Original Line Cylinders

Bimba Original Line Cylinders

WORKING WITH BIMBA GIVES YOU:

- The Original stainless steel body cylinder company — with more sizes and options than any other manufacturer.
- Fast service — many models and sizes kept in stock for immediate delivery.
- Worldwide availability through local stocking distributors.
- Custom-design capabilities for your specific needs.

OUR ORIGINAL LINE CYLINDER FEATURES AND ADVANTAGES INCLUDE:

- 304 stainless steel body with mirror finish ID for long, reliable life.
- Pre-lubrication with HT-99, our specially-formulated oil compound, for extensive maintenance-free performance.
- Piston-to-rod connection is threaded, sealed and riveted securely in place.
- Low breakaway frictional characteristics: collapsible U-cup rod and piston seals; oil-impregnated, sintered bronze rod bushing on most sizes; and breakaway slots on each endcap for fast seal inflation.
- Roll-formed rod threads on both ends for high strength.
- Blow-by flats on double acting model pistons ensures proper seal inflation.
- 250 psi rating.
- High strength aluminum alloy porting ends, machined for minimal breakaway during initial pressurization.

How to Order

The model number of all Original Line cylinders consists of three alphanumeric clusters. These designate product type, bore size and stroke length, and mounting styles and options.

Please refer to the charts below for an example of model number BR-013-DBEE0.5. This is a rear block, 7/16" bore, 3" stroke double acting cylinder with bumpers and an extra extension of 1/2".

TYPE

BXX – Block or Trunnion Mounted (BF, BR, BFT, BRT, BFM, BRM, BFTM, BRTM)
C – Cushion
(CR, CF, CS, CM, CRM, CFM, CSM)
H – Hydraulic cylinder
HL – Low Pressure Hydraulic
(250 PSI maximum)
M – Magnet option for standard cylinders
MRS® – Magnetic Reed Switch Cylinder
SR – Stainless rod, if nonstandard

BORE SIZE/POWER FACTOR

007 – 5/16"	12 – 1-1/4"
01 – 7/16"	17 – 1-1/2"
02 – 9/16"	24 – 1-3/4"
04 – 3/4"	31 – 2"
06 – 7/8"	50 – 2 1/2"
09 – 1-1/16"	70 – 3"

STROKE LENGTH

In inches and decimal fractions, i.e. 1.75 (See individual models for standard and maximum stroke)

BR-013-DBEE0.5

MOUNTING STYLE

(see individual bore sizes for designations)

OPTIONS*

(in alphabetical order, except for EE which is last)

B	–	Bumpers
E	–	Seals and factory lubrication for long life in non-lube applications
EEX.XX	–	Extra Rod Extension of X.XX
F	–	Molycoated body
G	–	Magnalube® G Lubrication
H	–	Heavy Spring (H designated before mounting style)
JR	–	Double-Acting Spring Extend
JS	–	Double-Acting Spring Return
K	–	Ports rotated 90°
N	–	Low temperature seals & lubrication
NT	–	No Thread
Q	–	Side ported rear head
T	–	Switch Track (T1, T2, T3 or T4) see Position Sensing Solutions, page 8.3 for switch selection information
V	–	High temperature seals & lubrication
W	–	Rod Wiper
Y	–	Pivot bushing replaces pivot pin

** Consult your distributor or option combination availability chart page 1.4.*
®Magnalube is a trademark of Carleton Stuart Corporation.

Approximate Power Factors

5/16"	–	0.07
7/16"	–	0.15
9/16"	–	0.25
3/4"	–	0.4
7/8"	–	0.6
1-1/16"	–	0.9
1-1/4"	–	1.2
1-1/2"	–	1.7
1-3/4"	–	2.4
2"	–	3.1
2-1/2"	–	5.0
3"	–	7.0

FORCE = *Airline Pressure* x *Piston Area*

PISTON AREA = *Bimba Power Factor*

FORCE = *Airline Pressure* x *Bimba Power Factor*

Bimba has made sizing a cylinder as easy as knowing the model number. Each base model number is developed by calculating the area of the cylinder bore. This area, or Power Factor, will provide the force the cylinder will exert when multiplied by the airline pressure.

Options

Many options can be added to our standard cylinders. Options vary by bore size. See individual bore sizes for valid options, pricing and length adders for that size. Consult specific cylinder types in this catalog for options available for those cylinder types.

Option Combination Availability Chart

Due to design or compatibility restrictions, the following options may **NOT** be ordered in combination. For example, option K (ports rotated) and option Q (side ported rear head) are not a valid combination.

Options F, NT and EE are available independently, with each other or with all other options or viable option combinations.

options / size	W[3] [4] Wiper	B[2] [5] Bumper	V[2] [4] High Temperature	H Heavy Spring	K Ports Rotated 90°	Y Pivot Bushing	N[2] Low Temperature	Q Side Ported Rear Head	G Magnalube G	E Special Lube & Seals	HL [6] Low Pressure Hydraulic
007	N/A	STD	N, E	N/A	Q	STD	V,G,E, HL	K	N, E, HL	N, G, V, HL	G,N,E,F,H
01	N/A	N, HL	N, E	N/A	Q	Q	B,V,G,E, HL	K,Y	N, E, HL	N, G, V, HL	B,G,N,E,F,H
02	N/A	N, HL	N, E	N/A	Q	STD	B,V,G,E, HL	K	N, E, HL	N, G, V, HL	B,G,N,E,F,H
04, 09, 17	H,N	N, HL	N, E	W, HL	Q	Q	W,B,V,G,E, HL	K,Y	N, E, HL	N, G, V, HL	B,G,N,E,F,H
06, 12, 24	N/A	STD, HL	N, E	N/A	Q	Q	V,G,E, HL	K,Y	N, E, HL	N, G, V, HL	B,G,N,E,F,H
31, 50	N/A	N, HL	N, E	N/A	Q	STD	B,V,G,E, HL	K	N, E, HL	N, G, V, HL	B,G,N,E,F,H
70	N/A	N, HL	N, E	N/A	Q	STD	V,G,E, HL	K	N, E, HL	N, G, V, HL	B,G,N,E,F,H

Notes:

[1] Option M is designated as a prefix, (ie M-041-DXP). When M is specified, the piston rod will be made of 303 stainless steel. Certain bore sizes and mounting styles offer the stainless rod standard.

[2] When bumpers are standard and high or low temperature option is specified, the bumpers are omitted and the overall length of the cylinder may decrease. When bumpers and high temperature are ordered as options on the same cylinder, the bumper material will be standard Buna N.

[3] Wipers are available in double acting and reverse single acting models only. Wipers may not be available with certain mounting configurations. Consult the specific bore size in this catalog for detail.

[4] When high temperature and the magnetic options are combined, operating temperature remains at 200°F. This combination is recommended when Fluoroelastomer seals are specified for compatibility. When specifying the high temperature and wiper options together, a standard Buna N or Urethane wiper will be provided.

[5] Bumpers are available in only double acting models for the 17 and 31 bores.

[6] Option HL applies only to Double Acting Original Line cylinders and is not available with the following series: Cushion, PC, MRS, NR, Z-Line, DNR, 500 Hydraulic and Multiple Position.

Overall Length Reductions for Options N & V

Double Acting	
0070-DV	N/A
0070-DXPN	.08"
BF-0070-DN	.08"
060-D (V or N)	.22"
060-DXP (V or N)	.22"
060-DXDE (V or N)	.25"
120-D (V or N)	.19"
120-DP (V or N)	.19"
120-DXDE (V or N)	.25"
120-DXDEH (V or N)	.25"
240-D (V or N)	.25"
240-DP (V or N)	.25"
240-DXDE (V or N)	.25"

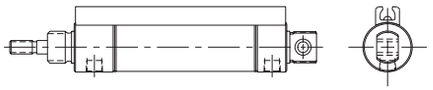
*0070 bumpers are high temperature option material and not removed when high temperature option is specified.

Single Acting	
0070-N	.04"
0070-XPN	.04"
0070-RN	.04"
0070-RPN	.04"
060- (V or N)	.09"
060-NR (V or N)	.09"
060-RP (V or N)	.125"
060-R (V or N)	.125"
120- (V or N)	.125"
120-NR (V or N)	.125"
120-NRP (V or N)	.125"
120-P (V or N)	.125"
120-R (V or N)	.125"
120-RP (V or N)	.125"
240- (V or N)	.125"
240-NR (V or N)	.125"
240-P (V or N)	.125"
240-R (V or N)	.125"

The switch track and port orientation when ordering the "Z" (Switch Track) & "K" (Ports Rotated) options on an Original Line *MRS* cylinder is shown Below. Double track option Z and K cannot be ordered in combination.

MRS- -DXP

MRS- -DXPZK



Accessories

Accessories have separate catalog numbers and are shown at the end of each bore size section. Most accessories are zinc-plated carbon steel. We also offer stainless steel accessories in some bore sizes.

Lubrication

All BIMBA cylinders are prelubricated with our special HT-99 lubrication and sealed at the factory for extensive maintenance-free life. Cylinder life can be lengthened by providing additional lubricant with an air line mist lubricator or direct introduction of oil to the cylinder every 500 hours of operation. Both Magnalube G and HT-99 can now be purchased from your Bimba distributor.

MAG-G-3CC	/bag
HT-99-7CC	/bag

(each bag contains six ampules)

Requirements will vary depending on the application. In general, one ampule will provide 500 hours of lubrication service for one 1-1⁄2" bore, 12" stroke double acting cylinder.

Other recommended oils for Buna N seals are medium to heavy inhibited, nondetergent hydraulic and general purpose oil. For cylinders with high temperature seals, use Dow Corning #710. For cylinders with low temperature seals, Dow Corning #55 grease is recommended.

Magnalube G can be ordered by specifying option G. Magnalube G's non-migratory properties provide benefits in applications where migration of lubricant can be problematic for cylinder performance or the application. Molycoating is available as standard option F. It is a dry, thin film of lubricant on the cylinder wall that can reduce piston seal wear. Bimba's new option E provides a proprietary combination of seal material and lubrication for extended life in non-lubricated environments. Other types of factory lubrication are available as required.

Piston Rod Material

Standard models feature ground and polished, high strength carbon steel piston rod or ground and roller burnished type 303 stainless steel. Stainless steel can also be ordered as an option on most models (see models for pricing). Stainless steel is standard on the following models:

- All 5/16", 7/16" and 9/16" bore cylinders
- All cylinders with adjustable cushions
- All 9/16" through 3" bore cylinders ordered with Magnet (M) option
- MRS cylinders
- "Z" Line cylinders
- Block and Trunnion-mounted cylinders
- Universal mount, double-end rod cylinders

Hard chrome plated rod is standard on "500" Hydraulic cylinders.

Temperature Range

Buna N seals with a temperature range of -20° F (-29° C) to 200° F (95° C) are standard in all BIMBA air cylinders. Fluoroelastomer seals rated for higher temperature applications (up to 400° F) are available. When specifying our magnetic piston ("M" option), maximum operating temperature is 185° F based on the material of the magnet. If cylinders are operated at temperatures below 0° F for extended time periods, our low temperature seal and lubrication option (N) is recommended. This option has a temperature range of -40° F to 200° F. If cylinders are operated below -20° F with low temperature seals for extended time periods, cylinder performance will be affected by the cold temperature.

Mounting

Mounting should be by the threaded stud ends, pivot or bolt holes provided. Mount cylinders to provide alignment with the driven mechanism, avoiding side loads that restrict the free operation of the cylinder.

Free Test Cylinder

Since 1975, our policy has been to provide a FREE TEST CYLINDER to any qualified original equipment manufacturer. This service is provided at no obligation, but we would appreciate a copy of your test results. Contact us or your local stocking BIMBA distributor for more information.

Special Cylinders

Do you have a complicated or unusual application? BIMBA will custom-design and build the cylinder that will solve your problem. Whatever your needs—special stroke, mounting styles, rod-end configurations, seal materials, dimensional changes, etc.—contact us or your local stocking BIMBA distributor.

Delivery/ Availability

Bimba cylinders are sold through local stocking distributors. Each distributor maintains an inventory of our most popular models. At the factory, Bimba classifies cylinders as shelving and nonshelving models. More than 125,000 units of various shelving models are kept in stock for immediate delivery. Standard stroke lengths shown in blue are stocked at Bimba. (Most stocked models shown in blue do not include options.) These stroke lengths are available in limited quantities for immediate shipment. Bimba also stocks a large quantity of cylinders with options such as stainless steel rods or bumpers. Nonstocked standard models are manufactured within 5 working days.

Cylinder Life Expectancy

Bimba cylinders have been designed and tested for a rated life of 1400 miles of travel when properly applied and lubricated per recommendations. Bimba's option E has been designed and tested for a rated life of 2,800 miles of travel when properly applied in an unlubricated environment.

Types of Cylinders

Bimba manufactures several different types of Original Line cylinders for your applications. These include the basic 5/16" to 3" bore cylinders described on pages 1.10-1.64. Weights published for each cylinder are approximate. Additional styles include:

Three-Position Cylinders

This multi-position Original Line stainless body cylinder provides three positive stroke positions with a single cylinder.

Cushion Cylinders

These include adjustable air cushions that slow cylinder speed at the end of stroke, reducing impact and extending cylinder life. Cushions can be ordered on rear, front or both ends, and can be ordered in combination with magnetic pistons.

MRS Cylinders

These include a magnet on the piston, designed to operate Bimba switches to actuate programmable controllers, relays, solenoids, timers or other electrically operated equipment. Dimensional differences from the basic Original Line include larger mounting threads and longer overall lengths in certain bore sizes.

Non-Rotating Cylinders

Double acting and reverse acting non-rotating cylinders have a unique square piston rod with rounded corners. They are dimensionally interchangeable with the standard Original Line.

PC Cylinders

These cylinders include acetal resin end caps. They are ideal for applications and environments that require exposure to moisture, lubricants and specific solvents. All dimensions except 1½" bore nose threads are interchangeable with the Original Line.

All Stainless Steel Non-Repairable Cylinders

The new all stainless Original Line cylinders are the perfect solution for applications in the food processing/packaging, medical, chemical, or marine environments where wash down solutions or other corrosives are present in the environment. Designed to be dimensionally interchangeable with our standard Original Line, these cylinders offer a cost effective method of extending cylinder life in difficult application environments.

All Stainless Steel Repairable Cylinders

The new all stainless repairable Original Line cylinders are ideal for food processing, chemical, medical, pharmaceutical, offshore or marine equipment, and energy production or waste management applications. The bell ring design also offers the added benefit of full repairability without the need for hand tools by securing the body to the rod guide with a knurled, threaded nut.

Z-line Cylinders

For extremely tough applications, with larger diameter, two-piece piston rod, elastomer bumpers and Buna N U-cup seals for low breakaway.

Rod Lock Cylinders

This cylinder is a normally clamped unit that holds the piston rod in position when air pressure is not present. It is ideal for preventing drift at machine shut down.

500 Hydraulic Cylinders

For hydraulic use, up to 500 psi.

Low Pressure Hydraulic Cylinders

Designed for use in low pressure hydraulic circuits with pressures not exceeding 250 psi. The design incorporates chrome plated piston rods and block-vee seals.

Hole Punchers

These are designed to punch millions of holes in thin film or plastic materials 2 to 3 mils thick.

Stroke Lengths

Standard stroke lengths and recommended maximum stroke lengths are listed in each model description. Special stroke lengths are available upon request. Stroke lengths are available in lengths longer than published, but an application review may be required. The cost per inch of stroke is listed below the base price of each cylinder. On models with 1/2" standard stroke length increments, add 1/2 of the per inch price for the 1/2" inch of stroke.

NOTE ON ROD MATERIAL: Bore sizes 3/4" to 1-3/4": rod lengths greater than 12" (stroke plus extra extension) require a stainless steel rod. Bore sizes 2" to 3": rod lengths greater than 6" require a stainless steel rod. Rod length equals stroke plus extension.

Fractional Stroke Lengths

Fractional stroke lengths for single and reverse acting cylinders, both standard and nonstandard, require special calculations to determine cylinder dimensions. The following equations apply:

Single Acting Cylinders
Calculate the length of next whole standard increment of stroke, then subtract the difference between desired stroke and next longer whole increment of stroke.

Example: 092.75

090 Base length =		1.94"
Plus 1.56 per inch of stroke =		+ 4.68"
1.56 X 3.0 (next longer stroke increment)		
093 length =		6.62
Whole stroke increment =	3.00"	
Minus desired stroke =	- 2.75	
Stroke difference =	.25 . . .	- 0.25
092.75 length =		6.37"

Reverse Acting Cylinders
Calculate length of next longer standard increment of stroke, then subtract twice the difference between desired stroke and next longer standard increment of stroke.

Example: 011.625-RP

010-RP Base length =		2.38"
Plus 1.44 per each 0.5" of stroke =		+ 5.76
1.44 X 4 (number of standard increments required for the next longer increment)		
012-RP length =		8.14
Standard stroke increment =	2.000"	
Minus desired stroke =	- 1.625	
Stroke difference =	.375	
Twice stroke difference =	.750 . . .	- 0.75
011.625 length =		7.39"

Double Acting Cylinders
Add desired stroke length to base length of cylinder.

Example: 041.25-D

040-D Base Length =	2.97"
Plus 1.25" stroke =	+ 1.25
041.25-D length =	4.22

NOTE: Additional charges may be added for small quantity orders of fractional, nonstandard stroke lengths. Consult your local stocking BIMBA distributor.

Spring Forces *(approximate)*

Bore Size	Relaxed (lbs.)	Compressed (lbs.)	Heavy Spring Relaxed (lbs.)	Heavy Spring Compressed (lbs.)
5/16"	.5	1	–	–
7/16"	1	2	–	–
9/16"	2	4	–	–
3/4"	3	6	4	10
7/8"	3	6	–	–
1-1/16"	3	6	6	12
1-1/4"	7.5	15	–	–
1-1/2"	7	14	8.5	17
1-3/4"	11	24	–	–
2"	15	30	–	–

NOTES
- *Heavy spring option may increase cylinder overall length*
- *Spring forces listed are for whole strokes*

Nose Mount Torque Values

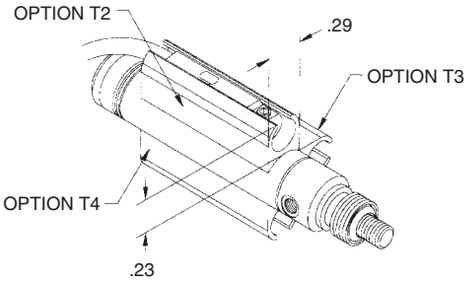
Thread Size	Torque (IN*LB) FT*LB	Bore Size
1/4-28 UNF	(27.6) 2.3	5/16" (007)
3/8-24 UNF	(60) 5	5/16" (007) & 7/16" (01)
7/16-20 UNF	(84) 7	7/16" (01) & 9/16" (02)
1/2-20 UNF	(144) 12	3/4" (04)
5/8-18 UNF	(336) 28	3/4" (04), 7/8" (06) & 1-1/16" (09)
3/4-16 UNF	(480) 40	3/4" (04), 1-1/16" (09), 1-1/4" (12) & 1-1/2" (17)
7/8-16 UNF	(780) 65	1-1/16" (09), 1-1/4" (12) & 1-1/2" (17)
1-14 UNS	(1200) 100	1-1/2" (17) & 1-3/4" (24)
1 1/8-12 UNF	(1320) 110	1-1/2" (17) & 1-3/4" (24)
1 1/4-12 UNF	(1440) 120	2" (31)
1 3/8-12 UNF	(1560) 130	2-1/2" (50)
1 1/2-12 UNF	(1680) 140	3" (70)

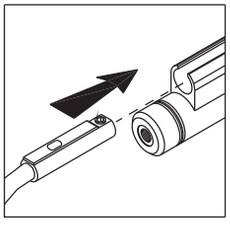
Pressure Rating

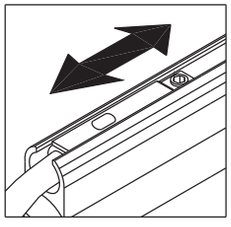
Original Line, Cushioned Original Line, NR series, Z-line, MRS and hole punchers = 250 psi.
PC cylinder = 100 psi.
Bimba 500 Hydraulic = 500 psi hydraulic.
Reservoirs = 250 psi.

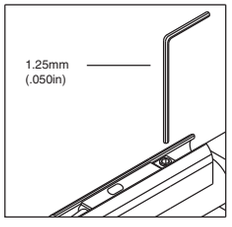
Switch Track Options

For Original Line cylinders, including MRS cylinders, with -T2, T3, and T4 options









Switch Track for use with Bimba MR, MS, MSC, and MSK Switches

Miniature Position Sensing track lengths can now be purchased separately for field mounting of custom track locations. Simply specify the length of track desired after the part number.

Mounting recommendations:
- Clean body with acetone. Remove all oil from body surface.
- Avoid mounting track over rolled construction. Locate edge of track 0.175" from rolled construction.
- Use a solid continuous bead of glue for the entire length of track used. Bead should fill center channel of track.
- Adhere to recommended cure times as specified by the glue manufacturer.

Bores	Part Number	List Price	Adder per Inch
007 - 04	D-74168-A-length		
06 - 31	D-78527-A-length		
50 - 70	D-78528-A-length		

Loctite U-05FL or similar adhesive is recommended (not included).

5/16" Bore Air Cylinders

- Ground and Roller Burnished 303 Stainless Steel Piston Rod Standard
- Force Exerted Approximately 0.07 of Air Line Pressure
- Enclosed Spring Force: .5 lb. Relaxed – 1 lb. Compressed
- Cushion Quiet Bumpers Standard on All Models

OPTIONS:

(also see Option Combination Availability Chart Page 1.4)

- ***MAGNALUBE G (G)** - NO CHARGE*
- ***PORTS ROTATED (K)*** - NO CHARGE*
- ***NO THREAD (NT)** - NO CHARGE*

**Rod guide port rotated 90° clockwise in BF model.*

- ***SIDE PORTED REAR HEAD (Q)***
  Add .20" to nose mount overall length

EXTRA EXTENSION (EE)
- *Add per inch of extension*

DOUBLE ACTING FAILSAFE
(JS = Spring Return, JR = Spring Extend)
- *Add to base price + to stroke adder*
- *See page 1.65 for overall length adders*

LOW TEMPERATURE (N)
Temperature Range: -40° to 200ºF
- *Single acting add*
- *Double acting add*
- *Reverse acting add*

OPTIONS continued...

HIGH TEMPERATURE "U" CUPS (V)
(overall length does not change)
Temperature Range: 0° to 400ºF (-18° to 205ºC)
- *Single acting add*
- *Double acting add*
- *Reverse acting add*

ROD WIPER (W)
(not available in standard single acting)
- *Add*

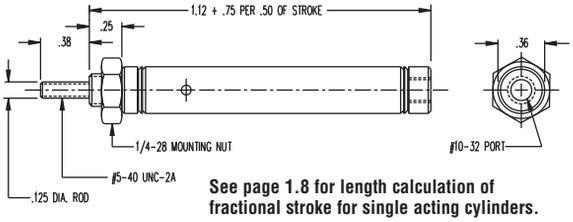
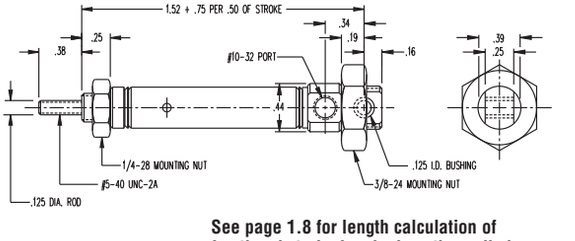
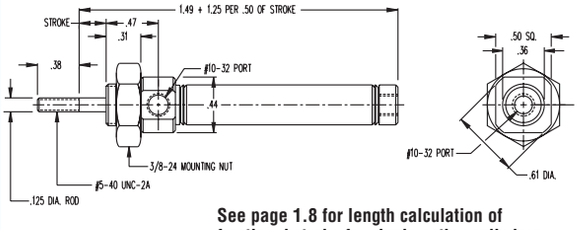
MOLYCOATED BODY (F)
- *Add per inch of stroke*

NON-LUBE SERVICE (E)
- *Single acting add*
- *Double acting add*

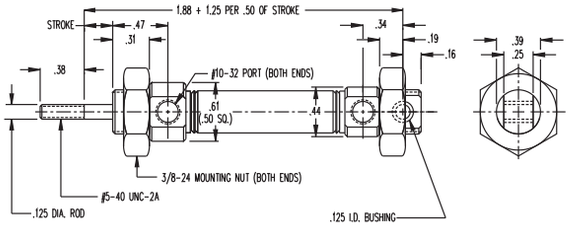
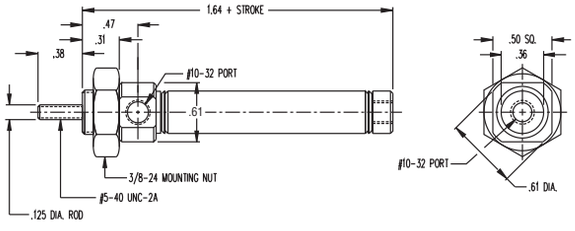
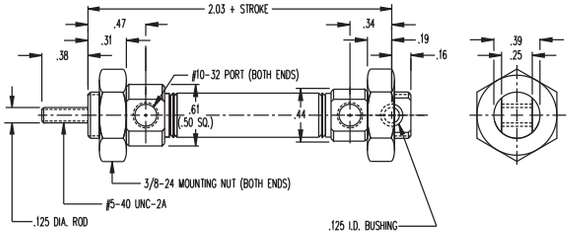
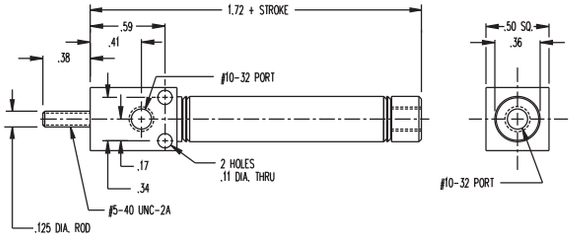
MAGNETIC POSITION SENSING (M)
- *Add*
- *Add .15" to overall length*
- *Must specify track(s) for use with Bimba's miniature position sensing (T2, T3, T4) – Add per track. See page 1.9 for track location details. See Position Sensing Solutions, page 8.3 for switch selection information.*

LOW PRESSURE HYDRAULIC (HL)
- *250 psi maximum*
- *Double acting models only*
- *Option specified as a prefix*
- *Add*

☐ Enter Stroke Length as 4th Digit

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
007☐ 	***Single Acting** – Spring Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 4" Stainless Steel Rod Standard *Optional Accessory:* D-26731 Mounting Bracket *Base Weight: .03* *Adder Per Inch of Stroke: .02*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
007☐-XP 	***Single Acting** – Spring Return – Double End or Rear Pivot Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 4" Stainless Steel Rod Standard *Optional Accessories:* D-26731 Mounting Bracket D-26689 Pivot Bracket D-26690 Piston Rod Clevis *Base Weight: .04* *Adder Per Inch of Stroke: .02*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
007☐-R 	***Reverse Single Acting** – Pull Type – Rod Normally Extended – Spring Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3" Maximum Stroke – 4" Stainless Steel Rod Standard *Optional Accessory:* D-26765 Mounting Bracket *Base Weight: .05* *Adder Per Inch of Stroke: .03*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**

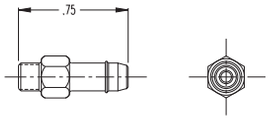
5/16" Bore Air Cylinders

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
007□-RP 	***Reverse Single Acting*** *– Pivot and Pull Type – Rod Normally Extended – Spring Return – Rear Pivot Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3" Maximum Stroke – 4" Stainless Steel Rod Standard *Optional Accessories:* D-26765 Mounting Bracket D-26689 Pivot Bracket D-26690 Piston Rod Clevis *Base Weight: .05* *Adder Per Inch of Stroke: .03*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
007□-D 	***Double Acting*** *– Air Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 4" Stainless Steel Rod Standard *Optional Accessory:* D-26765 Mounting Bracket *Base Weight: .05* *Adder Per Inch of Stroke: .01*	
007□-DXP 	***Double Acting*** *– Air Return – Double End or Rear Pivot Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 4" Stainless Steel Rod Standard *Optional Accessories:* D-26765 Mounting Bracket D-26689 Pivot Bracket D-26690 Piston Rod Clevis *Base Weight: .06* *Adder Per Inch of Stroke: .01*	
BF-007□-D 	***Double Acting*** *– Front Block Mounting – Air Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 4" Stainless Steel Rod Standard *Base Weight: .05* *Adder Per Inch of Stroke: .01*	

5/16" Bore Accessories

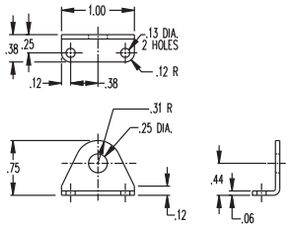
D-3229-A

PACKAGE OF SIX



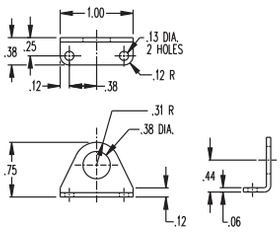
Aluminum Alloy Barbed Fitting.
¼" Hose (O.D.) Barbed Fitting Supplied with Gasket, No. 10-32 to ¼" O.D. Tubing.

D-26731



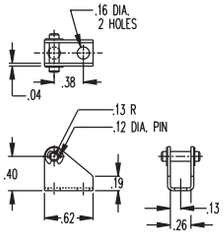
Mounting Bracket
(for Single Acting Models)

D-26765



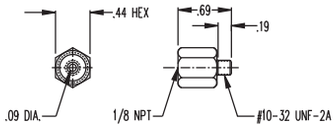
Mounting Bracket
(for Double Acting Models)

D-26689



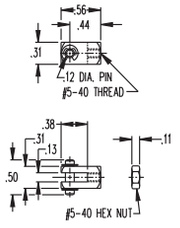
Pivot Bracket with Pin

D-855-A



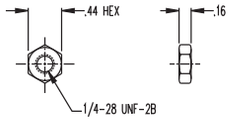
Adaptors (10-32 to 1/8 NPT Female)
Supplied with Gasket

D-26690



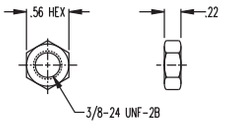
Piston Rod Clevis
(with Pin)

D-344



Mounting Nut

D-801



Mounting Nut

7/16" Bore Air Cylinders

- Ground and Roller Burnished 303 Stainless Steel Piston Rod Standard
- Force Exerted Approximately 0.15 of Air Line Pressure
- Enclosed Spring Force: 1 lb. Relaxed – 2 lbs. Compressed

OPTIONS:

NO CHARGE:

- ***MAGNALUBE G (G)***
- ***PORTS ROTATED (K)*** *(Not available in block mount)*
- ***NO THREAD (NT)***
- ***SIDE PORTED REAR HEAD (Q)***
  Add .19" to nose mount overall length
- ***PIVOT BUSHING (Y)***
  .157" ID (Use bracket D-12321-A)

SINGLE AND REVERSE ACTING BUMPER (B)

- *additional*
- *Add .062 to overall length; Reverse acting, add .125*

DOUBLE ACTING BUMPER (B)

- *additional*
- *Add .188 to overall length – DXDE; add .250*

EXTRA EXTENSION (EE)

- *Single, reverse and double acting, add per inch of extension*
- *DXDE, add per inch of extension; extension added to each end*

DOUBLE ACTING FAILSAFE
(JS = Spring Return, JR = Spring Extend)

- *Add to base price + to stroke adder*
- *See page 1.65 for overall length adders*

☐ Enter Stroke Length as 3rd Digit

OPTIONS continued...

LOW TEMPERATURE (N)
Temperature Range: -40° to 200ºF

- *Single acting add*
- *Reverse acting add*
- *Double acting add*
- *DXDE add*

HIGH TEMPERATURE "U" CUPS (V)
Temperature Range: 0° to 400ºF (-18° to 205ºC)

- *Single acting add*
- *Double acting add*
- *DXDE add*
- *Reverse acting add*

MAGNET (prefix M)

- *Add*
- *Add 0.25" to Double Acting overall length*
- *Add 0.20" to Single Acting overall length*
- *Must specify track(s) for use with miniature position sensing (T2, T3, T4) – add per track. See page 1.9 for track location details. See Position Sensing Solutions, page 8.3 for switch selection information.*

MOLYCOATED BODY (F)

- *Add per inch of stroke*

NON-LUBE SERVICE (E)

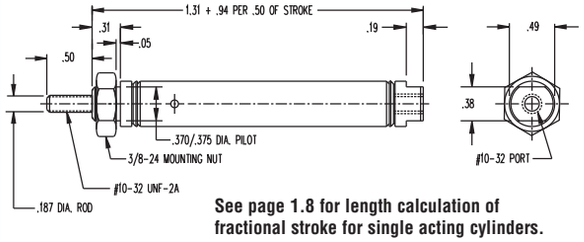
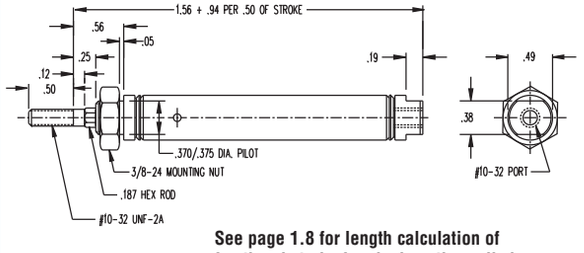
- *Single acting add*
- *Double acting add*
- *DXDE add*

ROD WIPER (W)
(not available in standard single acting)

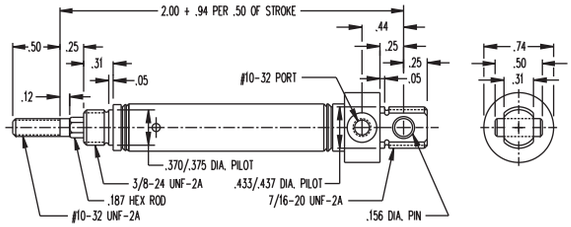
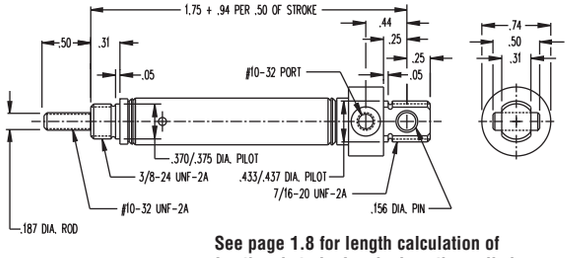
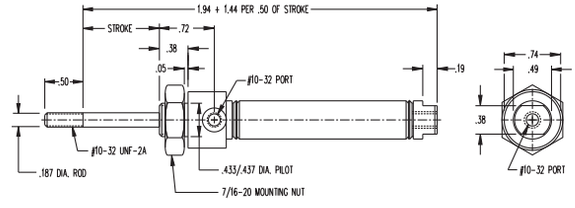
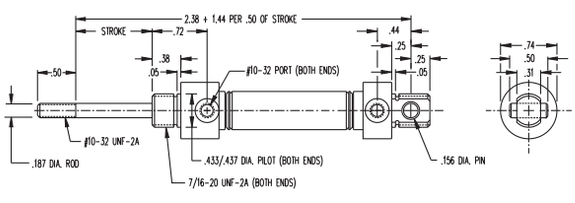
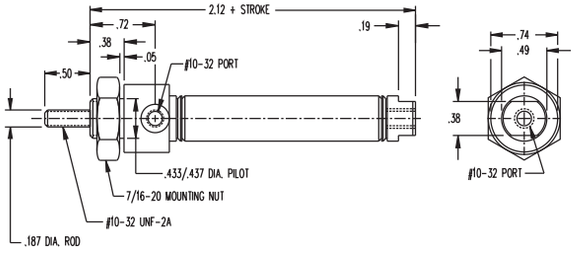
- *Add*
- *DXDE add*

LOW PRESSURE HYDRAULIC (HL)

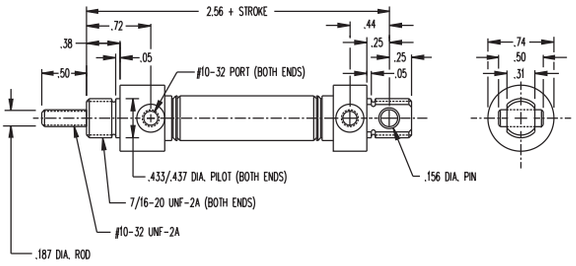
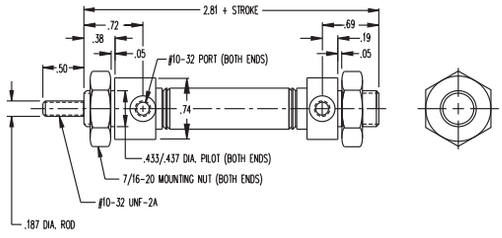
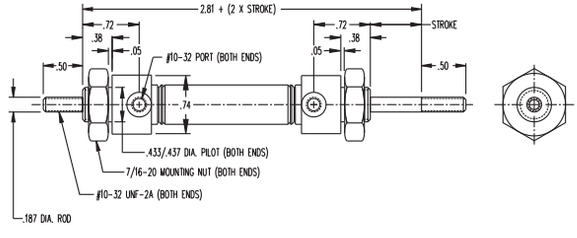
- *250 psi maximum*
- *Double acting models only*
- *Option specified as a prefix*
- *Add*

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
01☐ 	***Single Acting*** *– Spring Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Stainless Steel Rod Standard *Optional Accessory:* D-775 Mounting Bracket *Base Weight: .04* *Adder Per Inch of Stroke: .04*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
01☐-NR 	***Single Acting*** *– Non-rotating – Hexagon Rod – Spring Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Stainless Steel Rod Standard *Optional Accessory:* D-775 Mounting Bracket *Base Weight: .04* *Adder Per Inch of Stroke: .04*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**

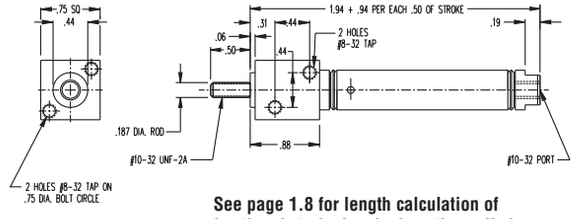
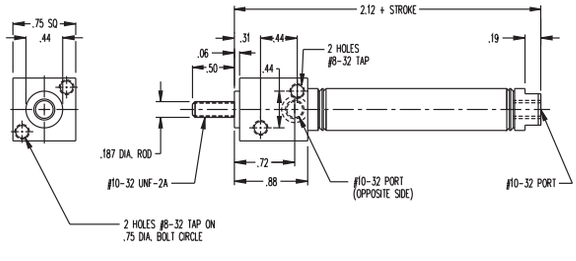
7/16" Bore Air Cylinders

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
01□-NRP 	***Single Acting*** *– Non-rotating Hexagon Rod – Pivot Type – Spring Return – Rear Pivot Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Stainless Steel Rod Standard *Optional Accessories:* D-850 Rod Clevis D-780 Pivot Brackets *Base Weight: .04* *Adder Per Inch of Stroke: .04*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
01□-P 	***Single Acting*** *– Pivot Type – Spring Return – Rear Pivot Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Stainless Steel Rod Standard *Optional Accessories:* D-780 Pivot Brackets D-850 Piston Rod Clevis *Base Weight: .04* *Adder Per Inch of Stroke: .04*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
01□-R 	***Reverse Single Acting*** *– Pull Type – Rod Normally Extended – Spring Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3" Maximum Stroke – 6" Stainless Steel Rod Standard *Optional Accessory:* D-770 Mounting Bracket *Base Weight: .08* *Adder Per Inch of Stroke: .03*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
01□-RP 	***Reverse Single Acting*** *– Pivot and Pull Type – Rod Normally Extended – Spring Return – Rear Pivot Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3" Maximum Stroke – 6" Stainless Steel Rod Standard *Optional Accessories:* D-780 Pivot Brackets D-850 Piston Rod Clevis *Base Weight: .08* *Adder Per Inch of Stroke: .03*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
01□-D 	***Double Acting*** *– Air Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 12" Stainless Steel Rod Standard *Optional Accessory:* D-770 Mounting Bracket *Base Weight: .07* *Adder Per Inch of Stroke: .02*	

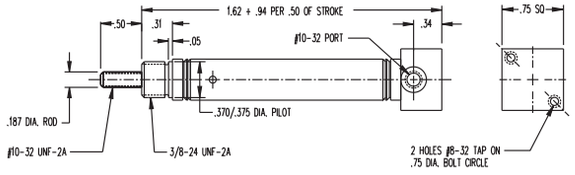
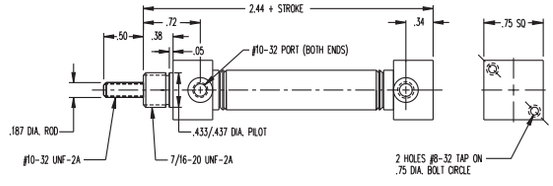
7/16" Bore Air Cylinders

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
01□-DP 	***Double Acting** – Pivot Type – Air Return – Rear Pivot Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 12" Stainless Steel Rod Standard *Optional Accessories:* D-780 Pivot Brackets D-850 Piston Rod Clevis *Base Weight: .08* *Adder Per Inch of Stroke: .02*	
01□-DX 	***Double Acting** – Double End Mount – Air Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 12" Stainless Steel Rod Standard *Optional Accessory:* D-770 Mounting Bracket *Base Weight: .11* *Adder Per Inch of Stroke: .02*	
01□-DXDE 	***Double Acting** – Double End Rod – Air Return – Double End Mount* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Stainless Steel Rod Standard *Optional Accessory:* D-770 Mounting Bracket *Base Weight: .14* *Adder Per Inch of Stroke: .03*	

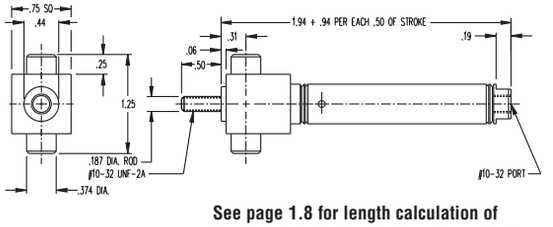
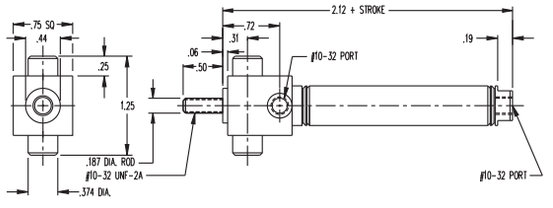
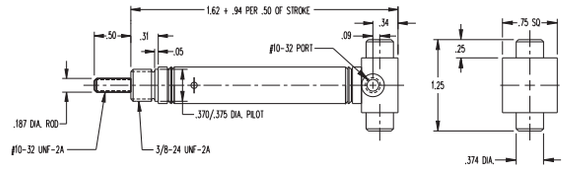
7/16" Bore Block Mounted Air Cylinders

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
BF-01□ 	***Single Acting** – Front Block Mounting – Spring Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Stainless Steel Rod Standard *Base Weight: .07* *Adder Per Inch of Stroke: .04*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
BF-01□-D 	***Double Acting** – Front Block Mounting – Air Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 12" Stainless Steel Rod Standard *Base Weight: .07* *Adder Per Inch of Stroke: .02*	

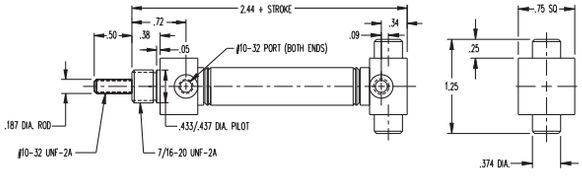
7/16" Bore Block Mounted Air Cylinders (continued)

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
BR-01□ 	***Single Acting*** *– Rear Block Mounting for Vertical Positioning – Spring Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Stainless Steel Rod Standard *Base Weight: .05* *Adder Per Inch of Stroke: .04*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
BR-01□-D 	***Double Acting*** *– Rear Block Mounting for Vertical Positioning – Air Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 12" Stainless Steel Rod Standard *Base Weight: .08* *Adder Per Inch of Stroke: .02*	

7/16" Bore Trunnion Mounted Air Cylinders

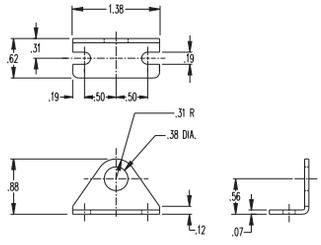
MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
BFT-01□ 	***Single Acting*** *– Front Block Trunnion Mounting – Spring Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Stainless Steel Rod Standard *Optional Accessories:* TRB-1 Trunnion Brackets D-850 Rod Clevis *Base Weight: .09* *Adder Per Inch of Stroke: .04*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
BFT-01□-D 	***Double Acting*** *– Front Block Trunnion Mounting – Air Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 12" Stainless Steel Rod Standard *Optional Accessories:* TRB-1 Trunnion Brackets D-850 Rod Clevis *Base Weight: .09* *Adder Per Inch of Stroke: .02*	
BRT-01□ 	***Single Acting*** *– Rear Block Trunnion Mounting – Spring Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Stainless Steel Rod Standard *Optional Accessories:* TRB-1 Trunnion Brackets D-850 Rod Clevis *Base Weight: .07* *Adder Per Inch of Stroke: .04*	

7/16" Bore Trunnion Mounted Air Cylinders (continued)

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
BRT-01□-D 	***Double Acting*** *– Rear Block Trunnion Mounting – Air Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 12" Stainless Steel Rod Standard *Optional Accessories:* TRB-1 Trunnion Brackets D-850 Rod Clevis *Base Weight: .10* *Adder Per Inch of Stroke: .02*	

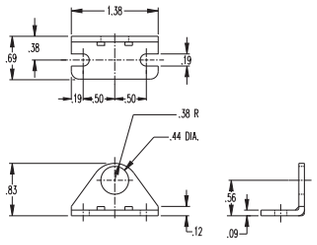
7/16" Bore Accessories

D-775



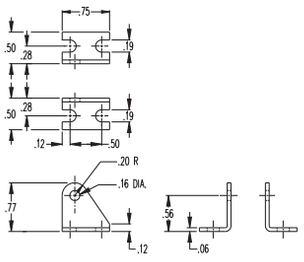
Mounting Bracket (for Single Acting Models)

D-770



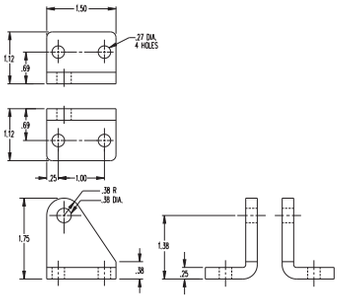
Mounting Bracket (for Double Acting Models)

D-780



Pivot Brackets

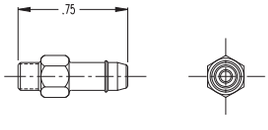
TRB-1



Trunnion Brackets

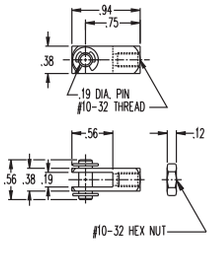
D-3229-A

PACKAGE OF SIX



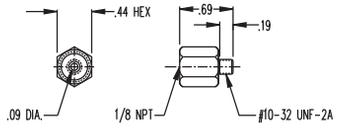
Anodized Aluminum Alloy Barbed Fitting. ¼" Hose (O.D.) Barbed Fitting Supplied with Gasket, No. 10-32 to ¼" O.D. Tubing.

D-850



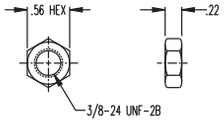
Piston Rod Clevis

D-855-A



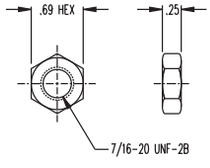
Adaptors (10-32 to ⅛ NPT Female) Supplied with Gasket

D-801



Mounting Nut

D-154



Mounting Nut

9/16" Bore Air Cylinders

- Ground and Roller Burnished 303 Stainless Steel Piston Rod Standard
- Force Exerted Approximately 0.25 of Air Line Pressure
- Enclosed Spring Force: 2 lbs. Relaxed – 4 lbs. Compressed

OPTIONS:

NO CHARGE:

- ***MAGNALUBE G (G)***
- ***PORTS ROTATED (K)***
- ***NO THREAD (NT)***
- ***SIDE PORTED REAR HEAD (Q)***
  Add .03" to nose mount overall length

SINGLE AND REVERSE ACTING BUMPER (B)

- *additional*
- *Add .062 to overall length*

DOUBLE ACTING BUMPERS (B)

- *additional*
- *Add .125 to overall length*

EXTRA EXTENSION (EE)

- *Single, reverse and double acting, add per inch of extension*
- *DXDE, add per inch of extension; extension added to each end*

DOUBLE ACTING FAILSAFE

(JS = Spring Return, JR = Spring Extend)

- *Add to base price + to stroke adder*
- *See page 1.65 for overall length adders*

☐ Enter Stroke Length as 3rd Digit

OPTIONS continued...

MAGNET (prefix M) – Add

- *Single and reverse acting add .125" to overall length*
- *Must specify track(s) for use with miniature position sensing (T2, T3, T4) – add per track. See page 1.9 for track location details. See Position Sensing Solutions, page 8.3 for switch selection information.*

LOW TEMPERATURE (N)

Temperature Range: -40° to 200ºF

- *Single acting add*
- *Reverse acting add*
- *Double acting add*
- *DXDE add*

HIGH TEMPERATURE "U" CUPS (V)

Temperature Range: 0° to 400ºF (-18° to 205ºC)

- *Single acting add*
- *Double acting add*
- *Double end rod add*
- *Reverse acting add*

MOLYCOATED BODY (F)

- *Add per inch of stroke*

NON-LUBE SERVICE (E)

- *Single acting add*
- *Double acting add*
- *DXDE add*

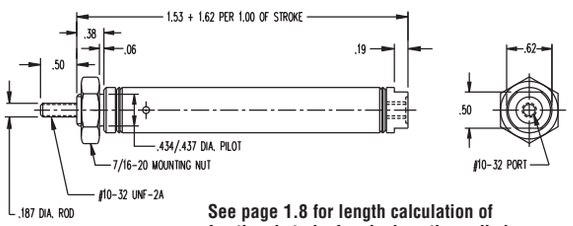
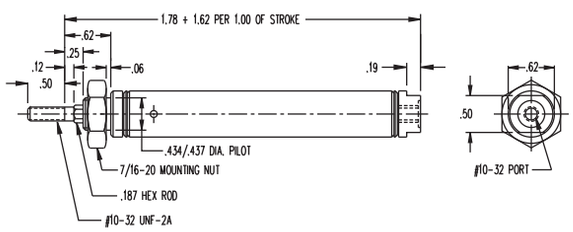
ROD WIPER (W)

(not available in standard single acting)

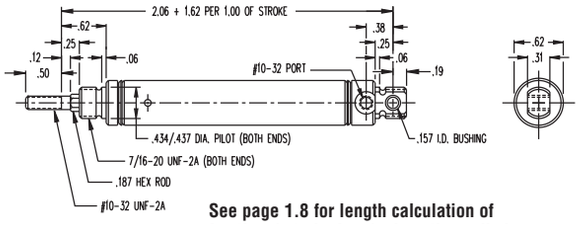
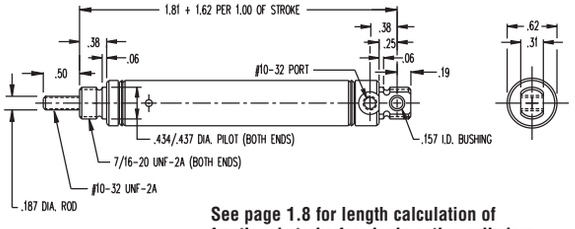
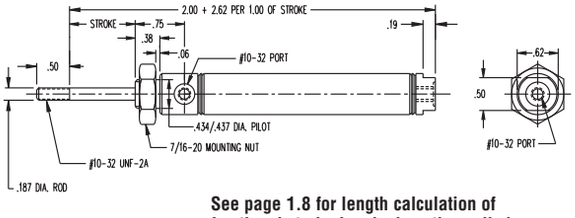
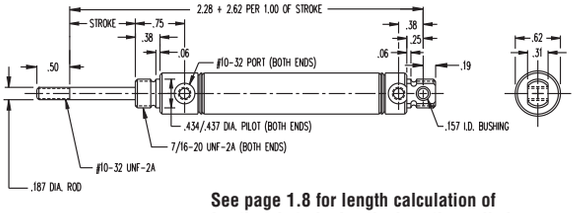
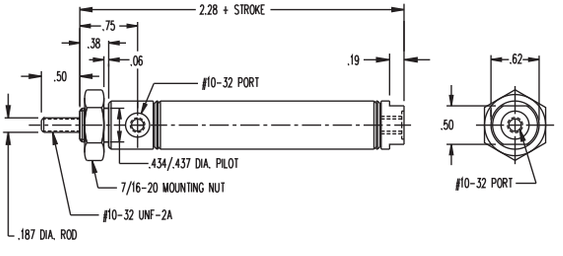
- *Add*
- *DXDE add*

LOW PRESSURE HYDRAULIC (HL)

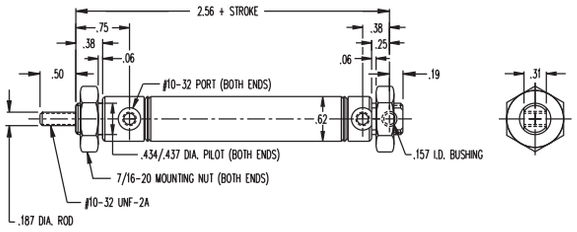
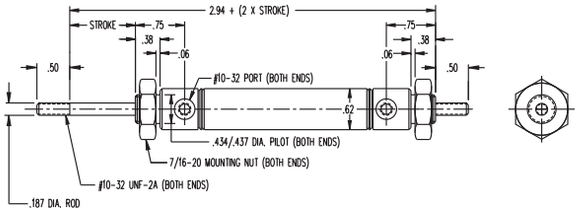
- *250 psi maximum*
- *Double acting models only*
- *Option specified as a prefix*
- *Add*

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
02☐ 	***Single Acting*** *– Spring Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Stainless Steel Rod Standard *Optional Accessory:* D-770 Mounting Bracket *Base Weight: .06* *Adder Per Inch of Stroke: .05*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
02☐-NR 	***Single Acting*** *– Non-rotating Hexagon Rod – Spring Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Stainless Steel Rod Standard *Optional Accessory:* D-770 Mounting Bracket *Base Weight: .06* *Adder Per Inch of Stroke: .05*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**

9/16" Bore Air Cylinders

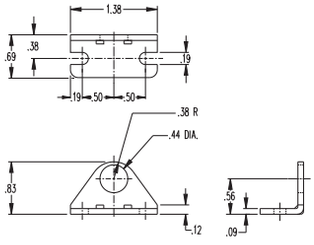
MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
02□-NRP 	***Single Acting*** *– Non-rotating Hexagon Rod – Pivot Type – Spring Return – Rear Pivot Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Stainless Steel Rod Standard *Optional Accessories:* D-850 Rod Clevis D-12321-A Pivot Bracket *Base Weight: .06* *Adder Per Inch of Stroke: .05*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
02□-P 	***Single Acting*** *– Pivot Type – Spring Return – Rear Pivot Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Stainless Steel Rod Standard *Optional Accessories:* D-850 Rod Clevis D-12321-A Pivot Bracket *Base Weight: .06* *Adder Per Inch of Stroke: .05*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
02□-R 	***Reverse Single Acting*** *– Pull Type – Rod Normally Extended – Spring Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3" Maximum Stroke – 6" Stainless Steel Rod Standard *Optional Accessory:* D-770 Mounting Bracket *Base Weight: .08* *Adder Per Inch of Stroke: .04*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
02□-RP 	***Reverse Single Acting*** *– Pivot and Pull Type – Rod Normally Extended – Spring Return – Rear Pivot Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3" Maximum Stroke – 6" Stainless Steel Rod Standard *Optional Accessories:* D-850 Rod Clevis D-12321-A Pivot Bracket *Base Weight: .08* *Adder Per Inch of Stroke: .04*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
02□-D 	***Double Acting*** *– Air Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 12" Stainless Steel Rod Standard *Optional Accessory:* D-770 Mounting Bracket *Base Weight: .09* *Adder Per Inch of Stroke: .02*	

9/16" Bore Air Cylinders

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
02□-DXP 	***Double Acting** – Double End or Rear Pivot Mounting – Air Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 12" Stainless Steel Rod Standard *Optional Accessories:* D-770 Mounting Bracket D-850 Rod Clevis D-12321-A Pivot Bracket *Base Weight: .09* *Adder Per Inch of Stroke: .02*	
02□-DXDE 	***Double Acting** – Double End Rod – Air Return – Double End Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Stainless Steel Rod Standard *Optional Accessory:* D-770 Mounting Bracket *Base Weight: .16* *Adder Per Inch of Stroke: .03*	

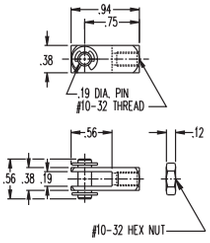
9/16" Bore Accessories

D-770



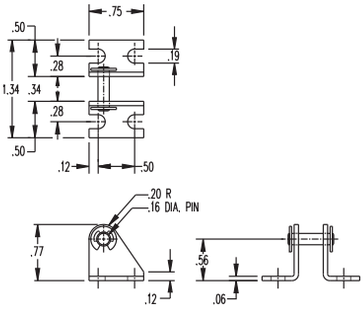
Mounting Bracket

D-850



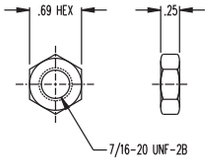
Piston Rod Clevis

D-12321-A



Pivot Bracket with Pin

D-154



Mounting Nut

Note: *For stainless steel accessories see page 1.99 and 1.102-1.103.*

3/4" Bore Air Cylinders

- Ground and Polished, High Strength Carbon Steel Piston Rod Standard – 303 Stainless Steel Rod Available as an Option – Bronze Rod Guide Bushing Standard
- Force Exerted Approximately 0.4 of Air Line Pressure
- Enclosed Spring Force: 3 lbs. Relaxed – 6 lbs. Compressed
- Rod Wipers Available on D, DP, DXP and DXDE Models

OPTIONS:

NO CHARGE:

- ***MAGNALUBE G (G)***
- ***PORTS ROTATED (K)***
- ***NO THREAD (NT)***
- ***SIDE PORTED REAR HEAD (Q)***
  Add .44" to nose mount overall length
- ***PIVOT BUSHING (Y)***
  .250" ID

SINGLE AND REVERSE ACTING BUMPER (B)

- *additional*
- *Add .125 to overall length*

DOUBLE ACTING BUMPERS (B)

- *additional*
- *No change in overall length*

EXTRA EXTENSION (EE)

- *Single, reverse and double acting, add $0.95 per inch of extension*
- *DXDE, add per inch of extension; extension added to each end*

DOUBLE ACTING FAILSAFE
(JS = Spring Return, JR = Spring Extend)

- *Add to base price + to stroke adder*
- *See page 1.65 for overall length adders*

☐ Enter Stroke Length as 3rd Digit

OPTIONS continued...

ROD WIPER (W) *(not available in standard single acting) (now available in block mount)*

- *Double acting, add*
- *DXDE add*

HEAVY SPRING *(available on single acting and reverse acting)* ***(H)***

- *Add*
- *Spring Force: 4 lbs. relaxed – 10 lbs. compressed*

MAGNET (prefix M) – Add

- *Single and reverse acting add .125" to overall length*
- *Stainless steel rod becomes standard with this option*
- *Must specify track(s) for use with miniature position sensing (T2, T3, T4) – add per track. See page 1.9 for track location details. See Position Sensing Solutions, page 8.3 for switch selection information.*

LOW TEMPERATURE (N)
Temperature Range: -40° to 200ºF

- *Single acting add*
- *Reverse acting add*
- *Double acting add*
- *DXDE add*

HIGH TEMPERATURE "U" CUPS (V)
Temperature Range: 0° to 400ºF (-18° to 205ºC)

- *Single acting add*
- *Double acting add*
- *Double end rod add*
- *Reverse acting add*

MOLYCOATED BODY (F)

- *Add per inch of stroke*

NON-LUBE SERVICE (E)

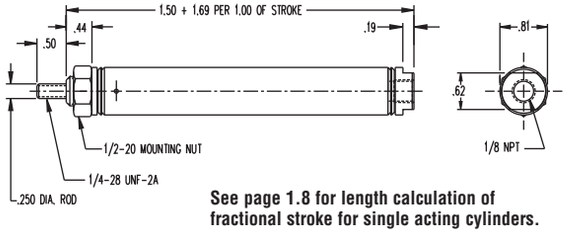
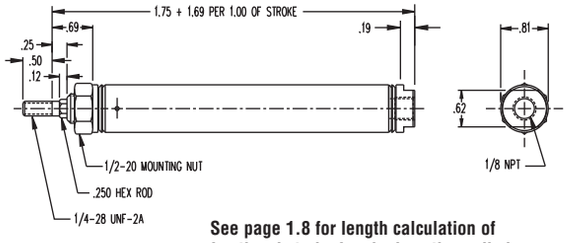
- *Single acting add*
- *Double acting add*
- *DXDE add*

STAINLESS STEEL ROD (prefix SR)

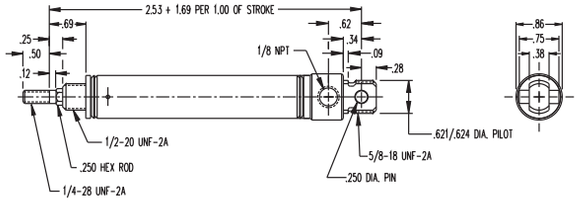
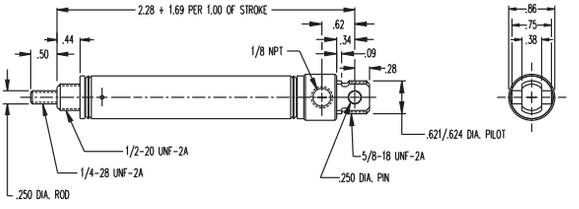
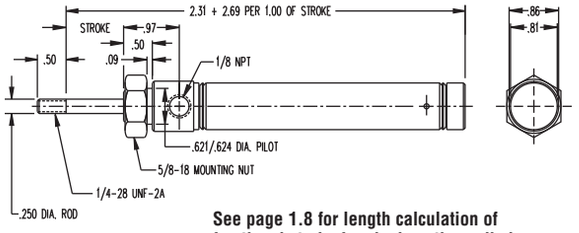
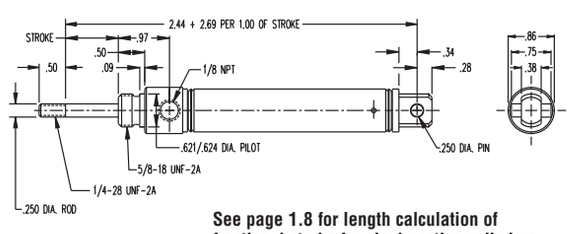
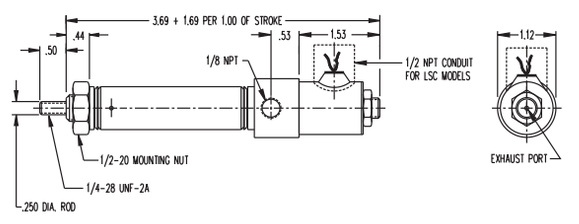
- *Add*
- *Standard on M option, block mount, DXP and DXDE models*

LOW PRESSURE HYDRAULIC (HL)

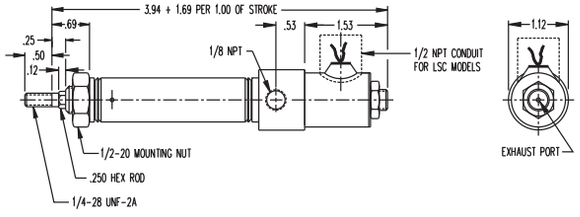
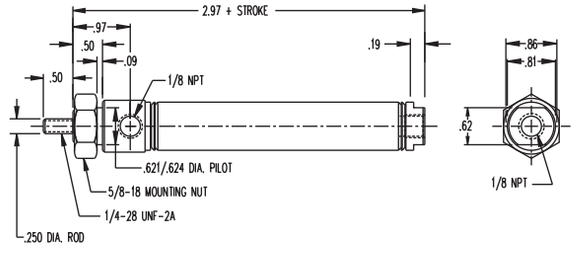
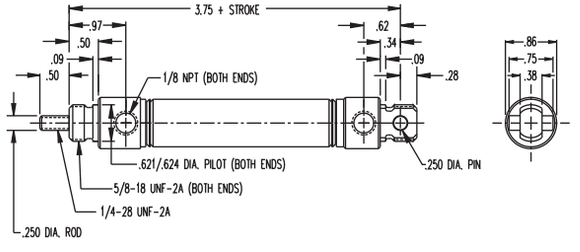
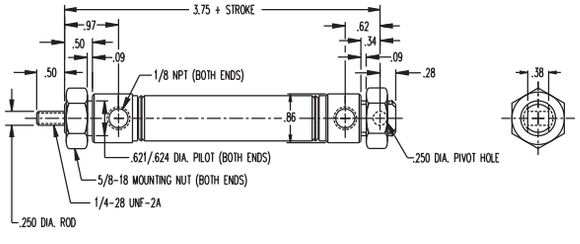
- *250 psi maximum*
- *Double acting models only*
- *Option specified as a prefix*
- *Add*

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
04☐ 	***Single Acting*** *– Spring Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessory:* D-226 Mounting Bracket *Base Weight: .10* *Adder Per Inch of Stroke: .08*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
04☐-NR 	***Single Acting*** *– Non-rotating Hexagon Rod – Spring Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessory:* D-226 Mounting Bracket *Base Weight: .10* *Adder Per Inch of Stroke: .08*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**

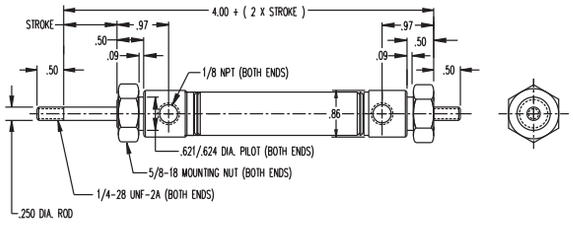
3/4" Bore Air Cylinders

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
04□-NRP 	***Single Acting** – Non-rotating Hexagon Rod – Pivot Type – Spring Return – Rear Pivot Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessories:* D-166-3 Piston Rod Clevis D-167 Pivot Brackets *Base Weight: .12* *Adder Per Inch of Stroke: .08*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
04□-P 	***Single Acting** – Pivot Type – Spring Return – Rear Pivot Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessories:* D-166-3 Piston Rod Clevis D-167 Pivot Brackets *Base Weight: .13* *Adder Per Inch of Stroke: .08*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
04□-R 	***Reverse Single Acting** – Pull Type – Rod Normally Extended – Spring Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessory:* D-129 Mounting Bracket *Base Weight: .18* *Adder Per Inch of Stroke: .07*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
04□-RP 	***Reverse Single Acting** – Pivot and Pull Type – Rod Normally Extended – Spring Return – Rear Pivot Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessories:* D-166-3 Piston Rod Clevis D-167 Pivot Brackets *Base Weight: .18* *Adder Per Inch of Stroke: .07*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
04□-LS or LSC Conduit Outlet* 	***Single Acting** – Built-in Midget 3-Way Solenoid Operated Valve – Spring Return – Front Nose Mounting – 150 PSI, 3/64" Orifice* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod Standard Voltage – 115/60 *Optional Voltages:* 24, 230 A.C. or 6, 12, 24 D.C. *Optional Accessory:* D-226 Mounting Bracket *Base Weight: .38* *Adder Per Inch of Stroke: .08*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**

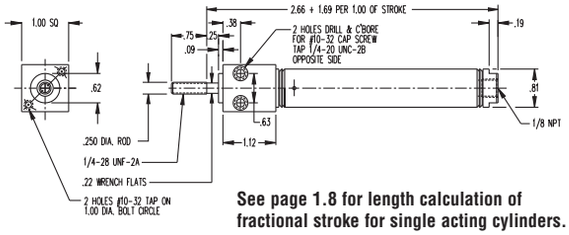
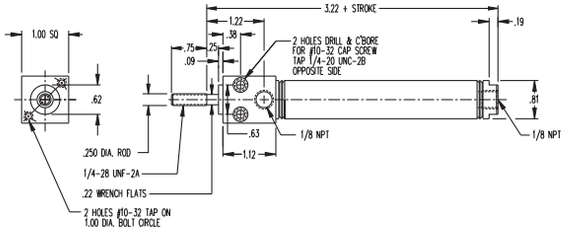
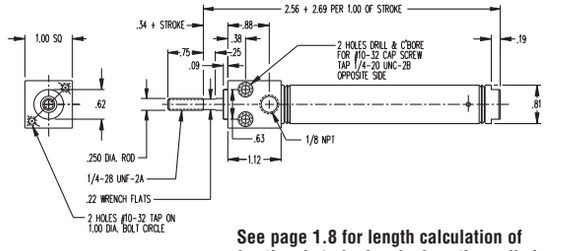
3/4" Bore Air Cylinders

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
04□-NRLS or NRLSC Conduit Outlet* 	***Single Acting** – Non-rotating Hexagon Piston Rod – Built-in Midget 3-Way Solenoid Operated Valve – Spring Return – Front Nose Mounting – 150 PSI, 3/64" Orifice* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod Standard Voltage – 115/60 *Optional Voltages:* 24, 230 A.C. or 6, 12, 24 D.C. *Optional Accessory:* D-226 Mounting Bracket *Base Weight: .46* *Adder Per Inch of Stroke: .08*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
04□-D 	***Double Acting** – Air Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" Optional Stainless Steel Rod Optional Rod Wiper *Optional Accessory:* D-129 Mounting Bracket *Base Weight: .21* *Adder Per Inch of Stroke: .03*	
04□-DP 	***Double Acting** – Pivot Type – Air Return – Rear Pivot Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 32" Optional Stainless Steel Rod Optional Rod Wiper *Optional Accessories:* D-166-3 Piston Rod Clevis D-167 Pivot Brackets *Base Weight: .21* *Adder Per Inch of Stroke: .03*	
04□-DXP 	***Double Acting** – Double End or Rear Pivot Mounting – Air Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 32" Stainless Steel Rod Standard Optional Rod Wiper *Optional Accessories:* D-129 Mounting Bracket D-13498-A Pivot Bracket D-166-3 Piston Rod Clevis *Base Weight: .29* *Adder Per Inch of Stroke: .03*	

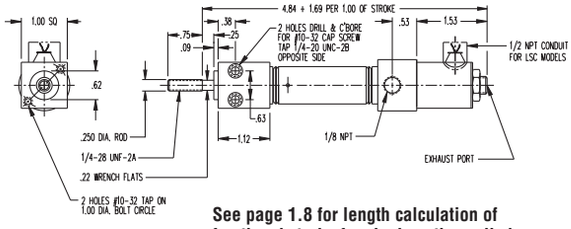
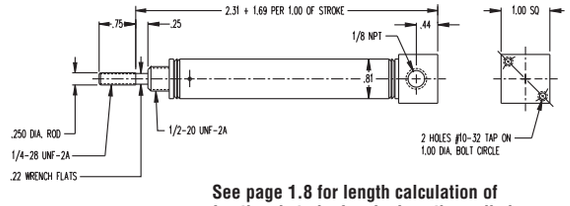
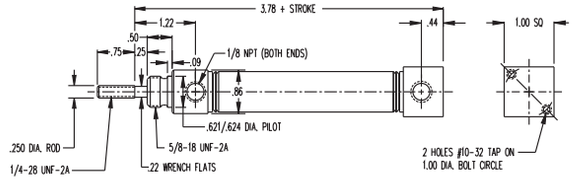
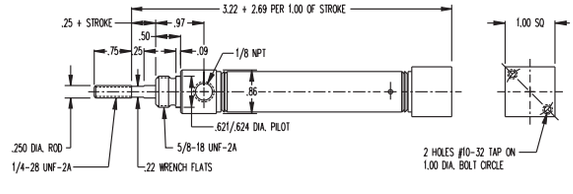
3/4" Bore Air Cylinders

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
04□-DXDE 	***Double Acting*** *– Double End Rod – Air Return – Double End Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" Stainless Steel Rod Standard Optional Rod Wiper *Optional Accessory:* D-129 Mounting Bracket *Base Weight: .37* *Adder Per Inch of Stroke: .04*	

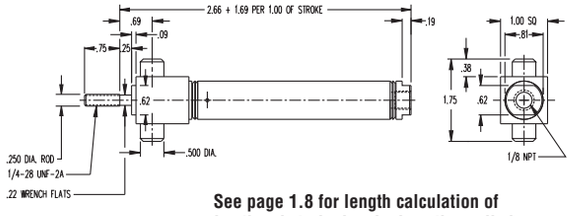
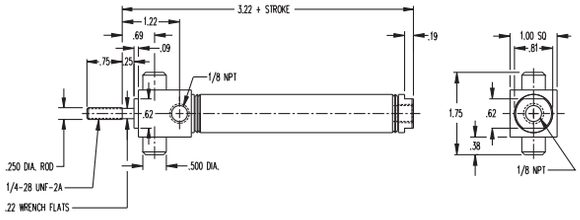
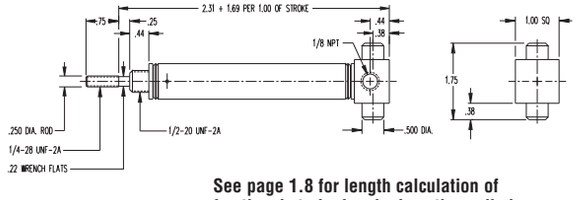
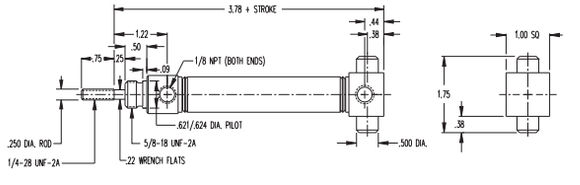
3/4" Bore Block Mounted

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
BF-04□ 	***Single Acting*** *– Front Block Mounting – Spring Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Stainless Steel Rod Standard *Base Weight: .18* *Adder Per Inch of Stroke: .08*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
BF-04□-D 	***Double Acting*** *– Front Block Mounting – Air Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" Stainless Steel Rod Standard *Base Weight: .22* *Adder Per Inch of Stroke: .03*	
BF-04□-R 	***Pull Type*** *– Front Block Mounting – Rod Normally Extended – Reverse Single Acting – Spring Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Stainless Steel Rod Standard *Base Weight: .19* *Adder Per Inch of Stroke: .07*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**

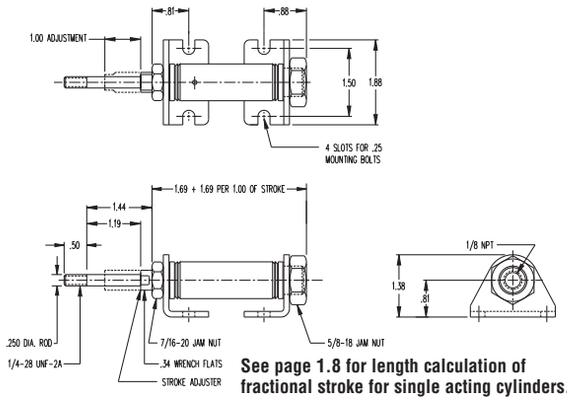
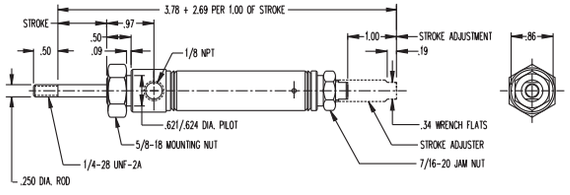
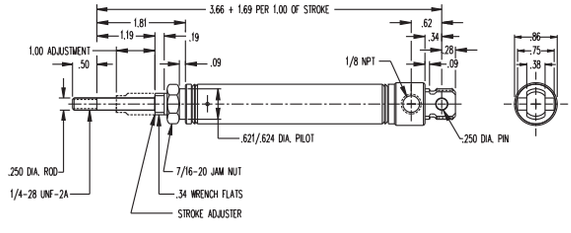
3/4" Bore Block Mounted (continued)

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
BF-04□-LS or LSC* 	***Built-in Midget 3-Way Solenoid Operated Valve*** *– Single Acting – Spring Return – Front Block Mounting – 150 PSI, 3/64" Orifice* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Stainless Steel Rod Standard Standard Voltage –115/60 *Optional Voltages:* 24, 230 A.C. or 6, 12, 24 D.C. *Base Weight: .38* *Adder Per Inch of Stroke: .08*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
BR-04□ 	***Single Acting*** *– Rear Block Mounting for Vertical Positioning – Spring Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Stainless Steel Rod Standard *Base Weight: .15* *Adder Per Inch of Stroke: .08*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
BR-04□-D 	***Double Acting*** *– Rear Block Mounting for Vertical Positioning – Air Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" Stainless Steel Rod Standard *Base Weight: .26* *Adder Per Inch of Stroke: .08*	
BR-04□-R 	***Pull Type*** *– Rear Block Mounting for Vertical Positioning – Rod Normally Extended – Reverse Single Acting – Spring Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Stainless Steel Rod Standard *Base Weight: .15* *Adder Per Inch of Stroke: .08*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**

3/4" Bore Trunnion Mounted

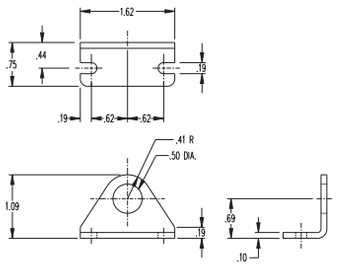
MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
BFT-04□ 	***Single Acting** – Front Block Trunnion Mounting – Spring Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Stainless Steel Rod Standard *Optional Accessories:* TRB-2 Trunnion Brackets D-166-3 Rod Clevis *Base Weight: .24* *Adder Per Inch of Stroke: .08*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
BFT-04□-D 	***Double Acting** – Front Block Trunnion Mounting – Air Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 12" Stainless Steel Rod Standard *Optional Accessories:* TRB-2 Trunnion Brackets D-166-3 Rod Clevis *Base Weight: .29* *Adder Per Inch of Stroke: .03*	
BRT-04□ 	***Single Acting** – Rear Block Trunnion Mounting – Spring Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Stainless Steel Rod Standard *Optional Accessories:* TRB-2 Trunnion Brackets D-166-3 Rod Clevis *Base Weight: .19* *Adder Per Inch of Stroke: .08*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
BRT-04□-D 	***Double Acting** – Rear Block Trunnion Mounting – Air Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 12" Stainless Steel Rod Standard *Optional Accessories:* TRB-2 Trunnion Brackets D-166-3 Rod Clevis *Base Weight: .28* *Adder Per Inch of Stroke: .03*	

3/4" Bore Adjustable Stroke

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
04□-A 	***Single Acting*** *– Spring Return – Adjustable Stroke – Double End Mounting – Brass Piston Rod Bearing and Stroke Adjustment in 1", 2", 3". Mounting Brackets are included.* *1" Stroke Adjusts 0" – 1", 2" Stroke 1" – 2", and 3" Stroke 2" – 3"* Maximum Stroke – 6" Optional Stainless Steel Rod *Base Weight: .40* *Adder Per Inch of Stroke: .07*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
04□-RA 	***Reverse Single Acting*** *– Pull Type – Rod Normally Extended – Nose Mounting – Stroke Adjustment in 1", 2", 3".* *1" Stroke Adjusts 0" – 1", 2" Stroke 1" – 2", and 3" Stroke 2" – 3"* Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessory:* D-129 Mounting Bracket *Base Weight: .23* *Adder Per Inch of Stroke: .07*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
04□-AP 	***Single Acting*** *– Pivot Type – Rear Pivot Mounting – Stroke Adjustment in 1", 2", 3".* *1" Stroke Adjusts 0" – 1", 2" Stroke 1" – 2", and 3" Stroke 2" – 3"* Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessories:* D-166-3 Piston Rod Clevis D-167 Pivot Brackets *Base Weight: .23* *Adder Per Inch of Stroke: .07*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**

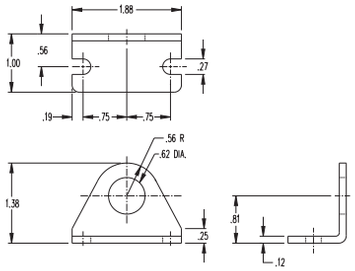
3/4" Bore Accessories

D-226



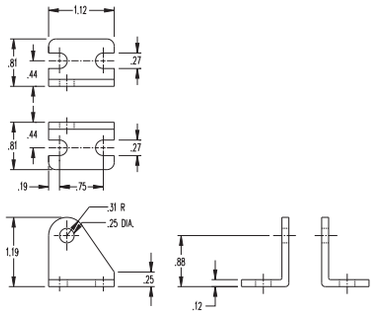
Mounting Bracket (for Single Acting Models)

D-129



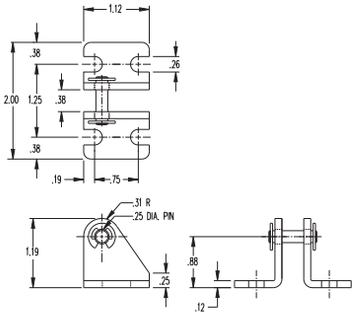
Mounting Bracket (for Double Acting Models)

D-167



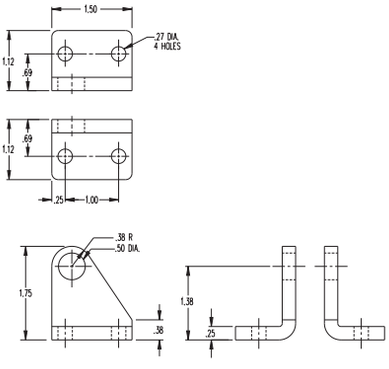
Pivot Brackets

D-13498-A



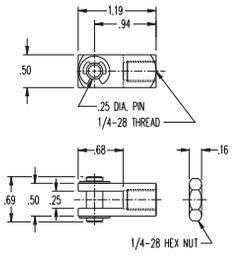
Pivot Bracket

TRB-2



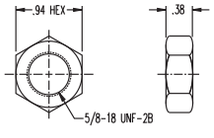
Trunnion Brackets

D-166-3



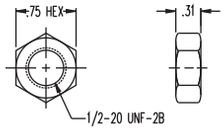
Piston Rod Clevis

D-9



Mounting Nut

D-98



Mounting Nut

Note: *For stainless steel accessories see page 1.99 and 1.102-1.103.*

7/8" Bore Air Cylinders

- Ground and Polished, High Strength Carbon Steel Piston Rod Standard – 303 Stainless Steel Rod Available as an Option – Bronze Rod Guide Bushing Standard
- Force Exerted Approximately 0.6 of Air Line Pressure
- Enclosed Spring Force: 3 lbs. Relaxed – 6 lbs. Compressed
- Cushion Quiet Bumpers Standard on All Models

OPTIONS:

NO CHARGE:
- ***MAGNALUBE G (G)***
- ***PORTS ROTATED (K)***
- ***NO THREAD (NT)***
- ***SIDE PORTED REAR HEAD (Q)***
  Add .28" to nose mount overall length
- ***PIVOT BUSHING (Y)***
  .250" ID

EXTRA EXTENSION (EE)
- *Single, reverse and double acting, add per inch of extension*
- *DXDE, add per inch of extension; extension added to each end*

DOUBLE ACTING FAILSAFE
(JS = Spring Return, JR = Spring Extend)
- *Add to base price + to stroke adder*
- *See page 1.65 for overall length adders*

MAGNET (prefix M) – Add
- *All models add .125" to overall length*
- *Stainless steel rod becomes standard with this option*
- *Must specify track(s) for use with miniature position sensing (T2, T3, T4) – add per track. See page 1.9 for track location details. See Position Sensing Solutions, page 8.3 for switch selection information.*

OPTIONS continued...

