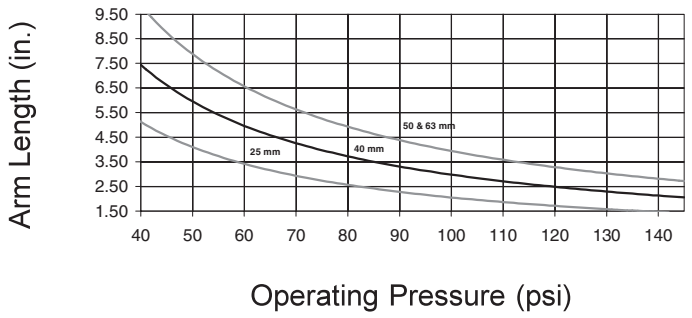
Lubrication: PTFE Grease

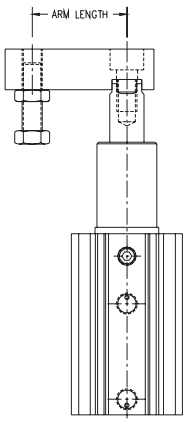
Shipping Weight

Bore	Weight
25mm	0.76
40mm	1.34
50mm	3.22
63mm	4.33

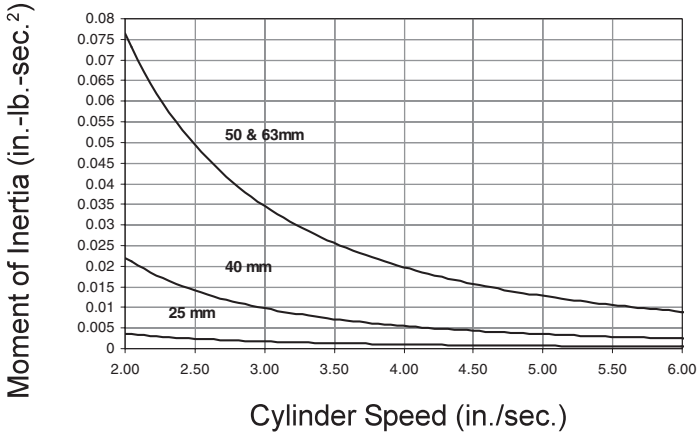
Twist Clamp Cylinders

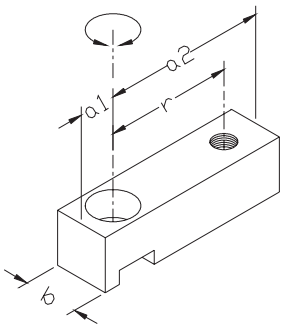
Maximum Clamp Arm Length





Maximum Kinetic Energy





$$I = \frac{W_{a1}}{g} * \frac{4(a1)^2 + b^2}{12} + \frac{W_{a2}}{g} * \frac{4(a2)^2 + b^2}{12}$$

Example, for standard EFCA-40-E

a1 - .50 in Wa1 = .028 lbs
a2 = 2.25 in Wa2 = .127 lbs
b = .75 in
r = 1.75 in
g = 386 in/sec²
clamp bolt and nut = .081 lbs

$$I \text{ arm} = \frac{.028 \text{ lb.}}{386 \text{ in./sec.}^2} * \frac{4\,(.50 \text{ in})^2 + (.75 \text{ in.})^2}{12} + \frac{.127 \text{ lb.}}{386 \text{ in./sec.}^2} * \frac{4(2.25 \text{ in})^2 + (.75 \text{ in.})^2}{12}$$

I arm = .000578 in.-lb.-sec.²

$$I \text{ bolt/nut} = \frac{.081 \text{ lbs.}}{386 \text{ in./sec.}^2} * (1.75 \text{ in.})^2 = .000642 \text{ in.-lb.-sec.}^2$$

I total = .000578 + .000642 = 0.00122 in.-lb.-sec.²

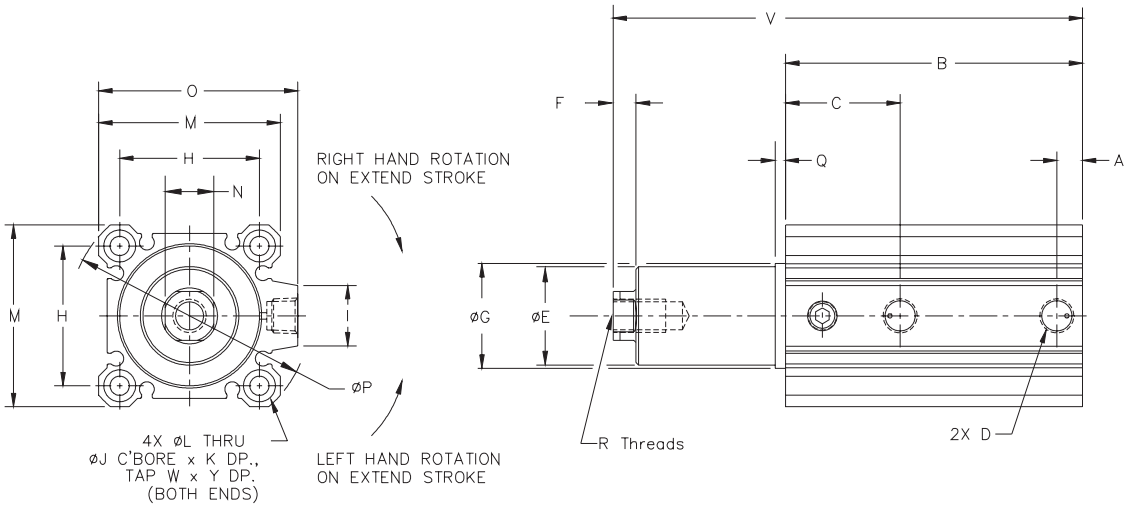
Operating Precautions:

- Do not clamp during rotary portion of stroke.
- Cylinder should be mounted vertically.
- Any force applied to clamped part perpendicular to clamping direction should not exceed 5% of the clamp force.

Bore	Power Factor
25mm	0.58
40mm	1.63
50mm	2.55
63mm	4.34

Clamp Force (lbs.) = pressure (psi) x power factor

Twist Clamp Cylinder Options and Dimensions

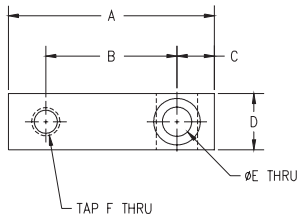


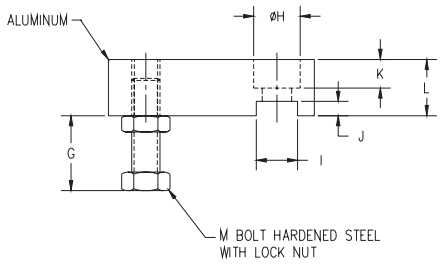
Bore	A	B	C	D	E	F	G	H	I	J
25mm	0.20	3.27	1.22	#10-32	0.84	0.16	0.905	1.10	0.41	0.35
40mm	0.29	3.34	1.29	1/8 NPT	1.12	0.26	1.180	1.57	0.68	0.35
50mm	0.37	4.98	1.29	1/4 NPT	1.39	0.30	1.456	1.97	0.79	0.44
63mm	0.38	5.12	1.37	1/4 NPT	1.82	0.30	1.888	2.36	0.79	0.56

Bore	K	L	M	N	Rod Dia.	O	P	Q	R	V	W	Y
25mm	0.28	0.22	1.57	0.39	0.47	1.57	2.05	0.16	5/16-24	4.47	1/4-20	0.67
40mm	0.28	0.22	2.05	0.54	0.63	2.24	2.72	0.11	3/8-24	5.30	1/4-20	0.67
50mm	0.31	0.27	2.52	0.66	0.79	2.80	3.39	0.14	1/2-20	8.35	5/16-18	0.86
63mm	0.41	0.35	3.03	0.66	0.79	3.31	4.06	0.16	1/2-20	8.47	7/16-14	1.12

Twist Clamp Accessory Options and Dimensions

Clamp Arm





Bore	A	B	C	D	E	F	G	H	I	J	K	L	M
25mm	2.00	1.38	0.38	0.63	0.34	1/4-20	1.13	0.50	0.393	0.08	0.32	0.63	1/4-20
40mm	2.75	1.75	0.50	0.75	0.39	3/8-16	1.00	0.62	0.550	0.19	0.38	0.75	3/8-16
50mm	3.44	2.50	0.50	1.25	0.53	3/8-16	1.00	0.78	0.668	0.19	0.50	1.00	3/8-16
63mm	3.44	2.50	0.50	1.25	0.53	3/8-16	1.00	0.78	0.668	0.19	0.50	1.00	3/8-16

The Model Number for all EF Twist Clamp cylinders consists of alphanumeric clusters. These designate type, bore size, stroke length, and special options. Please refer to the charts below for an example of a standard EFCL model with 63mm bore, 77mm stroke, and additional options.

Please note the following features are standard, and are included in all model numbers: 3 (threaded front/rear mounting holes), E (US/inch units), and M (magnetic position sensing).

Type	
EFCL	EF clamp cylinder, left rotation*
EFCR	EF clamp cylinder, right rotation

Stroke Length			
Bore	**Rotary**	**Clamp**	**Total**
25mm	20mm	15mm	35
40mm	28mm	15mm	43
50mm	39mm	38mm	77
63mm	39mm	38mm	77

EFCL - 63 77 - 3EM

Bore Size	
25	25mm (1")
40	40mm (1-1/2")
50	50mm (2")
63	63mm (2-1/2")

Options (Enter in alphabetical order)	
3	Threaded mounting holes (front/rear)
E	U.S. customary units (inch) (standard)
M	Magnetic position sensing (standard)
V	High temperature fluoroelastomer seals 15° F to 225° F (-10° C to 110° C)

* Left rotation is achieved as cylinder extends. As cylinder retracts, rotation will be to the right.
** Stroke in model number is called out as TOTAL stroke.

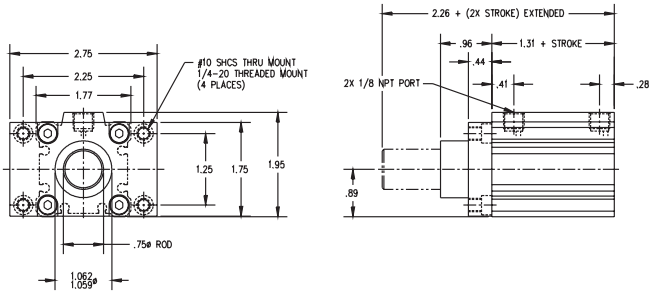
Product Features

The stopper cylinder is a modified EF-I cylinder designed specifically for conveyor stopping applications. It features a heavy-duty mounting plate, and the cylinder's rod/bearing design was developed specifically to withstand side impact loading. It is available in two double acting models, including a double acting failsafe spring extend design.

Stopper Compact Cylinders

> Standard U.S. customary (inch) threads for ports, mounting, and rods
> Stroke lengths available: 15, 20, 25mm
> Maximum Operating Pressure: 140 PSI
> Operating Temperature: 15° to 160°F (15° - 225° with -V option)
> Lubrication: PTFE grease
> Cylinder Body: Aluminum, hard coat with PTFE

Stopper Cylinder Options and Dimensions

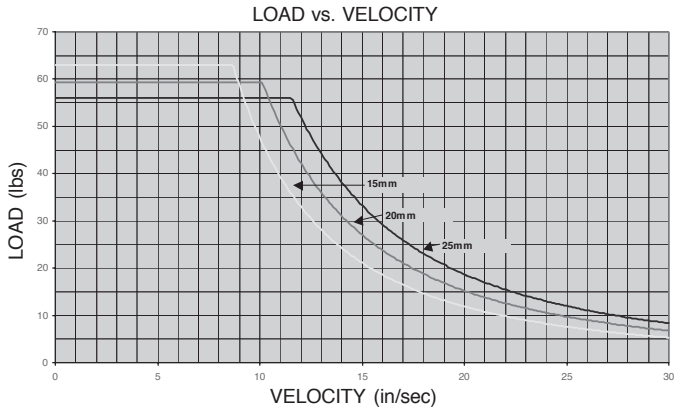


Engineering Specifications

Maximum Operating Pressure:	140 PSI
Operating Temperature:	15° F to 160° F (15° - 225° with -V option)
Lubrication:	PTFE Grease
Cylinder Body:	Aluminum; Hard-Coat with PTFE
Piston Rod:	303 Stainless Steel
Mounting Flange:	Anodized Aluminum
Seals:	Nitrile (fluoroelastomer optional)
Rod Bearing:	Sintered Iron
Spring Pre-final Loads:	2-8 lbs

Impact Limitations

Maximum Side Load	
Stroke (mm)	**Side Load (lb)**
15	12
20	11
25	10



How to Order

The Model Number for all Stopper cylinders consists of alphanumeric clusters. These designate type, bore size, stroke length, and special options. Please refer to the charts below for an example of a standard Stopper model. This is a 32mm bore, 25mm stroke cylinder with additional options.

Type	
EFL	Double Acting, Load-Bearing Conveyor-Stop
EFLR	Double Acting Failsafe, Spring Extended

Bore Size	
32	32mm (1-1/4")

Stroke Length	
15	15mm
20	20mm
25	25mm

EFL - 32 25 - E MV

Options (Enter in alphabetical order, except for EE which is last)	
M	Magnetic position sensing (see D-83136-AS)
V	High temperature option 15° F to 225° F (-10° C to 110° C)
EE	Extra rod extension in 1mm increments (up to 25mm)

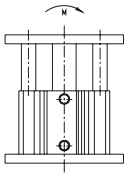
NOTE: Part number must include option -E; available only in inch series.

The Lift Table is an EF1-based, guided cylinder with four shafts for maximum rigidity. It is designed for lifting applications where other non-rotating cylinders cannot handle an overhung load and space is at a premium.

Extruded Flat Lift Tables

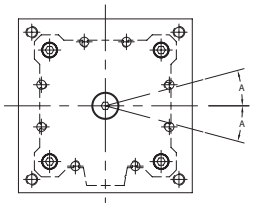
> Four-shaft support withstands offset loads and moments.
> Simple, efficient design provides economical alternative to other costly guided actuators.
> Joins the EF family of products and shares all the same benefits--long service life, low friction operation, fast delivery.
> Convenient wide tooling mounting surface.
> Intended for vertical lifting applications and should not be mounted horizontally or with tooling plates facing down.

Extruded Flat Lift Table Technical Specifications



Maximum Moment
Due to Side or Overhung Load

Bore	Max Moment
50mm	45 in-lb
80mm	125 in-lb
125mm	175 in-lb



Maximum Moment
Non-Rotational Accuracy

Bore	Accuracy (A)
50mm	+/- .17°
80mm	+/- .14°
125mm	+/- .11°

Materials of Construction

Cylinder Body: PTFE-impregnated hard anodized aluminum

Rear Mounting Plate: Anodized Aluminum

Guide Shafts: Hard Chrome Plated Stainless Steel

Guide Shaft Bearings: Composite Plastic

Tooling Plate: Anodized Aluminum

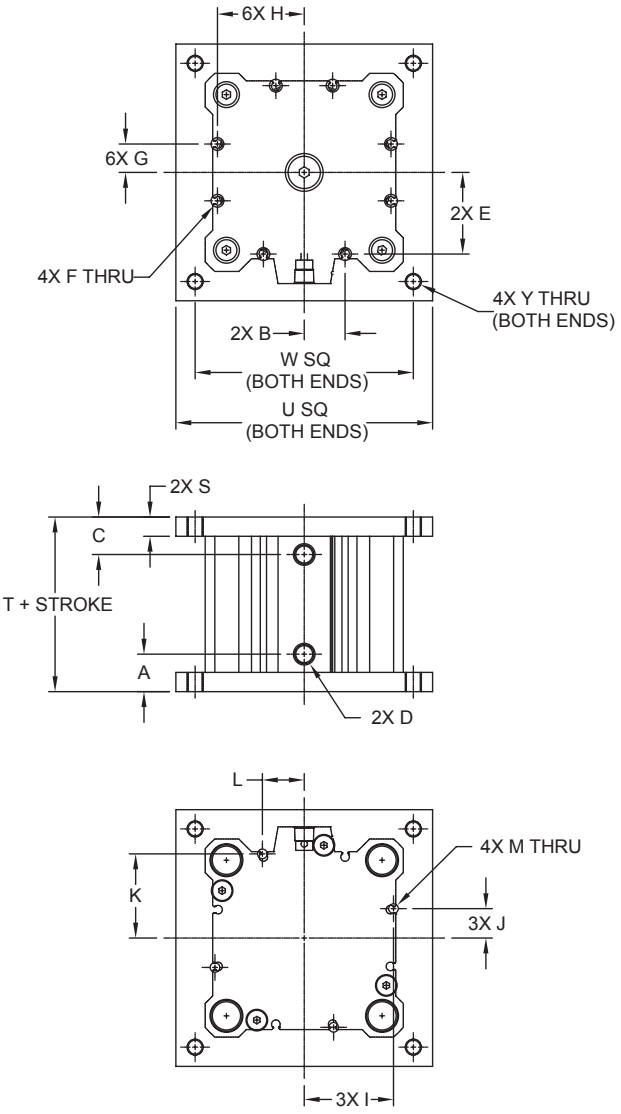
Piston Rod: Stainless Steel

Rod Guide: Aluminum Alloy

Seals: Nitrile (Fluoroelastomer optional)

Piston: Aluminum Alloy

Extruded Flat Lift Table Options and Dimensions



Overall Length, Dimension "T"

Bore	Without M Option	With M Option
50mm	Strokes: 0-24mm	Strokes: 0-21mm
	1.86	2.42
	Strokes: 25-100mm	Strokes: 22-100mm
	0.88 + Stroke	1.59 + Stroke
80mm	Strokes: 0-22mm	Strokes: 0-18mm
	2.14	2.30
	Strokes: 23-100mm	Strokes: 19-100mm
	1.28 + Stroke	1.59 + Stroke
125mm	Strokes: 0-37mm	Strokes: 0-30mm
	3.03	3.25
	Strokes: 38-100mm	Strokes: 31-100mm
	1.58 + Stroke	2.17 + Stroke

Bore	A	B	C	D	E	F	G
50mm	0.58	0.56	0.58	1/8 NPT	1.06	0.25	0.58
80mm	0.73	0.80	0.73	1/8 NPT	1.59	0.25	0.55
125mm	1.00	1.07	1.00	3/8 NPT	2.43	0.25	0.85

Bore	H	I	J	K	L	M	S
50mm	1.05	1.09	0.60	1.11	0.58	0.25	0.25
80mm	1.68	1.74	0.57	1.64	0.82	0.19	0.38
125mm	2.52	2.57	0.87	2.48	1.09	0.19	0.50

Bore	T	U	W	Y
50mm	See Table Above	3.00	2.50	#10-32 UNF
80mm		5.00	4.25	5/16-24 UNF
125mm		7.00	5.88	1/2-20 UNF

How to Order

The Model Number for all Extruded Flat Lift Tables consists of alphanumeric clusters. These designate type, bore size, stroke length, and special options. Please refer to the charts below for an example of a standard Lift Table model. This is a 80mm bore, 50mm stroke cylinder with additional options.

TYPE	
EFF	Double Acting, Non-Rotating Lift Table

Stroke length
5mm increments to 100mm max.

EFF - 80 50 - EM

Bore Size	
50	50mm
80	80mm
125	125mm

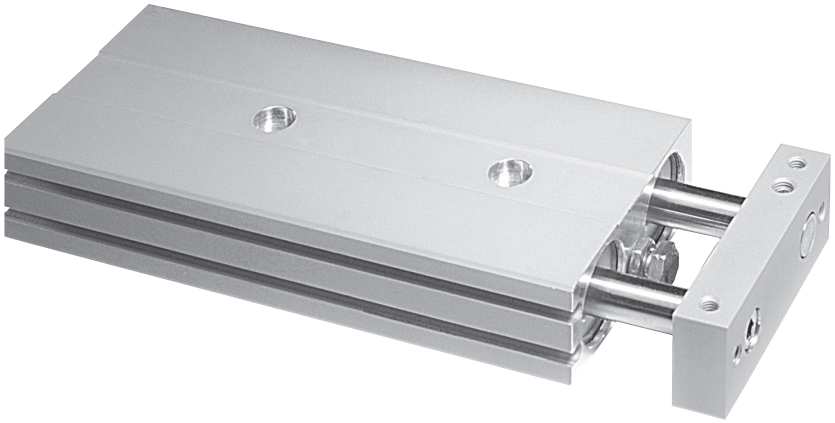
Options (Enter in alphabetical order)	
B	Internal bumpers[1]
E	U.S. customary (inch)[2]
M	Magnetic position sensing
V	High temperature (15° F to 225° F)

[1] Bumper on rod end only; stroke is reduced by 0.06".
[2] Inch series only; include "E" option in all model numbers.

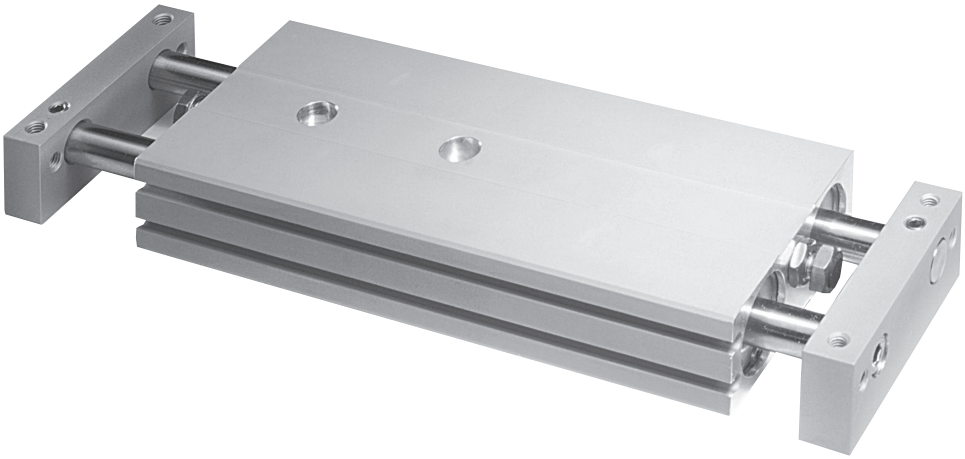
Product Features

The Bimba Twin Bore Cylinder is a small cross-section, double-bore cylinder that provides highly accurate linear motion. The cylinder incorporates extra long piston rod bearings, resulting in high radial load capacity. Single and double end rod units are available in both Delrin® and ball bushing styles. The highly precise Air Table incorporates a rigid linear rail with recirculating ball bearings.

Basic Twin Bore (TB)
Dual bores exert twice the force of a traditional cylinder while providing smooth, non-rotating actuation. The cylinder is symmetric and can be mounted from either side to allow convenient port access.



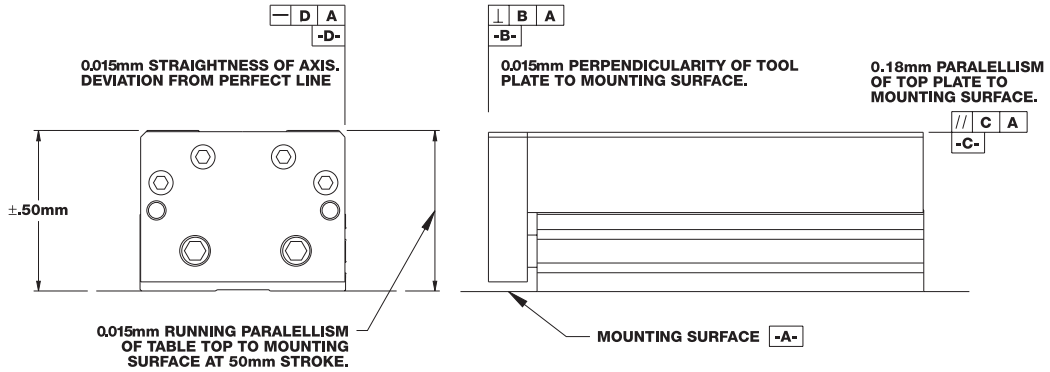
Double End Twin Bore (TBD)
Double rod end provides a saddle-mount unit with improved loading and resistance to deflection.



Twin Bore Air Table (TBA)
Smooth, precise movement is achieved via integration of a highly accurate recirculating ball bushing rail.

How it Works

Twin Bore Air Table (TBA Models)



*For filtered, lubricated air, no-load conditions; if unlubricated, life is approximately 1/3.

Engineering Specifications

Operating Medium: Air

Maximum Operating Pressure: 10 bar (140 PSI)

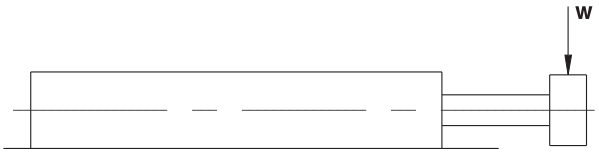
Temperature Range: -10° to 70° C (15° to 160° F)

Lubrication: PTFE Grease

Expected Service Life: 2500 kilometers (1500 miles)

Twin Bore (TB Models; Standard Bearings and Option X)

Maximum Radial Load kg-Force (lb)



Maximum allowable load for horizontally mounted cylinder with rods aligned in horizontal direction.

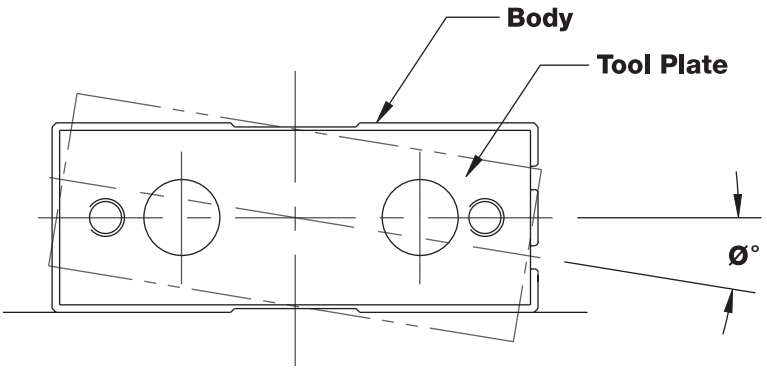
TB Standard Maximum Radial Loads Kgf (lb)							
Model No.	**10**	**20**	**30**	**40**	**50**	**75**	**100**
TB-6	0.15 (0.33)	0.12 (0.26)	0.10 (0.21)	0.08 (0.18)	0.07 (0.16)	N/A	N/A
TB-8	0.14 (0.31)	0.11 (0.24)	0.09 (0.20)	0.08 (0.17)	0.07 (0.15)	0.05 (0.11)	N/A
TB-12	1.0 (2.14)	0.8 (1.77)	0.7 (1.51)	0.6 (1.31)	0.5 (1.16)	0.4 (0.90)	N/A
TB-16	1.5 (3.31)	1.3 (2.80)	1.1 (2.42)	1.0 (2.14)	0.9 (1.91)	0.7 (1.51)	0.6 (1.25)
TB-20	2.3 (5.07)	2.0 (4.36)	1.7 (3.83)	1.6 (3.41)	1.4 (3.07)	1.1 (2.47)	0.9 (2.06)
TB-25	3.1 (6.76)	2.7 (5.85)	2.3 (5.15)	2.1 (4.60)	1.9 (4.16)	1.5 (3.35)	1.3 (2.81)
TB-32	5.8 (12.82)	5.1 (11.30)	4.6 (10.10)	4.2 (9.13)	3.8 (8.33)	3.1 (6.84)	2.6 (5.80)

TB-X Maximum Radial Loads Kgf (lb)							
Model No.	**10**	**20**	**30**	**40**	**50**	**75**	**100**
TB-12-X	0.7 (1.50)	0.6 (1.28)	0.5 (1.11)	0.4 (0.98)	0.4 (0.88)	0.3 (0.70)	N/A
TB-16-X	0.9 (2.08)	0.8 (1.80)	0.7 (1.58)	0.6 (1.42)	0.6 (1.28)	0.5 (1.03)	0.4 (0.86)
TB-20-X	1.4 (3.06)	1.2 (2.69)	1.1 (2.41)	1.0 (2.17)	0.9 (1.98)	0.7 (1.63)	0.6 (1.38)
TB-25-X	1.5 (3.36)	1.4 (2.97)	1.2 (2.67)	1.1 (2.42)	1.0 (2.21)	0.8 (1.82)	0.7 (1.55)
TB-32-X	2.7 (5.97)	2.4 (5.35)	2.2 (4.85)	2.0 (4.43)	1.9 (4.08)	1.6 (3.41)	1.3 (2.93)

Twin Bore (TB Models; Standard Bearings and Option X)

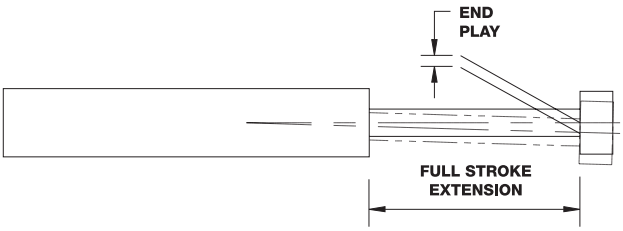
Maximum Radial Load kg-Force (lb)
Non-Rotational Accuracy (degrees)

Maximum allowable value for Ø° in a free unloaded condition.



TB Model (Standard Bushings)	
Model No.	**Degrees (±)**
TB-6	0.15
TB-8	0.12
TB-12	0.10
TB-16	0.08
TB-20	0.08
TB-25	0.06
TB-32	0.05
TB Model - X Option (Ball Bushing)	
Model No.	**Degrees (±)**
TB-12	0.02
TB-16	0.02
TB-20	0.02
TB-25	0.01
TB-32	0.01

Maximum End Play mm (inch)



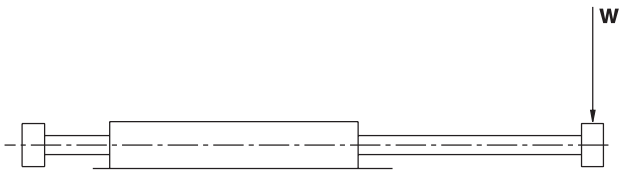
Maximum allowable movement of the tooling plate in the vertical direction with rods aligned in horizontal direction.

	TB Model						
Model No. (Standard Bushings)	**Stroke Length mm**						
	10	**20**	**30**	**40**	**50**	**75**	**100**
TB-6	0.243 (0.010)	0.327 (0.013)	0.410 (0.016)	0.494 (0.019)	0.577 (0.023)	N/A	N/A
TB-8	0.255 (0.010)	0.343 (0.013)	0.431 (0.017)	0.519 (0.020)	0.607 (0.024)	0.828 (0.033)	N/A
TB-12	0.224 (0.009)	0.283 (0.011)	0.341 (0.013)	0.400 (0.016)	0.458 (0.018)	0.604 (0.024)	0.750 (0.030)
TB-16	0.229 (0.009)	0.283 (0.011)	0.337 (0.013)	0.391 (0.015)	0.445 (0.018)	0.581 (0.023)	0.716 (0.028)
TB-20	0.252 (0.010)	0.305 (0.012)	0.359 (0.014)	0.412 (0.016)	0.466 (0.018)	0.600 (0.024)	0.734 (0.029)
TB-25	0.231 (0.009)	0.278 (0.011)	0.325 (0.013)	0.372 (0.015)	0.420 (0.017)	0.537 (0.021)	0.655 (0.026)
TB-32	0.224 (0.009)	0.260 (0.010)	0.297 (0.012)	0.334 (0.013)	0.370 (0.015)	0.462 (0.018)	0.553 (0.022)

(Option X - Ball Bushing)	**Stroke Length mm**						
	10	**20**	**30**	**40**	**50**	**75**	**100**
TB-12-X	0.143 (0.006)	0.185 (0.007)	0.228 (0.009)	0.271 (0.011)	0.313 (0.012)	0.420 (0.017)	0.526 (0.021)
TB-16-X	0.140 (0.006)	0.178 (0.007)	0.216 (0.008)	0.254 (0.010)	0.291 (0.011)	0.386 (0.015)	0.480 (0.019)
TB-20-X	0.133 (0.005)	0.165 (0.006)	0.197 (0.008)	0.229 (0.009)	0.260 (0.010)	0.340 (0.013)	0.419 (0.017)
TB-25-X	0.154 (0.006)	0.190 (0.007)	0.225 (0.009)	0.261 (0.010)	0.296 (0.012)	0.385 (0.015)	0.474 (0.019)
TB-32-X	0.156 (0.006)	0.185 (0.007)	0.214 (0.008)	0.243 (0.010)	0.273 (0.011)	0.346 (0.014)	0.419 (0.016)

Twin Bore (Tb Models; Standard Bearings and Option X)

Maximum Radial Load kg-Force (lb)



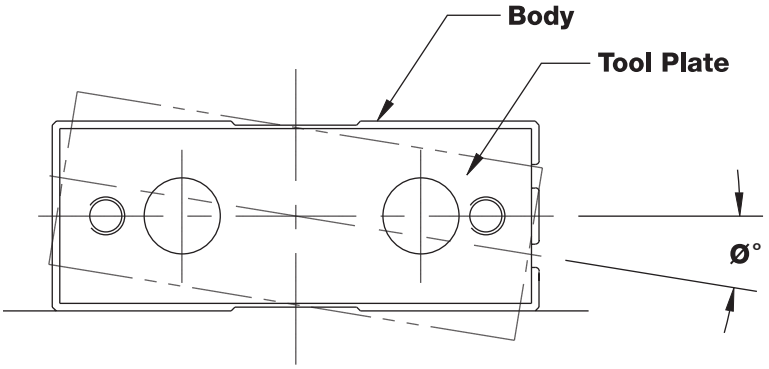
Maximum allowable load for horizontally mounted Double Rod End cylinder with rods aligned in horizontal direction.

TBD Standard Maximum Radial Loads Kgf (lb)							
Model No.	**10**	**20**	**30**	**40**	**50**	**75**	**100**
TBD-6	0.83 (1.83)	0.79 (1.75)	0.77 (1.69)	0.75 (1.65)	0.73 (1.62)	N/A	N/A
TBD-8	0.90 (1.98)	0.86 (1.90)	0.84 (1.84)	0.82 (1.80)	0.81 (1.77)	0.78 (1.72)	N/A
TBD-12	1.5 (3.35)	1.5 (3.27)	1.5 (3.22)	1.4 (3.18)	1.4 (3.15)	1.4 (3.09)	N/A
TBD-16	2.3 (4.97)	2.2 (4.89)	2.2 (4.83)	2.2 (4.79)	2.2 (4.76)	2.1 (4.70)	2.1 (4.66)
TBD-20	3.3 (7.29)	3.3 (7.19)	3.2 (7.11)	3.2 (7.05)	3.2 (7.01)	3.1 (6.92)	3.1 (6.86)
TBD-25	4.3 (9.46)	4.2 (9.33)	4.2 (9.22)	4.2 (9.14)	4.1 (9.07)	4.1 (8.95)	4.0 (8.87)
TBD-32	7.5 (16.44)	7.4 (16.21)	7.3 (16.02)	7.2 (15.88)	7.2 (15.76)	7.1 (15.53)	7.0 (15.37)

TBD-X Maximum Radial Loads Kgf (lb)							
Model No.	**10**	**20**	**30**	**40**	**50**	**75**	**100**
TBD-12-X	12.1 (26.70)	11.9 (26.09)	11.7 (25.65)	11.5 (25.33)	11.4 (25.08)	11.2 (24.64)	N/A
TBD-16-X	15.0 (33.04)	14.8 (32.51)	14.6 (32.13)	14.5 (31.84)	14.4 (31.61)	14.2 (31.20)	14.1 (30.94)
TBD-20-X	21.1 (46.37)	20.8 (45.71)	20.6 (45.22)	20.4 (44.84)	20.2 (44.54)	20.0 (43.99)	19.8 (43.62)
TBD-25-X	23.5 (51.64)	23.1 (50.89)	22.9 (50.32)	22.7 (49.87)	22.5 (49.51)	22.2 (48.86)	22.0 (48.42)
TBD-32-X	44.7 (98.38)	44.1 (96.98)	43.6 (95.89)	43.2 (95.01)	42.9 (94.29)	42.2 (92.94)	41.8 (92.01)

Non-Rotational Accuracy (degrees)

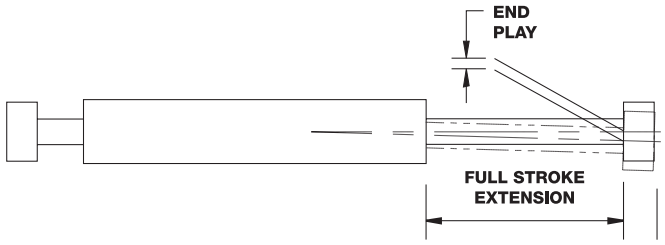
Maximum allowable value for Øº in a free unloaded condition.



TBD Model (Standard Bushings)	
Model No.	**Degrees (±)**
TBD-6	0.15
TBD-8	0.12
TBD-12	0.10
TBD-16	0.08
TBD-20	0.08
TBD-25	0.06
TBD-32	0.05
TBD Model - X Option (Ball Bushing)	
Model No.	**Degrees (±)**
TBD-12	0.02
TBD-16	0.02
TBD-20	0.02
TBD-25	0.01
TBD-32	0.01

Twin Bore (TBD Models; Standard Bearings and Option X)

Maximum End Play mm (inch)



Maximum allowable movement of the tooling plate in the vertical direction with rods aligned in horizontal direction.

TBD Model							
Model No. (Standard Bushings)	Stroke Length mm						
	10	20	30	40	50	75	100
TB-6	0.076 (0.003)	0.089 (0.003)	0.098 (0.004)	0.106 (0.004)	0.112 (0.004)	N/A	N/A
TB-8	0.068 (0.003)	0.080 (0.003)	0.088 (0.003)	0.095 (0.004)	0.101 (0.004)	0.111 (0.004)	N/A
TB-12	0.063 (0.002)	0.071 (0.003)	0.077 (0.003)	0.082 (0.003)	0.086 (0.003)	0.094 (0.004)	0.100 (0.004)
TB-16	0.068 (0.003)	0.075 (0.003)	0.081 (0.003)	0.086 (0.003)	0.091 (0.004)	0.099 (0.004)	0.105 (0.004)
TB-20	0.074 (0.003)	0.082 (0.003)	0.088 (0.003)	0.094 (0.004)	0.099 (0.004)	0.108 (0.004)	0.115 (0.005)
TB-25	0.069 (0.003)	0.076 (0.003)	0.082 (0.003)	0.087 (0.003)	0.092 (0.004)	0.101 (0.004)	0.107 (0.004)
TB-32	0.078 (0.003)	0.084 (0.003)	0.089 (0.003)	0.093 (0.004)	0.097 (0.004)	0.104 (0.004)	0.110 (0.004)

(Option X - Ball Bushing)	Stroke Length mm						
	10	20	30	40	50	75	100
TB-12-X	0.007 (0.0003)	0.008 (0.0003)	0.009 (0.0003)	0.009 (0.0004)	0.010 (0.0004)	0.011 (0.0004)	0.012 (0.0005)
TB-16-X	0.006 (0.0002)	0.006 (0.0002)	0.007 (0.0003)	0.007 (0.0003)	0.008 (0.0003)	0.009 (0.0003)	0.009 (0.0004)
TB-20-X	0.008 (0.0003)	0.009 (0.0004)	0.010 (0.0004)	0.011 (0.0004)	0.012 (0.0005)	0.013 (0.0005)	0.014 (0.0005)
TB-25-X	0.009 (0.0004)	0.010 (0.0004)	0.011 (0.0004)	0.012 (0.0005)	0.013 (0.0005)	0.014 (0.0006)	0.015 (0.0006)
TB-32-X	0.010 (0.0004)	0.010 (0.0004)	0.011 (0.0004)	0.012 (0.0005)	0.013 (0.0005)	0.014 (0.0005)	0.015 (0.0006)

Twin Bore Air Table (TBA Models)

Table Deflection By Pitch Moment

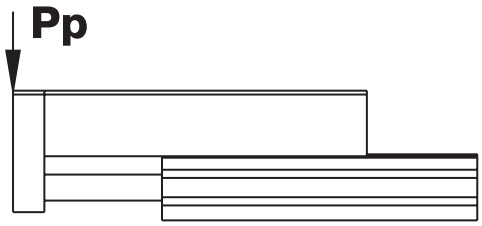
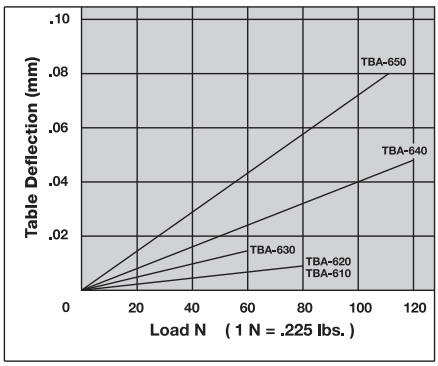
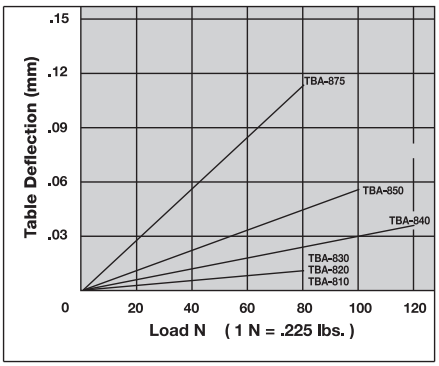


Table pitch deflection due to static pitch moment applied at arrow for fully extended stroke of slide table.

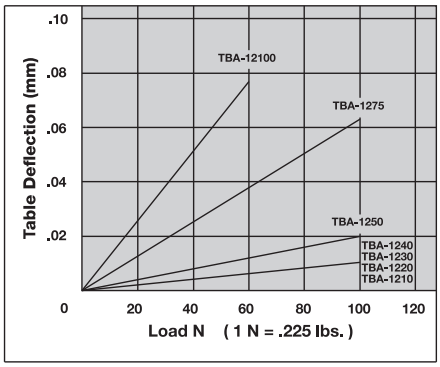
TBA-6



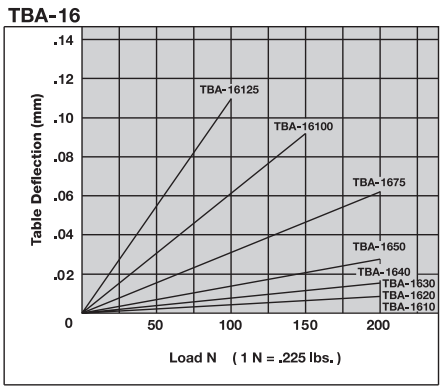
TBA-8



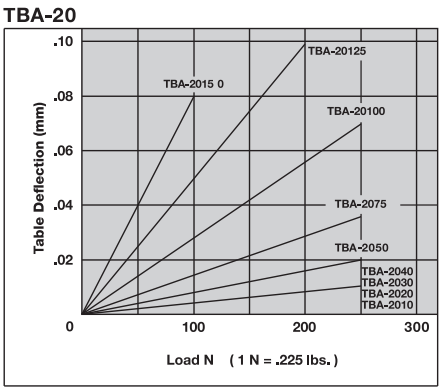
TBA-12



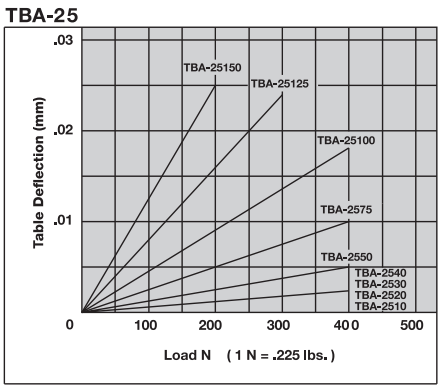
TBA-16



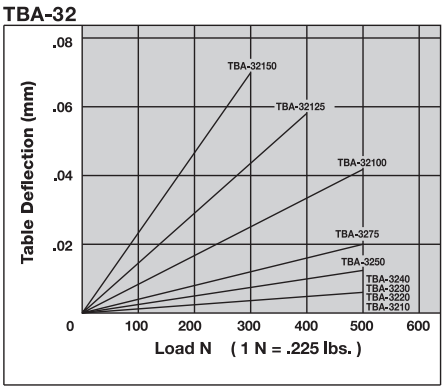
TBA-20



TBA-25



TBA-32



Twin Bore Air Table (TBA Models)

Table Deflection By Yaw Moment

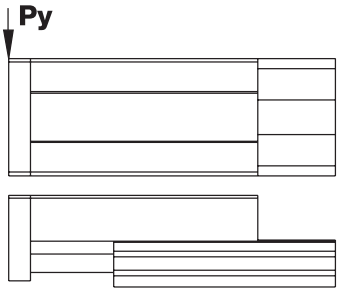
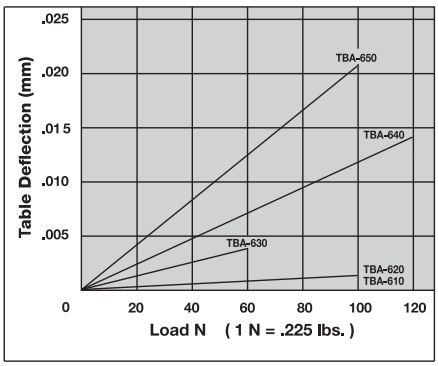
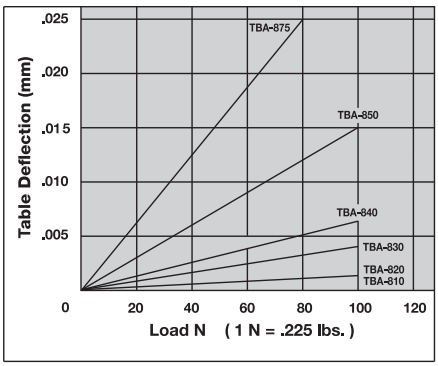


Table yaw deflection due to static yaw moment applied at arrow for fully extended stroke of slide table.

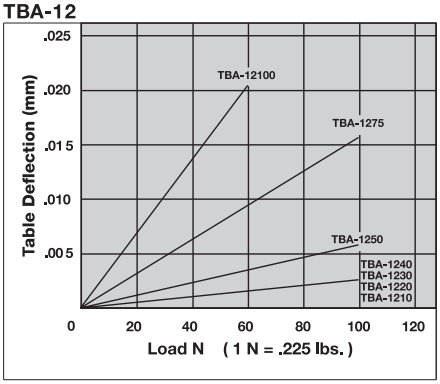
TBA-6



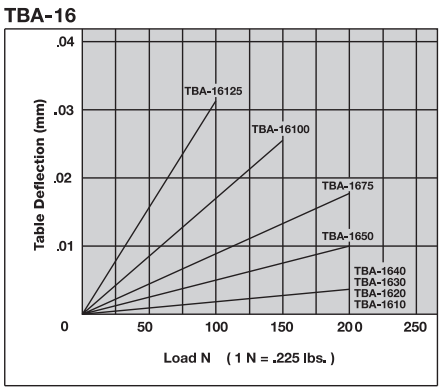
TBA-8



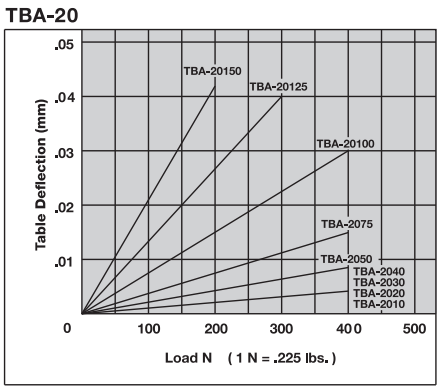
TBA-12



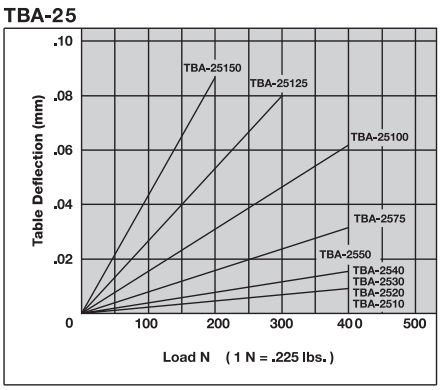
TBA-16



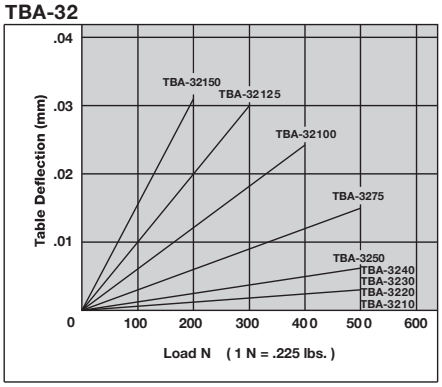
TBA-20



TBA-25

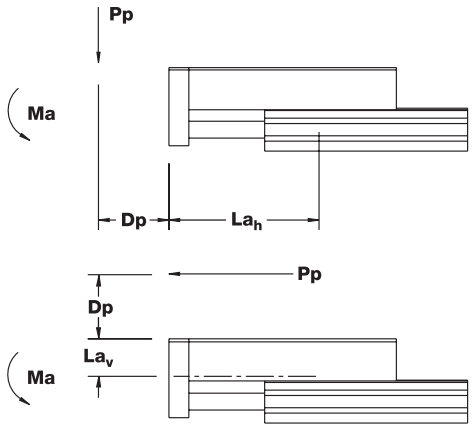


TBA-32



Twin Bore Air Table (TBA Models)

Formula for Calculation of Allowable Static Load Pp, Py and Pr



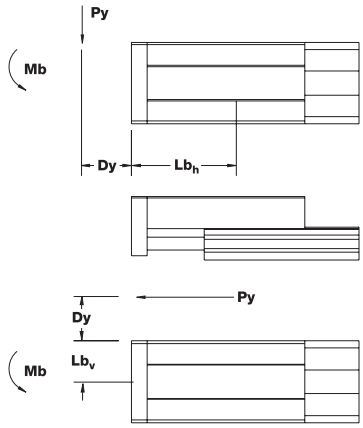
Pp = Ma x 1000 (Newtons)
Dp + La

Dp = Distance from load point to body (mm)

La = Moment arm (mm) see chart

Ma (Pitching Moment)

Model	Maximum Allowable Moment (Nm) by Stroke								
	10	20	30	40	50	75	100	125	150
TBA-6	2.55	2.55	2.55	8.65	8.65	N/A	N/A	N/A	N/A
TBA-8	2.55	2.55	2.55	8.65	8.65	8.65	N/A	N/A	N/A
TBA-12	5.39	5.39	5.39	5.39	5.39	14.1	14.1	N/A	N/A
TBA-16	8.72	8.72	8.72	8.72	31.5	31.5	31.5	31.5	N/A
TBA-20	31.5	31.5	31.5	31.5	31.5	31.5	42.1	42.1	42.1
TBA-25	44.9	44.9	44.9	44.9	44.9	44.9	72.2	72.2	72.2
TBA-32	44.9	44.9	44.9	44.9	44.9	120	120	120	120



Py = Mb x 1000 (Newtons)
Dy + Lb

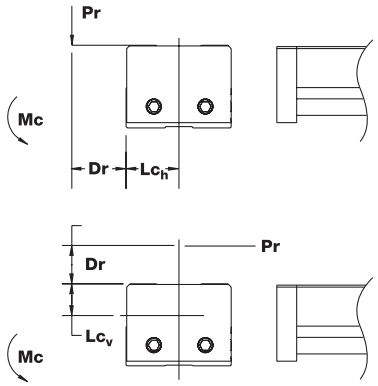
Dy = Distance from load point to body (mm)