LOW TEMPERATURE (N)
Temperature Range: -40° to 200ºF
- *Single acting add*
- *Reverse acting add*
- *Double acting add*
- *DXDE add*

HIGH TEMPERATURE "U" CUP SEALS (V)
Temperature Range: 0° to 400ºF (-18° to 205ºC)
- *Single acting add*
- *Double acting add*
- *DXDE add*
- *Reverse acting add*

MOLYCOATED BODY (F)
- *Add per inch of stroke*

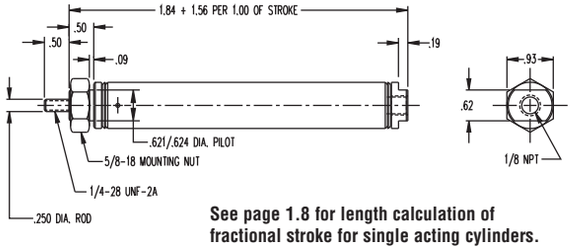
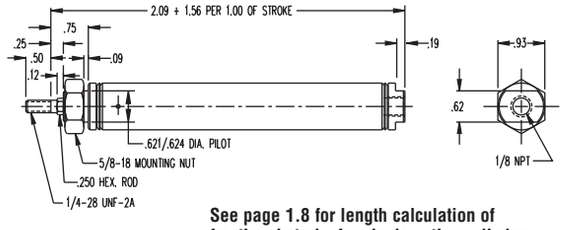
NON-LUBE SERVICE (E)
- *Single acting add*
- *Double acting add*
- *DXDE add*

ROD WIPER (W)
(not available in standard single acting)
- *Add*
- *DXDE add*

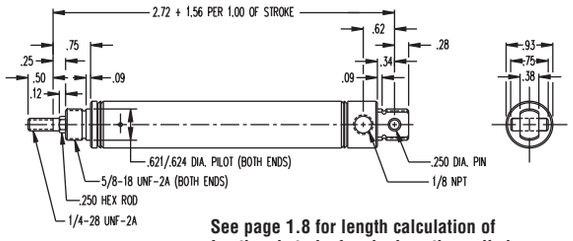
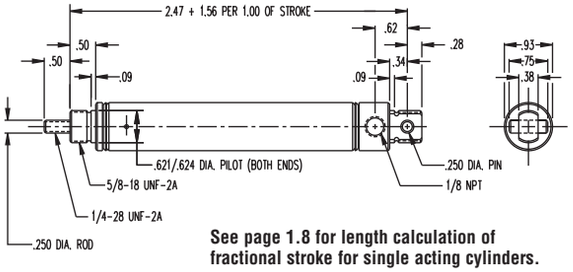
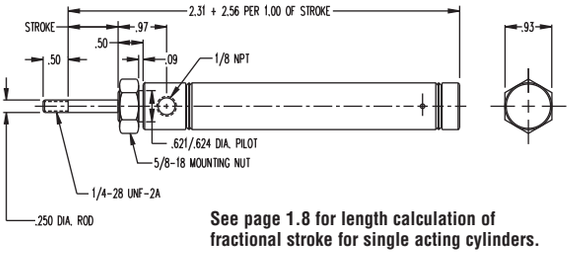
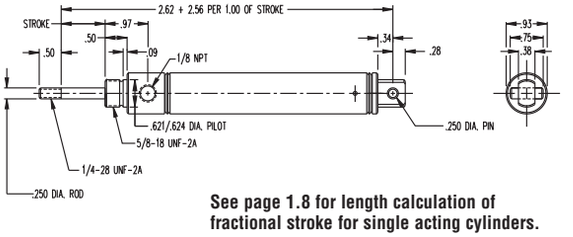
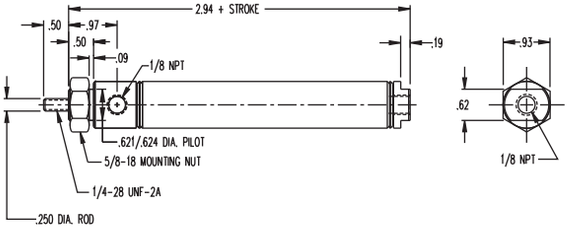
STAINLESS STEEL ROD (prefix SR)
- *Add*
- *Standard on DXP, DXDE, and M option*

LOW PRESSURE HYDRAULIC (HL)
- *250 psi maximum*
- *Double acting models only*
- *Option specified as a prefix*
- *Add*

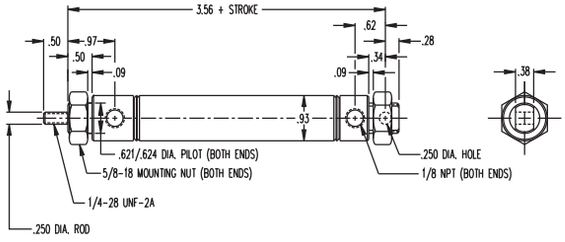
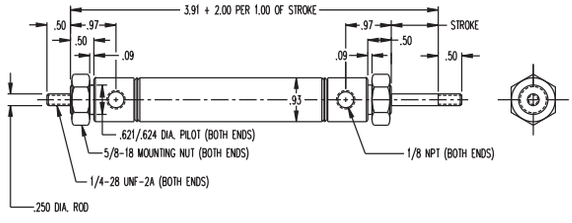
☐ Enter Stroke Length as 3rd Digit

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
06☐ 	***Single Acting** – Spring Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessory:* D-129 Mounting Bracket *Base Weight: .17* *Adder Per Inch of Stroke: .09*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
06☐-NR 	***Single Acting** – Non-rotating Hexagon Rod – Spring Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessory:* D-129 Mounting Bracket *Base Weight: .17* *Adder Per Inch of Stroke: .09*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**

7/8" Bore Air Cylinders

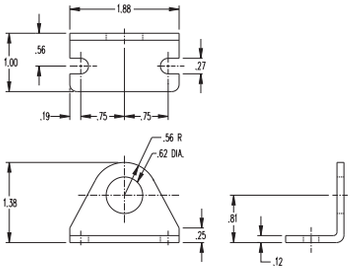
MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
06□-NRP 	***Single Acting*** *– Non-rotating Hexagon Rod – Pivot Type – Spring Return – Rear Pivot Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessories:* D-166-3 Piston Rod Clevis D-167 Pivot Brackets *Base Weight: .17* *Adder Per Inch of Stroke: .09*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
06□-P 	***Single Acting*** *– Pivot Type – Spring Return – Rear Pivot Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessories:* D-166-3 Piston Rod Clevis D-167 Pivot Brackets *Base Weight: .17* *Adder Per Inch of Stroke: .09*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
06□-R 	***Reverse Single Acting*** *– Pull Type – Rod Normally Extended – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessory:* D-129 Mounting Bracket *Base Weight: .20* *Adder Per Inch of Stroke: .09*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
06□-RP 	***Reverse Single Acting*** *– Pivot and Pull Type – Rod Normally Extended – Spring Return – Rear Pivot Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessories:* D-166-3 Piston Rod Clevis D-167 Pivot Brackets *Base Weight: .20* *Adder Per Inch of Stroke: .09*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
06□-D 	***Double Acting*** *– Air Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" Optional Stainless Steel Rod *Optional Accessory:* D-129 Mounting Bracket *Base Weight: .25* *Adder Per Inch of Stroke: .03*	

7/8" Bore Air Cylinders

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
06□-DXP 	***Double Acting** – Double End or Rear Pivot Mounting – Air Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 32" Stainless Steel Rod Standard *Optional Accessories:* D-166-3 Piston Rod Clevis D-129 Mounting Bracket D-13498-A Pivot Bracket *Base Weight: .32* *Adder Per Inch of Stroke: .03*	
06□-DXDE 	***Double Acting** – Double End Rod – Air Return – Double End Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" Stainless Steel Rod Standard *Optional Accessory:* D-129 Mounting Bracket *Base Weight: .39* *Adder Per Inch of Stroke: .06*	

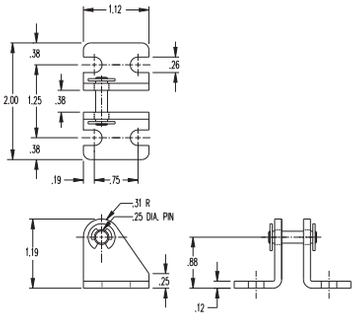
7/8" Bore Accessories

D-129



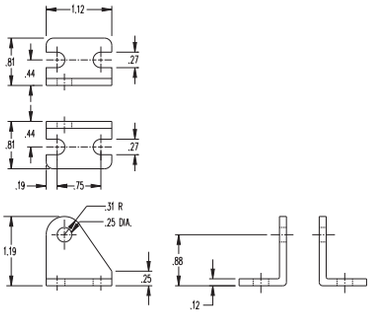
Mounting Bracket

D-13498-A



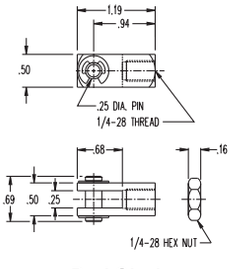
Pivot Bracket

D-167



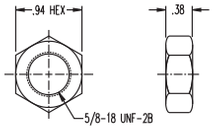
Pivot Brackets

D-166-3



Rod Clevis

D-9



Mounting Nut

1-1/16" Bore Air Cylinders

- Ground and Polished, High Strength Carbon Steel Piston Rod Standard – 303 Stainless Steel Rod Available as an Option – Bronze Rod Guide Bushing Standard
- Force Exerted Approximately 0.9 of Air Line Pressure
- Enclosed Spring Force: 3 lbs. Relaxed – 6 lbs. Compressed
- Rod Wipers Available on D, DP, DX and DXDE Models

OPTIONS:

NO CHARGE:

- ***MAGNALUBE G (G)***
- ***PORTS ROTATED (K)****

**Front port rotated 90° on BF-090-D.*

- ***NO THREAD (NT)***
- ***SIDE PORTED REAR HEAD (Q)***
  Add .25" to nose mount overall length
- ***PIVOT BUSHING (Y)***
  .250" ID

SINGLE AND REVERSE ACTING BUMPER (B)

- *additional*
- *Add .125 to overall length*

DOUBLE ACTING BUMPERS (B)

- *additional*
- *Add .125 to overall length*
- *Models DXDE and DXDEH add .500*

EXTRA EXTENSION (EE)

- *Single, reverse and double acting, add $0.95 per inch of extension*
- *DXDE, add per inch of extension; extension added to each end*
- *DXDE hollow rod, add per inch of extension; extension added to each end*

DOUBLE ACTING FAILSAFE
(JS = Spring Return, JR = Spring Extend)

- *Add to base price + to stroke adder*
- *See page 1.65 for overall length adders*

HEAVY SPRINGS (H) *are standard on all single acting block front and block rear mount and –NRLSC models, and reverse acting except –RA type.*
For all other single acting, add

- *Spring Force: 6 lbs. relaxed – 12 lbs. compressed*

OPTIONS continued...

MAGNET (prefix M) – Add

- *Single acting and DXDE add .125" to overall length*
- *Use bumper length adder for DXDE and DXDEH when magnet and bumper are ordered together.*
- *Stainless steel rod becomes standard with this option*
- *Must specify track(s) for use with miniature position sensing (T2, T3, T4) – add per track. See page 1.9 for track location details. See Position Sensing Solutions, page 8.3 for switch selection information.*

LOW TEMPERATURE (N)
Temperature Range: -40° to 200ºF

- *Single acting add*
- *Reverse acting add*
- *Double acting add*
- *DXDE add*

HIGH TEMPERATURE "U" CUPS (V)
Temperature Range: 0° to 400ºF (-18° to 205ºC)

- *Single acting add*
- *Double acting add*
- *DXDE add*
- *Reverse acting add*

ROD WIPER (W)
(not available in standard single acting)
(now available in block mount)

- *Double acting, add*
- *DXDE add*

MOLYCOATED BODY (F)

- *Add per inch of stroke*

NON-LUBE SERVICE (E)

- *Single acting add*
- *Double acting add*
- *DXDE add*

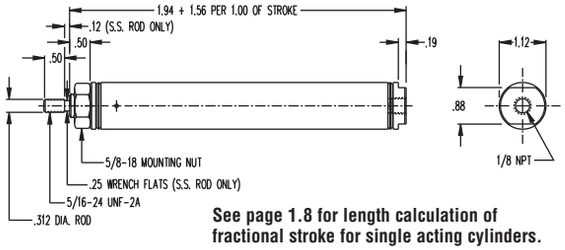
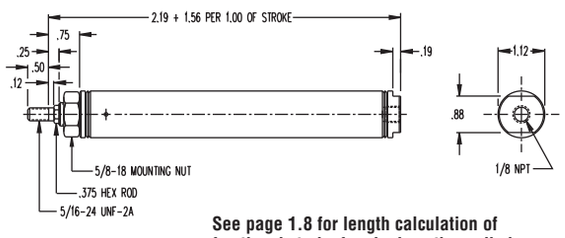
STAINLESS STEEL ROD (prefix SR)

- *Add*
- *Standard on DX, DXDE, DXDEH, All block mountings and M option*

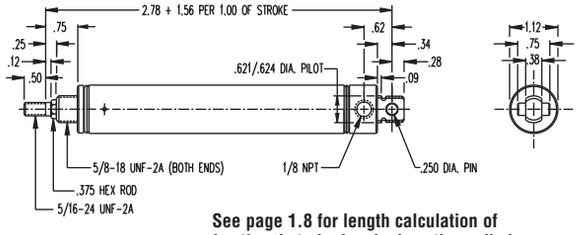
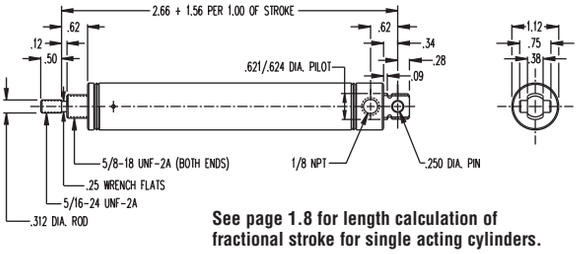
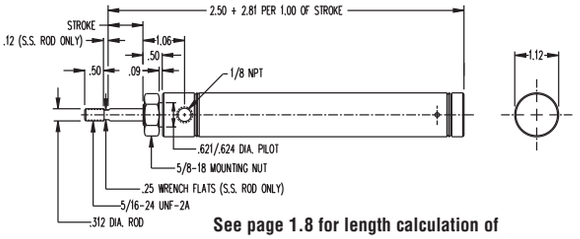
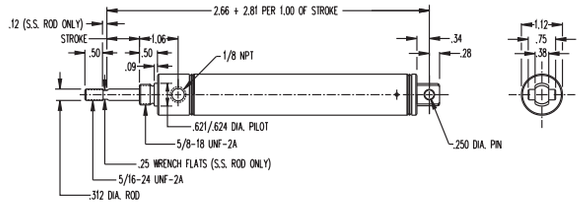
LOW PRESSURE HYDRAULIC (HL)

- *250 psi maximum*
- *Double acting models only*
- *Option specified as a prefix*
- *Add*

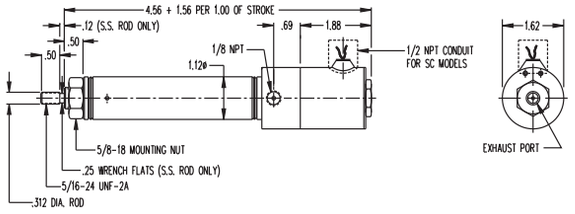
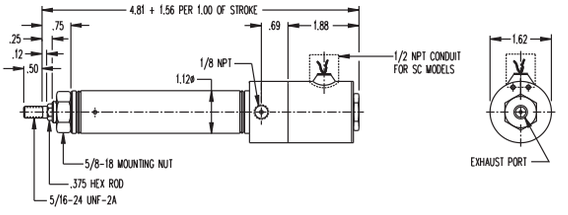
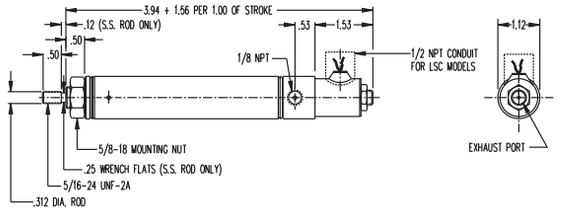
☐ Enter Stroke Length as 3rd Digit

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
09☐ 	***Single Acting*** *– Spring Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessory:* D-129 Mounting Bracket *Base Weight: .23* *Adder Per Inch of Stroke: .11*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
09☐-NR 	***Single Acting*** *– Non-rotating Hexagon Rod – Spring Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessory:* D-129 Mounting Bracket *Base Weight: .25* *Adder Per Inch of Stroke: .12*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**

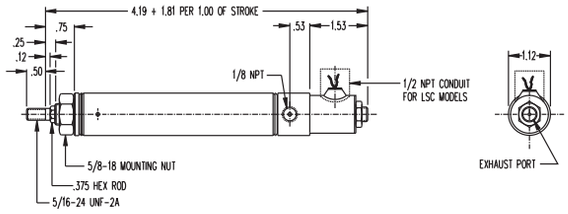
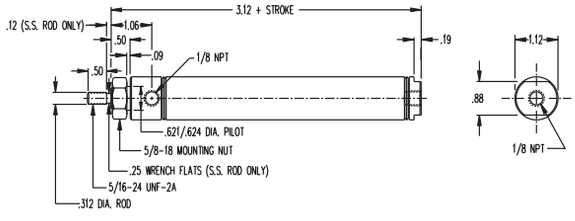
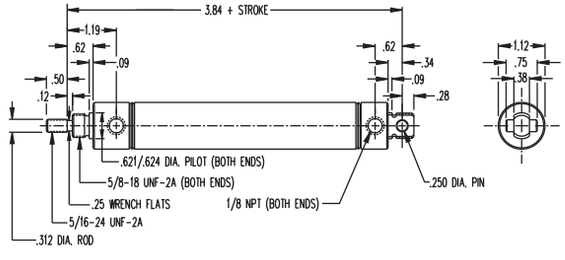
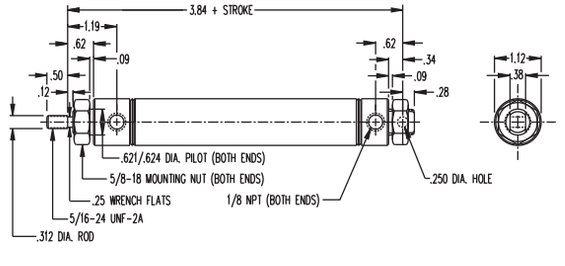
1-1/16" Bore Air Cylinders

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
09□-NRP 	***Single Acting*** *– Non-rotating Hexagon Rod – Pivot Type – Spring Return – Rear Pivot Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessories:* D-166-1 Piston Rod Clevis D-167 Pivot Brackets *Base Weight: .25* *Adder Per Inch of Stroke: .12*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
09□-P 	***Single Acting*** *– Pivot Type – Spring Return – Rear Pivot Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessories:* D-166-1 Piston Rod Clevis D-167 Pivot Brackets *Base Weight: .24* *Adder Per Inch of Stroke: .11*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
09□-R 	***Reverse Single Acting*** *– Pull Type – Rod Normally Extended – Spring Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessory:* D-129 Mounting Bracket *Base Weight: .24* *Adder Per Inch of Stroke: .16*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
09□-RP 	***Reverse Single Acting*** *– Pivot and Pull Type – Rod Normally Extended – Spring Return – Rear Pivot Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessories:* D-166-1 Piston Rod Clevis D-167 Pivot Brackets *Base Weight: .22* *Adder Per Inch of Stroke: .16*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**

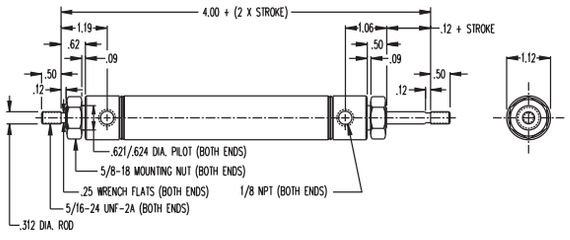
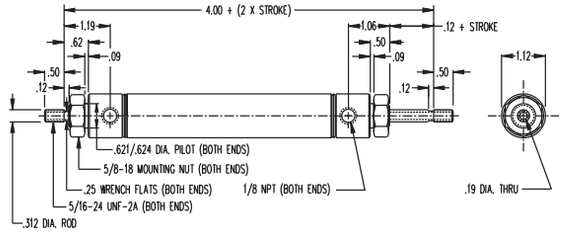
1-1/16" Bore Air Cylinders

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
09□-S or SC* 	***Single Acting** – Built-in 3-Way Solenoid Operated Valve – Spring Return – Front Nose Mounting – 100 PSI, 1/16" Orifice Standard – 150 PSI, 3/64" Orifice Optional* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod Standard Voltage – 115/60 *Optional Voltages:* 24, 230 A.C. or 6, 12, 24 D.C. *Optional Accessory:* D-129 Mounting Bracket *Base Weight: 1.11* *Adder Per Inch of Stroke: .11*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
09□-NRS or NRSC* 	***Single Acting** – Built-in 3-Way Solenoid Operated Valve – Non-rotating Hexagon Piston Rod – Spring Return – Front Nose Mounting – 100 PSI, 1/16" Orifice Standard – 150 PSI, 3/64" Orifice Optional* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod Standard Voltage – 115/60 *Optional Voltages:* 24, 230 A.C. or 6, 12, 24 D.C. *Optional Accessory:* D-129 Mounting Bracket *Base Weight: 1.13* *Adder Per Inch of Stroke: .12*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
09□-LS or LSC* 	***Single Acting** – Built-in Midget 3-Way Solenoid Operated Valve – Spring Return – Front Nose Mounting – 150 PSI, 3/64" Orifice* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod Standard Voltage – 115/60 *Optional Voltages:* 24, 230 A.C. or 6, 12, 24 D.C. *Optional Accessory:* D-129 Mounting Bracket *Base Weight: 1.20* *Adder Per Inch of Stroke: .11*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**

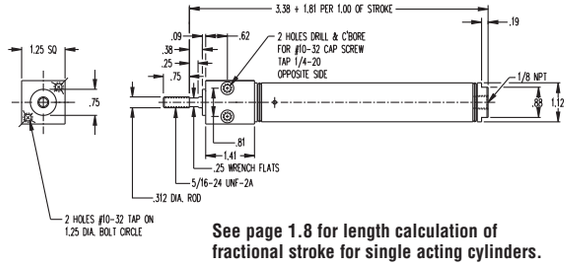
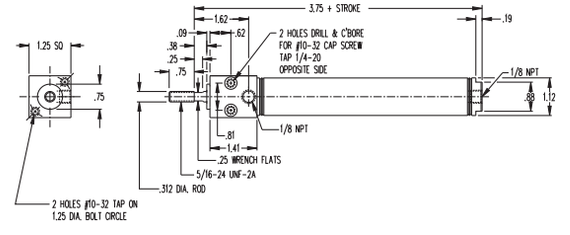
1-1/16" Bore Air Cylinders

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
09□-NRLS or NRLSC* 	***Single Acting** – Non-rotating Hexagon Piston Rod – Built-in Midget 3-Way Solenoid Operated Valve – Spring Return – Front Nose Mounting – 150 PSI, ¾64" Orifice* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod Standard Voltage – 115/60 *Optional Voltages:* 24, 230 A.C. or 6, 12, 24 D.C. *Optional Accessory:* D-129 Mounting Bracket *Base Weight: 1.20* *Adder Per Inch of Stroke: .11*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
09□-D 	***Double Acting** – Air Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" Optional Stainless Steel Rod Optional Rod Wiper *Optional Accessory:* D-129 Mounting Bracket *Base Weight: .33* *Adder Per Inch of Stroke: .05*	
09□-DP 	***Double Acting** – Pivot Type – Air Return – Rear Pivot Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 32" Optional Stainless Steel Rod Optional Rod Wiper *Optional Accessories:* D-166-1 Piston Rod Clevis D-167 Pivot Bracket *Base Weight: .33* *Adder Per Inch of Stroke: .05*	
09□-DX 	***Double Acting** – Universal Mounting Pivot, or Double End Mounting – Air Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 32" Stainless Steel Rod Standard Optional Rod Wiper *Optional Accessories:* D-13498-A Pivot Bracket D-129 Mounting Bracket D-166-1 Piston Rod Clevis *Base Weight: .33* *Adder Per Inch of Stroke: .05*	

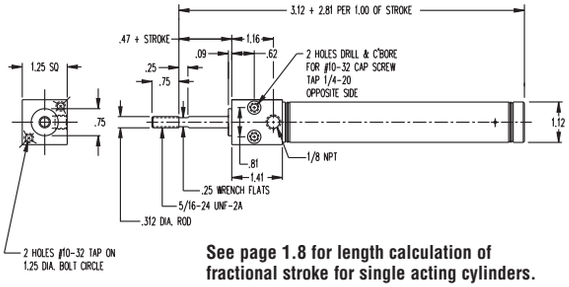
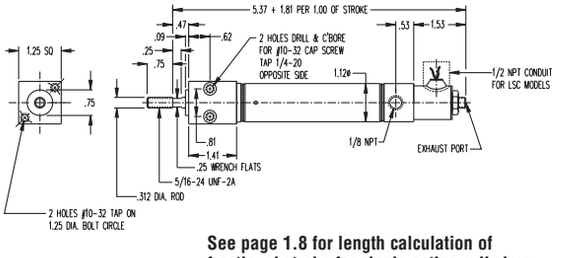
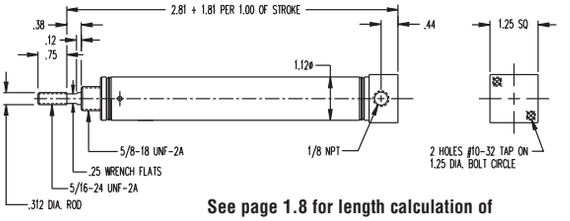
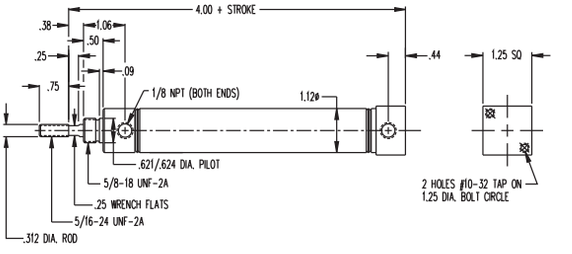
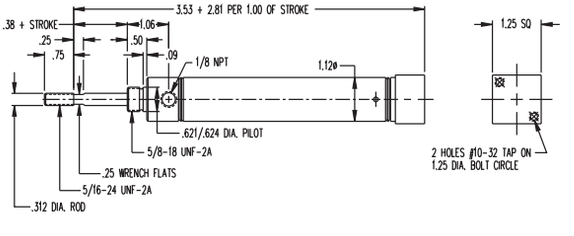
1-1/16" Bore Air Cylinders

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
09□-DXDE 	***Double Acting*** *– Double End Rod – Air Return – Double End Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" Stainless Steel Rod Standard Optional Rod Wiper *Optional Accessory:* D-129 Mounting Bracket *Base Weight: .48* *Adder Per Inch of Stroke: .07*	
09□-DXDEH 	***Double Acting*** *– Double End Hollow Rod – Air Return – Double End Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" Stainless Steel Rod Standard Optional Rod Wiper *Optional Accessory:* D-129 Mounting Bracket *Base Weight: .47* *Adder Per Inch of Stroke: .07*	

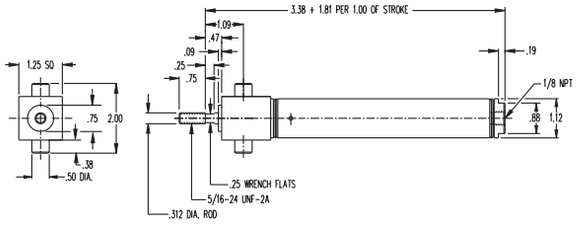
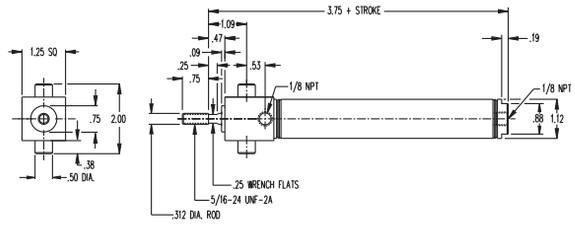
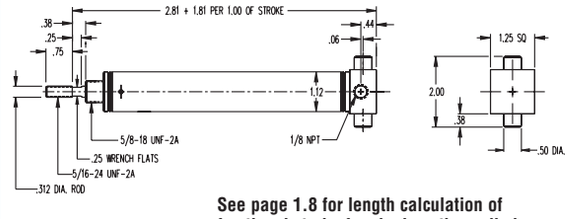
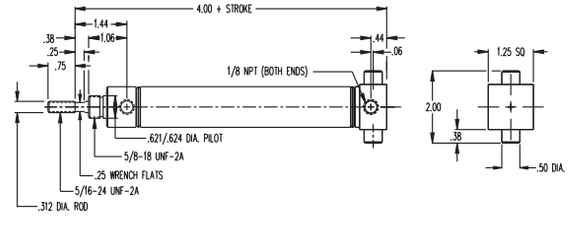
1-1/16" Bore Block Mounted · Spring Force: 6 lbs. Retracted, 12 lbs. Extended

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
BF-09□ 	***Single Acting*** *– Front Block Mounting – Spring Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Stainless Steel Rod Standard *Base Weight: .43* *Adder Per Inch of Stroke: .11*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
BF-09□-D 	***Double Acting*** *– Front Block Mounting – Air Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" Stainless Steel Rod Standard *Base Weight: .49* *Adder Per Inch of Stroke: .05*	

1-1/16" Bore Block Mounted (continued)

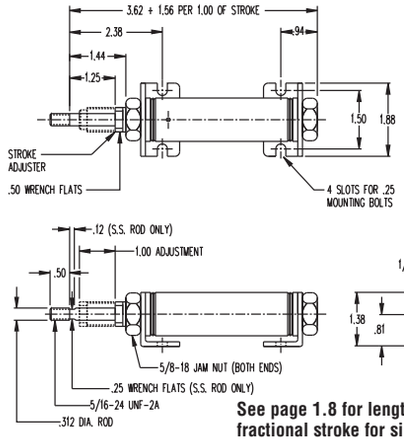
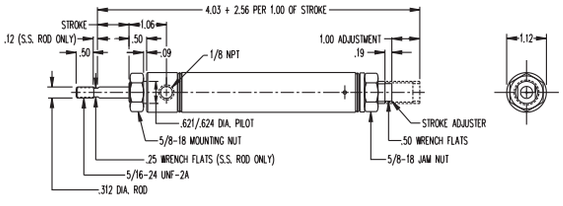
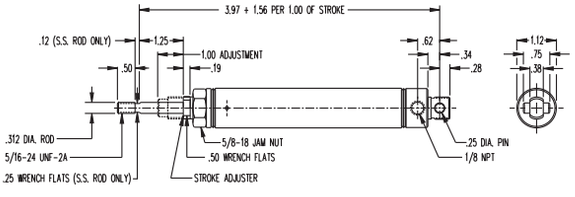
MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
BF-09□-R 	***Pull Type*** *– Front Block Mounting – Rod Normally Extended – Reverse Single Acting – Spring Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Stainless Steel Rod Standard *Base Weight: .36* *Adder Per Inch of Stroke: .16*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
BF-09□-LS or LSC* 	***Built-in Midget 3-Way Solenoid Operated Valve*** *– Single Acting – Spring Return – Front Block Mounting – 150 PSI, 3/64" Orifice* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Stainless Steel Rod Standard Standard Voltage – 115/60 *Optional Voltages:* 24, 230 A.C. or 6, 12, 24 D.C. *Base Weight: 1.31* *Adder Per Inch of Stroke: .11*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
BR-09□ 	***Single Acting*** *– Rear Block Mounting for Vertical Positioning – Spring Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Stainless Steel Rod Standard *Base Weight: .36* *Adder Per Inch of Stroke: .16*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
BR-09□-D 	***Double Acting*** *– Rear Block Mounting for Vertical Positioning – Air Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 12" Stainless Steel Rod Standard *Base Weight: .39* *Adder Per Inch of Stroke: .05*	
BR-09□-R 	***Pull Type*** *– Rear Block Mounting for Vertical Positioning – Rod Normally Extended – Reverse Single Acting – Spring Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Stainless Steel Rod Standard *Base Weight: .32* *Adder Per Inch of Stroke: .16*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**

1-1/16" Bore Trunnion Mounted · Spring Force: 6 lbs. Retracted, 13 lbs. Extended

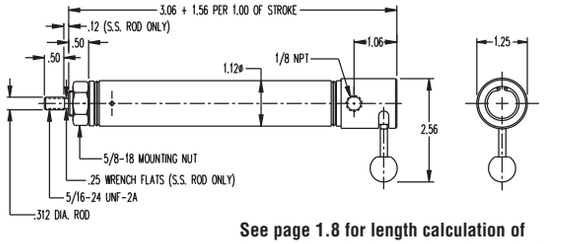
MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
BFT-09□ 	***Single Acting** – Front Block* *Trunnion Mounting – Spring Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Stainless Steel Rod Standard *Optional Accessories:* TRB-2 Trunnion Brackets D-166-1 Rod Clevis *Base Weight: .45* *Adder Per Inch of Stroke: .11*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
BFT-09□-D 	***Double Acting** – Front Block* *Trunnion Mounting – Air Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 12" Stainless Steel Rod Standard *Optional Accessories:* TRB-2 Trunnion Brackets D-166-1 Rod Clevis *Base Weight: .49* *Adder Per Inch of Stroke: .05*	
BRT-09□ 	***Single Acting** – Rear Block* *Trunnion Mounting – Spring Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Stainless Steel Rod Standard *Optional Accessories:* TRB-2 Trunnion Brackets D-166-1 Rod Clevis *Base Weight: .37* *Adder Per Inch of Stroke: .11*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
BRT-09□-D 	***Double Acting** – Rear Block* *Trunnion Mounting – Air Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 12" Stainless Steel Rod Standard *Optional Accessories:* TRB-2 Trunnion Brackets D-166-1 Rod Clevis *Base Weight: .43* *Adder Per Inch of Stroke: .05*	

1-1/16" Bore Air Cylinders

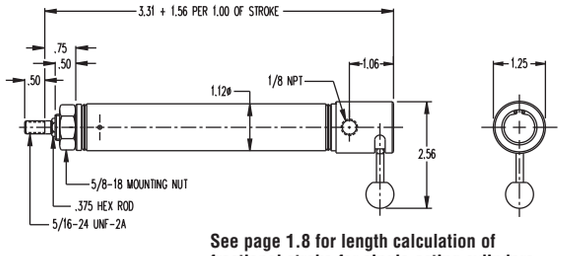
1-1/16" Bore Adjustable Stroke

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
09□-A 	***Single Acting*** *– Spring Return – Adjustable Stroke – Double End Mounting – Brass Piston Rod Bearing and Stroke Adjustment in 1", 2", 3".* *1" Stroke Adjusts 0" – 1", 2" Stroke 1" – 2", and 3" Stroke 2" – 3".* Mounting brackets are included. Maximum Stroke – 6" Optional Stainless Steel Rod *Base Weight: .58* *Adder Per Inch of Stroke: .11*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
09□-RA 	***Reverse Single Acting*** *– Pull Type – Rod Normally Extended – Spring Force: 6 lbs. Retracted, 3 lbs. Extended – Nose Mounting – Stroke Adjustment in 1", 2", 3".* *1" Stroke Adjusts 0" – 1", 2" Stroke 1" – 2", and 3" Stroke 2" – 3".* Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessory:* D-129 Mounting Brackets *Base Weight: .41* *Adder Per Inch of Stroke: .11*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
09□-AP 	***Single Acting*** *– Pivot Type – Rear Pivot Mounting – Stroke Adjustment in 1", 2", 3".* *1" Stroke Adjusts 0" – 1", 2" Stroke 1" – 2", and 3" Stroke 2" – 3".* Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessories:* D-166-1 Piston Rod Clevis D-167 Pivot Brackets *Base Weight: .40* *Adder Per Inch of Stroke: .11*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**

1-1/16" Bore Built-in Manual Valve

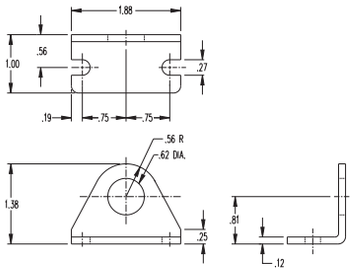
MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
09□-M 	***Single Acting*** *– Built-in 3-Way Manual Valve – Spring Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessory:* D-129 Mounting Bracket *Base Weight: .45* *Adder Per Inch of Stroke: .11*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**

1-1/16" Bore Built-in Manual Valve (continued)

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
09□-NRM 	***Single Acting** – Built-in 3-Way Manual Valve – Non-rotating Hexagon Rod – Spring Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessory:* D-129 Mounting Bracket *Base Weight: .47* *Adder Per Inch of Stroke: .12*	 See page 1.8 for length calculation of fractional stroke for single acting cylinders.

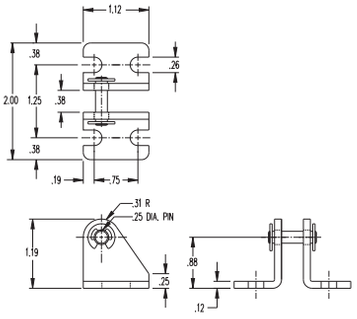
1-1/16" Bore Accessories

D-129



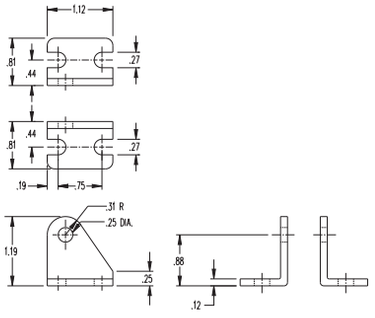
Mounting Bracket (for Single & Double Acting Models)

D-13498-A



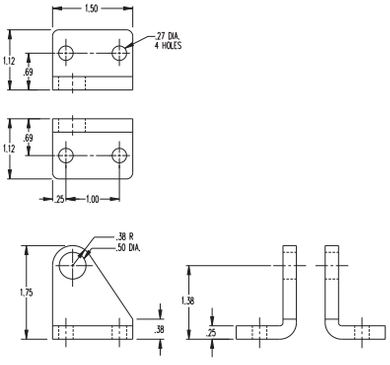
Pivot Bracket

D-167



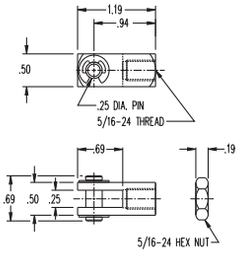
Pivot Brackets

TRB-2



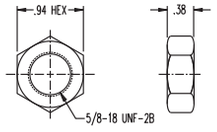
Trunnion Brackets

D-166-1



Piston Rod Clevis

D-9



Mounting Nut

Note: *For stainless steel accessories see pages 1.99 and 1.102-1.103.*

1-1/4" Bore Air Cylinders

- Ground and Polished, High Strength Carbon Steel Piston Rod Standard – 303 Stainless Steel Rod Available as an Option – Bronze Rod Guide Bushing Standard
- Force Exerted Approximately 1.2 of Air Line Pressure
- Enclosed Spring Force: 7.5 lbs. Relaxed – 15 lbs. Compressed
- Cushion Quiet Bumpers Standard

OPTIONS:

NO CHARGE:

- ***MAGNALUBE G (G)***
- ***PORTS ROTATED (K)***
- ***NO THREAD (NT)***
- ***SIDE PORTED REAR HEAD (Q)***
  Add .31" to nose mount overall length
- ***PIVOT BUSHING (Y)***
  .250" ID

EXTRA EXTENSION (EE)

- *Single, reverse and double acting, add per inch of extension*
- *DXDE, add per inch of extension; extension added to each end*
- *DXDE hollow rod, add per inch of extension; extension added to each end*

DOUBLE ACTING FAILSAFE
(JS = Spring Return, JR = Spring Extend)

- *Add to base price + to stroke adder*
- *See page 1.65 for overall length adders*

OPTIONS continued...

MAGNET (prefix M) – Add

- *Single and reverse acting add .125" to overall length,*
- *Stainless steel rod becomes standard with this option*
- *Must specify track(s) for use with miniature position sensing (T2, T3, T4) – add per track. See page 1.9 for track location details. See Position Sensing Solutions, page 8.3 for switch selection information.*

LOW TEMPERATURE (N)
Temperature Range: -40° to 200°F

- *Single acting add*
- *Reverse acting add*
- *Double acting add*
- *DXDE add*

HIGH TEMPERATURE "U" CUPS (V)
Temperature Range: 0° to 400°F (-18° to 205°C)

- *Single acting add*
- *Double acting add*
- *DXDE add*
- *Reverse acting add*

MOLYCOATED BODY (F)

- *Add per inch of stroke*

NON-LUBE SERVICE (E)

- *Single acting add*
- *Double acting add*
- *DXDE add*

STAINLESS STEEL ROD (prefix SR)

- *Add*
- *Standard on DXDE, DXDEH and M option*

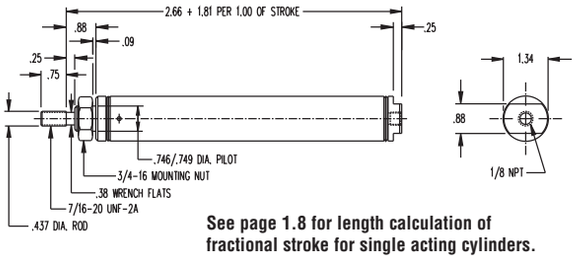
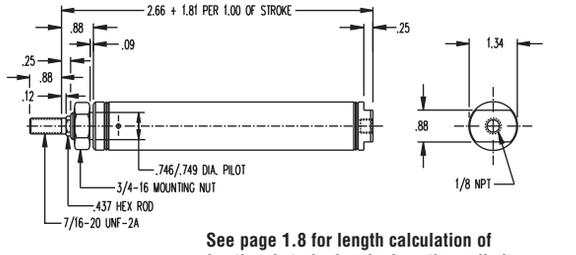
ROD WIPER (W)
(not available in standard single acting)

- *Add*
- *DXDE add*

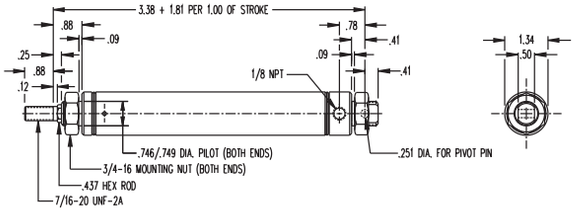
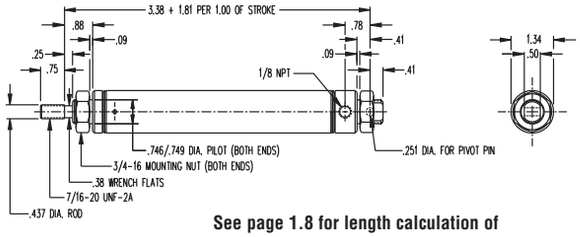
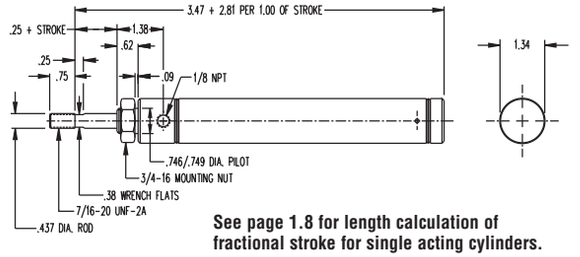
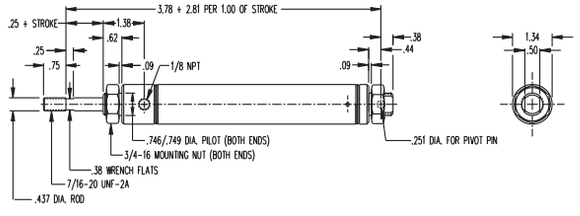
LOW PRESSURE HYDRAULIC (HL)

- *250 psi maximum*
- *Double acting models only*
- *Option specified as a prefix*
- *Add*

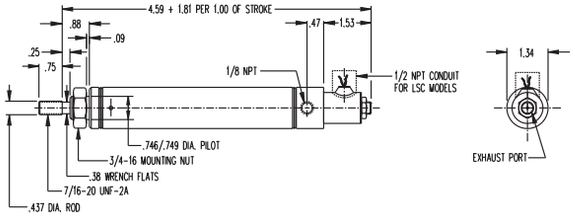
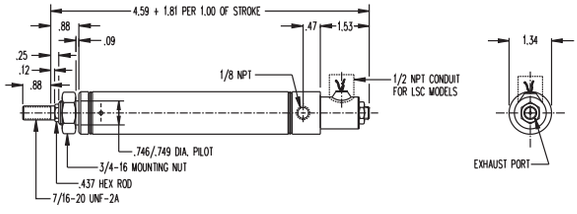
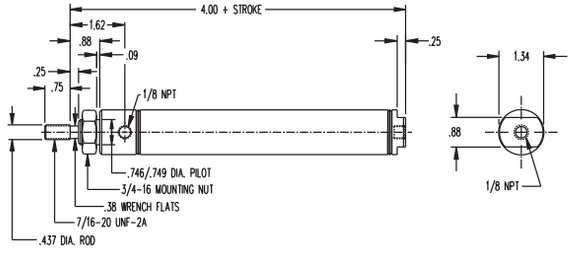
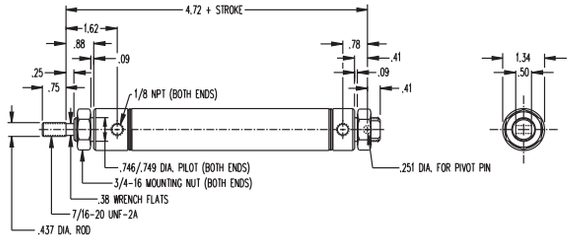
☐ Enter Stroke Length as 3rd Digit

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
12☐ 	***Single Acting** – Spring Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessory:* D-241 Mounting Bracket *Base Weight: .39* *Adder Per Inch of Stroke: .21*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
12☐-NR 	***Single Acting** – Non-rotating Hexagon Rod – Spring Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessory:* D-241 Mounting Bracket *Base Weight: .41* *Adder Per Inch of Stroke: .20*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**

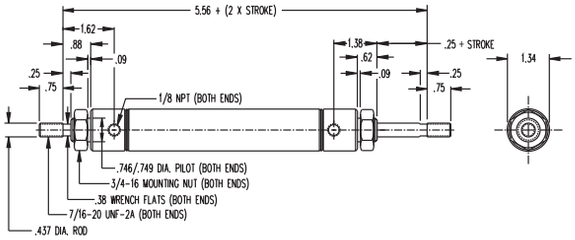
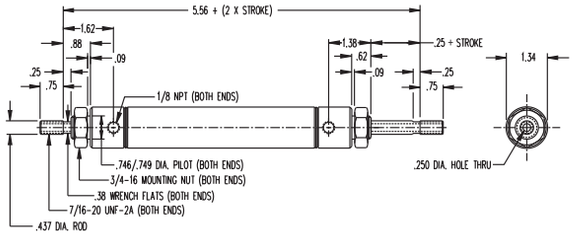
1-1/4" Bore Air Cylinders

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
12□-NRP 	***Single Acting*** *– Non-rotating Hexagon Rod – Pivot Type – Spring Return – Rear Pivot or Double End Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessories:* D-231-1 Piston Rod Clevis D-1360 Pivot Brackets *Base Weight: .41* *Adder Per Inch of Stroke: .20*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
12□-P 	***Single Acting*** *– Pivot Type – Spring Return – Rear Pivot or Double End Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessories:* D-231-1 Piston Rod Clevis D-1360 Pivot Brackets *Base Weight: .53* *Adder Per Inch of Stroke: .21*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
12□-R 	***Reverse Single Acting*** *– Pull Type – Rod Normally Extended – Spring Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessory:* D-241 Mounting Bracket *Base Weight: .50* *Adder Per Inch of Stroke: .21*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
12□-RP 	***Reverse Single Acting*** *– Pivot and Pull Type – Rod Normally Extended – Spring Return – Rear Pivot Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessories:* D-231-1 Piston Rod Clevis D-1360 Pivot Bracket *Base Weight: .57* *Adder Per Inch of Stroke: .21*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**

1-1/4" Bore Air Cylinders

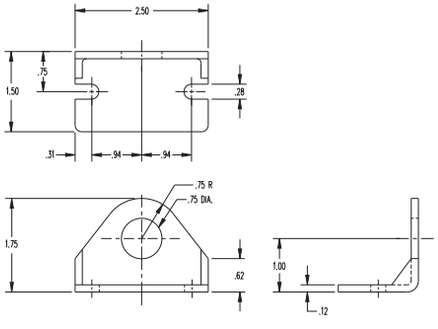
MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
12□-LS or LSC* 	***Single Acting** – Built-in Midget 3-Way Solenoid Operated Valve – Spring Return – Front Nose Mounting – 150 PSI, 3/64" Orifice* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod Standard Voltage – 115/60 *Optional Voltages:* 24, 230 A.C. or 6, 12, 24 D.C. *Optional Accessory:* D-241 Mounting Bracket *Base Weight: 1.30* *Adder Per Inch of Stroke: .21*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
12□-NRLS or NRLSC* 	***Single Acting** – Non-rotating Hexagon Piston Rod – Built-in Midget 3-Way Solenoid Operated Valve – Spring Return – Front Nose Mounting – 150 PSI, 3/64" Orifice* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod Standard Voltage – 115/60 *Optional Voltages:* 24, 230 A.C. or 6, 12, 24 D.C. *Optional Accessory:* D-241 Mounting Bracket *Base Weight: 1.30* *Adder Per Inch of Stroke: .21*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
12□-D 	***Double Acting** – Air Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" Optional Stainless Steel Rod *Optional Accessory:* D-241 Mounting Bracket *Base Weight: .58* *Adder Per Inch of Stroke: .08*	
12□-DP 	***Double Acting** – Pivot Type – Air Return – Rear Pivot or Double End Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 32" Optional Stainless Steel Rod *Optional Accessories:* D-231-1 Piston Rod Clevis D-1360 Pivot Brackets D-241 Mounting Bracket *Base Weight: .71* *Adder Per Inch of Stroke: .08*	

1-1/4" Bore Air Cylinders

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
12□-DXDE 	***Double Acting** – Double End Rod – Air Return – Double End Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 12" Stainless Steel Rod Standard *Optional Accessory:* D-241 Mounting Bracket *Base Weight: .98* *Adder Per Inch of Stroke: .12*	
12□-DXDEH 	***Double Acting** – Double End Hollow Rod – Air Return – Double End Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" Stainless Steel Rod Standard *Optional Accessory:* D-241 Mounting Bracket *Base Weight: .97* *Adder Per Inch of Stroke: .12*	

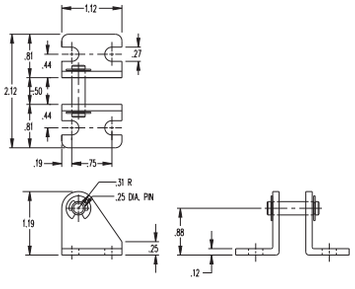
1-1/4" Bore Accessories

D-241



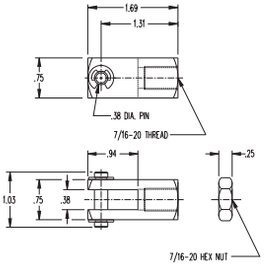
Mounting Bracket
(for Single & Double Acting Models)

D-1360



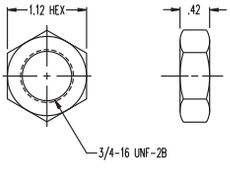
Pivot Brackets

D-231-1



Piston Rod Clevis

D-3556



Mounting Nut

1-1/2" Bore Air Cylinders

- Ground and Polished, High Strength Carbon Steel Piston Rod Standard – 303 Stainless Steel Rod Optional – Bronze Rod Guide Bushing Standard
- Force Exerted Approximately 1.7 of Air Line Pressure
- Enclosed Spring Force: 7 lbs. Relaxed – 14 lbs. Compressed
- Rod Wipers Available on D, DP, DX, DXDE, and DXDEH Models

OPTIONS:

NO CHARGE:

- ***MAGNALUBE G (G)***
- ***PORTS ROTATED (K)****

**Front port rotated 90° on BF models.*

- ***NO THREAD (NT)***
- ***SIDE PORTED REAR HEAD (Q)***
  Add .19" to nose mount overall length and DNR; BF and BFT add .38"
- ***PIVOT BUSHING (Y)***
  .375" ID (use D-620-1 pivot bracket)

SINGLE AND REVERSE ACTING BUMPERS (B)

- *additional*
- *Add .125" to overall length*

DOUBLE ACTING BUMPERS (B)

- *additional*
- *Add .125 to overall length*

** Front port rotated at 90° on BF model.*

EXTRA EXTENSION (EE)

- *Single, reverse and double acting, add per inch of extension*
- *DXDE, add per inch of extension; extension added to each end*
- *DXDE hollow rod, add per inch of extension; extension added to each end*

DOUBLE ACTING FAILSAFE
(JS = Spring Return, JR = Spring Extend)

- *Add to base price + to stroke adder*
- *See page 1.65 for overall length adders*

***HEAVY SPRINGS (H)** are standard on all single acting block front and block rear mount, and all reverse acting and stroke adjust models.*
For all other single acting, add

- *Spring Force: 8.5 lbs. relaxed – 17 lbs. compressed*

OPTIONS continued...

MAGNET (prefix M) – Add

- *Single and reverse acting add .125" to overall length,*
- *Stainless steel rod becomes standard with this option*
- *Must specify track(s) for use with miniature position sensing (T2, T3, T4) – add per track. See page 1.9 for track location details. See Position Sensing Solutions, page 8.3 for switch selection information.*

LOW TEMPERATURE (N)
Temperature Range: -40° to 200ºF

- *Single acting add*
- *Reverse acting add*
- *Double acting add*
- *DXDE add*

HIGH TEMPERATURE "U" CUPS (V)
Temperature Range: 0° to 400ºF (-18° to 205ºC)

- *Single acting add*
- *Double acting add*
- *DXDE add*
- *Reverse acting add*

***ROD WIPER (W)** (not available in standard single acting now available in block mount)*

- *Double acting add*
- *DXDE add*

MOLYCOATED BODY (F)

- *Add per inch of stroke*

NON-LUBE SERVICE (E)

- *Single acting add*
- *Double acting add*
- *DXDE add*

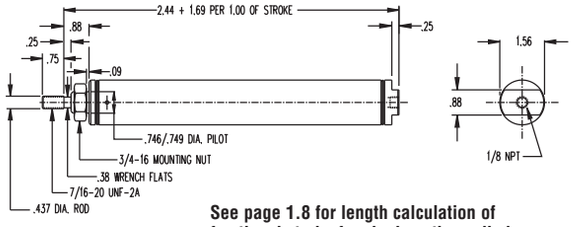
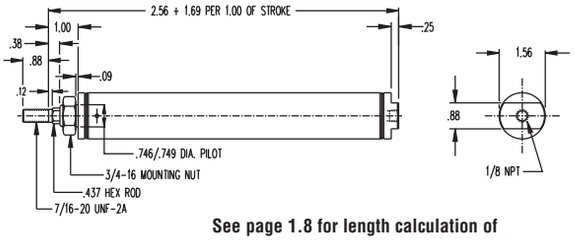
STAINLESS STEEL ROD (prefix SR)

- *Add*
- *Standard on DX, DXDE, DXDEH, DNR, DXNR, All block mounts, and M option*

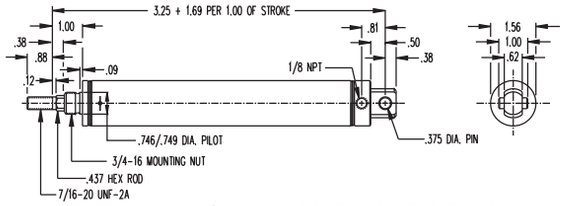
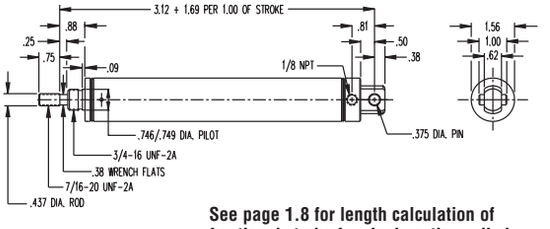
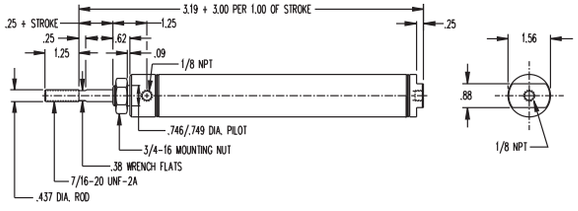
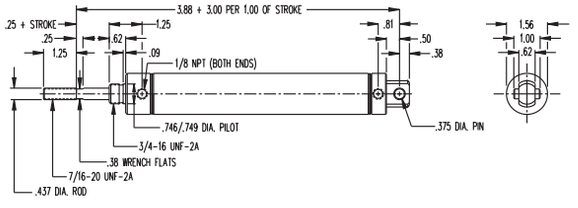
LOW PRESSURE HYDRAULIC (HL)

- *250 psi maximum*
- *Double acting models only*
- *Option specified as a prefix*
- *Add*

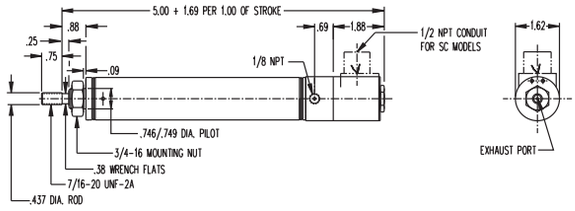
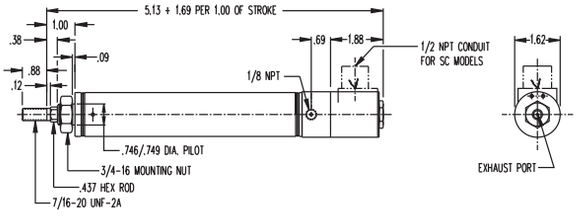
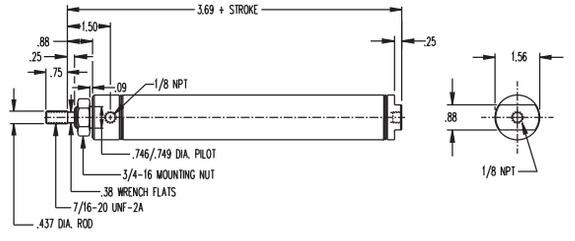
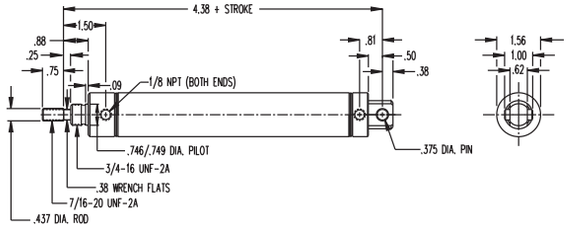
☐ Enter Stroke Length as 3rd Digit

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
17☐ 	***Single Acting** – Spring Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessory:* D-241 Mounting Bracket *Base Weight: .44* *Adder Per Inch of Stroke: .22*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
17☐-NR 	***Single Acting** – Non-rotating Hexagon Rod – Spring Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessory:* D-241 Mounting Bracket *Base Weight: .45* *Adder Per Inch of Stroke: .22*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**

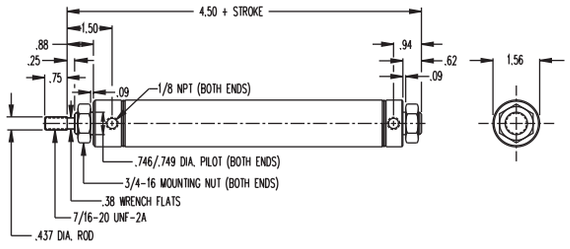
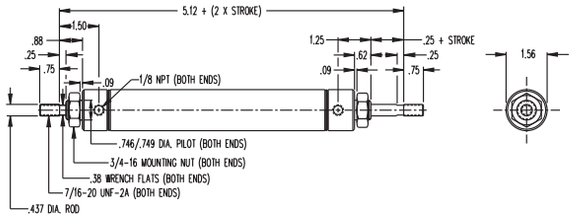
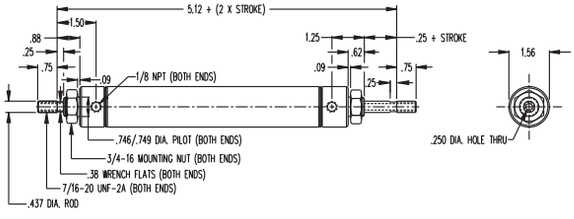
1-1/2" Bore Air Cylinders

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
17□-NRP 	***Single Acting*** *– Non-rotating Hexagon Rod – Spring Return – Rear Pivot Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessories:* D-231-1 Piston Rod Clevis D-229 Pivot Brackets *Base Weight: .46* *Adder Per Inch of Stroke: .22*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
17□-P 	***Single Acting*** *– Pivot Type – Spring Return – Rear Pivot Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessories:* D-231-1 Piston Rod Clevis D-229 Pivot Brackets *Base Weight: .45* *Adder Per Inch of Stroke: .22*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
17□-R 	***Reverse Single Acting*** *– Pull Type – Rod Normally Extended – Spring Return – Spring Force 8.5 lbs. Extended, 17 lbs. Retracted – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessory:* D-241 Mounting Bracket *Base Weight: .44* *Adder Per Inch of Stroke: .22*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
17□-RP 	***Reverse Single Acting*** *– Pivot and Pull Type – Rod Normally Extended – Spring Return – Spring Force 8.5 lbs, Extended, 17 lbs. Retracted – Rear Pivot Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessories:* D-231-1 Piston Rod Clevis D-229 Pivot Brackets *Base Weight: .45* *Adder Per Inch of Stroke: .22*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**

1-1/2" Bore Air Cylinders

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
17□-S or SC* 	***Single Acting** – Built-in 3-Way Solenoid Operated Valve – Spring Return – Front Nose Mounting – 100 PSI, 1/16" Orifice Standard – 150 PSI, 3/64" Orifice Optional* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod Standard Voltage – 115/60 *Optional Voltages:* 24, 230 A.C. or 6, 12, 24 D.C. *Optional Accessory:* D-241 Mounting Bracket *Base Weight: 1.38* *Adder Per Inch of Stroke: .22*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
17□-NRS or NRSC* 	***Single Acting** – Non-rotating Piston Rod – Built-in 3-Way Solenoid Operated Valve – Spring Return – Front Nose Mounting – 100 PSI, 1/16" Orifice Standard – 150 PSI, 3/64" Orifice Optional* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod Standard Voltage – 115/60 *Optional Voltages:* 24, 230 A.C. or 6, 12, 24 D.C. *Optional Accessory:* D-241 Mounting Bracket *Base Weight: 1.38* *Adder Per Inch of Stroke: .22*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
17□-D 	***Double Acting** – Air Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" Optional Stainless Steel Rod Optional Rod Wiper *Optional Accessory:* D-241 Mounting Bracket *Base Weight: .69* *Adder Per Inch of Stroke: .08*	
17□-DP 	***Double Acting** – Pivot Type – Air Return – Rear Pivot Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 32" Optional Stainless Steel Rod Optional Rod Wiper *Optional Accessories:* D-231-1 Piston Rod Clevis D-229 Pivot Brackets *Base Weight: .73* *Adder Per Inch of Stroke: .08*	

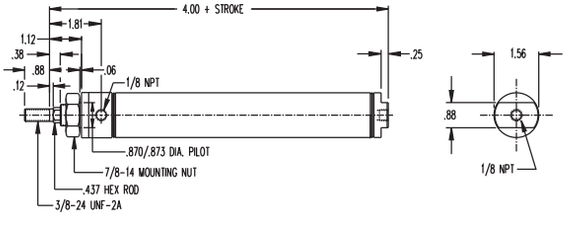
1-1/2" Bore Air Cylinders

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
17□-DX 	***Double Acting** – Double End Mounting – Air Return* ***Standard Stroke Lengths:*** ½", 1", 1½", 2", 2½", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 32" Stainless Steel Rod Standard Optional Rod Wiper ***Optional Accessory:*** D-241 Mounting Bracket ***Base Weight: .82*** ***Adder Per Inch of Stroke: .08***	
17□-DXDE 	***Double Acting** – Double End Rod – Air Return – Double End Mounting* ***Standard Stroke Lengths:*** ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" Stainless Steel Rod Standard Optional Rod Wiper ***Optional Accessory:*** D-241 Mounting Bracket ***Base Weight: 1.17*** ***Adder Per Inch of Stroke: .13***	
17□-DXDEH 	***Double Acting** – Double End Hollow Rod – Air Return – Double End Mounting* ***Standard Stroke Lengths:*** ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" Stainless Steel Rod Standard Optional Rod Wiper ***Optional Accessory:*** D-241 Mounting Bracket ***Base Weight: 1.16*** ***Adder Per Inch of Stroke: .13***	

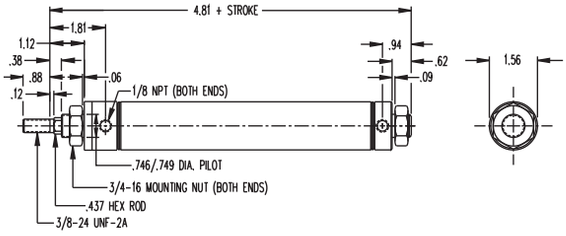
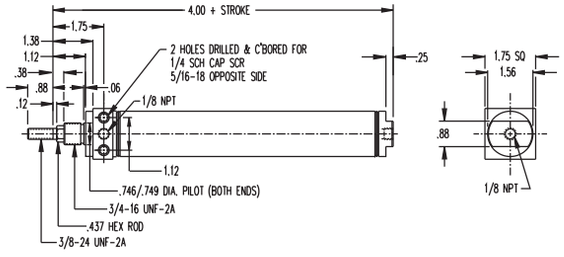
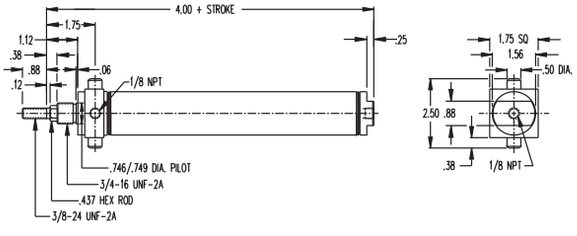
1-1/2" Bore Double Acting, Non-Rotating Rod

Repair Parts

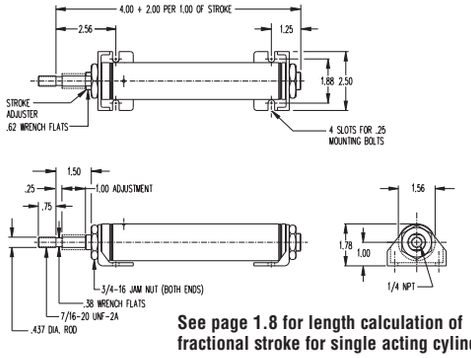
Rod Seal	*Rod Bearing*	*DXNR Rod Guide*	*DNR Rod Guide* 7/8-14 mounting threads
D-2500	***D-2501***	***D-1117***	***D-2509***

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
17□-DNR 	***Double Acting** – Non-rotating Hexagon Rod – Front Nose Mounting – Air Return* ***Standard Stroke Lengths:*** ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" Stainless Steel Rod Standard ***Optional Accessory:*** D-2669 Mounting Bracket ***Base Weight: .77*** ***Adder Per Inch of Stroke: .09***	

1-1/2" Bore Double Acting, Non-Rotating Rod (continued)

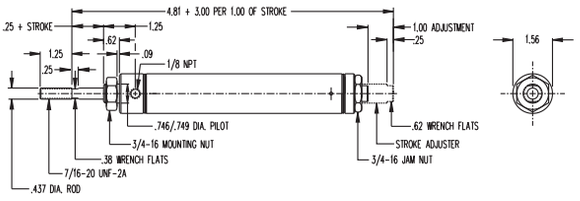
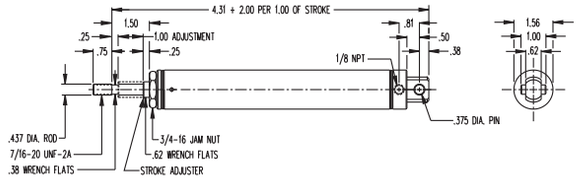
MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
17□-DXNR 	***Double Acting** – Non-rotating Hexagon Rod – Double End Mounting – Air Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" Stainless Steel Rod Standard *Optional Accessories:* D-241 Mounting Bracket D-8310-A Rod Clevis *Base Weight: .87* *Adder Per Inch of Stroke: .08*	
BF-17□-DNR 	***Double Acting** – Non-rotating Hexagon Rod – Front Block Mounting – Air Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" Stainless Steel Rod Standard *Optional Accessory:* D-8310-A Rod Clevis *Base Weight: .71* *Adder Per Inch of Stroke: .09*	
BFT-17□-DNR 	***Double Acting** – Non-rotating Hexagon Rod – Front Trunnion Mounting – Air Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" Stainless Steel Rod Standard *Optional Accessories:* TRB-2 Trunnion Brackets D-8310-A Rod Clevis *Base Weight: .78* *Adder Per Inch of Stroke: .09*	

1-1/2" Bore Adjustable Stroke

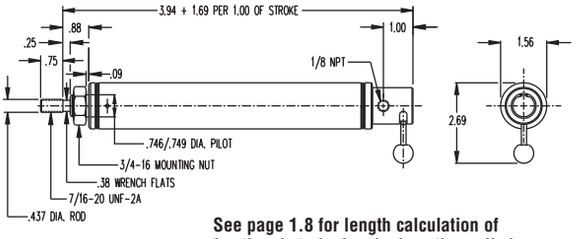
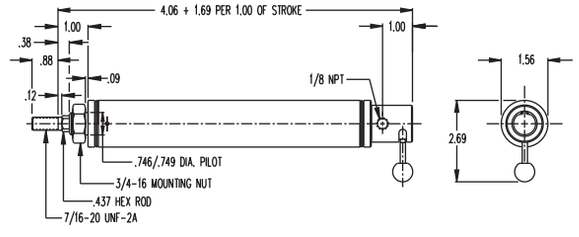
MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
17□-A 	***Single Acting** – Spring Return – Adjustable Stroke – Double End Mounting – Brass Piston Rod Bearing and Stroke Adjustment in 1" increments to 3". Mounting Brackets are included.* *1" Stroke Adjusts 0" to 1", 2" Stroke 1" to 2", 3" Stroke 2" to 3"* Maximum Stroke – 6" Optional Stainless Steel Rod *Base Weight: .75* *Adder Per Inch of Stroke: .25*	

See page 1.8 for length calculation of fractional stroke for single acting cylinders.