Lb = Moment arm (mm) see chart

Mb (Yawing Moment)

Model	Maximum Allowable Moment (Nm) by Stroke								
		20	30	40	50	75	100	125	150
TBA-6	2.55	2.55	2.55	8.65	8.65	N/A	N/A	N/A	N/A
TBA-8	2.55	2.55	2.55	8.65	8.65	8.65	N/A	N/A	N/A
TBA-12	5.39	5.39	5.39	5.39	5.39	14.1	14.1	N/A	N/A
TBA-16	8.72	8.72	8.72	8.72	31.5	31.5	31.5	31.5	N/A
TBA-20	31.5	31.5	31.5	31.5	31.5	31.5	42.1	42.1	42.1
TBA-25	44.9	44.9	44.9	44.9	44.9	44.9	72.2	72.2	72.2
TBA-32	44.9	44.9	44.9	44.9	44.9	120	120	120	120

Twin Bore Air Table (TBA Models)



Pr = Mc x 1000 (Newtons)
Dr + Lc

Dr = Distance from load point to body (mm)

Lc = Moment arm (mm) see chart

Mc (Rolling Moment)

Model	Maximum Allowable Moment (Nm) by Stroke								
	10	20	30	40	50	75	100	125	150
TBA-6	5.1	5.1	5.1	13.1	13.1	N/A	N/A	N/A	N/A
TBA-8	5.1	5.1	5.1	13.1	13.1	13.1	N/A	N/A	N/A
TBA-12	15.2	15.2	15.2	15.2	15.2	22.8	22.8	N/A	N/A
TBA-16	22.8	22.8	22.8	22.8	38.1	38.1	38.1	38.1	N/A
TBA-20	46.2	46.2	46.2	46.2	46.2	46.2	46.2	46.2	46.2
TBA-25	66.5	66.5	66.5	66.5	66.5	66.5	77.7	77.7	77.7
TBA-32	75.7	75.7	75.7	75.7	75.7	91.2	91.2	91.2	91.2

Bore/Stroke Constants

Model	Lah and Lbh Moment Lever Arm (mm) by Stroke								
	10	20	30	40	50	75	100	125	150
TBA-6	30.5	40.5	50.4	71.6	81.6	N/A	N/A	N/A	N/A
TBA-8	30.5	41	51	72.8	83.1	108.1	N/A	N/A	N/A
TBA-12	58	58	58	68	78	120	145	N/A	N/A
TBA-16	63.5	63.5	63.5	73.5	89.5	114.5	139.5	164.5	N/A
TBA-20	70.5	70.5	70.5	80.5	92.5	117.5	157	182	207
TBA-25	77	77	77	87.5	98.5	124.5	165	190	215
TBA-32	79	79	79	89	99	139.5	165.5	190.5	215

Model	Moment Lever Arm Distances (mm)			
	La$_v$	Lb$_v$	Lc$_h$	Lc$_v$
TBA-6	9.1	15.7	15.7	9.1
TBA-8	9.1	18.6	18.6	9.1
TBA-12	12.5	23	23	12.5
TBA-16	15.5	28.5	28.5	15.5
TBA-20	20.5	32	32	20.5
TBA-25	22.5	40	40	22.5
TBA-32	27	49	49	27

NOTE: 1 N-m = 8.851 in-lb
1N-m = .7376 ft-lb

Twin Bore Air Table (TBA Models)

Theoretical Cylinder Forces

Force = Power Factor x Input Pressure

Bore	Direction	Power Factor (When input pressure in bar)	Power Factor (When input pressure in psi)
6mm	Extend*	0.57	0.09
	Retract	0.42	0.07
8mm	Extend*	1.00	0.16
	Retract	0.75	0.12
12mm	Extend*	2.2	0.4
	Retract	1.6	0.2
16mm	Extend*	4.0	0.6
	Retract	3.0	0.4
20mm	Extend*	6.2	1.0
	Retract	4.8	0.8
25mm	Extend*	9.8	1.6
	Retract	7.6	1.2
32mm	Extend*	16.0	2.4
	Retract	12.0	1.8

*For TBD models use Retract Power Factors only; Extend is not applicable. BAR x Power Factor = kg
PSI x Power Factor = Pounds

Twin Bore Weights

TB Cylinder

Bore	Approx. Base Wt. of Cylinder gf (oz)	Wt. Added Per 5mm of Stk gf (oz)
6	52.3 (1.85)	4.9 (0.17)
8	75.5 (2.66)	6.5 (0.23)
12	127.4 (4.5)	9.4 (0.3)
16	212.6 (7.5)	13.6 (0.4)
20	345.6 (12.1)	19.1 (0.6)
25	551.8 (19.4)	28.0 (0.9)
32	1046.5 (36.9)	44.4 (1.5)

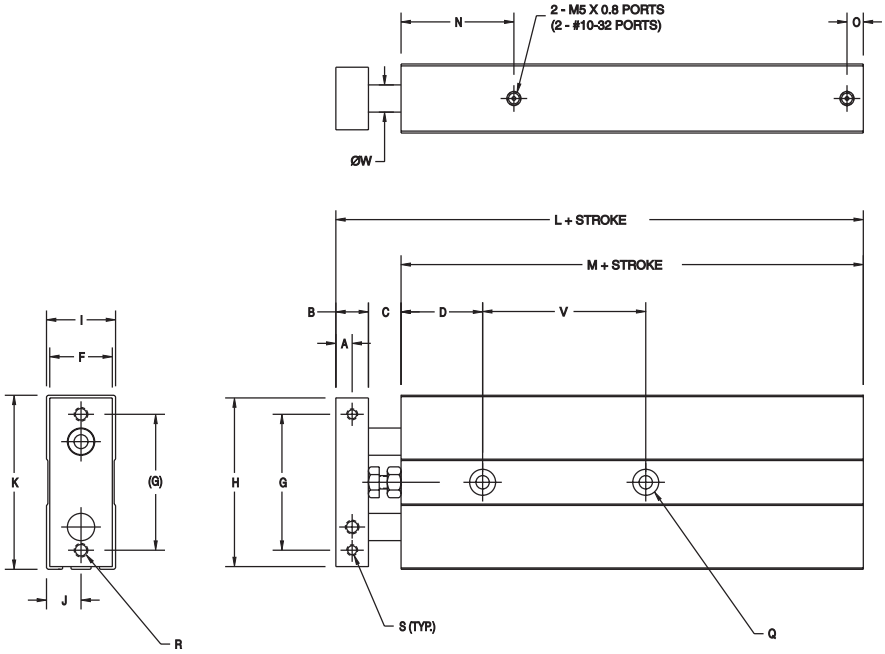
TBD Cylinder

Bore	Approx. Base Wt. of Cylinder gf (oz)	Wt. Added Per 5mm of Stk gf (oz)
6	81.8 (2.89)	5.5 (0.19)
8	109.7 (3.87)	7.4 (0.26)
12	208.7 (7.3)	11.6 (0.4)
16	361.3 (12.7)	17.6 (0.6)
20	580.9 (20.4)	25.3 (0.8)
25	943.1 (33.2)	36.9 (1.3)
32	1835.6 (64.7)	60.1 (2.1)

TBA Cylinder

Bore	Weight of Cylinder Based on Stroke Length gf (oz)								
	10mm	20mm	30mm	40mm	50mm	75mm	100mm	125mm	150mm
6	119.6 (4.22)	139.4 (4.92)	158.6 (5.60)	219.8 (7.75)	240.5 (8.48)	N/A	N/A	N/A	N/A
8	159.8 (5.64)	178.5 (6.30)	202.9 (7.16)	267.2 (9.42)	295.0 (10.41)	391.0 (13.79)	N/A	N/A	N/A
12	236.0 (8.3)	240.4 (8.4)	244.9 (8.6)	283.0 (9.9)	342.0 (12.0)	479.9 (16.9)	616.9 (21.7)	N/A	N/A
16	378.7 (13.3)	386.5 (13.6)	394.4 (13.9)	433.1 (15.2)	561.4 (19.8)	699.8 (24.6)	821.7 (28.9)	984.5 (34.7)	N/A
20	631.4 (22.2)	643.7 (22.7)	656.0 (23.1)	728.0 (25.6)	827.9 (29.2)	1047.4 (36.9)	1438.4 (50.7)	1645.0 (58.0)	1872.4 (66.0)
25	992.5 (35.0)	1010.2 (35.6)	1027.9 (36.2)	1128.3 (39.8)	1253.4 (44.2)	1636.0 (57.7)	2019.1 (71.2)	2525.8 (89.1)	2710.5 (95.6)
32	1660.0 (58.5)	1691.6 (59.6)	1723.1 (60.7)	1882.1 (66.3)	2078.8 (73.3)	2741.4 (96.7)	3277.9 (115.6)	4093.6 (144.4)	4591.6 (161.9)

TB Cylinder Dimensions mm (in)



Bore	A	B	C
6	2.8 (0.11)	5.5 (0.22)	8 (0.32)
8	3 (0.12)	6 (0.24)	8 (0.32)
12	4 (0.16)	8 (0.32)	9 (0.35)
16	5 (0.20)	10 (0.39)	9 (0.35)
20	6 (0.24)	12 (0.47)	12 (0.47)
25	6 (0.24)	12 (0.47)	12 (0.47)
32	8 (0.32)	16 (0.63)	14 (0.55)

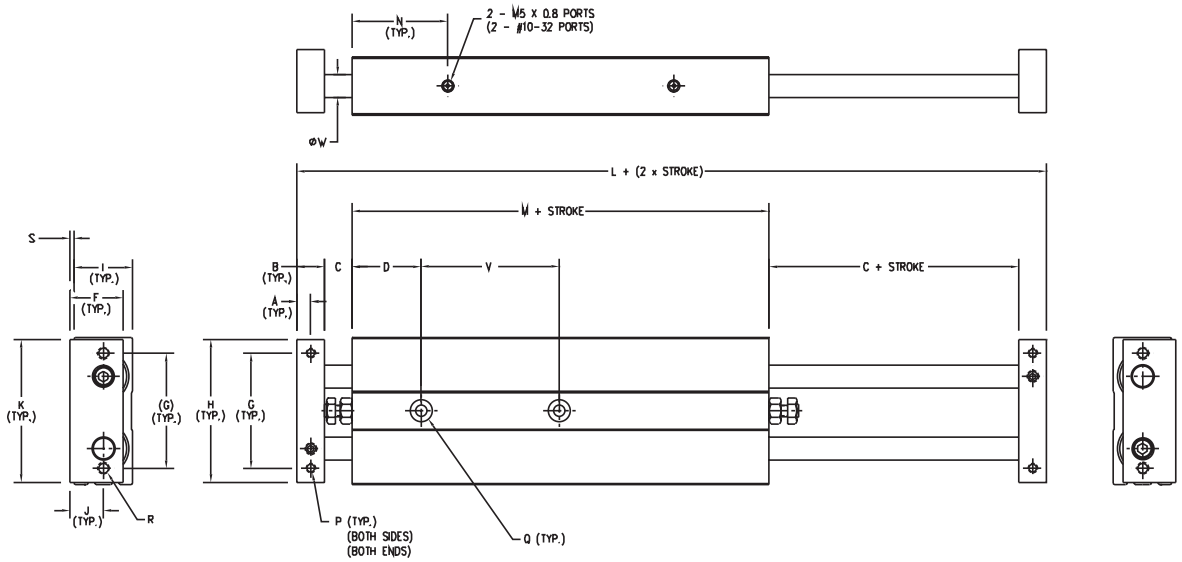
Bore	D	F	G
6	13 (0.51)	12 (0.47)	25 (0.98)
8	13 (0.51)	13 (0.51)	28 (1.10)
12	20 (0.79)	15 (0.59)	35 (1.38)
16	30 (1.18)	18 (0.71)	45 (1.77)
20	30 (1.18)	23 (0.91)	50 (1.97)
25	30 (1.18)	28 (1.10)	66 (2.60)
32	30 (1.18)	36 (1.42)	80 (3.15)

Bore	H	I	J	K	L	M	N	O
6	31 (1.22)	13.2 (0.52)	6.4 (0.25)	32 (1.26)	58.5 (2.30)	45 (1.77)	16 (0.63)	6.7 (0.27)
8	36 (1.42)	14.7 (0.58)	7.3 (0.29)	37.8 (1.49)	64 (2.52)	50 (1.97)	16.1 (0.64)	6.7 (0.27)
12	44 (1.73)	17.3 (0.68)	8.7 (0.34)	46 (1.81)	72 (2.83)	55 (2.17)	30.6 (1.20)	5 (0.20)
16	55 (2.17)	20.4 (0.80)	10.2 (0.40)	57 (2.24)	80 (3.16)	61 (2.41)	36.2 (1.42)	4.5 (0.18)
20	62 (2.44)	25.4 (1.00)	12.7 (0.50)	64 (2.52)	94 (3.70)	70 (2.76)	41.5 (1.63)	6 (0.24)
25	78 (3.07)	30.4 (1.20)	15.2 (0.60)	80 (3.15)	96 (3.78)	72 (2.84)	45 (1.77)	5 (0.20)
32	96 (3.78)	38.4 (1.51)	19.2 (0.76)	98 (3.86)	115 (4.51)	85 (3.33)	53 (2.09)	7.2 (0.28)

Bore	Q (Body Mounting Holes)	R	S	T (Ports)
6	M4x0.7 6H (#8-32 UNC-2B)	M3x0.5 6H (#4-40 UNC-2B)	M3x0.5 6H (#4-40 UNC-2B)	M5x0.8 6H (#10-32 UNF-2B)
8	M4x0.7 6H (#8-32 UNC-2B)	M3x0.5 6H (#4-40 UNC-2B)	M3x0.5 6H (#4-40 UNC-2B)	M5x0.8 6H (#10-32 UNF-2B)
12	M4x0.7 6H (#8-32 UNC-2B)	M4x0.7 6H (#8-32 UNC-2B)	M3x0.5 6H (#4-40 UNC-2B)	M5x0.8 6H (#10-32 UNF-2B)
16	M5x0.8 6H (#10-32 UNF-2B)	M5x0.8 6H (#10-32 UNF-2B)	M4x0.7 6H (#8-32 UNC-2B)	M5x0.8 6H (#10-32 UNF-2B)
20	M6x1 6H (1/4-20 UNC-2B)	M5x0.8 6H (#10-32 UNF-2B)	M4x0.7 6H (#8-32 UNC-2B)	M5x0.8 6H (#10-32 UNF-2B)
25	M8x1.25 6H (5/16-18 UNC-2B)	M6x1 6H (1/4-20 UNC-2B)	M5x0.8 6H (#10-32 UNF-2B)	M5x0.8 6H (#10-32 UNF-2B)
32	M8x1.25 6H (5/16-18 UNC-2B)	M6x1 6H (1/4-20 UNC-2B)	M5x0.8 6H (#10-32 UNF-2B)	G 1/8 (NPT 1/8)

Bore	V Based on Stroke											W
	0-10mm	11-20mm	0-20mm	21-25mm	21-30mm	26-50mm	31-40mm	41-50mm	51-75mm	51-80mm	81-100mm	
6	15 (0.59)	20 (0.79)	N/A	N/A	25 (0.98)	N/A	30 (1.18)	35 (1.38)	N/A	N/A	N/A	3 (.12)
8	15 (0.59)	20 (0.79)	N/A	N/A	25 (0.98)	N/A	30 (1.18)	35 (1.38)	47.5 (1.87)	N/A	N/A	4 (.16)
12	N/A	N/A	30 (1.18)	30 (1.18)	N/A	40 (1.58)	N/A	N/A	N/A	50 (1.97)	N/A	6 (.24)
16	N/A	N/A	25 (0.98)	35 (1.38)	N/A	35 (1.38)	N/A	N/A	N/A	45 (1.77)	55 (2.17)	8 (.32)
20	N/A	N/A	30 (1.18)	30 (1.18)	N/A	40 (1.58)	N/A	N/A	N/A	60 (2.36)	60 (2.36)	10 (.39)
25	N/A	N/A	30 (1.18)	30 (1.18)	N/A	40 (1.58)	N/A	N/A	N/A	60 (2.36)	60 (2.36)	12 (.47)
32	N/A	N/A	40 (1.58)	40 (1.58)	N/A	50 (1.97)	N/A	N/A	N/A	70 (2.76)	70 (2.76)	16 (.63)

TBD Cylinder Dimensions mm (in)

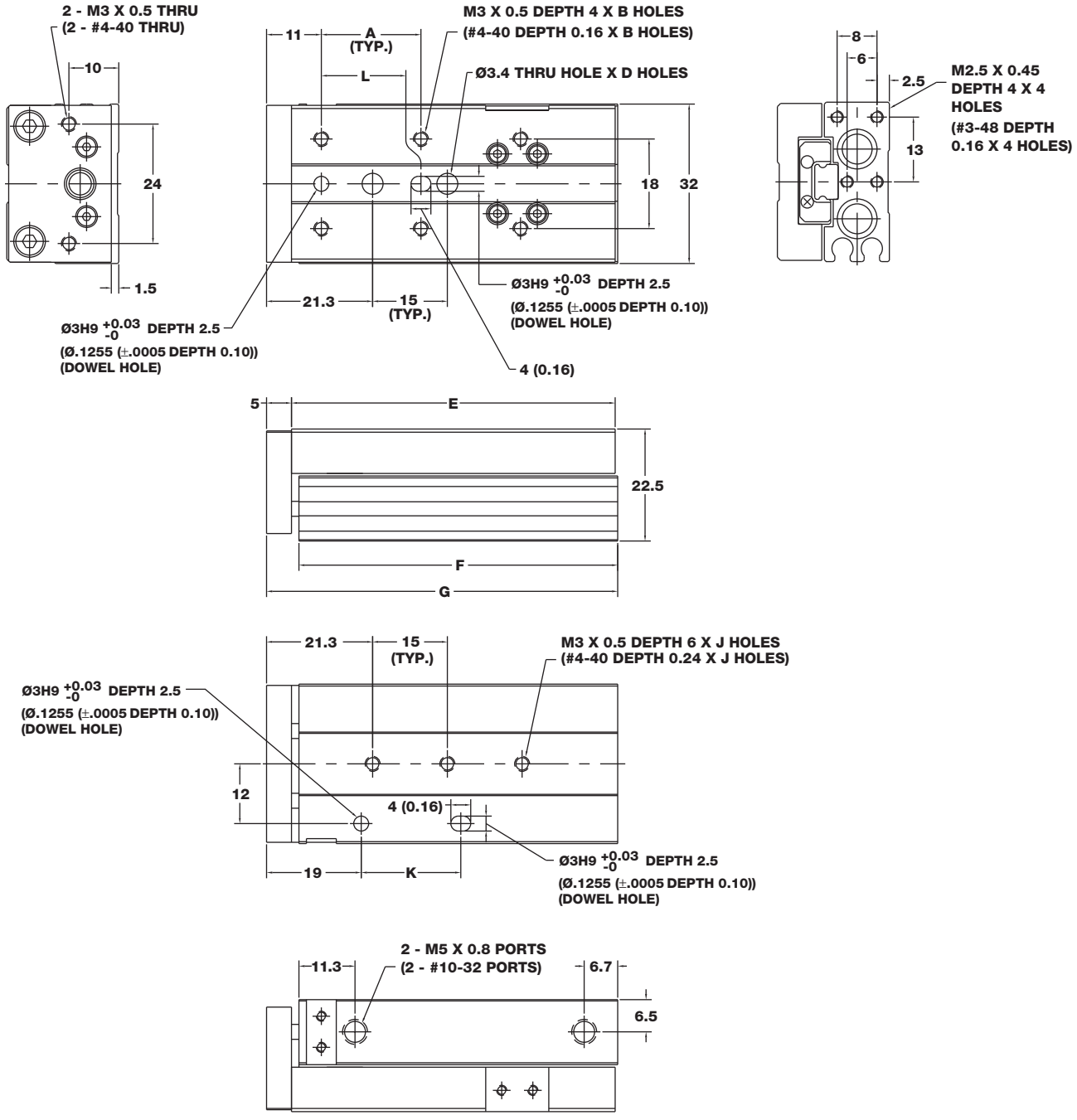


Bore	A	B	C	D	F	G	H	I	J	K	L	M	N
6	2.8 (0.11)	5.5 (0.22)	8 (0.32)	13 (0.51)	12 (0.47)	25 (0.98)	31 (1.22)	13.2 (0.52)	7.8 (0.31)	32 (1.26)	92.9 (3.66)	66 (2.60)	16 (0.63)
8	3 (0.12)	6 (0.24)	8 (0.32)	13 (0.51)	13 (0.51)	28 (1.10)	36 (1.42)	14.7 (0.58)	8.6 (0.34)	37.8 (1.49)	92.9 (3.66)	66 (2.60)	16.1 (0.64)
12	4 (0.16)	8 (0.32)	9 (0.35)	20 (0.79)	15 (0.59)	35 (1.38)	44 (1.73)	17.3 (0.68)	10.4 (0.41)	46 (1.81)	116.3 (4.58)	82.3 (3.24)	30.6 (1.20)
16	5 (0.20)	10 (0.39)	9 (0.35)	30 (1.18)	18 (0.71)	45 (1.77)	55 (2.17)	20.4 (0.80)	12.0 (0.47)	57 (2.24)	131.5 (5.16)	93.5 (3.68)	36.2 (1.42)
20	6 (0.24)	12 (0.47)	12 (0.47)	30 (1.18)	23 (0.91)	50 (1.97)	62 (2.44)	25.4 (1.00)	14.5 (0.57)	64 (2.52)	154.2 (6.07)	106.2 (4.18)	41.5 (1.63)
25	6 (0.24)	12 (0.47)	12 (0.47)	30 (1.18)	28 (1.10)	66 (2.60)	78 (3.07)	30.4 (1.20)	17.0 (0.67)	80 (3.15)	160.9 (6.33)	112.9 (4.45)	45 (1.77)
32	8 (0.32)	16 (0.63)	14 (0.55)	30 (1.18)	36 (1.42)	80 (3.15)	96 (3.78)	38.4 (1.51)	21.0 (0.83)	98 (3.86)	192.6 (7.58)	132.6 (5.22)	53 (2.09)

Bore	P	Q (Body Mounting Holes)	R	S	T (Ports)
6	M3x0.5 6H (#4-40 UNC-2B)	M4x0.7 6H (#8-32 UNC-2B)	M3x0.5 6H (#4-40 UNC-2B)	1.3 (.05)	M5x0.8 6H (#10-32 UNF-2B)
8	M3x0.5 6H (#4-40 UNC-2B)	M4x0.7 6H (#8-32 UNC-2B)	M3x0.5 6H (#4-40 UNC-2B)	1.3 (.05)	M5x0.8 6H (#10-32 UNF-2B)
12	M3x0.5 6H (#4-40 UNC-2B)	M4x0.7 6H (#8-32 UNC-2B)	M4x0.7 6H (#8-32 UNC-2B)	1.8 (.07)	M5x0.8 6H (#10-32 UNF-2B)
16	M4x0.7 6H (#8-32 UNC-2B)	M5x0.8 6H (#10-32 UNF-2B)	M5x0.8 6H (#10-32 UNF-2B)	1.8 (.07)	M5x0.8 6H (#10-32 UNF-2B)
20	M4x0.7 6H (#8-32 UNC-2B)	M6x1 6H (1/4-20 UNC-2B)	M5x0.8 6H (#10-32 UNF-2B)	1.8 (.07)	M5x0.8 6H (#10-32 UNF-2B)
25	M5x0.8 6H (#10-32 UNF-2B)	M8x1.25 6H (5/16-18 UNC-2B)	M6x1 6H (1/4-20 UNC-2B)	1.8 (.07)	M5x0.8 6H (#10-32 UNF-2B)
32	M5x0.8 6H (#10-32 UNF-2B)	M8x1.25 6H (5/16-18 UNC-2B)	M6x1 6H (1/4-20 UNC-2B)	1.8 (.07)	G 1/8 (NPT 1/8)