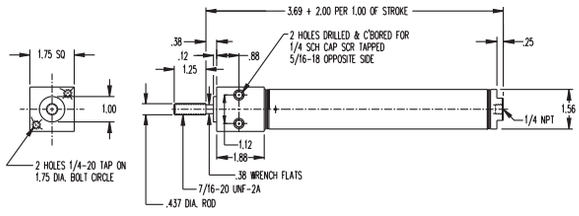
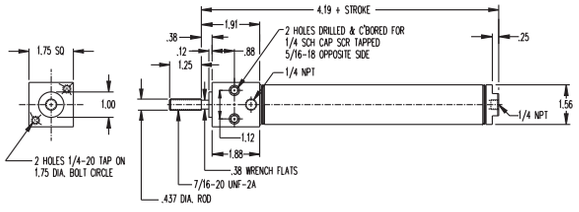
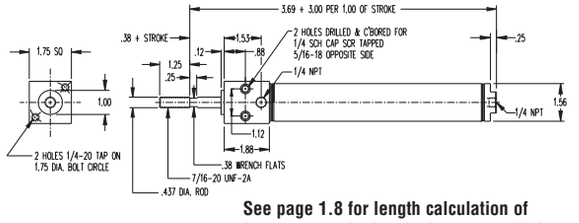
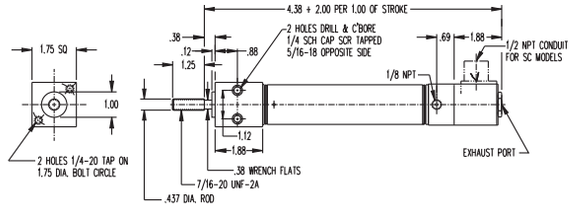
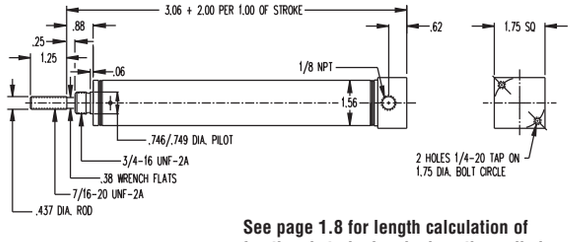
1-1/2" Bore Adjustable Stroke (continued)

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
17□-RA 	***Reverse Single Acting*** *– Pull Type – Rod Normally Extended – Nose Mounting – Stroke Adjustment in 1" increments to 3".* *1" Stroke Adjusts 0" to 1", 2" Stroke 1" to 2", 3" Stroke 2" to 3"* Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessory:* D-241 Mounting Bracket *Base Weight: .50* *Adder Per Inch of Stroke: .25*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
17□-AP 	***Single Acting*** *– Pivot Type – Rear Pivot Mounting – Stroke Adjustment in 1" increments to 3".* *1" Stroke Adjusts 0" to 1", 2" Stroke 1" to 2", 3" Stroke 2" to 3"* Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessories:* D-231-1 Piston Rod Clevis D-229 Pivot Brackets *Base Weight: .50* *Adder Per Inch of Stroke: .25*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**

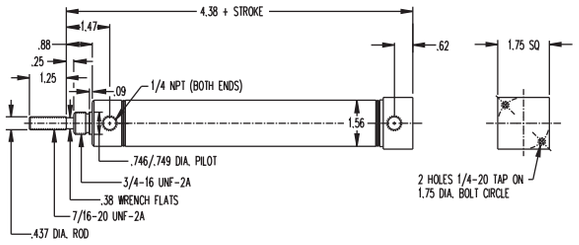
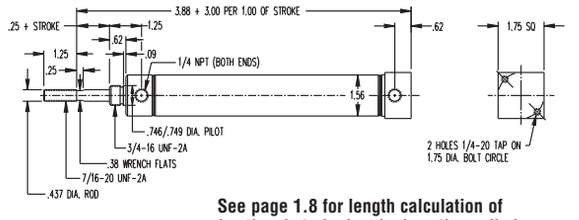
1-1/2" Bore Built-In Manual Valve

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
17□-M 	***Single Acting*** *– Built-in 3-Way Manual Valve – Spring Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessory:* D-241 Mounting Bracket *Base Weight: .75* *Adder Per Inch of Stroke: .22*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
17□-NRM 	***Single Acting*** *– Built-in 3-Way Manual Valve – Non-rotating Hexagon Rod – Spring Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessory:* D-241 Mounting Bracket *Base Weight: .75* *Adder Per Inch of Stroke: .22*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**

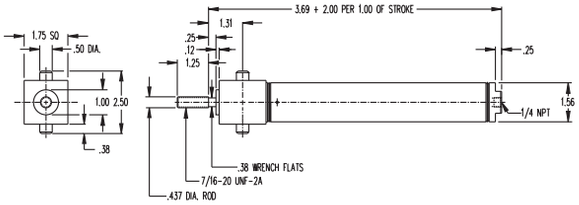
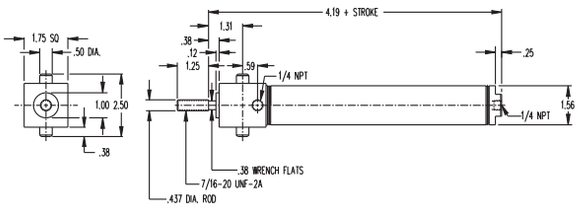
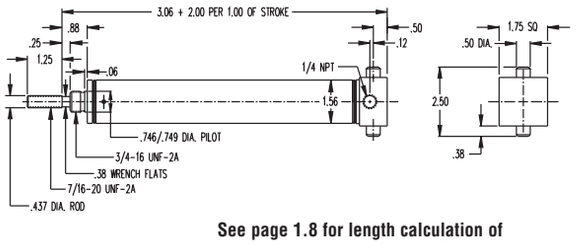
1-1/2" Bore Block Mounted · Spring Force: 8.5 lbs. Retracted, 17 lbs. Extended

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
BF-17□ 	***Single Acting*** *– Front Block Mounting – Spring Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Stainless Steel Rod Standard *Base Weight: .99* *Adder Per Inch of Stroke: .22*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
BF-17□-D 	***Double Acting*** *– Front Block Mounting – Air Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" Stainless Steel Rod Standard *Base Weight: .99* *Adder Per Inch of Stroke: .08*	
BF-17□-R 	***Pull Type*** *– Front Block Mounting – Rod Normally Extended – Reverse Single Acting – Spring Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Stainless Steel Rod Standard *Base Weight: .96* *Adder Per Inch of Stroke: .22*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
BF-17□-S or SC* 	***Built-in 3-Way Solenoid Operated Valve*** *– Single Acting – Spring Return – Front Block Mounting – 100 PSI, 1/16" Orifice Standard – 150 PSI, 3/64"Orifice Optional* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Stainless Steel Rod Standard Standard Voltage –115/60 *Optional Voltages:* 24, 230 A.C. or 6, 12, 24 D.C. *Base Weight: 1.90* *Adder Per Inch of Stroke: .22*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
BR-17□ 	***Single Acting*** *– Rear Block Mounting for Vertical Positioning– Spring Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Stainless Steel Rod Standard *Base Weight: .87* *Adder Per Inch of Stroke: .08*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**

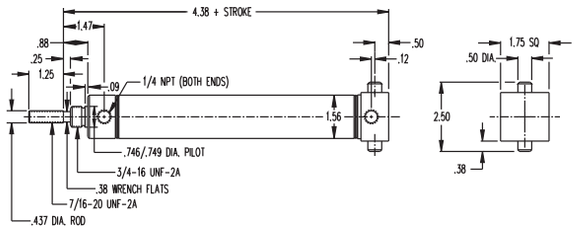
1-1/2" Bore Block Mounted (continued)

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
BR-17□-D 	***Double Acting*** *– Rear Block Mounting for Vertical Positioning – Air Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" Stainless Steel Rod Standard *Base Weight: .87* *Adder Per Inch of Stroke: .08*	
BR-17□-R 	***Pull Type*** *– Rear Block Mounting for Vertical Positioning – Rod Normally Extended – Reverse Single Acting – Spring Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Stainless Steel Rod Standard *Base Weight: .90* *Adder Per Inch of Stroke: .10*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**

1-1/2" Bore Trunnion Mounted · Spring Force: 8.5 lbs. Retracted, 17 lbs. Extended

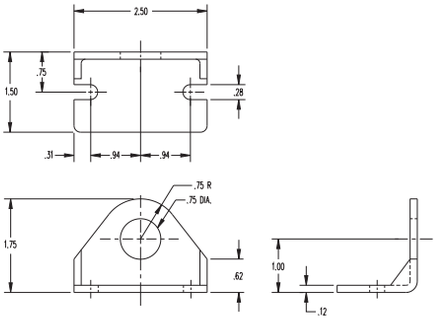
MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
BFT-17□ 	***Single Acting*** *– Front Block Trunnion Mounting – Spring Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Stainless Steel Rod Standard *Optional Accessories:* TRB-2 Trunnion Brackets D-231-1 Rod Clevis *Base Weight: 1.20* *Adder Per Inch of Stroke: .22*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
BFT-17□-D 	***Double Acting*** *– Front Block Trunnion Mounting – Air Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 12" Stainless Steel Rod Standard *Optional Accessories:* TRB-2 Trunnion Brackets D-231-1 Rod Clevis *Base Weight: 1.06* *Adder Per Inch of Stroke: .08*	
BRT-17□ 	***Single Acting*** *– Rear Block Trunnion Mounting – Spring Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Stainless Steel Rod Standard *Optional Accessories:* TRB-2 Trunnion Brackets D-231-1 Rod Clevis *Base Weight: 1.06* *Adder Per Inch of Stroke: .22*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**

1-1/2" Bore Trunnion Mounted (continued)

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
BRT-17□-D 	***Double Acting*** *– Rear Block Trunnion Mounting – Air Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 12" Stainless Steel Rod Standard *Optional Accessories:* TRB-2 Trunnion Brackets D-231-1 Rod Clevis *Base Weight: .91* *Adder Per Inch of Stroke: .08*	

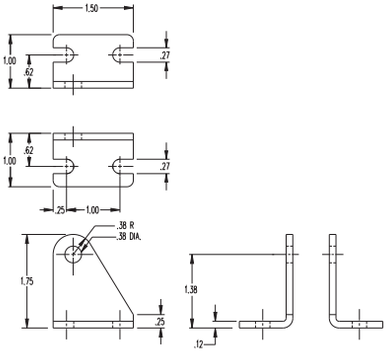
1-1/2" Bore Accessories

D-241



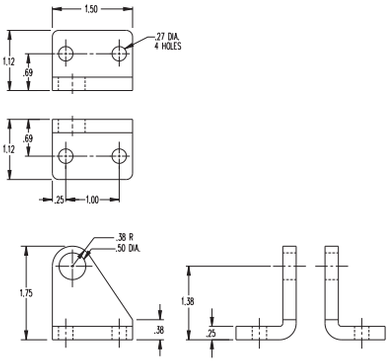
Mounting Bracket

D-229



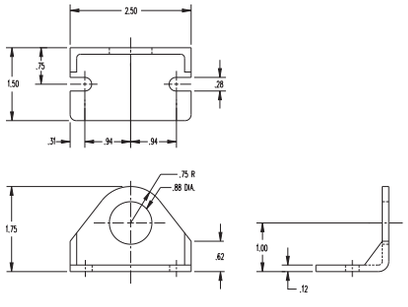
Pivot Bracket

TRB-2



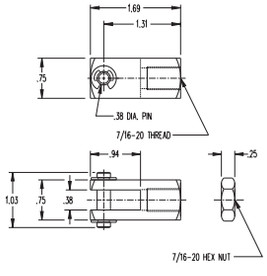
Trunnion Brackets

D-2669



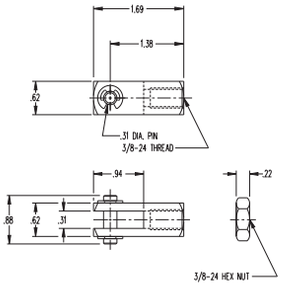
Mounting Bracket

D-231-1



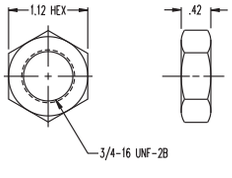
Piston Rod Clevis

D-8310-A



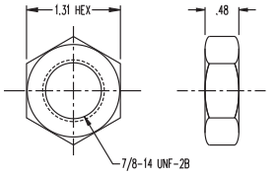
Rod Clevis

D-3556



Mounting Nut

D-2545



Mounting Nut

Note: *For stainless steel accessories see page 1.99 and 1.102-1.103. Mounting bracket not available in stainless steel.*

1-3/4" Bore Air Cylinders

- Ground and Polished, High Strength Carbon Steel Piston Rod Standard – 303 Stainless Steel Rod Available as an Option – Bronze Rod Guide Bushing Standard
- Force Exerted Approximately 2.4 of Air Line Pressure
- Enclosed Spring Force: 11 lbs. Relaxed – 24 lbs. Compressed
- Cushion Quiet Bumpers Standard

OPTIONS:

NO CHARGE:

- ***MAGNALUBE G (G)***
- ***PORTS ROTATED (K)***
- ***NO THREAD (NT)***
- ***SIDE PORTED REAR HEAD (Q)***
  Add .56" to nose mount overall length.
- ***PIVOT BUSHING (Y)***
  .375" ID

EXTRA EXTENSION (EE)

- *Single, reverse and double acting, add $1.40 per inch of extension*
- *DXDE, add per inch of extension; extension added to each end*
- *DXDE hollow rod, add per inch of extension; extension added to each end*

DOUBLE ACTING FAILSAFE

(JS = Spring Return, JR = Spring Extend)

- *Add to base price + to stroke adder*
- *See page 1.65 for overall length adders*

☐ Enter Stroke Length as 3rd Digit

OPTIONS continued...

MAGNET (prefix M) – Add

- *Single and reverse acting add .125" to overall length,*
- *Stainless steel rod becomes standard with this option*
- *Must specify track(s) for use with miniature position sensing (T2, T3, T4) – add per track. See page 1.9 for track location details. See Position Sensing Solutions, page 8.3 for switch selection information.*

LOW TEMPERATURE (N)

Temperature Range: -40° to 200ºF

- *Single acting add*
- *Reverse acting add*
- *Double acting add*
- *DXDE add*

HIGH TEMPERATURE "U" CUPS (V)

Temperature Range: 0° to 400ºF (-18° to 205ºC)

- *Single acting add*
- *Double acting add*
- *DXDE add*
- *Reverse acting add*

MOLYCOATED BODY (F)

- *Add per inch of stroke*

NON-LUBE SERVICE (E)

- *Single acting add*
- *Double acting add*
- *DXDE add*

ROD WIPER (W)

(not available in standard single acting)

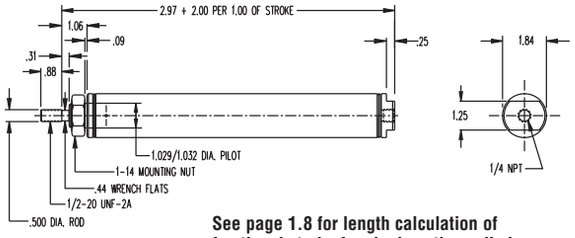
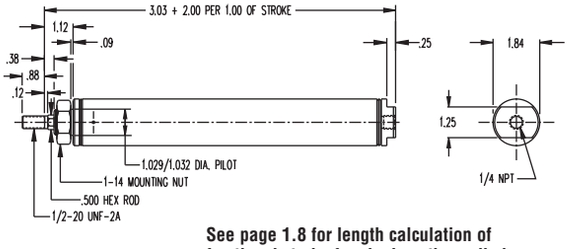
- *Add*
- *DXDE add*

STAINLESS STEEL ROD (prefix SR)

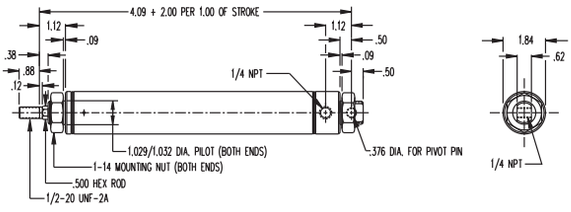
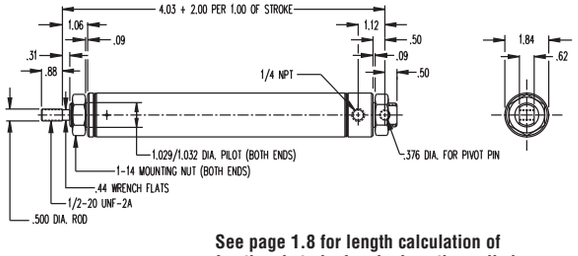
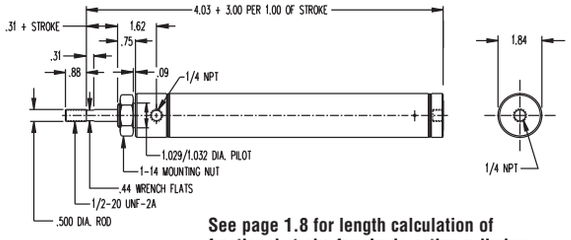
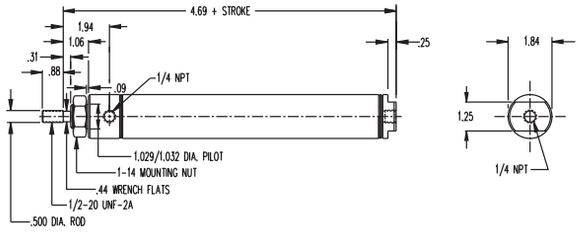
- *Add*
- *Standard on DXDE, DXDEH*

LOW PRESSURE HYDRAULIC (HL)

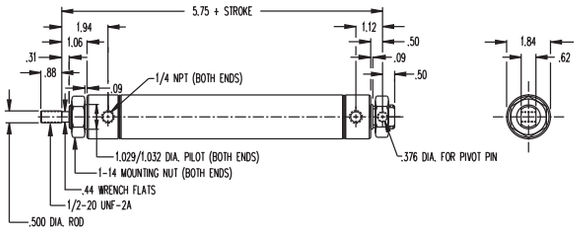
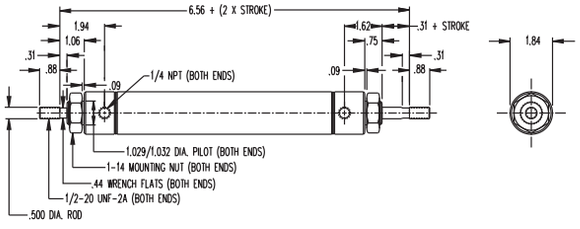
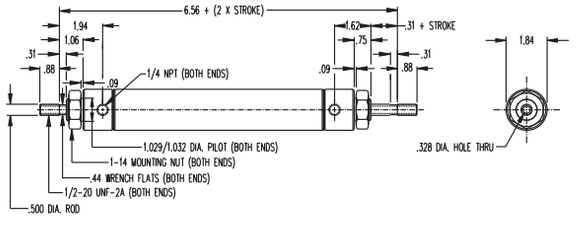
- *250 psi maximum*
- *Double acting models only*
- *Option specified as a prefix*
- *Add*

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
24☐ 	***Single Acting** – Spring Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessory:* C-1337 Mounting Bracket *Base Weight: .85* *Adder Per Inch of Stroke: .36*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
24☐-NR 	***Single Acting** – Non-rotating Hexagon Rod – Spring Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessory:* C-1337 Mounting Bracket *Base Weight: .86* *Adder Per Inch of Stroke: .36*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**

1-3/4" Bore Air Cylinders

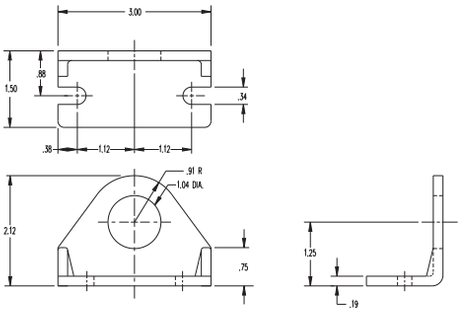
MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
24□-NRP 	***Single Acting*** *– Non-rotating Hexagon Rod – Pivot Type – Spring Return – Rear Pivot or Double End Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessories:* D-231-3 Piston Rod Clevis D-620-1 Pivot Brackets C-1337 Mounting Bracket *Base Weight: .86* *Adder Per Inch of Stroke: .36*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
24□-P 	***Single Acting*** *– Pivot Type – Spring Return – Rear Pivot or Double End Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessories:* D-231-3 Piston Rod Clevis D-620-1 Pivot Brackets C-1337 Mounting Bracket *Base Weight: .86* *Adder Per Inch of Stroke: .36*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
24□-R 	***Reverse Single Acting*** *– Pull Type – Rod Normally Extended – Spring Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 6" Optional Stainless Steel Rod *Optional Accessory:* C-1337 Mounting Bracket *Base Weight: 1.17* *Adder Per Inch of Stroke: .31*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
24□-D 	***Double Acting*** *– Air Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" Optional Stainless Steel Rod *Optional Accessory:* C-1337 Mounting Bracket *Base Weight: 1.29* *Adder Per Inch of Stroke: .11*	

1-3/4" Bore Air Cylinders

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
24□-DP 	***Double Acting** – Pivot Type – Air Return – Rear Pivot or Double End Mounting* ***Standard Stroke Lengths:*** ½", 1", 1½", 2", 2½", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 32" Optional Stainless Steel Rod ***Optional Accessories:*** D-231-3 Piston Rod Clevis D-620-1 Pivot Brackets C-1337 Mounting Bracket ***Base Weight: 1.64*** ***Adder Per Inch of Stroke: .11***	
24□-DXDE 	***Double Acting** – Double End Rod – Air Return – Double End Mounting* ***Standard Stroke Lengths:*** ½", 1", 1½", 2", 2½", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 12" Stainless Steel Rod Standard ***Optional Accessory:*** C-1337 Mounting Bracket ***Base Weight: 1.87*** ***Adder Per Inch of Stroke: .18***	
24□-DXDEH 	***Double Acting** – Double End Hollow Rod – Air Return – Double End Mounting* ***Standard Stroke Lengths:*** ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" Stainless Steel Rod Standard ***Optional Accessory:*** C-1337 Mounting Bracket ***Base Weight: 1.80*** ***Adder Per Inch of Stroke: .16***	

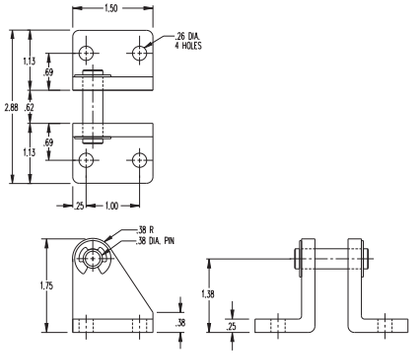
1-3/4" Bore Accessories

C-1337



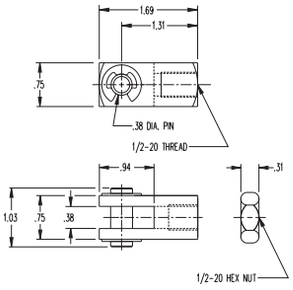
Mounting Bracket

D-620-1



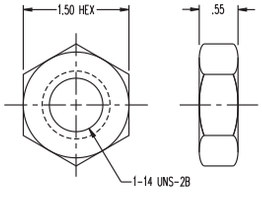
Pivot Brackets

D-231-3



Piston Rod Clevis

D-1331



Mounting Nut

2" Bore Air Cylinders

- Ground and Polished, High Strength Carbon Steel Piston Rod Standard – 303 Stainless Steel Rod Available as an Option – Bronze Rod Guide Bushing Standard
- Force Exerted Approximately 3.1 of Air Line Pressure
- Enclosed Spring Force: 15 lbs. Relaxed – 30 lbs. Compressed
- Mounting Nuts Not Included

OPTIONS:

NO CHARGE:

- ***MAGNALUBE G (G)***
- ***PORTS ROTATED (K)***
- ***NO THREAD (NT)***
- ***SIDE PORTED REAR HEAD (Q)***
  Add .38" to nose mount overall length.

SINGLE AND REVERSE ACTING BUMPERS (B)

- *additional*
- *Add .125" to overall length*

DOUBLE ACTING BUMPERS (B)

- *additional*
- *Add .250 to overall length*

EXTRA EXTENSION (EE)

- *Single, reverse and double acting, add per inch of extension*
- *DXDE, add per inch of extension; extension added to each end*

DOUBLE ACTING FAILSAFE
(JS = Spring Return, JR = Spring Extend)

- *Add to base price + to stroke adder*
- *See page 1.65 for overall length adders*

OPTIONS continued...

MAGNET (prefix M) – Add

- *Single and reverse acting add .125" to overall length,*
- *Stainless steel rod becomes standard with this option*
- *Must specify track(s) for use with miniature position sensing (T2, T3, T4) – add per track. See page 1.9 for track location details. See Position Sensing Solutions, page 8.3 for switch selection information.*

LOW TEMPERATURE (N)
Temperature Range: -40° to 200ºF

- *Single acting add*
- *Reverse acting add*
- *Double acting add*
- *DXDE add*

HIGH TEMPERATURE "U" CUPS (V)
Temperature Range: 0° to 400ºF (-18° to 205ºC)

- *Single acting add*
- *Double acting add*
- *DXDE add*
- *Reverse acting add*

MOLYCOATED BODY (F)

- *Add per inch of stroke*

NON-LUBE SERVICE (E)

- *Single acting add*
- *Double acting add*
- *DXDE add*

ROD WIPER (W)
(not available in standard single acting)

- *Add*
- *DXDE add*

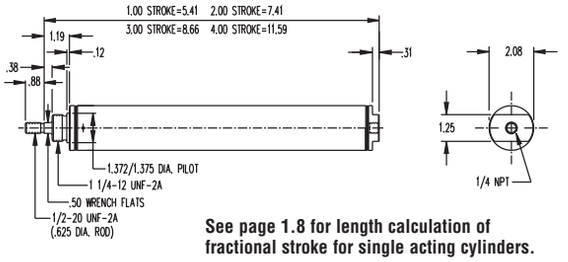
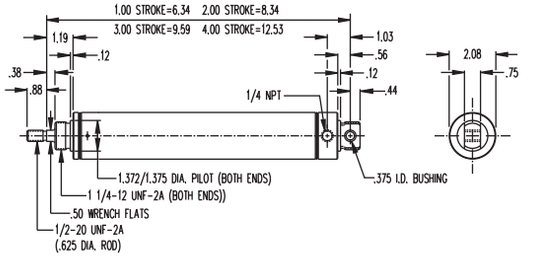
STAINLESS STEEL ROD (prefix SR)

- *Add*
- *Standard on DXP, DXDE, XP, M option*

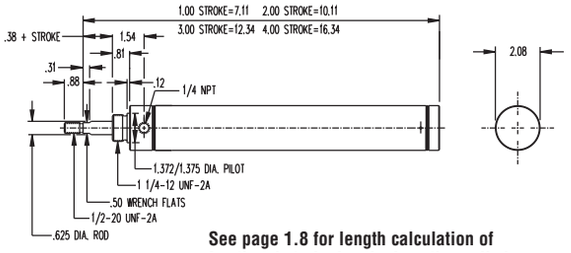
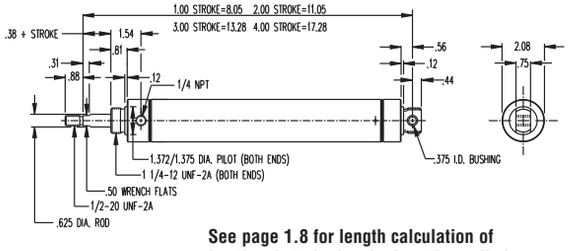
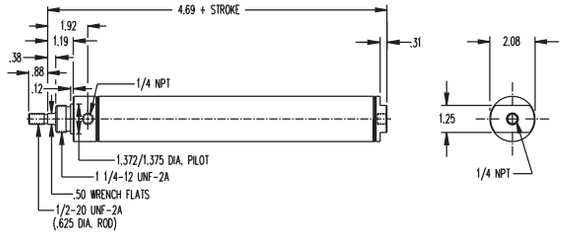
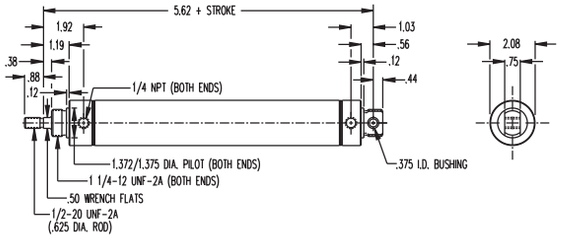
LOW PRESSURE HYDRAULIC (HL)

- *250 psi maximum*
- *Double acting models only*
- *Option specified as a prefix*
- *Add*

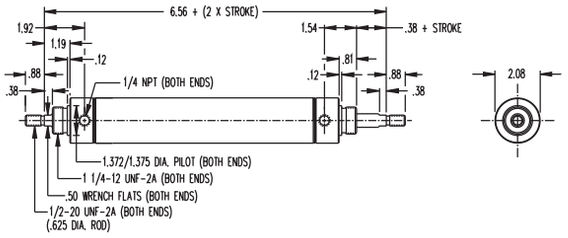
☐ Enter Stroke Length as 3rd Digit

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
31☐ 	***Single Acting** – Spring Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 4" Optional Stainless Steel Rod *Optional Accessories:* D-615 Mounting Bracket D-508 Mounting Nut *Base Weight: 1.04* *Adder Per Inch of Stroke: .43*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
31☐-XP 	***Single Acting** – Universal Mounting Type – Nose, Pivot or Double End – Spring Return – Bronze Rod Bushing and Bronze Pivot Bushing* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 4" Stainless Steel Rod Standard *Optional Accessories:* D-231-3 Piston Rod Clevis D-615 Mounting Bracket D-620 Pivot Brackets D-508 Mounting Nut *Base Weight: 1.26* *Adder Per Inch of Stroke: .43*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**

2" Bore Air Cylinders

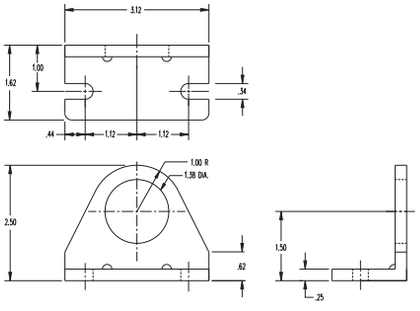
MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
31□-R 	***Reverse Single Acting*** *– Pull Type – Rod Normally Extended – Spring Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 4" Optional Stainless Steel Rod *Optional Accessories:* D-615 Mounting Bracket D-508 Mounting Nut *Base Weight: 1.24* *Adder Per Inch of Stroke: .43*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
31□-RP 	***Reverse Single Acting*** *– Pivot and Pull Type – Rod Normally Extended – Spring Return – Rear Pivot Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke – 4" Optional Stainless Steel Rod *Optional Accessories:* D-231-3 Piston Rod Clevis D-620 Pivot Bracket D-508 Mounting Nut D-615 Mounting Bracket *Base Weight: 1.46* *Adder Per Inch of Stroke: .43*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
31□-D 	***Double Acting*** *– Air Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" Optional Stainless Steel Rod *Optional Accessories:* D-508 Mounting Nut D-615 Mounting Bracket *Base Weight: 1.40* *Adder Per Inch of Stroke: .15*	
31□-DXP 	***Double Acting*** *– Universal Mounting Type – Pivot or Double End – Air Return – Bronze Pivot Bushing* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12", 13", 14", 15", 16", 17", 18", 19", 20", 21", 22", 23", 24" Maximum Stroke – 32" Stainless Steel Rod Standard *Optional Accessories:* D-231-3 Piston Rod Clevis D-615 Mounting Bracket D-620 Pivot Brackets D-508 Mounting Nut *Base Weight: 1.62* *Adder Per Inch of Stroke: .15*	

2" Bore Air Cylinders

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
31□-DXDE 	***Double Acting*** *– Double End Rod – Air Return – Double End Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 12" Stainless Steel Rod Standard *Optional Accessories:* D-615 Mounting Bracket D-508 Mounting Nut *Base Weight: 1.97* *Adder Per Inch of Stroke: .24*	

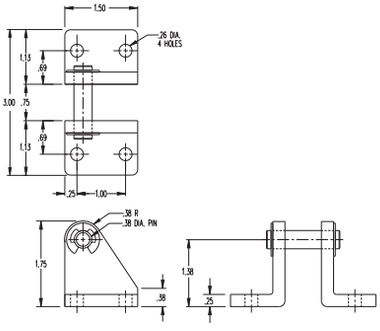
2" Bore Accessories

D-615



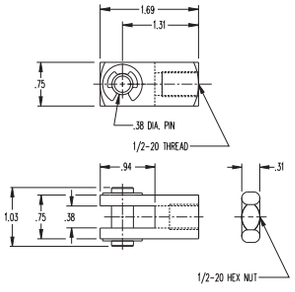
Mounting Bracket

D-620



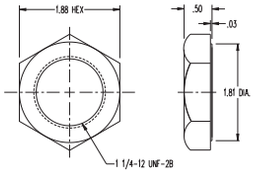
Pivot Brackets

D-231-3



Piston Rod Clevis

D-508



Mounting Nut

Note: *For stainless steel accessories see page 1.99 and 1.102-1.103.*

2-1/2" Bore Air Cylinders

- Ground and Polished, High Strength Carbon Steel Piston Rod Standard – 303 Stainless Steel Rod Available as an Option – Bronze Rod Guide Bushing Standard
- Force Exerted Approximately 5.0 of Air Line Pressure
- Double Acting Only
- Mounting Nuts Not Included

OPTIONS:

NO CHARGE:

- ***MAGNALUBE G (G)***
- ***PORTS ROTATED (K)***
- ***NO THREAD (NT)***
- ***SIDE PORTED REAR HEAD (Q)***
  Add .38" to nose mount overall length.

DOUBLE ACTING BUMPERS (B)

- *additional*
- *Add .250 to overall length*

EXTRA EXTENSION (EE)

- *Double acting, add per inch of extension*
- *DXDE, add . per inch of extension; extension added to each end*

☐ Enter Stroke Length as 3rd Digit

OPTIONS continued...

MAGNET (prefix M) – Add

- *Stainless steel rod becomes standard with this option*
- *Must specify track(s) for use with miniature position sensing (T2, T3, T4) – add per track. See page 1.9 for track location details. See Position Sensing Solutions, page 8.3 for switch selection information.*

LOW TEMPERATURE (N)
Temperature Range: -40° to 200ºF

- *Double acting add*
- *DXDE add*

HIGH TEMPERATURE "U" CUPS (V)
Temperature Range: 0° to 400ºF (-18° to 205ºC)

- *Double acting add*
- *DXDE add*

MOLYCOATED BODY (F)

- *Add per inch of stroke*

NON-LUBE SERVICE (E)

- *Double acting add*
- *DXDE add*

ROD WIPER (W)
(not available in standard single acting)

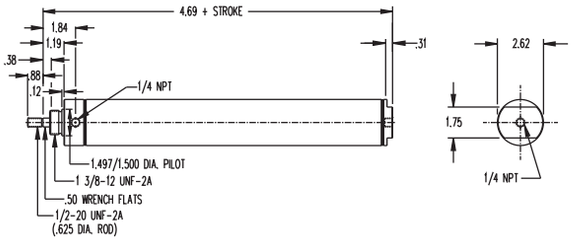
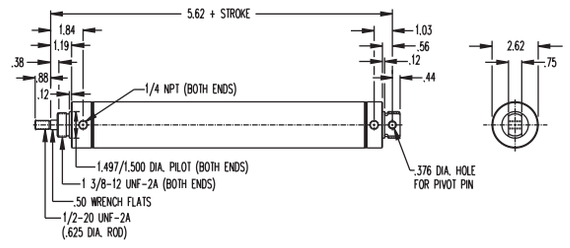
- *Add*
- *DXDE add*

STAINLESS STEEL ROD (prefix SR)

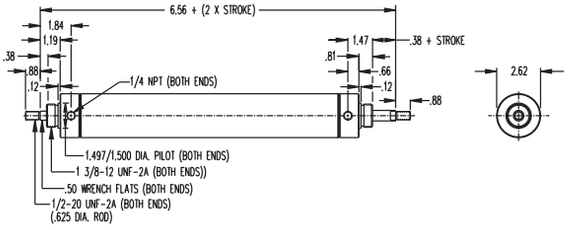
- *Add*
- *Standard on M option, DXP, DXDE*

LOW PRESSURE HYDRAULIC (HL)

- *250 psi maximum*
- *Double acting models only*
- *Option specified as a prefix*
- *Add*

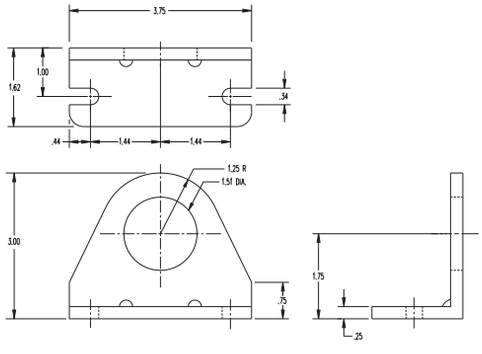
MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
50☐-D 	***Double Acting** – Air Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" Optional Stainless Steel Rod *Optional Accessories:* D-615-1 Mounting Bracket D-2540 Mounting Nut *Base Weight: 1.98* *Adder Per Inch of Stroke: .17*	
50☐-DXP 	***Double Acting** – Universal Mounting Type – Pivot or Double End – Air Return – Bronze Rod Bushing and Bronze Pivot Bushing* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12", 13", 14", 15", 16", 17", 18", 19", 20", 21", 22", 23", 24" Maximum Stroke – 32" Stainless Steel Rod Standard *Optional Accessories:* D-231-3 Piston Rod Clevis D-615-1 Mounting Bracket D-620 Pivot Brackets D-2540 Mounting Nut *Base Weight: 2.27* *Adder Per Inch of Stroke: .17*	

2-1/2" Bore Air Cylinders

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
50□-DXDE 	***Double Acting*** *– Double End Rod – Air Return – Double End Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 12" Stainless Steel Rod Standard *Optional Accessories:* D-615-1 Mounting Bracket D-2540 Mounting Nut *Base Weight: 2.32* *Adder Per Inch of Stroke: .34*	

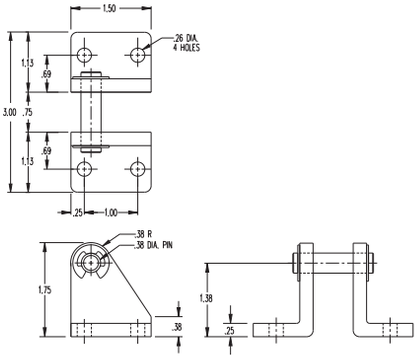
2-1/2" Bore Accessories

D-615-1



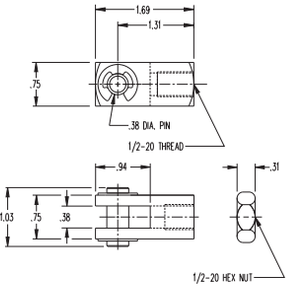
Mounting Bracket

D-620



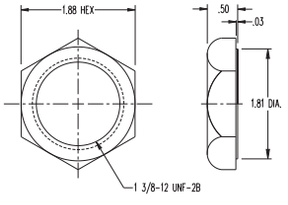
Pivot Brackets

D-231-3



Piston Rod Clevis

D-2540



Mounting Nut

3" Bore Air Cylinders

- Ground and Polished, High Strength Carbon Steel Piston Rod Standard – 303 Stainless Steel Rod Available as an Option – Bronze Rod Guide Bushing Standard
- Force Exerted Approximately 7.0 of Air Line Pressure
- Double Acting Only
- Mounting Nuts Not Included

OPTIONS:

NO CHARGE:

- ***MAGNALUBE G (G)***
- ***PORTS ROTATED (K)***
- ***NO THREAD (NT)***
- ***SIDE PORTED REAR HEAD (Q)***
  Add .44" to nose mount overall length.

DOUBLE ACTING BUMPERS (B)

- *additional*
- *Add .250 to the length*

EXTRA EXTENSION (EE)

- *Double acting, add per inch of extension*
- *DXDE, add per inch of extension; extension added to each end*

☐ Enter Stroke Length as 3rd Digit

OPTIONS continued...

MAGNET (prefix M) – Add

- *Stainless steel rod becomes standard with this option*
- *Must specify track(s) for use with miniature position sensing (T2, T3, T4) – add per track. See page 1.9 for track location details. See Position Sensing Solutions, page 8.3 for switch selection information.*

LOW TEMPERATURE (N)
Temperature Range: -40° to 200ºF

- *Double acting add*
- *DXDE add*

HIGH TEMPERATURE "U" CUPS (V)
Temperature Range: 0° to 400ºF (-18° to 205ºC)

- *Double acting add*
- *DXDE add*

MOLYCOATED BODY (F)

- *Add per inch of stroke*

NON-LUBE SERVICE (E)

- *Double acting add*
- *DXDE add*

ROD WIPER (W)
(not available in standard single acting)

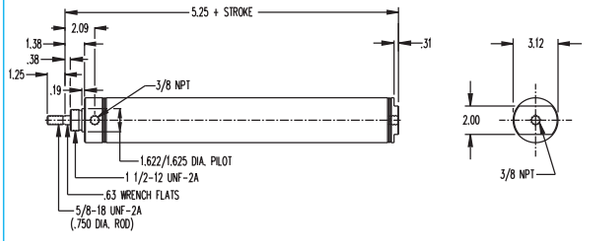
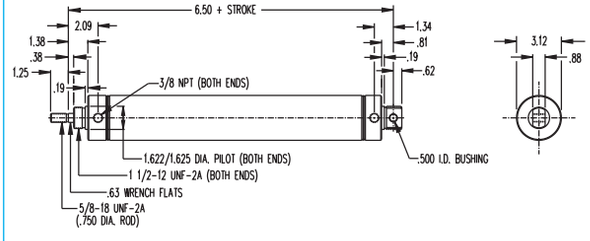
- *Add*
- *DXDE add*

STAINLESS STEEL ROD (prefix SR)

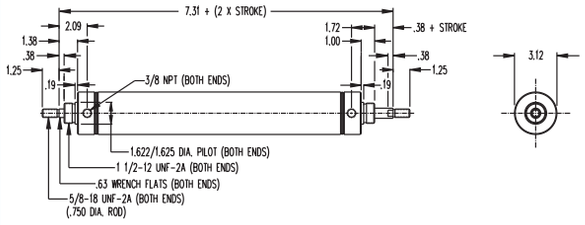
- *Add*
- *Standard on DXP, DXDE, and M option*

LOW PRESSURE HYDRAULIC (HL)

- *250 psi maximum*
- *Double acting models only*
- *Option specified as a prefix*
- *Add*

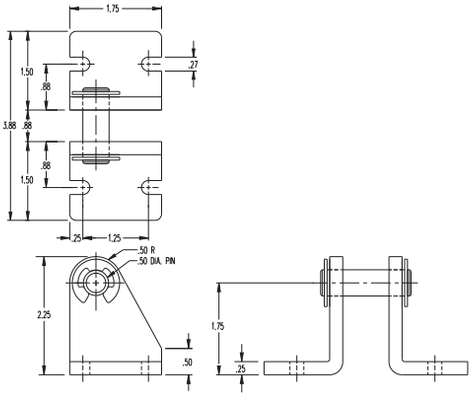
MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
70☐-D 	***Double Acting** – Air Return – Front Nose Mounting* ***Standard Stroke Lengths:*** ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" Carbon Steel Piston Rod Standard Optional Stainless Steel Rod ***Optional Accessories:*** D-19127 Mounting Bracket D-5379 Mounting Nut ***Base Weight: 3.34*** ***Adder Per Inch of Stroke: .26***	
70☐-DXP 	***Double Acting** – Universal Mount Pivot or Double End Mounting* ***Standard Stroke Lengths:*** ½", 1", 1½", 2", 2½", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12", 13", 14", 15", 16", 17", 18", 19", 20", 21", 22", 23", 24" Maximum Stroke – 32" Stainless Steel Rod Standard ***Optional Accessories:*** D-13512-A Pivot Bracket D-19127 Mounting Bracket D-8314-A Rod Clevis D-5379 Mounting Nut ***Base Weight: 3.87*** ***Adder Per Inch of Stroke: .26***	

3" Bore Air Cylinders

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
70□-DXDE 	***Double Acting*** *– Double End Rod – Double End Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 12" Stainless Steel Rod Standard *Optional Accessories:* D-19127 Mounting Bracket D-5379 Mounting Nut *Base Weight: 4.05* *Adder Per Inch of Stroke: .52*	

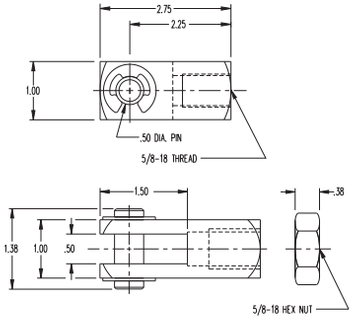
3" Bore Accessories

D-13512-A



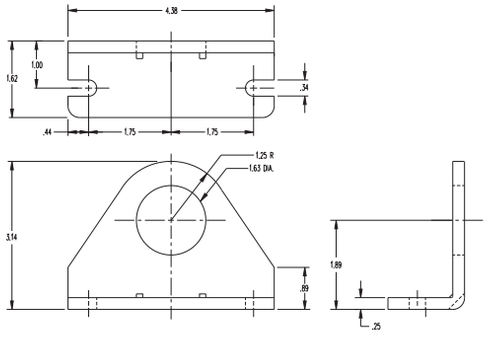
Pivot Bracket

D-8314-A



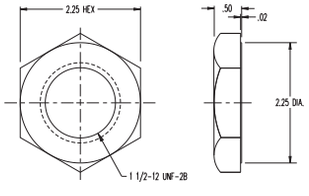
Rod Clevis

D-19127



Mounting Bracket

D-5379



Mounting Nut

Fail Safe Length Adders (Options JS and JR)

Spring Extend Length Adder

Bore	Type	Overall Length Adder for -JR Option
5/16"	0070-D	1.65 + 1.25 per 0.50" of stroke
	0070-DXP	2.19 + 1.25 per 0.50" of stroke
	BF-0070-D	1.71 + 1.25 per 0.50" of stroke
7/16"	010-D, BF-010-D & BFT-010-D	2.17 + 1.44 per 0.50" of stroke
	010-DP & 010-DX	2.86 + 1.44 per 0.50" of stroke
	BR-010-D & BRT-010-D	3.36 + 1.44 per 0.50" of stroke
9/16"	020-D	2.34 + 2.63 per 1" of stroke
	020-DXP	2.81 + 2.63 per 1" of stroke
3/4"	040-D	3.03 + 2.69 per 1" of stroke
	040-DP, 040-DXP, BR-040-D & BRT-040-D	3.81 + 2.69 per 1" of stroke
	BF-040-D & BFT-040-D	3.28 + 2.69 per 1" of stroke
7/8"	060-D	3.19 (3.60 High Temp.) + 2.56 per 1" of stroke
	060-DXP	4.10 (4.50 High Temp.) + 2.56 per 1" of stroke
1-1/16"	090-D	3.38 (3.5) + 2.56 per 1" of stroke
	090-DP, 090-DX	4.38 + 2.56 per 1" of stroke
	BF-090-D, BFT-090-D	4.25 + 2.56 per 1" of stroke
	BR-090-D, BRT-090-D	4.50 + 2.56 per 1" of stroke
1-1/4"	120-D	4.38 (4.25) + 2.81 per 1" of stroke
	120-DP	5.50 (5.44) + 2.81 per 1" of stroke
1-1/2"	170-D	3.75 + 2.69 per 1" of stroke
	170-DP	4.81 + 2.69 per 1" of stroke
	170-DX	4.56 + 2.69 per 1" of stroke
	BF-170-D, BFT-170-D	4.25 + 2.69 per 1" of stroke
	BR-170-D, BRT-170-D	4.44 + 2.69 per 1" of stroke
1-3/4"	240-D	5.12 (4.99 High Temp.) = 3" per 1" of stroke
	240-DP	6.68 (6.56 High Temp.) = 3" per 1" of stroke

Spring Return Length Adder

Bore	Type	Overall Length Adder for -JS Option
5/16"	0070-D	1.65 + 0.75 per 0.50" of stroke
	0070-DXP	2.19 + 0.75 per 0.50" of stroke
	BF-0070-D	1.71 + 0.75 per 0.50" of stroke
7/16"	010-D, BF-010-D & BFT-010-D	2.17 + 0.94 per 0.50" of stroke
	010-DP & 010-DX	2.86 + 0.94 per 0.50" of stroke
	BR-010-D & BRT-010-D	3.36 + 1.44 per 0.50" of stroke
	010-DXDE	2.86 + 1.44 per 0.50" of stroke
9/16"	020-D	2.34 + 1.63 per 1" of stroke
	020-DXP	2.84 + 1.63 per 1" of stroke
	020-DXDE	3.00 + 2.63 per 1" of stroke
3/4"	040-D	3.03 + 1.69 per 1" of stroke
	040-DP, 040-DXP, BR-040-D & BRT-040-D	3.81 + 1.69 per 1" of stroke
	BF-040-D & BFT-040-D	3.28 + 1.69 per 1" of stroke
	040-DXDE	4.06 + 2.69 per 1" of stroke
7/8"	060-D	3.19 (3.60 High Temp.) + 1.56 per 1" of stroke
	060-DXP	4.10 (4.50 High Temp.) + 1.56 per 1" of stroke
	060-DXDE	4.16 (5.03 High Temp.) + 2.56 per 1" of stroke
1-1/16"	090-D	3.38 (3.50) + 1.56 per 1" of stroke
	090-DP, 090-DX	4.38 + 1.56 per 1" of stroke
	BF-090-D, BFT-090-D	4.25 + 1.56 per 1" of stroke
	BR-090-D, BRT-090-D	4.50 + 1.56 per 1" of stroke
	090-DXDE	4.25 + 2.56 per 1" of stroke
1-1/4"	120-D	4.38 (4.25 High Temp.) + 1.81 per 1" of stroke
	120-DP	5.50 (5.44 High Temp.) + 1.81 per 1" of stroke
	120-DXDE	5.94 (5.81 High Temp.) + 2.81 per 1" of stroke
1-1/2"	170-D	3.75 + 1.69 per 1" of stroke
	170-DP	4.81 + 1.69 per 1" of stroke
	170-DX	4.56 + 1.69 per 1" of stroke
	BF-170-D, BFT-170-D	4.25 + 1.69 per 1" of stroke
	BR-170-D, BRT-170-D	4.44 + 1.69 per 1" of stroke
	170-DXDE	4.19 + 2.69 per 1" of stroke
1-3/4"	240-D	5.12 (4.99 High Temp.) = 2" per 1" of stroke
	240-DP	6.68 (6.56 High Temp.) = 2" per 1" of stroke
	240-DXDE	7.25 (6.86 High Temp.) = 3" per 1" of stroke

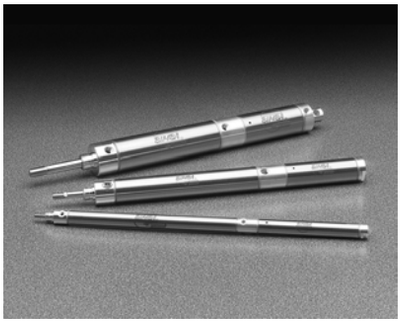
Spring Return Length Adder for 2" Bore

Bore	Type	Stroke			
		1"	2"	3"	4"
2"	310-D, 310-DP	5.94 + stroke	6.94 + stroke	7.19 + stroke	9.13 + stroke
	310-DXP	7.32 + stroke	8.32 + stroke	8.57 + stroke	10.51 + stroke
	310-DXDE	7.81 + 2 x stroke	8.81 + 2 x stroke	9.06 + 2 x stroke	11.00 + 2 x stroke

Spring Extend Length Adder for 2" Bore

Bore	Type	Stroke			
		1"	2"	3"	4"
2"	310-D, 310-DP	5.94 + 2 x stroke	6.94 + 2 x stroke	7.19 + 2 x stroke	9.13 + 2 x stroke
	310-DXP	7.32 + 2 x stroke	8.32 + 2 x stroke	8.57 + 2 x stroke	10.51 + 2 x stroke

Three-Position Original Line Cylinders



Bimba's Three-Position Original Line stainless steel body cylinder provides three positions with a single cylinder. Bimba offers the performance and quality of the unitized Original Line cylinder design along with it's product breadth now in three positive stroke positions.

How to Order

The model number for all Three-Position Original Line cylinders consists of three alphanumeric clusters. These designate product type, bore size and stroke length, and options. Please refer to the charts below for an example of model number M-043/4.5-DW. This is a 3/4" bore, with a 3" stroke for position A, plus an additional 4-1/2" stroke for position B, double acting cylinder with a rod wiper.

Product Type	Bore Sizes	Stroke A	Stroke B	Standard Stroke Lengths and Stroke Maximums
Blank – Three-position Original Line M – Magnet option for cylinders* NR – Non-rotating rod option	02 – 9/16" 04 – 3/4" 09 – 1-1/16" 17 – 1-1/2" 31 – 2"	0.5 = 1/2" 1 = 1" 1.5 = 1-1/2" 3.75 = 3-3/4" etc.	0.5 = 1/2" 1" = 1" 2.5 = 2-1/2" 3.75 = 3-3/4" etc.	Nose Mount 1" increments to 12" 2 x Stroke A + Stroke B Maximum = 12" Universal Mount 1" increments to 24" 2 x Stroke A + Stroke B Maximum = 32"

*Magnet located on stroke B piston only.

M - 043 / 4.5 - D W

Mounting Options
D – Double acting, nose mount DXP – Double acting, universal mount

Options
(Enter in alphabetical order, except EE which is last) B – Bumpers E – Non-lube seals and lubrication F – Molycoated body G – Magnalube® G K – Ports rotated 90 degrees N – Low temperature seals & lubrication NT – Non-threaded rod Q – Side ported rear head (see standard Original Line information for applicable length adders by bore size) T – Switch Track (T2, T3 or T4), see Position Sensing Solutions, page 8.3 for switch selection information V – High temperature seals & lubrication W – Rod wiper EEX.XX – Extra rod extension

Note: Consult page 1.4 for option combination compatibility.

Specifications

Expected life:	1400 miles when lubricated
Total stroke tolerance:	
9/16" – 1-1/2"	+.075/-.040
2":	+.095/-.060
Operating Medium:	Air only
Maximum Operating Pressure:	250 psi
Temperature Range:	-20˚F to 200˚F
Standard Lubrication:	HT-99
Endcaps, center section, and piston material:	Aluminum
Cylinder body:	304 stainless steel
Piston and rod seals:	Buna N "U" cups
Rod and pivot bushings:	Sintered bronze
Piston rod:	303 stainless steel

® Magnalube is a registered trademark of Carleton Stuart Corporation

List Prices

Bore	Mounting		Total
	Mounting-D List Price	-DXP List Price	combined stroke adder, per inch**
02 - 9/16"			
04 - 3/4"			
09 - 1-1/16"			
17 - 1-1/2"			
31 - 2"			

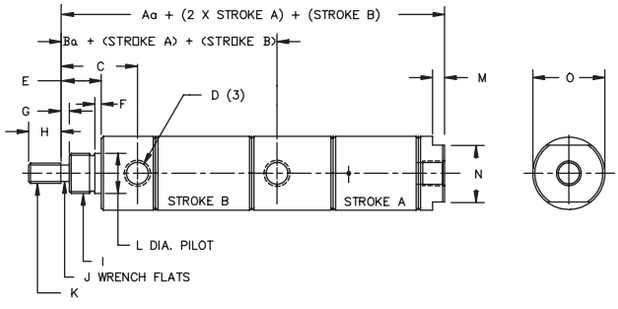
**Total combined stroke = (2 X stroke A) + Stroke B

Bore	Options								
	M (Prefix) Magnetic Position Sensing	B Bumpers	E Non-lube Seals and Lubrication	F Molycoated Body per inch	N Low Temperature Seals	V High Temperature Seals and Lubrication	W Rod Wiper	EE Extra Rod Extension per inch	NR Prefix Non-rotating rod
9/16" (02)									
3/4" (04)									
1-1/16" (09)									
1-1/2" (17)									.
2" (31)									

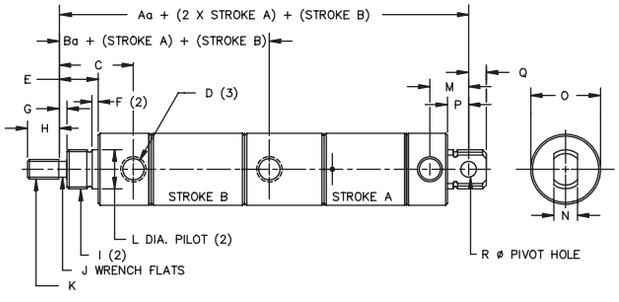
No Charge Options: G, K, NT

Dimensions

D Mounting Style (in.)



DXP Mounting Style (in.)



D Model																Bumper Option	
Bore	Aa	Ba	C	D	E	F	G	H	I	J	K	L	M	N	O	Aa	Ba
9/16" (02)	4.12	2.25	0.75	#10-32	0.38	0.06	N/A	0.50	7/16-20	N/A	#10-32	.434/.437	0.19	0.50	0.62	4.31	2.31
3/4" (04)	5.47	3.12	0.97	1/8 NPT	0.50	0.09	N/A	0.50	5/8-18	N/A	1/4-28	.621/.624	0.19	0.62	0.81	5.47	3.12
1-1/16" (09)	5.97	3.25	1.19	1/8 NPT	0.62	0.09	0.12	0.50	5/8-18	0.25	5/16-24	.621/.624	0.49	0.88	1.12	6.09	3.25
1-1/2" (17)	6.5	3.69	1.50	1/8 NPT	0.88	0.09	0.25	0.75	3/4-16	0.38	7/16-20	.746/.749	0.25	0.88	1.56	6.62	3.69
2" (31)	8.25	4.78	1.92	1/4 NPT	1.19	0.12	0.38	0.88	1-1/4-12	0.50	1/2-20	1.375/1.372	0.31	1.25	2.09	8.62	4.91

DXP Model																			Bumper Option	
Bore	Aa	Ba	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	Aa	Ba
9/16" (02)	4.41	2.25	0.75	#10-32	0.38	0.06	N/A	0.50	7/16-20	N/A	#10-32	.434/.437	0.38	0.31	0.62	0.25	0.19	0.157	4.66	2.31
3/4" (04)	6.25	3.12	0.97	1/8 NPT	0.50	0.09	N/A	0.50	5/8-18	N/A	1/4-28	.621/.624	0.62	0.38	0.86	0.34	0.28	0.250	6.25	3.12
1-1/16" (09)	6.56	3.25	1.19	1/8 NPT	0.62	0.09	0.12	0.50	5/8-18	0.25	5/16-24	.621/.624	0.62	0.38	1.12	0.34	0.28	0.250	6.68	3.25
1-1/2" (17)	7.18	3.69	1.50	1/8 NPT	0.63	0.09	0.25	0.75	3/4-16	0.38	7/16-20	.746/.749	0.81	0.62	1.56	0.50	0.38	0.375	7.31	3.69
2" (31)	9.19	4.78	1.92	1/4 NPT	1.19	0.12	0.38	0.88	1-1/4-12	0.50	1/2-20	1.375/1.372	1.03	0.75	2.08	0.56	0.44	0.375	9.56	4.91

Air Cylinders with Adjustable Cushions*

- Readily Accessible Cushion Needle For Easy Adjustment
- Double Acting Models
- Rated 250 PSI
- 304 Stainless Steel Body – Mirror Finish I.D.
- High Strength Aluminum Alloy Porting Ends
- Ground and Roller Burnished 303 Stainless Steel Piston Rod Standard
- Buna N "U" Cup Seals
- Low Breakaway Friction – Less Than 5 PSI
- Special Stroke Lengths Available on Request

OPTIONS FOR EACH BORE SIZE:

NO CHARGE:

- ***MAGNALUBE G (G)***
- ***NO THREAD (NT)***
  (Available on ¾", 1⅛" and 1½" bores)
- ***PIVOT BUSHING (Y)***
  .250" ID

EXTRA EXTENSION (EE)

- *Double acting, per inch of extension:*
  ¾" Bore, add
  1⅛" Bore, add
  1½" Bore, add
  2" Bore, add
  2½" Bore, add
  3" Bore, add

HIGH TEMPERATURE SEALS (V)

	Double Acting	DXDE
04 Bore		
09 Bore		
17 Bore		
31 Bore		
50 Bore		
70 Bore	$39.00	$45.90

OPTIONS FOR EACH BORE SIZE: continued...

EXTRA EXTENSION (EE)

- *DXDE, per inch of extension:*
  (added to each end)
  ¾" Bore, add
  1⅛" Bore, add
  1½" Bore, add
  2" Bore, add
  2½" Bore, add
  3" Bore, add

PORTS ROTATED (K)*
(Rotates ports and cushion screw location 90° clockwise)

MAGNETIC PISTON (prefix M)
¾" Bore, add
1⅛" Bore, add
1½" Bore, add
2" Bore, add
2½" Bore, add
3" Bore, add

***MINI SWITCH TRACKS** on all bore sizes*
Must specify track(s) for use with Bimba's miniature position sensing (T2, T3, T4 – Add per track. See page 1.9 for track location details. See Position Sensing Solutions, page 8.3 for switch selection information.

***ROD WIPER (W)** (Available on ¾", 1⅛" and 1½" bores)*

- *Double acting, add*
- *DXDE add*

MOLYCOATED BODY (F)

- *Add per inch of stroke*

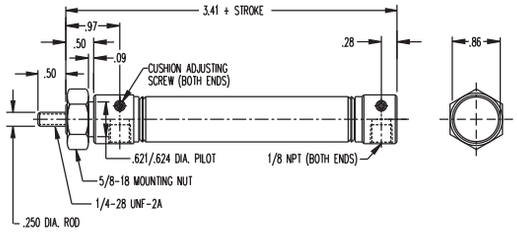
NON-LUBE SERVICE (E)
See corresponding standard Original Line bore size catalog page for pricing.

**Consult local distributor for pricing.*

• **Cylinders** *are supplied with adjustable cushions on both ends. To order cushion on one end only, specify CF (front head cushion only), or CR (rear head cushion only), or CS (one end only) and deduct from base price as shown.*
(ex: ¾" bore, cushion on front head only – CF-04☐-D;
¾" bore, cushion on rear head only – CR-04☐-D;
¾" DXDE model, cushion on one side only – CS-04-D).

☐ Enter Stroke Length as 3rd Digit

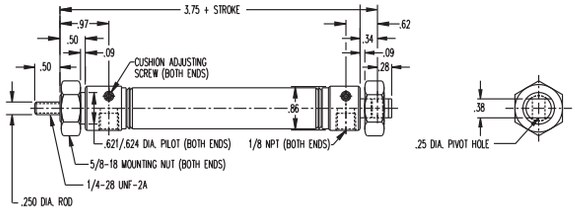
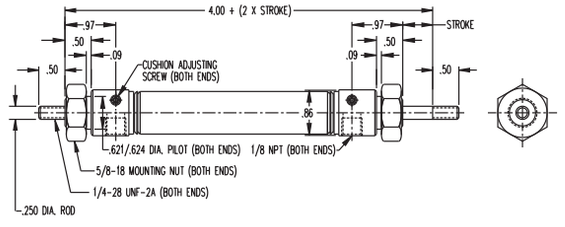
3/4" Bore Air Cylinders with Adjustable Cushions

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
C-04☐-D	***Double Acting** – Air Return – Front Nose Mounting* *Standard Stroke Lengths:* 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" Stainless Steel Rod Standard Optional Rod Wiper *Optional Accessory:* D-129 Mounting Bracket *Base Weight: .24* *Adder Per Inch of Stroke: .03*	

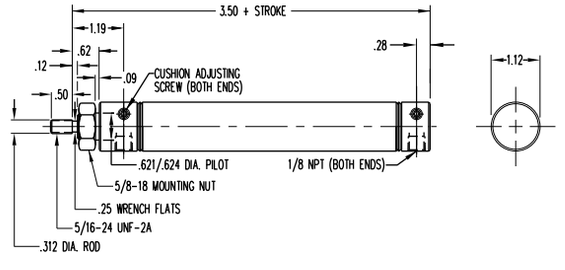
CF-04☐-D (Front only)
CR-04☐-D (Rear only)

**U.S. Patent nos. 4,794,681 and 4,862,786*

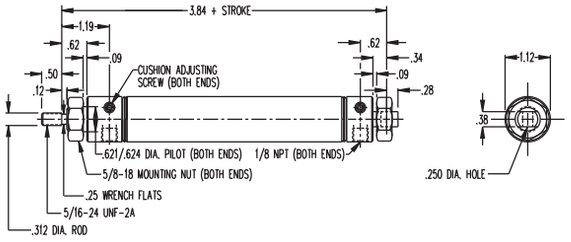
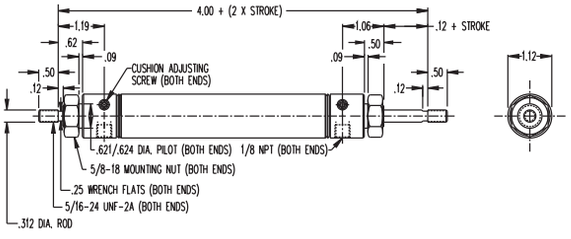
3/4" Bore Air Cylinders with Adjustable Cushions (continued)

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
C-04□-DXP  *CF-04□-DXP (Front only)* *CR-04□-DXP (Rear only)*	***Double Acting** – Double End or Rear Pivot Mounting – Air Return* ***Standard Stroke Lengths:*** 1", 1½", 2", 2½", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 32" Stainless Steel Rod Standard Optional Rod Wiper ***Optional Accessories:*** D-129 Mounting Bracket D-13498-A Pivot Bracket D-166-3 Piston Rod Clevis ***Base Weight: .29*** ***Adder Per Inch of Stroke: .03***	
C-04□-DXDE  *CS-04□-DXDE (One end only)*	***Double Acting** – Double End Rod – Air Return – Double End Mounting* ***Standard Stroke Lengths:*** 1", 2", 3", 4", 5", 6" Maximum Stroke – 12" Stainless Steel Rod Standard Optional Rod Wiper ***Optional Accessory:*** D-129 Mounting Bracket ***Base Weight: .30*** ***Adder Per Inch of Stroke: .06***	

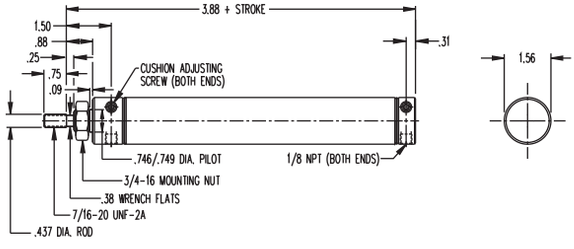
1-1/16" Bore Air Cylinders with Adjustable Cushions

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
C-09□-D  *CF-09□-D (Front only)* *CR-09□-D (Rear only)*	***Double Acting** – Air Return – Front Nose Mounting* ***Standard Stroke Lengths:*** 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" Stainless Steel Rod Standard Optional Rod Wiper ***Optional Accessory:*** D-129 Mounting Bracket ***Base Weight: .38*** ***Adder Per Inch of Stroke: .04***	

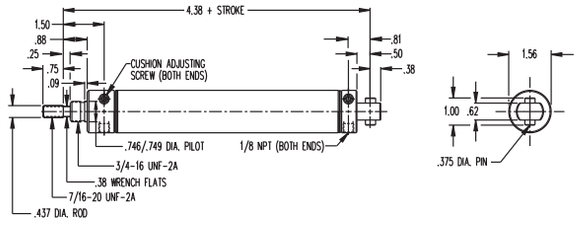
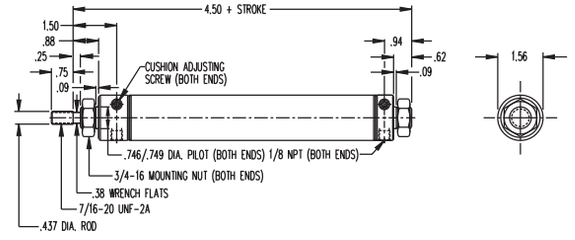
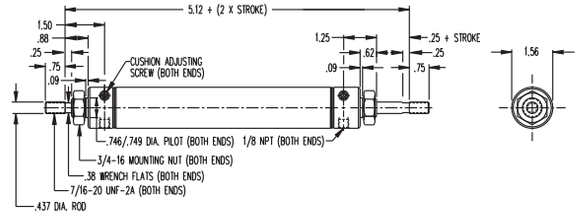
1-1/16" Bore Air Cylinders with Adjustable Cushions (continued)

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
C-09□-DXP  *CF-09□-DXP (Front only)* *CR-09□-DXP (Rear only)*	***Double Acting** – Universal Mounting Pivot, or Double End Mounting – Air Return* ***Standard Stroke Lengths:*** 1", 1½", 2", 2½", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 32" Stainless Steel Rod Standard Optional Rod Wiper ***Optional Accessories:*** D-13498-A Pivot Bracket D-129 Mounting Bracket D-166-1 Piston Rod Clevis ***Base Weight: .44*** ***Adder Per Inch of Stroke: .04***	
C-09□-DXDE  *CS-09□-DXDE (One end only)*	***Double Acting** – Double End Rod – Air Return – Double End Mounting* ***Standard Stroke Lengths:*** 1", 2", 3", 4", 5", 6" Maximum Stroke – 12" Stainless Steel Rod Standard Optional Rod Wiper ***Optional Accessory:*** D-129 Mounting Bracket ***Base Weight: .46*** ***Adder Per Inch of Stroke: .08***	

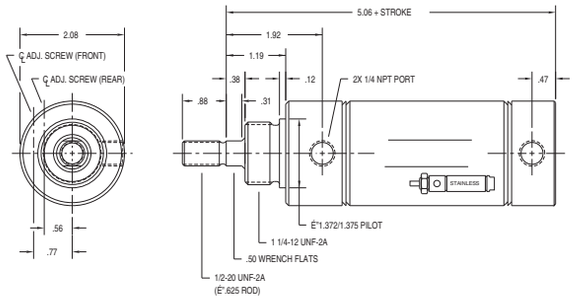
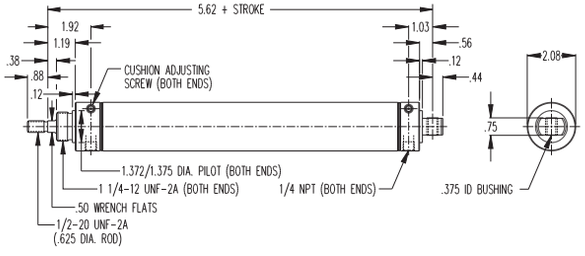
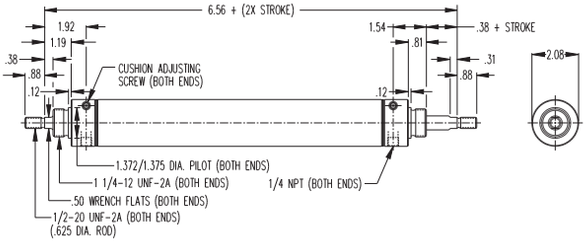
1-1/2" Bore Air Cylinders with Adjustable Cushions

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
C-17□-D  *CF-17□-D (Front only)* *CR-17□-D (Rear only)*	***Double Acting** – Air Return – Front Nose Mounting* ***Standard Stroke Lengths:*** 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" Stainless Steel Rod Standard Optional Rod Wiper ***Optional Accessory:*** D-241 Mounting Bracket ***Base Weight: .76*** ***Adder Per Inch of Stroke: .09***	

1-1/2" Bore Air Cylinders with Adjustable Cushions (continued)

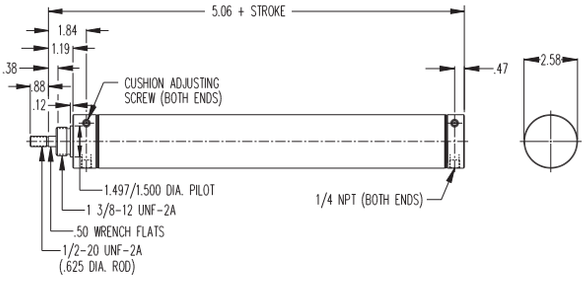
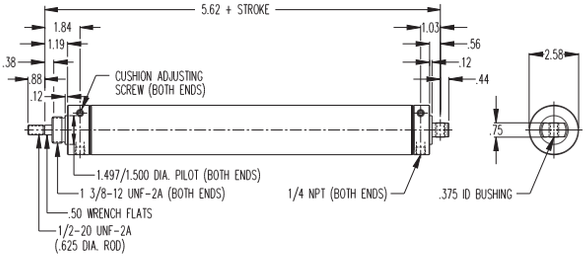
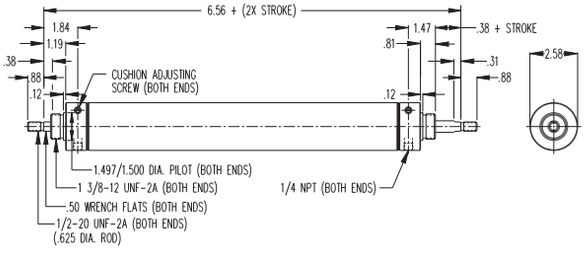
MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
C-17□-DP  *CF-17□-DP (Front only)* *CR-17□-DP (Rear only)*	***Double Acting** – Pivot Type – Air Return – Rear Pivot Mounting* ***Standard Stroke Lengths:*** 1", 1½", 2", 2½", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 32" Stainless Steel Rod Standard Optional Rod Wiper ***Optional Accessories:*** D-231-1 Piston Rod Clevis D-229 Pivot Brackets ***Base Weight: .77*** ***Adder Per Inch of Stroke: .09***	
C-17□-DX  *CF-17□-DX (Front only)* *CR-17□-DX (Rear only)*	***Double Acting** – Double End Mounting – Air Return* ***Standard Stroke Lengths:*** 1", 1½", 2", 2½", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 32" Stainless Steel Rod Standard Optional Rod Wiper ***Optional Accessory:*** D-241 Mounting Bracket ***Base Weight: .84*** ***Adder Per Inch of Stroke: .09***	
C-17□-DXDE  *CS-17□-DXDE (One end only)*	***Double Acting** – Double End Rod – Air Return – Double End Mounting* ***Standard Stroke Lengths:*** 1", 2", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 12" Stainless Steel Rod Standard Optional Rod Wiper ***Optional Accessory:*** D-241 Mounting Bracket ***Base Weight: .90*** ***Adder Per Inch of Stroke: .18***	

2" Bore Air Cylinders with Adjustable Cushions

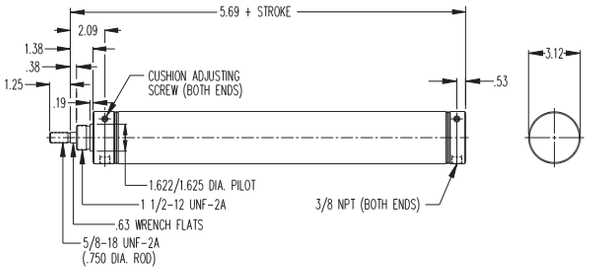
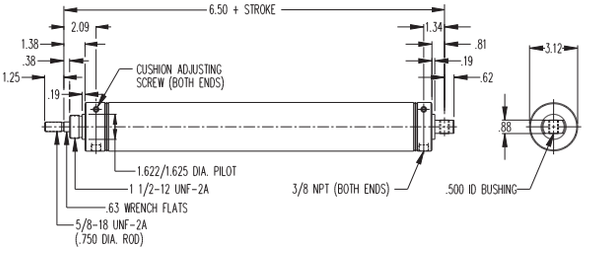
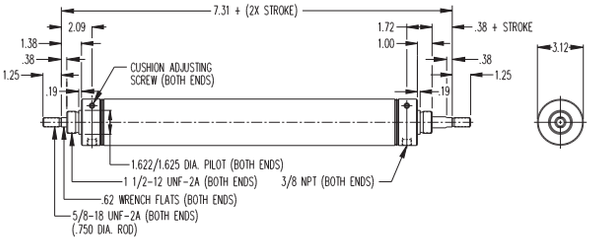
MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
C-31□-D  *CF-31□-D (Front only)* *CR-31□-D (Rear only)*	***Double Acting** – Air Return – Front Nose Mounting* ***Standard Stroke Lengths:*** 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" Stainless Steel Rod Standard ***Optional Accessories:*** D-615 Mounting Bracket D-508 Mounting Nut ***Base Weight: 1.64*** ***Adder Per Inch of Stroke: .15***	
C-31□-DXP  *CF-31□-DXP (Front only)* *CR-31□-DXP (Rear only)*	***Double Acting** – Double End or Rear Pivot Mounting – Air Return* ***Standard Stroke Lengths:*** 1", 1½", 2", 2½", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 32" Stainless Steel Rod Standard ***Optional Accessories:*** D-615 Mounting Bracket D-620 Pivot Bracket D-231-3 Piston Rod Clevis D-508 Mounting Nut ***Base Weight: 1.68*** ***Adder Per Inch of Stroke: .15***	
C-31□-DXDE  *CS-31□-DXDE (One end only)*	***Double Acting** – Double End Rod – Air Return – Double End Mounting* ***Standard Stroke Lengths:*** 1", 2", 3", 4", 5", 6" Maximum Stroke – 12" Stainless Steel Rod Standard ***Optional Accessories:*** D-615 Mounting Bracket D-508 Mounting Nut ***Base Weight: 1.99*** ***Adder Per Inch of Stroke: .24***	

**U.S. Patent nos. 4,794,681 and 4,862,786*

2-1/2" Bore Air Cylinders with Adjustable Cushions

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
C-50□-D  *CF-50□-D (Front only)* *CR-50□-D (Rear only)*	***Double Acting** – Air Return – Front Nose Mounting* ***Standard Stroke Lengths:*** 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" Stainless Steel Rod Standard ***Optional Accessories:*** D-615-1 Mounting Bracket D-2540 Mounting Nut ***Base Weight: 2.21*** ***Adder Per Inch of Stroke: .17***	
C-50□-DXP  *CF-50□-DXP (Front only)* *CR-50□-DXP (Rear only)*	***Double Acting** – Universal Mounting Pivot, or Double End Mounting – Air Return* ***Standard Stroke Lengths:*** 1", 1½", 2", 2½", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 32" Stainless Steel Rod Standard ***Optional Accessories:*** D-615-1 Mounting Bracket D-620 Pivot Bracket D-231-3 Piston Rod Clevis D-2540 Mounting Nut ***Base Weight: 2.33*** ***Adder Per Inch of Stroke: .17***	
C-50□-DXDE  *CS-50□-DXDE (One end only)*	***Double Acting** – Double End Rod – Air Return – Double End Mounting* ***Standard Stroke Lengths:*** 1", 2", 3", 4", 5", 6" Maximum Stroke – 12" Stainless Steel Rod Standard ***Optional Accessories:*** D-615-1 Mounting Bracket D-2540 Mounting Nut ***Base Weight: 2.38*** ***Adder Per Inch of Stroke: .34***	

3" Bore Air Cylinders with Adjustable Cushions

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
C-70□-D  *CF-70□-D (Front only)* *CR-70□-D (Rear only)*	***Double Acting** – Air Return – Front Nose Mounting* ***Standard Stroke Lengths:*** 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" Stainless Steel Rod Standard ***Optional Accessories:*** D-19127 Mounting Bracket D-5379 Mounting Nut ***Base Weight: 3.81*** ***Adder Per Inch of Stroke: .26***	
C-70□-DXP  *CF-70□-DXP (Front only)* *CR-70□-DXP (Rear only)*	***Double Acting** – Pivot Type – Air Return – Rear Pivot Mounting* ***Standard Stroke Lengths:*** 1", 1½", 2", 2½", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 32" Stainless Steel Rod Standard ***Optional Accessories:*** D-8314-A Piston Rod Clevis D-13512-A Pivot Brackets D-5379 Mounting Nut ***Base Weight: 3.97*** ***Adder Per Inch of Stroke: .26***	
C-70□-DXDE  *CS-70□-DXDE (One end only)*	***Double Acting** – Double End Rod – Air Return – Double End Mounting* ***Standard Stroke Lengths:*** 1", 2", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 12" Stainless Steel Rod Standard ***Optional Accessories:*** D-19127 Mounting Bracket D-5379 Mounting Nut ***Base Weight: 4.15*** ***Adder Per Inch of Stroke: .52***	

• **Accessories –** *For ¾" bore, see page 1.28. For 1⅛" bore, see page 1.40. For 1½" bore, see page 1.53. For 2" bore, see page 1.60. For 2½" bore, see page 1.62. For 3" bore, see page 1.64.*

Cushion Energy Absorption

Cylinders with air cushions provide a possible solution to destructive energies. The air cushion traps a small amount of exhaust air at the end of stroke, providing an air pocket that decelerates the load. This reduces the potentially destructive energy being transmitted to the cylinder and other components. The following is a brief explanation on how to determine the energy level of your application and decide if an air cushion can provide adequate energy absorption. For a more detailed description, consult the factory at 1-800-44-BIMBA.

Step 1. Determine the load to be stopped by the cylinder.

Step 2. Determine the velocity at which the load impacts the cylinder endcap.

Step 3. Calculate the energy the cylinder generates. Use the following equation:

$$\text{energy (e)} = \left(\frac{w}{64} \times v^2\right) + (p \times k)$$

w = weight of the load (lbs.)
V = velocity of the cylinder as the piston impacts the endcap (feet per second)
p = driving pressure (psi)
k = bore constant

Example: C-316-D at 80 psi with total load of 8 lbs.
driving pressure (p) = 80 psi
total load (w) = 8 lbs.
bore constant (k) = .24
maximum velocity (v) = 6 fps

$= (8/64) \times (6^2) + (80 \times .24) = 23.7$ ft. lbs.

Maximum Energy Calculation Data

Bore	Max Energy (ft-lbs)	k
04	4.47	0.03
09	10.40	0.05
17	18.80	0.11
31	27.60	0.24
50	40.11	0.37
70	77.72	0.58

Cushion Lengths
0.75"
0.75"
0.75"
0.90"
0.90"
0.99"

MRS® Magnetic Reed Switch Air Cylinders

Specifically designed to operate Bimba position sensing switches to actuate programmable controllers, relays, solenoids, timers, or any other electrically operated equipment. MRS cylinders have an additional groove in the piston to accommodate a magnet. They differ from the Moption because they combine features of the "Z" line with Original Line construction; check dimensional drawings for each size for more specific information. Type 303 stainless steel rods are standard.

OPTIONS:

NO CHARGE:

- ***MAGNALUBE G (G)***
- ***NO THREAD (NT)***

SWITCH TRACK for Heavy Duty Track Mounted Switches

- *Must specify Z for one track, ZTT for 2 tracks – add per track. See page 1.86 for track information. See Position Sensing Solutions, page 8.3 for switch*

☐ Enter Stroke Length as 3rd Digit

OPTIONS continued...

DOUBLE ACTING BUMPERS (B)

- *⁹⁄₁₆", add and .125" to length*
- *¾" and 1⁹⁄₁₆" add and .250" to length*
- *1¼" and 1½" add and .250" to length*
- *1¾", 2" and 2½" add and .250" to length*

MOLYCOATED BODY (F)

- *Add per inch of stroke*

EXTRA EXTENSION (EE)

- *Double acting, per inch of extension:*
  ⁹⁄₁₆", ¾" and 1⁹⁄₁₆" Bore, add
  1¼" Bore, add
  1½" and 1¾" Bore, add
  2" Bore, add
  2½" Bore, add
- *DXDE, per inch of extension: (added to both ends)*
  ⁹⁄₁₆", ¾" and 1⁹⁄₁₆" Bore, add
  1¼" Bore, add
  1½" and 1¾" Bore, add
  2" Bore, add
  2½" Bore, add

PORTS ROTATED 90° (K)*

SIDE PORTED REAR HEAD (Q)*

NON-LUBE SERVICE (E)

FLUOROELASTOMER/HIGH TEMPERATURE SEAL (V)

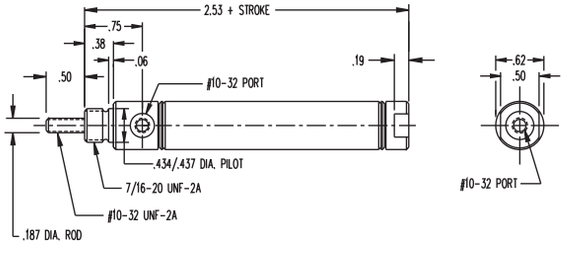
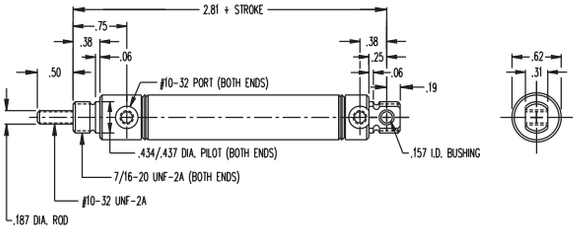
See corresponding standard Original Line bore size catalog page for pricing of options E and V.

**Consult local distributor for pricing.*

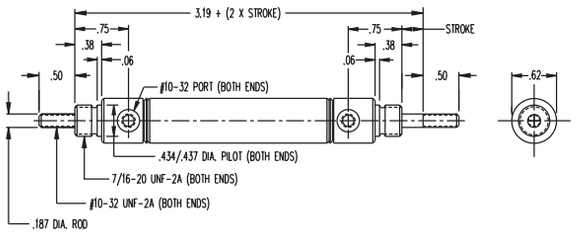
SWITCH TRACK for Miniature Switches (T2, T3, T4)

- *Must specify track(s) for use with miniature position sensing (T2, T3, T4) – add per track. See page 1.9 for track location details. See Position Sensing Solutions, page 8.3 for switch selection information.*

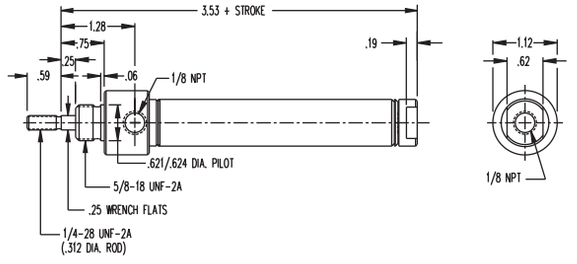
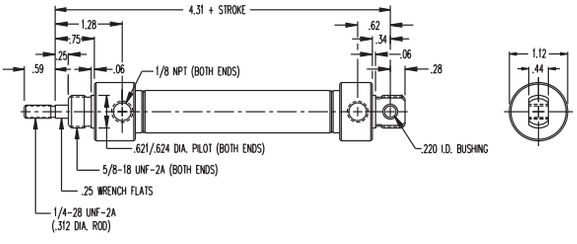
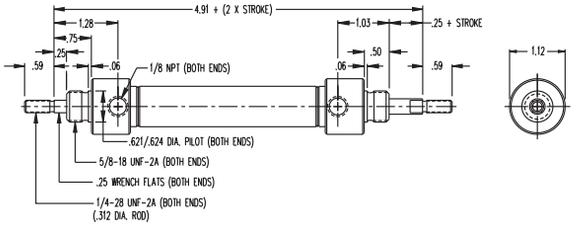
9/16" Bore MRS Air Cylinders

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
MRS-02☐-D 	***Nose Mount*** *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" *Optional Accessory:* D-770 Mounting Bracket *Base Weight: .10* *Adder Per Inch of Stroke: .01*	
MRS-02☐-DXP 	***Double End or Rear Pivot Mounting*** *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 12" *Optional Accessories:* D-12321-A Pivot Bracket D-770 Mounting Bracket D-850 Rod Clevis *Base Weight: .10* *Adder Per Inch of Stroke: .01*	

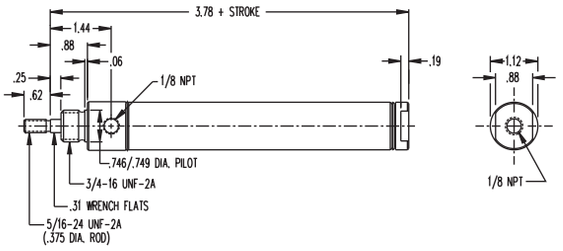
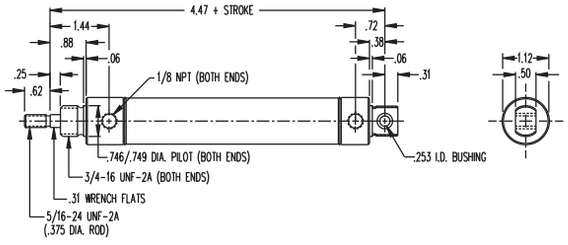
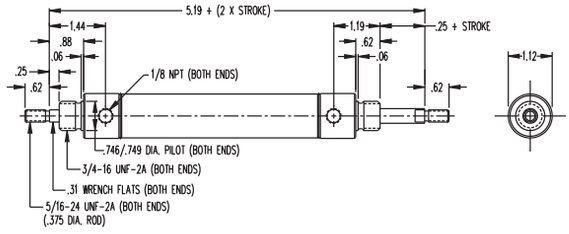
9/16" Bore MRS Air Cylinders (continued)

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
MRS-02□DXDE 	***Double End Rod** – Double End Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" *Optional Accessory:* D-770 Mounting Bracket *Base Weight: .14* *Adder Per Inch of Stroke: .02*	

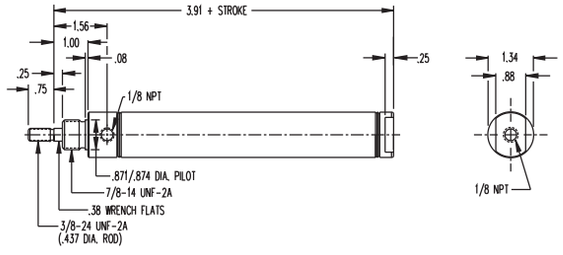
3/4" Bore MRS Air Cylinders

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
MRS-04□-D 	***Nose Mount*** *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" *Optional Accessory:* D-129 Mounting Bracket *Base Weight: .24* *Adder Per Inch of Stroke: .04*	
MRS-04□-DXP 	***Double End or Rear Pivot Mounting*** *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 32" *Optional Accessories:* D-10131-A Pivot Bracket D-129 Mounting Bracket D-10139-A Rod Clevis *Base Weight: .30* *Adder Per Inch of Stroke: .06*	
MRS-04□DXDE 	***Double End Rod** – Double End Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" *Optional Accessory:* D-129 Mounting Bracket *Base Weight: .41* *Adder Per Inch of Stroke: .06*	

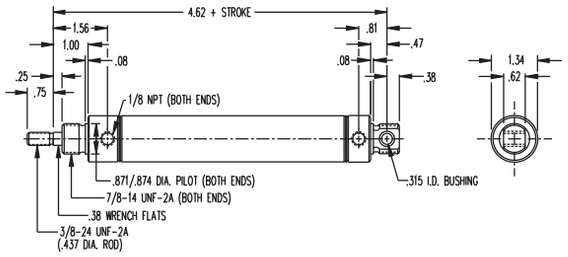
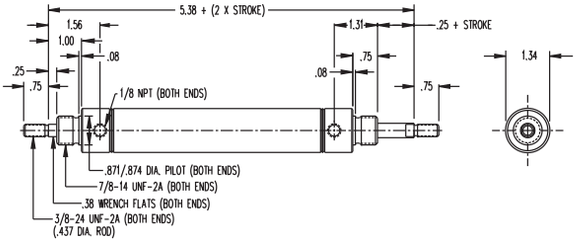
1-1/16" Bore MRS Air Cylinders

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
MRS-09□-D 	***Nose Mount*** *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" *Optional Accessory:* D-8315 Mounting Bracket *Base Weight: .37* *Adder Per Inch of Stroke: .05*	
MRS-09□-DXP 	***Double End or Rear Pivot Mounting*** *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 32" *Optional Accessories:* D-8321-A Pivot Bracket D-8315 Mounting Bracket D-8309-A Rod Clevis *Base Weight: .42* *Adder Per Inch of Stroke: .05*	
MRS-09□DXDE 	***Double End Rod*** *– Double End Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" *Optional Accessory:* D-8315 Mounting Bracket *Base Weight: .60* *Adder Per Inch of Stroke: .08*	

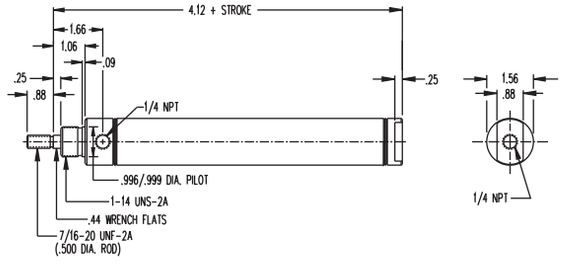
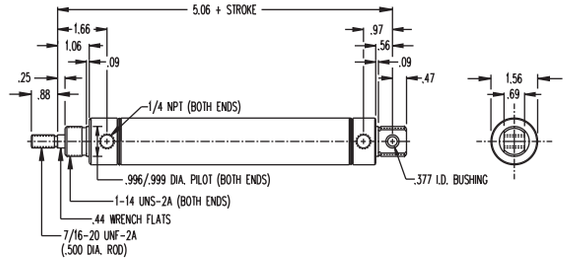
1-1/4" Bore MRS Air Cylinders

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
MRS-12□-D 	***Nose Mount*** *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" *Optional Accessory:* D-8316 Mounting Bracket *Base Weight: .51* *Adder Per Inch of Stroke: .07*	

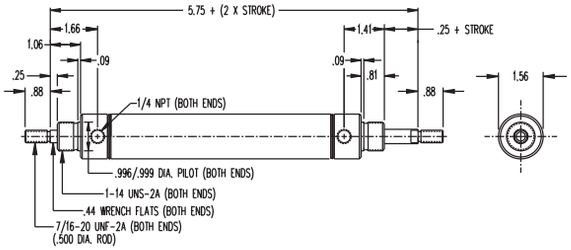
1-1/4" Bore MRS Air Cylinders (continued)

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
MRS-12□-DXP 	***Double End or Rear Pivot Mounting*** *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 32" *Optional Accessories:* D-8322-A Pivot Bracket D-8316 Mounting Bracket D-8310-A Rod Clevis *Base Weight: .61* *Adder Per Inch of Stroke: .05*	
MRS-12□DXDE 	***Double End Rod*** *– Double End Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" *Optional Accessory:* D-8316 Mounting Bracket *Base Weight: .70* *Adder Per Inch of Stroke: .14*	

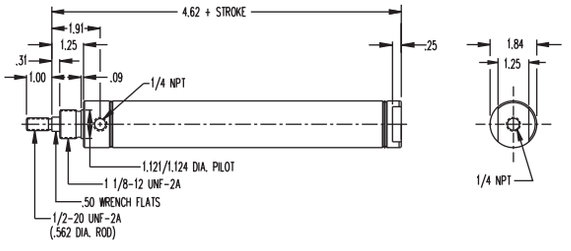
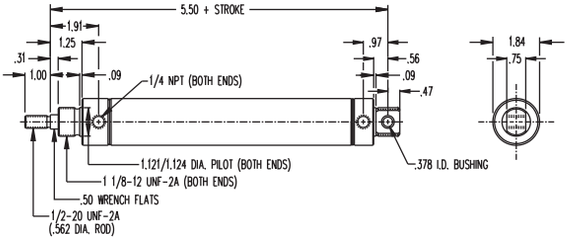
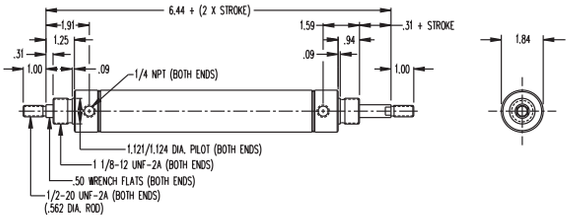
1-1/2" Bore MRS Air Cylinders

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
MRS-17□-D 	***Nose Mount*** *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" *Optional Accessory:* D-8317 Mounting Bracket *Base Weight: .74* *Adder Per Inch of Stroke: .10*	
MRS-17□-DXP 	***Double End or Rear Pivot Mounting*** *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 32" *Optional Accessories:* D-8323-A Pivot Bracket D-8317 Mounting Bracket D-8311-A Rod Clevis *Base Weight: .87* *Adder Per Inch of Stroke: .10*	

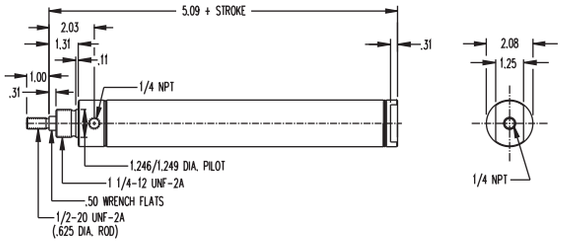
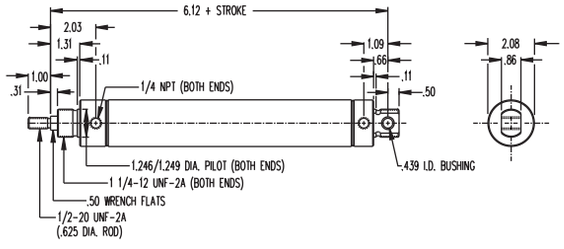
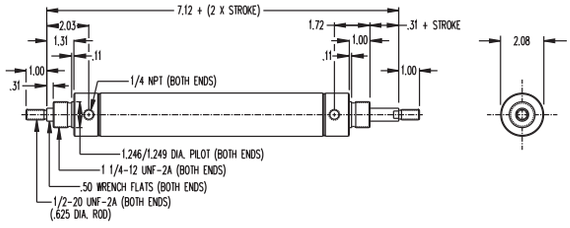
1-1/2" Bore MRS Air Cylinders (continued)

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
MRS-17□-DXDE 	***Double End Rod*** *– Double End Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" *Optional Accessory:* D-8317 Mounting Bracket *Base Weight: .94* *Adder Per Inch of Stroke: .20*	

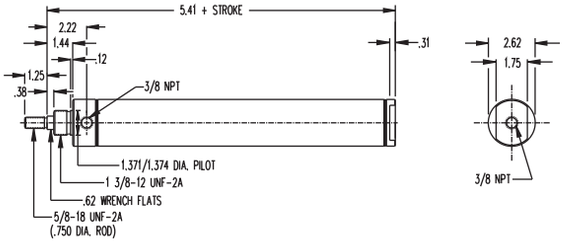
1-3/4" Bore MRS Air Cylinders

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
MRS-24□-D 	***Nose Mount*** *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" *Optional Accessory:* D-8318 Mounting Bracket *Base Weight: 1.14* *Adder Per Inch of Stroke: .13*	
MRS-24□-DXP 	***Double End or Rear Pivot Mounting*** *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 32" *Optional Accessories:* D-8324-A Pivot Bracket D-8318 Mounting Bracket D-8312-A Rod Clevis *Base Weight: 1.30* *Adder Per Inch of Stroke: .13*	
MRS-24□-DXDE 	***Double End Rod*** *– Double End Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" *Optional Accessory:* D-8318 Mounting Bracket *Base Weight: 1.40* *Adder Per Inch of Stroke: .26*	

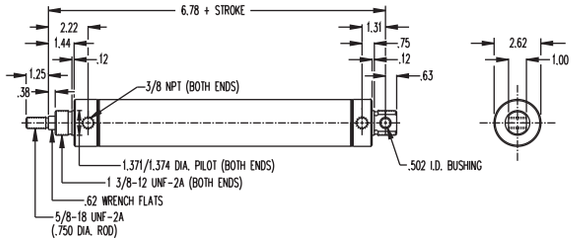
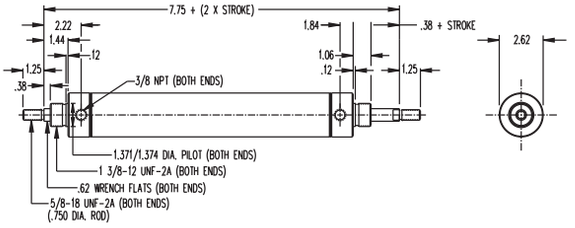
2" Bore MRS Air Cylinders

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
MRS-31□-D 	***Nose Mount*** *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" *Optional Accessory:* D-8319 Mounting Bracket *Base Weight: 1.55* *Adder Per Inch of Stroke: .15*	
MRS-31□-DXP 	***Double End or Rear Pivot Mounting*** *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 32" *Optional Accessories:* D-8325-A Pivot Bracket D-8319 Mounting Bracket D-8313-A Rod Clevis *Base Weight: 1.80* *Adder Per Inch of Stroke: .15*	
MRS-31□DXDE 	***Double End Rod*** *– Double End Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" *Optional Accessory:* D-8319 Mounting Bracket *Base Weight: 1.90* *Adder Per Inch of Stroke: .30*	

2-1/2" Bore MRS Air Cylinders

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
MRS-50□-D 	***Nose Mount*** *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" *Optional Accessory:* D-8320 Mounting Bracket *Base Weight: 2.48* *Adder Per Inch of Stroke: .20*	

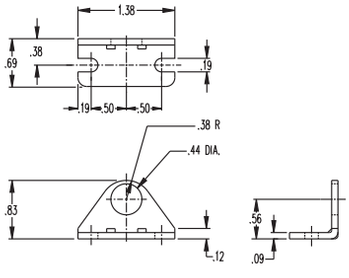
2-1/2" Bore MRS Air Cylinders (continued)

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
MRS-50□-DXP 	***Double End or Rear Pivot Mounting*** *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 32" *Optional Accessories:* D-8326-A Pivot Bracket D-8320 Mounting Bracket D-8314-A Rod Clevis *Base Weight: 2.90* *Adder Per Inch of Stroke: .20*	
MRS-50□DXDE 	***Double End Rod*** *– Double End Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke – 12" *Optional Accessory:* D-8320 Mounting Bracket *Base Weight: 3.15* *Adder Per Inch of Stroke: .40*	

MRS Accessories

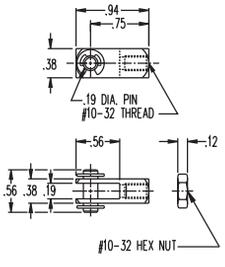
9/16" Bore Accessories

D-770



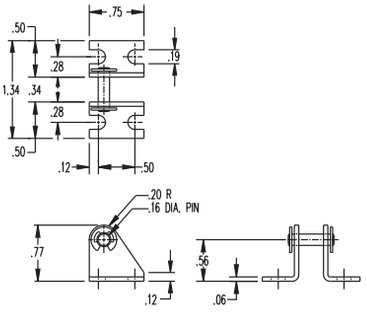
Mounting Bracket

D-850



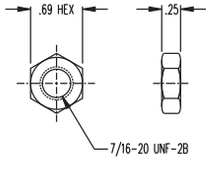
Rod Clevis

D-12321-A



Pivot Bracket

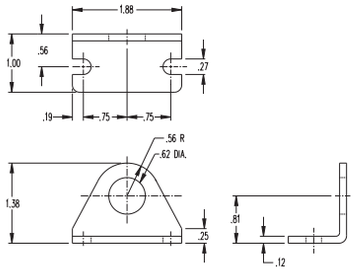
D-154



Mounting Nut

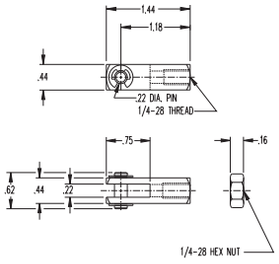
3/4" Bore Accessories

D-129



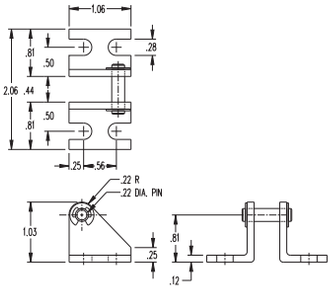
Mounting Bracket

D-10139-A



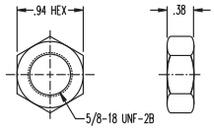
Rod Clevis

D-10131-A



Pivot Bracket

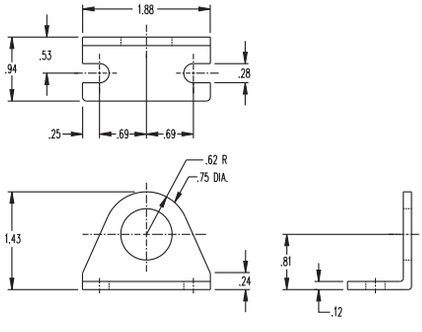
D-9



Mounting Nut

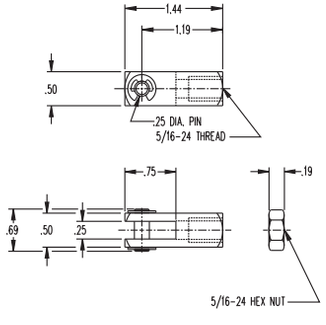
1-1/16" Bore Accessories

D-8315



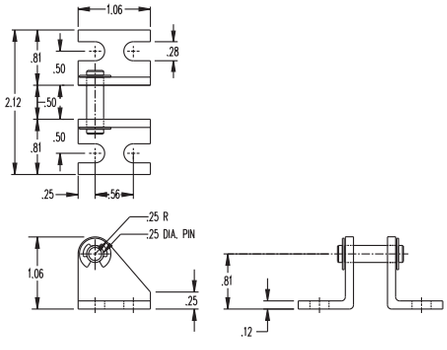
Mounting Bracket

D-8309-A



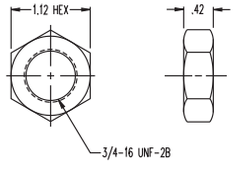
Rod Clevis

D-8321-A



Pivot Bracket

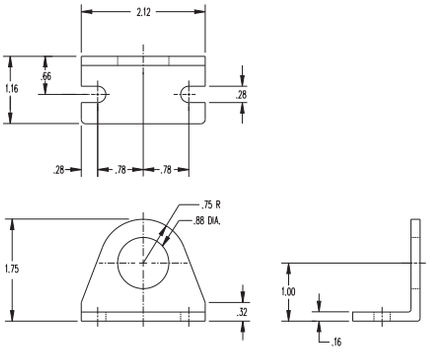
D-3556



Mounting Nut

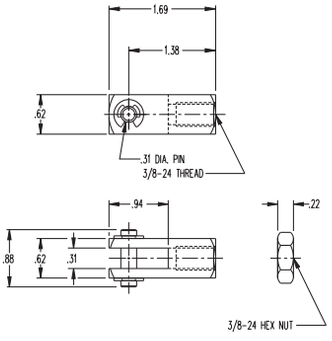
1-1/4" Bore Accessories

D-8316



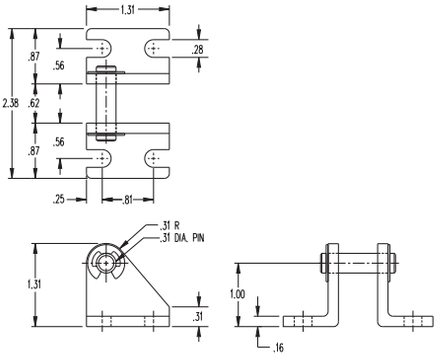
Mounting Bracket

D-8310-A



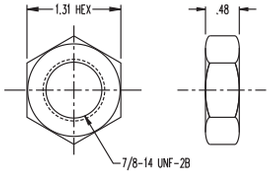
Rod Clevis

D-8322-A



Pivot Bracket

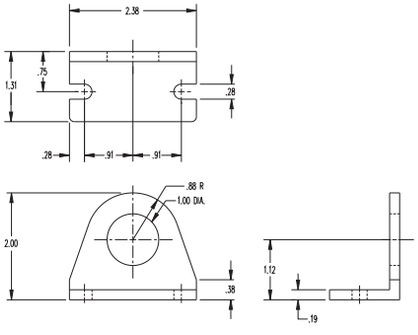
D-2545



Mounting Nut

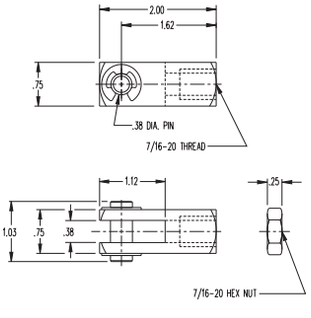
1-1/2" Bore Accessories

D-8317



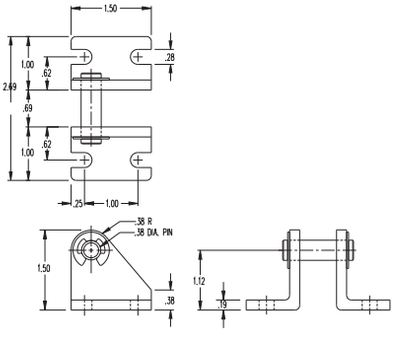
Mounting Bracket

D-8311-A



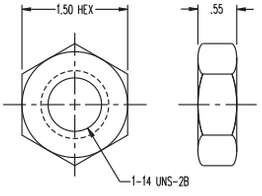
Rod Clevis

D-8323-A



Pivot Bracket

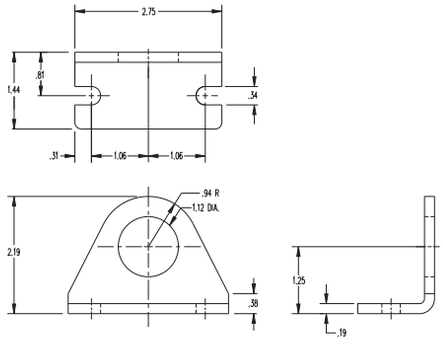
D-1331



Mounting Nut

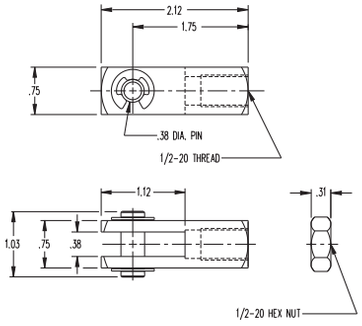
1-3/4" Bore Accessories

D-8318



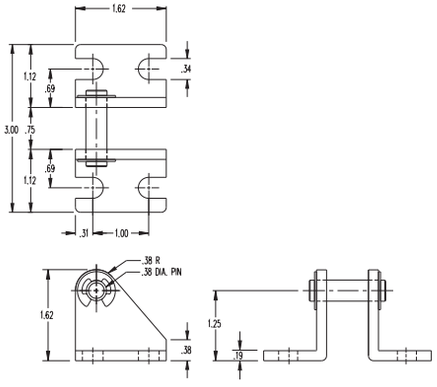
Mounting Bracket

D-8312-A



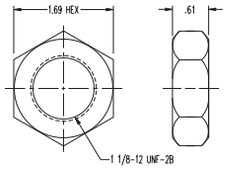
Rod Clevis

D-8324-A



Pivot Bracket

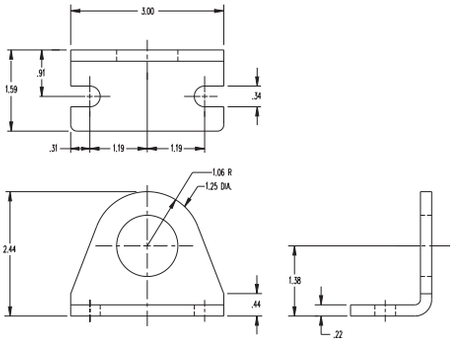
D-8484



Mounting Nut

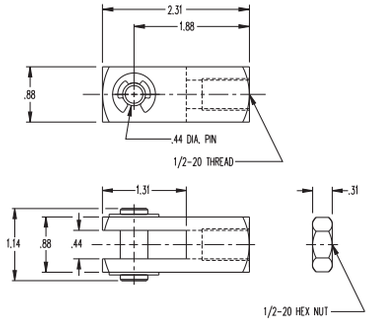
2" Bore Accessories

D-8319



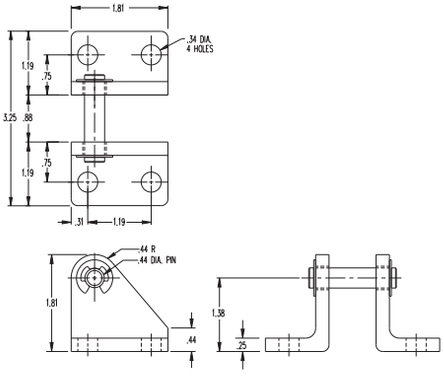
Mounting Bracket

D-8313-A



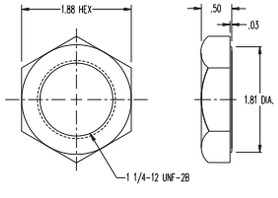
Rod Clevis

D-8325-A



Pivot Bracket

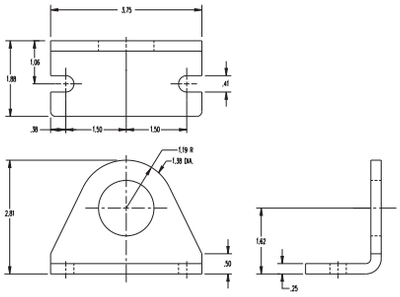
D-508



Mounting Nut

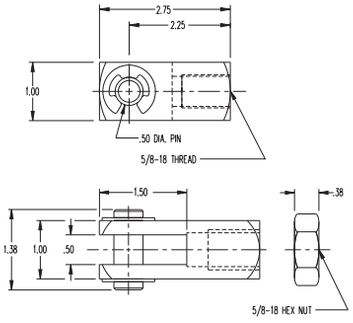
2-1/2" Bore Accessories

D-8320



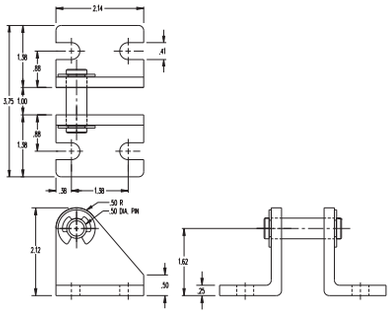
Mounting Bracket

D-8314-A



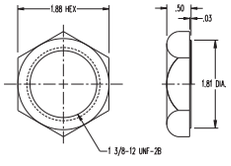
Rod Clevis

D-8326-A



Pivot Bracket

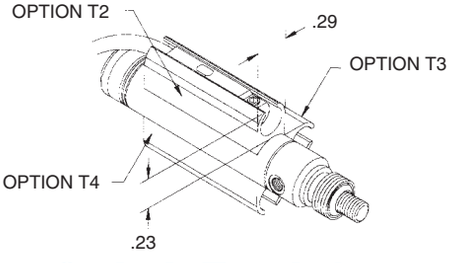
D-2540

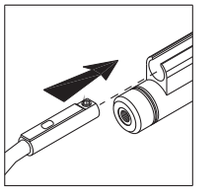


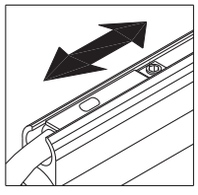
Mounting Nut

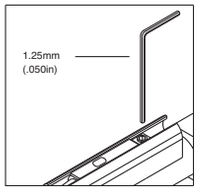
Switch Track Options

For Original Line cylinders, including MRS cylinders, with -T2, T3, and T4 options









Switch Track for use with Bimba MR, MS, MSC, and MSK

Miniature Position Sensing track lengths can now be purchased separately for field mounting of custom track locations. Simply specify the length of track desired after the part number.

Mounting recommendations:

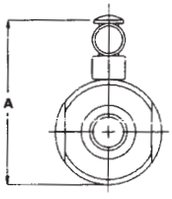
- Clean body with acetone. Remove all oil from body surface.
- Avoid mounting track over rolled construction. Locate edge of track 0.175" from rolled construction.
- Use a solid continuous bead of glue for the entire length of track used. Bead should fill center channel of track.
- Adhere to recommended cure times as specified by the glue manufacturer.

Bores	Part Number	List Price	Adder per Inch
007 - 04	D-74168-A-length		
06 - 31	D-78527-A-length		
50 - 70	D-78528-A-length		

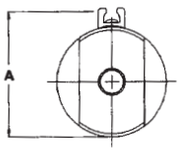
Loctite U-05FL or similar adhesive is recommended (not included).

For MRS cylinders with –Z or –ZTT options

For 9/16" and 3/4" Bore



For 1-1/16" to 2-1/2" Bore



Bore Designator	Bore	A
02	9/16"	1.00
04	3/4"	1.38
09	1-1/16"	1.50
12	1-1/4"	1.68
17	1-1/2"	1.91
24	1-3/4"	2.20
31	2	2.43
50	2-1/2"	2.98

Non-Rotating Original Line Air Cylinders

Bimba's new Non-Rotating Original Line stainless steel body air cylinder design consists of a unique square piston rod with rounded corners. The square rod prevents rotation better than other rod configurations, and the rounded corners provide longer seal life than conventional hexagon rods. The unusual geometry of the square rod also provides superior rotation control. All bore sizes have a rotational control of less than or equal to ±3 degrees. The special high strength aluminum alloy rod guide provides high load carrying capability and abrasion resistance. The urethane-based rod seal provides excellent seal life and leak-free service. The Non-Rotating Original Line cylinder is dimensionally interchangeable with the standard Original Line stainless steel cylinder.

9/16" Bore Non-Rotating Air Cylinders

- *New!* Stainless Steel Piston Rod Standard.
- Unique Square Piston Rod with Rounded Corners.
- High Strength Aluminum Alloy Rod Guide.
- Urethane-based Rod Seal.
- Buna N "U" Cup Piston Seal.
- Pressure Rating - 250 PSI Maximum (Air only)
- Available in Double Acting and Reverse Acting Models.
- Enclosed Spring Force: 2 lbs. Relaxed - 4 lbs. Compressed.
- Standard Buna N Seals Temperature Range of -20°F (-25°C) to 200°F (95°C)

☐ Enter Stroke Length as 3rd Digit

OPTIONS

NO CHARGE:
- ***MAGNALUBE® G (G)***
- ***SIDE PORTED REAR HEAD (Q)***
- ***PORTS ROTATED (K)***

REVERSE ACTING BUMPERS (B)
- *additional*
- *Add .062 to overall length*

DOUBLE ACTING BUMPERS (B)
- *additional*
- *Add .125 to overall length*

NON LUBE SERVICE (E)
- *Reverse acting add*
- *Double acting add*

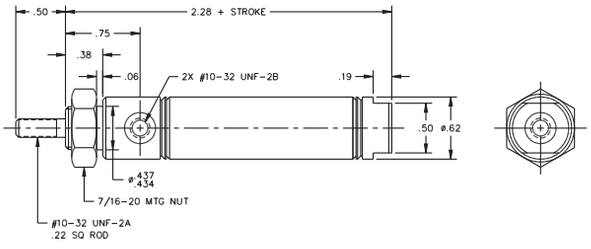
EXTRA EXTENSION (EE)
- *Add per inch of extension*

MOLYCOATED BODY (F)
- *Add per inch of stroke*

MAGNET (prefix M) - Add
- *Reverse acting add .125" to overall length*
- *Must specify track(s) for use with miniature position sensing (T2, T3, T4) – add per track. See page 1.9 for track location details. See Position Sensing Solutions, page 8.3 for switch selection information.*

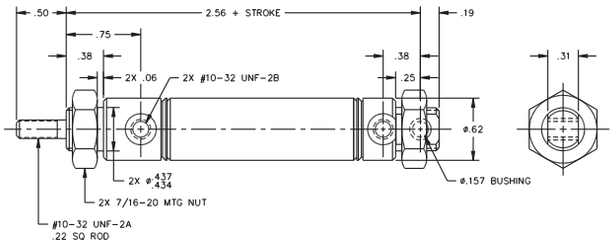
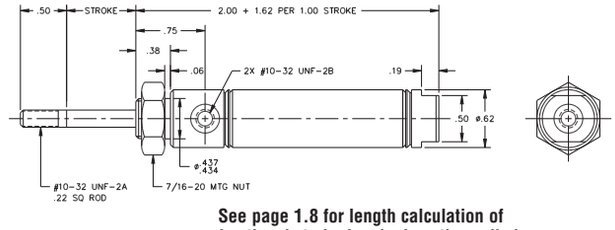
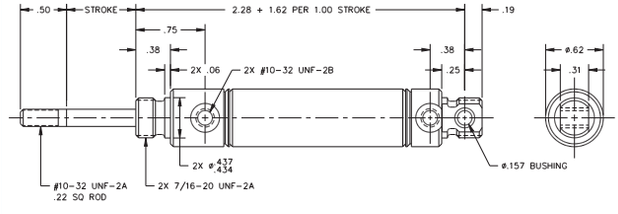
LOW TEMPERATURE (N)
Temperature Range: -40˚ to 200˚F
- *Reverse acting add*
- *Double acting add*

HIGH TEMPERATURE SEALS (V)
Temperature Range : 0° to 400°F (-18° to 205°C)
- *Double acting add*
- *Reverse acting add*

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
NR-02☐-D 	***Double Acting*** *– Air Return-Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke 10" *Optional Accessory:* D-770 Mounting Bracket *Base Weight: .09* *Adder Per Inch of Stroke: .02*	

®Magnalube is a registered trademark of the Carleton-Stuart Corporation.

9/16" Bore Non-Rotating Air Cylinders (continued)

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
NR-02□-DXP 	***Double Acting*** *– Double End or Rear Pivot Mounting – Air Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke 10" *Optional Accessories:* D-770 Mounting Nut D-850 Rod Clevis D-12321-A Pivot Bracket *Base Weight: .09* *Adder Per Inch of Stroke: .02*	
NR-02□-R 	***Reverse Single Acting*** *– Pull Type – Rod Normally Extended – Spring Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3" Maximum Stroke 4" *Optional Accessory:* D-770 Mounting Bracket *Base Weight: .08* *Adder Per Inch of Stroke: .04*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
NR-02□-RP 	***Reverse Single Acting*** *– Pivot and Pull Type – Rod Normally Extended – Spring Return – Rear Pivot Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3" Maximum Stroke 4" *Optional Accessories:* D-850 Rod Clevis D-12321-A Pivot Bracket *Base Weight: .08* *Adder Per Inch of Stroke: .04*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**

3/4" Bore Non-Rotating Air Cylinders

- *New!* Stainless Steel Piston Rod Standard.
- Unique Square Piston Rod with Rounded Corners.
- High Strength Aluminum Alloy Rod Guide.
- Urethane-based Rod Seal.
- Buna N "U" Cup Piston Seal.
- Pressure Rating – 250 PSI Maximum (Air only)
- Available in Double Acting and Reverse Acting Models.
- Enclosed Spring Force: 3 lbs. Relaxed – 6 lbs. Compressed.
- Standard Buna N Seals Temperature Range of -20ºF (-25ºC) to 200ºF (95ºC)

☐ Enter Stroke Length as 3rd Digit

OPTIONS

NO CHARGE:
- *MAGNALUBE® G (G)*
- *PORTS ROTATED (K)*
- *SIDE PORTED REAR HEAD (Q)*
- *PIVOT BUSHING (Y)*

REVERSE ACTING BUMPERS (B)
- *0 additional*
- *Add .062 to overall length*

DOUBLE ACTING BUMPERS (B)
- *additional*
- *Add .125 to overall length*

NON LUBE SERVICE (E)
- *Reverse acting add*
- *Double acting add*

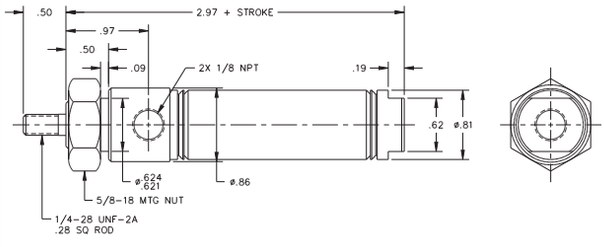
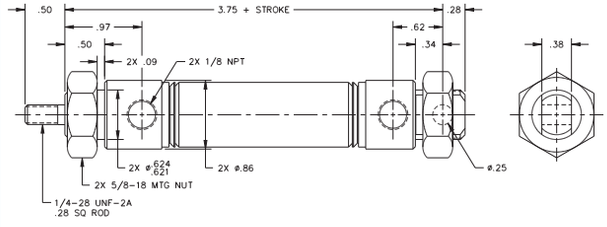
EXTRA EXTENSION (EE)
- *Add per inch of extension*

MOLYCOATED BODY (F)
- *Add per inch of stroke*

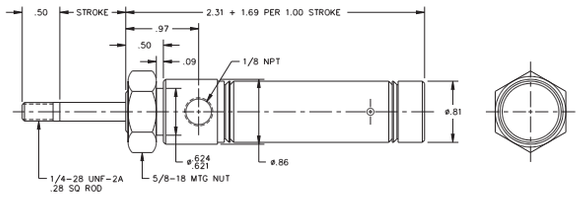
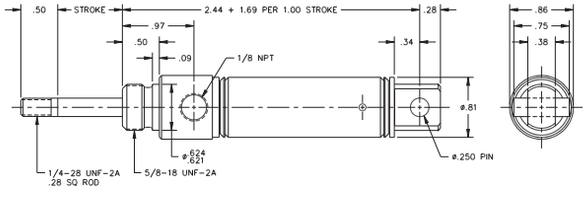
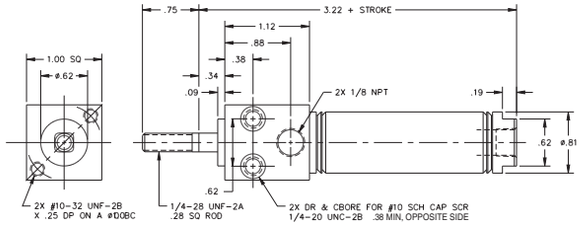
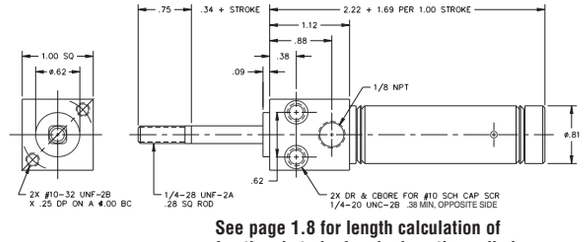
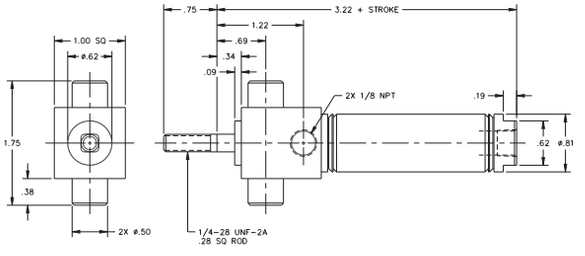
MAGNET (prefix M) - Add
- *Reverse acting add .125" to overall length*
- *Must specify track(s) for use with miniature position sensing (T2, T3, T4) – add per track. See page 1.9 for track location details. See Position Sensing Solutions, page 8.3 for switch selection information.*

LOW TEMPERATURE (N)
Temperature Range: -40˚ to 200˚F
- *Reverse acting add*
- *Double acting add*

HIGH TEMPERATURE SEALS (V)
Temperature Range : 0° to 400°F (-18° to 205°C)
- *Reverse acting add*
- *Double acting add*

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
NR-04☐-D 	***Double Acting** – Air Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke 12" *Option Accessory:* D-129 Mounting Bracket *Base Weight : .21* *Adder Per Inch of Stroke: .03*	
NR-04☐-DXP 	***Double Acting** – Double End or Rear Pivot Mounting – Air Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke 24" *Optional Accessories:* D-129 Mounting Bracket D-166-3 Rod Clevis D-13498-A Pivot Bracket *Base Weight: .29* *Adder Per Inch of Stroke: .03*	

3/4" Bore Non-Rotating Air Cylinders (continued)

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
NR-04□-R 	***Reverse Single Acting*** *– Pull Type – Rod Normally Extended – Spring Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke 6" *Optional Accessory:* D-129 Mounting Bracket *Base Weight: .18* *Adder Per Inch of Stroke: .07*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
NR-04□-RP 	***Reverse Single Acting*** *– Pull Type – Rod Normally Extended – Spring Return – Rear Pivot Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke 6" *Optional Accessories:* D-167 Mounting Brackets D-166-3 Piston Rod Clevis *Base Weight: .18* *Adder Per Inch of Stroke: .07*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
BFNR-04□-D 	***Double Acting*** *– Front Block Mounting – Air Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke 12" *Base Weight: .22* *Adder Per Inch of Stroke: .03*	
BFNR-04□-R 	***Pull Type*** *– Front Block Mounting Rod Normally Extended – Reverse Single Acting – Spring Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke 6" *Base Weight: .19* *Adder per inch of stroke: .07*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
BFTNR-04□-D 	***Double Acting*** *– Front Block Trunnion Mounting – Air Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke 12" *Optional Accessories:* TRB-2 Trunnion Brackets D-166-3 Rod Clevis *Base Weight: .29* *Adder Per Inch of Stroke: .03*	

1-1/16" Bore Non-Rotating Air Cylinders

- *New!* Stainless Steel Piston Rod Standard.
- Unique Square Piston Rod with Rounded Corners.
- High Strength Aluminum Alloy Rod Guide.
- Urethane-based Rod Seal.
- Buna N "U" Cup Piston Seal.
- Pressure Rating – 250 PSI Maximum (Air only)
- Available in Double Acting and Reverse Acting Models.
- Enclosed Spring Force: 6 lbs. Relaxed – 12 lbs. Compressed.
- Standard Buna N Seals Temperature Range of -20ºF (-25ºC) to 200º F (95ºC)

☐ Enter Stroke Length as 3rd Digit

OPTIONS

NO CHARGE:
- ***MAGNALUBE® G (G)***
- ***PORTS ROTATED (K)***
- ***SIDE PORTED REAR HEAD (Q)***
- ***PIVOT BUSHING (Y)***

REVERSE ACTING BUMPERS (B)
- *additional*
- *Add .062 to overall length*

DOUBLE ACTING BUMPERS (B)
- *additional*
- *Add .125 to overall length*

NON LUBE SERVICE (E)
- *Reverse acting add*
- *Double acting add*

EXTRA EXTENSION (EE)
- *Add per inch of extension*

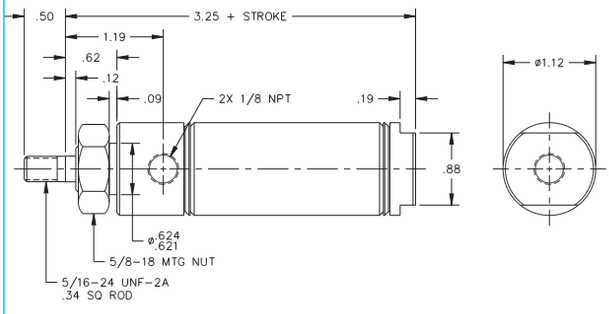
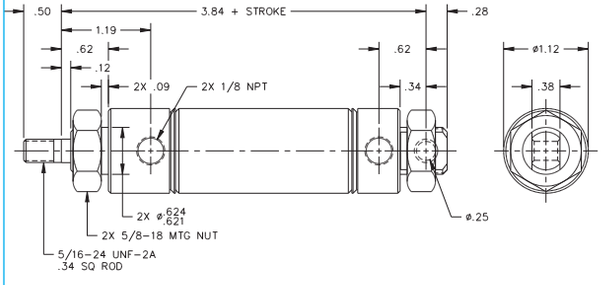
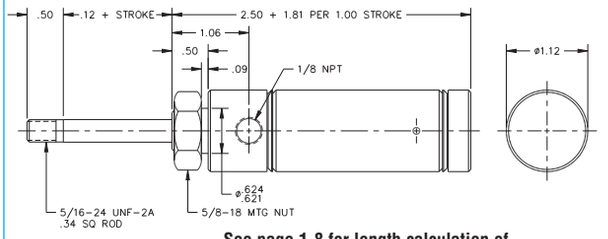
MOLYCOATED BODY (F)
- *Add per inch of stroke*

MAGNET (prefix M) - Add
- *Reverse acting add .125'" to overall length*
- *Must specify track(s) for use with miniature position sensing (T2, T3, T4) – add per track.*

See page 1.9 for track location details. See Position Sensing Solutions, page 8.3 for switch selection information.

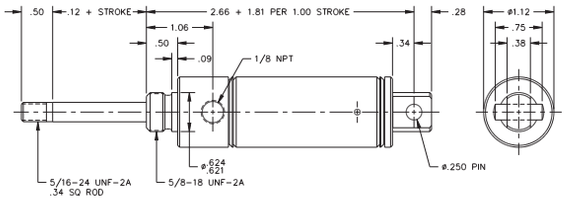
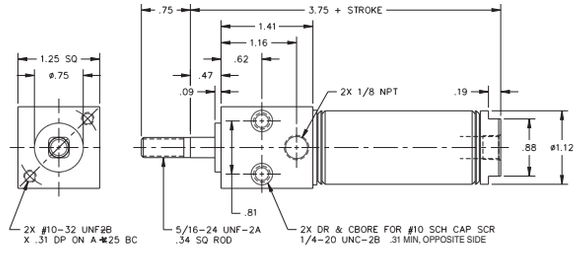
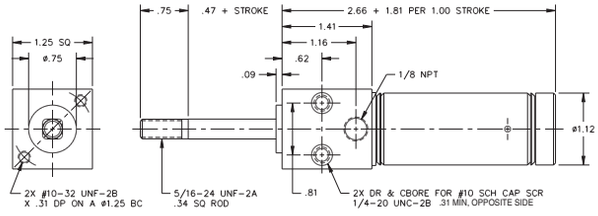
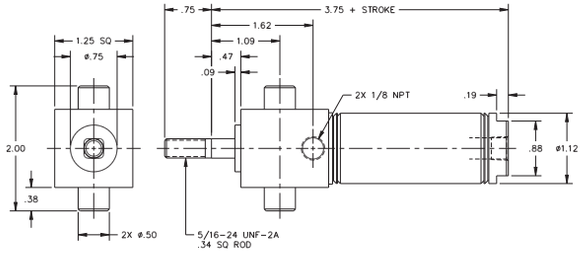
LOW TEMPERATURE (N)
Temperature Range: -40˚ to 200˚F
- *Reverse acting add*
- *Double acting add*

HIGH TEMPERATURE SEALS (V)
Temperature Range : 0° to 400°F (-18° to 205°C)
- *Reverse acting add*
- *Double acting add*

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
NR-09☐-D 	***Double Acting*** *– Air Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke 12" *Option Accessory:* D-129 Mounting Bracket *Base Weight : .33* *Adder Per Inch of Stroke: .05*	
NR-09☐-DXP 	***Double Acting*** *– Double End or Rear Pivot Mounting – Air Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke 24" *Optional Accessories:* D-129 Mounting Bracket D-166-1 Rod Clevis D-13498-A Pivot Bracket *Base Weight: .33* *Adder Per Inch of Stroke: .05*	
NR-09☐-R 	***Reverse Single Acting*** *– Pull Type – Rod Normally Extended – Spring Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke 6" *Optional Accessory:* D-129 Mounting Bracket *Base Weight: .24* *Adder Per Inch of Stroke: .16*	

See page 1.8 for length calculation of fractional stroke for single acting cylinders.

1-1/16" Bore Non-Rotating Air Cylinders (continued)

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
NR-09□-RP 	***Reverse Single Acting*** *– Pivot or Pull Type – Rod Normally Extended Spring Return – Rear Pivot Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke 6" *Optional Accessories:* D-166-1 Piston Rod Clevis D-167 Mounting Bracket *Base Weight: .22* *Adder Per Inch of Stroke: .16*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
BFNR-09□-D 	***Double Acting*** *– Front Block Mounting – Air Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke 12" *Base Weight: .49* *Adder Per Inch of Stroke: .05*	
BFNR-09□-R 	***Reverse Single Acting*** *– Front Block Mounting – Rod Normally Extended – Reverse Single Acting – Spring Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke 6" *Base Weight: .36* *Adder Per Inch of Stroke: .16*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
BFTNR-09□-D 	***Double Acting*** *– Front Block Trunnion Mounting – Air Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke 12" *Optional Accessories:* TRB-2 Trunnion Brackets D-166-1 Rod Clevis *Base Weight: .49* *Adder Per Inch of Stroke: .05*	

1-1/2" Bore Non-Rotating Air Cylinders

- *New!* Stainless Steel Piston Rod Standard.
- Unique Square Piston Rod with Rounded Corners.
- High Strength Aluminum Alloy Rod Guide.
- Urethane-based Rod Seal.
- Buna N "U" Cup Piston Seal.
- Pressure Rating – 250 PSI Maximum (Air only)
- Available in Double Acting and Reverse Acting Models.
- Enclosed Spring Force: 8.5 lbs. Relaxed – 17 lbs. Compressed.
- Standard Buna N Seals Temperature Range of -20ºF (-25ºC) to 200ºF (95ºC)

☐ Enter Stroke Length as 3rd Digit

OPTIONS

NO CHARGE:
- *MAGNALUBE® G (G)*
- *PORTS ROTATED (K)*
- *SIDE PORTED REAR HEAD (Q)*
- *PIVOT BUSHING (Y)*

REVERSE ACTING BUMPERS (B)
- *additional*
- *Add .062 to overall length*

DOUBLE ACTING BUMPERS (B)
- *additional*
- *Add .125 to overall length*

NON LUBE SERVICE (E)
- *Reverse acting add*
- *Double acting add .80*

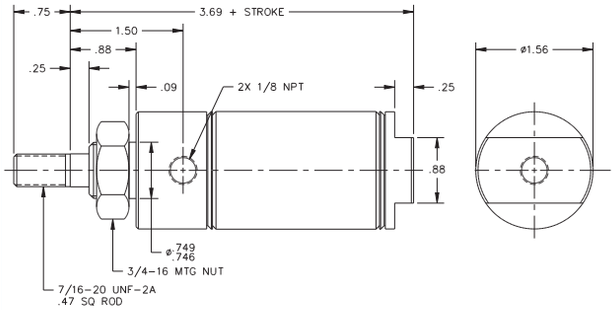
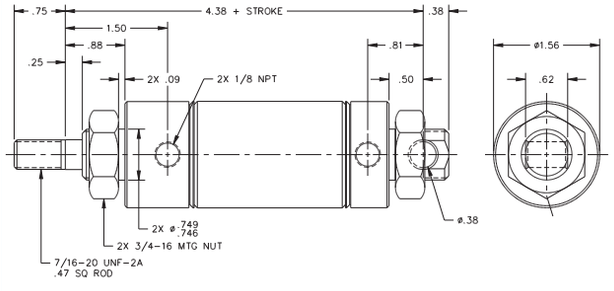
EXTRA EXTENSION (EE)
- *Add per inch of extension*

MOLYCOATED BODY (F)
- *Add per inch of stroke*

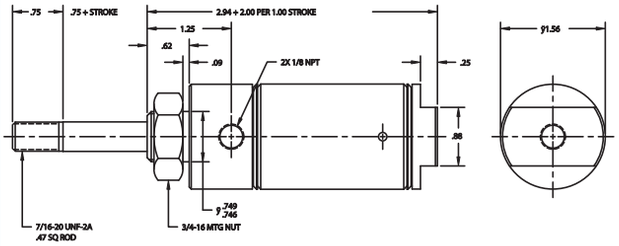
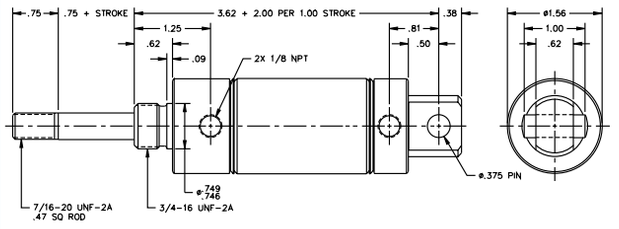
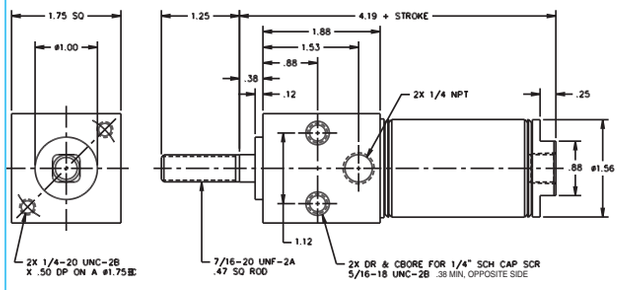
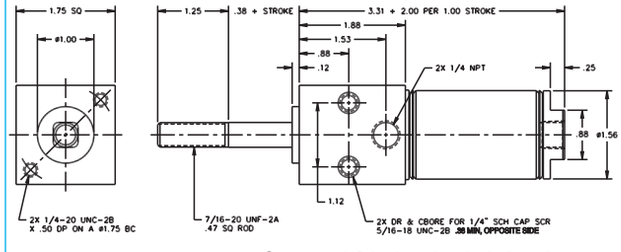
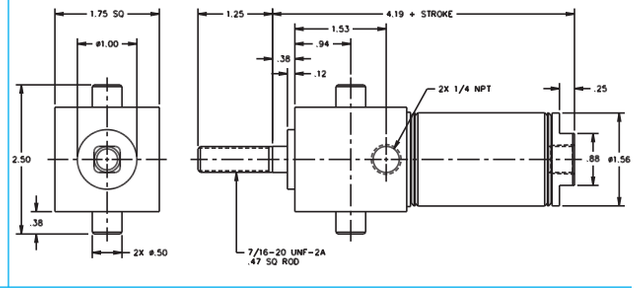
MAGNET (prefix M) – Add
- *Reverse acting add .125" to overall length*
- *Must specify track(s) for use with miniature position sensing (T2, T3, T4) – add per track. See page 1.9 for track location details. See Position Sensing Solutions, page 8.3 for switch selection information.*

LOW TEMPERATURE (N)
Temperature Range: -40˚ to 200˚F
- *Reverse acting add*
- *Double acting add*

HIGH TEMPERATURE SEALS (V)
Temperature Range : 0° to 400°F (-18°to 205°C)
- *Reverse acting add*
- *Double acting add*

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
NR-17☐-D 	***Double Acting** – Air Return – Front Nose Mounting – Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke 12" *Optional Accessory:* D-241 Mounting Bracket *Base Weight: .69* *Adder Per Inch of Stroke: .08*	
NR-17☐-DXP 	***Double Acting** – Double End or Rear Pivot Mounting – Air Return Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke 24" *Optional Accessories:* D-241 Mounting Bracket D-231-1 Rod Clevis D-8323-A Pivot Bracket *Base Weight: .82* *Adder Per Inch of Stroke: .08*	

1-1/2" Bore Non-Rotating Air Cylinders (continued)

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
NR-17□-R 	***Reverse Single Acting*** *– Pull Type – Rod Normally Extended Spring Return – Spring force 8.5 lbs. relaxed, 17 lbs. compressed - Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke 6" *Optional Accessory:* D-241 Mounting Bracket *Base Weight: .44* *Adder Per Inch of Stroke: .22*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
NR-17□-RP 	***Reverse Single Acting*** *– Pivot and Pull Type – Rod Normally Extended – Spring Return – Spring Force 8.5 lbs. relaxed, 17 lbs. compressed – Rear Pivot Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke 6" *Optional Accessories:* D-231-1 Piston Rod Clevis D-229 Mounting Bracket *Base Weight: .45* *Adder Per Inch of Stroke: .22*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
BFNR-17□-D 	***Double Acting*** *– Front Block Mounting – Air Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke 12" *Base Weight: .99* *Adder Per Inch of Stroke: .08*	
BFNR-17□-R 	***Pull Type*** *– Front Block Mounting – Rod Normally Extended – Reverse Single Acting – Spring Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke 6" *Base Weight: .96* *Adder Per Inch of Stroke: .22*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
BFTNR-17□-D 	***Double Acting*** *– Front Block Trunnion Mounting – Spring Return* *Standard Stroke Lengths:* ½"', 1", 1½", 2", 2½", 3", 4" Maximum Stroke 12" *Optional Accessories:* TRB-2 Trunnion Brackets D-231-1 Rod Clevis *Base Weight: 1.06* *Adder Per Inch of Stroke: .08*	

2" Bore Non-Rotating Air Cylinders

- *New!* Stainless Steel Piston Rod Standard.
- Unique Square Piston Rod with Rounded Corners.
- High Strength Aluminum Alloy Rod Guide.
- Urethane-based Rod Seal.
- Buna N "U" Cup Piston Seal.
- Pressure Rating – 250 PSI Maximum (Air only)
- Available in Double Acting and Reverse Acting models.
- Enclosed Spring Force: 15 lbs. Relaxed – 30 lbs. Compressed.
- Standard Buna N Seals Temperature Range of -20ºF (-25ºC) to 200ºF (95ºC)

☐ Enter Stroke Length as 3rd Digit

OPTIONS

NO CHARGE:
- ***MAGNALUBE® G (G)***
- ***PORTS ROTATED (K)***
- ***SIDE PORTED REAR HEAD (Q)***

REVERSE ACTING BUMPERS (B)
- *additional*
- *Add .062 to overall length*

DOUBLE ACTING BUMPERS (B)
- *additional*
- *Add .125 to overall length*

NON LUBE SERVICE (E)
- *Reverse acting add*
- *Double acting add*

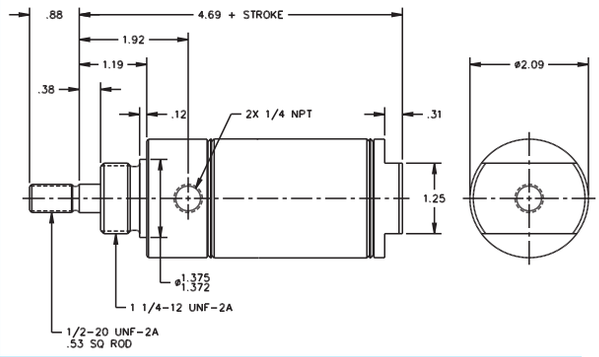
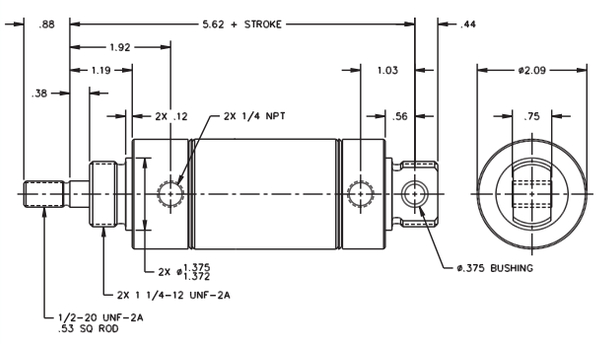
EXTRA EXTENSION (EE)
- *Add per inch of extension*

MOLYCOATED BODY (F)
- *Add per inch of stroke*

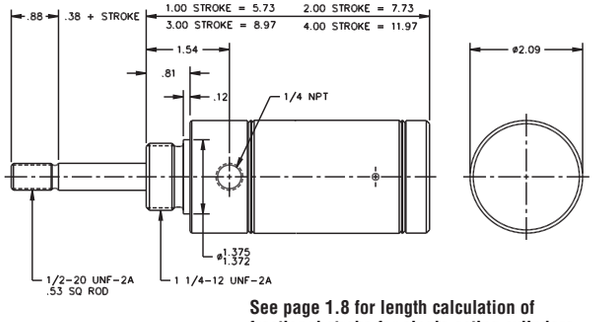
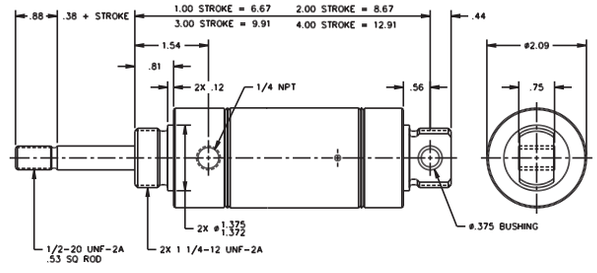
MAGNET (prefix M) – Add
- *Reverse acting add .125" to overall length*
- *Must specify track(s) for use with miniature position sensing (T2, T3, T4) – add per track. See page 1.9 for track location details. See Position Sensing Solutions, page 8.3 for switch selection information.*

LOW TEMPERATURE (N)
Temperature Range: -40˚ to 200˚F
- *Reverse acting add*
- *Double acting add*

HIGH TEMPERATURE SEALS (V)
Temperature Range : 0° to 400°F (-18° to 205°C)
- *Reverse acting add*
- *Double acting add*

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
NR-31☐-D 	***Double Acting** – Air Return* *Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke 12" *Optional Accessories:* D-615 Mounting Bracket D-508 Mounting Nut *Base Weight: 1.40* *Adder Per Inch of Stroke: .15*	
NR-31☐-DXP 	***Double Acting** – Universal Mounting Type – Pivot or Double End – Air Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke 24" *Optional Accessories:* D-615 Mounting Bracket D-231-3 Rod Clevis D-620 Pivot Bracket D-508 Mounting Nut *Base Weight: 1.62* *Adder Per Inch of Stoke: .15*	

2" Bore Non-Rotating Air Cylinders (continued)

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
NR-31□-R 	***Reverse Single Acting*** *– Pull Type – Rod Normally Extended – Spring Return – Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke 4" *Optional Accessories:* D-129 Mounting Bracket D-508 Mounting Nut *Base Weight: 1.24* *Adder Per Inch of Stroke: .43*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**
NR-31□-RP 	***Reverse Single Acting*** *– Pivot or Pull Type – Rod Normally Extended Spring Return – Rear Pivot Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4" Maximum Stroke 4" *Optional Accessories:* D-231-3 Piston Rod Clevis D-620 Pivot Bracket D-508 Mounting Nut D-615 Mounting Bracket *Base Weight: 1.46* *Adder Per Inch of Stroke: .43*	 **See page 1.8 for length calculation of fractional stroke for single acting cylinders.**

2-1/2" Bore Non-Rotating Air Cylinders

- *New!* Stainless Steel Piston Rod Standard.
- Unique Square Piston Rod with Rounded Corners.
- High Strength Aluminum Alloy Rod Guide.
- Urethane-based Rod Seal.
- Buna N "U" Cup Piston Seal.
- Pressure Rating – 250 PSI Maximum (Air only)
- Available in Double Acting.
- Standard Buna N Seals Temperature Range of -20°F (-25°C) to 200° F (95°C)

☐ Enter Stroke Length as 3rd Digit

OPTIONS

NO CHARGE:
- ***MAGNALUBE® G (G)***
- ***PORTS ROTATED (K)***
- ***SIDE PORTED REAR HEAD (Q)***

DOUBLE ACTING BUMPERS (B)
- *additional*
- *Add .125 to overall length*

NON LUBE SERVICE (E)
- *Double acting add*

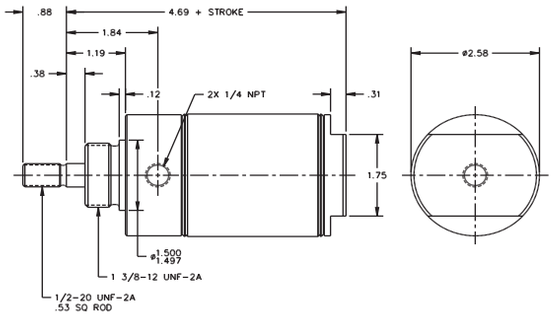
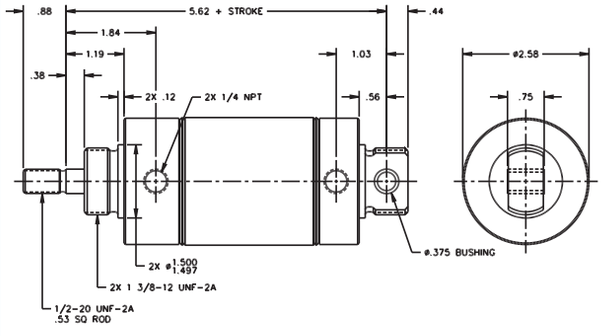
EXTRA EXTENSION (EE)
- *Add per inch of extension*

MOLYCOATED BODY (F)
- *Add per inch of stroke*

MAGNET (prefix M) – Add
- *Must specify track(s) for use with miniature position sensing (T2, T3, T4) – add per track. See page 1.9 for track location details. See Position Sensing Solutions, page 8.3 for switch selection information.*

LOW TEMPERATURE (N)
Temperature Range: -40˚ to 200˚F
- *Double acting add*

HIGH TEMPERATURE SEALS (V)
Temperature Range : 0° to 400°F (-18° to 205°C)
- *Double acting, add*

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
NR-50☐-D 	***Double Acting*** *– Air Return* *Front Nose Mounting* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6" Maximum Stroke 12" *Optional Accessories:* D-615-1 Mounting Bracket D-2540 Mounting Nut *Base Weight: 1.98* *Adder Per Inch of Stroke: .17*	
NR-50☐-DXP 	***Double Acting*** *– Universal* *Mounting Type – Pivot or Double End – Air Return* *Standard Stroke Lengths:* ½", 1", 1½", 2", 2½", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke 24" *Optional Accessories:* D-615-1 Mounting Bracket D-231-3 Rod Clevis D-620 Pivot Bracket D-2540 Mounting Nut *Base Weight: 2.27* *Adder Per Inch of Stroke: .17*	

• Accessories –

- For 9/16'' bore, see page 1.20.
- For 3/4'' bore, see page 1.28.
- For 1-1/16'' bore, see page 1.40.
- For 1-1/2'' bore, see page 1.53.
- For 2'' bore, see page 1.60.
- For 2-1/2'' bore, see page 1.62.