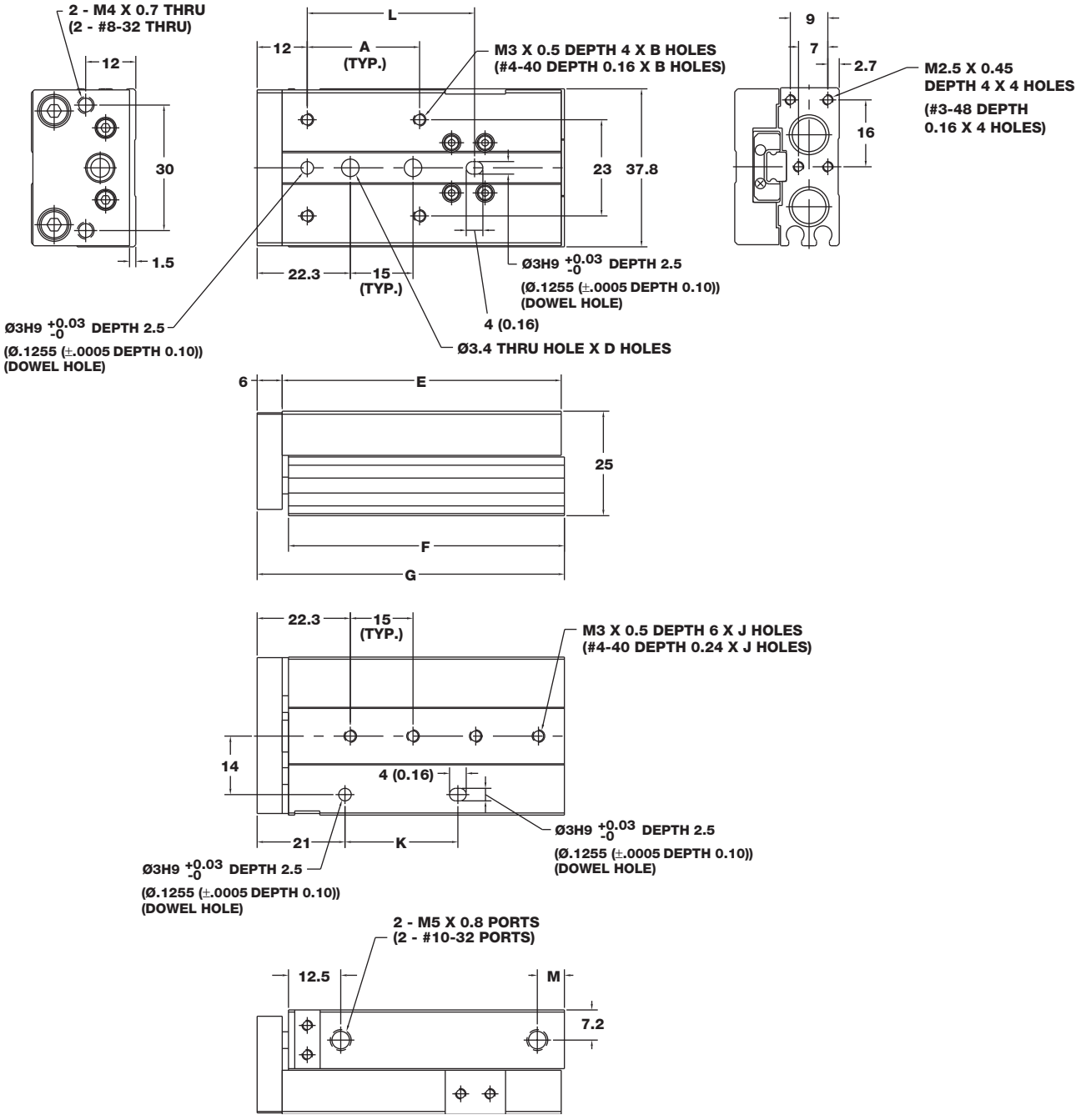
Bore	V Based on Stroke											W
	0-10mm	11-20mm	0-20mm	21-25mm	21-30mm	26-50mm	31-40mm	41-50mm	51-75mm	51-80mm	81-100mm	
6	15 (0.59)	20 (0.79)	N/A	N/A	25 (0.98)	N/A	30 (1.18)	35 (1.38)	N/A	N/A	N/A	3 (.12)
8	15 (0.59)	20 (0.79)	N/A	N/A	25 (0.98)	N/A	30 (1.18)	35 (1.38)	47.5 (1.87)	N/A	N/A	4 (.16)
12	N/A	N/A	30 (1.18)	30 (1.18)	N/A	40 (1.58)	N/A	N/A	N/A	50 (1.97)	N/A	6 (.24)
16	N/A	N/A	25 (0.98)	35 (1.38)	N/A	35 (1.38)	N/A	N/A	N/A	45 (1.77)	55 (2.17)	8 (.32)
20	N/A	N/A	30 (1.18)	30 (1.18)	N/A	40 (1.58)	N/A	N/A	N/A	60 (2.36)	60 (2.36)	10 (.39)
25	N/A	N/A	30 (1.18)	30 (1.18)	N/A	40 (1.58)	N/A	N/A	N/A	60 (2.36)	60 (2.36)	12 (.47)
32	N/A	N/A	40 (1.58)	40 (1.58)	N/A	50 (1.97)	N/A	N/A	N/A	70 (2.76)	70 (2.76)	16 (.63)

TBA Cylinder (6mm bore) Dimensions mm (in)



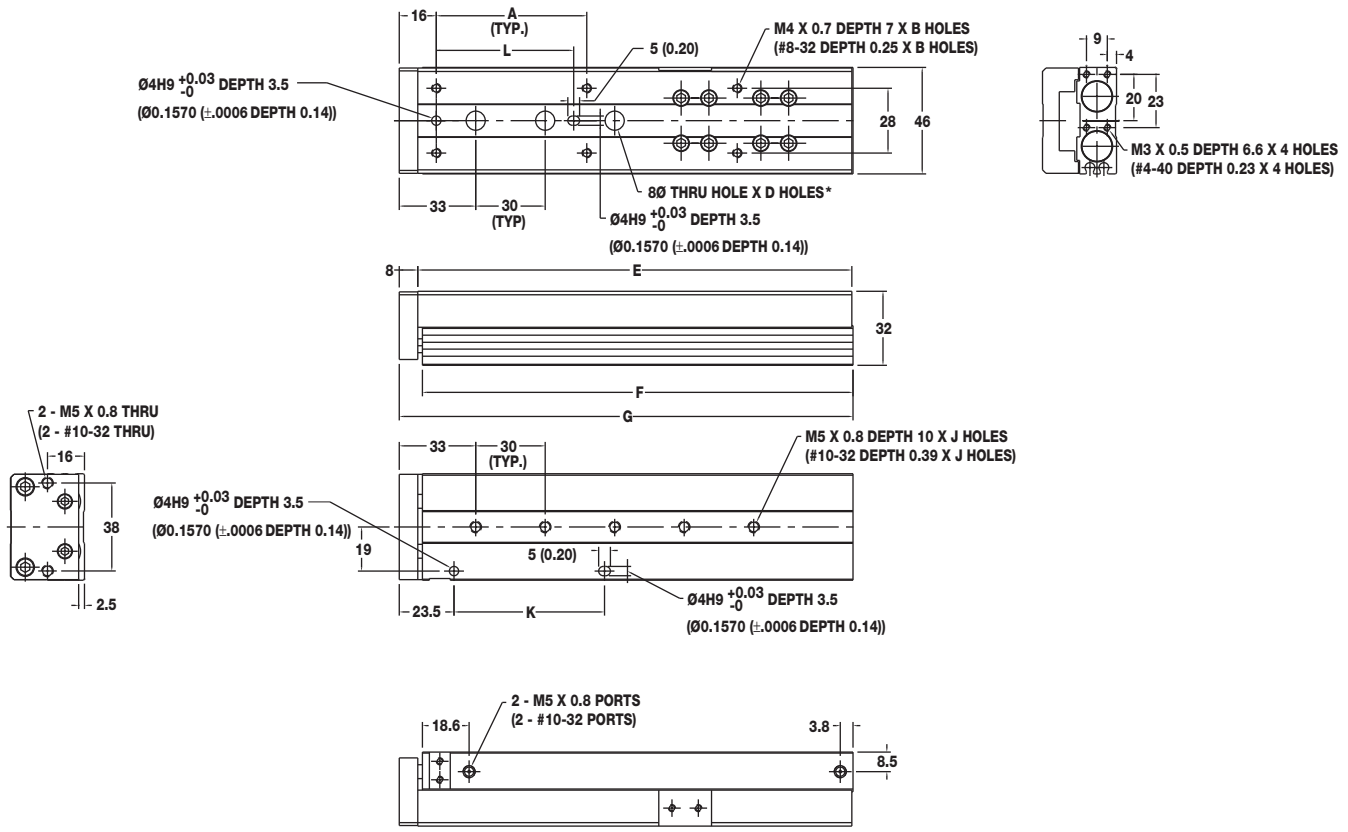
Stroke	A	B	D	E	F	G	J	K	L
10	20 (0.79)	4	2	45 (1.77)	44 (1.73)	50.5 (1.99)	2	16 (0.630)	20 (0.787)
20	30 (1.18)	4	2	55 (2.17)	54 (2.13)	60.5 (2.38)	3	18 (0.709)	20 (0.787)
30	20 (0.79)	6	2	65 (2.56)	64 (2.52)	70.5 (2.78)	3	20 (0.787)	20 (0.787)
40	28 (1.10)	6	3	95 (3.74)	94 (3.70)	100.5 (3.96)	5	28 (1.102)	35 (1.378)
50	38 (1.50)	6	3	104.5 (4.11)	104.5 (4.11)	111 (4.37)	6	28 (1.102)	35 (1.378)

TBA Cylinder (8mm bore) Dimensions mm (in)



Stroke	A	B	D	E	F	G	J	K	L	M
10	25 (0.98)	4	3	49.7 (1.96)	49 (1.93)	55.5 (2.19)	3	19 (0.748)	18 (0.709)	6.5 (0.26)
20	25 (0.98)	4	3	56.7 (2.23)	56 (2.21)	62.5 (2.46)	3	28 (1.102)	18 (0.709)	6.5 (0.26)
30	40 (1.58)	4	2	66.7 (2.63)	66 (2.60)	72.5 (2.85)	3	28 (1.102)	40 (1.575)	6.5 (0.26)
40	50 (1.97)	4	3	91.2 (3.59)	90.4 (3.56)	97 (3.82)	5	31 (1.220)	50 (1.969)	11 (0.43)
50	38 (1.50)	6	3	102.3 (4.03)	101.5 (4.0)	108 (4.25)	6	58 (2.283)	50 (1.969)	6.5 (0.26)
75	50 (1.97)	6	5	133.7 (5.27)	133 (5.24)	139.5 (5.49)	8	60 (2.362)	50 (1.969)	6.5 (0.26)

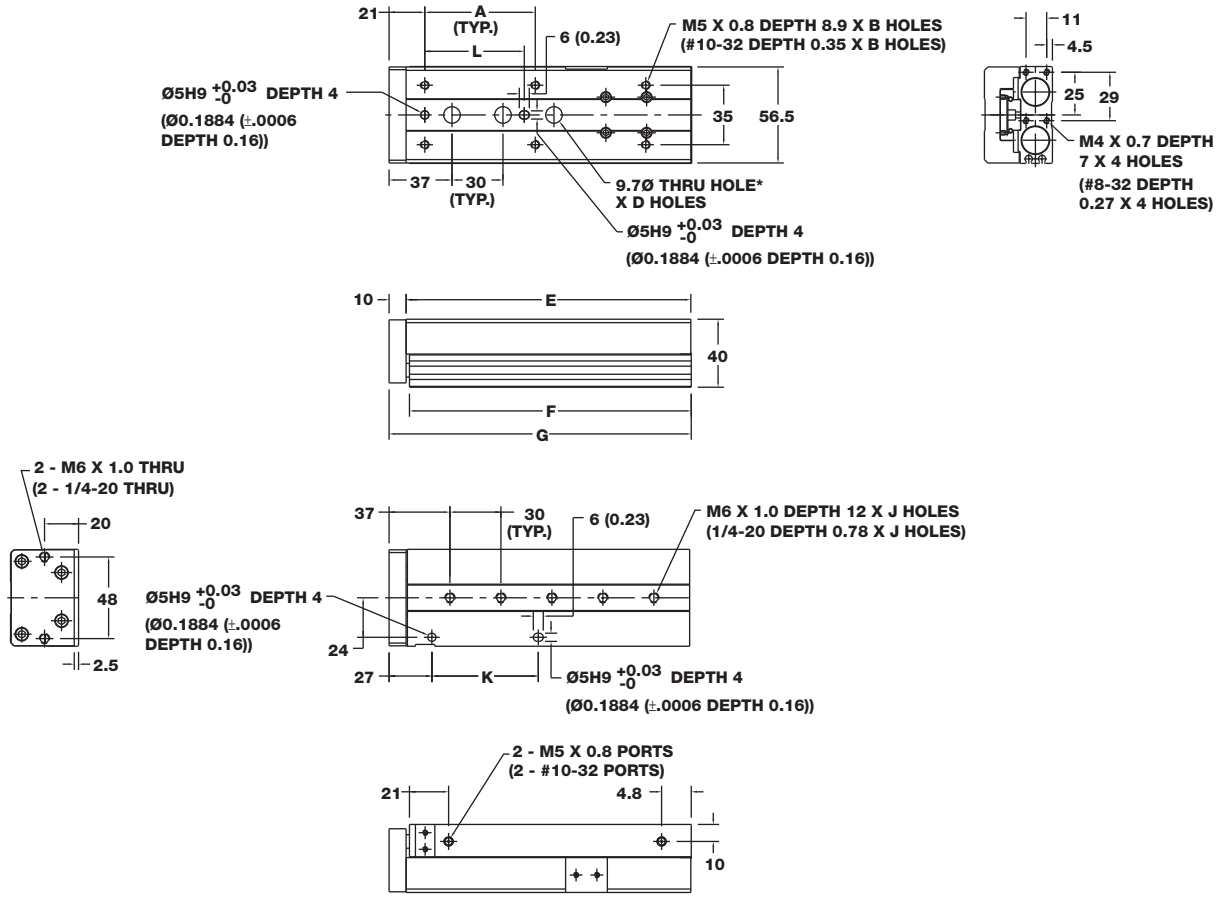
TBA Cylinder (12mm bore) Dimensions mm (in)



*Thru holes go through table top to access smaller counter-bored mounting holes in the cylinder body.

Stroke	A	B	D	E	F	G	J	K	L
10	35 (1.38)	4	1	73 (2.86)	71 (2.80)	81 (3.20)	2	35 (1.378)	35 (1.378)
20	35 (1.38)	4	1	73 (2.86)	71 (2.80)	81 (3.20)	2	35 (1.378)	35 (1.378)
30	35 (1.38)	4	1	73 (2.86)	71 (2.80)	81 (3.20)	2	35 (1.378)	35 (1.378)
40	50 (1.97)	4	1	85 (3.36)	83 (3.28)	93 (3.67)	2	50 (1.968)	50 (1.968)
50	35 (1.38)	6	1	105 (4.12)	103 (4.06)	113 (4.46)	3	35 (1.378)	35 (1.378)
75	55 (2.17)	6	2	151 (5.93)	149 (5.88)	159 (6.27)	4	55 (2.165)	55 (2.165)
100	65 (2.56)	6	3	189 (7.43)	187 (7.37)	197 (7.76)	5	65 (2.559)	65 (2.559)

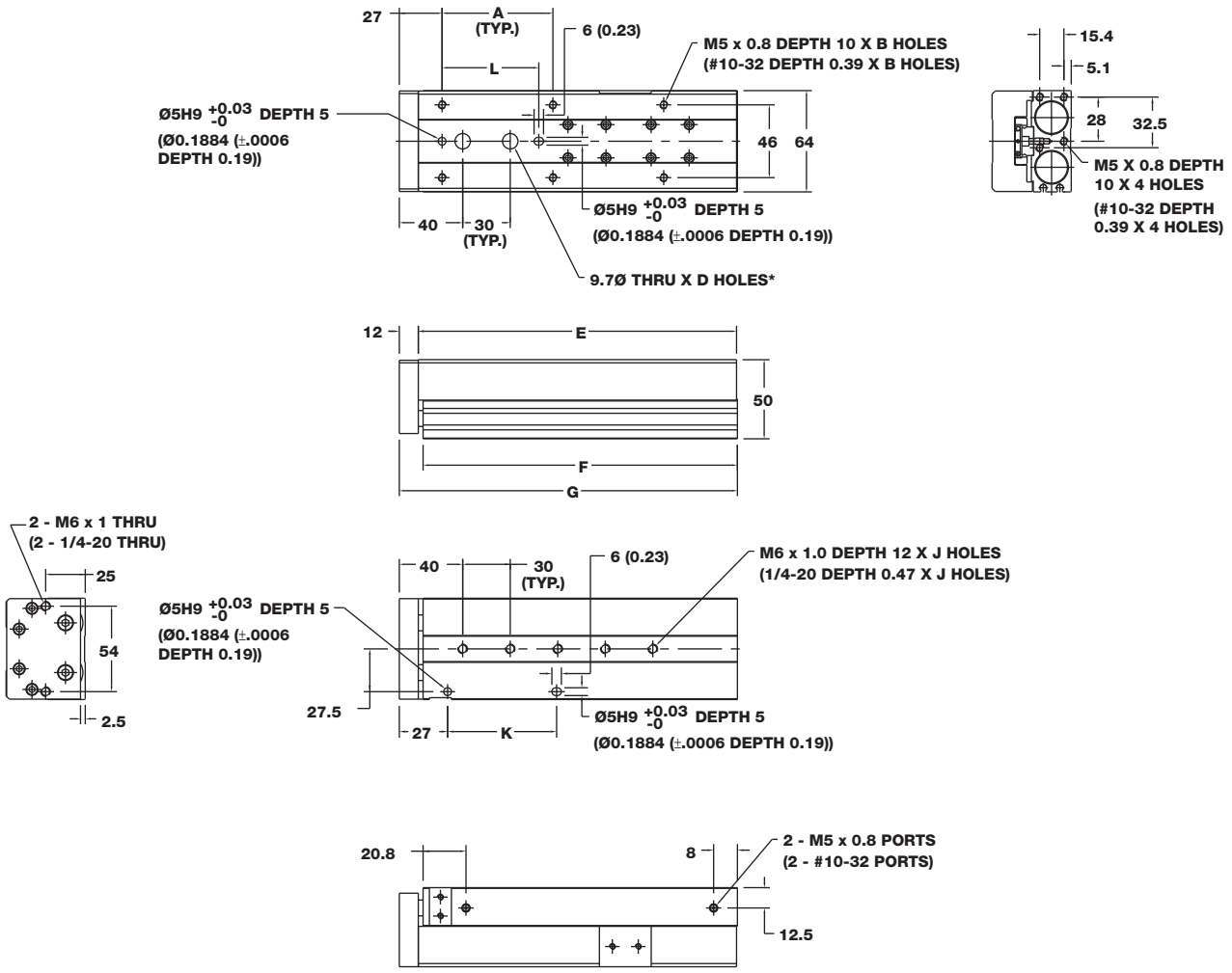
TBA Cylinder (16mm bore) Dimensions mm (in)



*Thru holes go through table top to access smaller counterbored mounting holes in the cylinder body.

Stroke	A	B	D	E	F	G	J	K	L
10	35 (1.38)	4	1	79 (3.11)	77 (3.05)	89 (3.52)	2	35 (1.378)	35 (1.378)
20	35 (1.38)	4	1	79 (3.11)	77 (3.05)	89 (3.52)	2	35 (1.378)	35 (1.378)
30	35 (1.38)	4	1	79 (3.11)	77 (3.05)	89 (3.52)	2	35 (1.378)	35 (1.378)
40	40 (1.58)	6	1	89 (3.50)	87 (3.44)	99 (3.91)	3	40 (1.575)	40 (1.575)
50	30 (1.18)	6	1	116 (4.56)	114 (4.51)	126 (4.98)	3	30 (1.181)	30 (1.181)
75	55 (2.17)	6	2	145 (5.71)	143 (5.65)	155 (6.12)	4	55 (2.165)	55 (2.165)
100	65 (2.56)	6	3	170 (6.69)	168 (6.63)	180 (7.10)	5	65 (2.559)	65 (2.559)
125	70 (2.70)	8	4	205 (8.07)	203 (8.01)	215 (8.48)	6	70 (2.756)	70 (2.756)

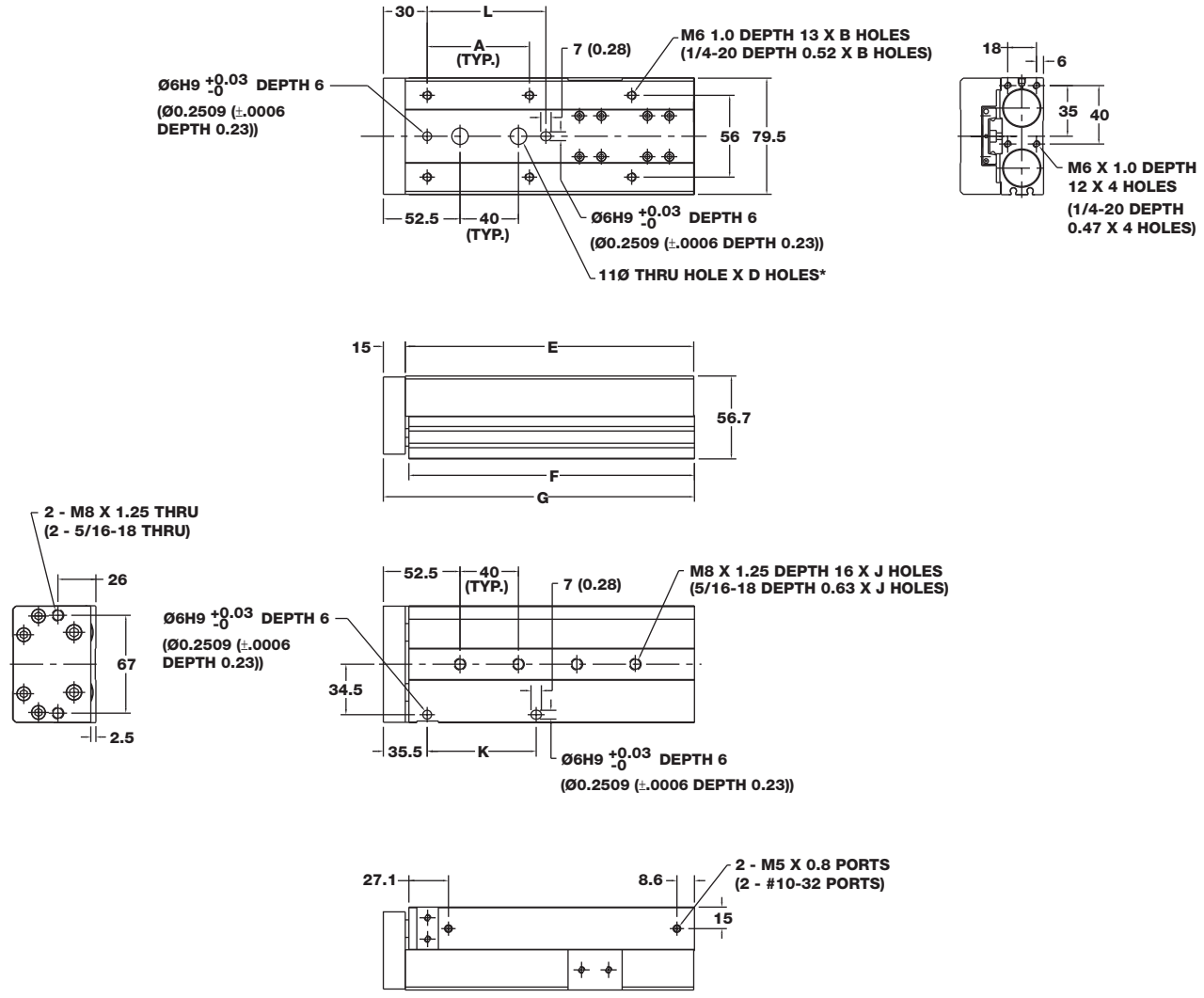
TBA Cylinder (20mm bore) Dimensions mm (in)



*Thru holes go through table top to access smaller counterbored mounting holes in the cylinder body.

Stroke	A	B	D	E	F	G	J	K	L
10	50 (1.97)	4	1	84 (3.30)	81.5 (3.21)	96 (3.78)	2	50 (1.968)	50 (1.968)
20	50 (1.97)	4	1	84 (3.30)	81.5 (3.21)	96 (3.78)	2	50 (1.968)	50 (1.968)
30	50 (1.97)	4	1	84 (3.30)	81.5 (3.21)	96 (3.78)	2	50 (1.968)	50 (1.968)
40	60 (2.36)	4	1	94 (3.69)	91.5 (3.60)	106 (4.17)	2	60 (2.362)	60 (2.362)
50	35 (1.38)	6	1	108.5 (4.27)	106.5 (4.19)	121 (4.76)	3	35 (1.378)	35 (1.378)
75	60 (2.36)	6	2	140 (5.51)	138 (5.44)	152.5 (6.01)	4	60 (2.362)	60 (2.362)
100	70 (2.76)	6	3	200.5 (7.89)	198.5 (7.82)	213 (8.39)	5	70 (2.756)	64 (2.520)
125	70 (2.76)	8	4	230 (9.06)	228 (8.98)	242.5 (9.55)	6	70 (2.756)	64 (2.520)
150	80 (3.15)	8	5	263 (10.36)	261 (10.28)	275.5 (10.85)	7	80 (3.150)	80 (3.150)

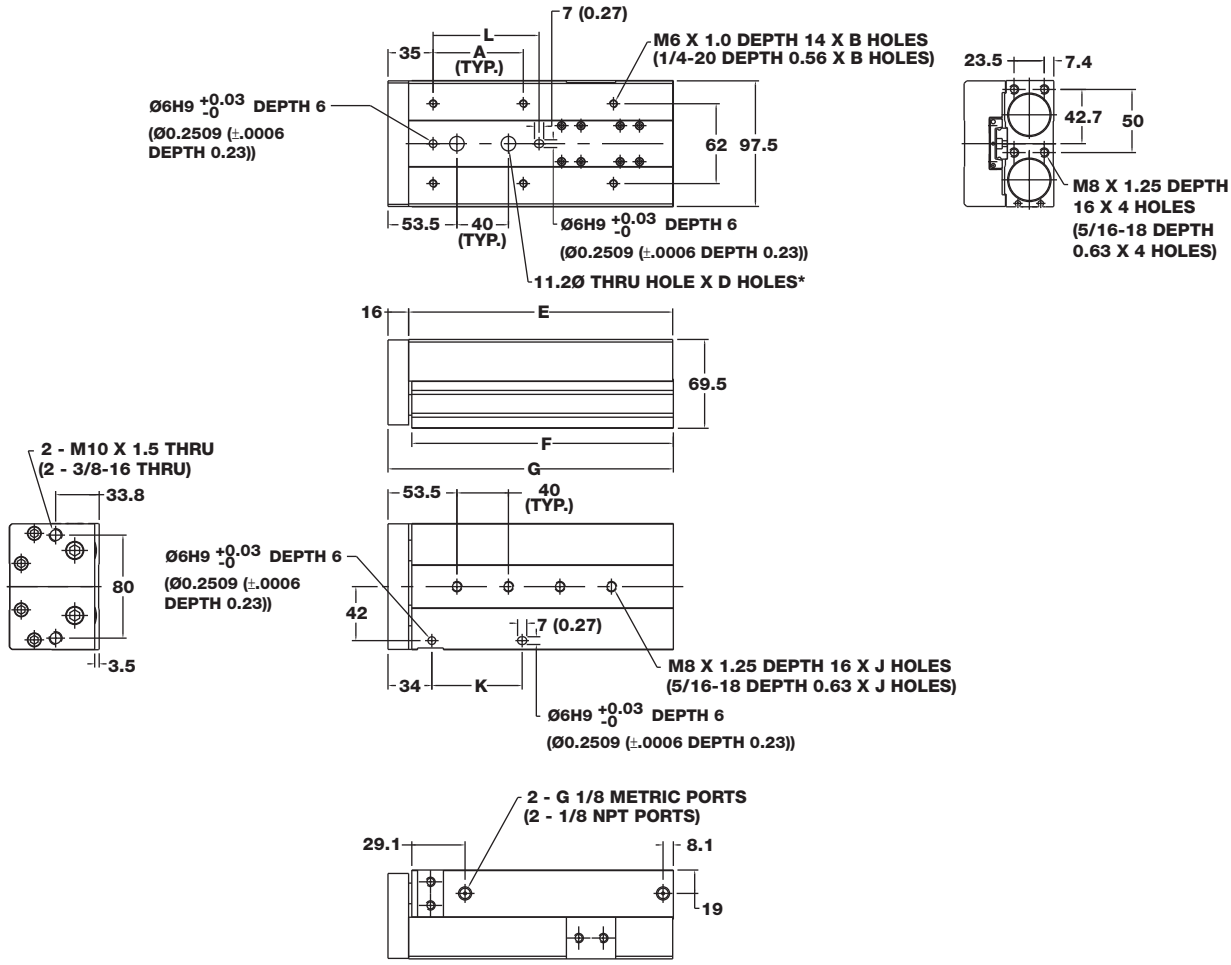
TBA Cylinder (25mm bore) Dimensions mm (in)



*Thru holes go through table top to access smaller counterbored mounting holes in the cylinder body.