The Bimba PC Cylinder has a stainless steel body, stainless steel rod and acetal resin end caps. It is ideal for applications and environments that require exposure to moisture, lubricants and specific solvents.

How to Order

The model number of all PC Cylinders consists of three alphanumeric clusters. These designate product type, bore size and stroke length, and options. Please refer to the charts below for an example of model number **PC-096-DXPW**. This is an 1-1/16" bore, 6" stroke PC cylinder with a universal mount and rod wiper.

PC – 09 6 – DXP W

Delrin End Cap Cylinder

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

Standard Stroke Lengths
All models: 1/2", 1", 1-1/2", 2", 2-1/2", 3", 4", 5", 6"
DXP & DXDE models: 7", 8", 9", 10", 11", 12"
Consult your local distributor for price and availablity of nonstandard strokes

Mounting	
D	Nose Mount
DXP	Universal Mount
DXDE	Double Ended Rod

Options	
B	Bumpers
C	Air Cushions, both ends
C1	Air Cushion, front end only
C2	Air Cushion, rear head only
E	Non-Lube Service
EEX.XX	Extra Extension
F	Molycoated Body
G	Magnalube® G
K	Pivot 90° (DXP model only)
M	Magnetic Piston
NT	No Thread
Q	Side Ported Rear Head
T	Switch Track (T2,T3 or T4, see page 1.9 for track location details. See Position Sensing Solutions, page 8.3 for switch selection information.)
V	Fluoroelastomer Seals (for compatibility only)
W	Rod Wiper (not available for 9/16" bore)

Approximate Power Factors

9/16"	=	0.2
3/4"	=	0.4
1-1/16"	=	0.9
1-1/2"	=	1.7
2"	=	3.1

For example, a PC-096-DXPW will exert a force of 0.9 times the air line pressure; a PC-173-D will exert a force of 1.7 times the air pressure, etc.

List Prices

Bore	Mounting		Stroke Adder*	Options												
	D	DXP		B Bumpers	C	C1 or C2	C with V D & DXP	C1V or C2V** D & DXP	EE Extra Extension per inch	F Molycoated Body per inch	K Pivot 90° (DXP only)	M Magnetic Piston	T Switch Track (T2,T3,T4)	V Fluoro-elastomer Seals	W Rod Wiper
9/16" (02)											N/C		per Track		
3/4" (04)															
1-1/16" (09)															
1-1/2" (17)															
2" (31)															

Bore	Mounting	Stroke Adder*	Options									
	DXDE		B Bumpers	C	C with V**	C1V	EE Extra Extension per inch	F Molycoated Body per inch	M Magnetic Piston	T Switch Track (T2,T3,T4)	V Fluoro-elastomer Seals	W Rod Wiper
9/16" (02)										per Track		
3/4" (04)												
1-1/16" (09)												
1-1/2" (17)												
2" (31)												

Nonstandard fractional strokes are priced to the next full inch increment.
****Price adder includes the cushion and the floroelastomer seals.***
No charge Option - G, NT, Q
NOTE: See Original Line portion of the catalog for option E pricing.

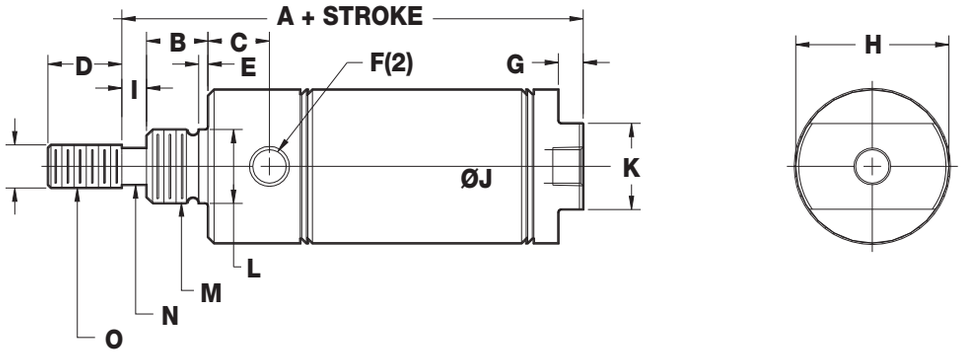
Stainless Steel Accessory Prices

Bore	Rod End Clevis		Mounting Nut	
	Model	Price	Model	Price
9/16" (02)	D-850-SS		D-154-SS	
3/4" (04)	D-54565-SS		D-9-SS	
1-1/16" (09)	D-54564-SS		D-9-SS	
1-1/2" (17)	D-54562-SS		D-1331-SS	
2" (31)	D-54563-SS		D-508-SS	

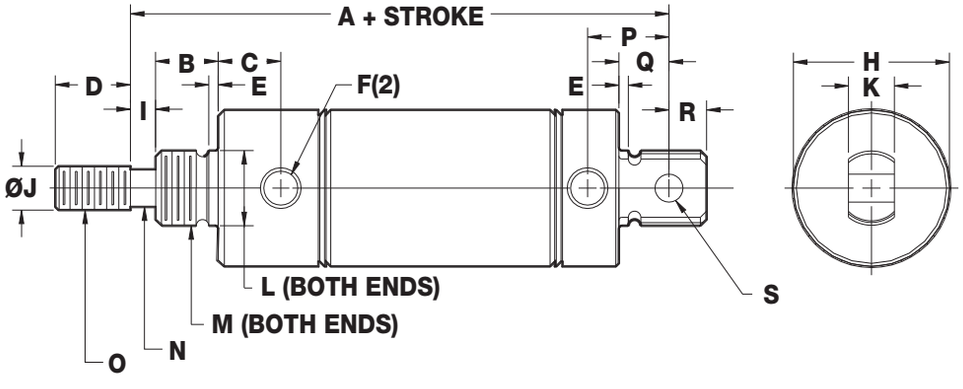
Bore	Foot Bracket		Pivot Bracket	
	Model	Price	Model	Price
9/16" (02)	D-770-SS		D-55202-SS	
3/4" (04)	D-129-SS		D-55203-SS	
1-1/16" (09)	D-129-SS		D-55203-SS	
1-1/2" (17)	D-61288-SS		D-55204-SS	
2" (31)	D-615-SS		D-55205-SS	

Dimensions

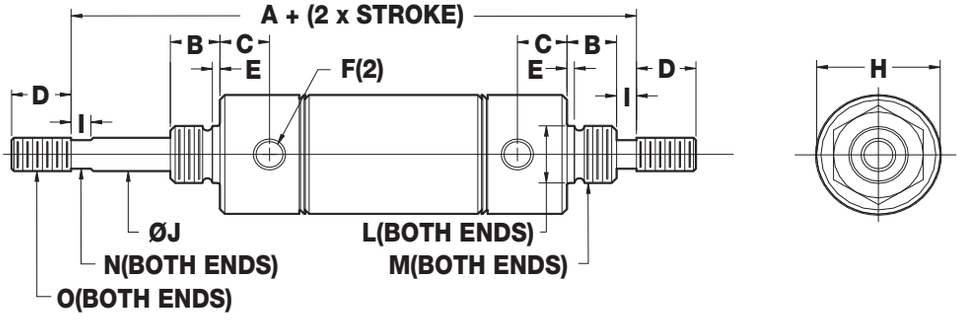
D Mounting Style



DXP Mounting Style



DXDE Mounting



Dimensions

D Mounting Style

Bore	A	A (cushion or Q option)	B	C	D	E	F	G	H	H (cushion option)	I	J	K	L	M	N	O
9/16" (02)	2.28	--	0.38	0.38	0.50	0.06	#10-32	0.19	0.61	--	--	0.19	0.50	.434/.437	7/16-20	--	#10-32
3/4" (04)	2.97	3.44	0.50	0.47	0.50	0.09	1/8 NPT	0.19	0.81	0.96	--	0.25	0.63	.621/.624	5/8-18	--	1/4-28
1-1/16" (09)	3.25	3.50	0.50	0.56	0.50	0.09	1/8 NPT	0.19	1.13	1.13	0.13	0.31	0.88	.621/.624	5/8-18	0.25	5/16-24
1-1/2" (17)	3.69	3.88	0.63	0.63	0.75	0.09	1/8 NPT	0.25	1.56	1.56	0.25	0.44	0.88	.996/.999	1-14	0.38	7/16-20
2" (31)	4.69	5.27	0.81	0.72	0.88	0.13	1/4 NPT	0.31	2.08	2.08	0.38	0.63	1.25	1.372/1.375	1-1/4-12	0.50	1/2-20

Magnetic Piston Length Adder: 0.125" for 1-1/16" and 1-1/2", all other sizes 0.250"

DXP Mounting Style

Bore	A	B	C	D	E	F	H	H (cushion option)	I	J
9/16" (02)	2.56	0.38	0.38	0.50	0.06	#10-32	0.61	--	--	0.19
3/4" (04)	3.75	0.50	0.47	0.50	0.09	1/8 NPT	0.86	0.96	--	0.25
1-1/16" (09)	3.84	0.50	0.56	0.50	0.09	1/8 NPT	1.13	1.13	0.13	0.31
1-1/2" (17)	4.38	0.63	0.63	0.75	0.09	1/8 NPT	1.56	1.56	0.25	0.44
2" (31)	5.63	0.81	0.73	0.88	0.13	1/4 NPT	2.08	2.08	0.38	0.63

Bore	K	L	M	N	O	P	Q	R	S
9/16" (02)	0.31	.434/.437	7/16-20	--	#10-32	0.38	0.25	0.19	0.16
3/4" (04)	0.38	.621/.624	5/8-18	--	1/4-28	0.63	0.34	0.28	0.25
1-1/16" (09)	0.38	.621/.624	5/8-18	0.25	5/16-24	0.63	0.34	0.28	0.25
1-1/2" (17)	0.63	.996/.999	1-14	0.38	7/16-20	0.81	0.50	0.38	0.38
2" (31)	0.74	1.372/1.375	1-1/4-12	0.50	1/2-20	1.03	0.56	0.44	0.38

Magnetic Piston Length Adder: 0.125" for 1-1/16" and 1-1/2", all other sizes 0.250"

DXDE Mounting

Bore	A	B	C	D	E	F	H	H (cushion option)	I	J	L	M	N	O
9/16" (02)	2.94	0.38	0.38	0.50	0.06	#10-32	0.61	--	--	0.19	.434/.437	7/16-20	--	#10-32
3/4" (04)	4.00	0.50	0.47	0.50	0.09	1/8 NPT	0.86	0.96	--	0.25	.621/.624	5/8-18	--	1/4-28
1-1/16" (09)	4.00	0.50	0.56	0.50	0.09	1/8 NPT	1.13	1.13	0.13	0.31	.621/.624	5/8-18	0.25	5/16-24
1-1/2" (17)	5.13	0.63	0.63	0.75	0.09	1/8 NPT	1.56	1.56	0.25	0.44	.996/.999	1-14	0.38	7/16-20
2" (31)	6.56	0.81	0.73	0.88	0.13	1/4 NPT	2.08	2.08	0.38	0.63	1.372/1.375	1-1/4-12	0.50	1/2-20

Magnetic Piston Length Adder: 0.250"

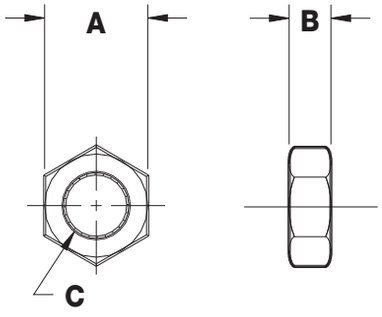
Bumper Length Adder

9/16" (02)	3/4" (04)	1-1/16" (09)	1-1/2" (17)	2" (31)
0.125	0	0.125*	0.125	0.250

For DXDE model, add 0.500"

Dimensions

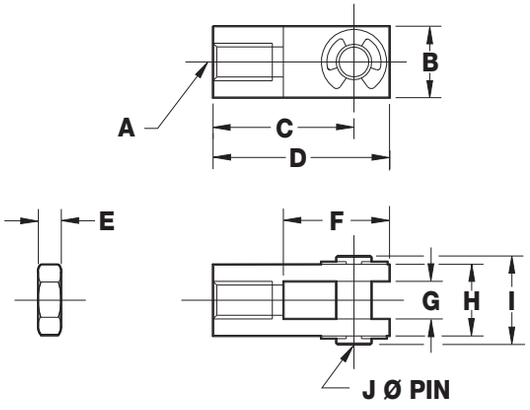
Stainless Steel Mounting Nut*



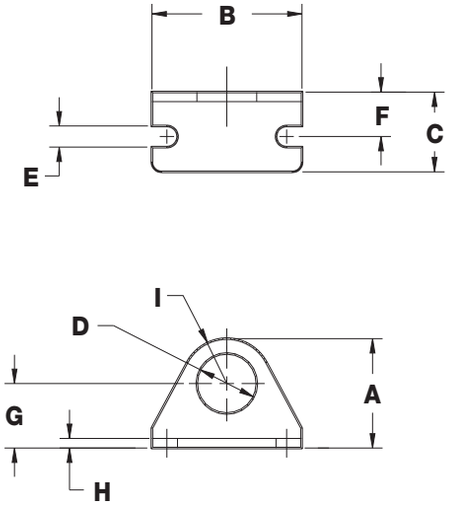
Bore	Model	A	B	C
9/16" (02)	D-154-SS	0.69	0.25	7/16-20
3/4" (04)	D-9-SS	0.94	0.38	5/8-18
1-1/16" (09)	D-9-SS	0.94	0.38	5/8-18
1-1/2" (17)	D-1331-SS	1.50	0.55	1-14
2" (31)	D-508-SS	1.88	0.50	1-1/4-12

See page 1.103 for torque specifications

Stainless Steel Rod End Clevis (includes nut)



Stainless Steel Foot Bracket



Stainless Steel Rod End Clevis (includes nut)

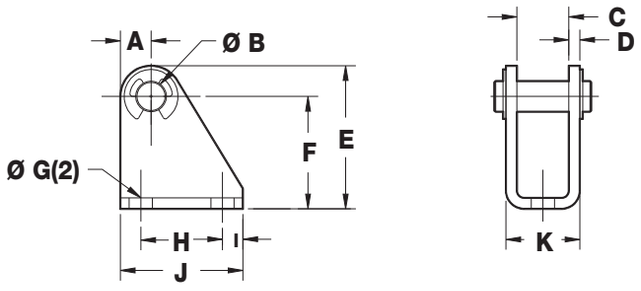
Bore	Model	A	B	C	D	E	F	G	H	I	J
9/16" (02)	D-850-SS	#10-32	0.38	0.75	0.94	0.13	0.56	0.19	0.38	0.56	0.19
3/4" (04)	D-54565-SS	1/4-28	0.50	0.94	1.19	0.16	0.69	0.25	0.50	0.69	0.25
1-1/16" (09)	D-54564-SS	5/16-24	0.50	0.94	1.19	0.19	0.69	0.25	0.50	0.69	0.25
1-1/2" (17)	D-54562-SS	7/16-20	0.75	1.31	1.69	0.25	0.94	0.38	0.75	1.03	0.38
2" (31)	D-54563-SS	1/2-20	0.75	1.31	1.69	0.31	0.94	0.38	0.75	1.03	0.38

Stainless Steel Foot Bracket

Bore	Model	A	B	C	D	E	F	G	H	I
9/16" (02)	D-770-SS	0.84	1.38	0.69	0.44	0.19	0.38	0.56	0.09	0.38
3/4" (04)	D-129-SS	1.38	1.88	1.00	0.63	0.27	0.56	0.81	0.12	0.56
1-1/16" (09)	D-129-SS	1.38	1.88	1.00	0.63	0.27	0.56	0.81	0.12	0.56
1-1/2" (17)	D-61288-SS	1.75	2.50	1.50	1.03	0.28	0.75	1.00	0.12	0.75
2" (31)	D-615-SS	2.50	3.13	1.63	1.38	0.34	1.00	1.50	0.25	1.00

Dimensions

Stainless Steel Pivot Bracket



Bore	Model	A	B	C	D	E	F	G	H	I	J	K
9/16" (02)	D-55202-SS	0.20	0.16	0.31	0.06	0.76	0.56	0.20	0.50	0.13	0.75	0.44
3/4" (04)	D-55203-SS	0.31	0.25	0.38	0.12	1.19	0.88	0.22	0.75	0.19	1.13	0.63
1-1/16" (09)	D-55203-SS	0.31	0.25	0.38	0.12	1.19	0.88	0.22	0.75	0.19	1.13	0.63
1-1/2" (17)	D-55204-SS	0.38	0.38	0.63	0.13	1.75	1.38	0.28	1.00	0.25	1.50	0.91
2" (31)	D-55205-SS	0.38	0.38	0.75	0.25	1.75	1.38	0.28	1.00	0.25	1.50	1.25

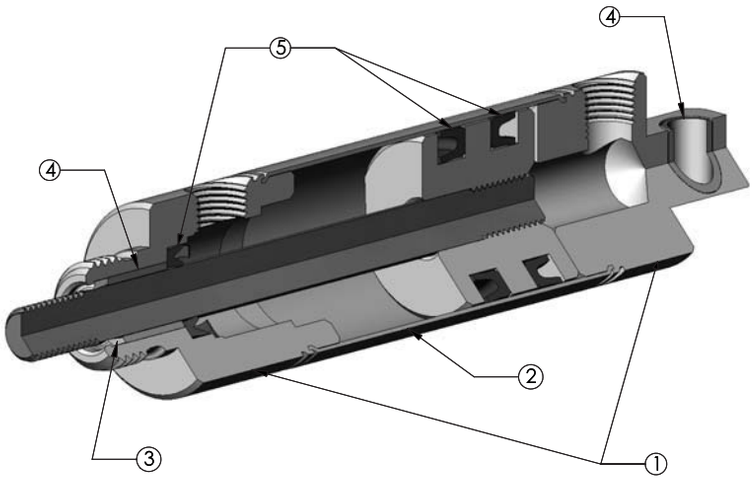
Specifications

Pressure Rating: 100 psi (Air)
Temperature Range: 32°F to 160°F (0°C to 72°C)
Delrin End Caps
304 Stainless Steel Body
303 Stainless Steel Rod
Anodized Aluminum Alloy Piston
Options: Buna N Bumpers
Polyurethane Wiper
Fluoroelastomer Seals (for compatibility only, not high temperature)

CYLINDER WEIGHT (lbs.)					
Bore	Base Weight			Adder per 1"	
	D	DXP	DXDE	D & DXP	DXDE
9/16" (02)	0.05	0.06	0.07	0.02	0.03
3/4" (04)	0.13	0.15	0.18	0.03	0.05
1-1/16" (09)	0.21	0.25	0.3	0.05	0.07
1-1/2" (17)	0.46	0.48	0.6	0.08	0.13
2" (31)	1.08	1.17	1.48	0.15	0.24

MOUNTING NUT Torque Specifications		
Bore Size	Thread Size	Max Torque (in- lbs.)
9/16" (02)	7/16-20	4.0
3/4" (04) 1-1/16" (09)	5/8-18	12.0
1-1/2" (17)	1-14	30.0
2" (31)	1 1/4-12	45.0

Component Description



1. Corrosion resistant 303 Stainless Steel end caps.
2. 304 SS body with mirror finish ID for long, reliable seal life.
3. Urethane rod wiper designed to withstand exposure to harsh chemical solutions while limiting ingress of the solutions and application matter into the cylinder.
4. PTFE-based rod and pivot bushings selected for their resistance to many commonly used cleaning solutions.
5. Nitrile seals are standard with optional high temperature or other materials available.

Operating Specifications

Pressure Rating

250 psi air maximum

Temperature Rating

-20° F to 200° F. Note that if the magnetic piston is used, maximum temperature is derated to 185° F. Fluoroelastomer seals rated for higher temperatures (up to 400° F) are available. If cylinders are operated at temperatures below 0° F for extended time periods, our low temperature option (N) is recommended. This option has a temperature range of -40° F to 200° F. If cylinders are operated below -20° F with low temperature seals for extended time periods, cylinder performance will be affected by the cold temperature.

How to Order

The model number of all Original Line Cylinders consists of three alphanumeric clusters. These designate product type, bores size and stroke length, and mounting styles and options.

Please refer to the charts below for an example of model number SS-092-DW. This is a 303 Stainless Steel End cap Cylinder, 1-1/16" bore, Double Acting Nose Mount, Rod Wiper (standard).

Model Type	
SS	303 Stainless Steel End caps
SSM	Includes Magnetic Piston

*Stainless Steel Rod Standard on all Models

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

Stroke Lengths
In inches and decimal fractions, i.e., 1.75". See individual models for maximum standard stroke. Stroke lengths are available up to 50"

SS - 09 2 - D W

Mounting Styles	
D	Double Acting Nose Mount
DXP	Double Acting, Double End or Rear Pivot Mount

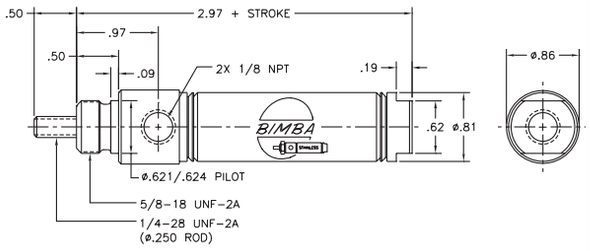
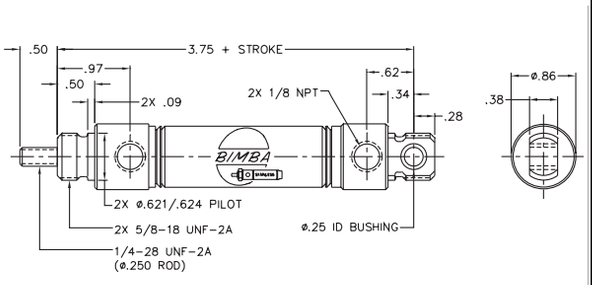
Options	
EE	Extra Rod Extention of x.xx"
F	Molycoated Body
G	Magnalube® G Lubrication
N	Low Temperature Seals and Lube
NT	No Rod Thread
V	High Temperature Seals and Lube
W	Rod Wiper (standard)

*Consult the option combination availability chart on page 1.4.

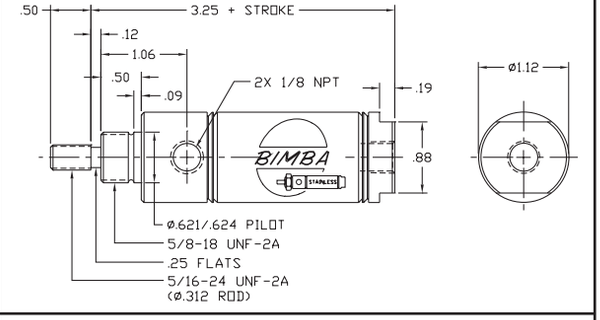
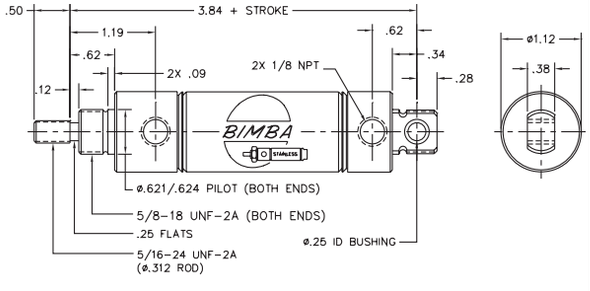
*Rod Wiper is standard; "W" option must be included in part number.

®Magnalube is a registered trademark of Carleton Stuart Corp.

3/4" Bore

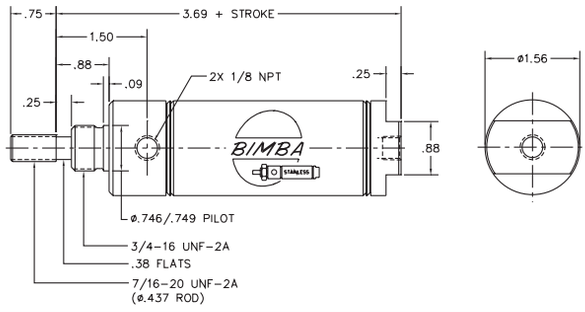
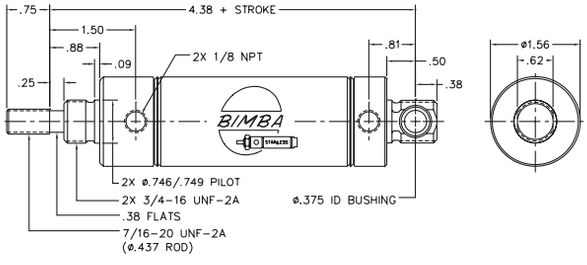
MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
SS-04☐-DW	Stainless Steel End Caps ***Double Acting*** – *Front Nose Mount* Maximum Standard Stroke – 12" Rod Wiper is Standard *Optional Accessories:* D-54565-SS Rod End Clevis D-9-SS Mounting Nut D-129-SS Foot Bracket	
SS-04☐-DXPW	Stainless Steel End Caps ***Double Acting*** – *Universal Mount* Maximum Standard Stroke – 32" Rod Wiper is Standard *Optional Accessories:* D-54565-SS Rod End Clevis D-9-SS Mounting Nut D-129-SS Foot Bracket D-55203-SS Pivot Bracket	

1-1/16" Bore

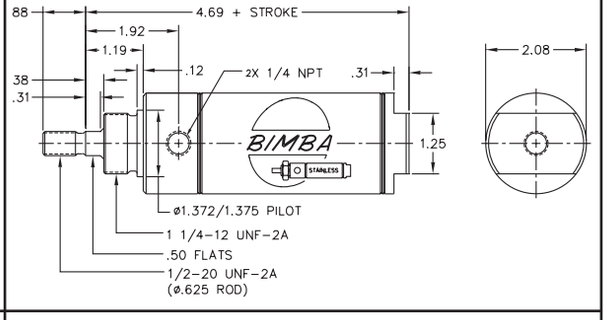
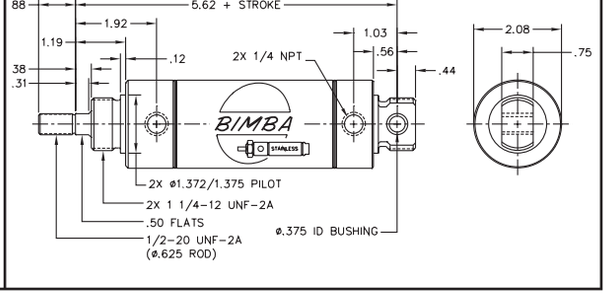
MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
SS-09☐-DW	Stainless Steel End Caps ***Double Acting*** – *Front Nose Mount* Maximum Standard Stroke – 12" Rod Wiper is Standard *Optional Accessories:* D-54564-SS Rod End Clevis D-9-SS Mounting Nut D-129-SS Foot Bracket	
SS-09☐-DXPW	Stainless Steel End Caps ***Double Acting*** – *Universal Mount* Maximum Standard Stroke – 32" Rob Wiper is Standard *Optional Accessories:* D-54564-SS Rod End Clevis D-9-SS Mounting Nut D-129-SS Foot Bracket D-55203-SS Pivot Bracket	

☐Enter Stroke Length

1-1/2" Bore

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
SS-17☐-DW	Stainless Steel End Caps ***Double Acting*** – *Front Nose Mount* Maximum Standard Stroke – 12" Rod Wiper is Standard *Optional Accessories:* D-54562-SS Rod End Clevis D-3556-SS Mounting Nut D-241-SS Foot Bracket	
SS-17☐-DXPW (24" max. stroke)	Stainless Steel End Caps ***Double Acting*** – *Universal Mount* Maximum Standard Stroke – 32" Rod Wiper is Standard *Optional Accessories:* D-54562-SS Rod End Clevis D-3556-SS Mounting Nut D-241-SS Foot Bracket D-55204-SS Pivot Bracket	

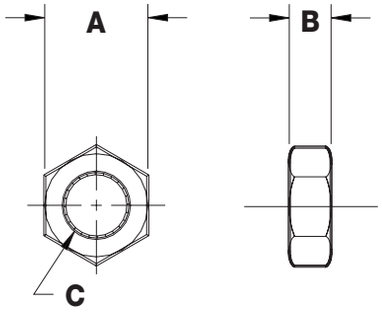
2" Bore

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
SS-31☐-DW	Stainless Steel End Caps ***Double Acting*** – *Front Nose Mount* Maximum Standard Stroke – 12" Rod Wiper is Standard *Optional Accessories:* D-54563-SS Rod End Clevis D-508-SS Mounting Nut D-615-SS Foot Bracket	
SS-31☐-DXPW	Stainless Steel End Caps ***Double Acting*** – *Universal Mount* Maximum Standard Stroke – 32" Rod Wiper is Standard *Optional Accessories:* D-54563-SS Rod End Clevis D-508-SS Mounting Nut D-615-SS Foot Bracket D-55205-SS Pivot Bracket	

☐Enter Stroke Length

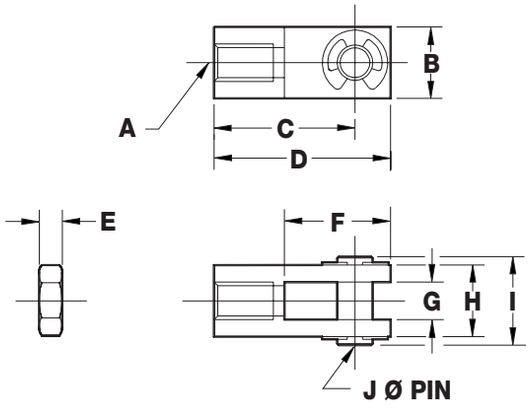
Dimensions (in)

Stainless Steel Mounting Nut

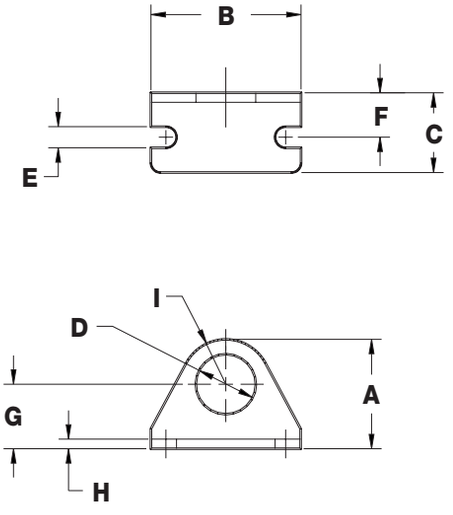


Bore	Model	A	B	C
3/4" (04)	D-9-SS	0.94	0.38	5/8-18
1-1/16"	D-9-SS	0.94	0.38	5/8-18
1-1/2" (17)	D-3556-SS	1.12	0.42	3/4-16
2" (31)	D-508-SS	1.88	0.50	1-1/4-12

Stainless Steel Rod End Clevis (includes nut)



Stainless Steel Foot Bracket



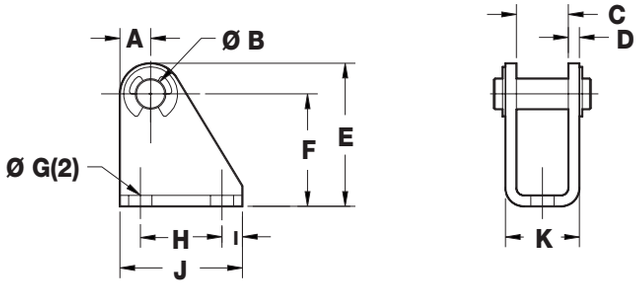
Stainless Steel Rod End Clevis (includes nut)

Bore	Model	A	B	C	D	E	F	G	H	I	J
3/4" (04)	D-54565-SS	1/4-28	0.50	0.94	1.19	0.16	0.69	0.25	0.50	0.69	0.25
1-1/16" (09)	D-54564-SS	5/16-24	0.50	0.94	1.19	0.19	0.69	0.25	0.50	0.69	0.25
1-1/2" (17)	D-54562-SS	7/16-20	0.75	1.31	1.69	0.25	0.94	0.38	0.75	1.03	0.38
2" (31)	D-54563-SS	1/2-20	0.75	1.31	1.69	0.31	0.94	0.38	0.75	1.03	0.38

Stainless Steel Foot Bracket

Bore	Model	A	B	C	D	E	F	G	H	I
3/4" (04)	D-129-SS	1.38	1.88	1.00	0.63	0.27	0.56	0.81	0.12	0.56
1-1/16" (09)	D-129-SS	1.38	1.88	1.00	0.63	0.27	0.56	0.81	0.12	0.56
1-1/2" (17)	D-241-SS	1.75	2.50	1.50	0.75	0.28	0.75	1.00	0.12	0.75
2" (31)	D-615-SS	2.50	3.13	1.63	1.38	0.34	1.00	1.50	0.25	1.00

Stainless Steel Pivot Bracket



Bore	Model	A	B	C	D	E	F	G	H	I	J	K
3/4" (04)	D-55203-SS	0.31	0.25	0.38	0.12	1.19	0.88	0.22	0.75	0.19	1.13	0.63
1-1/16" (09)	D-55203-SS	0.31	0.25	0.38	0.12	1.19	0.88	0.22	0.75	0.19	1.13	0.63
1-1/2" (17)	D-55204-SS	0.38	0.38	0.63	0.13	1.75	1.38	0.28	1.00	0.25	1.50	0.91
2" (31)	D-55205-SS	0.38	0.38	0.75	0.25	1.75	1.38	0.28	1.00	0.25	1.50	1.25

List Prices

	Mounting		Stroke Adder	Options				
Bore	D	DXP		EE (per inch)	F	N	M	V
3/4" (04)								
1-1/16" (09)								
1-1/2" (17)								
2" (31)								

*No charge options - G and NT

Note: Pricing for fractional and non-standard stroke lengths follow the same pricing rules as our standard Original Line cylinders.

Stainless Steel Accessory Prices

Bore	Rod End Clevis		Mounting Nut	
	Model	Price	Model	Price
3/4" (04)	D-54565-SS		D-9-SS	
1-1/16" (09)	D-54564-SS		D-9-SS	
1-1/2" (17)	D-54562-SS		D-3556-SS	
2" (31)	D-54563-SS		D-508-SS	

Bore	Foot Bracket		Pivot Bracket	
	Model	Price	Model	Price
3/4" (04)	D-129-SS		D-55203-SS	
1-1/16" (09)	D-129-SS		D-55203-SS	
1-1/2" (17)	D-241-SS		D-55204-SS	
2" (31)	D-615-SS		D-55205-SS	

How to Order/List Prices

Protection Rating: IP67
R10, RAC, MSS, and R10P Switches

R10 X

Switch Model		
R10	-	AC/DC Reed
RAC	-	High Power AC Reed
MSS	-	Solid State
R10P	-	AC/DC Reed with Circuit Protection

Switch Lead Options		
(leave blank)	-	24" Plain Cable
X	-	120" Plain Cable
Q	-	8mm Quick Connect (not available on RAC or R10P)

Switch Only		
Model	**Description**	**List Each**
R10	AC/DC Reed Switch with 24" Plain Cable Lead	
R10X	AC/DC Reed Switch with 120" Plain Cable Lead	
R10P	AC/DC Reed Switch with Circuit Protection, 24" Plain Cable Lead	
R10PX	AC/DC Reed Switch with Circuit Protection, 120" Plain Cable Lead	
R10Q	AC/DC Reed Switch with 8mm Quick Connect	
RAC	High Power AC Reed Switch with 24" Plain Cable Lead	
RACX	High Power AC Reed Switch with 120" Plain Cable Lead	
MSS	Solid State Switch with 24" Plain Cable Lead	
MSSX	Solid State Switch with 120" Plain Cable Lead	
MSSQ	Solid State Switch with 8mm Quick Connect	

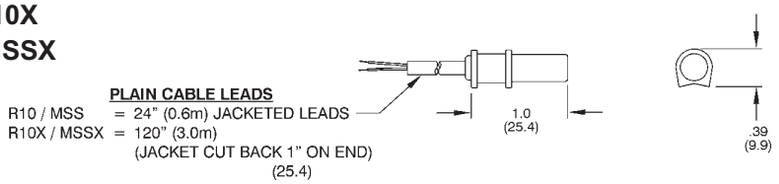
Switch Bands (ordered separately)		
Model	**Description**	**List Each**
USB25	Use with bores, 3/4", 1-1/16", 1-1/2", 2"	

See Position Sensing Solutions, page 8.4 to order Cable Connectors separately.

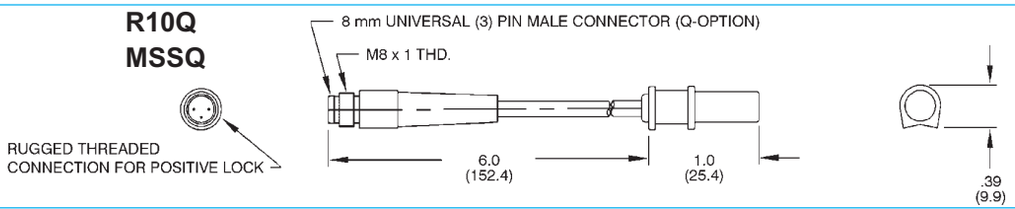
Dimensions

R10, RAC, MSS, and R10P Switches

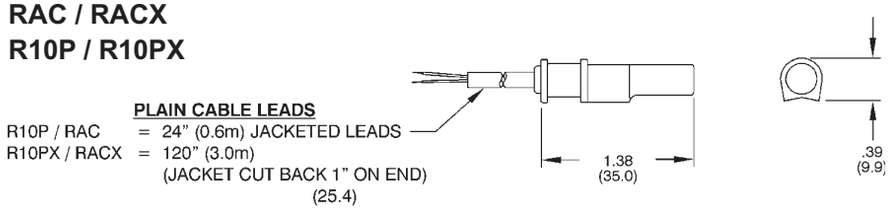
R10 / R10X
MSS / MSSX



R10Q
MSSQ



RAC / RACX
R10P / R10PX

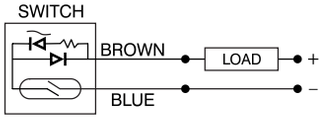


Electrical Circuit Diagrams

R10, RAC, MSS, and R10P Switches

R10 / R10X

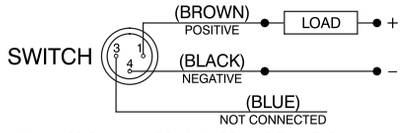
Miniature Reed Switch, Cable Type,
(2 Wire Switch)



Input Voltage	110 Volts Max. DC, 120 Volts Max. AC
Maximum Load Current	400 mA Max. (Resistive) @ 25°C (77°F)
	150 mA Max. (Resistive) @ 70°C (158°F)

R10Q

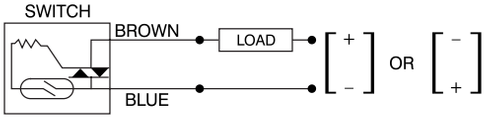
Miniature Reed Switch, 8mm Male Quick Connect,
(2 Wire Switch)



Input Voltage	60 Volts Max. AC or DC
Maximum Load Current	400 mA Max. (Resistive) @ 25°C (77°F)
	150 mA Max. (Resistive) @ 70°C (158°F)

RAC / RACX

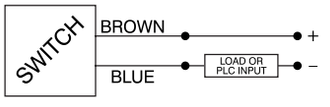
High Power AC Reed Switch, Cable Type,
(2 Wire Switch)



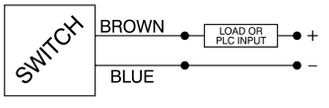
Contact Rating	200 Watts Max.
Input Voltage	12 to 240 Volts (AC only)
Minimum Load Current	80 mA
Maximum Load Current	800 mA

MSS / MSSX

Miniature Solid State Switch, Cable Type,
(2 Wire Switch)



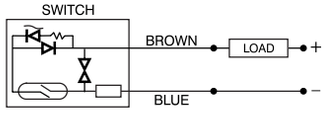
Typical Current Sourcing (PNP) Configuration



Typical Current Sinking (NPN) Configuration

R10P / R10PX

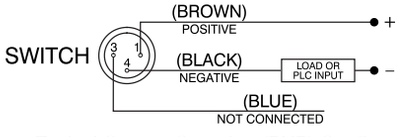
Miniature Reed Switch, Cable Type,
Circuit Protected (2 Wire Switch)



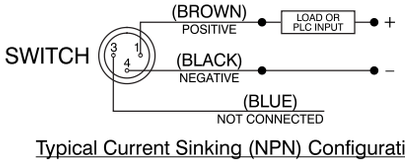
Input Voltage	120 Volts Max. AC, 110 Volts Max. DC
Maximum Load Current	150 mA Max. (Resistive)
Circuit Protection	
Varistor	138 Volts
Choke	680 µH

MSSQ

Miniature Solid State Switch, 8mm Male Quick Connect,
(2 Wire Switch)



Typical Current Sourcing (PNP) Configuration



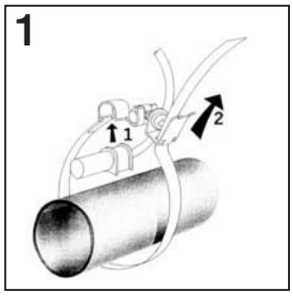
Typical Current Sinking (NPN) Configuration

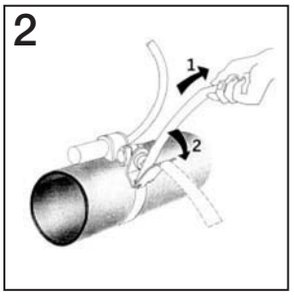
Mounting

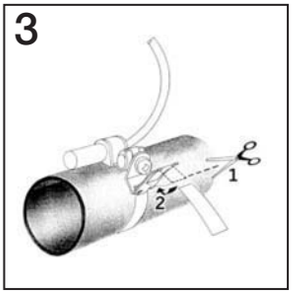
R10, RAC, MSS, and R10P Switches

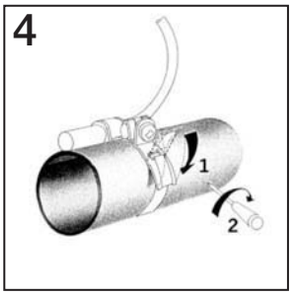
Universal Switch Band

(Mounting Illustrations)





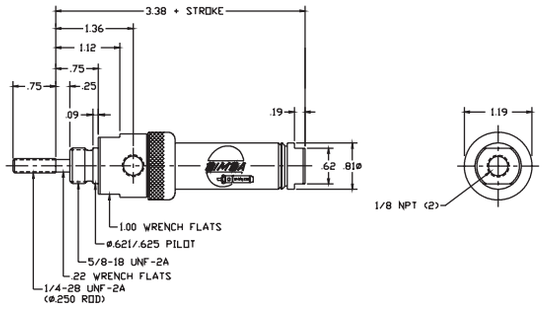
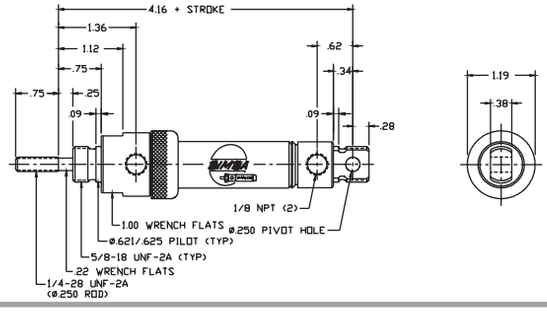




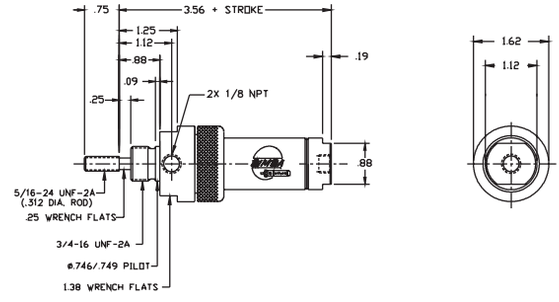
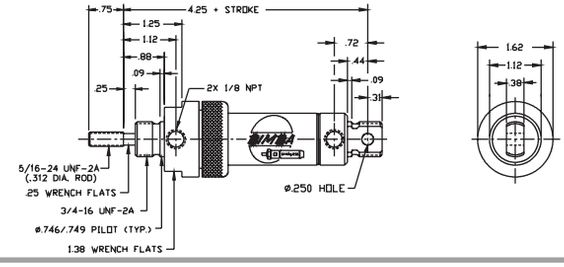
All Stainless Steel Repairable (Bell Ring Style) Original Line Cylinders

The new all stainless repairable Original Line cylinders are ideal for food processing, chemical, medical, pharmaceutical, offshore or marine equipment, and energy production or waste management applications. The bell ring design also offers the added benefit of full repairability without the need for hand tools by securing the body to the rod guide with a knurled, threaded nut.

3/4" Bore

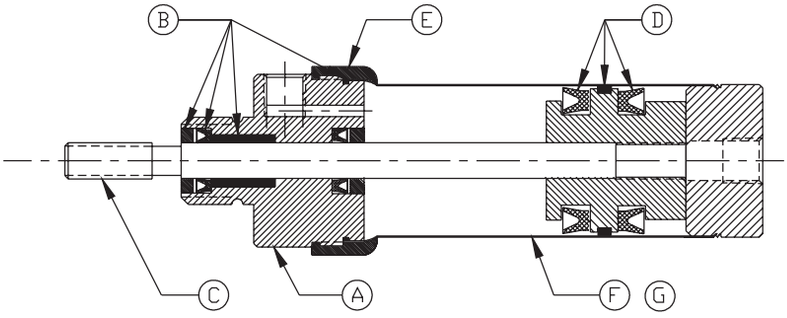
MODEL/PRICE	DESCRIPTION/ACCESSORIES	DIMENSIONS (inch)
D-4161-A-☐ Add per inch of stroke (12" max. stroke)	***Double-Acting*** - Air Return - Front Nose Mounting *Optional Stainless Steel Accessories:* D-129-SS Foot Bracket D-9-SS Mounting Nut D-54565-SS Rod Clevis	
D-4231-A-☐ Add per inch of stroke (24" max. stroke)	***Double-Acting*** - Universal Mounting - Pivot, or Double End Mounting - Air Return *Optional Stainless Steel Accessories:* D-129-SS Foot Bracket D-55203-SS Pivot Bracket D-9-SS Mounting Nut D-54565-SS Rod Clevis	

1-1/16" Bore

MODEL/PRICE	DESCRIPTION/ACCESSORIES	DIMENSIONS (inch)
D-4173-A-☐ Add per inch of stroke (12" max. stroke)	***Double-Acting*** - Air Return - Front Nose Mounting *Optional Stainless Steel Accessories:* D-241-SS Foot Bracket D-3556-SS Mounting Nut D-54564-SS Rod Clevis	
D-4232-A-☐ Add per inch of stroke (24" max. stroke)	***Double-Acting*** - Universal Mounting - Pivot, or Double End Mounting - Air Return *Optional Stainless Steel Accessories:* D-241-SS Foot Bracket D-55203-SS Pivot Bracket D-3556-SS Mounting Nut D-54564-SS Rod Clevis	

☐Enter Stroke Length

Cylinder Assemblies and Component List



3/4" Bore

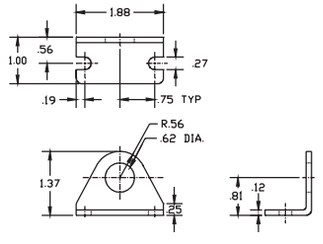
ITEM	PART NO.	DESCRIPTION LIST
A	D-4485-A	ROD GUIDE ASSEMBLY (Includes Rod Guide and D-4530 Kit)
B	D-4530-A	ROD SEAL KIT (Includes Seals, Bushing, Seal Retainer and Body Seal)
C	D-4486-A-☐	PISTON ROD ASSEMBLY (Includes Rod, Piston and D-4531 Kit)
D	D-4531	PISTON SEAL KIT (Includes Piston Seals and Piston Guide Ring)
E	D-3961-SS	BELL RING
F	D-4487-A-☐	REAR HEAD AND BODY ASSEMBLY (Nose Mount)
G	D-4488-A-☐	REAR HEAD AND BODY ASSEMBLY (Universal Mount)

1-1/16" Bore

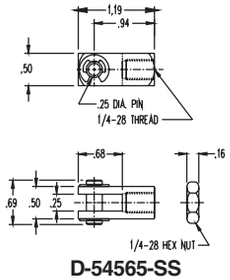
ITEM	PART NO.	DESCRIPTION LIST
A	D-4489-A	ROD GUIDE ASSEMBLY (Includes Rod Guide and D-4533 Kit)
B	D-4533-A	ROD SEAL KIT (Includes Seals, Bushing, Seal Retainer and Body Seal)
C	D-4490-A-☐	PISTON ROD ASSEMBLY (Includes Rod, Piston and D-4534 Kit)
D	D-4534-A	PISTON SEAL KIT (Includes Piston Seals and Piston Guide Ring)
E	D-1778-SS	BELL RING
F	D-4491-A-☐	REAR HEAD AND BODY ASSEMBLY (Nose Mount)
G	D-4492-A-☐	REAR HEAD AND BODY ASSEMBLY (Universal Mount)

SOLID STAINLESS ACCESSORIES (in.)

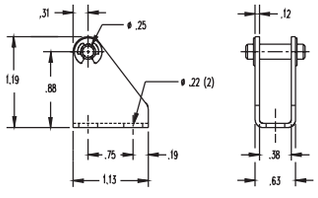
3/4" Bore



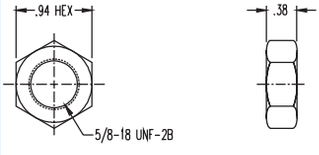
D-129-SS
Foot Bracket



D-54565-SS
Rod Clevis

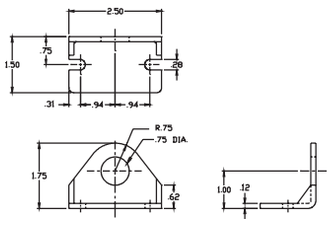


D-55203-SS
Pivot Bracket

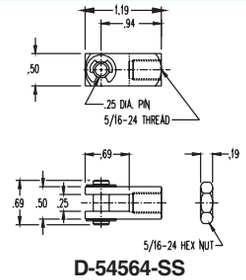


D-9-SS
Mounting Nut

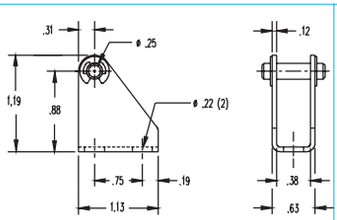
1-1/16" Bore



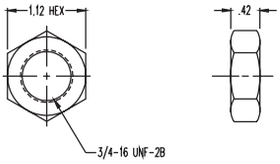
D-241-SS
Foot Bracket



D-54564-SS
Rod Clevis



D-55203-SS
Pivot Bracket



D-3556-SS
Mounting Nut

Engineering Specifications

- 304 Stainless steel body
- Low friction Buna N "U" Cup seals and rod wiper
- 303 Stainless steel endcaps, piston rod, and bell ring nut
- Pressure Rating: 250 psi (air)
- Composite FDA approved rod bearing and FDA approved lubricant

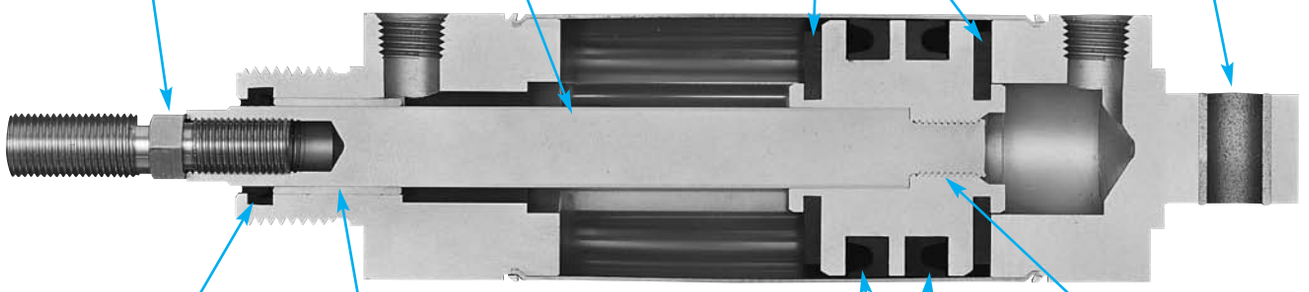
Z Line Air Cylinders
For extremely tough applications

HEX-STUD® rod end heat treated alloy steel easily removed in case of failure

Piston rod ground and polished type 303 stainless steel

CUSHION-QUIET elastomer bumpers for smooth, quiet operation

Sintered bronze pivot bushing



Buna N "U" cup piston rod wiper seal (1⅛" - 1½" - 2" models only)

Sintered bronze rod bushing

Type 304 stainless steel body

Buna N "U" cup piston seals

Piston rod — piloted, threaded and riveted into piston

The Z-Line air cylinder has the rolled-in construction of the Original Line but features the following:

- Larger diameter, two-piece 303 stainless steel piston rod
- HEX-STUD rod end thread of heat treated alloy steel – easily removed in case of failure due to overload
- CUSHION QUIET elastomer bumpers

☐ Enter Stroke Length as 3rd Digit

OPTIONS:

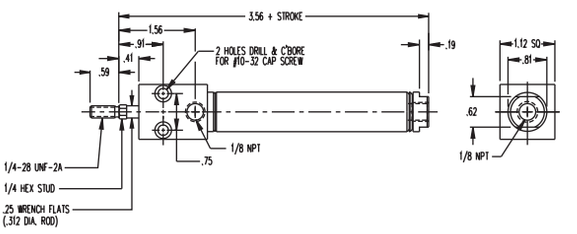
NO CHARGE:
- *MAGNALUBE G (G)*

EXTRA EXTENSION (EE), PER INCH OF EXTENSION:
- *¾" Bore, add*
- *1⅛" Bore, add*
- *1½" Bore, add*
- *2" Bore, add*

MOLYCOATED BODY (F)
- *Add per inch of stroke*

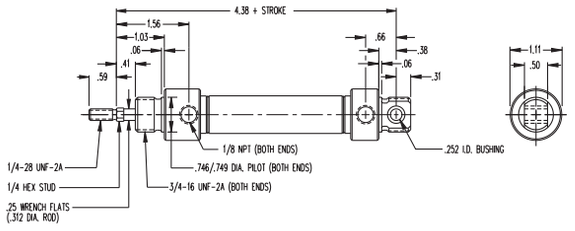
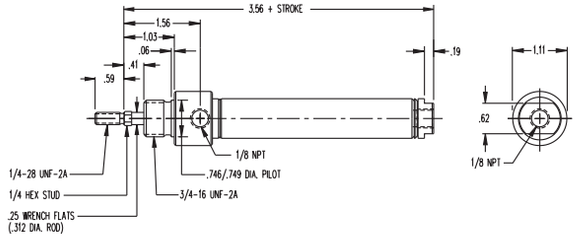
MAGNET (prefix M)
- *¾" Bore, add*
- *1⅛" Bore, add*
- *1½" Bore, add*
- *2" Bore, add*
- *Must specify track(s) for use with miniature position sensing (T2, T3, T4) – add per track. See page 1.9 for track location details. See Position Sensing Solutions, page 8.3 for switch selection information.*

3/4" Bore Z Line Air Cylinders
Push Force = .441 x psi · Pull Force = .365 x psi

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
04☐-DBZ 	***Block Mount** – Double Acting – Two bolt holes are provided for positive mounting to a base.* *Standard Stroke Lengths:* 1", 2", 3", 4", 5", 6" Maximum Stroke – 12" *Base Weight: .30* *Adder Per Inch of Stroke: .04*	

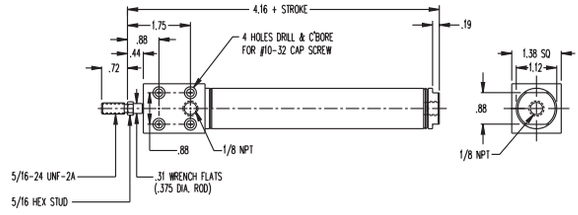
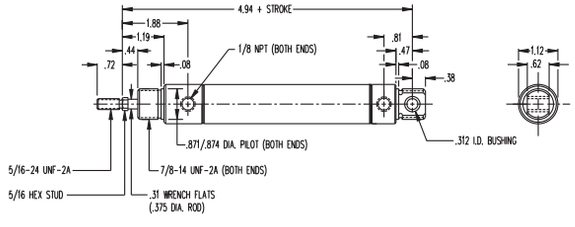
3/4" Bore Z Line Air Cylinders (continued)

Push Force = .441 x psi · Pull Force = .365 x psi

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
04□-DUZ 	***Universal Mount*** *– Double Acting – For double end mounting use D-8315 mounting bracket. For rear pivot mounting use D-8321-A pivot bracket. Use D-10139-A rod clevis. Standard Stroke Lengths:* 1", 2", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 32" *Base Weight: .30 Adder Per Inch of Stroke: .04*	
04□-DZ 	***Nose Mount*** *– Double Acting – Use D-8315 mounting bracket. Standard Stroke Lengths:* 1", 2", 3", 4", 5", 6" Maximum Stroke – 12" *Base Weight: .27 Adder Per Inch of Stroke: .04*	

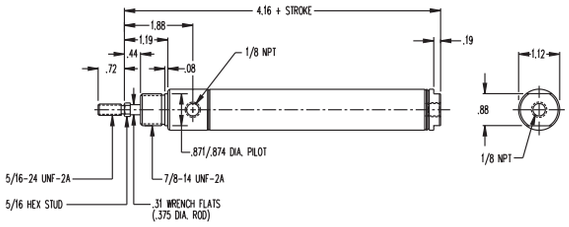
1-1/16" Bore Z Line Air Cylinders

Push Force = .886 x psi · Pull Force = .776 x psi

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
09□-DBZ 	***Block Mount*** *– Double Acting – Four bolt holes are provided for positive mounting to a base. Standard Stroke Lengths:* 1", 2", 3", 4", 5", 6" Maximum Stroke – 12" *Base Weight: .55 Adder Per Inch of Stroke: .06*	
09□-DUZ 	***Universal Mount*** *– Double Acting – For double end mounting use D-8316 mounting bracket. For rear pivot mounting use D-8322-A pivot bracket. Use D-8309-A rod clevis. Standard Stroke Lengths:* 1", 2", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 32" *Base Weight: .45 Adder Per Inch of Stroke: .06*	

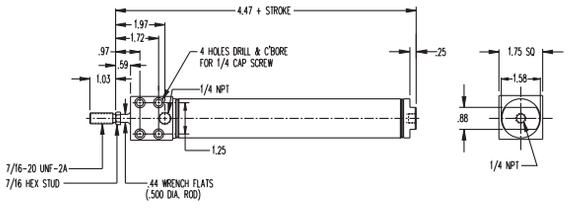
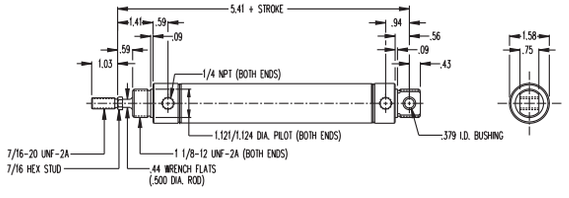
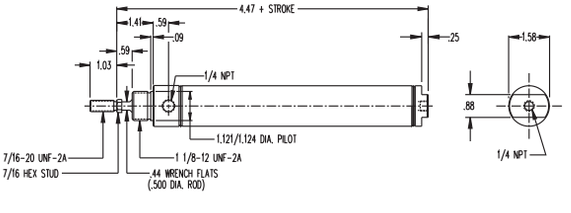
1-1/16" Bore Z Line Air Cylinders (continued)

Push Force = .886 x psi · Pull Force = .776 x psi

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
09□-DZ 	***Nose Mount*** *– Double Acting – Use D-8316 mounting bracket. Standard Stroke Lengths:* 1", 2", 3", 4", 5", 6" Maximum Stroke – 12" *Base Weight: .38 Adder Per Inch of Stroke: .06*	

1-1/2" Bore Z Line Air Cylinders

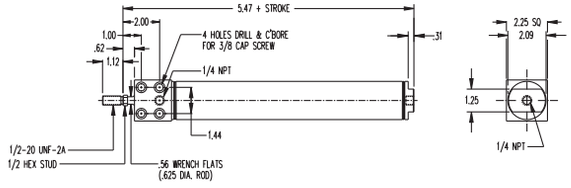
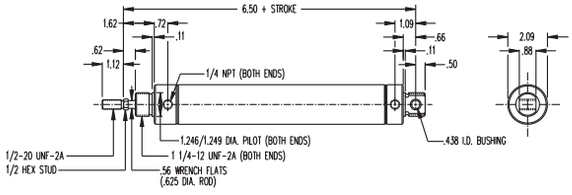
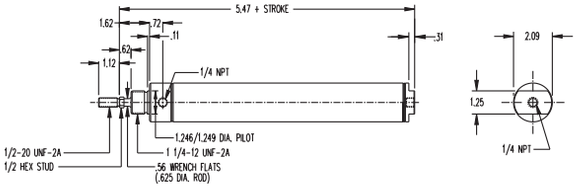
Push Force = 1.77 x psi · Pull Force = 1.57 x psi

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
17□-DBZ 	***Block Mount*** *– Double Acting – Four bolt holes are provided for positive mounting to a base. Standard Stroke Lengths:* 1", 2", 3", 4", 5", 6" Maximum Stroke – 12" *Base Weight: 1.00 Adder Per Inch of Stroke: .10*	
17□-DUZ 	***Universal Mount*** *– Double Acting – For double end mounting use D-8318 mounting bracket. For rear pivot mounting use D-8324-A pivot bracket. Use D-8311-A rod clevis. Standard Stroke Lengths:* 1", 2", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 32" *Base Weight: .92 Adder Per Inch of Stroke: .10*	
17□-DZ 	***Nose Mount*** *– Double Acting – Use D-8318 mounting bracket. Standard Stroke Lengths:* 1", 2", 3", 4", 5", 6" Maximum Stroke – 12" *Base Weight: .78 Adder Per Inch of Stroke: .10*	

Z Line Air Cylinders

2" Bore Z Line Air Cylinders

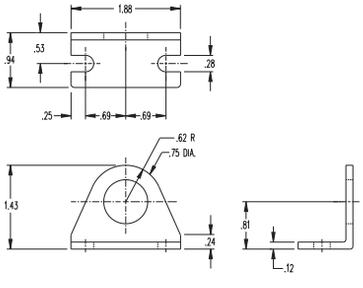
Push Force = 3.14 x psi · Pull Force = 2.83 x psi

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
31□-DBZ 	***Block Mount*** *– Double Acting – Four bolt holes are provided for positive mounting to a base. Standard Stroke Lengths:* 1", 2", 3", 4", 5", 6" Maximum Stroke – 12" *Base Weight: 2.03 Adder Per Inch of Stroke: .15*	
31□-DUZ 	***Universal Mount*** *– Double Acting – For double end mounting use D-8319 mounting bracket. For rear pivot mounting use D-8325-A pivot bracket. Use D-8313-A rod clevis. Standard Stroke Lengths:* 1", 2", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 32" *Base Weight: 2.15 Adder Per Inch of Stroke: .15*	
31□-DZ 	***Nose Mount*** *– Double Acting – Use D-8319 mounting bracket. Standard Stroke Lengths:* 1", 2", 3", 4", 5", 6" Maximum Stroke – 12" *Base Weight: 1.91 Adder Per Inch of Stroke: .15*	

Z Line Accessories

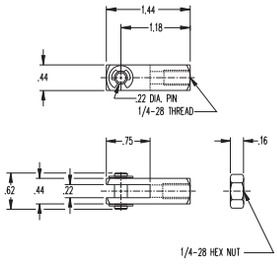
3/4" Bore Accessories

D-8315



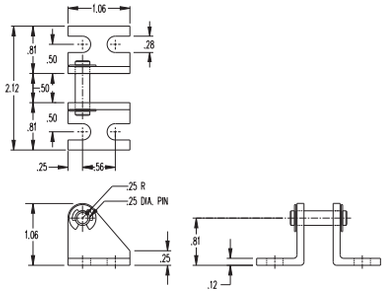
Mounting Bracket

D-10139-A



Rod Clevis

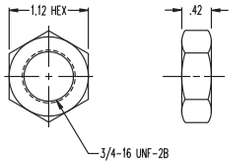
D-8321-A



Pivot Bracket

3/4" Bore Accessories (continued)

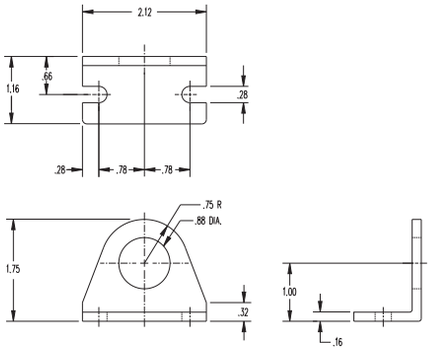
D-3556



Mounting Nut

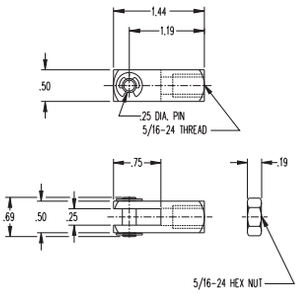
1-1/16" Bore Accessories

D-8316



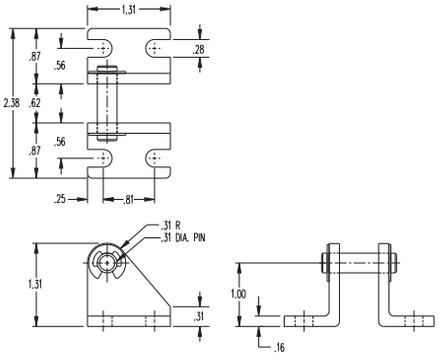
Mounting Bracket

D-8309-A



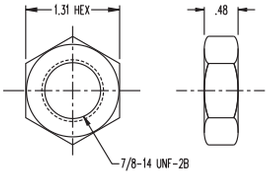
Rod Clevis

D-8322-A



Pivot Bracket

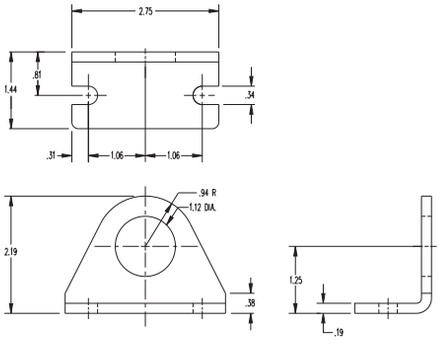
D-2545



Mounting Nut

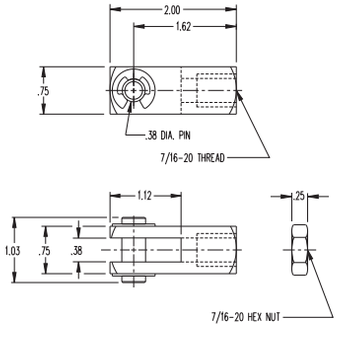
1-1/2" Bore Accessories

D-8318



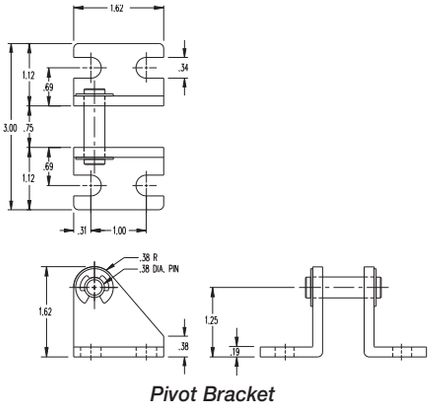
Mounting Bracket

D-8311-A



Rod Clevis

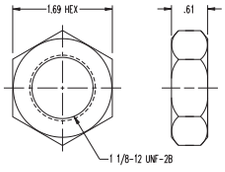
D-8324-A



Pivot Bracket

1-1/2" Bore Accessories (continued)

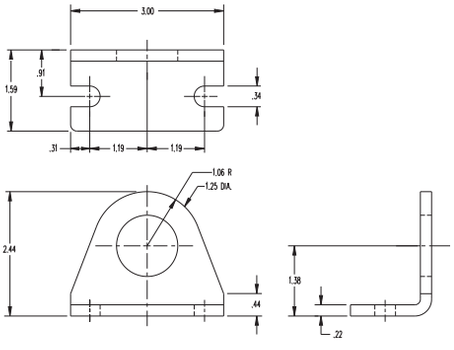
D-8484



Mounting Nut

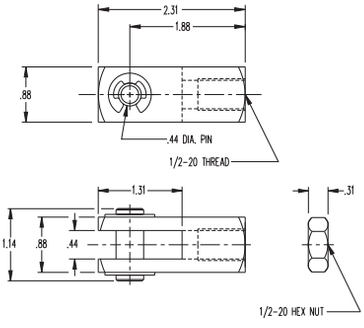
2" Bore Accessories

D-8319



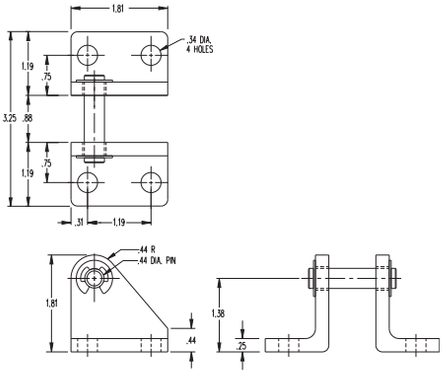
Mounting Bracket

D-8313-A



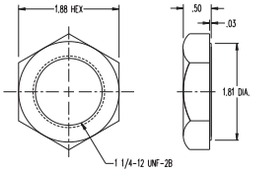
Rod Clevis

D-8325-A



Pivot Bracket

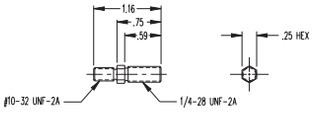
D-508



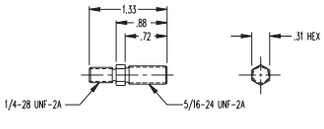
Mounting Nut

Hex-Stud

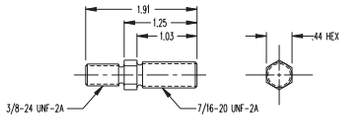
¾" BORE D-9868



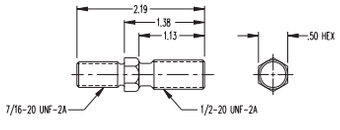
1 1/16" BORE D-6583

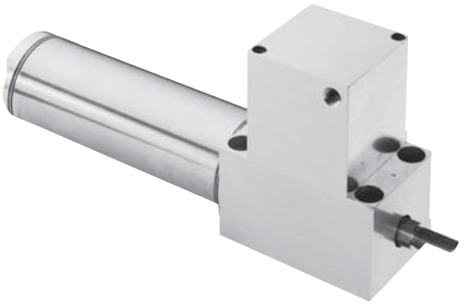


1½" BORE D-6636



2" BORE D-6637





The Bimba Original Line Rod Lock Cylinder is a normally clamped unit that holds the piston rod in position when air pressure is not present. It is ideal for preventing drift at machine shut down.

How to Order

The model number for all Original Line Rod Lock cylinders consists of three alphanumeric clusters. These designate product type, bore size and stroke length, and options.

Please note the following features are standard, and are included in all model numbers: BFLM (Block Front with Magnet) and W (Rod Wiper).

Product Type
BFLM - Original Line Rod Lock
(Block Front and Magnet Standard)

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

Standard Stroke Lengths
Refer by bore size to OL double-acting standard stroke lengths

BFLM - 093 - DW

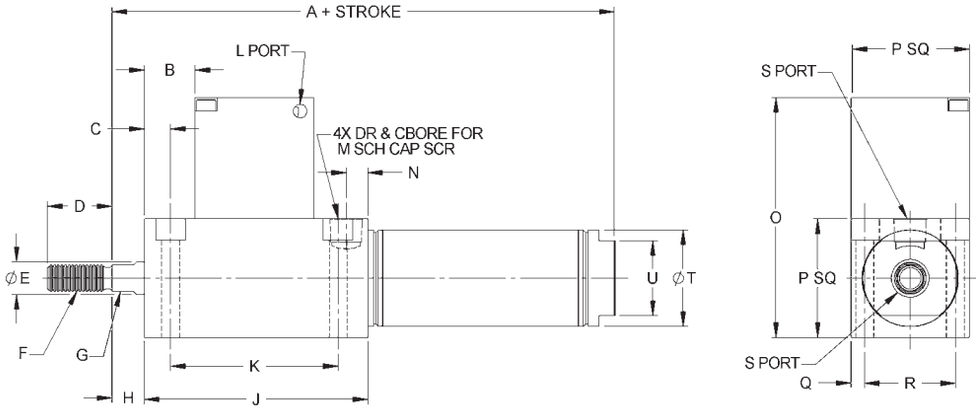
Mounting Style	
D	- Axial Rear Port
DXP	- Universal Mount (Includes pivot bushing)

Options		
B	-	Double Acting Bumpers
F	-	Molycoated Body ID
N	-	Low Temperature Operation (-40°F to +200°F)
Q	-	Side Port Rear Head
T2, T3, T4	-	Add Track for MS Series Switch
V	-	High Temperature Operation (0°F to +400°F)
W	-	Rod Wiper (standard)
EE	-	Extra Rod Extension

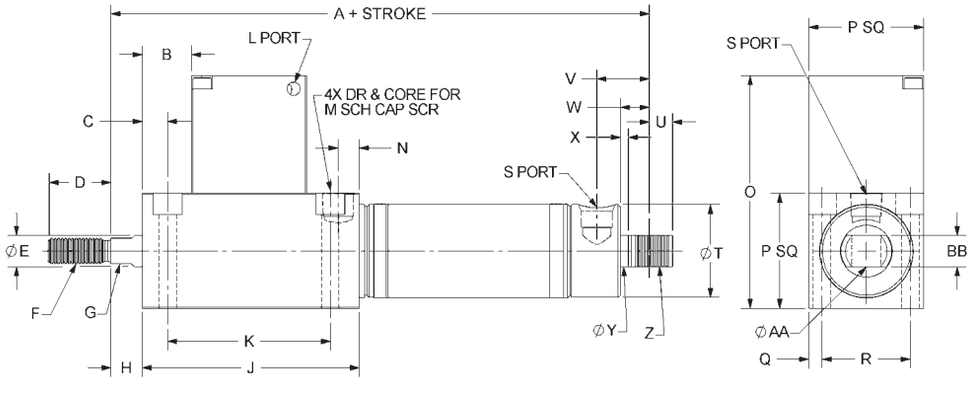
List Prices

Bore	Mounting Style D	Mounting Style DXP	Add per 1" Stroke	Bumpers B	Molycoat F (per inch)	Low Temp N	Switch Track T2, T3, T4 (per track)	High Temp V	Extra Extension EE (per inch)
3/4" (04)									
1-1/16" (09)									
1-1/2" (17)									
2" (31)									
2-1/2" (50)									
3" (70)									

Dimensions
D Mounting Style



DXP Mounting Style



Dimensions (in.)

D Model

Bore	A	B	C	D	E	F	G	H	J	K	L
3/4" (04)	4.48	0.72	0.37	0.75	0.31	1/4-28 UNF-2A	0.25	0.25	2.48	1.83	#10-32 UNF-2B
1-1/16" (09)	4.84	0.61	0.31	0.75	0.38	5/16-24 UNF-2A	0.31	0.38	2.6	1.95	#10-32 UNF-2B
1-1/2" (17)	5.47	0.82	0.32	1.25	0.5	7/16-20 UNF-2A	0.43	0.38	3.37	2.75	1/8 NPT
2" (31)	6.84	0.88	0.44	1.25	0.62	1/2-20 UNF-2A	0.56	0.38	3.97	3.13	1/8 NPT
2-1/2" (50)	7.48	0.87	0.43	1.25	0.75	1/2-20 UNF-2A	0.62	0.38	4.61	3.62	1/4 NPT
3" (70)	8.22	0.92	0.46	1.25	0.75	5/8-18 UNF-2A	0.62	0.38	5.15	4.17	1/4 NPT

Bore	M	N	O	P	Q	R	S	T	U
3/4" (04)	#10	0.25	2.32	1.12	0.16	0.81	1/8 NPT	0.80	0.62
1-1/16" (09)	#10	0.25	2.78	1.38	0.16	1.06	1/8 NPT	1.12	0.87
1-1/2" (17)	1/4	0.32	3.38	1.75	0.25	1.25	1/4 NPT	1.56	0.88
2" (31)	3/8	0.39	4.45	2.25	0.31	1.62	1/4 NPT	2.08	1.24
2-1/2" (50)	7/16	0.42	5.67	2.75	0.44	1.88	1/4 NPT	2.58	1.74
3" (70)	1/2	0.42	6.28	3.25	0.5	2.25	3/8 NPT	3.13	1.99

DXP Model

Bore	A	U	V	W	X	Y	Z	AA	BB
3/4" (04)	5.26	0.28	0.62	0.35	0.09	0.62	5/8-18 UNF-2A	0.25	0.37
1-1/16" (09)	5.44	0.28	0.62	0.34	0.09	0.62	5/8-18 UNF-2A	0.25	0.37
1-1/2" (17)	6.68	0.47	0.97	0.56	0.09	1.00	1-14 UNF-2A	0.38	0.68
2" (31)	7.78	0.44	1.03	0.56	0.13	1.37	1-1/4-12 UNF-2A	0.38	0.72
2-1/2" (50)	8.42	0.44	1.03	0.56	0.12	1.50	1-3/8-12 UNF-2A	0.38	0.72
3" (70)	9.47	0.63	1.34	0.81	0.19	1.62	1-1/2-12 UNF-2A	0.50	0.85

Options

Dimensional Deviations from Standard

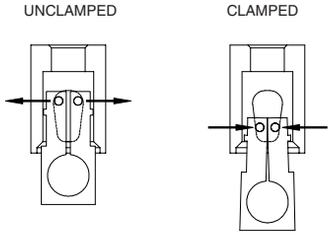
Option	Dimensional Deviation
Q - Side Port Rear Head	Use DXP model, omit rear pivot tang
B - Bumpers Add to Overall Length by Bore Size:	04 - no adder 09 - .13" 17 - .13" 31 - .25" 50 - .25" 70 - .25"

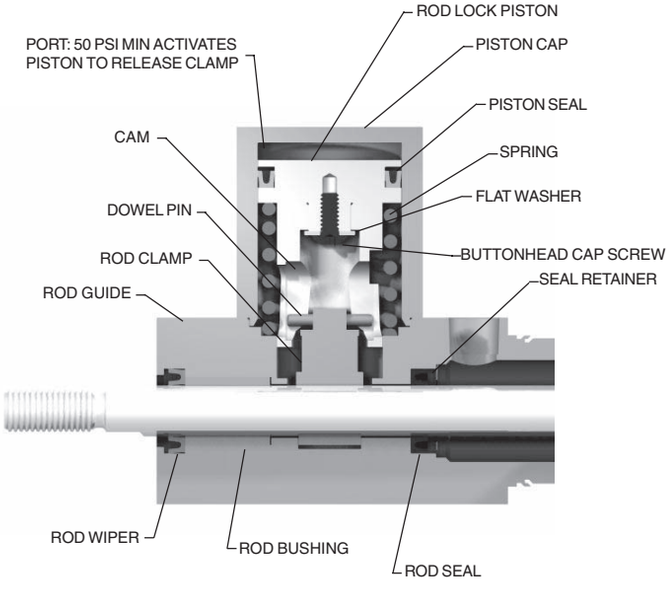
Weights (lbs.)

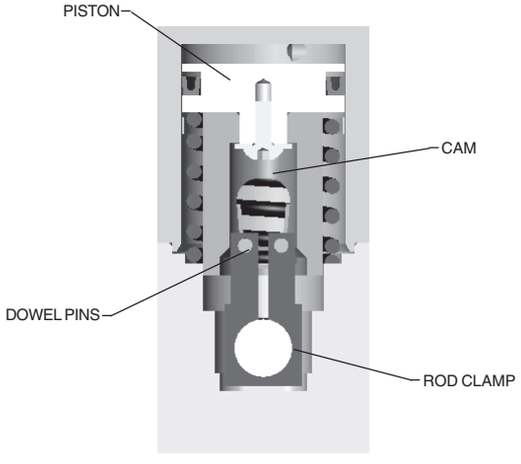
Bore	Base Weight	Adder per Inch of Stroke
3/4" (04)	0.46	0.03
1-1/16" (09)	1.03	0.05
1-1/2" (17)	1.97	0.08
2" (31)	4.08	0.15
2-1/2" (50)	7.13	0.17
3" (70)	10.55	0.26

How It Works

- Dowel pins ride in the cam groove.
- When air pressure is present, piston actuates and dowel pins follow cam to open position, allowing piston rod to travel freely through clamp.
- In absense of pressure, the spring actuates piston and dowels follow to closed position, activating the rod clamp.







Engineering Specifications

Operating Medium:	Air
Operating Pressure:	50 psi minimum (to actuate lock piston) 125 psi maximum
Temperature Range:	-20 to +200 degrees F
Lubrication:	HT-99
Cylinder body:	304 stainless steel
Rod Guide, Rear Head:	Aluminum
Cap:	Anodized aluminum
Piston & Rod Seal:	Buna-N
Rod & Pivot Bushing:	Sintered bronze
Piston Rod:	Hard chrome plated stainless steel
Expected Service Life:	5 million cylinder actuations 1 million lock actuations

Rod Lock Holding Forces

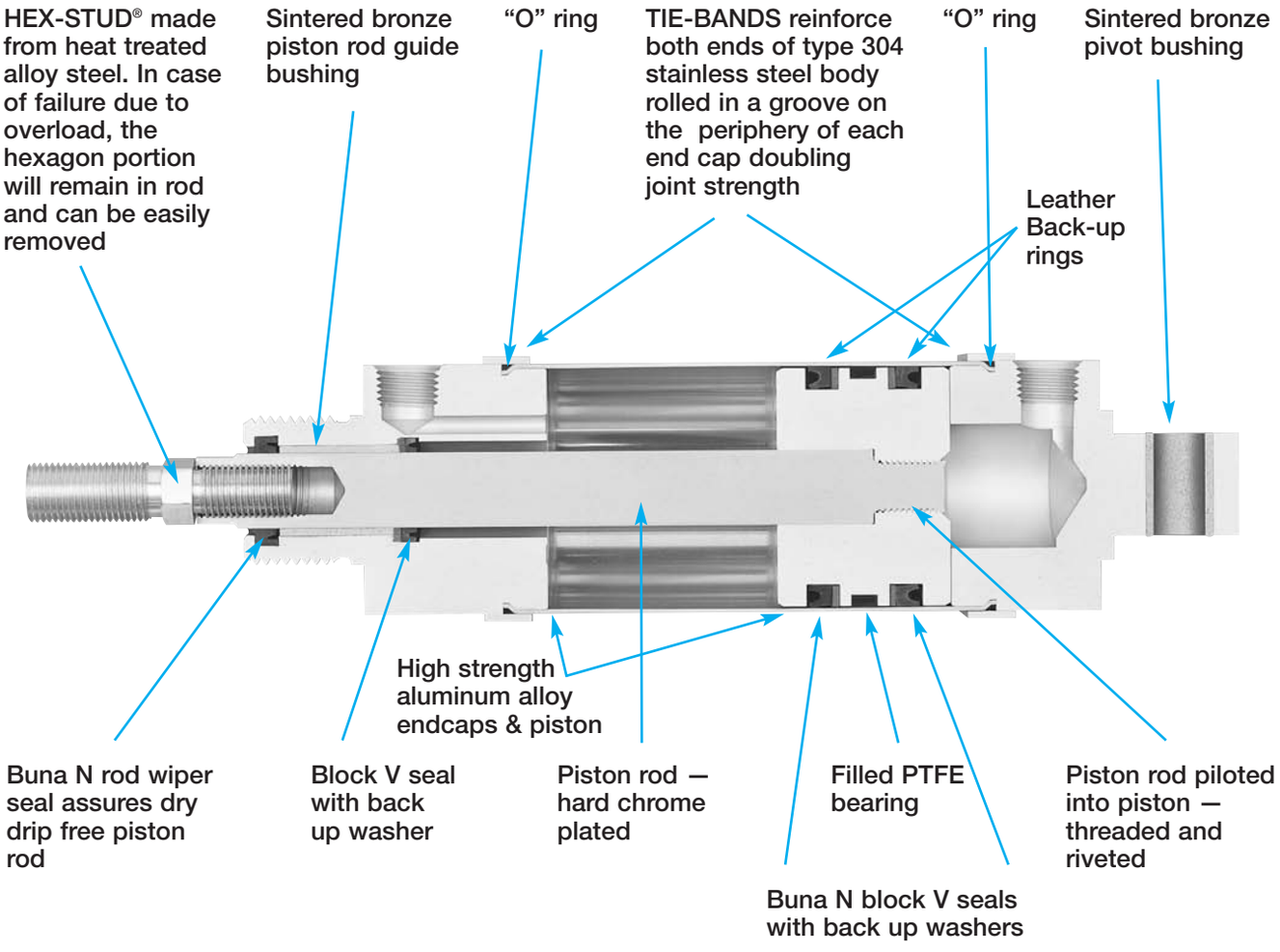
Bore	Holding Force (Pounds)
3/4" (04)	40
1-1/16" (09)	90
1-1/2" (17)	170
2" (31)	310
2-1/2" (50)	500
3" (70)	700

Operating Guidelines/Product Precautions

- The Rod Lock is not a safety device.
- Do not use for intermediate stopping; the cylinder is designed to prevent drift from a stationary position.
- Load weight must not exceed the stated holding force for the cylinder.

500

Hydraulic Cylinders



The Bimba "500" is a precision built, compact, lightweight hydraulic cylinder designed specifically for hydraulic use only, at pressures up to 500 psi.

- Rated 500 PSI Hydraulic (non-shock), Double Acting

OPTIONS:

EXTRA EXTENSION (EE), PER INCH OF EXTENSION:

- *1 1/16" Bore, add per inch*
- *1 1/2" Bore, add per inch*
- *2" Bore, add per inch*

PORTS ROTATED 90 DEGREES (K) (no charge)

☐ Enter Stroke Length as 3rd Digit

OPTIONS continued...

MAGNET (prefix M)

Example: HM-096-DZ

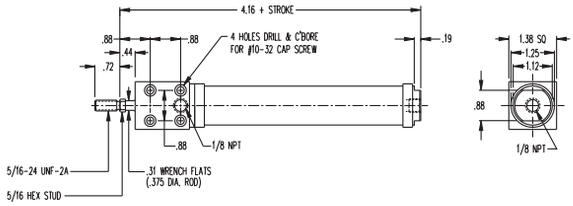
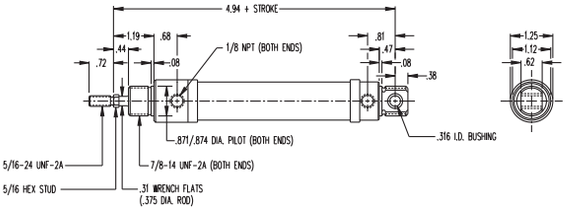
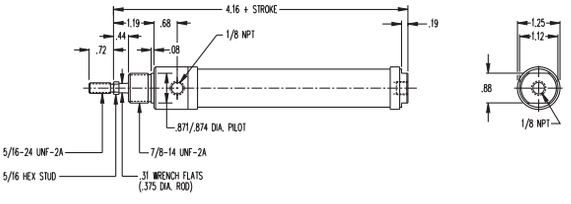
- *4" stroke or greater required*
- *Overall length increases by 0.25"*
- *1 1/16" Bore, add*
- *1 1/2" Bore, add*
- *2" Bore, add*

FLUOROELASTOMER SEALS (V)

- *Specify for compatibility*
- *1 1/16" Bore, add*
- *1 1/2" Bore, add*
- *2" Bore, add*

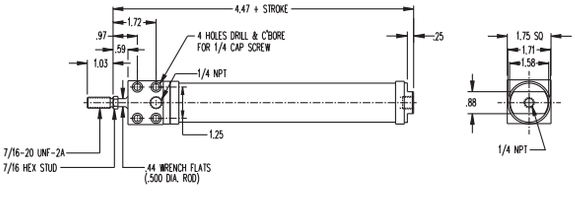
1-1/16" Bore "500" Hydraulic Cylinders

Push Force = .886 x psi · Pull Force = .776 x psi

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
H-09□-DBZ 	***Front Block Mount*** *Standard Stroke Lengths:* 1", 2", 3", 4", 5", 6" Maximum Stroke – 12" *Base Weight: .57* *Adder Per Inch of Stroke: .06*	
H-09□-DUZ 	***Universal Mount*** *– Double End or Rear Pivot* *Standard Stroke Lengths:* 1", 2", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 32" *Optional Accessories:* D-8316 Mounting Bracket D-8322-A Pivot Bracket D-8309-A Clevis *Base Weight: .50* *Adder Per Inch of Stroke: .06*	
H-09□-DZ 	***Nose Mount*** *Standard Stroke Lengths:* 1", 2", 3", 4", 5", 6", 7" Maximum Stroke – 12" *Optional Accessory:* D-8316 Mounting Bracket *Base Weight: .43* *Adder Per Inch of Stroke: .06*	

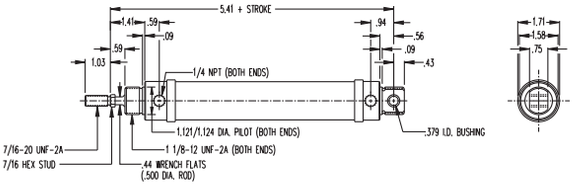
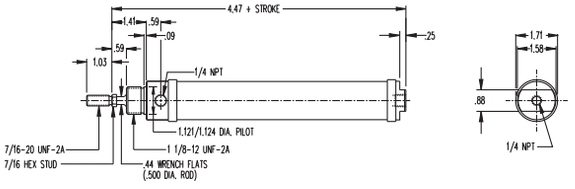
1-1/2" Bore "500" Hydraulic Cylinders

Push Force = 1.77 x psi · Pull Force = 1.57 x psi

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
H-17□-DBZ 	***Front Block Mount*** *Standard Stroke Lengths:* 1", 2", 3", 4", 5", 6" Maximum Stroke – 12" *Base Weight: 1.00* *Adder Per Inch of Stroke: .10*	

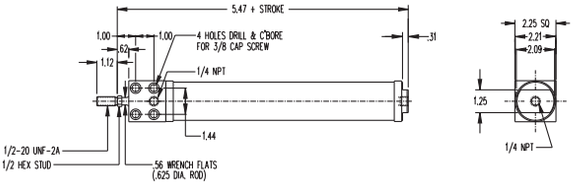
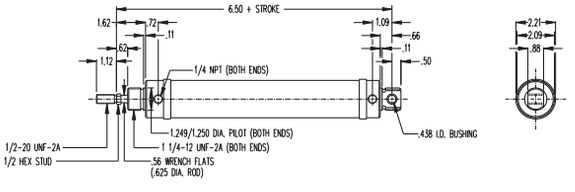
1-1/2" Bore "500" Hydraulic Cylinders (continued)

Push Force = 1.77 x psi · Pull Force = 1.57 x psi

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
H-17□-DUZ 	***Universal Mount*** *– Double End or Rear Pivot* *Standard Stroke Lengths:* 1", 2", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 32" *Optional Accessories:* D-8318 Mounting Bracket D-8324-A Pivot Bracket D-8311-A Clevis *Base Weight: .95* *Adder Per Inch of Stroke: .10*	
H-17□-DZ 	***Nose Mount*** *Standard Stroke Lengths:* 1", 2", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 12" *Optional Accessory:* D-8318 Mounting Bracket *Base Weight: .84* *Adder Per Inch of Stroke: .10*	

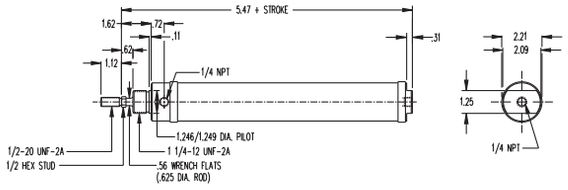
2" Bore "500" Hydraulic Cylinders

Push Force = 3.14 x psi · Pull Force = 2.83 x psi

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
H-31□-DBZ 	***Front Block Mount*** *Standard Stroke Lengths:* 1", 2", 3", 4", 5", 6" Maximum Stroke – 12" *Base Weight: 1.90* *Adder Per Inch of Stroke: .24*	
H-31□-DUZ 	***Universal Mount*** *– Double End or Rear Pivot* *Standard Stroke Lengths:* 1", 2", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12" Maximum Stroke – 32" *Optional Accessories:* D-8319 Mounting Bracket D-8325-A Pivot Bracket D-8313-A Clevis *Base Weight: 1.75* *Adder Per Inch of Stroke: .24*	

2" Bore "500" Hydraulic Cylinders (continued)

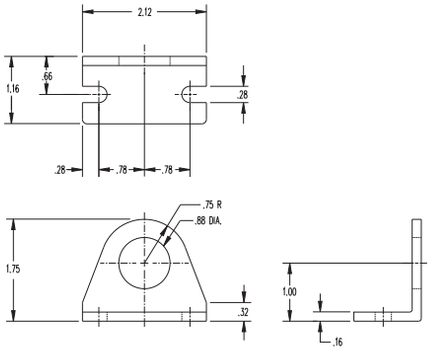
Push Force = 3.14 x psi · Pull Force = 2.83 x psi

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
H-31□-DZ 	***Nose Mount*** *Standard Stroke Lengths:* 1", 2", 3", 4", 5", 6" Maximum Stroke – 12" *Optional Accessory:* D-8319 Mounting Bracket *Base Weight: 1.63* *Adder Per Inch of Stroke: .24*	

"500" Hydraulic Cylinder Accessories

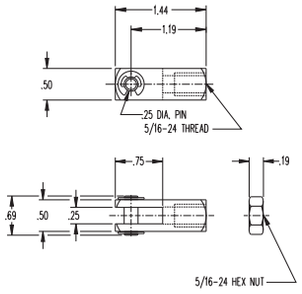
1-1/16" Bore Accessories

D-8316



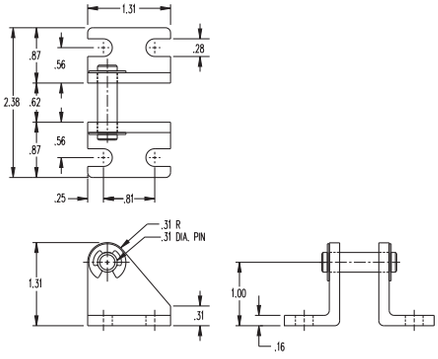
Mounting Bracket

D-8309-A



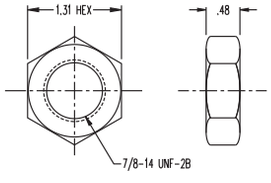
Rod Clevis

D-8322-A



Pivot Bracket

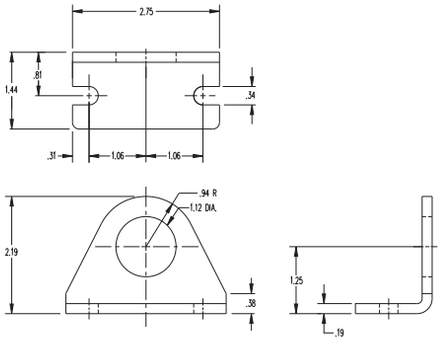
D-2545



Mounting Nut

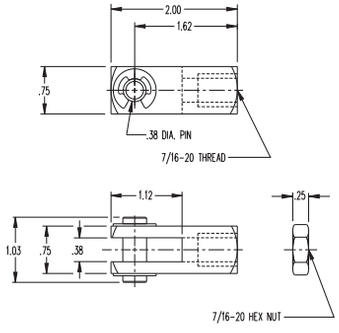
1-1/2" Bore Accessories

D-8318



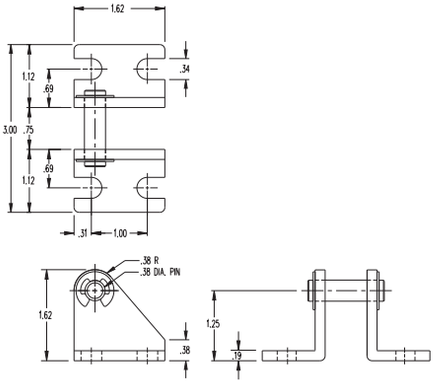
Mounting Bracket

D-8311-A



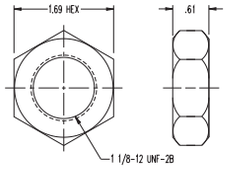
Rod Clevis

D-8324-A



Pivot Bracket

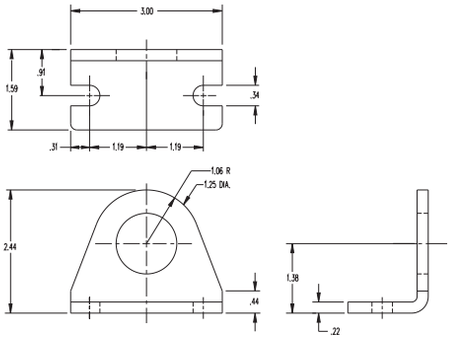
D-8484



Mounting Nut

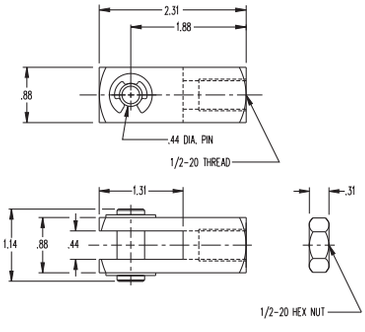
2" Bore Accessories

D-8319



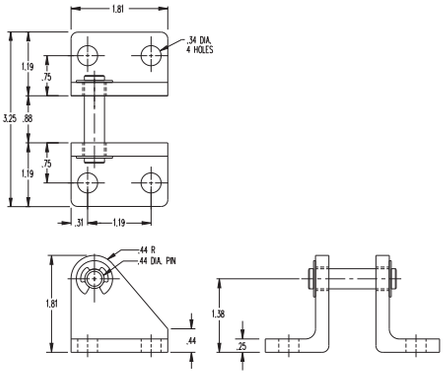
Mounting Bracket

D-8313-A



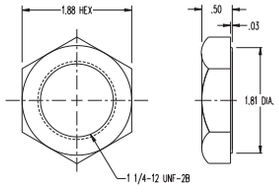
Rod Clevis

D-8325-A



Pivot Bracket

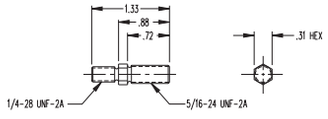
D-508



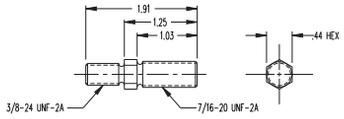
Mounting Nut

Hex-Stud

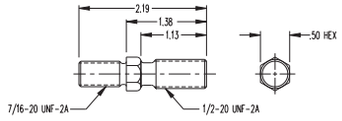
1 1/16" BORE
D-6583



1½" BORE
D-6636



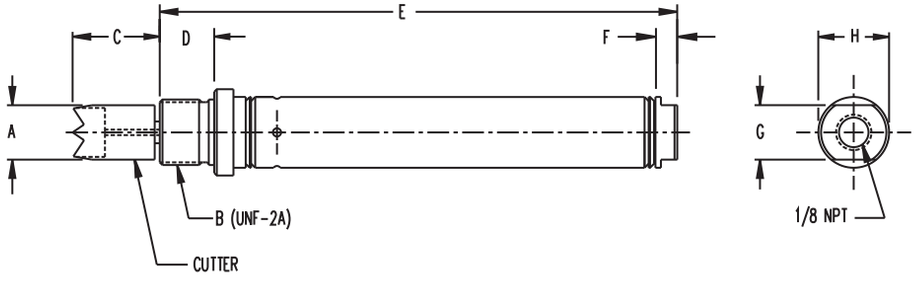
2" BORE
D-6637



Hole Punch Cylinders

Designed to punch millions of holes in plastic or other thin sheet materials 2 to 3 mils thick, the long-life BIMBA Pneumatic Hole Puncher will give you more cycles per penny. The hardened steel cutter with ground razor sharp edges is an integral part of the cylinder. A small air jet ejects the slugs from the cutter preventing slug build up, and Elastomer Bumpers insure Cushion Quiet operation. Less than 1" in diameter, several cylinders can be closely mounted. Available in seven hole cutter sizes from ¼" to ⅝".

This stainless steel body, single acting spring return cylinder has a ¾" bore and 1" stroke. A nickel plated steel rod guide is threaded for easy nose mounting, and a ⅛" NPT air inlet is conveniently located in the rear head. Prelubricated with HT-99, the cylinder can be operated with ordinary shop air at pressures up to 250 psi.



MODEL NO.	HOLE SIZE	A	B	C	D	E	F	G	H	PRICE
D-11840-A *Base Weight: .18*	1/4"	.250"	1/2-20	.50	.44	3.44	.19	.62	.81	
D-9846-A* *Base Weight: .19*	N/A	N/A	1/2-20	.50	.44	3.44	.19	.62	.81	
D-11811-A *Base Weight: .20*	5/16"	.312"	1/2-20	1.00	.44	3.44	.19	.62	.81	
D-11618-A *Base Weight: .21*	3/8"	.375"	1/2-20	1.00	.44	3.44	.19	.62	.81	
D-11998-A *Base Weight: .23*	7/16"	.438"	5/8-18	1.00	.50	3.50	.19	.62	.81	
D-11999-A *Base Weight: .24*	1/2"	.500"	5/8-18	1.00	.50	3.50	.19	.62	.81	
D-12107-A *Base Weight: .29*	9/16"	.562"	3/4-16	1.00	.63	3.63	.19	.62	.99	
D-12108-A *Base Weight: .29*	5/8"	.625"	3/4-16	1.00	.63	3.63	.19	.62	.99	

** The Pneumatic Hole Puncher Cylinder may be ordered without the cutter under model number D-9846-A. This cylinder has the same features and dimensions as the Hole Puncher except ¼-28 UNF-2A by 0.50 long rod threads are provided so you may attach your own cutter.*

Flat Cylinders

BIMBA FLAT-1 FITS RIGHT IN!

BIMBA Flat-1 cylinders were designed with space savings in mind.
Six models offer six ways to save space.

Flat-1–
The original round cylinder.

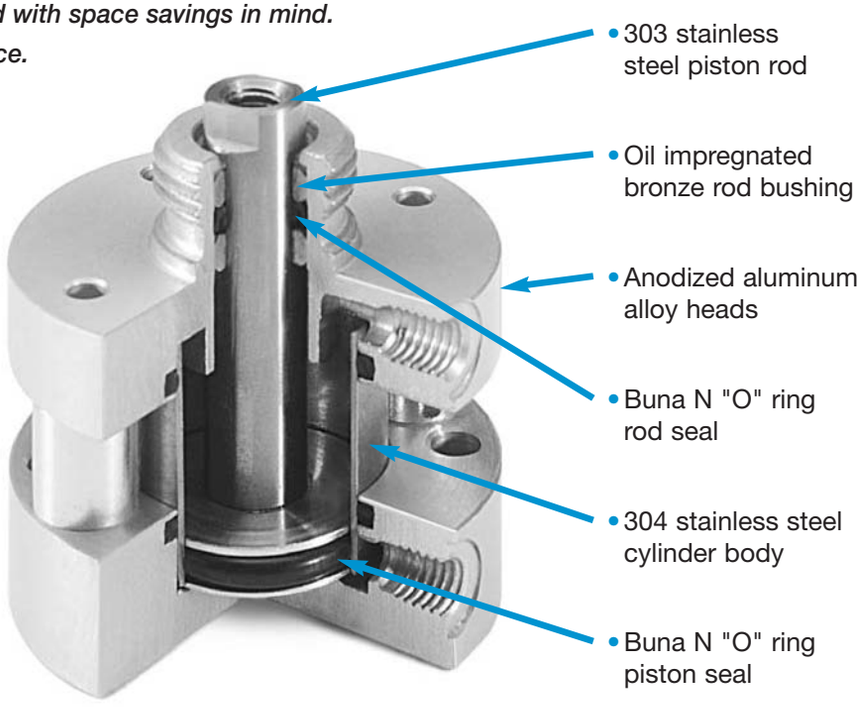
Square Flat-1–
For additional mounting variations.

Flat-II –
The dual piston rod, nonrotating cylinder.

Square Flat-II –
The dual piston rod, square nonrotating cylinder.

FO2, 3, 4 –
Force multiplying cylinders.

FOP –
For three positions.



Space savings without sacrificing quality means better performance and longer cylinder life. Flat-1 offers these quality features:

- 304 stainless steel cylinder body with a mirror finish I.D. Stainless steel fights corrosion and scoring from dirt particles. The result is longer piston seal life.
- Oil impregnated bronze rod bushing is standard in all models.
- Ground and polished 303 stainless steel piston rod.
- High strength piston to rod connection.
- Precision machined, anodized aluminum alloy heads.

Approximate Power Factors (For all models except FO2, 3, 4)

9/16" (02)	=	0.25
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

For example, a 3/4" bore model FO-041 will exert a force of approximately 0.4 times the air line pressure.

- 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
- Spring Forces — See page 2.10
- Pressure Rating — 200 PSI Maximum (Air only)
- Temperature Rating — From -20°F to +150°F (-25°C to +65°C) Buna N seals with a temperature range of -20°F to +150°F (-25°C to +65°C) are standard in all Bimba air cylinders. Fluoroelastomer seals rated for higher temperature applications are available. If cylinders are operated below 0°F (-18°C) for extended time periods, special modifications may be required. Special seal materials are available upon request.

How to Order

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-170.125-1V. This is a double acting, 1-1/2" bore, 1/8" stroke, pivot mount cylinder with high temperature option.

TYPE		
FO	-	Double Acting, Single End Rod
FOD	-	Double Acting, Double End Rod
FOR	-	Reverse Acting
FOS	-	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
0.125 - 1/8"
0.25 - 1/4"
0.375 - 3/8"
ETC.

FO-170.125-1V

MOUNTING OPTIONS

(Enter in numeric order)

No Number	-	Basic model (Standard counter-bored 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
4	-	Screw clearance holes, both ends[2]
4F	-	Screw clearance holes, front[2]
4R	-	Screw clearance holes, rear[2]
5	-	Nose Mount[3]

[1] Not available in 9/16" bore.

[2] "Screw clearance" to allow bolt head to pass through; no counter bores (see page 2.8).

[3] Available in FO, FOR and FOS models; includes heavy-duty rear head and wiper.

OPTIONS

(Enter in alphabetical order, except EE which is last)

B	-	Bumpers, both ends[1]
BF	-	Bumper, front only[1]
BR	-	Bumper, rear only[1]
CFT	-	Coarse female thread (fine thread standard) (see page 2.7)
CMT	-	Male rod end (coarse thread) (see page 2.10)
G	-	Magnalube® G
H	-	Hollow rod (double end models only) (see page 2.10)
HD	-	Heavy duty rear head (see page 2.9)[3]
J	-	Failsafe operation (FOS models)[2]
L	-	Low friction seals (see table page 2.9)[3]
M, M1, M3, M4	-	Magnetic position sensing (see table page 2.9[3], 2.10, and Position Sensing Solution Section)
MT	-	Male rod end (fine thread) (see page 2.10)
NT	-	Non-threaded rod
P2, P3, P4	-	Front port position #2, etc. (see page 2.6)[2]
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)[4]
W	-	Rod wiper (Buna N only) (see page 2.10)
Y	-	Moly-coat (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): FOS, BR only; FOR, BF only.

[2] Not available in 9/16" bore.

[3] Overall cylinder length increases with this option.

[4] 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.

® Magnalube is a trademark of the Carleton-Stuart Company

List Prices

Basic Model	Base Price by Bore Size							
	9/16"	3/4"	1-1/16"	1-1/2"	2"	2-1/2"	3"	4"
FO								
FOS (0-1" Stroke)								
FOS (1-1/8-4" Stroke)								
FOR (0-1" Stroke)								
FOR (1-1/8-4" Stroke)								
Add per 1/8" of Stroke								
FOD								
Add per 1/8" of Stroke								

Mounting Options	Adders by Bore Size							
	9/16"	3/4"	1-1/16"	1-1/2"	2"	2-1/2"	3"	4"
Pivot Mount (Options 1, 1N)								
Trunnion Mount (Option 2, 2F, 2R)								
Threaded Mounting Holes (Options 3, 3F, 3R)								
Screw Clearance Holes (Options 4, 4F, 4R)								
Nose Mount (Option 5)								

Options	Adders by Bore Size							
	9/16"	3/4"	1-1/16"	1-1/2"	2"	2-1/2"	3"	4"
B (both ends)								
BF (front only)								
BR (rear only)								
EE (each 1/2" each end)								
H								
J (With Standard Seals)								
J (With High Temperature Seals)								
MT, CMT (each end)								
V (With Standard Seals) Single Acting Reverse Acting Double Acting Double End Rod								
V (With Low Friction Seals) Single Acting Reverse Acting Double Acting Double End Rod								
W Single End Double End								
L								
Magnetic Piston Sensing (Options M, M1, M3, M4)								
S								
Switch Mounting Post (Options T1, T3, T4) (Per post)								
Y (Adder per 1/8" of stroke)								
Q (Low Temp Seals) Single Acting Reverse Acting Double Acting Double End Rod								
Q (Low Temp w/L Option) Single Acting Reverse Acting Double Acting Double End Rod								

No charge options – CFT, G, HD, NT, P2, P3, P4.

All prices are F.O.B. Monee, Illinois and are subject to change without notice.

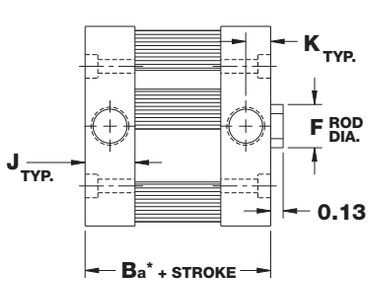
Bimba is a JIT manufacturer and we are able to provide FO, FOD, FOR, or FOS model cylinders in *ANY 0.001" stroke length increment for all option styles within our standard three-day lead time*. Longer stroke lengths are also available upon request at standard lead times. Please consult Technical Assistance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

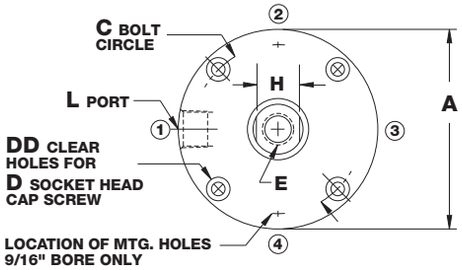
The tables represent our standard stroke lengths. **Blue** stroke lengths are BASIC FO, FOD, FOS, and FOR cylinders in stock available for Same Day Shipping.

Basic Models

Model FO

(Double Acting, Single End Rod)



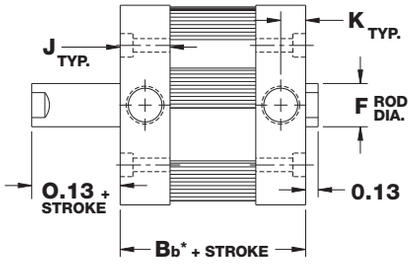


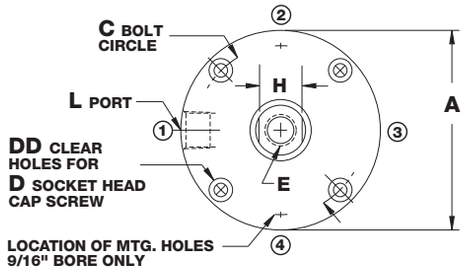
*Some options affect cylinder length; see page 2.9.

Nominal Bore Diameter	Bore Code	Standard Stroke Length Availability															
9/16"	02	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"
3/4"	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"

Model FOD

(Double Acting, Double End Rod)





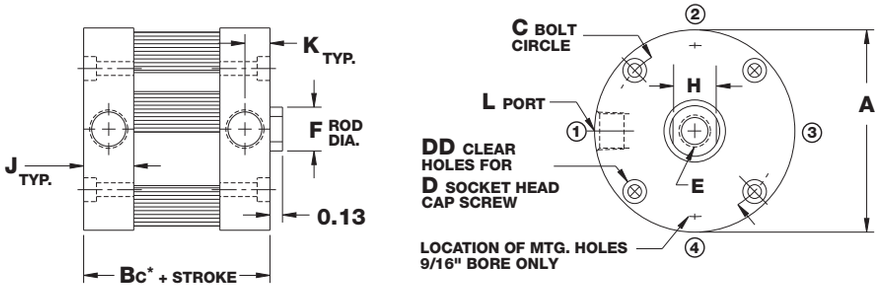
*Some options affect cylinder length; see page 2.9.

Nominal Bore Diameter	Bore Code	Standard Stroke Length Availability															
9/16"	02	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"
3/4"	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"

Basic Models

Model FOS

(Single Acting,
Spring Return,
Rod Normally Retracted)

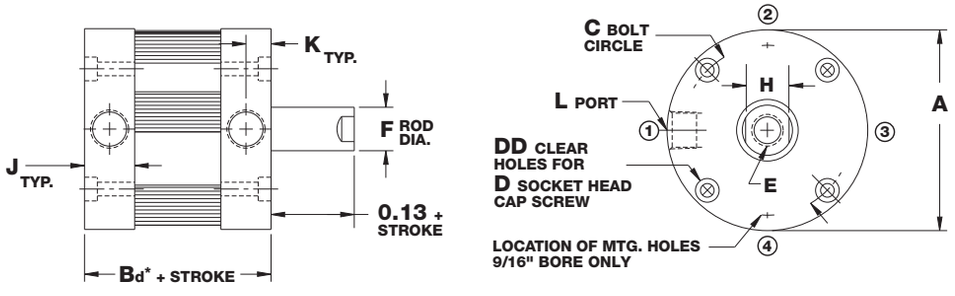


See page 2.10 for spring forces.
**Some options affect cylinder length; see page 2.9.*

Nominal Bore Diameter	Bore Code	Standard Stroke Length Availability															
9/16"	02	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"
3/4"	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"

Model FOR

(Reverse Acting,
Spring Return,
Rod Normally Extended)



See page 2.10 for spring forces.
**Some options affect cylinder length; see page 2.9.*

Nominal Bore Diameter	Bore Code	Standard Stroke Length Availability															
9/16"	02	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"
3/4"	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"

Dimensions (in)

(Basic Model)

Bore	A	Ba*	Bb*	Bc*				Bd*				C	DD
				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.		
9/16" (02)	1.12	0.56	0.69	0.81	1.38	1.96	2.52	1.06	1.62	2.14	2.70	0.88	2
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	1.22	4
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	1.69	4
1-1/2" (17)	2.62	0.88	1.00	0.88	1.50	2.13	2.75	1.38	2.00	2.63	3.25	2.19	4
2" (31)	3.12	0.94	1.06	0.94	1.56	2.19	3.81	1.44	2.06	2.69	N/A	2.69	4
2-1/2" (50)	3.75	1.19	1.31	1.19	2.06	2.94	2.81	1.94	2.81	2.81	N/A	3.25	4
3" (70)	4.25	1.25	1.38	1.25	2.12	3.00	3.88	2.00	2.88	2.88	N/A	3.78	4
4" (125)	5.50	1.56	1.69	1.56	2.44	3.31	4.19	2.31	3.19	3.19	N/A	4.94	4

Bore	D	E Standard	E Coarse	E Depth	F	H	J	K	L
9/16" (02)	#4	#8-32 UNC	N/A	0.46	0.25	0.22	0.34	0.14	#10-32 UNF
3/4" (04)	#6	#10-32 UNF	#10-24 UNC	0.46	0.31	0.25	0.34	0.14	#10-32 UNF
1-1/16" (09)	#6	5/16-24 UNF	5/16-18 UNC	0.70	0.50	0.44	0.50	0.25	1/8 NPT
1-1/2" (17)	#10	3/8-24 UNF	3/8-16 UNC	0.70	0.63	0.50	0.50	0.25	1/8 NPT
2" (31)	#10	1/2-20 UNF	1/2-13 UNC	0.70	0.75	0.63	0.53	0.25	1/8 NPT
2-1/2" (50)	1/4	1/2-20 UNF	1/2-13 UNC	0.70	0.75	0.63	0.66	0.33	1/4 NPT
3" (70)	1/4	5/8-18 UNF	5/8-11 UNC	0.73	0.88	0.75	0.69	0.33	1/4 NPT
4" (125)	5/16	3/4-16 UNF	3/4-10 UNC	0.80	1.00	0.88	0.84	0.42	3/8 NPT

See page 2.9 for length adders for options.

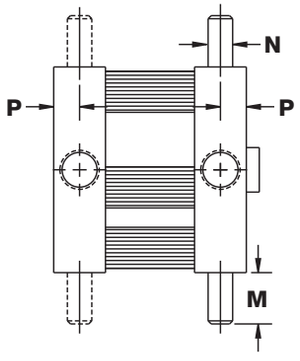
Weights

Bore	Approximate Cylinder Weights (oz.)							
	FO, FOS		FOD			FOR		Nose Mount option
	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	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)	4.9	0.3	5.8	0.4	0.3	5.3	0.3	1.1
1-1/2" (17)	9.6	0.4	11.2	0.6	0.5	10.5	0.4	1.8
2" (31)	13.0	0.5	15.2	0.7	0.6	14.0	0.5	2.7
2-1/2" (50)	22.4	0.6	28.0	0.8	0.7	25.0	0.6	3.1
3" (70)	28.9	0.8	38.0	1.1	0.9	32.5	0.8	3.5
4" (125)	55.7	1.0	71.8	1.3	1.1	61.8	1.0	5.9

Mounting Options

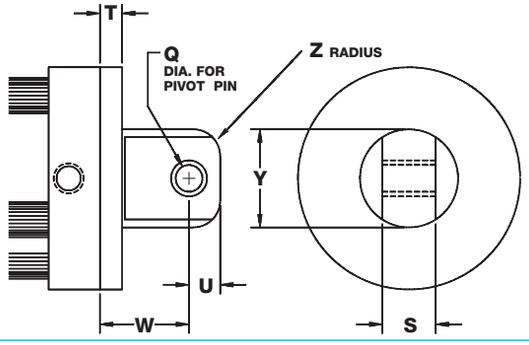
Trunnion Mount

(Option 2F, 2R, 2)
Available in front, rear, or both locations.
Not available in 9/16" bore.



Pivot Mount

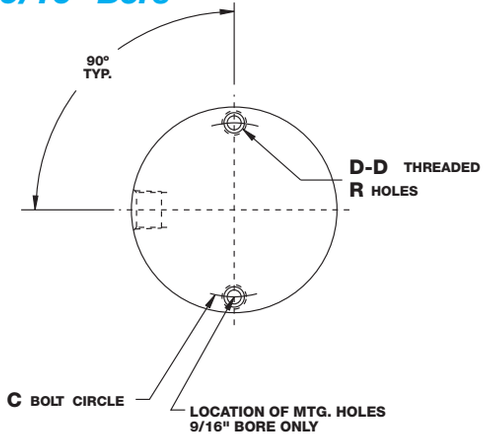
(Option 1, 1N)
Available in standard or 90˚.
Complete with bronze pivot bushing.
Not available as an accessory.
Option 1 as shown.



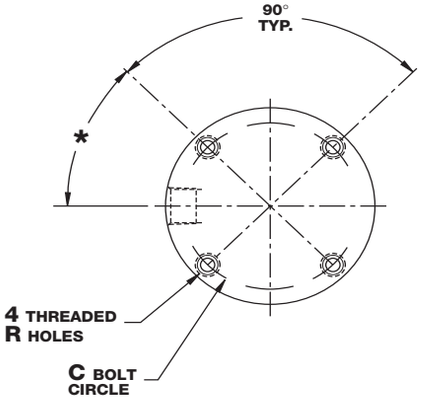
Threaded Mounting Holes

(Option 3F, 3R, 3)
Available in front, rear or both locations.
(-3R shown)

9/16" Bore



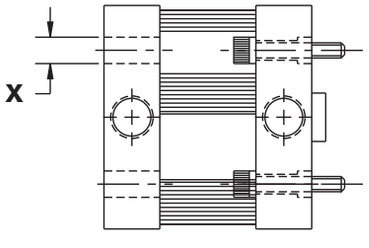
3/4" Bore and larger



**43°-3/4" Bore only 45°-all other bores*

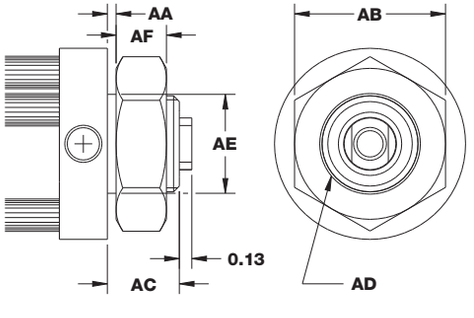
Screw Clearance Holes

(Option 4F, 4R, 4)
Available in front, rear or both locations.
(-4R shown)



Nose Mount

(Option 5)
Available in FO, FOS, FOR models.



Mounting Option Dimensions (in)

Bore	AA	AB	AC	AD	AE	AF	M	N	P	Q
9/16" (02)	.06	0.75 Hex	.38	1/2 – 20 UNF-2A	.50	.31	N/A	N/A	N/A	0.19
3/4" (04)	.06	0.75 Hex	.38	5/8 – 18 UNF-2A	.62	.25	0.31	0.12	0.17	0.19
1-1/16" (09)	.13	1.50 Hex	.75	1– 14 UNS-2A	1.00	.55	0.50	0.25	0.25	0.19
1-1/2" (17)	.13	1.88 Hex	.75	1-1/4 – 12 UNF-2A	1.25	.52	0.50	0.25	0.25	0.38
2" (31)	.19	1.88 Hex	.88	1-3/8 – 12 UNF-2A	1.38	.52	0.50	0.25	0.25	0.38
2-1/2" (50)	.25	1.88 Hex	1.00	1-3/8 – 12 UNF-2A	1.38	.52	0.63	0.31	0.33	0.38
3" (70)	.25	1.88 Hex	1.00	1-3/8 – 12 UNF-2A	1.38	.52	0.63	0.31	0.33	0.63
4" (125)	.19	2.62 Hex	1.12	1-3/4 – 12 UN-2A	1.75	.88	0.75	0.38	0.42	0.63

Dimensions (in)

Bore	R	S	T	U	W	X	Y	Z
9/16" (02)	#4-40 UNC	0.38	0.19	0.25	0.75	0.17	0.63	0.19
3/4" (04)	#6-32 UNC	0.38	0.19	0.25	0.75	0.23	0.75	0.19
1-1/16" (09)	#6-32 UNC	0.38	0.25	0.25	0.81	0.25	0.75	0.19
1-1/2" (17)	#10-24 UNC	0.75	0.25	0.44	1.19	0.34	1.38	0.38
2" (31)	#10-24 UNC	0.75	0.31	0.44	1.25	0.34	1.38	0.38
2-1/2" (50)	1/4-20 UNC	0.75	0.38	0.44	1.31	0.41	1.38	0.38
3" (70)	1/4-20 UNC	1.00	0.38	0.56	1.69	0.41	1.88	0.38
4" (125)	5/16-18 UNC	1.00	0.44	0.56	1.75	0.50	1.88	0.38

Maximum Torque Recommendations for Nose Mount Option (ft-lb)

Bore	Maximum Torque
9/16" (02)	12
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

Length Adder Dimensions for Options

(Dimensional variations from standard as shown.)

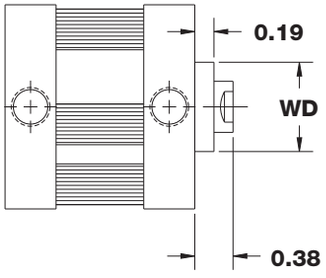
Bore	Length Adder				
	Low Friction Seals (L)	Heavy Duty Rear Head* (HD)	Magnetic Position Sensing** (M)		
			FO, FOD	FOS	FOR
9/16" (02)	0.25	0.13	0.88	0.63	0.38
3/4" (04)	0.25	0.13	0.88	0.88	0.88
1-1/16" (09)	0.38	0.19	0.88	0.88	0.88
1-1/2" (17)	0.38	0.19	0.88	0.88	0.88
2" (31)	0.38	0.19	0.88	0.88	0.88
2-1/2" (50)	0.38	0.25	0.88	0.88	0.88
3" (70)	0.50	0.25	0.88	0.88	0.88
4" (125)	0.50	0.38	0.88	0.88	0.88

**Heavy duty rear head is recommended for applications where the cylinder is mounted on the front face or trunnion-mounted, and impact loading (20 or more cycles per minute) occurs between the piston and rear head. It increases the overall length of the cylinder as shown.*

***A minimum stroke of 0.38 inches is required to sense extending end-of-stroke position. For low friction seals used in conjunction with magnetic position sensing, use M length adder only.*

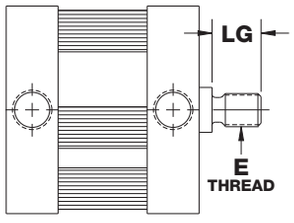
Options

Rod Wiper (Option W)



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)	1.13
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 UNC	N/A	0.38
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), 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

FOD Hollow Rods (Option H)

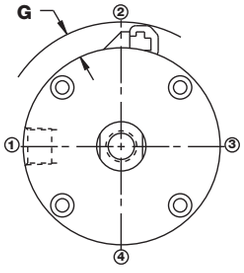
Bore	Hole Diameter	
	Female Rod Thread	Male Rod Thread
9/16" (02)	0.14	N/A
3/4" (04)	0.14	0.09
1-1/16" (09)	0.22	0.16
1-1/2" (17)	0.28	0.19
2" (31)	0.38	0.25
2-1/2" (50)	0.38	0.25
3" (70)	0.44	0.31
4" (125)	0.50	0.38

Enclosed Spring Forces

Bore	Maximum Force (lb)	Spring Rate			
		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)	5.25	4.25	1.75	1.24	0.88
3/4" (04)	10.00	6.00	2.50	1.76	1.25
1-1/16" (09)	11.50	6.00	2.50	1.76	1.25
1-1/2" (17)	13.00	5.50	2.25	1.60	1.13
2" (31)	13.00	5.50	2.25	1.60	1.13
2-1/2" (50)	25.00	6.50	2.75	1.93	1.38
3" (70)	25.00	6.50	2.75	1.93	1.38
4" (125)	25.00	6.50	2.75	1.93	1.38

MRS Switch Option Dimensions

For all ROUND 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, M3, or M4. For additional tracks, please specify options T1, T3, or T4 for the appropriate location.



Bore Designator	Bore	G inch (mm)
02	9/16" (14mm)	0.29 (7.4)
04	3/4" (19mm)	0.25 (6.4)
09	1-1/16" (27mm)	0.07 (1.8)
17	1-1/2" (38mm)	0.02 (.5)
31	2" (50mm)	0.03 (.8)
50	2-1/2" (63mm)	0.02 (.5)
70	3" (76mm)	0.03 (.8)
125	4" (101mm)	0.00 (0)

Repair Kits

Single End Rod Kits

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

Double End Rod Kits

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

Single End Rod Kits for Nose Mount Option

Basic Repair Kit (K-B-FO-N)		
Part No.	**Description**	**Quantity**
PF-1	Rod Seal	1
PF-2	Piston Seal	1
PF-3	Tube Seal	2
PF-4	Bushing	2
Wiper for Nose Mount Option		
D-63632	9/16" (02)	1
D-63633	3/4" (04)	1
D-63634	1-1/16" (09)	1
D-63635	1-1/2" (17)	1
D-63636	2" (31), 2-1/2" (50)	1
D-63637	3" (70)	1
D-63638	4" (125)	1

Mounting Nuts for Nose Mount Option			
Bore	**Part No.**	**Bore**	**Part No.**
9/16" (02)	D-98	2" (31)	D-2540
3/4" (04)	D-62702	2-1/2" (50)	D-2540
1-1/16" (09)	D-1331	3" (70)	D-2540
1-1/2" (17)	D-508	4" (125)	D-62703

Bimba Square FLAT-1

The convenient alternative for horizontal and side mounting, with provisions for both bottom flush or face mounting. The Square Flat-1 also minimizes the centerline distance when cylinders are mounted side-by-side.

- 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
- Tie Rods — 303 Stainless Steel
- Spring Forces — See page 2.18
- Pressure Rating — Bore Sizes 3/4"-2" 200 PSI Maximum (Air only)
  Bore Sizes 2-1/2"-4" 150 PSI Maximum (Air only)
- Temperature Rating — From -20°F to +150°F (-25°C to +65°C)
  Buna N seals with a temperature range of -20°F to +150°F (-25°C to +65°C) are standard in all Bimba air cylinders. 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.

How to Order

The Model Number for all Square Flat-1 cylinders consists of three alphanumeric clusters. These designate type, bore size and stroke length, and options. Please refer to the charts below for an example of Model Number FS-170.375-1V. 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"	50	-	2-1/2"
09	-	1-1/16"	70	-	3"
17	-	1-1/2"	125	-	4"
31	-	2"			

STROKE LENGTH

0.125	-	1/8"
0.25	-	1/4"
0.375	-	3/8"
ETC.		

FS-170.375-1V

MOUNTING OPTIONS

No Number	-	Basic model
1	-	Pivot mount
1N	-	Pivot mount 90° from standard

OPTIONS

(Enter in alphabetical order, except EE which is last)

B	-	Bumpers, both ends[1]
BF	-	Bumpers, front only[1]
BR	-	Bumpers, rear only[1]
CFT	-	Coarse female thread (see page 2.16)
CMT	-	Male rod end (coarse thread) (see page 2.17)
G	-	Magnalube® G
H	-	Hollow rod (double end models only) (see page 2.18)
J	-	Failsafe operation (FSS models)
L	-	Low friction seals (see table page 2.17)
M, M1, M4	-	Magnetic position sensing (see table page 2.17[2], 2.27, and Position Sensing Solution Section)
MT	-	Male rod end (fine thread) (see page 2.17)
NT	-	Non-threaded rod
Q	-	Low temperature option (-40° F to 200° F)
T1, T4	-	Additional switch track located in position #1 or 4
V	-	High temperature option (0°F to 400° F)
W	-	Rod wiper (Buna N, see page 2.17)[3]
Y	-	Moly-coat (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] Overall cylinder length will increase with this option.

[3] 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.

List Prices

Basic Model	Base Price by Bore Size						
	3/4"	1-1/16"	1-1/2"	2"	2-1/2"	3"	4"
FS							
FSS (0-1" Stroke)							
FSS (1-1/8-4" Stroke)							
FSR (0-1" Stroke)							
FSR (1-1/8-4" Stroke)							
Add per 1/8" of Stroke							
FSD							
Add per 1/8" of Stroke							

Mounting Options	Base Price by Bore Size						
	3/4"	1-1/16"	1-1/2"	2"	2-1/2"	3"	4"
Pivot Mount (Options 1, 1N)							

Options	Adders by Bore Size						
	3/4"	1-1/16"	1-1/2"	2"	2-1/2"	3"	4"
B (both ends)							
BF (front only)							
BR (rear only)							
EE (each 1/2" each end)							
H							
J (With Standard Seals)							
J (With High Temperature Seals)							
MT, CMT (each end)							
V (With Standard Seals) Single Acting Reverse Acting Double Acting Double End Rod							
V (With Low Friction Seals) Single Acting Reverse Acting Double Acting Double End Rod							
W Single End Double End							
L							
Magnetic Piston Sensing (Options M, M1, M4)							
Switch Mounting Post (Options T1, T4)							
Y (Add per 1/8" of stroke)							
Q (With Low Temp Seals) Single Acting Reverse Acting Double Acting Double End Rod							
Q (Low Temp w/L Option) Single Acting Reverse Acting Double Acting Double End Rod							

No charge options – CFT, G, NT.

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.

Basic Models

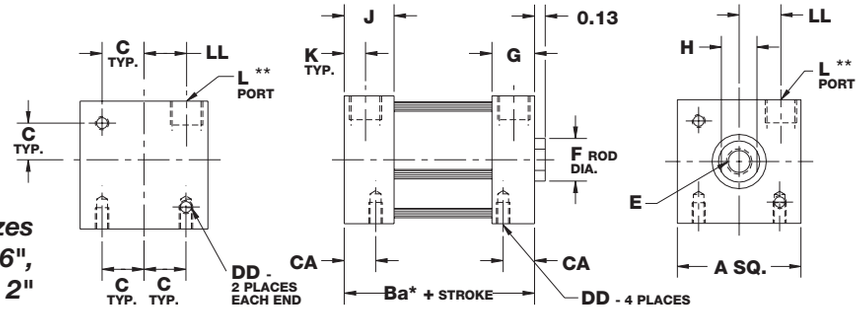
Model FS

(Double Acting, Single End Rod)

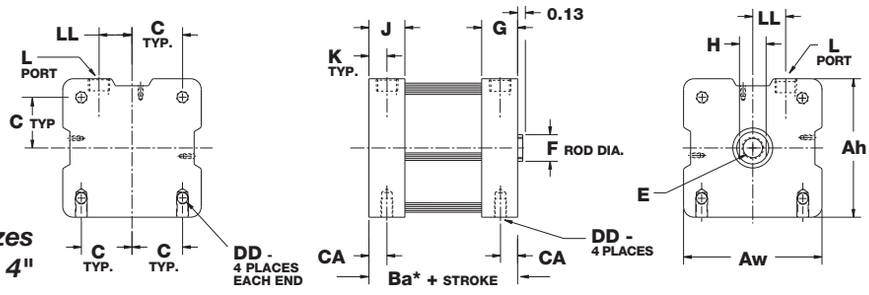
**Some options affect cylinder length; see page 2.17.*

***Port location is on the same side for M option only.*

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



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



The table below represents our standard stroke lengths. **Blue** stroke lengths are BASIC FS cylinders in stock available for Same Day Shipping.

Nominal Bore Diameter	Bore Code	Standard Stroke Length Availability Blue Stroke Lengths are BASIC, FS Stocked Cylinders Models Available for Same Day Shipping															
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"

Basic Models

Model FSD

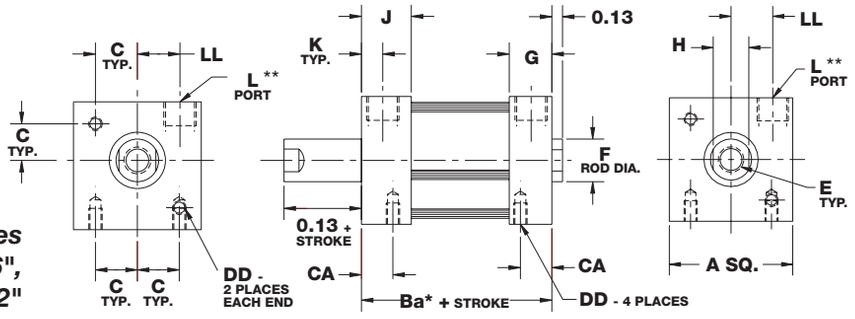
(Double Acting, Double End Rod)

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"

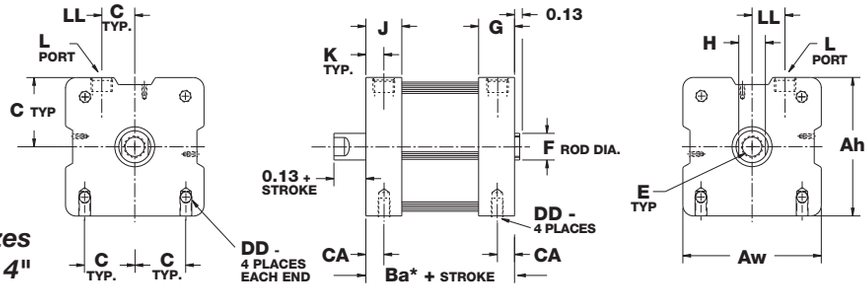
**Some options affect cylinder length; see page 2.17.*

***Port location is on the same side for M option only.*

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



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



Model FSS

(Single Acting, Spring Return, Rod Normally Retracted)

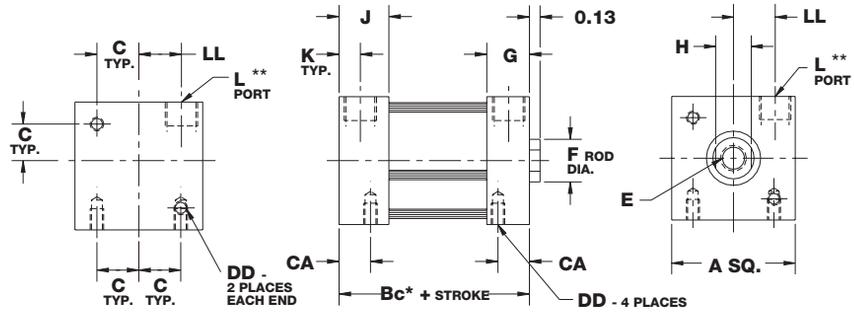
Standard strokes
1/8", 1/4", 3/8", 1/2", 5/8", 3/4", 7/8", 1", 1-1/4", 1-1/2", 1-3/4", 2", 2-1/2", 3", 3-1/2", 4"

See page 2.18 for spring forces.

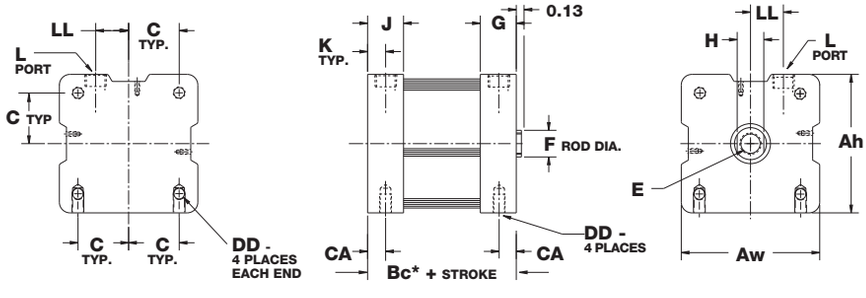
**Some options affect cylinder length; see page 2.17.*

***Port location is on the same side for M option only.*

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



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



Basic Models

Model FSR

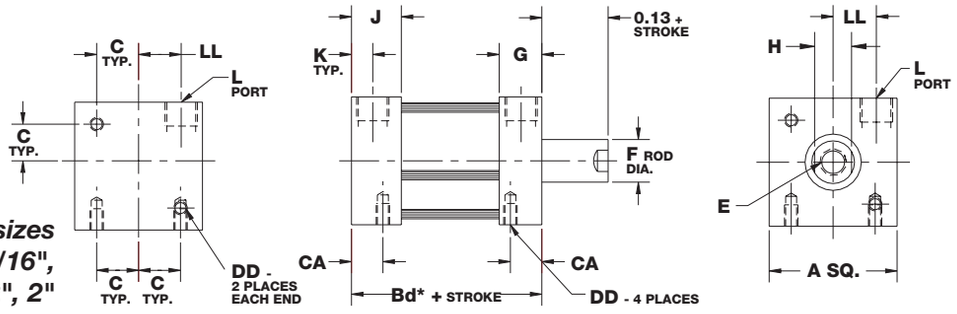
(Reverse Acting, Spring Return, Rod Normally Extended)

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

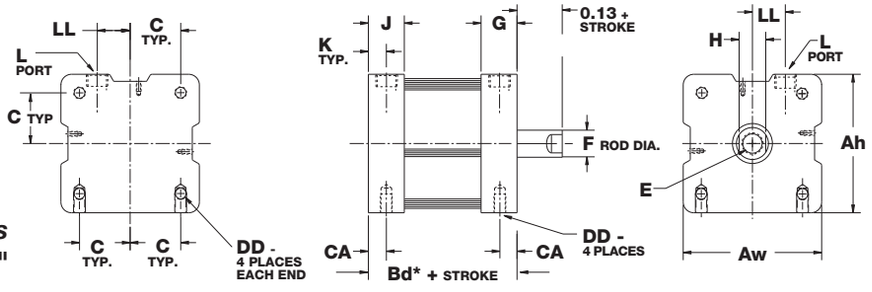
See page 2.18 for spring forces.

**Some options affect cylinder length; see page 2.17.*

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



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



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

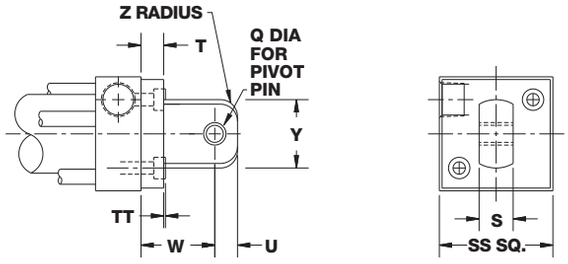
** See page 2.17 for length adders for options.*

Mounting Options

Pivot Mount

The pivot mount option is available as shown or rotated 90° to port and can be ordered as a separate mounting attachment.

See page 2.43 for dimensions.



Length Adder Dimensions for Options

(Dimensional variations from standard as shown.)

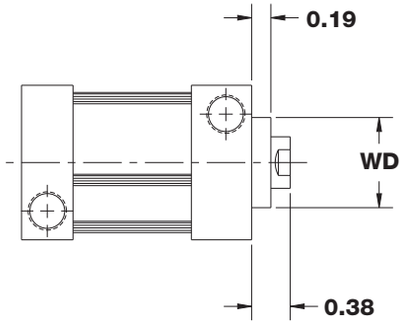
Bore	Length Adder		
	Low Friction Seals (L)	Magnetic Position Sensing* (M)	Low Friction Seals and Magnetic Position Sensing
3/4" (04)	0.25	0.75	0.75
1-1/16" (09)	0.38	0.50	0.50
1-1/2" (17)	0.38	0.63	0.63
2" (31)	0.38	0.63	0.63
2-1/2" (50)	0.38	0.88	0.88
3" (70)	0.50	0.88	0.88
4" (125)	0.50	0.88	0.88

**A minimum stroke of 0.38" is required to sense extending end-of-stroke position. For port locations with Option-M, see page 2.26.*

Options

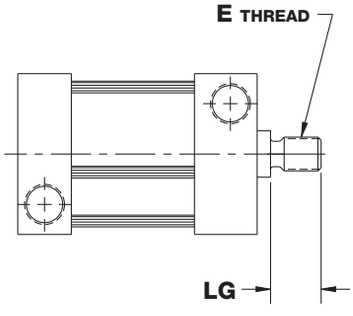
Rod Wiper (Option W)

(Buna N standard, not available in Viton)



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

Options

Enclosed Spring Forces

Bore	Maximum Force (lb)	Spring Rate			
		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)
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

Repair Kits

Single End Rod 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 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.*

***Note: 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.*

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

Flat-II nonrotating, double-acting cylinder provides the answer to applications where rotation cannot be tolerated and space is at a minimum. Nonrotation 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.

- Body — 304 Stainless Steel
- Heads — Anodized Aluminum Alloy
- Piston Rod — Ground and Polished 303 Stainless Steel
- Piston Seals — Buna N (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
- Pressure Rating — 200 PSI Maximum (Air only)
- Temperature Rating — From -20°F to +150°F (-25°C to +65°C)
  Buna N seals with a temperature range of -20°F to +150°F (-25°C to +65°C) are standard in all Bimba air cylinders. Fluoroelastomer seals rated for higher temperature applications are available. If cylinders are operated below -0°F (18°C) for extended time periods, special modifications may be required. Special seal materials are available upon request.

How to Order

The model number for Flat-II 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 FT-040.375-1CE. This is a nonrotating, double-acting, 3/4" bore, 3/8" stroke, pivot mount cylinder with counter-bored mounting holes in the rod end block.

TYPE

FT - Nonrotating, 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-040.375-1CE

MOUNTING OPTIONS

(Enter in numeric order)

No Number	-	Basic model (Standard counter-bored 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]

[1] "Screw clearance" to allow bolt head to pass through; no counter bores (see page 2.21).

OPTIONS

(Enter in alphabetical order, except EE which is last)

CE	-	Counter bored rod end block (see page 2.22)
G	-	Magnalube® G
K	-	Endblock rotated 90 degrees
M, M1, M3, M4	-	Magnetic position sensing (see table page 2.9[1], 2.10, and Position Sensing Solution Section)
P3	-	Front port position (see page 2.21)
Q	-	Low temperature option (-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° to 400° F)[1]
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.

Price List

Basic Model	Base Price by Bore Size			
	3/4"	1-1/16"	1-1/2"	2"
Base Model				
Adder per 1/8" of stroke				

Mounting Options	Price Adders by Bore Size			
	3/4"	1-1/16"	1-1/2"	2"
Pivot Mount (Options 1, 1N)				
Trunnion Mount (Options 2, 2F, 2R)				
Threaded Mounting Holes (Options 3, 3F, 3R)				
Screw Clearance Holes (Options 4, 4F, 4R)				

Options	Price Adders by Bore Size			
	3/4"	1-1/16"	1-1/2"	2"
EE (each 1/2" each end)				
Magnetic Position Sensing (Options M, M1, M3, M4)				
S				
Switch Mounting Post (Options T1, T3, T4)				
High Temperature Seals (Option V)				
Y (Adder per 1/8" of stroke)				
Q (low temp seals)				

No charge options – CE, G, K, P3.

Repair Kits

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.

Weights

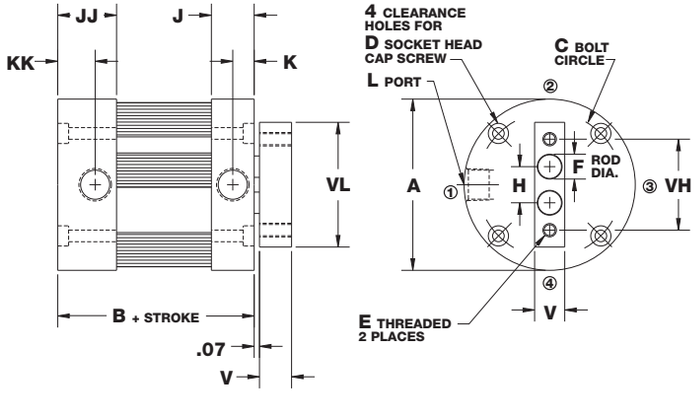
Bore	Approximate Cylinder Weights (oz.)	
	Base	Adder per 1/8" of stroke
3/4" (04)	2.7	0.1
1-1/16" (09)	6.4	0.5
1-1/2" (17)	12.2	0.7
2" (31)	18.4	0.9

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.

Basic Model

Model FT

(Nonrotating, double acting)



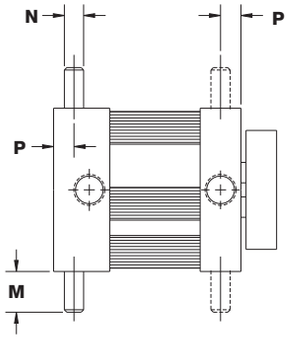
The table below represents our standard stroke lengths. **Blue** stroke lengths are BASIC FT cylinders in stock available for Same Day Shipping.

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

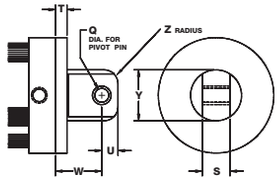
Trunnion Mount

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



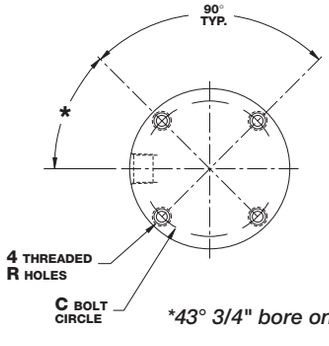
Pivot Mount

(complete with bronze bushing)
(-1 shown)



Threaded Mounting Holes

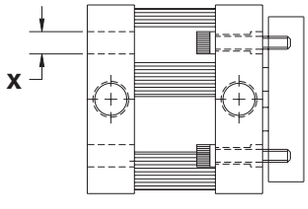
(available either or both ends)
(-3R shown)



**43° 3/4" bore only. 45° all other bores.*

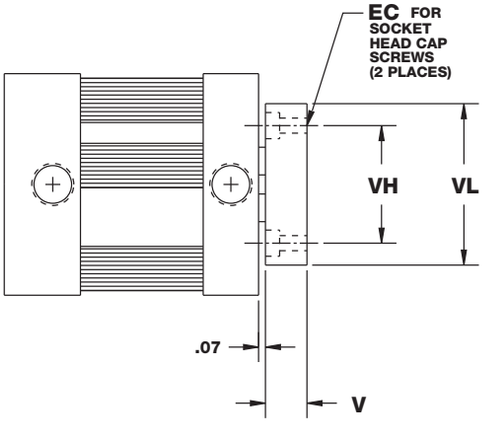
Screw Clearance Holes

(available either or both ends)
(-4R shown)



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.