Stroke	A	B	D	E	F	G	J	K	L
10	50 (1.97)	4	1	92.5 (3.64)	90.5 (3.56)	108 (4.25)	2	50 (1.968)	50 (1.968)
20	50 (1.97)	4	1	92.5 (3.64)	90.5 (3.56)	108 (4.25)	2	50 (1.968)	50 (1.968)
30	50 (1.97)	4	1	92.5 (3.64)	90.5 (3.56)	108 (4.25)	2	50 (1.968)	50 (1.968)
40	60 (2.36)	4	1	102.5 (4.04)	100.5 (3.96)	118 (4.65)	2	60 (2.362)	60 (2.362)
50	35 (1.38)	6	1	115.5 (4.55)	113.5 (4.47)	131 (5.16)	2	35 (1.378)	35 (1.378)
75	60 (2.36)	6	1	156.5 (6.16)	154.5 (6.08)	172 (6.77)	3	60 (2.362)	60 (2.362)
100	70 (2.76)	6	2	197.5 (7.78)	195.5 (7.70)	213 (8.39)	4	70 (2.756)	76 (2.992)
125	75 (2.95)	8	3	253.5 (9.98)	251.5 (9.90)	269 (10.59)	5	75 (2.953)	75 (2.953)
150	80 (3.15)	8	3	270.5 (10.65)	268.5 (10.57)	286 (11.26)	6	80 (3.150)	80 (3.150)

TBA Cylinder (32mm bore) Dimensions mm (in)



*Thru holes go through table top to access smaller counterbored mounting holes in the cylinder body.

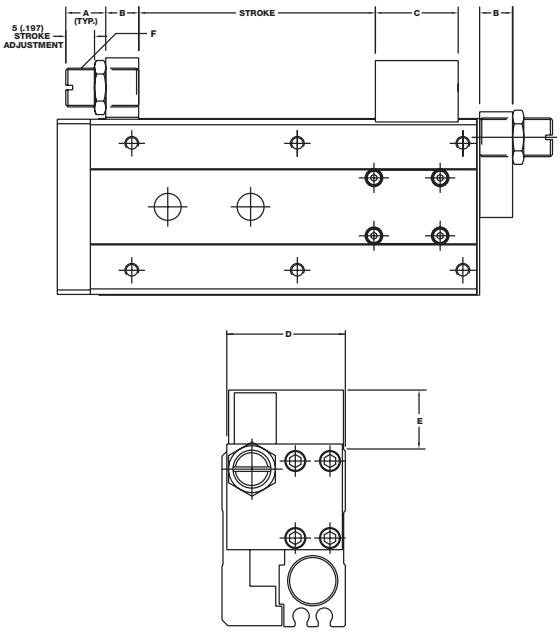
Stroke	A	B	D	E	F	G	J	K	L
10	50 (1.97)	4	NA	102 (4.02)	100 (3.94)	119 (4.67)	2	50 (1.968)	50 (1.968)
20	50 (1.97)	4	NA	102 (4.02)	100 (3.94)	119 (4.67)	2	50 (1.968)	50 (1.968)
30	50 (1.97)	4	NA	102 (4.02)	100 (3.94)	119 (4.67)	2	50 (1.968)	50 (1.968)
40	60 (2.36)	4	1	112 (4.41)	110 (4.34)	129 (5.06)	2	60 (2.362)	60 (2.362)
50	35 (1.38)	6	1	125 (4.93)	123 (4.85)	142 (5.58)	2	35 (1.378)	35 (1.378)
75	60 (2.36)	6	1	171 (6.73)	169 (6.66)	188 (7.39)	3	60 (2.362)	60 (2.362)
100	70 (2.76)	6	2	207 (8.15)	205 (8.08)	224 (8.80)	4	70 (2.756)	76 (2.992)
125	75 (2.95)	8	3	265 (10.44)	263 (10.36)	282 (11.09)	5	75 (2.953)	75 (2.953)
150	80 (3.15)	8	3	298 (11.74)	296 (11.66)	315 (12.39)	6	80 (3.150)	80 (3.150)

Twin Bore Air Table Cylinder Options

Stroke Adjuster (Options A1, A2, A3)

Provides 5mm (.197) of stroke adjustment at the end of stroke.

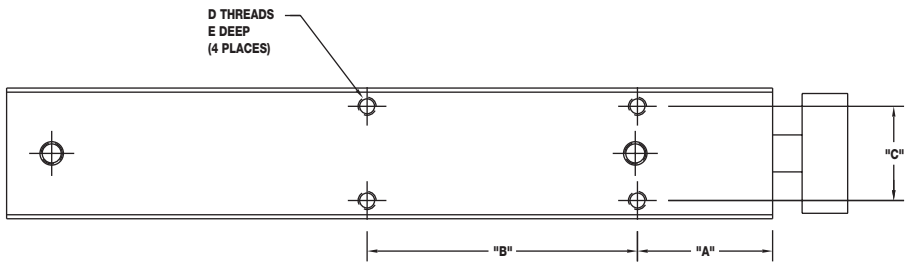
Bore	A	B	C	D	E	F
6	7.7 (0.30)	6 (0.24)	12.5 (0.49)	21.7 (0.85)	9 (0.35)	M5x0.8
8	8 (0.31)	6 (0.24)	14.3 (0.56)	24.6 (0.97)	12.2 (0.48)	M8x1
12	10 (.39)	8 (.31)	18.1 (.71)	30 (1.18)	17 (.67)	M10x1
16	10 (.39)	10 (.39)	21.1 (.83)	37.5 (1.48)	18 (.71)	M12x1
20	10 (.39)	12 (.47)	30 (1.18)	47.5 (1.87)	22 (.87)	M14x1
25	10 (.39)	16 (.63)	30 (1.18)	54.5 (2.15)	24.5 (.96)	M20x1.5
32	10 (.39)	16 (.63)	32 (1.26)	67.3 (2.65)	32.3 (1.27)	M25x1.5



(Option A1 shown)

Twin Bore Air Table Cylinder Options

Side Mounting Holes (Option S)
Use for TB and TBD model cylinders

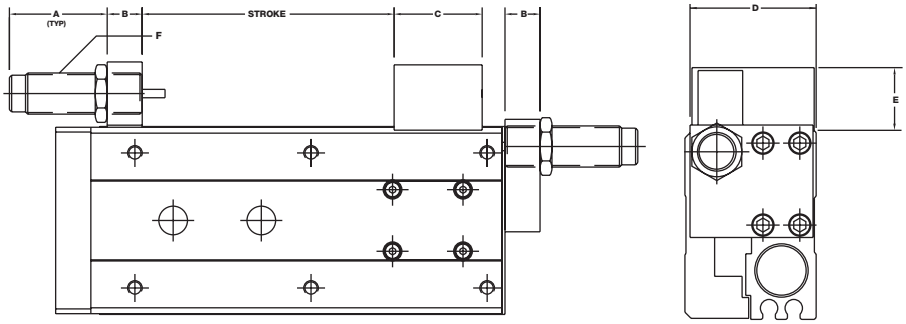


Bore	A	B	Stroke Length	C	D		E
					Standard	Option E	
6mm	10 (0.394)	23 (0.906)	0-10mm	6 (0.236)	M2x0.4	#2-56 UNC	3 (0.118)
		33 (1.299)	11-20mm				
		43 (1.693)	21-30mm				
		53 (2.087)	31-40mm				
		63 (2.480)	41-50mm				
8mm	10 (0.394)	23 (0.906)	0-10mm	7 (0.276)	M2.5x0.45	#3-48 UNC	3 (0.118)
		33 (1.299)	11-20mm				
		43 (1.693)	21-30mm				
		53 (2.087)	31-40mm				
		63 (2.480)	41-50mm				
		88 (3.465)	51-75mm				
12mm	20 (.787)	30 (1.181)	0-25mm	10 (.394)	M3x.5	#4-40 UNC	4.5 (.177)
		40 (1.575)	26-50mm				
		50 (1.969)	51-75mm				
16mm	30 (1.181)	25 (.984)	0-20mm	12 (.472)	M4x0.7	#8-32 UNC	4.5 (.177)
		35 (1.378)	21-50mm				
		45 (1.772)	51-80mm				
		55 (2.165)	81-100mm				
20mm	30 (1.181)	30 (1.181)	0-25mm	16 (.630)	M4x0.7	#8-32 UNC	4.5 (.177)
		40 (1.575)	26-50mm				
		60 (2.362)	51-100mm				
25mm	30 (1.181)	30 (1.181)	0-20mm	22 (.866)	M5x0.8	#10-32 UNF	7.4 (.290)
		40 (1.575)	21-50mm				
		60 (2.362)	51-80mm				
32mm	30 (1.181)	40 (1.575)	0-25mm	25 (.984)	M5x0.8	#10-32 UNF	7.5 (.295)
		50 (1.969)	26-50mm				
		70 (2.756)	51-100mm				

Twin Bore Air Table Cylinder Options

Shock Absorbers (Option K)

Provides shock absorption at the ends of stroke. The shock absorbers are available in three dampening levels: light duty, standard duty, and heavy duty, so the shock can be selected based on the energies of the application. Shock absorbers can also be provided at either end of stroke or at both ends.



Bore	A	B	C	D	E	F
8	22.5 (0.89)	6 (0.24)	14.3 (0.56)	24.6 (0.97)	12.2 (0.48)	M8x1
12	20.7 (.81)	8 (.31)	18.1 (.71)	30 (1.18)	17 (.67)	M10x1
16	39.8 (1.57)	10 (.30)	21.1 (.83)	37.5 (1.48)	18 (.71)	M12x1
20	70.2 (2.76)	12 (.47)	30 (1.18)	47.5 (1.87)	22 (.87)	M14x1
25	82.7 (3.26)	16 (.63)	30 (1.18)	54.5 (2.15)	24.5 (.96)	M20x1.5
32	90.4 (3.56)	16 (.63)	32 (1.26)	67.3 (2.65)	32.3 (1.27)	M25x1.5

See the following section on how to size the shock absorber to a specific application. Shock absorbers within a given bore size have the same dimensions regardless of dampening strength.

How to Size The Shock Absorber

The shock absorber is pre selected for size by the bore diameter of the cylinder. However, the “dampening strength must be selected to choose the proper shock absorber”. To calculate the necessary shock, the following values must be known.

Cylinder Bore Diameter	d(mm)
Operating Pressure	p(bar)
Load on the Actuator	W(kg)
Impact Velocity*	v(m / sec)
Weight Constant	k1
Cylinder Constant	k2
Shock Constant	k3
Cycles per Hour	c
Mounting Orientation (horizontal or vertical)	

Et (Total Energy) equals the sum of Ek (Kinetic Energy) and Ew (Work Energy).**

Ek = ((W/2) + k1) x v2 [Nm]

Ewh = k2 x p x k3 [Nm]

Ewv = ((k2 x p) + W + k1) x k3 [Nm]

Et = Ek + Ew [Nm]

EtC = Et x c [Nm / hr]

Et and EtC must not exceed maximum values listed.
Dampening must be chosen from graphs.

* Impact velocity may be estimated at 2 times average velocity.
** The “work Energy” calculation varies with mounting orientation, Ewh for horizontal and Ewv for “vertical” applications.

Twin Bore Air Table Cylinder Options

Shock Absorbers (Option K)

Shock Specifications

Model Bore	Shock Bore (mm)	K_3 Shock Constant	Thread Size	E_t Max Nm per Cycle	E_tC Max Nm per Hour	Max Shock Force (N)	Max Propelling Force (N)	Shock Weight (g)
8	5.6	0.0051	M8x1	0.45	3954	N/A	N/A	9
12	7.1	0.006	M10x1.0	2.2	4100	700	89	12
16	6	0.010	M12x1.0	5.0	14125	1000	220	42
20	7	0.016	M14x1.0	21.5	34000	2225	530	71
25	11	0.022	M20x1.5	45.0	53700	3110	890	200
32	13	0.025	M25x1.5	73.5	70000	4440	1550	285

Weight Constant (k1)

Stroke	Bore					
	8	12	16	20	25	32
10	0.08	0.17	0.29	0.51	0.82	1.34
20	0.10	0.17	0.29	0.52	0.84	1.38
30	0.12	0.17	0.30	0.53	0.86	1.41
40	0.15	0.20	0.33	0.58	0.92	1.51
50	0.20	0.23	0.42	0.64	0.99	1.63
75	0.22	0.32	0.50	0.78	1.22	2.05
100	N/A	0.40	0.57	1.02	1.46	2.38
125	N/A	N/A	0.67	1.15	1.76	2.86
150	N/A	N/A	N/A	1.29	1.88	3.17

Shock Graph Legend

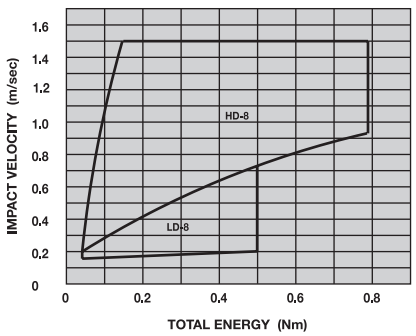
Bore	Dampening		
	Light Duty	Std. Duty	Heavy Duty
8	LD-8	SD-8	N/A
12	LD-12	SD-12	HD-12
16	LD-16	SD-16	HD-16
20	LD-20	SD-20	HD-20
25	LD-25	SD-25	HD-25
32	LD-32	SD-32	HD-32
Order Code	1	2	3

Cylinder Constant (k2)

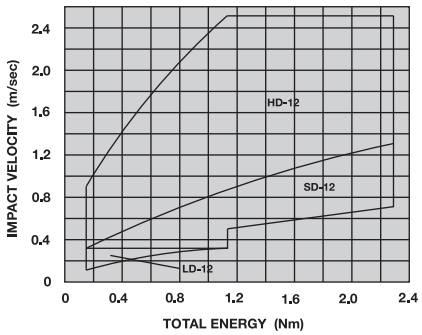
Bore	k
8	10.06
12	22.62
16	40.22
20	62.84
25	98.19
32	160.87

Based on bore diameter, impact velocity (v), and calculated Total Energy (Et), choose the LD, SD, or HD shock from the appropriate graph.

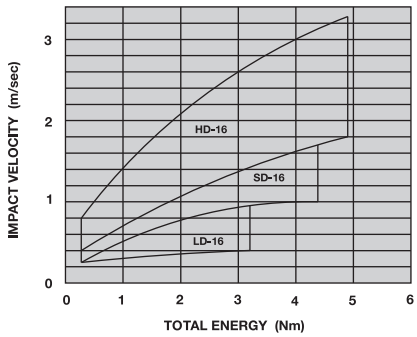
8mm Bore



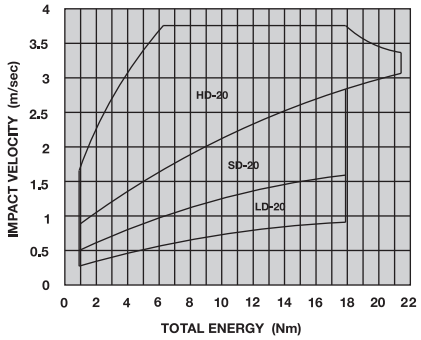
12mm Bore



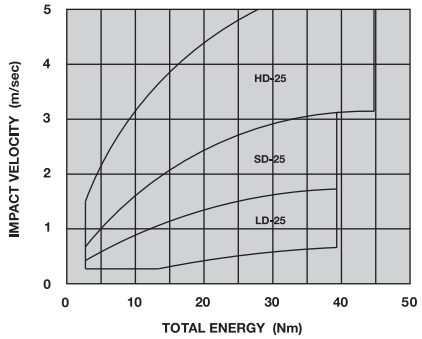
16mm Bore



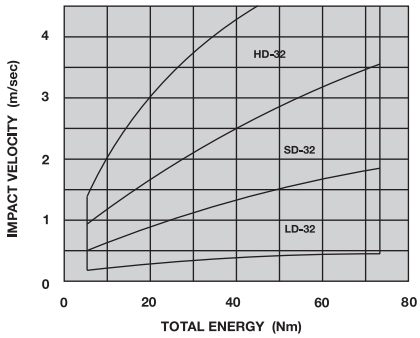
20mm Bore



25mm Bore



32mm Bore



NOTE: A minimum impact velocity of .25 m/sec. is necessary before shock will be effective.

How to Order

The Model Number for all Twin Bore cylinders consists of alphanumeric clusters. These designate type, bore size, stroke length, and special options. Please refer to the charts below for an example of a standard double-acting Twin Bore model with 16mm bore, 10mm stroke, ball bushings, and U.S. customary threads.

Type	
TB	Twin Bore
TBD	Twin Bore, Double End
TBA	Twin Bore Air Table

Bore Size	
6	6mm
8	8mm
12	12mm
16	16mm
20	20mm
25	25mm
32	32mm

TB - 16 10 - EX

Standard Stroke Lengths (Mm)	Bore Size													
	TB & TBD							TBA						
	6	8	12	16	20	25	32	6	8	12	16	20	25	32
10	X	X	X	X	X	X	X	X	X	X	X	X	X	X
15	N/A	N/A	X	X	X	X	X	N/A	N/A	N/A	N/A	N/A	N/A	N/A
20	X	X	X	X	X	X	X	X	X	X	X	X	X	X
25	N/A	N/A	X	X	X	X	X	N/A	N/A	N/A	N/A	N/A	N/A	N/A
30	X	X	X	X	X	X	X	X	X	X	X	X	X	X
35	N/A	N/A	X	X	X	X	X	N/A	N/A	N/A	N/A	N/A	N/A	N/A
40	X	X	X	X	X	X	X	X	X	X	X	X	X	X
45	N/A	N/A	X	X	X	X	X	N/A	N/A	N/A	N/A	N/A	N/A	N/A
50	X	X	X	X	X	X	X	X	X	X	X	X	X	X
60	N/A	N/A	X	X	X	X	X	N/A	N/A	N/A	N/A	N/A	N/A	N/A
70	N/A	N/A	X	X	X	X	X	N/A	N/A	N/A	N/A	N/A	N/A	N/A
75	N/A	X	X	X	X	X	X	N/A	X	X	X	X	X	X
80	N/A	N/A	N/A	X	X	X	X	N/A	N/A	N/A	N/A	N/A	N/A	N/A
90	N/A	N/A	N/A	X	X	X	X	N/A	N/A	N/A	N/A	N/A	N/A	N/A
100	N/A	N/A	N/A	X	X	X	X	N/A	N/A	X	X	X	X	X
125	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	X	X	X	X
150	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	X	X	X

Options (Enter in alphabetical order)		
A1	Stroke adjustment, both ends[1]	
A2	Stroke adjustment, extend only[1]	
A3	Stroke adjustment, retract only[1]	
E	U.S. customary units (inch)	
F	Full-flow port orifice	
K_ _	Shock absorbers	
	First _ will be:	1 (shock both ends)
		2 (shock extend only)
		3 (shock retract only)
	Second _ will be:	1 (light shock)
		2 (standard shock)
		3 (heavy shock)[4]
M	Magnetic position sensing	
S	Side mounting holes[2]	
V	High temperature; -15 to 135 C (0 to 275 F)	
X	Ball bushings[2 3 4]	

NOTE: Bumpers standard on all models.
[1] TBA models only.
2 TB and TBD models only. (TB and TBD stroke lengths available in any 0.1mm increment up to 225mm maximum [12-32 bores only]. Consult your distributor for pricing of any stroke length not listed as standard. TBA models available only in those stroke lengths listed as standard above.
3 Not available on 6mm bore.
[4] Not available on 8mm bore.

Combination Availability

Options	All Bore Sizes
A1	E; M; V
A2	E; K31, 2,or 3; M; V
A3	E; K21, 2,or 3, M; V
E	A1, 2,or 3; K11, 2,or 3; K21, 2,or 3; K31, 2,or 3; M; S; V; X
K11, 2 or 3	E; M; V
K21, 2 or 3	A3; E; M; V

Options	All Bore Sizes
K31, 2 or 3	A2; E; M; V
M	A1, 2,or 3; K11, 2,or 3; E; K21, 2,or 3; K31, 2,or 3; S; V; X
S	E; M; V; X
V	A1, 2,or 3; E; K11, 2,or 3; K21, 2,or 3; K31, 2,or 3; M; S; X
X	E; M; S; V

Twin Bore Repair Kits

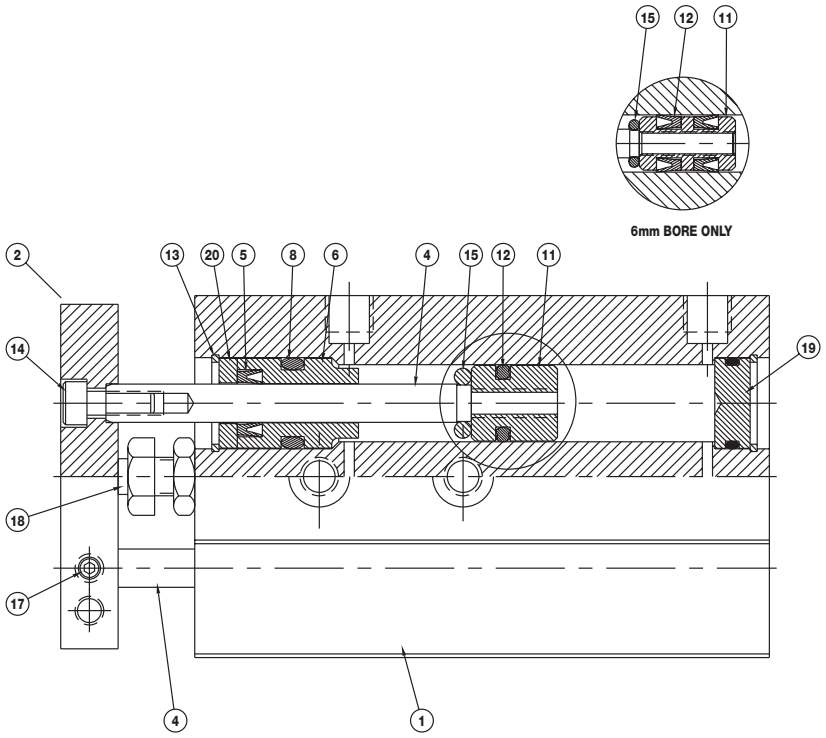
Repair Kit
K2-B-TB-[Bore]
K2-B-TB-[Bore]-V
K2-B-TBD-[Bore]
K2-B-TBD-[Bore]-V
K2-B-TB-[Bore]-X
K2-B-TB-[Bore]-VX
K2-B-TBD-[Bore]-X
K2-B-TBD-[Bore]-VX
K2-B-TBA-[Bore]
K2-B-TBA-[Bore]-V

Each TB and TBD repair kit includes the appropriate number cup seals, rod wiper seals, rod seals, and rod guides. The TBA kits include the bumper in addition to the seals. Repair kits are not available on 6mm and 8mm.

To order, please insert the bore code after the model designation for the desired repair kit. Suffix after bore code indicates seal and ball bushing options. **For example, on cylinder part number TB-1610-EM, order repair kit number K2-B-TB-16.**

Contact your local Bimba distributor for additional information.

Standard Model 6mm - 8mm Bore



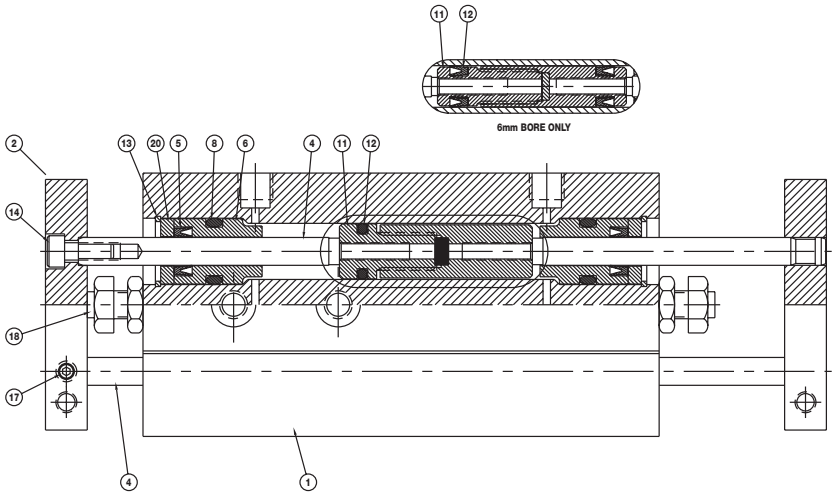
Part #	Description	Material
1	Body	Aluminum - (Anodized over wear surfaces)
2	End Block	Anodized Aluminum
4	Rod	Hard Chrome Plated Carbon Steel
5	Rod Seal	Nitrile
6	Rod Guide	White Delrin®
8	Rod Guide Seal	Nitrile
11	Piston	Aluminum
12	Piston Seal	Nitrile
13	Snap Ring	Zinc Plated Carbon Steel
14	Socket Head Cap Screw	Zinc Plated Carbon Steel
15	Bumper	Urethane
17	Socket Head Set Screw	Zinc Plated Carbon Steel
18	Stroke Adjuster/ Bumper	Stainless Bolt with Urethane Bumper
19	Rear Head	Anodized Aluminum
20	Rod Seal Retainer	Stainless Steel

NOTE: Field repair requires special assembly tooling and may not be practical. Factory rework is recommended.

Contact Bimba for all repair options.

Twin Bore Repair Kits

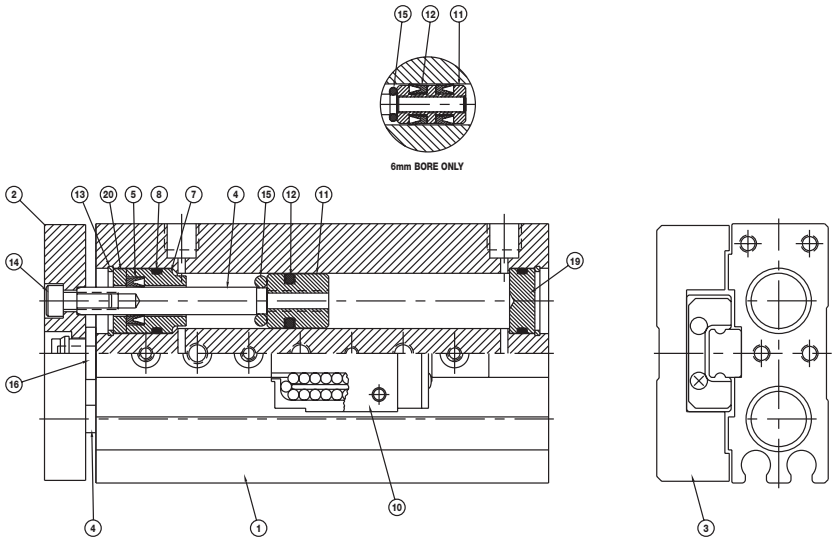
TBD (Double Rod End) 6mm - 8mm Bore



Part #	Description	Material
1	Body	Aluminum - (Anodized over wear surfaces)
2	End Block	Anodized Aluminum
4	Rod	Hard Chrome Plated Carbon Steel
5	Rod Seal	Nitrile
6	Rod Guide	White Delrin®
8	Rod Guide Seal	Nitrile
11	Piston	Aluminum
12	Piston Seal	Nitrile
13	Snap Ring	Zinc Plated Carbon Steel
14	Socket Head Cap Screw	Zinc Plated Carbon Steel
17	Socket Head Set Screw	Zinc Plated Carbon Steel
18	Stroke Adjuster/ Bumper	Stainless Bolt with Urethane Bumper
20	Rod Seal Retainer	Stainless Steel

NOTE: Contact Bimba for all repair options.

TBA (Air Table Model) 6mm - 8mm Bore



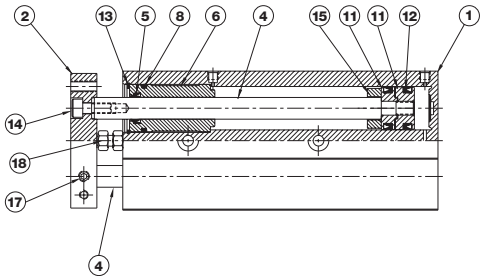
Part #	Description	Material
1	Body	Aluminum - (Anodized over wear surfaces)
2	End Block	Anodized Aluminum
3	Table Plate	Anodized Aluminum
4	Rod	Hard Chrome Plated Carbon Steel
5	Rod Seal	Nitrile
7	Rod Guide	Anodized Aluminum
8	Rod Guide Seal	Nitrile
10	Table Bearing	Stainless Steel Rail + Stainless Steel Bearings
11	Piston	Aluminum
12	Piston Seal	Nitrile
13	Snap Ring	Zinc Plated Carbon Steel
14	Socket Head Cap Screw	Zinc Plated Carbon Steel
15	Bumper	Urethane
19	Rear Head	Anodized Aluminum
20	Rod Seal Retainer	Stainless Steel

NOTE: Contact Bimba for all repair options.

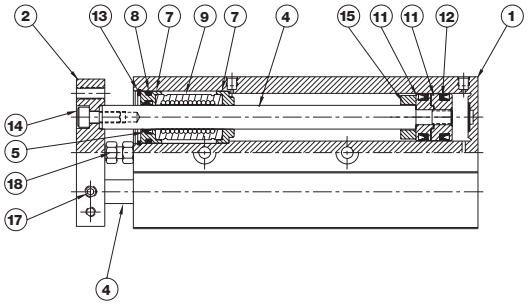
Twin Bore Repair Kits

12mm - 32mm Bore

Standard Model

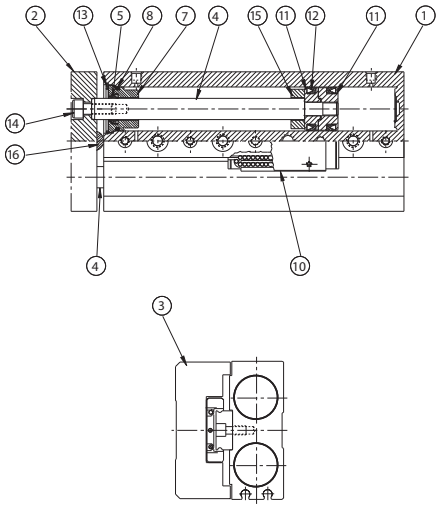


Ball Bearing Model (Option X)



Part #	Description	Material
1	Body	Aluminum - (Anodized over wear surfaces)
2	End Block	Anodized Aluminum
4	Rod	Hard Chrome Plated Carbon Steel
5	Rod Seal/Wiper	Nitrile (Standard) or Fluoroelastomer (High Temperature Option)
6	Rod Guide	White Delrin®
7	Rod Guide	Anodized Aluminum
8	Rod Guide Seal	Nitrile (Standard) or Fluoroelastomer (High Temperature Option)
9	Ball Bushing	Stainless Steel
11	Piston	Aluminum
12	Piston Seal	Nitrile (Standard) or Fluoroelastomer (High Temperature Option)
13	Snap Ring	Zinc Plated Carbon Steel
14	Socket Head Cap Screw	Zinc Plated Carbon Steel
15	Bumper	Urethane
17	Socket Head Set Screw	Zinc Plated Carbon Steel
18	Stroke Adjuster/Bumper	Stainless Bolt w/Urethane Bumper

Air Table Model (TBA) 12mm - 32mm Bore

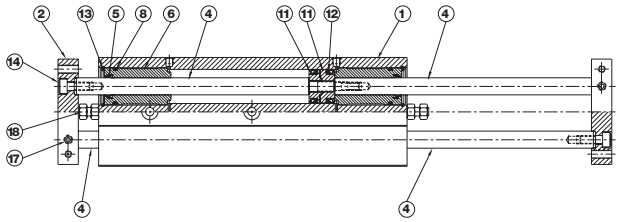


Part #	Description	Material
1	Body	Aluminum - (Anodized over wear surfaces)
2	End Block	Anodized Aluminum
3	Table Plate	Anodized Aluminum
4	Rod	Hard Chrome Plated Carbon Steel
5	Rod Seal/Wiper	Nitrile (Standard) or Fluoroelastomer (High Temperature Option)
7	Rod Guide	Anodized Aluminum
8	Rod Guide Seal	Nitrile (Standard) or Fluoroelastomer (High Temperature Option)
10	Table Bearing	Stainless Steel Rail + Stainless Steel Bearings
11	Piston	Aluminum
12	Piston Seal	Nitrile (Standard) or Fluoroelastomer (High Temperature Option)
13	Snap Ring	Zinc Plated Carbon Steel
14	Socket Head Cap Screw	Zinc Plated Carbon Steel
15	Bumper	Urethane
16	Bumper	Urethane

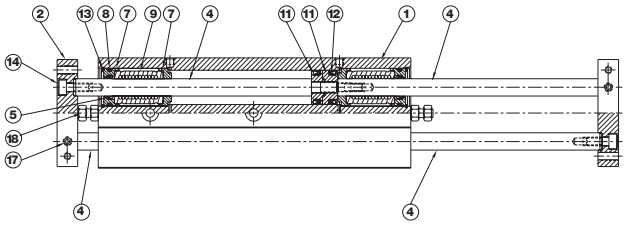
Twin Bore Repair Kits

TBD (Double Rod End) 12mm - 32mm Bore

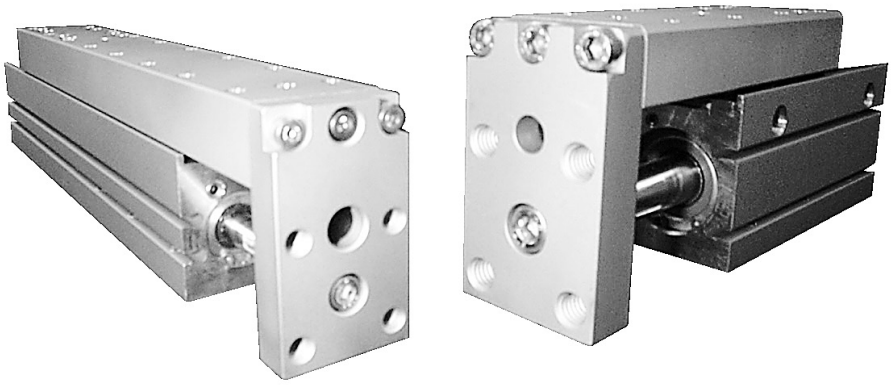
Standard Model



Ball Bearing Model (Option X)



Part #	Description	Material
1	Body	Aluminum - (Anodized over wear surfaces)
2	End Block	Anodized Aluminum
4	Rod	Hard Chrome Plated Carbon Steel
5	Rod Seal/Wiper	Nitrile (Standard) or Fluoroelastomer (High Temperature Option)
6	Rod Guide	White Delrin®
7	Rod Guide	Anodized Aluminum
8	Rod Guide Seal	Nitrile (Standard) or Fluoroelastomer (High Temperature Option)
9	Ball Bushing	Stainless Steel
11	Piston	Aluminum
12	Piston Seal	Nitrile (Standard) or Fluoroelastomer (High Temperature Option)
13	Snap Ring	Zinc Plated Carbon Steel
14	Socket Head Cap Screw	Zinc Plated Carbon Steel
17	Socket Head Set Screw	Zinc Plated Carbon Steel
18	Stroke Adjuster/Bumper	Stainless Bolt w/Urethane Bumper



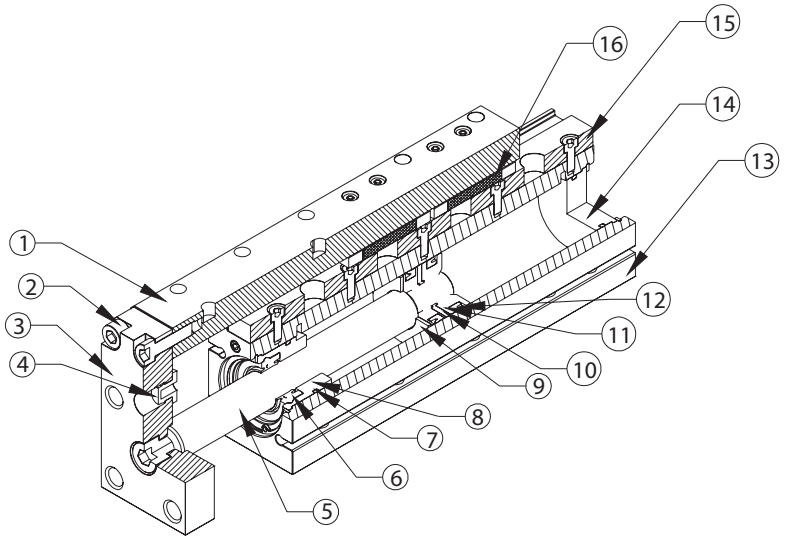
The Narrow Profile (NPA) actuator provides precise load guiding with a recirculating ball rail above its bore. Two bearing styles are offered (single/double bearing block) to accommodate both lower cost and higher precision/cost applications. With standard strokes up to 120mm, the NPA offers longer travel length than any competitive actuator of its type.

Narrow Profile Air Table

- Standard metric threads for ports, mounting, and rods (Specify “E” option for inch threads)
- Bore sizes: 12mm, 20mm, 32mm
- Double carrier bearing block optional
- Anodized aluminum body
- Stainless steel, hard chrome plated piston rod
- Maximum Operating Pressure: 10 bar (140 PSI)

How it Works

Narrow Profile Air Table



Part #	Description	Material
1	Table	Aluminum, anodized
2	SHCS	Steel, zinc plated
3	Tooling Plate	Aluminum, anodized
4	Retract Bumper	Urethane
5	Piston Rod	Stainless steel, hard chrome plated
6	Rod Seal	Nitrile (fluoroelastomer optional)
7	Rod Guide Seal	Nitrile (fluoroelastomer optional)
8	Rod Guide	Aluminum
9	Extend Bumper	Urethane
10	Magnet	Nitrile base
11	Piston	Aluminum
12	Piston Seal	Nitrile (fluoroelastomer optional)
13	Body	Aluminum, anodized
14	Rear Head	Aluminum
15/16	Table Bearing	Stainless steel

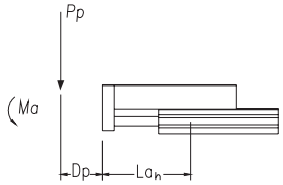
Engineering Specifications

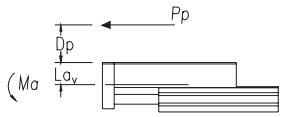
Operating Medium: Air

Maximum Operating Pressure: 10 bar (140 PSI)

Temperature Range: -10° to 70° C (15° to 160° F)

Narrow Profile Air Table

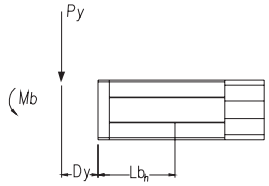


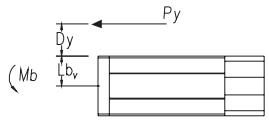


Pp = Ma x 1000 (Newtons)
Dp + La

Dp = Distance from load point to body (mm)

La = Moment arm (mm) see chart

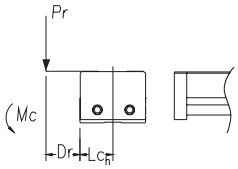


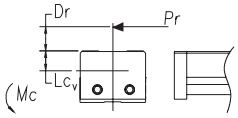


Py = Mb x 1000 (Newtons)
Dy + Lb

Dy = Distance from load point to body (mm)

Lb = Moment arm (mm) see chart





Pr = Mc x 1000 (Newtons)
Dr + Lc

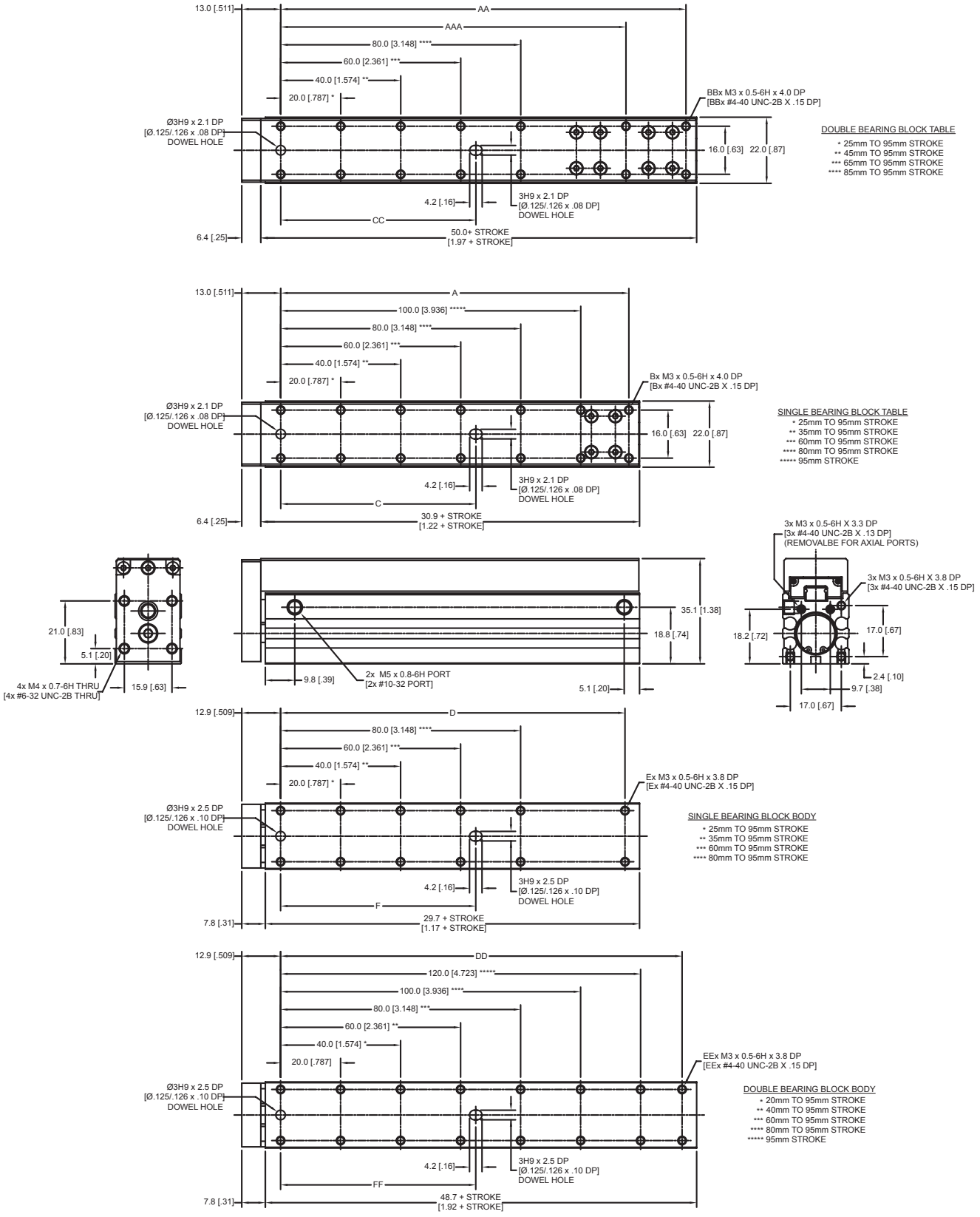
Dr = Distance from load point to body (mm)

Lc = Moment arm (mm) see chart

	Maximum Allowable Moment (Nm)					
	12mm		20mm		32mm	
	Standard	Option D	Standard	Option D	Standard	Option D
Ma	2.55	8.65	22.0	27.0	36.0	70.2
Mb	2.55	8.65	22.0	27.0	36.0	70.2
Mc	5.10	13.10	59.0	70.0	107.0	157.0

	Moment Lever Arm Constants (mm)					
	12mm		20mm		32mm	
	Standard	Option D	Standard	Option D	Standard	Option D
Lah	25 + stroke	32 + stroke	45 + stroke	46 + stroke	60 + stroke	38 + stroke
Lbh	25 + stroke	32 + stroke	45 + stroke	46 + stroke	60 + stroke	38 + stroke
Lav	10.9	10.9	21.2	21.2	22.0	22.0
Lbv	10.6	10.6	17.5	17.5	23.0	23.0
Lch	10.6	10.6	17.5	17.5	23.0	23.0
Lcv	10.9	10.9	21.2	21.2	22.0	22.0

Narrow Profile Air Table (NPA-12 models) Dimensions mm (in)



Narrow Profile Air Table (NPA-12 models) Dimensions

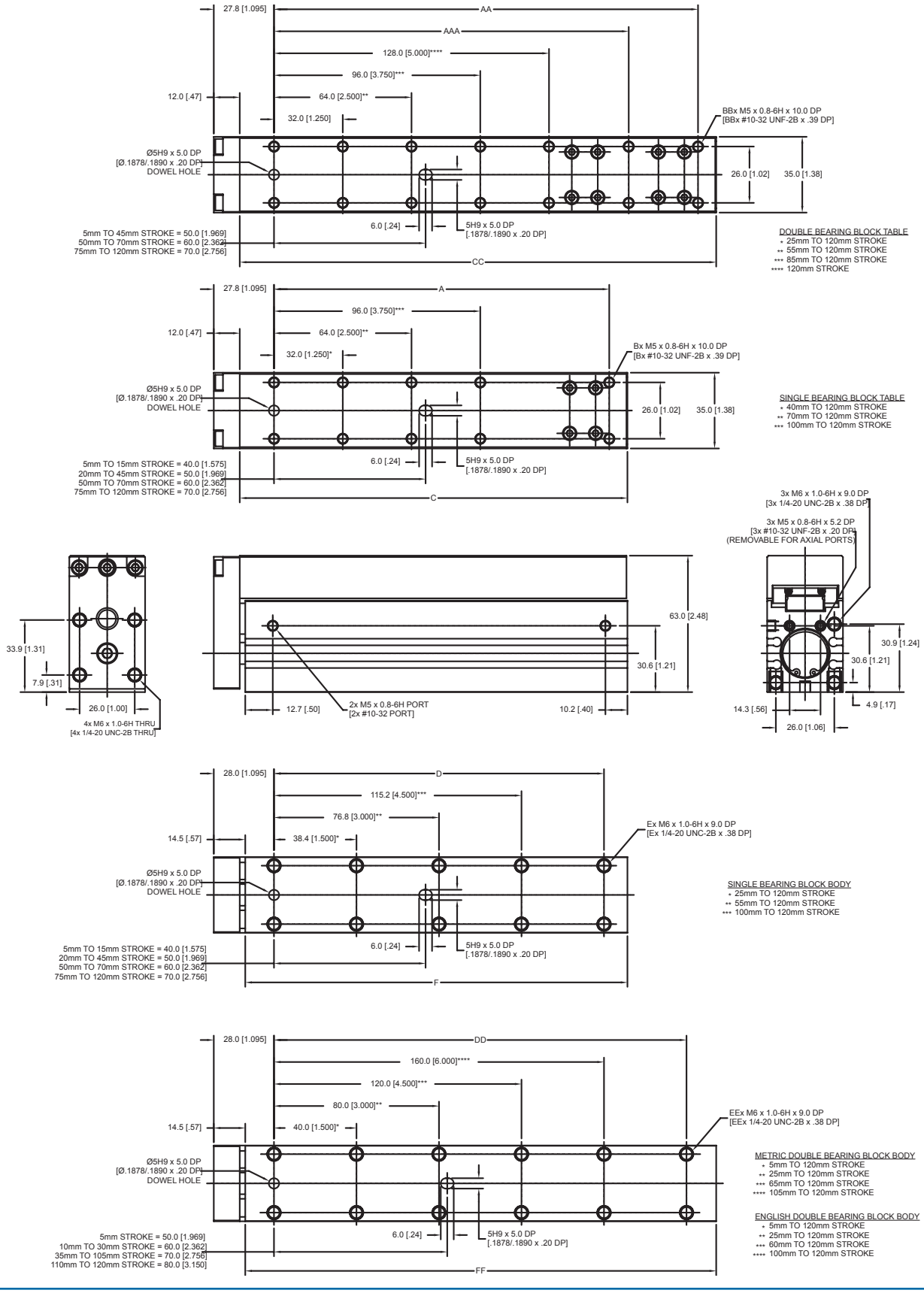
Metric Dimensions (mm)

Stroke	A	AA	AAA	B	BB	C	CC	D	DD	E	EE	F	FF
5	26	45	25	4	6	26	45	24.7	43.8	4	6	24.8	43.9
10	31	50	30	4	6	31	50	29.7	48.8	4	6	29.8	48.9
15	36	55	35	4	6	36	55	34.7	53.8	4	6	34.8	53.9
20	41	60	40	4	6	41	60	39.7	58.8	4	8	39.9	58.9
25	46	65	45	6	8	46	65	44.7	63.8	6	8	44.8	63.9
30	51	70	50	6	8	51	65	49.7	68.8	6	8	49.8	65.0
35	56	75	55	8	8	56	65	54.7	73.8	8	8	54.8	65.0
40	61	80	60	8	8	61	65	59.7	78.8	8	10	59.8	65.0
45	66	85	65	8	10	65	65	64.7	83.8	8	10	65.0	65.0
50	71	90	70	8	10	65	65	69.7	88.8	8	10	65.0	65.0
55	76	95	75	8	10	65	65	74.7	93.8	8	10	65.0	65.0
60	81	100	80	10	10	65	65	79.7	98.8	10	12	65.0	65.0
65	86	105	85	10	12	65	65	84.7	103.8	10	12	65.0	65.0
70	91	110	90	10	12	65	65	89.7	108.8	10	12	65.0	65.0
75	96	115	95	10	12	65	65	94.7	113.8	10	12	65.0	65.0
80	101	120	100	12	12	65	65	99.7	118.8	12	14	65.0	65.0
85	106	125	105	12	14	65	65	104.7	123.7	12	14	65.0	65.0
90	111	130	110	12	14	65	65	109.7	128.8	12	14	65.0	65.0
95	116	135	115	14	14	65	65	114.7	133.8	12	16	65.0	65.0

English Dimensions (in [stroke is specified in mm])