Nonrotation 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:

$$\text{Ø} = \frac{TL^3}{K}$$

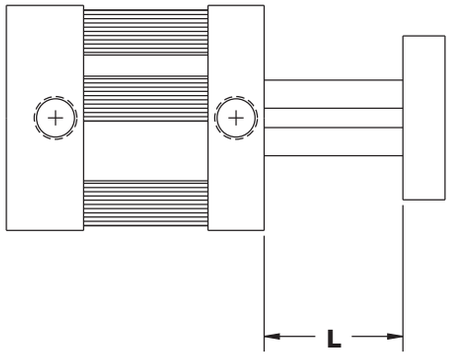
Where T = Torque (in.-lb.)
L = Length (see sketch below)
K = Per chart above
Ø = Angular deflection

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



Square Flat-II nonrotating, double acting cylinder provides the answer to applications where rotation cannot be tolerated. Nonrotation is achieved with dual piston rods and a rod end block that insures the rods work in tandem. Square Flat-II eliminates the need for external alignment devices. It also provides a convenient alternative for horizontal and side mounting, with provisions for both bottom flush or face mounting. Centerline distances are minimized, facilitating side-by-side cylinder mounting.

- Body — 304 Stainless Steel
- Heads — Anodized Aluminum Alloy
- Piston Rod — Ground and Polished 303 Stainless Steel
- Piston Seals — Buna N (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
- Pressure Rating — 200 PSI Maximum (Air only)
- Temperature Rating — From -20°F to +150°F (-25°C to +65°C)
  Buna N seals with a temperature range of -20°F to +150°F (-25°C to +65°C) are standard in all Bimba air cylinders. Fluoroelastomer seals rated for higher temperature applications are available. If cylinders are operated below 0°F (-18°C) for extended time periods, special modifications may be required. Special seal materials are available upon request.

How to Order

The Model Number for all Square Flat-II cylinders consists of three alphanumeric clusters. These designate type, bore size and stroke length, mounting and special options. Please refer to the charts below for an example of Model Number FST-170.125-1V. This is a nonrotating, double acting, 1-1/2" bore, 1/8" stroke, pivot mount cylinder with high temperature seals.

TYPE

FST - Nonrotating, 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.		

FST-170.125-1V

MOUNTING OPTIONS

No Number	-	Basic model
1	-	Pivot mount
1N	-	Pivot mount 90° from standard

OPTIONS

(Enter in alphabetical order, except EE which is last)

CE	-	Counterbored Endblock
G	-	Magnalube®G
K	-	Endblock rotated 90 degrees (see page 2.28)
L	-	Low Friction Seals (see page 2.27)
M, M1, M4	-	Magnetic Position Sensing (see page 2.27[1] and Position Sensing Solution Section)
Q	-	Low temperature option (-40° F to 200° F)
T1, T4	-	Additional switch track located in position #1 or 4
V	-	High temperature option (0°F to 400°F)[1]
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.

Price List

Basic Model	Base Price by Bore Size			
	3/4" (04)	1-1/16" (09)	1-1/2" (17)	2" (31)
Base Model				
Adder per 1/8" of Stroke				
Mounting Options	**Price Adders by Bore Size**			
	3/4" (04)	1-1/16" (09)	1-1/2" (17)	2" (31)
Pivot Mount (Options 1,1N)				
Options	**Price Adders by Bore Size**			
	3/4" (04)	1-1/16" (09)	1-1/2" (17)	2" (31)
EE (each 1/2" each end)				
V Option (Standard Seals)				
V Option (Low Friction Seals)				
L (Low Friction Seals)				
Magnetic Position Sensing (Options M, M1, M3, M4)				
Switch Mounting Post (Options T1, T4) (Per post)				
Q Option (Standard Seals)				
Q Option (Low Friction Seals)				
Y (Adder per 1/8" of stroke)				

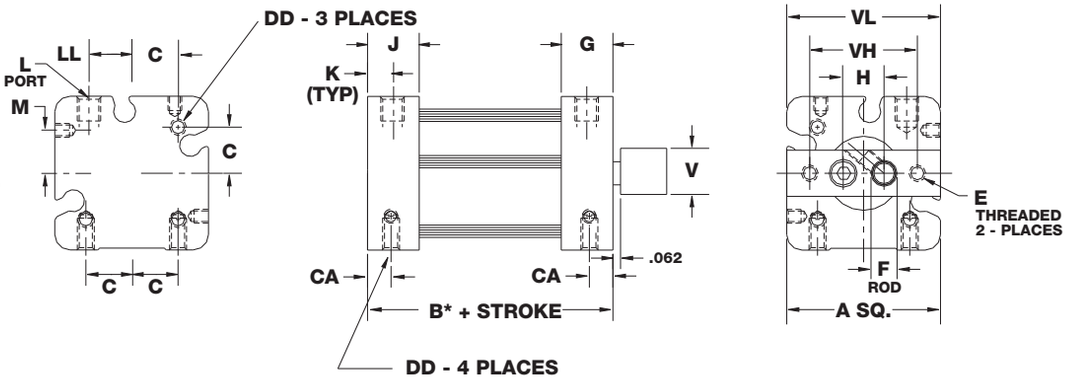
No Charge Options - CE, G, K

Basic Model

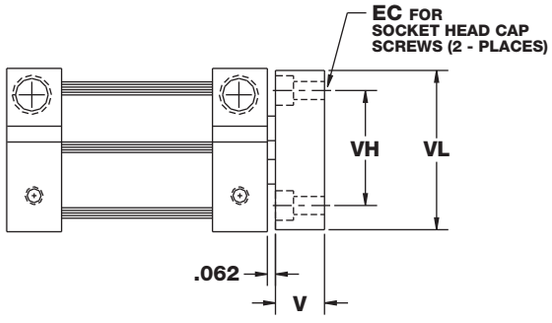
Model FST

(Nonrotating, 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 2.27.*



Counterbored Rod End Block



Dimensions (in)

Bore	A	B	C	CA	DD	E	EC	F	G	H
3/4" (04)	1.25	0.75	0.38	0.28	#6-32 UNC	#6-32 UNC	#6	0.19	0.42	0.332
1-1/16" (09)	1.50	1.25	0.50	0.38	#8-32 UNC	#8-32 UNC	#8	0.25	0.58	0.422
1-1/2" (17)	2.00	1.25	0.69	0.31	#10-24 UNC	1/4-20 UNC	1/4	0.38	0.58	0.562
2" (31)	2.50	1.31	0.88	0.38	#1/4-20 UNC	5/16-18 UNC	5/16	0.50	0.62	0.750

Bore	J	K	L	LL	M	V	VH	VL
3/4" (04)	0.42	0.19	#10-32	0.35	0.349	0.38	0.88	1.25
1-1/16" (09)	0.50	0.25	1/8 NPT	0.45	0.321	0.38	1.06	1.44
1-1/2" (17)	0.50	0.25	1/8 NPT	0.60	0.200	0.50	1.50	2.00
2" (31)	0.62	0.25	1/8 NPT	0.76	0.186	0.63	1.88	2.50

A minimum stroke of .38" is required to sense extending end-of-stroke position.
See page 2.27 for length adders for magnet option.

Repair Kits

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.*

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

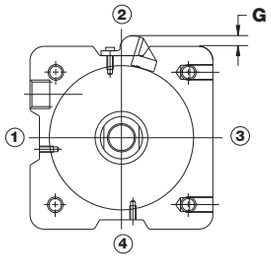
Bore	Length Adder		
	Low Friction Seals (L)	Magnetic Position Sensing* (M)	Low Friction Seals and Magnetic Position Sensing
3/4" (04)	0.25	0.75	0.75
1-1/16" (09)	0.25	0.50	0.50
1-1/2" (17)	0.25	0.63	0.63
2" (31)	0.25	0.63	0.63

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

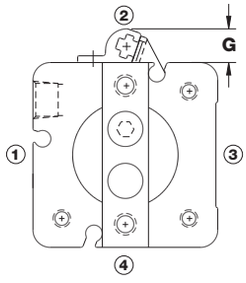
MRS Switch Option Dimensions

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)

Nonrotation 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:

$$\text{Ø} = \frac{TL^3}{K}$$

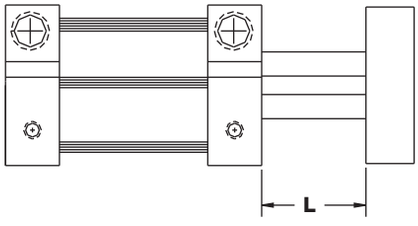
Where T = Torque (in.-lb.)
L = Length (see sketch below)
K = Per chart above
Ø = Angular deflection

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

Rotational Tolerance

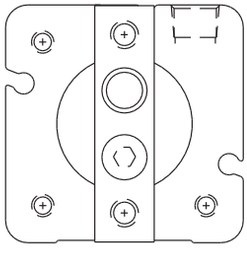
Bore	Maximum Rotation
3/4" (04)	±1°
1-1/16" (09)	±3/4°
1-1/2" (17)	±1/2°
2" (31)	±1/2°

Deflection L Value



L = .062 + STROKE

Option K - Endblock Rotated 90°



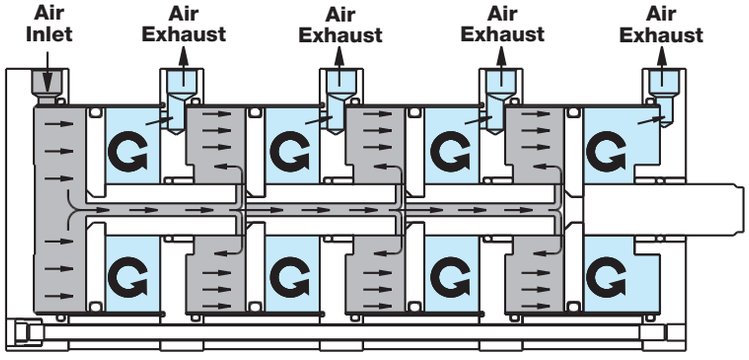
Space-Saving Cylinders That Multiply Force Output

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.

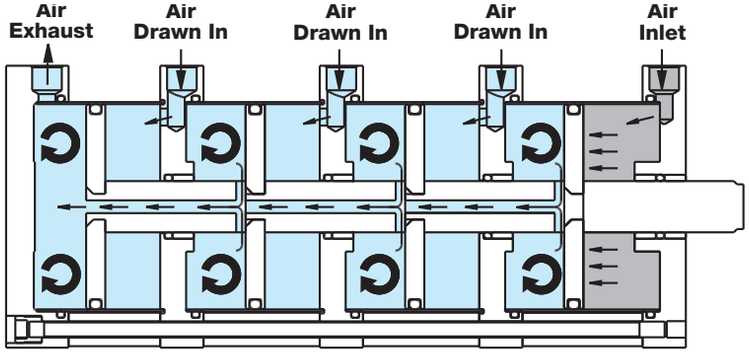
- Body — 304 Stainless Steel
- Heads — Anodized Aluminum Alloy
- Piston Rod — Ground and Polished 303 Stainless Steel
- Seals — Buna N (High temperature seals optional)
- Rod Bushing — Oil Impregnated Bronze
- Pressure Rating — 100 PSI Maximum (Air only)
- Temperature Rating — From -20°F to +150°F (-25°C to +65°C) Buna N seals with a temperature range of -20°F to +150°F (-25°C to +65°C) are standard in all Bimba air cylinders. Fluoroelastomer seals rated for higher temperature applications are available. If cylinders are operated below 0°F (-18°C) for extended time periods, special modifications may be required. Special seal materials are available upon request.

How it Works

Extension-air supplied to multiple pistons



Retraction-air supplied to one piston only



How to Order

The model number for all FO2, FO3 and FO4 Series 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 our example of Model Number FO2-501-3M. This is a 2-1/2" bore FO2 Series Flat-1 with 1" stroke, threaded mounting holes in both ends, with the magnetic position sensing option.

TYPE	BORE SIZE	STROKE LENGTH
FO2 - 2 Stage Extend, Single Stage Retract FO3 - 3 Stage Extend, Single Stage Retract FO4 - 4 Stage Extend, Single Stage Retract	50 - 2-1/2" 70 - 3" 125 - 4"	0.25 - 1/4" 1 - 1" ETC.

FO2-501-3 M

MOUNTING OPTIONS

(Enter in numeric order)

No Number	-	Basic model (Standard counter-bored 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 2.32).

OPTIONS

(Enter in alphabetical order, except EE which is last)

CFT	-	Coarse female thread (fine thread standard) (see page 2.32)
CMT	-	Male rod end (coarse thread) (see page 2.34)
G	-	Magnalube® G
L	-	Low friction seals (see page 2.34)
M, M1, M3, M4	-	Magnetic position sensing[1]
MT	-	Male rod end (fine thread) (see page 2.34)
NT	-	Non-threaded rod
P2, P3, P4	-	Front port position #2, etc. (see page 2.33)
P6, P7, P8	-	Rear port position #6, etc. (see page 2.33)
Q	-	Low temperature option (-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)
W	-	Rod wiper (Buna N only) (see page 2.34)
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.

Approximate Power Factors

Bore	Bore Model Designator	Power Factor Extension			Power Factor Retraction
		FO2	FO3	FO4	
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 752 lbs. on extension, and 360 lbs. on retraction.

List Prices

Basic Model	Base Price by Bore Size		
	2-1/2"	3"	4"
FO2			
Adder per 1/8" of Stroke			
FO3			
Adder per 1/8" of Stroke			
FO4			
Adder per 1/8" of Stroke			

Mounting Options	Base Price by Bore Size		
	2-1/2"	3"	4"
Threaded Mounting Holes (Options 3, 3F, 3R)			
Screw Clearance Holes (Options 4, 4F, 4R)			

No charge options - CFT, G, NT, P2, P3, P4, P6, P7, P8.

Options		Adders by Bore Size		
		2-1/2"	3"	4"
EE (per 1/2" increments)				
L (Low Friction Seals)	FO2			
	FO3			
	FO4			
Magnet Position Sensing (Options M, M1, M3, M4)				
MT, CMT (Male Rod)				
Switch Mounting Post (Options T1, T3, T4) (per post)				
V - High Temperature (Fluoroelastomer Seals)	FO2			
	FO3			
	FO4			
V - High Temperature (with L Option)	FO2			
	FO3			
	FO4			
W (Wiper)				
Y (Adder per 1/8" of stroke)	FO2			
	FO3			
	FO4			
Q - Low Temperature	FO2			
	FO3			
	FO4			
Q - Low Temperature (with Option L)	FO2			
	FO3			
	FO4			

Repair Kits

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

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	0.93	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	0.95	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	1.36	2.47	3.58

See page 2.34 for length adders for options.

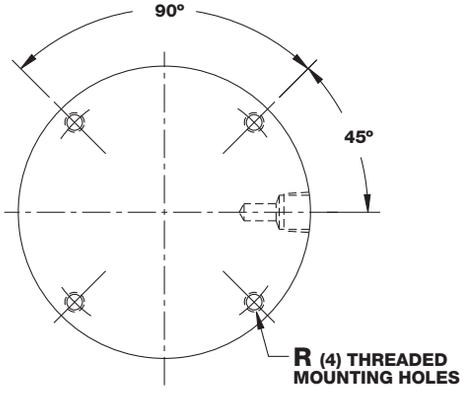
** For Strokes .125, .188, and .250

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

Mounting Options

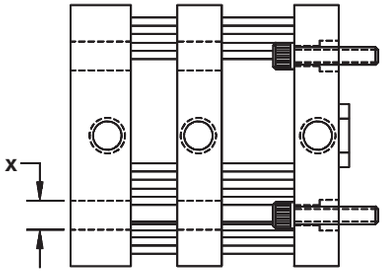
Threaded Mounting Holes

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



Screw Clearance Holes

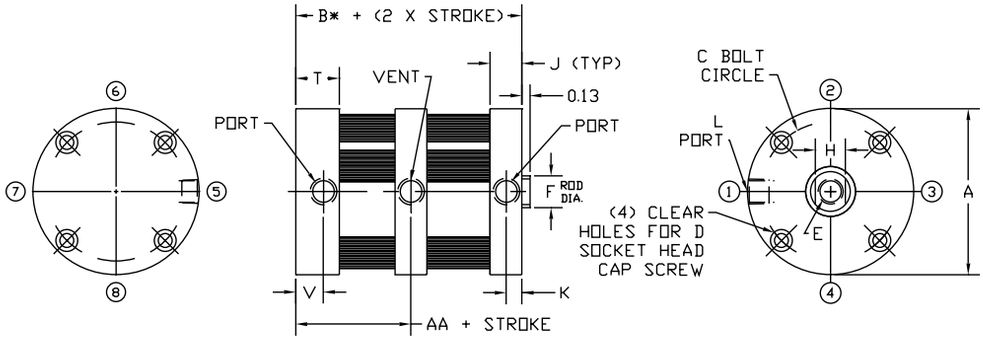
(available either or both ends)
(-4R shown) Screw clearance holes standard on all center sections



Basic Model

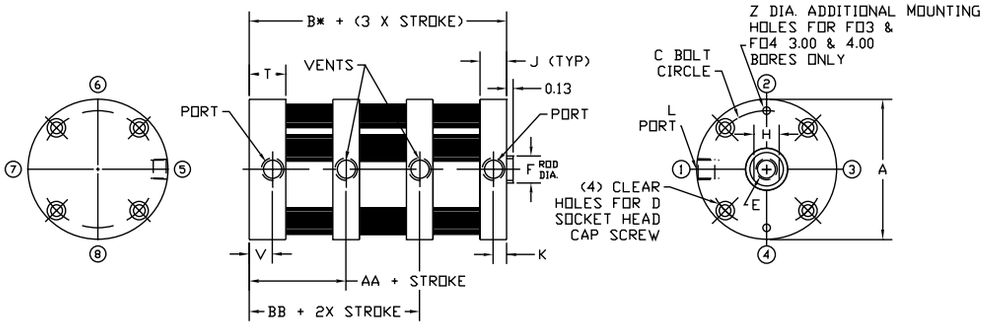
Standard strokes
1/8", 1/4", 3/8", 1/2", 5/8", 3/4", 1", 1-1/4", 1-1/2", 1-3/4", 2", 2-1/2", 3", 3-1/2", 4"
Special strokes available on request

Model FO2



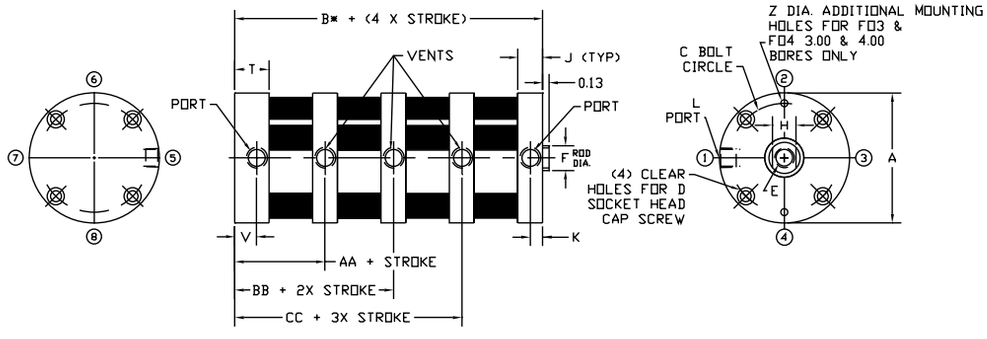
**Some options affect cylinder length, see page 2.34.*

Model FO3



**Some options affect cylinder length, see page 2.34.*

Model FO4



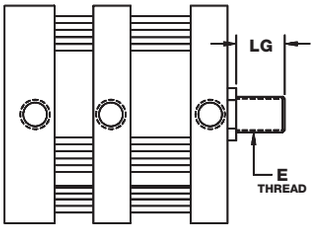
**Some options affect cylinder length, see page 2.34.*

Options

Bore	Type	Length Adder		
		Low Friction Seal (L)	Magnetic Position Sensing (M)	Low Friction Seals & Magnetic Position Sensing (LM)
2-1/2" (50)	FO2	0.75	.88	1.25
	FO3	1.13		1.63
	FO4	1.50		2.00
3" (70)	FO2	1.00	.88	1.38
	FO3	1.50		1.88
	FO4	2.00		2.38
4" (125)	FO2	1.00	.88	1.38
	FO3	1.50		1.88
	FO4	2.00		2.38

Male Rod Ends (Option MT or CMT)

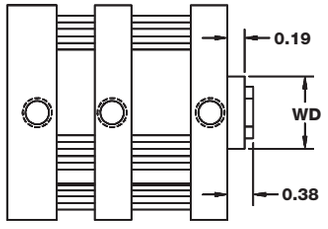
(Model FO2 shown)



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)



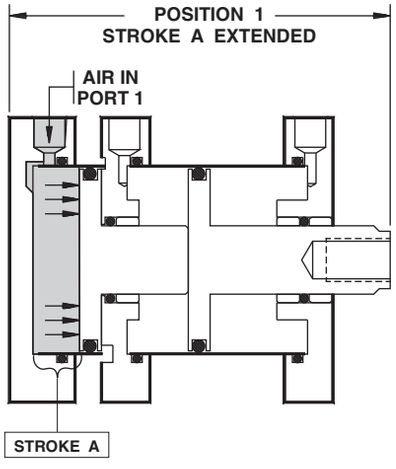
Bore	WD
2-1/2" (50)	1.13
3" (70)	1.25
4" (125)	1.38

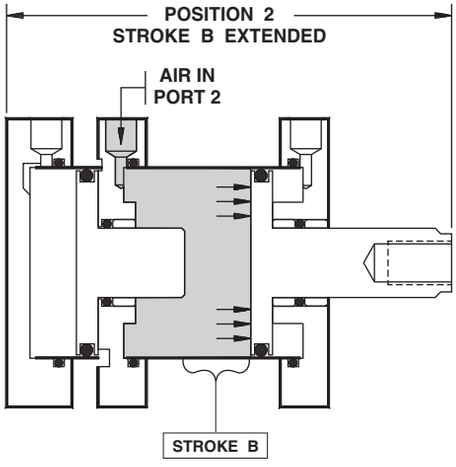
*The Bimba Multiple Position FOP Flat-1 is a double-acting, single rod end cylinder that provides three positions with just one cylinder.**

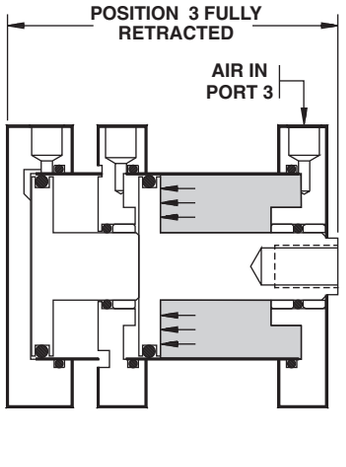
- Body — 304 Stainless Steel
- Heads—Anodized Aluminum Alloy
- Piston Rod — Ground and Polished 303 Stainless Steel
- Seals — Buna N (High temperature seals optional)
- Rod Bushing — Oil Impregnated Bronze
- Pressure Rating — 200 PSI Maximum (Air only)
- Temperature Rating — From -20°F to +150°F (-25°C to +65°C) Buna N seals with a temperature range of -20°F to +150°F (-25°C to +65°C) are standard in all Bimba air cylinders. Fluoroelastomer seals rated for higher temperature applications are available. If cylinders are operated at temperatures below 0°F (-18°C) for extended time periods, special modifications may be required. Special seal materials are available on request.

**Other positions (4, 5, etc.) are available as specials. Contact your local Bimba distributor for more information.*

How it Works







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.

How to Order

The model number for all Multiple Position FOP Flat-1 cylinders consists of three alphanumeric clusters. The first cluster designates type, the second cluster bore size and stroke lengths A and B, and the third cluster designates mounting and special options. Please refer to the charts below for an example of Model Number FOP 170.375/0.25-1V. This is a 1-1/2" bore multiple position FOP Flat-1 with a 3/8" stroke for position A, plus an **additional** stroke of 1/4" for position B, with a pivot mount on the rear head and high temperature seals.

TYPE	BORE SIZE	STROKE LENGTH A	STROKE LENGTH B
FOP - Double acting multiple position, single end rod	02 - 9/16" 04 - 3/4" 09 - 1-1/16" 17 - 1-1/2" 31 - 2" 50 - 2-1/2" 70 - 3" 125 - 4"	0.25 - 1/4" 0.375 - 3/8" 0.625 - 5/8" ETC.	0.25 - 1/4" 0.375 - 3/8" 0.625 - 5/8" ETC.

FOP-170.375/0.25-1V

MOUNTING OPTIONS

(Enter in numeric order)

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]

[1] "Screw clearance" to allow bolt head to pass through; no counter bores (see page 2.38).

OPTIONS

(Enter in alphabetical order, except EE which is last)

CFT	-	Coarse female rod thread (fine thread standard) (see page 2.39)
CMT	-	Male rod thread end (coarse thread) (see page 2.40)
G	-	Magnalube® G
L	-	Low friction seals (see page 2.40)
M, M1, M3, M4	-	Magnetic position sensing (see table page 2.9[1] and Position Sensing Solution Section)
MT	-	Male rod thread end (fine thread) (see page 2.40)
NT	-	Non-threaded rod
P2*, P3, P4	-	Front port position #2, etc. (see page 2.38)[1]
P6*, P7, P8	-	Rear port position #6, etc. (see page 2.38)[1]
Q	-	Low temperature option (-40° F to 200° F)
T1, T3, T4	-	Additional switch mounting post located in position #1, #3 or #4
V	-	High temperature option (0° to +400° F)[2]
W	-	Rod wiper (Buna-N only) (see page 2.40)
Y	-	Moly-coat (MoS_2 I. D. coating)
EE0.375	-	3/8" extra rod extension
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.

List Prices

Basic Model	Base Price by Bore Size							
	9/16"	3/4"	1-1/16"	1-1/2"	2"	2-1/2"	3"	4"
Base Model								
Total combined stroke adder (per 1/8")*								

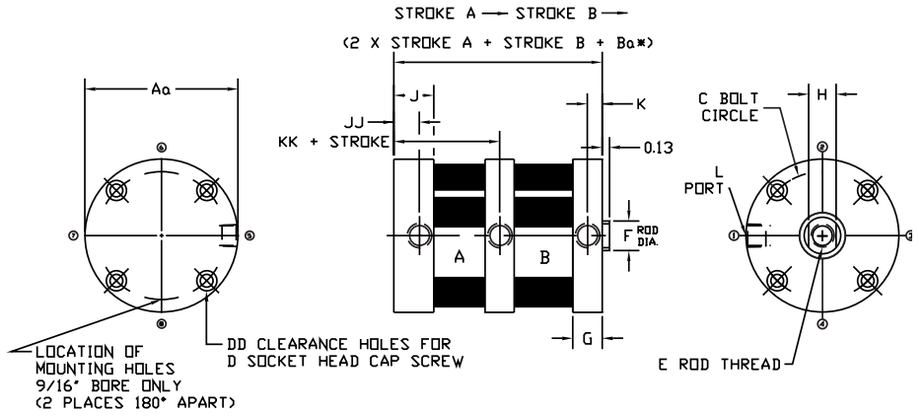
**Total combined stroke = (2 x Stroke A) + Stroke B.*

Mounting Options	Price Adders by Bore Size							
	9/16"	3/4"	1-1/16"	1-1/2"	2"	2-1/2"	3"	4"
Pivot Mount (Options 1, 1N)								
Threaded Mounting Holes (Options 3, 3F, 3R)								
Screw Clearance Holes (Options 4, 4F, 4R)								

Options	Price Adders by Bore Size							
	9/16"	3/4"	1-1/16"	1-1/2"	2"	2-1/2"	3"	4"
EE (per 1/2" increments)								
MT, CMT Male Rod Thread								
V Option (Standard Seals)								
V Option (Low Friction Seals)								
W Rod Wiper								
L Low Friction Seals								
Magnetic Piston Sensing (Options M, M1, M3, M4)								
Switch Mounting Post (Options T1, T3, T4)								
Y (Adder per 1/8" of total combined stroke)								
Q Option (Standard Seals)								
Q Option (Low Friction seals)								

No charge options – CFT, G, NT, P2, P3, P4, P6, P7, P8.

Basic Model

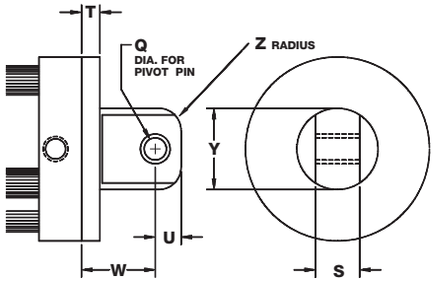


*Some options affect cylinder length; see page 2.40.

Mounting Options

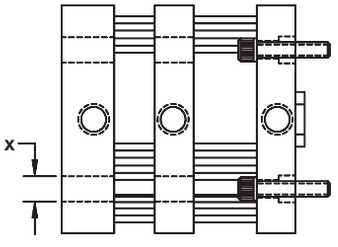
Pivot Mount

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



Screw Clearance Holes

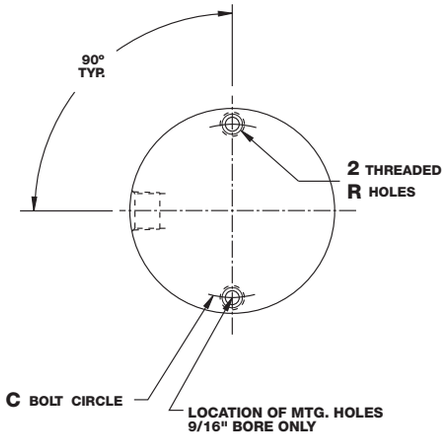
(available either or both ends)
(-4R shown) Screw clearance holes standard on all center sections



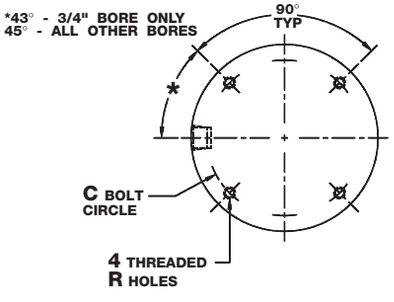
Threaded Mounting Holes

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

9/16" Bore



3/4" Bore and larger



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 2.40 for length adders for options.

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.*

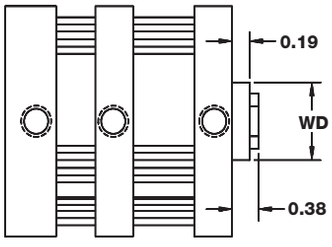
Minimum Stroke

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.

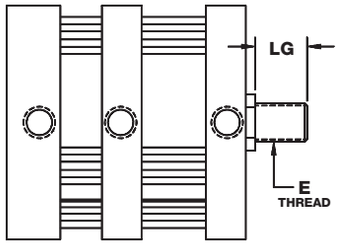
Rod Wiper (Option W)

(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

Repair Kits

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

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

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

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

Selection Guide

(All Models)

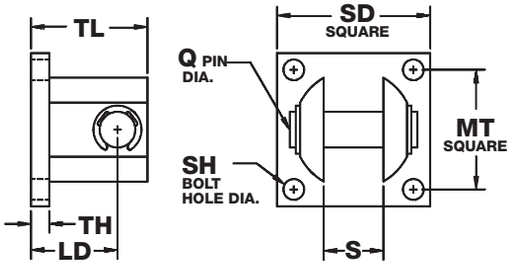
Accessory	Flat-1	Square Flat-1	Square Flat-II	Flat-II	FO2	FOP
Clevis Bracket	X	X	X	X	N/A	X
Trunnion Bracket	X	N/A	N/A	X	N/A	N/A
Rod Pivot	X	X	N/A	N/A	X	X
Pivot Attachment	N/A	X	X	N/A	N/A	N/A

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

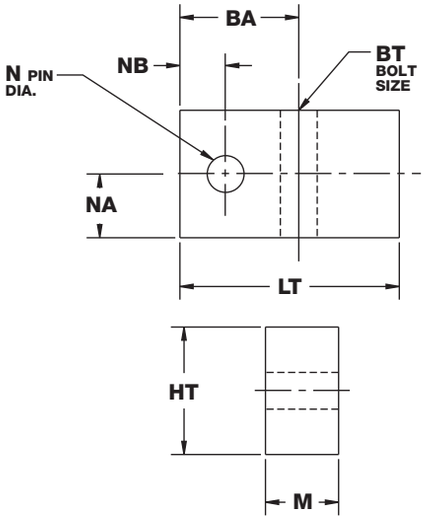
Bracket intended to mount with either rod pivot or pivot mount, not directly to the cylinder rear head.



Trunnion Bracket (pair)

Anodized aluminum alloy, complete with bronze pivot bushings

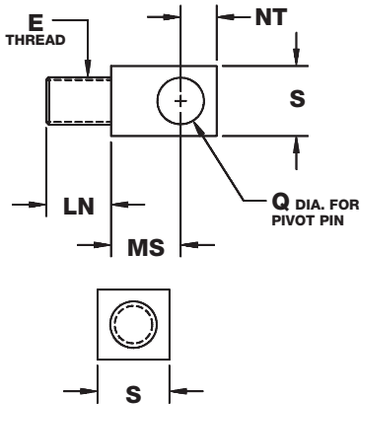
Model	Bore	BA	BT	HT	LT	M	N	NA	NB
BT-1	3/4" (04)	0.56	#10	0.63	1.12	0.31	0.13	0.30	0.22
BT-2	1-1/16" (09) 1-1/2" (17), 2" (31)	0.81	0.25	0.88	1.50	0.50	0.25	0.38	0.31
BT-3	2-1/2" (50), 3" (70),	0.94	0.31	1.00	1.63	0.63	0.31	0.45	0.38
BT-4	4" (125)	1.06	0.38	1.25	1.88	0.75	0.38	0.55	0.44



Rod Pivot

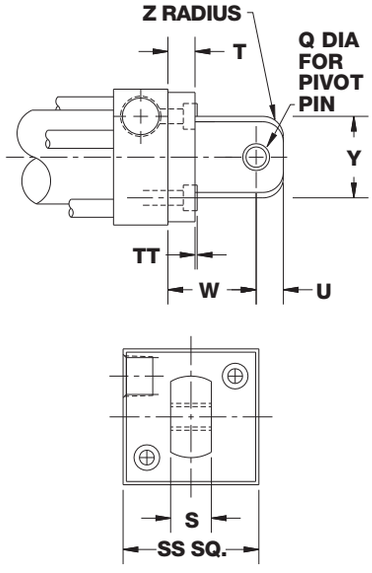
Zinc plated, high strength, heat treated alloy steel, complete with a bronze pivot bushing and nut

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



Pivot Attachment

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



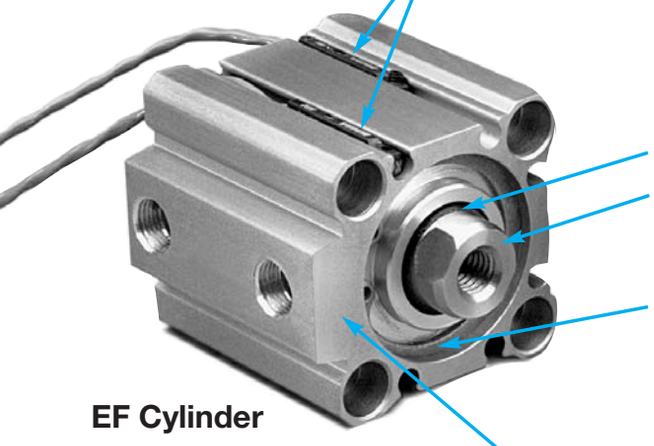
Model	Bore	Q	S	SS	T	TT	U	W	Y	Z
PM-1	3/4" (04)	0.19	0.38	1.13	0.19	0.020	0.25	0.75	0.75	–
PM-2	1-1/16" (09)	0.19	0.38	1.25	0.25	0.020	0.25	0.81	0.75	–
PM-3	1-1/2" (17)	0.38	0.75	1.75	0.25	0.025	0.44	1.19	1.38	–
PM-4	2" (31)	0.38	0.75	2.25	0.31	0.080	0.44	1.38	1.38	–
PM-5	2-1/2" (50)	0.38	0.75	3.00	0.38	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

Price List

Description	Model	List Price
Rod Pivot	RP-1/2	
	RP-1	
	RP-2	
	RP-3	
	RP-4	
	RP-5	
	RP-6	
Trunnion Bracket	BT-1	
	BT-2	
	BT-3	
	BT-4	
Clevis Bracket	BC-1	
	BC-2	
	BC-3	
Pivot Attachment	PM-1	
	PM-2	
	PM-3	
	PM-4	
	PM-5	
	PM-6	
	PM-7	
Wrench Kit (Fits wrench flats on all piston rods)	FWK	

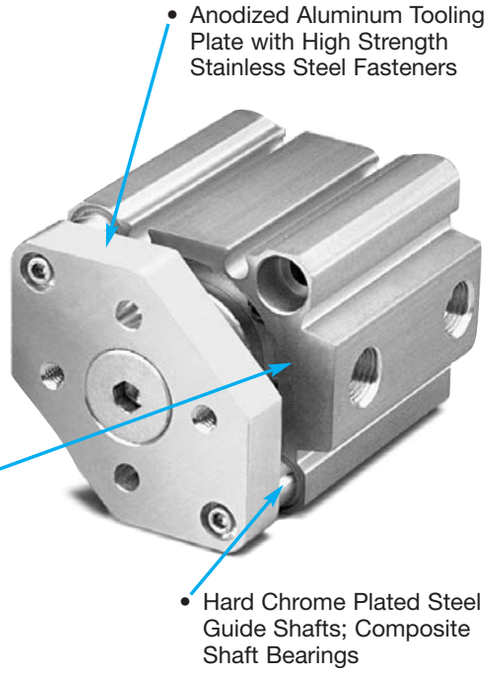
The Bimba EF Series is a compact, aluminum-extruded body air cylinder designed for international machine requirements.

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.



- Nitrile Piston Seal
- High Strength Aluminum Alloy Piston
- Nitrile Rod Seal and Wiper
- 4301 (303) Stainless Steel Rod
- Nitrile Rod Guide Seal
- Zinc Plated Carbon Steel Retaining Ring
- Bronze Bushing (12-20mm); Self-lubricating Nylon (25-100mm)
- Bronze Rod Guide (12-20mm); Anodized Aluminum (25-100mm)
- PTFE-Impregnated, Hard Anodized Aluminum Body

EFT Cylinder



Features and Advantages

- 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.
- NEW!! EFDT cylinders are now 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.
- NEW!! 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!

How to Order

The Model Number for all EF1 cylinders consists of three alphanumeric clusters. These designate type, bore size and stroke length, and options. Please refer to the charts below for an example of Model Number EF-2510-3MMTV. This is a 25mm bore, double acting, single end rod cylinder, with metric threads and ports, 10mm of stroke, threaded front/rear mounting holes, magnetic position sensing, male rod end and high temperature option.

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

STROKE LENGTH**

See table - page 2.46

EF-2510-3MMTV

MOUNTING OPTIONS (Enter in numeric order)	
No Number	Basic model
1	Threaded bottom mounting option
3	Threaded front/rear mounting option
6	Rear Clevis
6N	Rear Clevis 90°

OPTIONS

(Enter in alphabetical order, except EE which is last)

- B - Bumpers (see page 2.56)[1]
- C - Stainless steel retaining ring
- E - U.S. customary units (inch)[2]
- F - Full-flow port orifice[5]
- M - Magnetic position sensing (see page 2.56)[3]
- MT - Male rod end (fine thread) (see page 2.55)[4]
- NT - Non-threaded rod
- V - High temperature option -10ºC to 110ºC (15°F to 225°F)
- 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.*

Bimba EF1 Cylinders

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. **Blue** stroke lengths are EF cylinders with -E and -3EM options in stock available for Same Day Shipping.

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, 15, 20
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, 15, 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	10, 15, 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	10, 15, 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

List Prices

Model Type	Bore Size									
	12mm	16mm	20mm	25mm	32mm	40mm	50mm	63mm	80mm	100mm
EF										
Add per 5mm										
EFS										
EFR										
Add per 5mm										
EFD										
Add per 5mm										
Mounting Options										
1(threaded bottom)										
3 (thread front/rear)										
6, 6N (rear clevis)										
Options										
B										
C (EF,EFS,EFR)										
C (EFD)										
F (includes B)										
MT (per end)										
M										
V (EF)										
V (EFS)										
V (EFR)										
V (EFD)										
EE (per 1mm/end)										

No charge options: E (U.S. customary units), NT
Invalid option combination: NT/MT
EFD models not available with option NT

Engineering Specifications

Operating Medium:	Air
Maximum Operating Pressure:	10 bar (140 psi)
Ambient and Fluid Temperature:	-10° to 70°C (15° 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.

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)

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)

**Power Factor x bar = kg.*

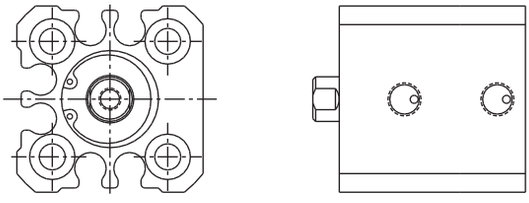
***Power Factor x psi = Pounds*

Enclosed Spring Forces

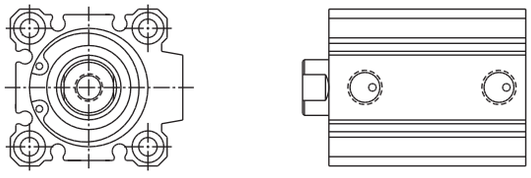
Action	Bore		Compressed Spring Force		Spring Rate	
			N	(lb)	N/mm	(lb/in)
Single Acting Spring Return	12mm	(1/2")	12.8	(2.9)	0.8	(4.8)
	16mm	(5/8")	16.0	(3.6)	1.0	(5.7)
	20mm	(3/4")	18.1	(4.1)	1.2	(6.9)
	25mm	(1")	21.4	(4.8)	1.1	(6.4)
	32mm	(1-1/4")	22.2	(5.0)	0.8	(4.3)
	40mm	(1-1/2")	33.1	(7.4)	0.9	(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)

Body Styles

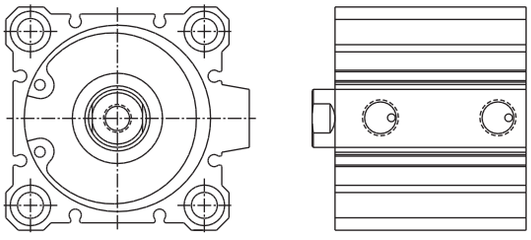
12mm Bore



16mm to 32mm Bore



40mm to 100mm Bore

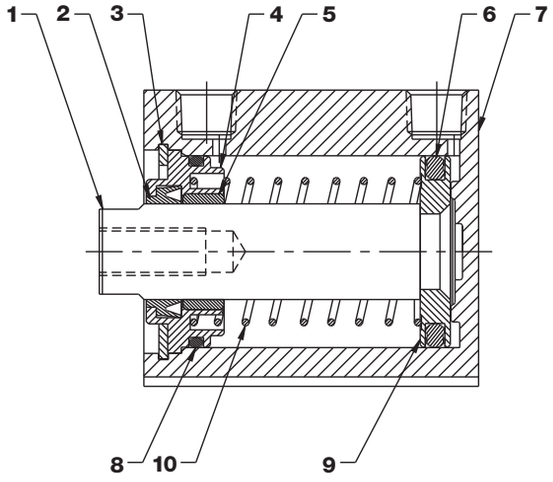


Components

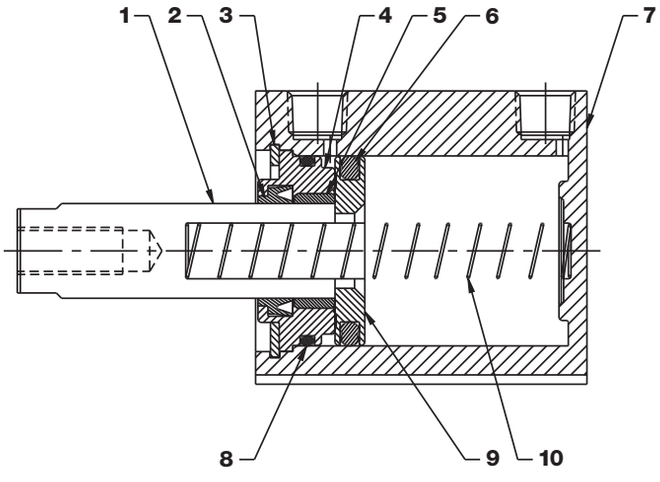
Part List

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

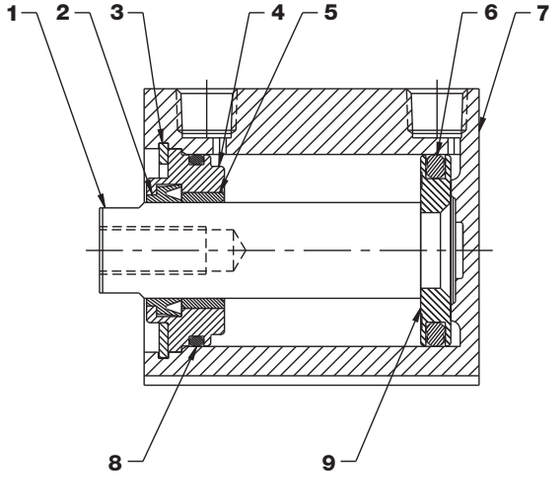
Single Acting/Spring Retract



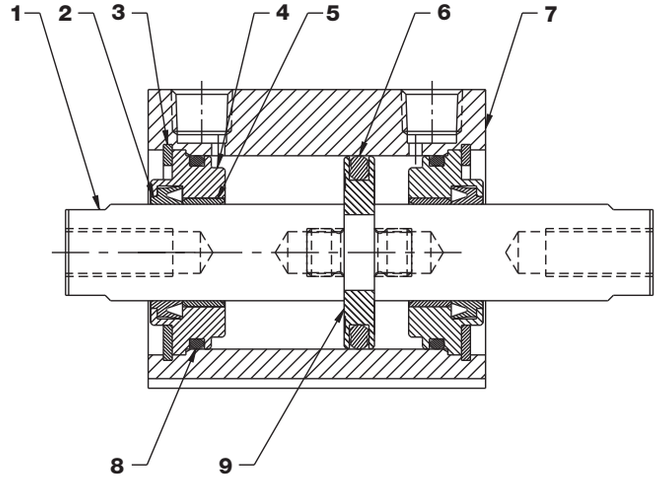
Single Acting/Spring Extend



Double Acting/Single Rod



Double Acting/Double Rod



Dimensions

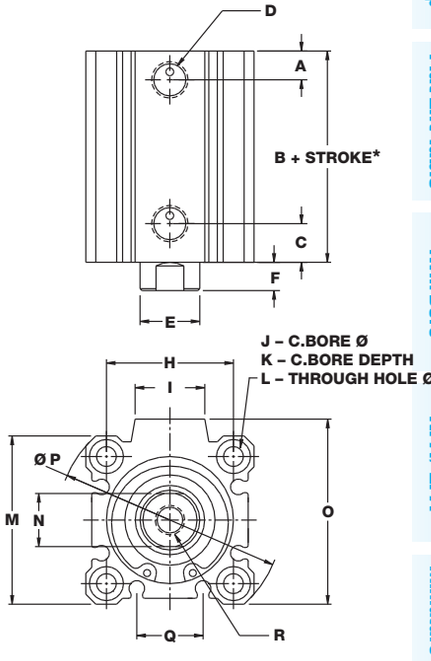
Shown in millimeters (inches)

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 2.56 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).

Dimensions

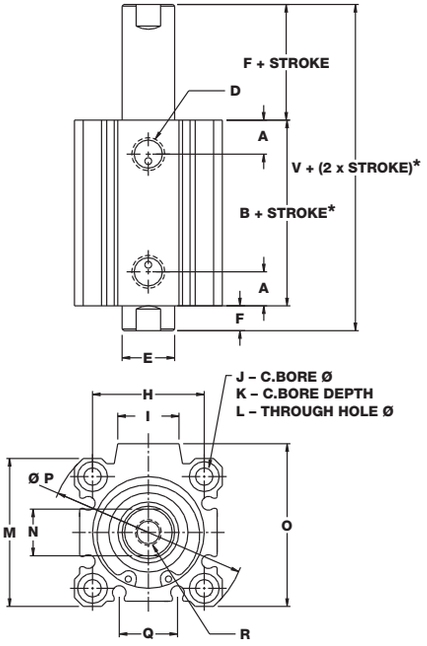
Shown in millimeters (inches)

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 2.56 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).

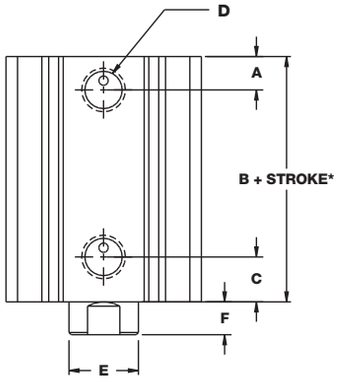
Dimensions

Shown in millimeters (inches)

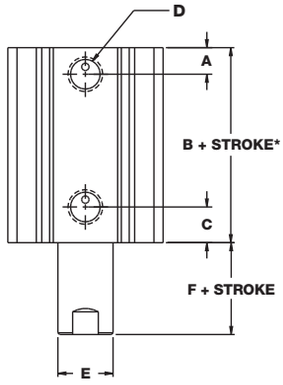
Spring Retract/Spring Extend

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 2.56 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

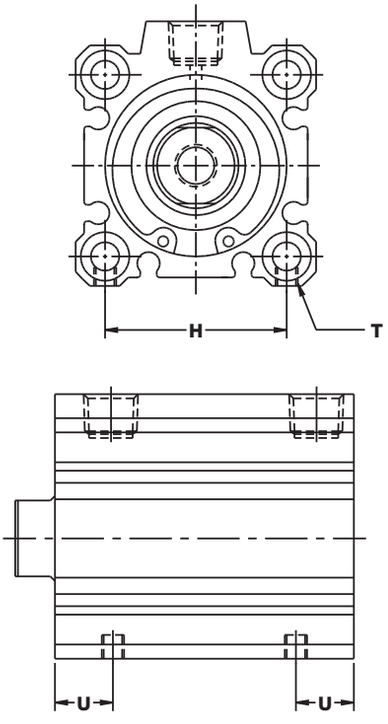
Bore		Approximate Base Weight of Cylinder gram-force (oz.)		Weight Adder per 5mm of Stroke gram-force (oz.)	
12mm	(1/2")	21.8	(0.77)	5.6	(0.20)
16mm	(5/8")	38.7	(1.36)	8.0	(0.28)
20mm	(3/4")	46.4	(1.64)	11.5	(0.41)
25mm	(1")	73.1	(2.58)	14.6	(0.52)
32mm	(1-1/4")	113.3	(4.00)	20.9	(0.74)
40mm	(1-1/2")	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)

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)

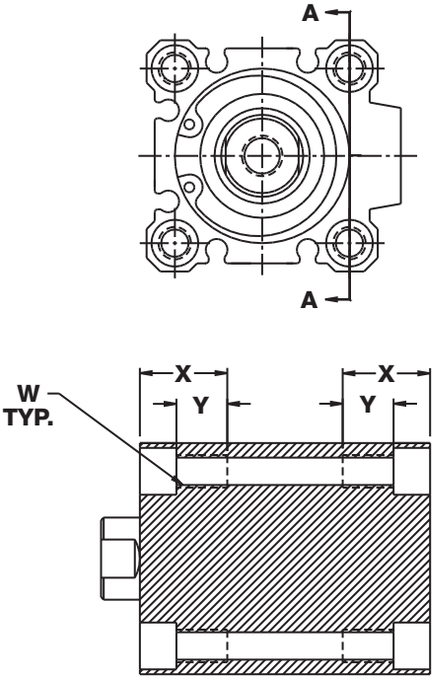
Note: On the following models, only the front set of threaded bottom mounting holes is provided; EF-205, EF-2010, EF-255, EF-325, EF-8010.



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.

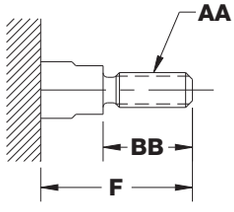


SECTION "A-A"

Options

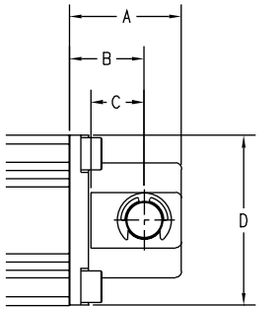
Male Rod End (MT)

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	35.5 (1.40)	43.5 (1.71)	3/4-16 UNF	28.5 (1.12)	40.5 (1.59)

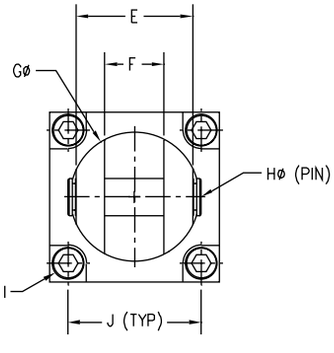


Rear Clevis Mount (6, 6N)

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)

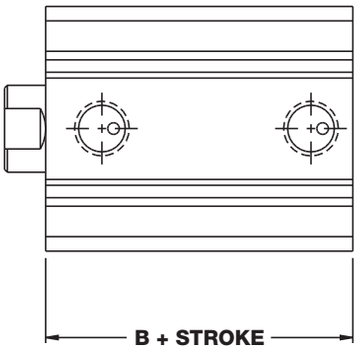


Bore	G	HØ (PIN	I	J
12mm	13 (0.51)	5 (0.197)	M4x0.7 (#8-32 UNC)	15.5 (0.61)
16mm	15 (0.58)	5 (0.197)	M4x0.7 (#8-32 UNC)	20 (0.79)
20mm	21 (0.82)	8 (0.315)	M6x1.0 (1/4-20 UNC)	25.5 (1.00)
25mm	22 (0.85)	10 (0.394)	M6x1.0 (1/4-20 UNC)	28 (1.10)
32mm	39 (1.53)	10 (0.394)	M6x1.0 (1/4-20 UNC)	34 (1.34)
40mm	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)



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 (inches)
Double Acting Single Rod End Double Acting Double Rod End	3.0 (.12)
Single Acting Spring Retract Reverse Acting Spring Extend	1.5 (.06)

Extruded Flat Repair Kits

For bore sizes of 12, 16, and 20, each Extruded Flat Basic Kit includes the appropriate rod guide, rod seal, piston seals, cylinder, body seals, and instructions. For larger bore sizes (25mm and up), a rod bushing is included instead of the rod guide. Please note that EF repair kits will work on EF2 cylinders.

To order, please provide the correct bore code in the kit part number blank. Specialty seals are designated by their suffix option.

Repair Kit
K-B-EF-__
K-B-EFD-__
K-B-EF-__-V
K-B-EFD-__-V

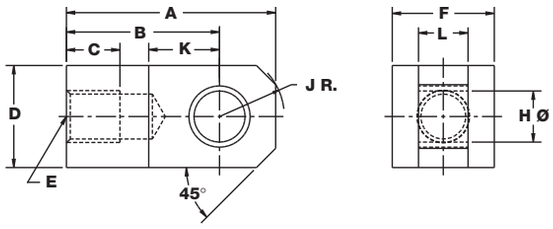
Accessories

Rod Pivot List Prices

Model Number	Bore	List Price
RP(M,E)K-12	12mm (1/2")	
RP(M,E)K-16	16mm (5/8")	
RP(M,E)K-20	20mm (3/4")	
RP(M,E)K-25	25mm (1")	
RP(M,E)K-32	32mm (1-1/4")	
RP(M,E)K-40	40mm (1-1/2")	
RP(M,E)K-50	50mm (2")	
	63mm (2-1/2")	
RP(M,E)K-80	80mm (3-1/4")	
RP(M,E)K-100	100mm (4")	

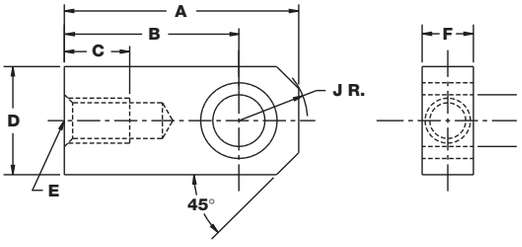
Note: To use Rod Pivot, cylinder must be specified with male thread option (MT).

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.



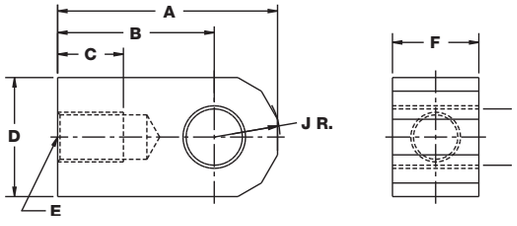
Metric Small Bore Rod Pivot (for 12mm to 63mm bore cylinders)

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

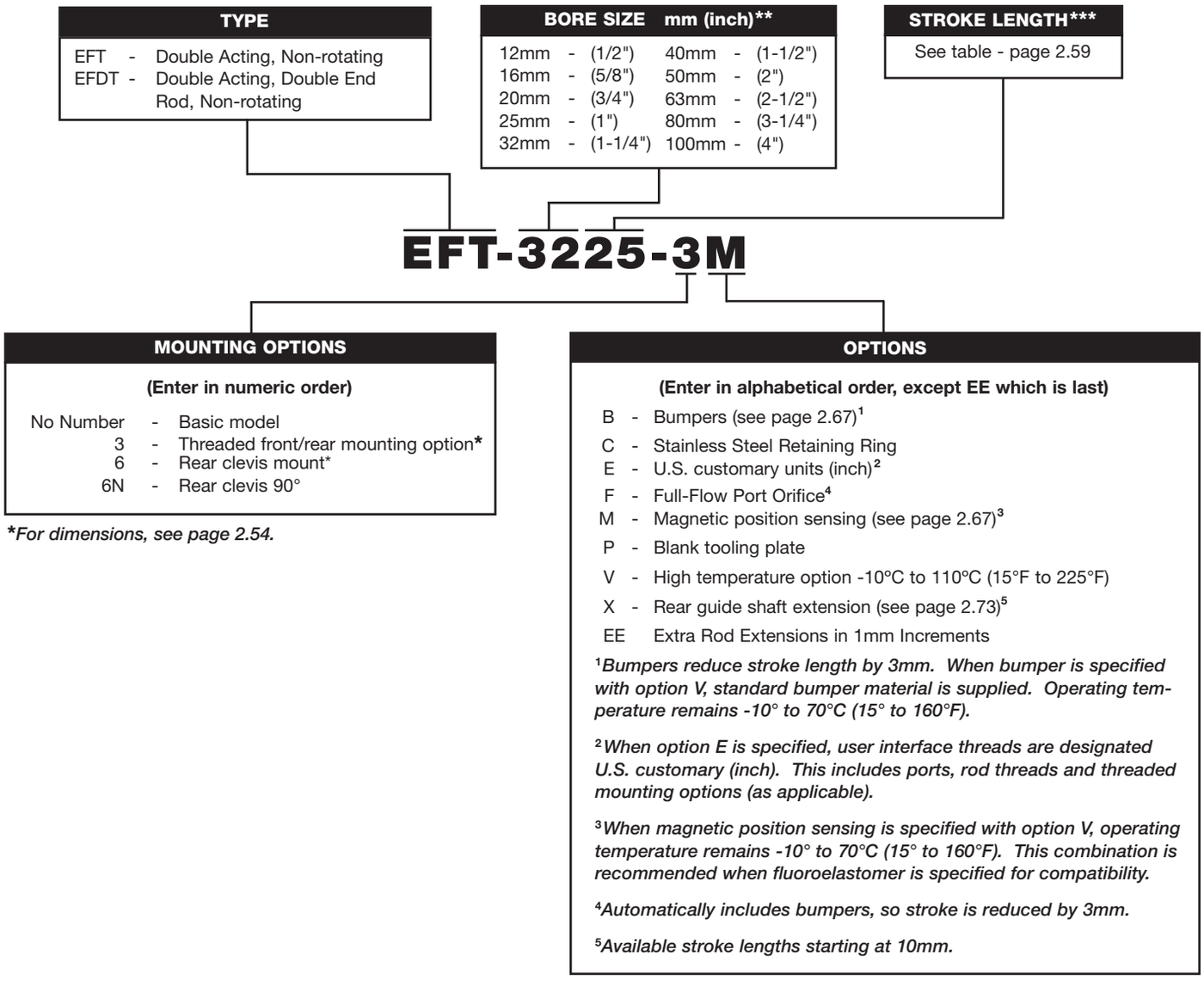
Rod Pivot Dimensions

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 (0.99)	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 (0.99)	8.5 (0.24)	16.0 (0.63)	M8 x 1.25 (# 10-32 UNF)
RP(M,E)K-25	25mm (1")	41.0 (1.62)	30.0 (1.19)	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 (1.60)	30.0 (1.19)	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 (1.60)	30.0 (1.19)	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")	4.7 (0.19)	5.0 (0.190)	6.3 (0.25)	6.9 N/A	4.7 N/A
RP(M,E)K-16	16mm (5/8")	12.0 (0.25)	5.0 (0.190)	7.9 (0.31)	13.9 N/A	6.2 N/A
RP(M,E)K-20	20mm (3/4")	16.0 (0.31)	8.0 (0.314)	10.3 (0.41)	11.4 N/A	7.7 N/A
RP(M,E)K-25	25mm (1")	20.0 (0.38)	10.0 (0.394)	12.7 (0.50)	13.9 N/A	9.7 N/A
RP(M,E)K-32	32mm (1-1/4")	22.0 (0.70)	10.0 (0.394)	12.0 (0.47)	13.9 N/A	17.6 N/A
RP(M,E)K-40	40mm (1-1/2")	22.0 (0.70)	10.0 (0.394)	12.0 (0.47)	13.9 N/A	17.6 N/A
RP(M,E)K-50	50mm (2") 63mm (2-1/2")	28.0 (0.85)	14.0 (0.501)	16.0 (0.63)	19.9 N/A	21.6 N/A
RP(M,E)K-80	80mm (3-1/4")	27.6 (1.09)	18.04 (0.753)	21.0 (0.83)	N/A	N/A
RP(M,E)K-100	100mm (4")	31.6 (1.25)	22.04 (0.878)	24.0 (0.94)	N/A	N/A

How to Order

The Model Number for the EF2 cylinder consists of three alphanumeric clusters. These designate type, bore size and stroke length, and options. Please refer to the charts below for an example of Model Number EFT-3225-3M. This is a 32mm bore, double acting, guided cylinder with metric threads and ports, 25mm stroke, threaded front/rear mounting holes, and magnetic position sensing.



**For dimensions, see page 2.54.*

[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.*

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.*

Bimba is a JIT manufacturer and we are able to provide EFT 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. **Blue** stroke lengths are EF cylinders with -3EM options in stock available for Same Day Shipping.

Stroke Length Availability

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

List Prices

Model Type	Bore Size									
	12mm	16mm	20mm	25mm	32mm	40mm	50mm	63mm	80mm	100mm
EFT										
Add per 5mm										
EFDT										
Add per 5mm										
Mounting Options										
3										
6, 6N (EFT)										
Options										
B										
C (EFT)										
C (EFDT)										
F (includes B)										
M										
V										
X (base)										
Add per 5mm										
EE (per 1mm)										

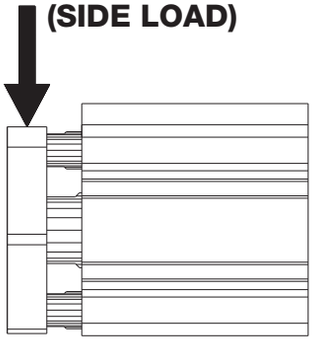
No charge options: E (U.S. Customary Units), P.

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)

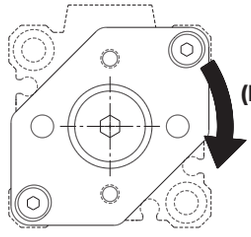


Maximum Moments N-m (in-lb)

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)

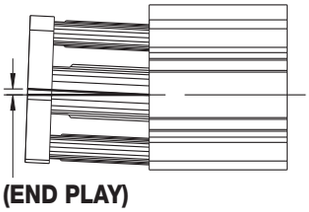
EFT Cylinders
Maximum Moments N-m (in-lb)

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/A		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)

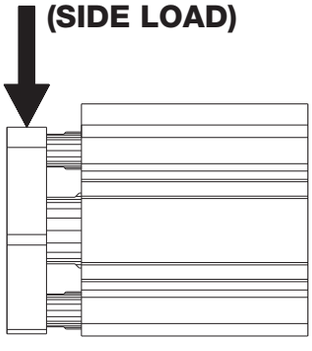


Bore	Stroke Length									
	40mm		45mm		50mm		75mm		100mm	
12mm (1/2")	N/A		N/A		N/A		N/A		N/A	
16mm (5/8")	N/A		N/A		N/A		N/A		N/A	
20mm (3/4")	0.35	(.014)	0.38	(.015)	0.40	(.016)	N/A		N/A	
25mm (1")	0.36	(.014)	0.39	(.015)	0.42	(.016)	N/A		N/A	
32mm (1-1/4")	0.37	(.015)	0.40	(.016)	0.43	(.017)	0.57	(.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)

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)

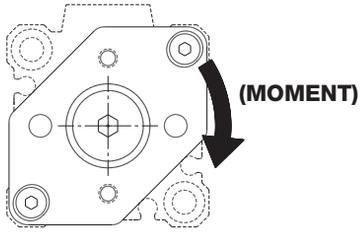


Maximum Moments N-m (in-lb)

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)

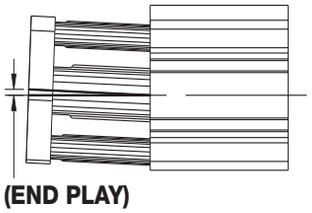
EFT Cylinders with X Option
Maximum Moments N-m (in-lb)

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)



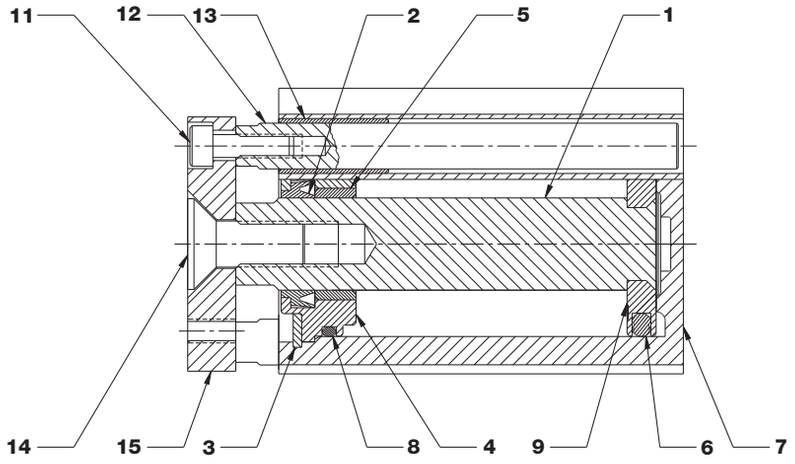
Bore	Stroke Length				
	40mm	45mm	50mm	75mm	100mm
12mm (1/2")	N/A	N/A	N/A	N/A	N/A
16mm (5/8")	N/A	N/A	N/A	N/A	N/A
20mm (3/4")	0.05 (.002)	0.05 (.002)	0.05 (.002)	N/A	N/A
25mm (1")	0.05 (.002)	0.05 (.002)	0.03 (.001)	N/A	N/A
32mm (1-1/4")	0.05 (.002)	0.05 (.002)	0.03 (.001)	0.03 (.001)	0.03 (.001)
40mm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

Components

Shown in millimeters (inches)

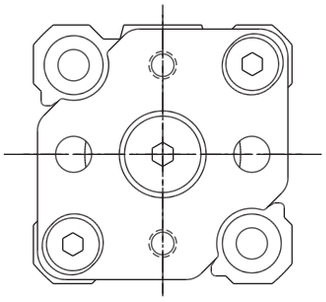
Part List

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

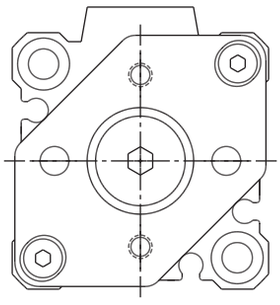


Tooling Plate Styles

12mm to 16mm Bore



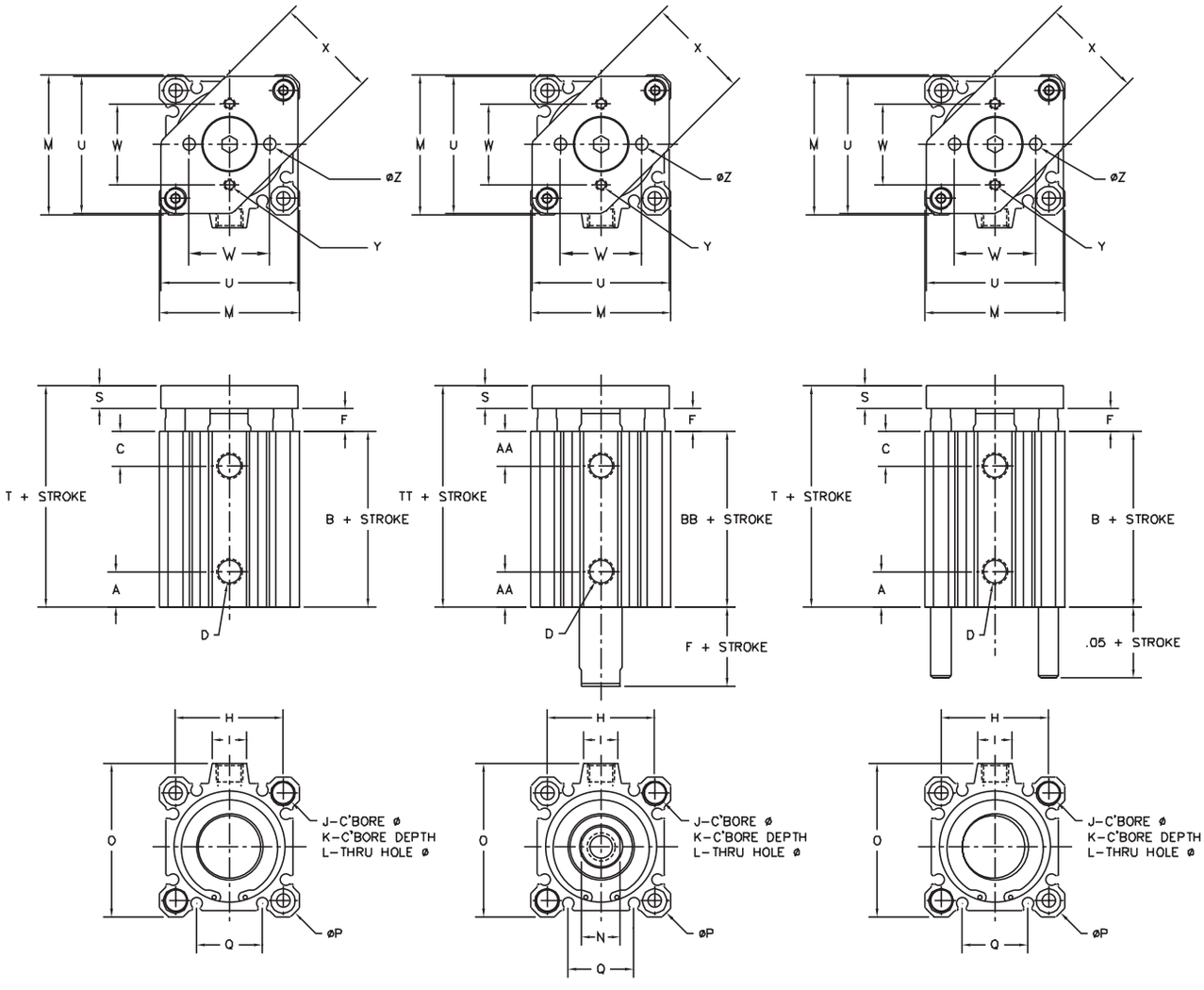
20mm to 100mm Bore



Dimensions

Shown in millimeters (inches)

EFT Cylinder **EFDT Cylinder** **X Option**



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)

Dimensions

Shown in millimeters (inches)

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 2.67 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

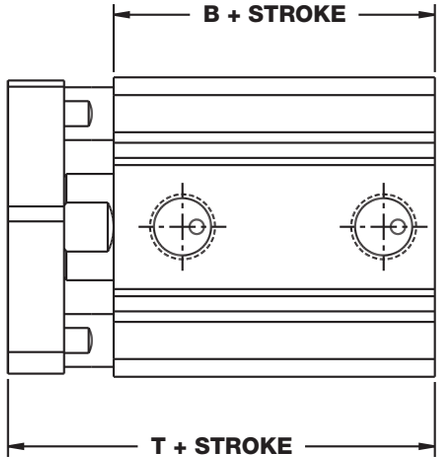
Bore		Approximate Base Weight of Cylinder gram-force (oz.)		Weight Adder per 5mm of Stroke gram-force (oz.)	
12mm	(1/2")	32.3	(1.14)	6.1	(0.22)
16mm	(5/8")	53.4	(1.89)	8.6	(0.30)
20mm	(3/4")	74.4	(2.62)	13.3	(0.47)
25mm	(1")	114.6	(4.04)	16.3	(0.58)
32mm	(1-1/4")	166.9	(5.89)	22.6	(0.80)
40mm	(1-1/2")	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)

(Body Lengths With MRS Option)

Bore		B		T	
12mm	(1/2")	27.0	(1.06)	36.7	(1.44)
16mm	(5/8")	28.5	(1.12)	38.2	(1.51)
20mm	(3/4")	29.5	(1.16)	41.0	(1.61)
25mm	(1")	32.5	(1.28)	46.0	(1.81)
32mm	(1-1/4")	33.2	(1.31)	48.7	(1.92)
40mm	(1-1/2")	39.5	(1.56)	55.0	(2.17)
50mm	(2")	40.5	(1.60)	60.6	(2.39)
63mm	(2-1/2")	46.0	(1.81)	66.3	(2.61)
80mm	(3-1/4")	53.5	(2.11)	77.4	(3.05)
100mm	(4")	63.0	(2.48)	88.9	(3.50)



Bumpers (B)

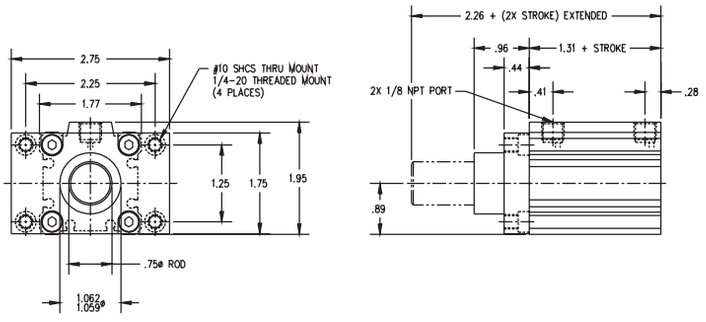
(Stroke reduction by model for all bores)

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

Bimba Stopper Cylinders

A Bimba EF1 Cylinder was modified for a conveyor stopping application. Featuring a heavy-duty mounting, the cylinder's rod/bearing design was developed to withstand side impact loading.