Stroke	A	AA	AAA	B	BB	C	CC	D	DD	E	EE	F	FF
5	1.023	1.772	0.985	4	6	1.023	1.772	0.974	1.723	4	6	0.978	1.727
10	1.220	1.969	1.182	4	6	1.220	1.969	1.171	1.920	4	6	1.175	1.924
15	1.417	2.166	1.379	4	6	1.417	2.165	1.368	2.117	4	6	1.372	2.121
20	1.613	2.362	1.575	4	6	1.614	2.362	1.564	2.313	4	8	1.569	2.318
25	1.810	2.559	1.772	6	8	1.810	2.559	1.761	2.510	6	8	1.765	2.514
30	2.007	2.756	1.969	6	8	2.007	2.560	1.958	2.707	6	8	1.962	2.560
35	2.204	2.953	2.166	8	8	2.204	2.560	2.155	2.904	8	8	2.159	2.560
40	2.401	3.150	2.363	8	8	2.401	2.560	2.352	3.101	8	10	2.356	2.560
45	2.598	3.347	2.560	8	10	2.560	2.560	2.549	3.298	8	10	2.560	2.560
50	2.795	3.544	2.757	8	10	2.560	2.560	2.746	3.495	8	10	2.560	2.560
55	2.991	3.740	2.953	8	10	2.560	2.560	2.942	3.691	8	10	2.560	2.560
60	3.188	3.937	3.150	10	10	2.560	2.560	3.139	3.888	10	12	2.560	2.560
65	3.385	4.134	3.347	10	12	2.560	2.560	3.336	4.085	10	12	2.560	2.560
70	3.582	4.331	3.544	10	12	2.560	2.560	3.533	4.282	10	12	2.560	2.560
75	3.779	4.528	3.741	10	12	2.560	2.560	3.730	4.479	10	12	2.560	2.560
80	3.976	4.725	3.938	12	12	2.560	2.560	3.927	4.676	12	14	2.560	2.560
85	4.172	4.921	4.134	`12	14	2.560	2.560	4.123	4.872	12	14	2.560	2.560
90	4.369	5.118	4.331	12	14	2.560	2.560	4.320	5.069	12	14	2.560	2.560
95	4.566	5.315	4.528	14	14	2.560	2.560	4.517	5.266	12	16	2.560	2.560

Narrow Profile Air Table (NPA-20 models) Dimensions mm (in)



Narrow Profile Air Table (NPA-20 models) Dimensions

Metric Dimensions (mm)

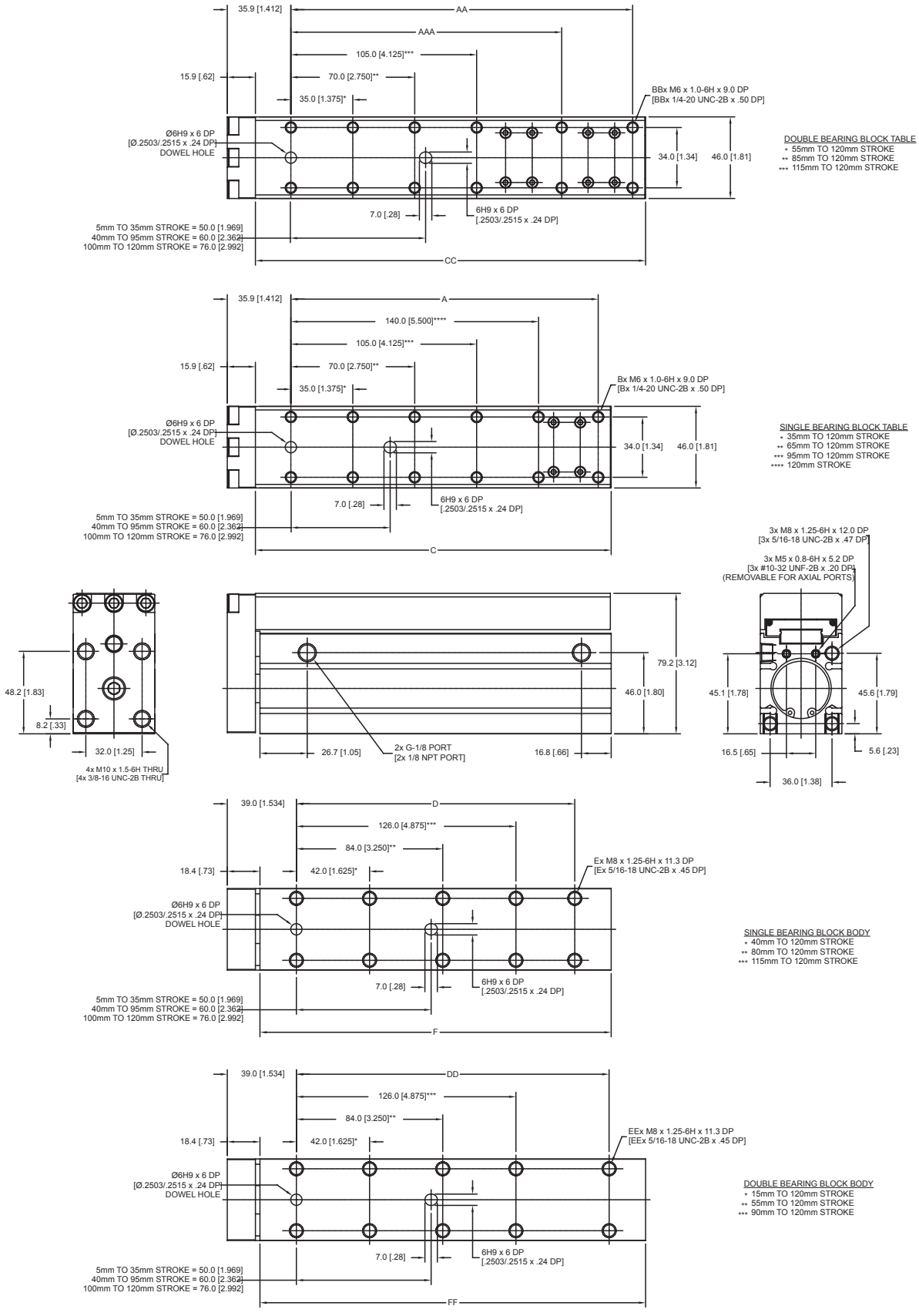
Stroke	A	AA	AAA	B	BB	C	CC	D	DD	E	EE	F	FF
5	39.8	80.8	48.8	4	6	63.6	104.6	35	76	4	6	61.5	102.5
10	44.8	85.8	53.8	4	6	68.6	109.6	40	81	4	6	66.5	107.5
15	49.8	95.8	63.8	4	6	73.6	119.6	45	91	4	6	71.5	117.5
20	54.8	95.8	63.8	4	6	78.6	119.6	50	91	4	6	76.5	117.5
25	64.8	100.8	68.8	4	8	88.6	124.6	60	96	6	8	86.5	122.5
30	64.8	105.8	73.8	4	8	88.6	129.6	60	101	6	8	86.5	127.5
35	69.8	110.8	78.8	4	8	93.6	134.6	65	106	6	8	91.5	132.5
40	74.8	115.8	83.8	6	8	98.6	139.6	70	111	6	8	96.5	132.5
45	79.8	125.8	93.8	6	8	103.6	149.6	75	121	6	8	101.5	147.5
50	84.8	125.8	93.8	6	8	108.6	149.6	80	121	6	8	106.5	147.5
55	94.8	130.8	98.8	6	10	118.6	154.6	90	126	6	8	116.5	152.5
60	94.8	135.8	103.8	6	10	118.6	159.6	90	131	6	8	116.5	157.5
65	99.8	140.8	108.8	6	10	123.6	164.6	95	136	8	10	121.5	162.5
70	104.8	145.8	113.8	8	10	128.6	169.6	100	141	8	10	126.5	167.5
75	109.8	155.8	123.8	8	10	133.6	179.6	105	151	8	10	131.5	177.5
80	114.8	155.8	123.8	8	10	138.6	179.6	110	151	8	10	136.5	177.5
85	124.8	160.8	128.8	8	12	148.6	184.6	120	156	8	10	146.5	182.5
90	124.8	165.8	133.8	8	12	148.6	189.6	120	161	8	10	146.5	187.5
95	129.8	170.8	138.8	8	12	153.6	194.6	125	166	8	10	151.5	192.5
100	134.8	175.8	143.8	10	12	158.6	199.6	130	171	8	10	156.5	197.5
105	139.8	185.8	153.8	10	12	163.6	209.6	135	181	10	12	161.5	207.5
110	144.8	185.8	153.8	10	12	168.6	209.6	140	181	10	12	166.5	207.5
115	154.8	190.8	158.8	10	12	178.6	214.6	150	186	10	12	176.5	212.5
120	154.8	195.8	163.8	10	14	178.6	219.6	150	191	10	12	176.5	217.5
125	159.8	200.8	168.8	12	14	183.6	224.6	155	196	10	12	181.5	222.5
130	164.8	205.8	173.8	12	14	188.6	229.6	160	201	10	12	186.5	227.5
135	169.8	215.8	183.8	12	14	193.6	239.6	165	206	10	12	191.5	237.5
140	174.8	215.8	183.8	12	14	198.6	239.6	170	216	10	12	196.5	237.5
145	184.8	220.8	188.8	12	14	208.6	244.6	180	216	12	14	206.5	242.5
150	184.8	225.8	193.8	12	16	208.6	249.6	180	221	12	14	206.5	247.5
155	189.8	230.8	198.5	14	16	213.6	254.6	185	226	12	14	211.5	252.5
160	194.8	235.8	203.8	14	16	218.6	259.6	190	231	12	14	216.5	257.5
165	199.8	N/A	N/A	14	N/A	223.6	N/A	195	N/A	12	N/A	221.5	N/A
170	204.8	N/A	N/A	14	N/A	228.6	N/A	200	N/A	12	N/A	226.5	N/A
175	214.8	N/A	N/A	14	N/A	238.6	N/A	210	N/A	12	N/A	236.5	N/A
180	214.8	N/A	N/A	14	N/A	238.6	N/A	210	N/A	12	N/A	236.5	N/A
185	219.8	N/A	N/A	16	N/A	243.6	N/A	215	N/A	14	N/A	241.5	N/A
190	224.8	N/A	N/A	16	N/A	248.6	N/A	220	N/A	14	N/A	246.5	N/A
195	229.8	N/A	N/A	16	N/A	253.6	N/A	225	N/A	14	N/A	251.5	N/A
200	234.8	N/A	N/A	16	N/A	258.6	N/A	230	N/A	14	N/A	256.5	N/A

Narrow Profile Air Table (NPA-20 models) Dimensions

English Dimensions (in [stroke is specified in mm])

Stroke	A	AA	AAA	B	BB	C	CC	D	DD	E	EE	F	FF
5	1.568	3.182	1.922	4	6	2.50	4.12	1.377	2.991	4	6	2.42	4.04
10	1.764	3.379	2.119	4	6	2.70	4.32	1.574	3.188	4	6	2.62	4.23
15	1.961	3.772	2.512	4	6	2.90	4.71	1.771	3.582	4	6	2.82	4.63
20	2.158	3.772	2.512	4	6	3.09	4.71	1.968	3.582	4	6	3.01	4.63
25	2.552	3.969	2.709	4	8	3.49	4.91	2.362	3.779	6	8	3.41	4.82
30	2.552	4.166	2.906	4	8	3.49	5.10	2.362	3.976	6	8	3.41	5.02
35	2.749	4.363	3.103	4	8	3.69	5.30	2.558	4.173	6	8	3.60	5.22
40	2.946	4.560	3.300	6	8	3.88	5.50	2.755	4.369	6	8	3.80	5.41
45	3.142	4.953	3.693	6	8	4.08	5.89	2.952	4.763	6	8	4.00	5.81
50	3.339	4.953	3.693	6	8	4.28	5.89	3.149	4.763	6	8	4.19	5.81
55	3.733	5.150	3.890	6	10	4.67	6.09	3.543	4.960	8	8	4.59	6.00
60	3.733	5.347	4.087	6	10	4.67	6.28	3.543	5.157	8	10	4.59	6.20
65	3.930	5.544	4.284	6	10	4.87	6.48	3.739	5.354	8	10	4.78	6.40
70	4.127	5.741	4.481	8	10	5.06	6.68	3.936	5.550	8	10	4.98	6.59
75	4.324	6.135	4.875	8	10	5.26	7.07	4.133	5.944	8	10	5.18	6.99
80	4.520	6.135	4.875	8	10	5.46	7.07	4.330	5.944	8	10	5.37	6.99
85	4.914	6.331	5.071	8	12	5.85	7.27	4.724	6.141	8	10	5.77	7.19
90	4.914	6.528	5.268	8	12	5.85	7.46	4.724	6.338	8	10	5.77	7.38
95	5.111	6.725	5.465	8	12	6.05	7.66	4.921	6.535	8	10	5.97	7.58
100	5.308	6.922	5.662	10	12	6.24	7.86	5.117	6.732	10	12	6.16	7.78
105	5.505	7.316	6.056	10	12	6.44	8.25	5.314	7.125	10	12	6.36	8.17
110	5.701	7.316	6.056	10	12	6.64	8.25	5.511	7.125	10	12	6.56	8.17
115	6.095	7.513	6.253	10	12	7.03	8.45	5.905	7.322	10	12	6.95	8.37
120	6.095	7.709	6.449	10	14	7.03	8.65	5.905	7.519	10	12	6.95	8.56
125	6.292	7.906	6.646	12	14	7.23	8.84	6.102	7.716	10	12	7.15	8.76
130	6.489	8.103	6.843	12	14	7.43	9.04	6.299	7.913	10	12	7.34	8.96
135	6.686	8.497	7.237	12	14	7.62	9.43	6.495	8.306	12	14	7.54	9.35
140	6.883	8.497	7.237	12	14	7.82	9.43	6.692	8.306	12	14	7.74	9.35
145	7.276	8.694	7.434	12	14	8.21	9.63	7.086	8.503	12	14	8.13	9.55
150	7.276	8.890	7.630	12	16	8.21	9.83	7.086	8.700	12	14	8.13	9.74
155	7.473	9.087	7.827	14	16	8.41	10.02	7.283	8.897	12	14	8.33	9.94
160	7.670	9.284	8.024	14	16	8.61	10.22	7.480	9.094	12	14	8.52	10.14
165	7.867	N/A	N/A	14	N/A	8.80	N/A	7.676	N/A	12	N/A	8.72	N/A
170	8.064	N/A	N/A	14	N/A	9.00	N/A	7.873	N/A	12	N/A	8.92	N/A
175	8.457	N/A	N/A	14	N/A	9.39	N/A	8.267	N/A	14	N/A	9.31	N/A
180	8.457	N/A	N/A	14	N/A	9.39	N/A	8.267	N/A	14	N/A	9.31	N/A
185	8.654	N/A	N/A	16	N/A	9.59	N/A	8.464	N/A	14	N/A	9.51	N/A
190	8.851	N/A	N/A	16	N/A	9.79	N/A	8.661	N/A	14	N/A	9.71	N/A
195	9.048	N/A	N/A	16	N/A	9.98	N/A	8.858	N/A	14	N/A	9.90	N/A
200	9.245	N/A	N/A	16	N/A	10.18	N/A	9.054	N/A	14	N/A	10.10	N/A

Narrow Profile Air Table (NPA-32 models) Dimensions mm (in)



Narrow Profile Air Table (NPA-32 Models) Dimensions

Metric Dimensions (mm)

Stroke	A	AA	AAA	B	BB	C	CC	D	DD	E	EE	F	FF
5	53.3	77.7	37.7	4	6	80.2	104.6	37	61.4	4	4	78.1	102.5
10	58.3	82.8	42.7	4	6	85.2	109.6	42	66.4	4	4	83.1	107.5
15	63.3	92.8	52.8	4	6	90.2	119.6	47	76.4	4	6	88.1	117.5
20	68.3	92.8	52.8	4	6	95.2	119.6	52	76.4	4	6	93.1	117.5
25	73.3	97.8	57.8	4	6	100.2	124.6	57	81.4	4	6	98.1	122.5
30	78.3	102.8	62.8	4	6	105.2	129.6	62	86.4	4	6	103.1	127.5
35	83.3	107.8	67.8	6	6	110.2	134.6	67	91.4	4	6	108.1	132.5
40	93.3	112.8	72.7	6	6	120.2	139.6	77	96.4	6	6	118.1	137.5
45	93.3	117.8	77.7	6	6	120.2	144.6	77	101.4	6	6	118.1	142.5
50	98.3	122.8	82.8	6	6	125.2	149.6	82	106.4	6	6	123.1	147.5
55	103.3	132.8	92.8	6	8	130.2	159.6	87	116.4	6	8	128.1	157.5
60	108.3	132.8	92.8	6	8	135.2	159.6	92	116.4	6	8	133.1	157.5
65	113.3	137.8	97.8	8	8	140.2	164.6	97	121.4	6	8	138.1	162.5
70	118.3	142.7	102.7	8	8	145.2	169.6	102	126.4	6	8	143.1	167.5
75	123.3	147.8	107.7	8	8	150.2	174.6	107	131.4	6	8	148.1	172.5
80	133.3	152.8	112.8	8	8	160.2	179.6	117	136.4	8	8	158.1	177.5
85	133.3	157.8	117.8	8	10	160.2	184.6	117	141.4	8	8	158.1	182.5
90	138.3	162.8	122.8	8	10	165.2	189.6	122	146.4	8	10	163.1	187.5
95	143.3	172.8	132.8	10	10	170.2	199.6	127	156.4	8	10	168.1	197.5
100	148.3	172.8	132.8	10	10	175.2	199.6	132	156.4	8	10	173.1	197.5
105	153.3	177.7	137.7	10	10	180.2	204.6	137	161.4	8	10	178.1	202.5
110	158.3	182.8	142.7	10	10	185.2	209.6	142	166.4	8	10	183.1	207.5
115	163.3	187.8	147.8	10	12	190.2	214.6	147	171.4	10	10	188.1	212.5
120	173.3	192.8	152.8	12	12	200.2	219.6	157	176.4	10	10	198.1	217.5
125	173.3	N/A	N/A	12	N/A	200.2	N/A	157	N/A	10	N/A	198.1	N/A
130	178.3	N/A	N/A	12	N/A	205.2	N/A	162	N/A	10	N/A	203.1	N/A
135	183.3	N/A	N/A	12	N/A	210.2	N/A	167	N/A	10	N/A	208.1	N/A
140	188.3	N/A	N/A	12	N/A	215.2	N/A	172	N/A	10	N/A	213.1	N/A
145	193.3	N/A	N/A	12	N/A	220.2	N/A	177	N/A	10	N/A	218.1	N/A
150	198.3	N/A	N/A	12	N/A	225.2	N/A	182	N/A	12	N/A	223.1	N/A
155	203.3	N/A	N/A	14	N/A	230.2	N/A	187	N/A	12	N/A	228.1	N/A
160	213.3	N/A	N/A	14	N/A	240.2	N/A	192	N/A	12	N/A	233.1	N/A
165	213.3	N/A	N/A	14	N/A	240.2	N/A	197	N/A	12	N/A	238.1	N/A
170	218.3	N/A	N/A	14	N/A	245.2	N/A	202	N/A	12	N/A	243.1	N/A

Narrow Profile Air Table (NPA-32 models) Dimensions

English Dimensions (in [stroke is specified in mm])

Stroke	A	AA	AAA	B	BB	C	CC	D	DD	E	EE	F	FF
5	2.100	3.061	1.486	4	6	3.16	4.12	1.457	2.417	4	4	3.08	4.04
10	2.297	3.258	1.683	4	6	3.35	4.32	1.654	2.614	4	4	3.27	4.23
15	2.494	3.652	2.077	4	6	3.55	4.71	1.851	3.008	4	6	3.47	4.63
20	2.690	3.652	2.077	4	6	3.75	4.71	2.047	3.008	4	6	3.67	4.63
25	2.887	3.849	2.274	4	6	3.94	4.91	2.244	3.205	4	6	3.86	4.82
30	3.084	4.046	2.471	4	6	4.14	5.10	2.441	3.402	4	6	4.06	5.02
35	3.281	4.243	2.668	6	6	4.34	5.30	2.638	3.599	4	6	4.26	5.22
40	3.675	4.439	2.864	6	6	4.73	5.50	3.032	3.795	6	6	4.65	5.41
45	3.675	4.636	3.061	6	6	4.73	5.69	3.032	3.992	6	6	4.65	5.61
50	3.872	4.833	3.258	6	6	4.93	5.89	3.229	4.189	6	6	4.85	5.81
55	4.068	5.227	3.652	6	8	5.13	6.28	3.425	4.583	6	8	5.04	6.20
60	4.265	5.227	3.652	6	8	5.32	6.28	3.622	4.583	6	8	5.24	6.20
65	4.462	5.424	3.849	8	8	5.52	6.48	3.819	4.780	6	8	5.44	6.40
70	4.659	5.620	4.045	8	8	5.72	6.68	4.016	4.976	6	8	5.63	6.59
75	4.856	5.817	4.242	8	8	5.91	6.87	4.213	5.173	6	8	5.83	6.79
80	5.249	6.014	4.439	8	8	6.31	7.07	4.606	5.370	8	8	6.22	6.99
85	5.249	6.211	4.636	8	10	6.31	7.27	4.606	5.567	8	8	6.22	7.19
90	5.446	6.408	4.833	8	10	6.50	7.47	4.803	5.764	8	10	6.42	7.38
95	5.643	6.802	5.227	10	10	6.70	7.86	5.000	6.158	8	10	6.62	7.78
100	5.840	6.802	5.227	10	10	6.90	7.86	5.197	6.158	8	10	6.82	7.78
105	6.037	6.998	5.423	10	10	7.09	8.06	5.394	6.354	8	10	7.01	7.97
110	6.234	7.195	5.620	10	10	7.29	8.25	5.591	6.551	8	10	7.21	8.17
115	6.431	7.392	5.817	10	12	7.49	8.45	5.788	6.748	10	10	7.41	8.37
120	6.824	7.589	6.014	12	12	7.88	8.65	6.181	6.945	10	10	7.80	8.56
125	6.824	N/A	N/A	12	N/A	7.88	N/A	6.181	N/A	10	N/A	7.80	N/A
130	7.021	N/A	N/A	12	N/A	8.08	N/A	6.378	N/A	10	N/A	8.00	N/A
135	7.218	N/A	N/A	12	N/A	8.28	N/A	6.575	N/A	10	N/A	8.19	N/A
140	7.415	N/A	N/A	12	N/A	8.47	N/A	6.772	N/A	10	N/A	8.39	N/A
145	7.612	N/A	N/A	12	N/A	8.67	N/A	6.969	N/A	10	N/A	8.59	N/A
150	7.809	N/A	N/A	12	N/A	8.87	N/A	7.166	N/A	12	N/A	8.78	N/A
155	8.005	N/A	N/A	14	N/A	9.06	N/A	7.362	N/A	12	N/A	8.98	N/A
160	8.399	N/A	N/A	14	N/A	9.46	N/A	7.756	N/A	12	N/A	9.37	N/A
165	8.399	N/A	N/A	14	N/A	9.46	N/A	7.756	N/A	12	N/A	9.37	N/A
170	8.596	N/A	N/A	14	N/A	9.65	N/A	7.953	N/A	12	N/A	9.57	N/A

How to Order

The Model Number for all Narrow Profile Air Tables consists of alphanumeric clusters. These designate type, bore size, stroke length, and special options. Please refer to the charts below for an example of a standard NPA model. This is a 20mm bore, 50mm stroke cylinder with additional options.

Type	
NPA	Narrow Profile Air Table

Stroke Length	
Bore	**Strokes**
12mm	5-95mm
20-32mm	5-120mm

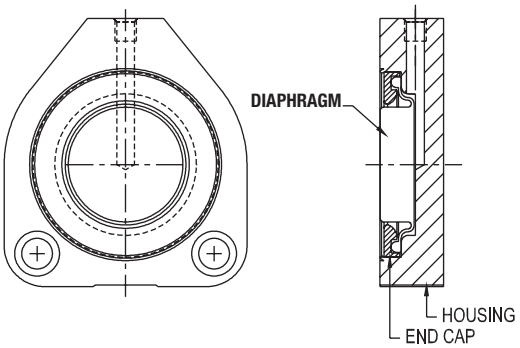
NPA - 20 50 - DEM

Bore Size	
12	12mm
20	20mm
32	32mm

Options (Enter in alphabetical order)	
D	Double carrier bearing block
E	U.S. customary (inch)
M	Magnetic position sensing
V	High temperature (15° F to 225° F)

This 1-1/4" bore diaphragm cylinder is designed for a clamping application with minimal friction losses. Its short overall height allows the cylinder to fit into a tight space with minimal friction.

Diaphragm Cylinder



Engineering Specifications

Maximum Operating Pressure: 120 PSI

Operating Temperature: 150° F

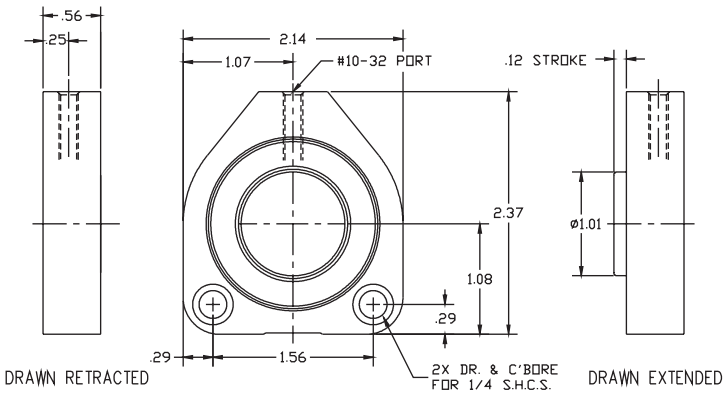
Cylinder Body: Aluminum

Diaphragm: 50 Durometer Nitrile with reinforced polyester fabric

NOTES:
Output force will be approximately 15% less than theoretical when units are not extended full stroke.
Cylinders should not be operated without a part being clamped (extension should be limited by customer to maximize life).

How to Order

The Model Number for all Diaphragm Cylinders is not configurable. Please contact Bimba's Customer Service for additional information.

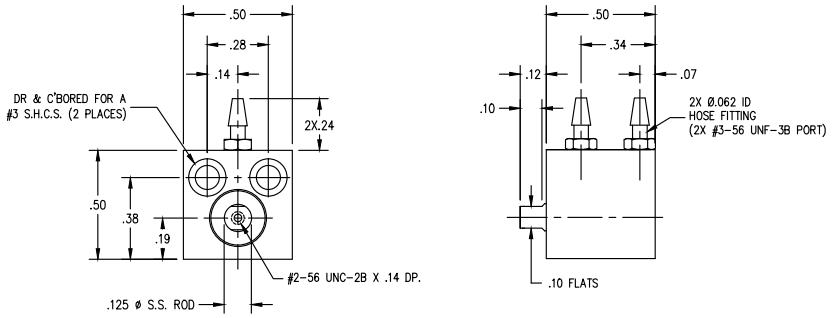


CSS - 00119 - A

Type
Diaphragm Cylinders

CFS-01011-A double-acting, miniature “cube” cylinders (1/2" x 1/2" x 1/2") are ideal for applications requiring low output force in extremely tight spaces. This cylinder has been successfully applied in various semiconductor industry applications. Several are mounted side-by-side in a test fixture for circuit board continuity testing. Another application involves silicon wafer processing, in which the cylinders are used to clamp wafers during certain operations.

Miniature “Cube” Cylinder



Engineering Specifications

Maximum Operating Pressure: 100 PSI

Power Factors: Extend: 0.028; Retract: 0.015

Cylinder Body: Aluminum Alloy

Piston Rod: 303 Stainless Steel

Rod Bearing: Brass

Weight: 0.25 oz (7.8 grams)

Lubrication: Silicone Fluid

How to Order

The Model Number for all Miniature “Cube” Cylinders is not configurable. Please contact Bimba’s Customer Service for additional information.

CFS - 01011 - A

Type
Miniature “Cube” Cylinder

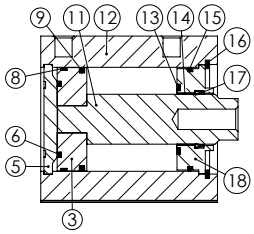
MACQ Actuators

Engineering Specifications

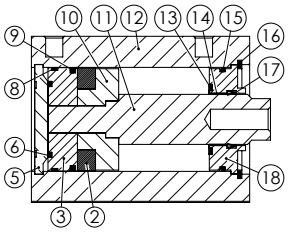
Bore Size (mm)		12	16	20	25	32	40	50	63	80	100
Fluid		Air (Clean/Dry)									
Action		Double Acting									
Pressure Range		14 to 145 PSI (0.1 to 1.0 MPa)									
Proof Pressure		215 PSI (1.5 MPa)									
Temperature Range		-4 °F to 176 °F (-20 °C to 80 °C)									
Cushion Type		Bumper									
Speed Range		30 to 500 mm/s									
Stroke Tolerance		+1.0 / -0									
Port Size		M5 X 0.8				1/8 NPT		1/4 NPT		3/8 NPT	
Thrust, N (lbs)[1]	Pushing Force	68 (15)	121 (27)	189 (42)	295 (66)	483 (108)	754 (169)	1178 (264)	1870 (420)	3016 (678)	4712 (1059)
	Pulling Force	51 (11)	91 (20)	141 (32)	227 (51)	362 (81)	633 (142)	990 (222)	1682 (378)	2721 (611)	4230 (950)
Sensor Switch Compatibility[2]	Reed Switch	MCS1-G									
	Solid State Switch	MDS1-G									

[1] Thrust at 0.6 MPa (87psi) inlet pressure.
[2] See Switch chapter for switch specifications.
See page 286 for male thread adapter.

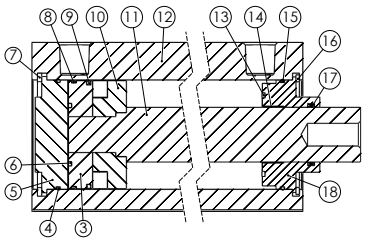
Stroke ≤100mm, No Magnet



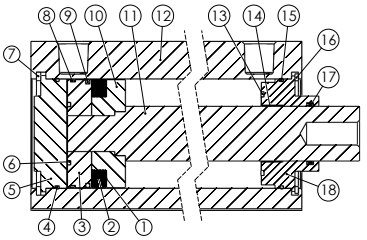
Stroke ≤100mm, With Magnet



Stroke >100mm, No Magnet



Stroke >100mm, With Magnet

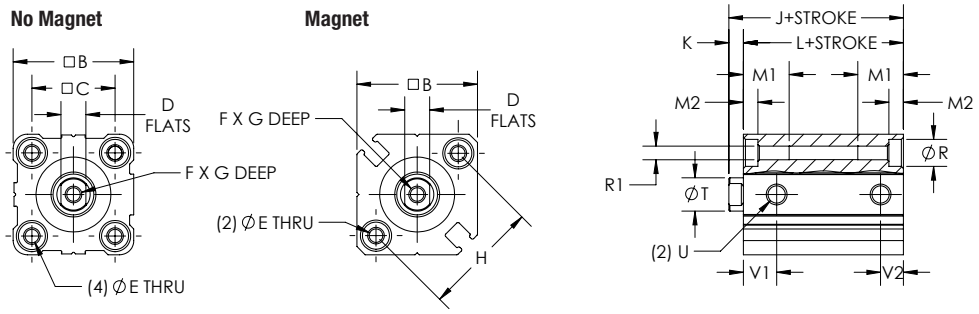


Materials

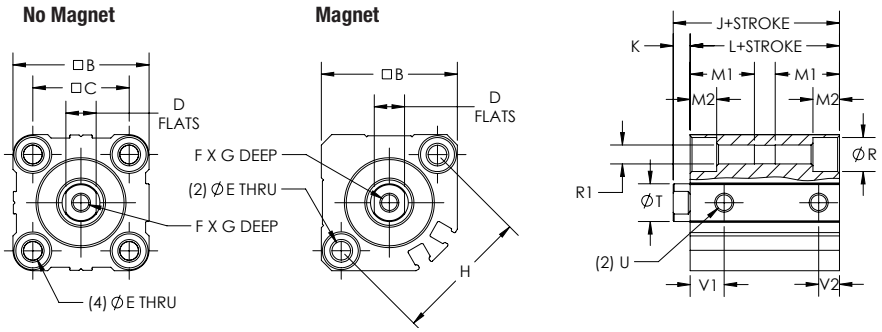
Number	Item	Material
1	Washer	No Washer (Ø12-Ø25 and Ø32-Ø100 with stroke ≤100mm); NBR (Ø32-Ø100 with stroke >100mm)
2	Magnet	Sintered Metal (Neodymium-Iron-Boron) (Ø12-Ø25); Plastic (Ø32-Ø100)
3	Piston	Brass (Ø12, Ø16); Aluminum Alloy (Ø20-Ø100)
4	O-Ring	NBR
5	Back Cap	Cap incorporated into body (Ø12, Ø16); Hard Anodized Aluminum Alloy
6	Bumper	TPU (Ø12-Ø25); NBR (Ø32-Ø100)
7	Retaining Ring	Spring Steel
8	Wear Ring	No Wear Ring (Ø12-Ø32); Polymer Bearing Material (Ø40-Ø100)
9	Piston Seal	NBR
10	Magnet Holder	Brass (Ø12, Ø16); Aluminum Alloy (Ø20-Ø100)
11	Piston Rod	Carbon Steel with 20µm Chrome Plating
12	Body	Hard Anodized Aluminum Alloy
13	Bumper	NBR
14	Bearing	No Bearing (Ø12-Ø32); Bearing Alloy (Ø40-Ø100)
15	O-Ring	NBR
16	Retaining Ring	Spring Steel
17	Rod Seal	NBR
18	Front Cap	Aluminum Alloy

MACQ Cylinder Dimensions (mm)

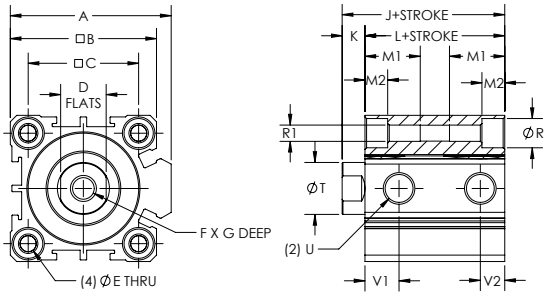
Ø12, Ø16



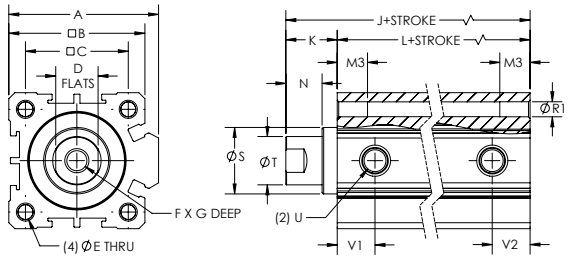
Ø20, Ø25



Ø32 - Ø100 (Stroke ≤ 100)



Ø32 - Ø100 (Stroke > 100)



Dimensions (mm)

	Stroke (mm)	Bore Size (mm)									
		12	16	20	25	32	40	50	63	80	100
A		-	-	-	-	49.5	57	71	84	104	123.5
B		25	29	36	40	45	53	64	77	98	117
C		15.5	20	25.5	28	34	40	50	60	77	94
D		5	6	8	10	14	14	17	17	22	27
E		3.4	3.4	5.2	5.2	5.2	5.2	6.8	8.5	10.3	10.3
F		M3 X 0.5	M4 X 0.7	M5 X 0.8	M6 X 1.0	M8 X 1.25	M8 X 1.25	M10 X 1.5	M10 X 1.5	M16 X 2.0	M20 X 2.5
G	5-100	6	8	7	12	13	13	15	15	20	26
	125+	-	-	-	-	13	13	15	15	21	27
H		22	28	36	40	-	-	-	-	-	-
J	5-50	20.5* 31.5**	22* 34**	24* 36**	27.5* 37.5**	30* 40**	36.5* 46.5**	38.5* 48.5**	44* 54**	53.5* 63.5**	65* 75**
	75-100	-	-	34* 36**	37.5	40	46.5	48.5	54	63.5	75
	125+	-	-	-	-	62.5	72	73.5	75	86	97.5
K	5-50	3.5	3.5	4.5	5	7	7	8	8	10	12
	125+	-	-	-	-	17	17	18	18	20	22
L	5-50	17* 28**	18.5* 30.5**	19.5* 31.5**	22.5* 32.5**	23* 33**	29.5* 39.5**	30.5* 40.5**	36* 46**	43.5* 53.5**	53* 63**
	75-100	-	-	29.5* 31.5**	32.5	33	39.5	40.5	46	53.5	63
	125+	-	-	-	-	45.5	55	55.5	57	66	75.5
M1		11	11	17	17	17	17	22	28.5	35.5	35.5
M2		3.5	3.5	7	7	7	7	8	10.5	13.5	13.5
M3		-	-	-	-	17	17	22	27	32	33
N	5-100	-	-	-	-	-	-	-	-	-	-
	125+	-	-	-	-	12	12	13	13	15	17
P		3.5	3	4	4.5	6	6	6.5	6.5	8.5	9.5
R	5-100	6.5	6.5	9	9	9	9	11	14	17.5	17.5
R1		M4 X 0.7	M4 X 0.7	M6 X 1.0	M6 X 1.0	M6 X 1.0	M6 X 1.0	M8 X 1.25	M10 X 1.5	M12 X 1.75	M12 X 1.75
S	5-100	-	-	-	-	-	-	-	-	-	-
	125+	-	-	-	-	22	28	35	35	43	59
T		6	8	10	12	16	16	20	20	25	32
U		M5 X 0.8	M5 X 0.8	M5 X 0.8	M5 X 0.8	1/8 NPT	1/8 NPT	1/4 NPT	1/4 NPT	3/8 NPT	3/8 NPT
V1	5	7.5* 9**	8* 9.5**	9* 9.5*	11	7.5* 10.5**	11	9* 10.5**	14* 15**	16	20
	10-100	7.5* 9**	8* 9.5**	9* 9.5**	11	10.5	11	10.5	15	16	20
	125+	-	-	-	-	12.5	14	14	16.5	19	23
V2	5	5* 7**	5.5	5.5	5.5	6.5* 7.5**	8	9* 10.5**	9.5* 10.5**	14	17.5
	10-100	5* 7**	5.5	5.5	5.5	7.5	8	10.5	10.5	14	17.5
	125+	-	-	-	-	12.5	14	14	16.5	19	23

* No Magnet
** With Magnet
See page 286 for male thread adapter.

The Model Numbers for all MACQ compact cylinders are configurable. Designate bore size, stroke, magnet, and ports.

MACQ - 16 x 30 - S - T

Product
MACQ Compact Cylinder

Magnet	
Blank	No Magnet
S	with Magnet

Ports	
T	Standard[1]

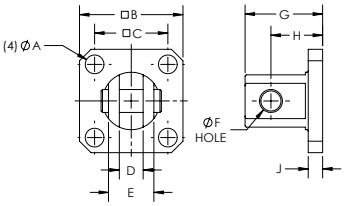
[1] See page 282 for the Port Sizes listed in the Engineering Specifications table.

Stroke (mm)	Bore Size (mm)									
	12	16	20	25	32	40	50	63	80	100
5	X	X	X	X	X	X	X	X	X	X
10	X	X	X	X	X	X	X	X	X	X
15	X	X	X	X	X	X	X	X	X	X
20	X	X	X	X	X	X	X	X	X	X
25	X	X	X	X	X	X	X	X	X	X
30	X	X	X	X	X	X	X	X	X	X
40	X	X	X	X	X	X	X	X	X	X
50	X	X	X	X	X	X	X	X	X	X
75			X	X	X	X	X	X	X	X
100			X	X	X	X	X	X	X	X
125					X	X	X	X	X	X
150					X	X	X	X	X	X

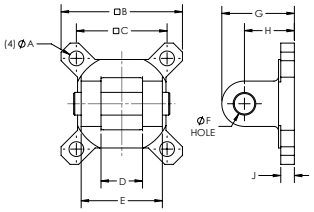
Product Information

Clevis Brackets for MACQ Series

Ø12 - Ø25



Ø32 - Ø100

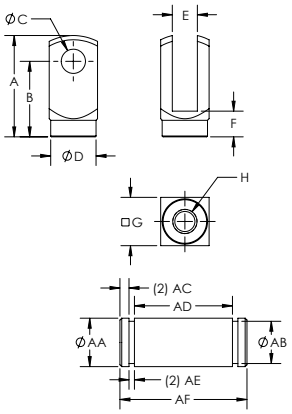


Model	A	B	C	D	E	F	G	H	J
F-MACQ-12-CB	4.5	25	15.5	5.3	9.8	5	20	14	4
F-MACQ-16-CB	4.5	29	20	6.8	11.8	5	21	15	4
F-MACQ-20-CB	6.5	36	25.5	8.3	15.8	8	27	18	5
F-MACQ-25-CB	6.5	40	28	10.3	19.8	10	30	20	5
F-MACQ-32-CB	6.5	45.5	34	18.3	35.8	10	30	20	5.5
F-MACQ-40-CB	6.5	53.5	40	18.3	35.8	10	32	22	7
F-MACQ-50-CB	8.5	64.5	50	22.3	43.8	14	42	28	8
F-MACQ-63-CB	10.5	77.5	60	22.3	43.8	14	44	30	10
F-MACQ-80-CB	12.5	98.5	77	28.3	55.8	18	56	38	10
F-MACQ-100-CB	12.5	117.5	94	32.3	63.8	22	67	45	13

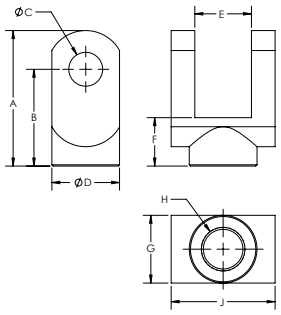
Pin, c-clips, and hardware included with all Clevis Brackets

Rod Clevis Brackets for MACQ Series

Ø12 - Ø25



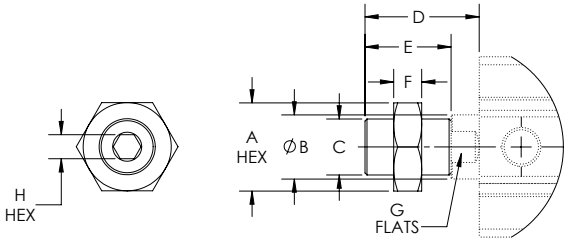
Ø32 - Ø100



Model	A	B	C	D	E	F	G	H	J	AA	AB	AC	AD	AE	AF
F-MACQ-12-Y	22	16	5 +.048/-0	9	5.3±0.1	6	10	M5 X 0.8	-	5 -.03/-.06	4	1.5	10.2	0.7	14.6
F-MACQ-16-Y	28	21	5 +.048/-0	11	6.6±0.1	11	12	M6 X 1.0	-	5 -.03/-.06	4	1.5	12.4	0.7	16.8
F-MACQ-20-Y	34	25	8 +.058/-0	15	8.3±0.1	8.5	16	M8 X 1.25	-	8 -.04/-.076	7	1.5	16.2	0.9	21
F-MACQ-25-Y	41	30	10 +.058/-0	19	10.3±0.1	10.5	20	M10 X 1.25	-	10 -.04/-.076	8	2	20.2	1.1	26.4
F-MACQ-32-Y	42	30	10 +.058/-0	22	18.4±0.1	16	22	M14 X 1.5	36	10 -.04/-.076	8	2	36.2	1.1	42.4
F-MACQ-40-Y	42	30	10 +.058/-0	22	18.4±0.1	16	22	M14 X 1.5	36	10 -.04/-.076	8	2	36.2	1.1	42.4
F-MACQ-50-Y	56	40	14 +.07/-0	28	22.4±0.1	20	28	M18 X 1.5	44	14 -.05/-.093	12	2	44.2	1.1	50.4
F-MACQ-63-Y	56	40	14 +.07/-0	28	22.4±0.1	20	28	M18 X 1.5	44	14 -.05/-.093	12	2	44.2	1.1	50.4
F-MACQ-80-Y	71	50	18 +.07/-0	38	28.4±0.1	23	38	M22 X 1.5	56	18 -.05/-.093	15	2	56.2	1.7	63.6
F-MACQ-100-Y	79	55	22 +.084/-0	44	32.4±0.1	22	44	M26 X 1.5	64	22 -.065/-.117	19	2.5	64.2	1.7	72.6

Pin, c-clips, and male adapter included with all Rod Clevis Brackets

Male Adapter for MACQ Series



Male Adapter includes jam nut (cylinder not included).

Model	A	B	C	D	E	F	G	H
F-MACQ-12-A	8	6	M5 X 0.8	14	10.5	4	5	2.5
F-MACQ-16-A	10	8	M6 X 1.0	15.5	12	5	6	3
F-MACQ-20-A	12	10	M8 X 1.25	18.5	14	6	8	4
F-MACQ-25-A	17	12	M10 X 1.25	22.5	17.5	6	10	5
F-MACQ-32-A	19	16	M14 X 1.5	28.5* / 38.5**	21.5	8	14	6
F-MACQ-40-A	19	16	M14 X 1.5	28.5* / 38.5**	21.5	8	14	6
F-MACQ-50-A	27	20	M18 X 1.5	33.5* / 43.5**	25.5	11	17	8
F-MACQ-63-A	27	20	M18 X 1.5	33.5* / 43.5**	25.5	11	17	8
F-MACQ-80-A	32	25	M22 X 1.5	43.5* / 53.5**	33.5	13	22	10
F-MACQ-100-A	36	32	M26 X 1.5	43.5* / 53.5**	31.5	13	27	10

* Stroke = 5 to 100 ** Stroke = 125, 150

Space Saver

Full Power in Half the Space

Space Saver cylinders provide the power and stroke of standard cylinders in less than half the space. They are ideally suited for use in machinery where space and weight are at a premium. Best of all, Space Saver cylinders cost up to 50% less than standard models.

Built to Last

> Oil impregnated sintered bronze rod bearing and hard chrome plated piston rod work together to prolong cylinder life.
> Hard coated cylinder bore eliminates cylinder wall scoring.

SS-250

SS-300

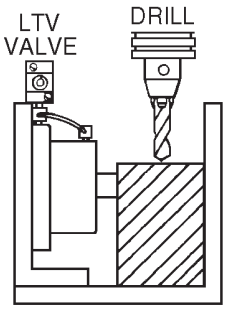
Offers A Wide Range Of Power

Bore	3/4"	1-1/8"	1-1/2"	2"	2-1/2"	3"	4"
Force @ 100 PSI (lbs)	44	100	177	314	491	707	1257

NOTE: Pull force is approximately 10% less.

Perfect for Tooling

Space Saver cylinders are ideal for use on drill fixtures and other automated tooling to provide compact, lightweight holding power.



Valving

Efficient 4-way LTV valves, shown in the Valves catalog, are perfect with Space Saver cylinders. Valve hookup is made easy because the top cylinder port re-indexes to any position.

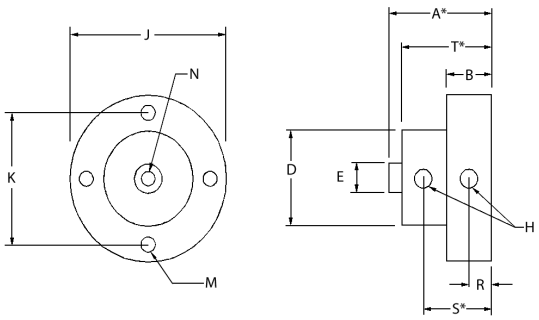
Technical Data

Specifications	
Pressure:	0-150 PSI, Air only
Temperature:	-40° F to 250° F (-40° C to 121° C) (to 400° F [204° C] with FKM)
Lubrication:	Petroleum base oil
Filtration:	40 Micron minimum
Seals:	Buna-N

How to Specify

Product Information

Dimensions



NOTE: 3/4" - 2" Bore Models have two (2) Mounting Holes. See Dimension M.

Bore	3/4"	1-1/8"	1-1/2"	2"	2-1/2"	3"	4"
A*	0.77	0.78	0.91	1.06	1.08	1.37	1.52
B	0.50	0.50	0.50	0.56	0.56	0.75	0.75
D	1.00	1.38	1.75	2.25	2.75	3.25	4.25
E	0.31	0.50	0.50	0.63	0.63	0.75	0.75
H	#10-32	#10-32	#10-32	1/8 NPT	1/8 NPT	1/8 NPT	1/8 NPT
J	1.74	2.12	2.49	3.11	3.74	4.24	5.22
K	1.41	1.78	2.16	2.72	3.25	3.78	4.78
M	0.19	0.19	0.19	0.19	0.27	0.27	0.27
N	#10-32 X .25	5/16-24 X .38	5/16-24 X .38	3/8-24 X .38	3/8-24 X .38	1/2-20 X .50	1/2-20 X .50
R	0.16	0.16	0.16	0.31	0.31	0.33	0.33
S*	0.38	0.38	0.51	0.69	0.68	0.91	1.04
T*	0.76	0.77	0.90	1.05	1.06	1.36	1.50

* Plus Stroke
NOTE: To obtain a 1/8" or 3/16" stroke on 3/4" or 1-1/8" bore models, a 1/4" stroke cylinder is used and spacers are added.

Stroke Availability

Model	Stroke Lengths												
	Bore	1/8	3/16	1/4	3/8	1/2	5/8	3/4	1	1-1/2	2	2-1/2	3
SS-075	3/4"	X*	-	X*	X	X	X	X	X	X	X	-	-
SS-112	1-1/8"	X*	X*	X*	-	X	-	X	X	X	X	X	X
SS-150	1-1/2"	X*	-	X	-	X	-	X	X	X	X	X	X
SS-200	2"	X	-	X	-	X	-	X	X	X	X	X	X
22-250	2-1/2"	X	-	X	-	X	-	X	X	X	X	X	X
SS-300	3"	X	-	X	-	X	-	X	X	X	X	X	X
SS-400	4"	X	-	X	-	X	-	X	X	X	X	X	X

* Includes special fitting
NOTE: To obtain a 1/8" or 3/16" stroke on 3/4" on 1-1/8" bore models, a 1/4" stroke cylinder is used and spacers are added.
Non-standard strokes subject to special machining charge.

Mounting Options

Uniform base thickness makes mounting easy regardless of stroke.

How to Order

When ordering, specify model number, stroke length, and FKM seal option if required

Example: SS-150 X 0.25 - FB-VI

Common Cylinder Design Modifications

This table shows common modifications to our standard design which have been provided to customers. Please contact your local distributor for information on pricing and delivery for these special options.

Feature	Deviation From Standard Model
Body or End Cap	Add customer logo
Clean Room Design	Design modifications
End Caps	Additional standard ports
End Caps	Reduced port size
End Caps	Rotated ports
End Caps	Omit Bimba logo
Lubrication	Customer-specified lubricants
Rod	Cross-drilled hole
Rod	Spherical rod end
Rod	Screwdriver slot in rod end
Rod	MT one end only (FOD models)
Rod	EE one end only (FOD models)
Rod	Special thread sizes
Rod	Special thread lengths/depths
Rod	Non-standard OD or ID
Rod	Case hardened
Seals	Non-standard materials
Seals	U-Cup style rod seal
Stroke Length	Longer than standard

Common Cylinder Design Modifications (Stainless Steel Flat-1®)

This table shows common modifications to our standard design which have been provided to customers. Please contact your local distributor for information on pricing and delivery for these special options.

Feature	Deviation From Standard Model
Rod	Thread modification, non-standard threads on existing rod diameter
Lubrication	Customer specified non-standard lubricants
Seals	Special compounds, EPDM, internally lubricated, Teflon coated
Mounting Dimensions	Special hole patterns and sizes, mounting flanges and plates
Non-Rotating Rod	Square piston rod prevents piston rod rotation

Notes