How to Order and List Prices

Model/Price	Dimensions (inch)
Model Number: EFL—Double-acting load-bearing conveyor-stop cylinder EFLR—Double-acting failsafe, spring extended Part Number: EFL or EFLR-32 □-E(options) Note: Part number must include option -E; available only in inch series. Stroke Length: 15, 20, 25mm Blue stroke lengths are stocked EFL/EFLR cylinders with -EM options. Options: EE (Extra rod extension up to 25mm) M (MRS position sensing) V (High Temp, to 225° F)	

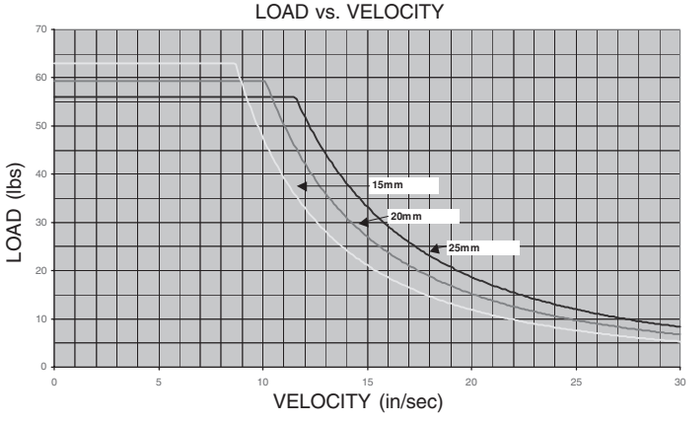
Engineering Specifications

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
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 it Works/Materials of Construction

The Guide Pin rides in the Cam Bushing. The bottom portion of stroke is linear travel. As the cylinder extends, the pin follows the groove and creates 90 degrees of rotary motion.

Engineering Specifications

Operating Medium:	Air
Maximum Operating Pressure:	140 psi
Ambient and Fluid Temperature:	+15 to +160 degrees F
Lubrication:	PTFE grease

Bimba Twist Clamp Cylinders

The Bimba Twist Clamp Cylinder combines linear and 90-degree 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.

How to Order

The model number for all EF Twist Clamp cylinders consists of three alphanumeric clusters. These designate product type, bore size and stroke length, and 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).

Product Type
EFCL - EF clamp cylinder, left rotation
EFCR - EF clamp cylinder, right rotation

Bore Size
25 - 25mm
40 - 40mm
50 - 50mm
63 - 63mm

EFCL - 6377 - 3EM*

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

*Stroke in model number is called out as TOTAL stroke. Blue stroke lengths are stocked EFCL/EFCR cylinders with 3EM options.

Options		
V	-	Fluoroelastomer seals (15° to 225°F)
3	-	Threaded mounting holes front/rear
E	-	U.S. units (inch)
M	-	Magnet for position sensing

***Note: Options 3, E, and M are standard features and included in all model numbers**

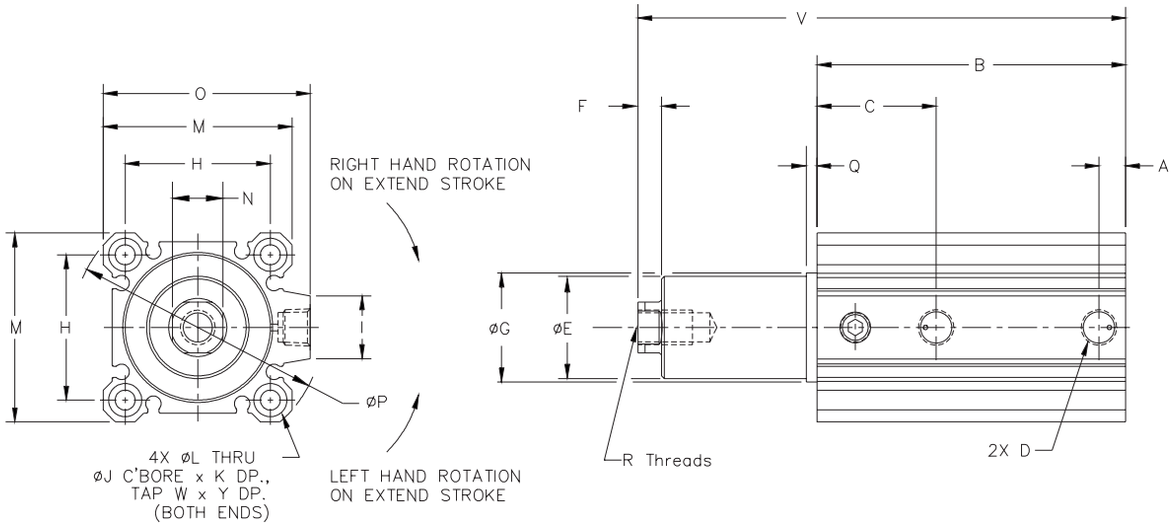
List Prices

Bore	Base Price (includes stroke)	Options V-fluoroelastomer Seals
25mm		
40mm		
50mm		
63mm		

Shipping Weight

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

Dimensions

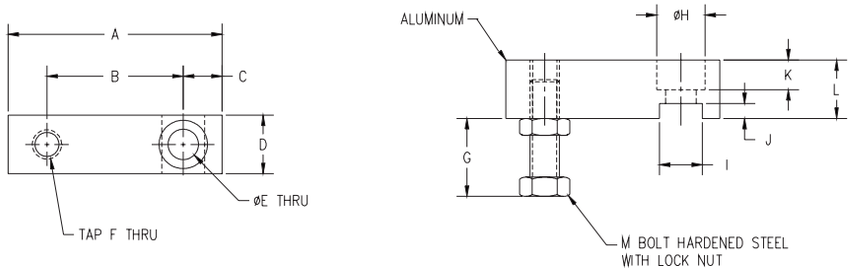


Bore	A	B	C	D	E	F	G	H	I	J
25mm	0.20	3.27	1.22	#10-32	0.84	0.16	0.905	1.10	0.41	0.35
40mm	0.29	3.34	1.29	1/8 NPT	1.12	0.26	1.180	1.57	0.68	0.35
50mm	0.37	4.98	1.29	1/4 NPT	1.39	0.30	1.456	1.97	0.79	0.44
63mm	0.38	5.12	1.37	1/4 NPT	1.82	0.30	1.888	2.36	0.79	0.56

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

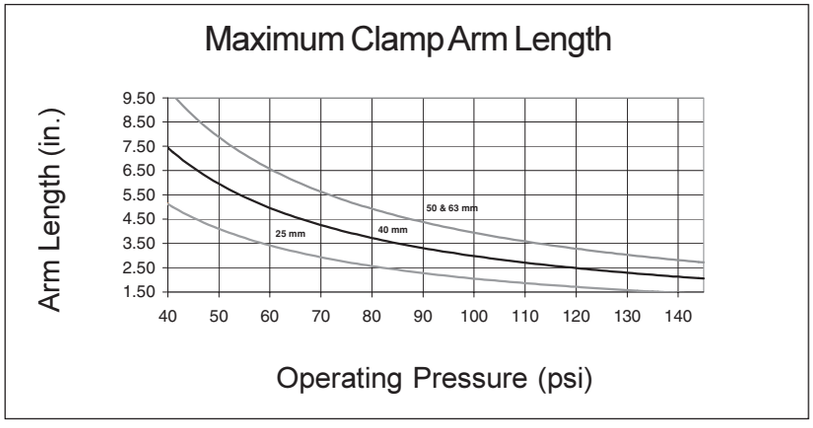
Accessories

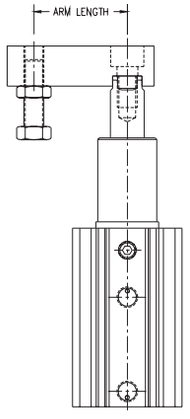
Clamp Arm Accessory	
Model Number	
EFCA-25-E	
EFCA-40-E	
EFCA-50-E	
EFCA-63-E	

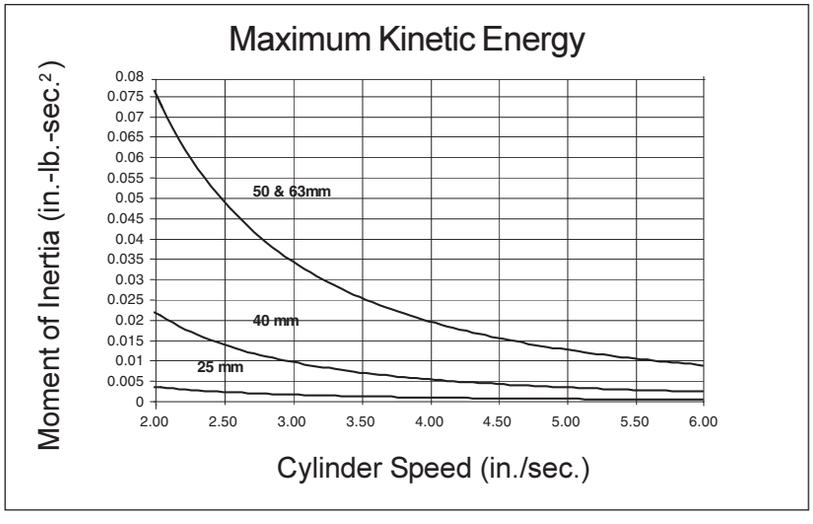


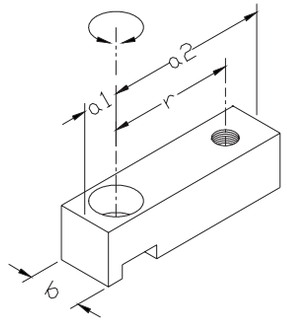
Bore	A	B	C	D	E	F	G	H	I	J	K	L	M
25mm	2.00	1.38	0.38	0.63	0.34	1/4-20	1.13	0.50	0.393	0.08	0.32	0.63	1/4-20
40mm	2.75	1.75	0.50	0.75	0.39	3/8-16	1.00	0.62	0.550	0.19	0.38	0.75	3/8-16
50mm	3.44	2.50	0.50	0.88	0.53	3/8-16	1.00	0.78	0.668	0.19	0.50	0.88	3/8-16
63mm	3.44	2.50	0.50	0.88	0.53	3/8-16	1.00	0.78	0.668	0.19	0.50	0.88	3/8-16

Engineering Specifications









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

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./sec.²
clamp bolt and nut = .081 lbs.

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

$$I_{arm} = .000578\ in.\text{-}lb.\text{-}sec.^2$$

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

$$I_{total} = .000578 + .000642 = 0.00122\ in.\text{-}lb.\text{-}sec.^2$$

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.

Power Factor

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

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

Bimba Extruded Flat Lift Table

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.

- 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.

How to Order

Type	
EFF	Double-Acting Non-Rotating Lift Table

Bore Size	
50	50mm
80	80mm
125	125mm

Stroke Length
5mm increments to 100mm max

EFF - 80 50 - EM

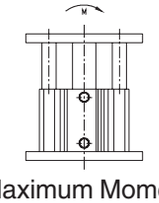
Options	
B	Internal Bumpers[1]
E	U.S. Customary (inch)[2]
M	Magnetic Position Sensing
V	High Temperature (15°F to 225°F)

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

List Prices

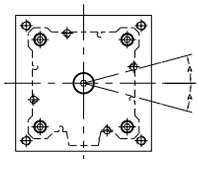
	50mm	80mm	125mm
Base			
Add per 5mm			
B			
M			
V			

Engineering Specifications



Maximum Moment
Due to Side or Overhung Load

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

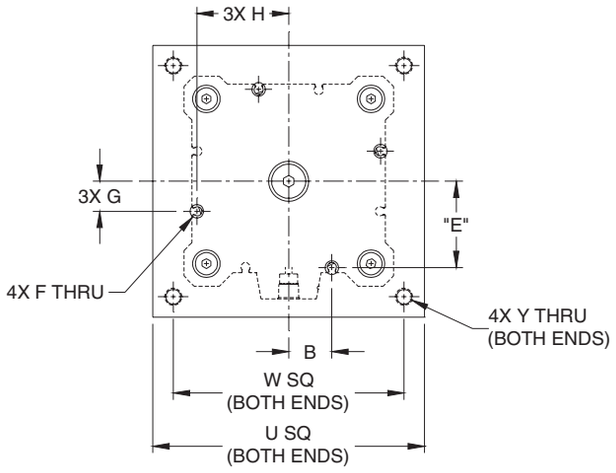


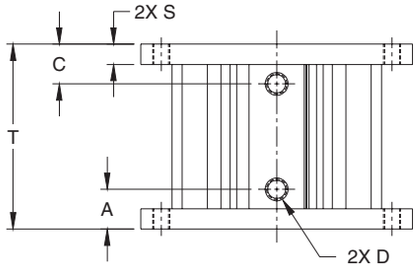
Non-Rotational Accuracy

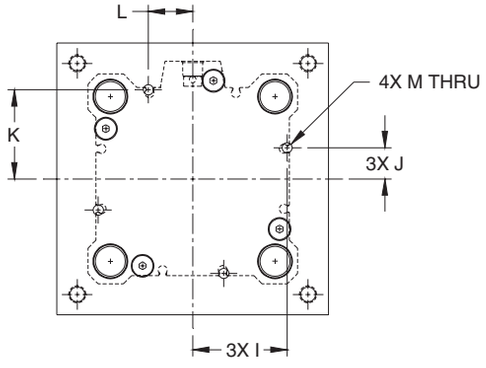
Bore	Accuracy (A)
50mm	+/- .17°
80mm	+/- .14°
125mm	+/- .11°

Materials of Construction

Component	Material
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







Dimensions (inches)

Bore	A	B	C	D	E	F	G	H	I	J	K	L	M	S	T	U	W	Y
50mm	0.58	0.56	0.58	1/8 NPT	1.06	0.25	0.58	1.05	1.09	0.60	1.11	0.58	0.25	0.25	See Table Below	3.00	2.50	#10-32 UNF
80mm	0.73	0.80	0.73	1/8 NPT	1.59	0.25	0.55	1.68	1.74	0.57	1.64	0.82	0.19	0.38		5.00	4.25	5/16-24 UNF
125mm	1.00	1.07	1.00	3/8 NPT	2.43	0.25	0.85	2.52	2.57	0.87	2.48	1.09	0.19	0.50		7.00	5.88	1/2-20 UNF

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

Bimba Metric Twin Bore Series Cylinders

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.

Delrin® is a trademark of Dupont.

How to Order

The model number for all Twin Bore cylinders consists of three alphanumeric clusters. These designate product type, bore size and stroke length, and options. Please refer to the charts below for an example of model number TB-1610-EX. This is a double-acting 16mm bore, Twin Bore Cylinder, with 10mm stroke, ball bushings, and U.S. customary threads.

PRODUCT TYPE

TB	-	Twin Bore Actuator
TBD	-	Twin Bore; Double End
TBA	-	Twin Bore Air Table

BORE SIZE

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

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

TB-1610-EX

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[1 2]
		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
M	-	Magnetic position sensing
S	-	Side mounting holes[3]
V	-	High temperature; -15° to 135°C (0° to 275°F)[4]
X	-	Ball bushings[3 4]

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
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

Bumpers standard on all models
[1]*TBA Models Only (Standard on TB and TBD)*
[2]*N/A on 6mm bore*
[3]*TB and TBD Models Only*
NOTE: TB and TBD stroke lengths are 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 above. TBA models available only in those stroke lengths listed as standard above.
[4]*Not available on 6mm and 8mm*

List Prices

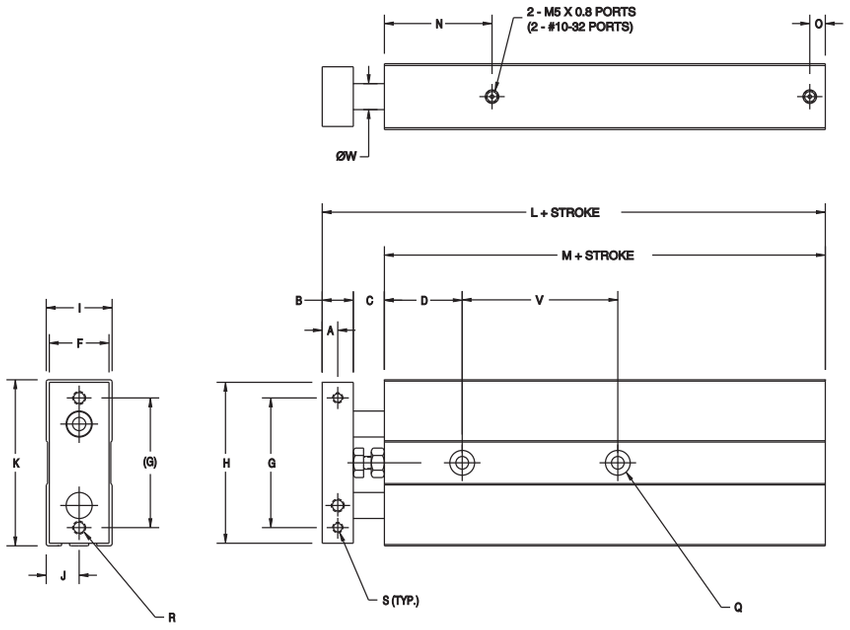
Model Type	Bore Size						
	6mm	8mm	12mm	16mm	20mm	25mm	32mm
TB							
add per 5mm							
TBD							
add per 5mm							
TBA; Prices by Stroke							
10mm							
20mm							
30mm							
40mm							
50mm							
75mm							
100mm							
125mm							
150mm							

Options	Bore Size						
	6mm	8mm	12mm	16mm	20mm	25mm	32mm
A- Stroke Adjustment (TBA; per end)							
F- Full-flow Port Orifice							
K- Shock Absorbers (TBA; per end)							
M - MRS Position Sensing							
S - Side Mount Holes							
V - High Temperature							
X - Ball Bushings (TB)							
X - Ball Bushings (TBD)							

No Charge Options: E

TB Cylinder

Dimensions mm (inch)



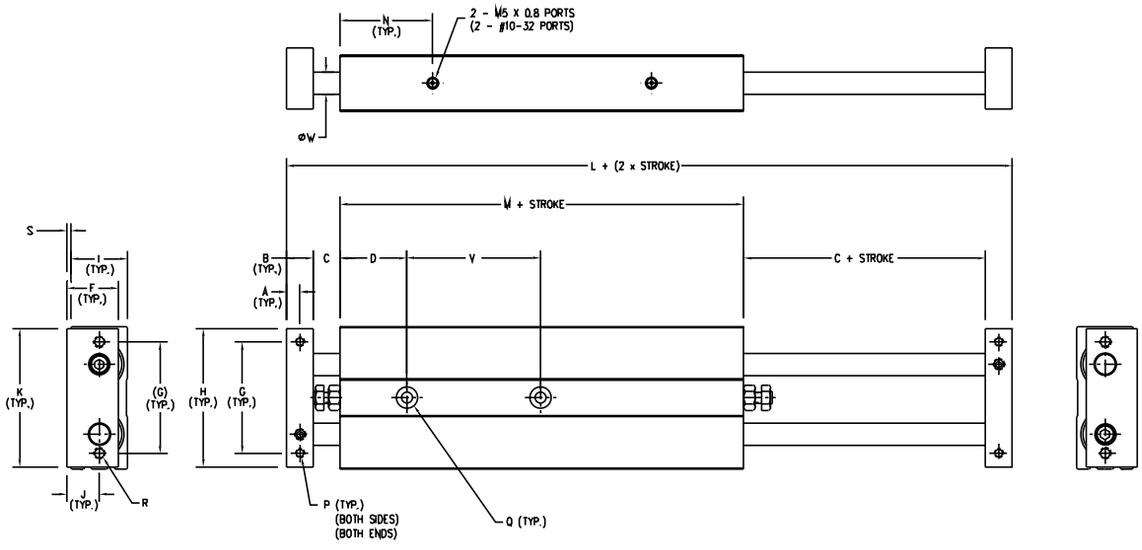
Bore	A	B	C	D	F	G	H	I	J	K	L	M
6	2.8 (0.11)	5.5 (0.22)	8 (0.32)	13 (0.51)	12 (0.47)	25 (0.98)	31 (1.22)	13.2 (0.52)	6.4 (0.25)	32 (1.26)	58.5 (2.30)	45 (1.77)
8	3 (0.12)	6 (0.24)	8 (0.32)	13 (0.51)	13 (0.51)	28 (1.10)	36 (1.42)	14.7 (0.58)	7.3 (0.29)	37.8 (1.49)	64 (2.52)	50 (1.97)
12	4 (0.16)	8 (0.32)	9 (0.35)	20 (0.79)	15 (0.59)	35 (1.38)	44 (1.73)	17.3 (0.68)	8.7 (0.34)	46 (1.81)	72 (2.83)	55 (2.17)
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)	10.2 (0.40)	57 (2.24)	80 (3.16)	61 (2.41)
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)	12.7 (0.50)	64 (2.52)	94 (3.70)	70 (2.76)
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)	15.2 (0.60)	80 (3.15)	96 (3.78)	72 (2.84)
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)	19.2 (0.76)	98 (3.86)	115 (4.51)	85 (3.33)

Bore	N	O	Q (Body Mounting Holes)	R	S	T (Ports)
6	16 (0.63)	6.7 (0.27)	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	16.1 (0.64)	6.7 (0.27)	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	30.6 (1.20)	5 (0.20)	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	36.2 (1.42)	4.5 (0.18)	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	41.5 (1.63)	6 (0.24)	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	45 (1.77)	5 (0.20)	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	53 (2.09)	7.2 (0.28)	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	N/A N/A	25 (0.98)	N/A N/A	30 (1.18)	35 (1.38)	N/A N/A	N/A N/A	N/A N/A	3 (.12)
8	15 (0.59)	20 (0.79)	N/A N/A	N/A N/A	25 (0.98)	N/A N/A	30 (1.18)	35 (1.38)	47.5 (1.87)	N/A N/A	N/A N/A	4 (.16)
12	N/A N/A	N/A N/A	30 (1.18)	30 (1.18)	N/A N/A	40 (1.58)	N/A N/A	N/A N/A	N/A N/A	50 (1.97)	N/A N/A	6 (.24)
16	N/A N/A	N/A N/A	25 (0.98)	35 (1.38)	N/A N/A	35 (1.38)	N/A N/A	N/A N/A	N/A N/A	45 (1.77)	55 (2.17)	8 (.32)
20	N/A N/A	N/A N/A	30 (1.18)	30 (1.18)	N/A N/A	40 (1.58)	N/A N/A	N/A N/A	N/A N/A	60 (2.36)	60 (2.36)	10 (.39)
25	N/A N/A	N/A N/A	30 (1.18)	30 (1.18)	N/A N/A	40 (1.58)	N/A N/A	N/A N/A	N/A N/A	60 (2.36)	60 (2.36)	12 (.47)
32	N/A N/A	N/A N/A	40 (1.58)	40 (1.58)	N/A N/A	50 (1.97)	N/A N/A	N/A N/A	N/A N/A	70 (2.76)	70 (2.76)	16 (.63)

TBD Cylinder

Dimensions mm (inch)



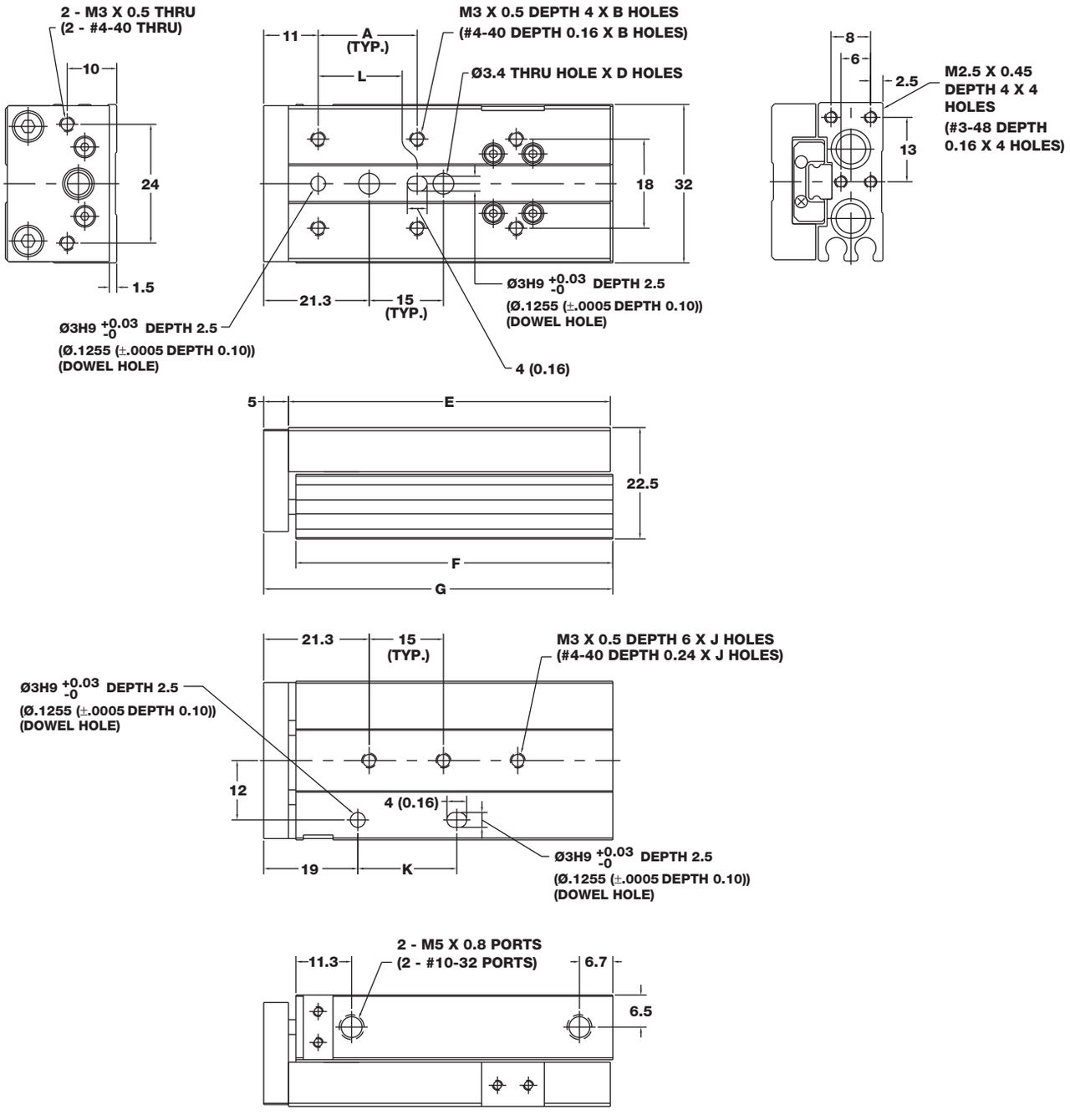
Bore	A	B	C	D	F	G	H	I	J	K	L	M	N
6	2.8 (0.11)	5.5 (0.22)	8 (0.32)	13 (0.51)	12 (0.47)	25 (0.98)	31 (1.22)	13.2 (0.52)	7.8 (0.31)	32 (1.26)	92.9 (3.66)	66 (2.60)	16 (0.63)
8	3 (0.12)	6 (0.24)	8 (0.32)	13 (0.51)	13 (0.51)	28 (1.10)	36 (1.42)	14.7 (0.58)	8.6 (0.34)	37.8 (1.49)	92.9 (3.66)	66 (2.60)	16.1 (0.64)
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 (5.18)	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	N/A N/A	25 (0.98)	N/A N/A	30 (1.18)	35 (1.38)	N/A N/A	N/A N/A	NA (NA)	3 (.12)
8	15 (0.59)	20 (0.79)	N/A N/A	N/A N/A	25 (0.98)	N/A N/A	30 (1.18)	35 (1.38)	47.5 (1.87)	N/A N/A	NA (NA)	4 (.16)
12	N/A N/A	N/A N/A	30 (1.18)	30 (1.18)	N/A N/A	40 (1.58)	N/A N/A	N/A N/A	N/A N/A	50 (1.97)	NA (NA)	6 (.24)
16	N/A N/A	N/A N/A	25 (0.98)	35 (1.38)	N/A N/A	35 (1.38)	N/A N/A	N/A N/A	N/A N/A	45 (1.77)	55 (2.17)	8 (.32)
20	N/A N/A	N/A N/A	30 (1.18)	30 (1.18)	N/A N/A	40 (1.58)	N/A N/A	N/A N/A	N/A N/A	60 (2.36)	60 (2.36)	10 (.39)
25	N/A N/A	N/A N/A	30 (1.18)	30 (1.18)	N/A N/A	40 (1.58)	N/A N/A	N/A N/A	N/A N/A	60 (2.36)	60 (2.36)	12 (.47)
32	N/A N/A	N/A N/A	40 (1.58)	40 (1.58)	N/A N/A	50 (1.97)	N/A N/A	N/A N/A	N/A N/A	70 (2.76)	70 (2.76)	16 (.63)

TBA Cylinder: 6mm Bore

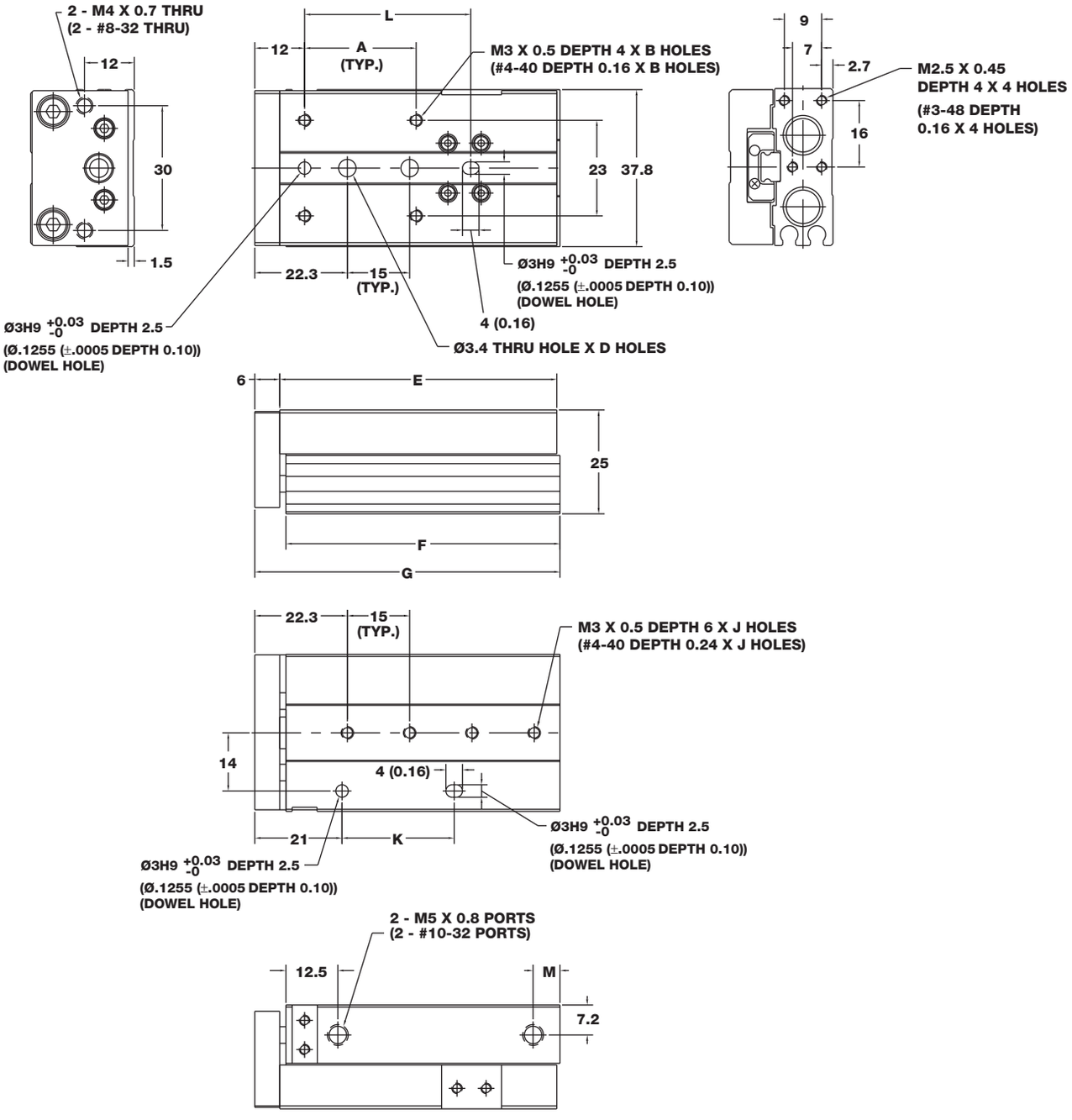
Dimensions mm (inch)



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	(0.63)	20	(0.79)
20	30	(1.18)	4	2	55	(2.17)	54	(2.13)	60.5	(2.38)	3	18	(0.71)	20	(0.79)
30	20	(0.79)	6	2	65	(2.56)	64	(2.52)	70.5	(2.78)	3	20	(0.79)	20	(0.79)
40	28	(1.10)	6	3	95	(3.74)	94	(3.70)	100.5	(3.96)	5	28	(1.10)	35	(1.38)
50	38	(1.50)	6	3	104.5	(4.11)	104.5	(4.11)	111	(4.37)	6	28	(1.10)	35	(1.38)

TBA Cylinder: 8mm Bore

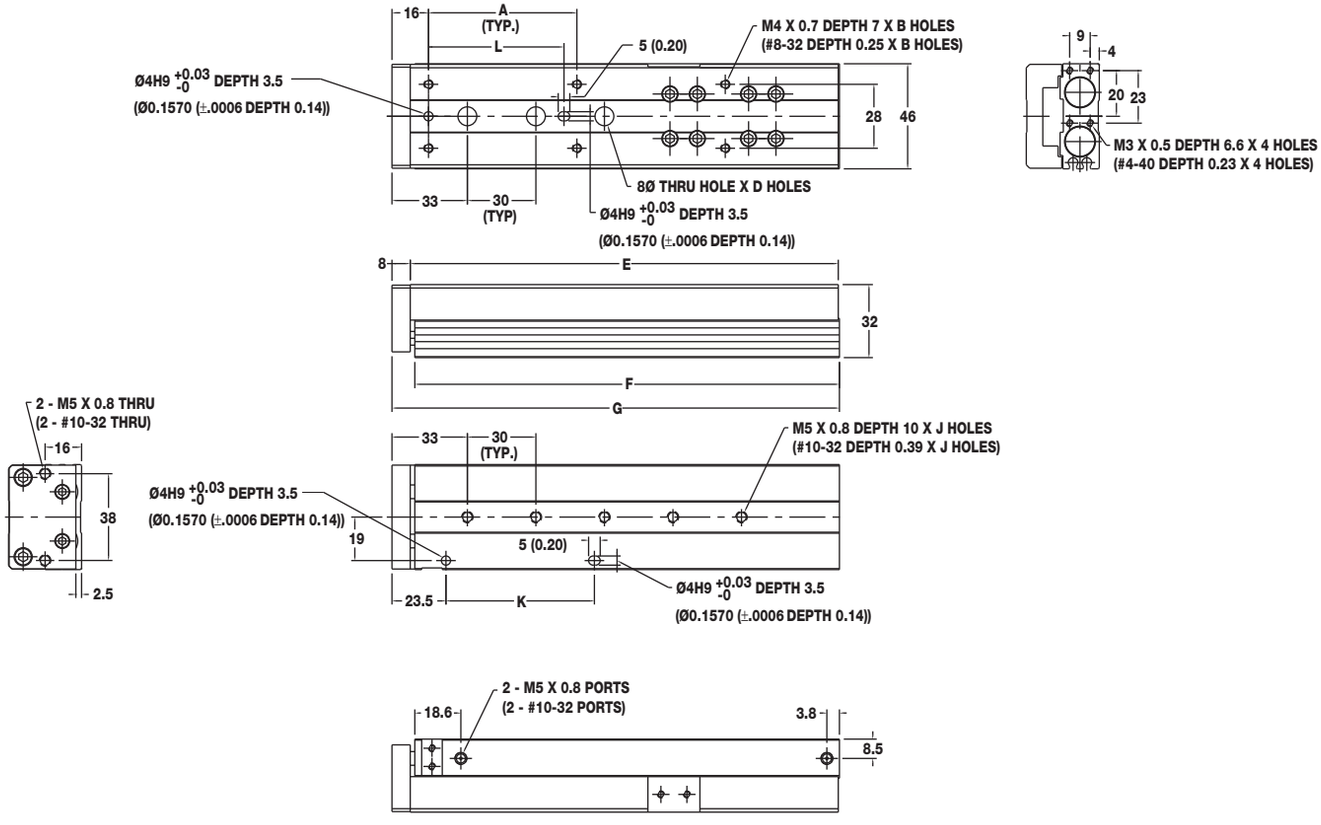
Dimensions mm (inch)



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 (0.75)	18 (0.71)	6.5 (0.26)
20	25 (0.98)	4	3	56.7 (2.23)	56 (2.21)	62.5 (2.46)	3	28 (1.10)	18 (0.71)	6.5 (0.26)
30	40 (1.58)	4	2	66.7 (2.63)	66 (2.60)	72.5 (2.85)	3	28 (1.10)	40 (1.58)	6.5 (0.26)
40	50 (1.97)	4	3	91.2 (3.59)	90.4 (3.56)	97 (3.82)	5	31 (1.22)	50 (1.97)	11 (0.43)
50	38 (1.50)	6	3	102.3 (4.03)	101.5 (4.0)	108 (4.25)	6	58 (2.28)	50 (1.97)	6.5 (0.26)
75	50 (1.97)	6	5	133.7 (5.27)	133 (5.24)	139.5 (5.49)	8	60 (2.36)	50 (1.97)	6.5 (0.26)

TBA Cylinder: 12mm Bore

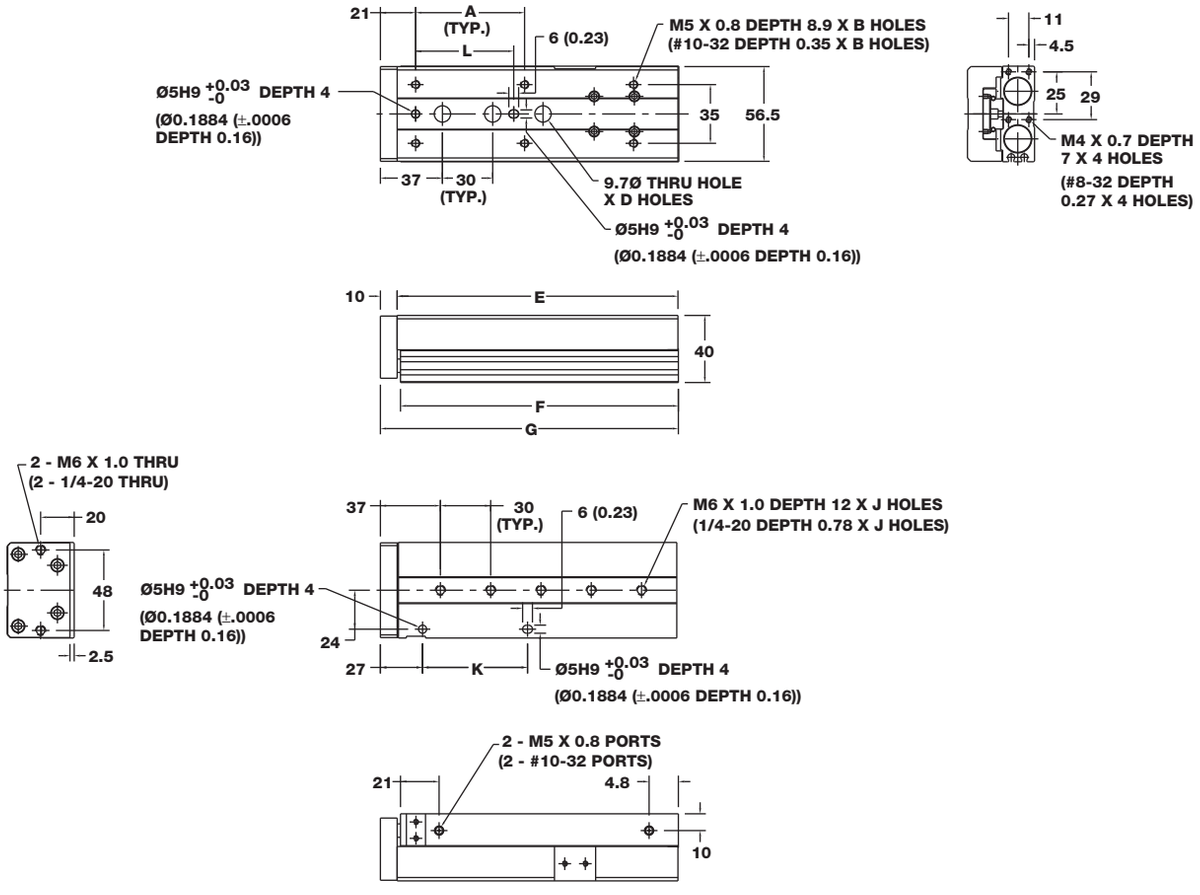
Dimensions mm (inch)



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 (1.38)	35 (1.38)
20	35 (1.38)	4	1	73 (2.86)	71 (2.80)	81 (3.20)	2	35 (1.38)	35 (1.38)
30	35 (1.38)	4	1	73 (2.86)	71 (2.80)	81 (3.20)	2	35 (1.38)	35 (1.38)
40	50 (1.97)	4	1	85 (3.36)	83 (3.28)	93 (3.67)	2	50 (1.97)	50 (1.97)
50	35 (1.38)	6	1	105 (4.12)	103 (4.06)	113 (4.46)	3	35 (1.38)	35 (1.38)
75	55 (2.17)	6	2	151 (5.93)	149 (5.88)	159 (6.27)	4	55 (2.17)	55 (2.17)
100	65 (2.56)	6	3	189 (7.43)	187 (7.37)	197 (7.76)	5	65 (2.56)	65 (2.56)

TBA Cylinder: 16mm Bore

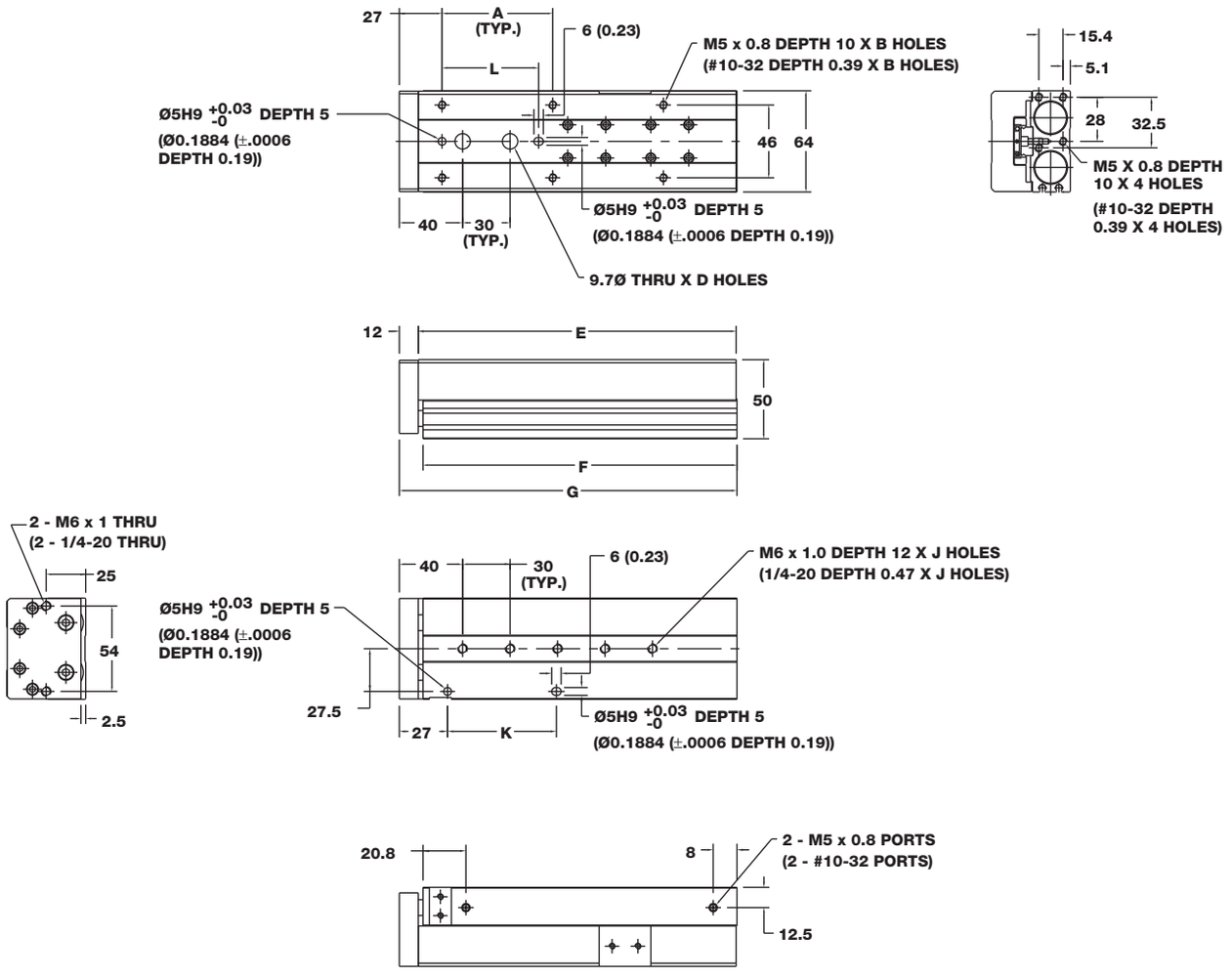
Dimensions mm (inch)



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	(1.38)	35	(1.38)
20	35	(1.38)	4	1	79	(3.11)	77	(3.05)	89	(3.52)	2	35	(1.38)	35	(1.38)
30	35	(1.38)	4	1	79	(3.11)	77	(3.05)	89	(3.52)	2	35	(1.38)	35	(1.38)
40	40	(1.58)	6	1	89	(3.50)	87	(3.44)	99	(3.91)	3	40	(1.57)	40	(1.57)
50	30	(1.18)	6	1	116	(4.56)	114	(4.51)	126	(4.98)	3	30	(1.18)	30	(1.18)
75	55	(2.17)	6	2	145	(5.71)	143	(5.65)	155	(6.12)	4	55	(2.17)	55	(2.17)
100	65	(2.56)	6	3	170	(6.69)	168	(6.63)	180	(7.10)	5	65	(2.56)	65	(2.56)
125	70	(2.70)	8	4	205	(8.07)	203	(8.01)	215	(8.48)	6	70	(2.76)	64	(2.52)

TBA Cylinder: 20mm Bore

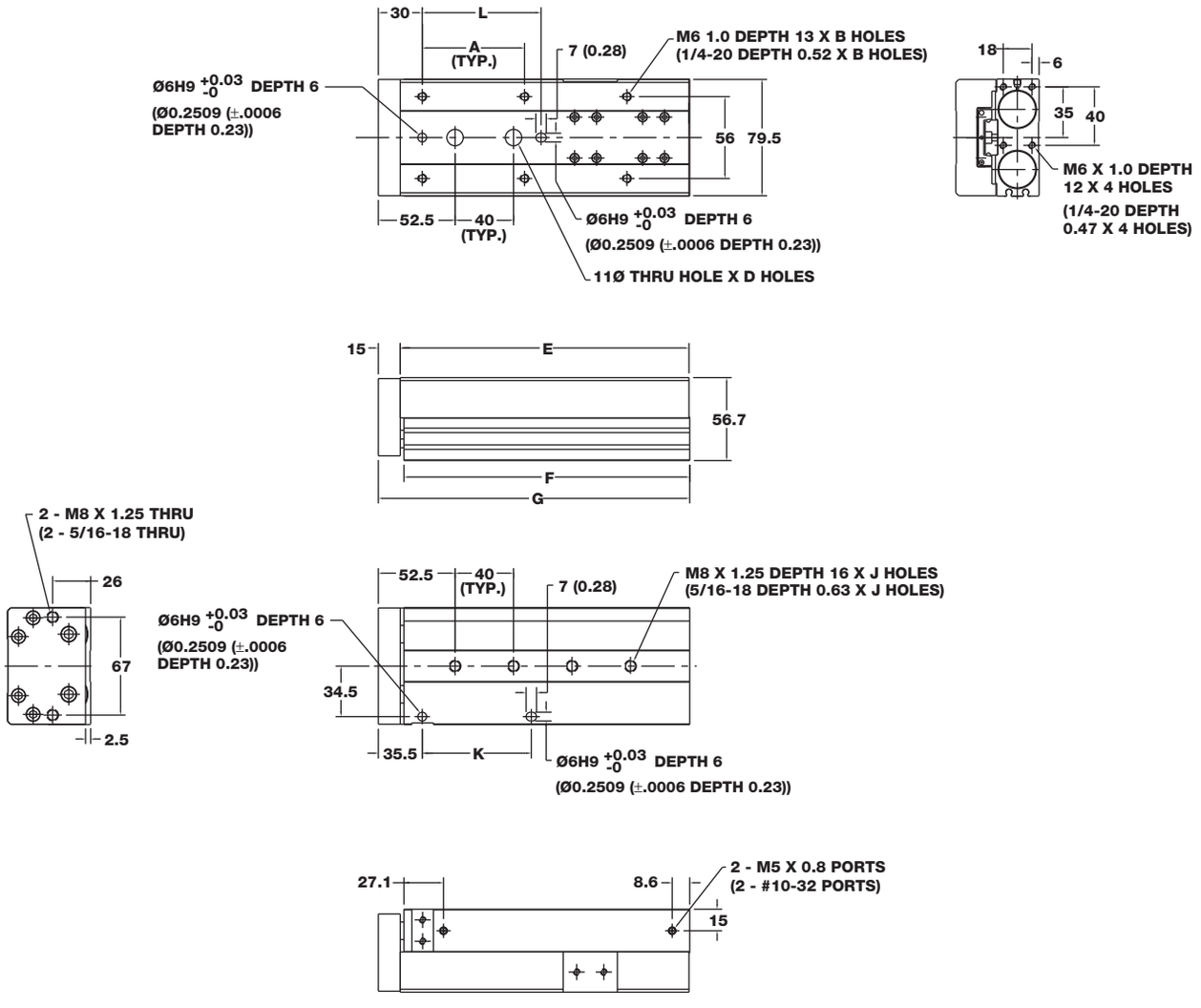
Dimensions mm (inch)



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 (1.97)	50 (1.97)
20	50 (1.97)	4	1	84 (3.30)	81.5 (3.21)	96 (3.78)	2	50 (1.97)	50 (1.97)
30	50 (1.97)	4	1	84 (3.30)	81.5 (3.21)	96 (3.78)	2	50 (1.97)	50 (1.97)
40	60 (2.36)	4	1	94 (3.69)	91.5 (3.60)	106 (4.17)	2	60 (2.36)	60 (2.36)
50	35 (1.38)	6	1	108.5 (4.27)	106.5 (4.19)	121 (4.76)	3	35 (1.38)	35 (1.38)
75	60 (2.36)	6	2	140 (5.51)	138 (5.44)	152.5 (6.01)	4	60 (2.36)	60 (2.36)
100	70 (2.76)	6	3	200.5 (7.89)	198.5 (7.82)	213 (8.39)	5	70 (2.76)	64 (2.52)
125	70 (2.76)	8	4	230 (9.06)	228 (8.98)	242.5 (9.55)	6	70 (2.76)	64 (2.52)
150	80 (3.15)	8	5	263 (10.36)	261 (10.28)	275.5 (10.85)	7	80 (3.15)	80 (3.15)

TBA Cylinder: 25mm Bore

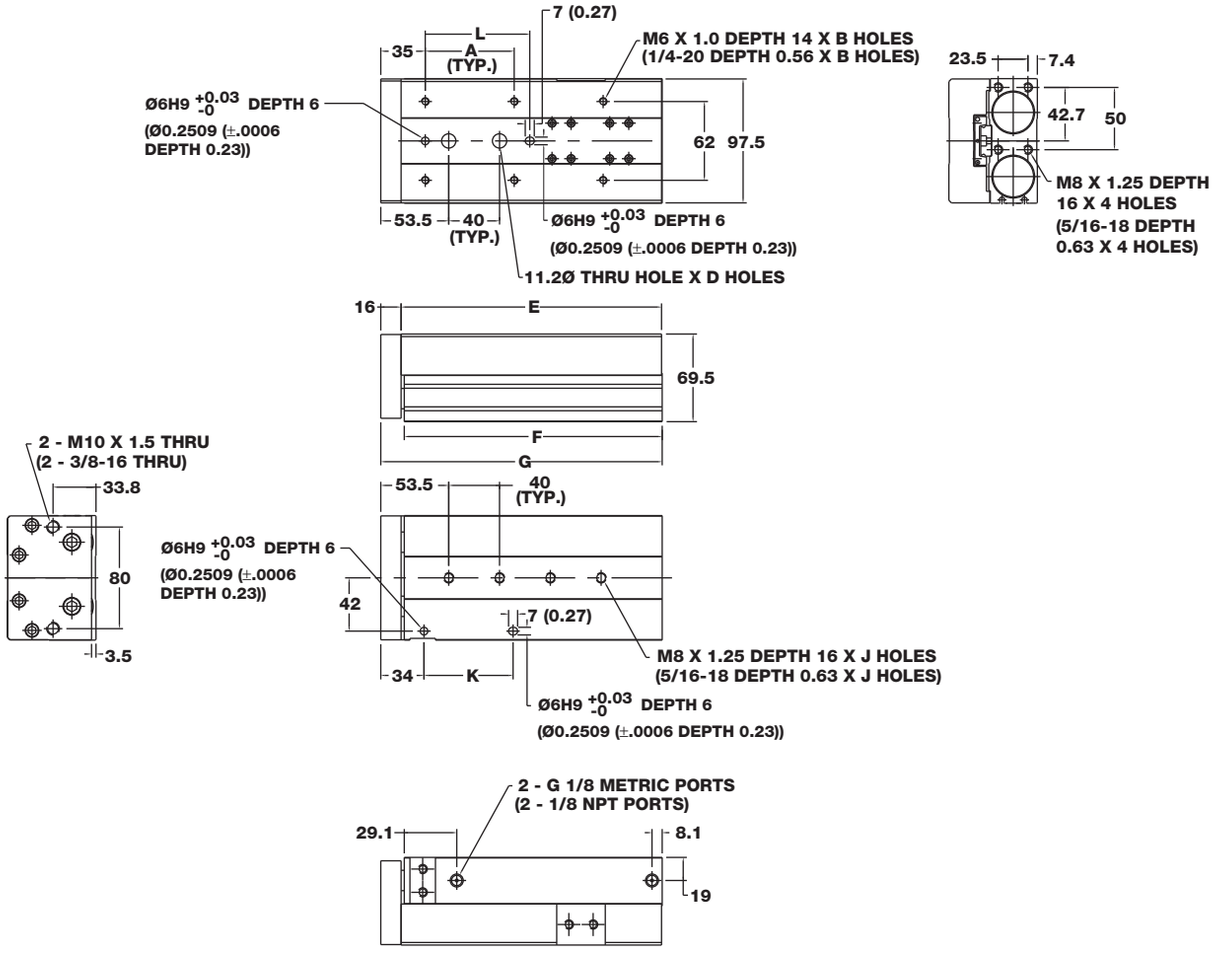
Dimensions mm (inch)



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 (1.97)	50 (1.97)
20	50 (1.97)	4	1	92.5 (3.64)	90.5 (3.56)	108 (4.25)	2	50 (1.97)	50 (1.97)
30	50 (1.97)	4	1	92.5 (3.64)	90.5 (3.56)	108 (4.25)	2	50 (1.97)	50 (1.97)
40	60 (2.36)	4	1	102.5 (4.04)	100.5 (3.96)	118 (4.65)	2	60 (2.36)	60 (2.36)
50	35 (1.38)	6	1	115.5 (4.55)	113.5 (4.47)	131 (5.16)	2	35 (1.38)	35 (1.38)
75	60 (2.36)	6	1	156.5 (6.16)	154.5 (6.08)	172 (6.77)	3	60 (2.36)	60 (2.36)
100	70 (2.76)	6	2	197.5 (7.78)	195.5 (7.70)	213 (8.39)	4	70 (2.76)	76 (2.99)
125	75 (2.95)	8	3	253.5 (9.98)	251.5 (9.90)	269 (10.59)	5	75 (2.95)	75 (2.95)
150	80 (3.15)	8	3	270.5 (10.65)	268.5 (10.57)	286 (11.26)	6	80 (3.15)	80 (3.15)

TBA Cylinder: 32mm Bore

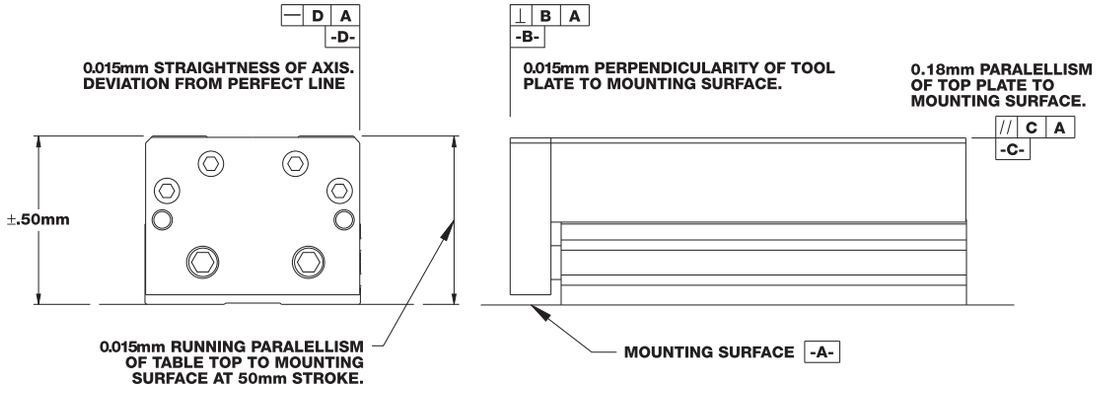
Dimensions mm (inch)



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	(1.97)	50	(1.97)
20	50	(1.97)	4	NA	102	(4.02)	100	(3.94)	119	(4.67)	2	50	(1.97)	50	(1.97)
30	50	(1.97)	4	NA	102	(4.02)	100	(3.94)	119	(4.67)	2	50	(1.97)	50	(1.97)
40	60	(2.36)	4	1	112	(4.41)	110	(4.34)	129	(5.06)	2	60	(2.36)	60	(2.36)
50	35	(1.38)	6	1	125	(4.93)	123	(4.85)	142	(5.58)	2	35	(1.38)	35	(1.38)
75	60	(2.36)	6	1	171	(6.73)	169	(6.66)	188	(7.39)	3	60	(2.36)	60	(2.36)
100	70	(2.76)	6	2	207	(8.15)	205	(8.08)	224	(8.80)	4	70	(2.76)	76	(2.99)
125	75	(2.95)	8	3	265	(10.44)	263	(10.36)	282	(11.09)	5	75	(2.95)	75	(2.95)
150	80	(3.15)	8	3	298	(11.74)	296	(11.66)	315	(12.39)	6	80	(3.15)	80	(3.15)

Engineering Specifications

Twin Bore Air Table (Model TBA)



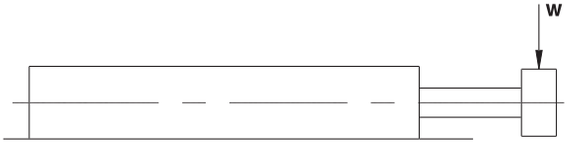
Engineering Specifications

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)*

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

Twin Bore Style

(Model TB; Standard Bearings and Option X)
Maximum Radial Load kg-Force (lb)



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

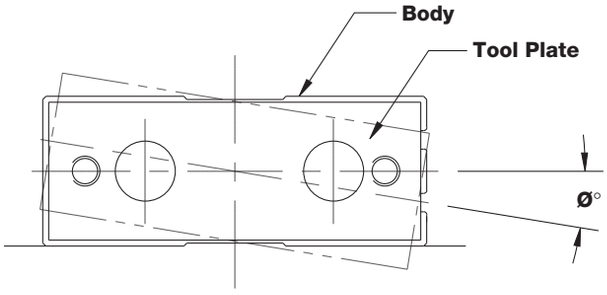
TB Standard Maximum Radial Loads Kgf (lb)													
Model No.	**10**		**20**		**30**		**40**		**50**		**75**		**100**	
TB-6	0.15	(0.33)	0.12	(0.26)	0.10	(0.21)	0.08	(0.18)	0.07	(0.16)	N/A	N/A	N/A	N/A
TB-8	0.14	(0.31)	0.11	(0.24)	0.09	(0.20)	0.08	(0.17)	0.07	(0.15)	0.05	(0.11)	N/A	N/A
TB-12	1.0	(2.14)	0.8	(1.77)	0.7	(1.51)	0.6	(1.31)	0.5	(1.16)	0.4	(0.90)	N/A	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	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)

Engineering Specifications

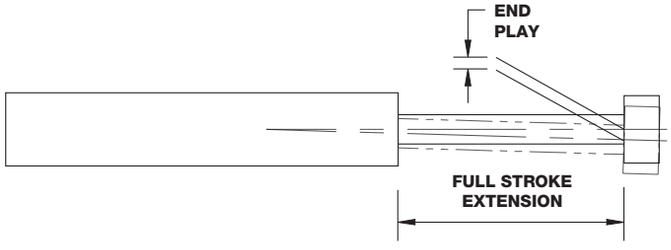
(Model TB; Standard Bearings and Option X) Maximum Radial Load kg-Force (lb) Non-Rotational Accuracy (degrees)

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

(Model TB; Standard Bearings and Option X) Maximum End Play mm (inch)

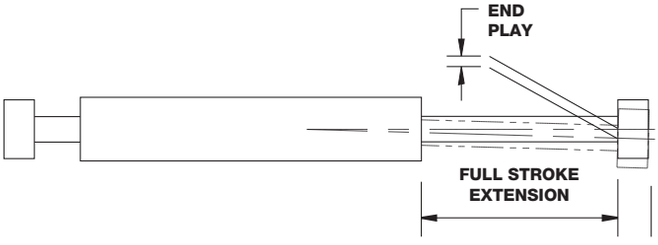


Maximum allowable movement of the tooling plate in the vertical direction with rods aligned in horizontal direction

TB Model							
Model No.	**Stroke Length mm**						
(Standard Bushings)	**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	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 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)

Engineering Specifications

(Model TBD; Standard Bearings and Option X) Maximum End Play mm (inch)

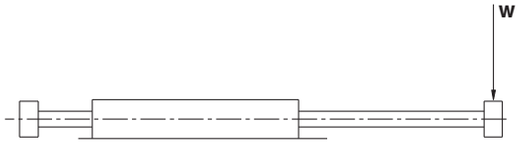


Maximum allowable movement of the tooling plate in the vertical direction with rods aligned in horizontal direction

TBD Model							
Model No.	**Stroke Length mm**						
(Standard Bushings)	**10**	**20**	**30**	**40**	**50**	**75**	**100**
TBD-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	N/A N/A
TBD-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 N/A
TBD-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)
TBD-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)
TBD-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)
TBD-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)
TBD-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**
TBD-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)
TBD-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)
TBD-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)
TBD-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)
TBD-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)

Engineering Specifications

Twin Bore, Double-End Style (Model TBD; Standard Bearings and Option X)
Maximum Radial Load kg-Force (lb)



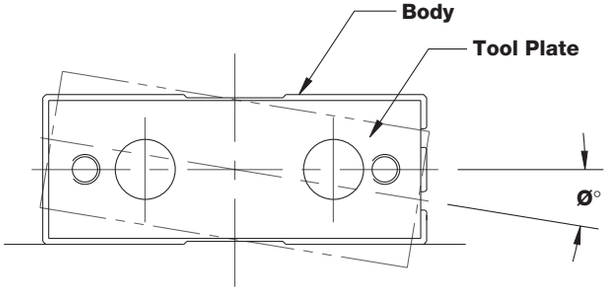
Maximum allowable load for horizontally mounted Double Rod End cylinder with rods aligned in horizontal direction.

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	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	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	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	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 Ø° 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

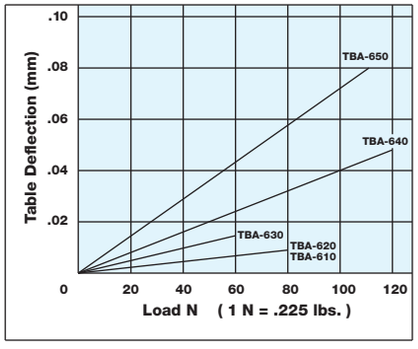
Engineering Specifications

Twin Bore Air Table (Model TBA)

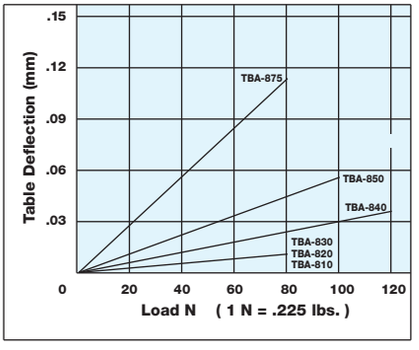
Table deflection by pitch moment

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

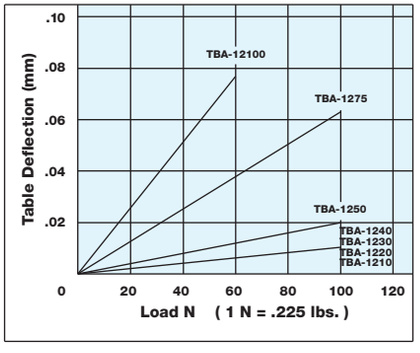
TBA-6



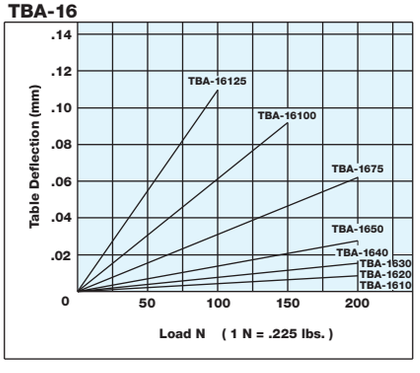
TBA-8



TBA-12



TBA-16



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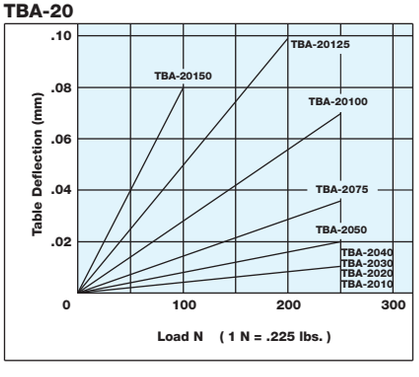

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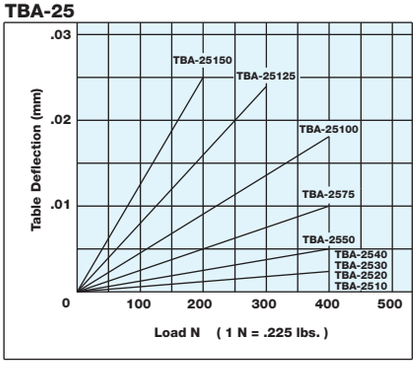
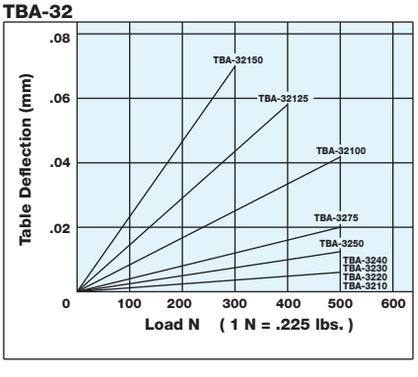


TBA-32



Engineering Specifications

Twin Bore Air Table (Model TBA)

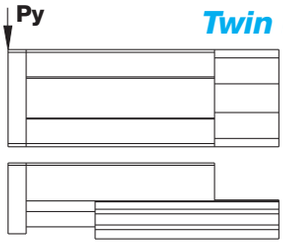
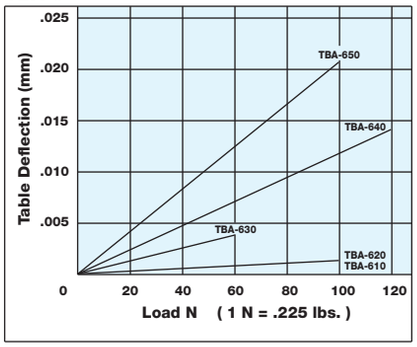


Table deflection by yaw moment

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

TBA-6



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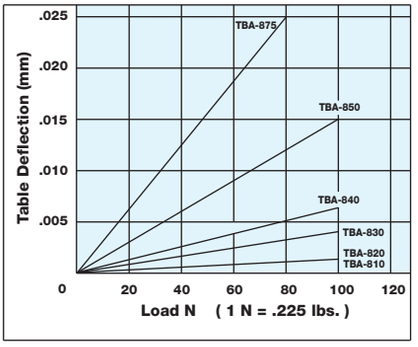
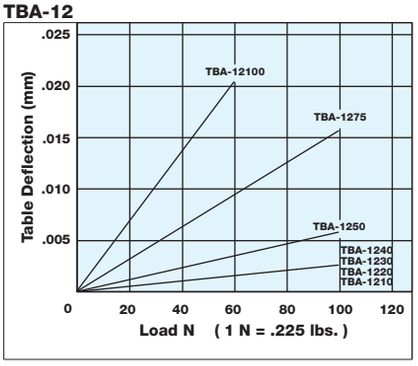


TBA-12



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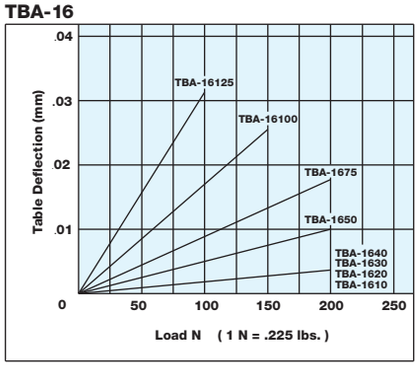

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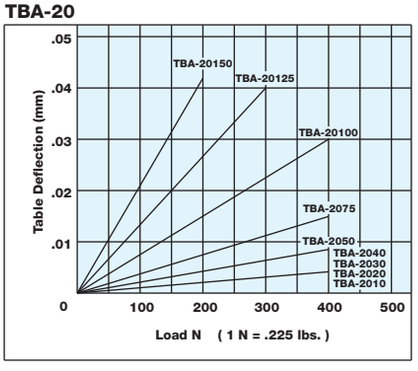

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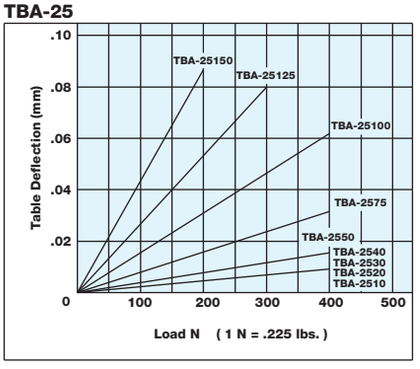
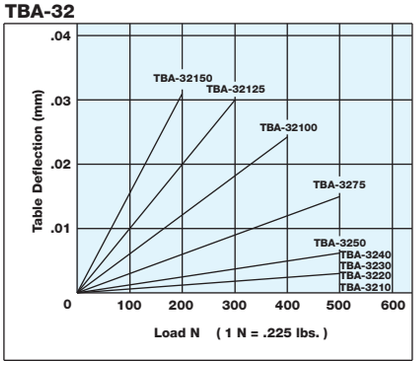


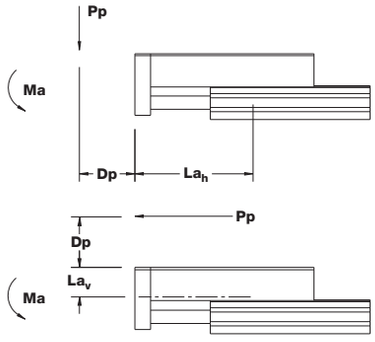
TBA-32



Engineering Specifications

Twin Bore Air Table (Model TBA)

Formula for calculation of allowable static load Pp, Py and Pr



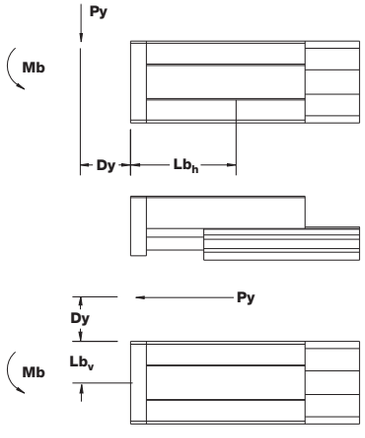
$$Pp = \frac{Ma \times 1000}{Dp + La} \text{ (Newtons)}$$

Dp = Distance from load point to body (mm).

La = Moment arm (mm) see chart.

Ma (Pitching Moment)

Model \ Stroke (mm)	Maximum Allowable Moment (Nm)								
	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



$$Py = \frac{Mb \times 1000}{Dy + Lb} \text{ (Newtons)}$$

Dy = Distance from load point to body (mm).

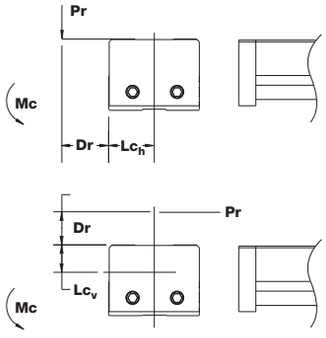
Lb = Moment arm (mm) see chart.

Mb (Yawing Moment)

Model \ Stroke (mm)	Maximum Allowable Moment (Nm)								
	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

Engineering Specifications

Twin Bore Air Table (Model TBA)



$$Pr = \frac{Mc \times 1000}{Dr + Lc} \text{ (Newtons)}$$

Dr = Distance from load point to body (mm).

Lc = Moment arm (mm) see chart.

Mc (Rolling Moment)

Model \ Stroke (mm)	Maximum Allowable Moment (Nm)								
	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 \ Stroke (mm)	Lah and Lbh Moment Lever Arm (mm)								
	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

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

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	
6	119.6	(4.22)	139.4	(4.92)	158.6	(5.60)	219.8	(7.75)	240.5	(8.48)
8	159.8	(5.64)	178.5	(6.30)	202.9	(7.16)	267.2	(9.42)	295.0	(10.41)
12	236.0	(8.3)	240.4	(8.4)	244.9	(8.6)	283.0	(9.9)	342.0	(12.0)
16	378.7	(13.3)	386.5	(13.6)	394.4	(13.9)	433.1	(15.2)	561.4	(19.8)
20	631.4	(22.2)	643.7	(22.7)	656.0	(23.1)	728.0	(25.6)	827.9	(29.2)
25	992.5	(35.0)	1010.2	(35.6)	1027.9	(36.2)	1128.3	(39.8)	1253.4	(44.2)
32	1660.0	(58.5)	1691.6	(59.6)	1723.1	(60.7)	1882.1	(66.3)	2078.8	(73.3)

TBA Cylinder

Bore	Weight of Cylinder Based on Stroke Length gf (oz.)							
	75mm		100mm		125mm		150mm	
6	N/A		N/A		N/A		N/A	
8	391.0	(13.79)	N/A		N/A		N/A	
12	479.9	(16.9)	616.9	(21.7)	N/A		N/A	
16	699.8	(24.6)	821.7	(28.9)	984.5	(34.7)	N/A	
20	1047.4	(36.9)	1438.4	(50.7)	1645.0	(58.0)	1872.4	(66.0)
25	1636.0	(57.7)	2019.1	(71.2)	2525.8	(89.1)	2710.5	(95.6)
32	2741.4	(96.7)	3277.9	(115.6)	4093.6	(144.4)	4591.6	(161.9)

Twin Bore Repair Kits

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.

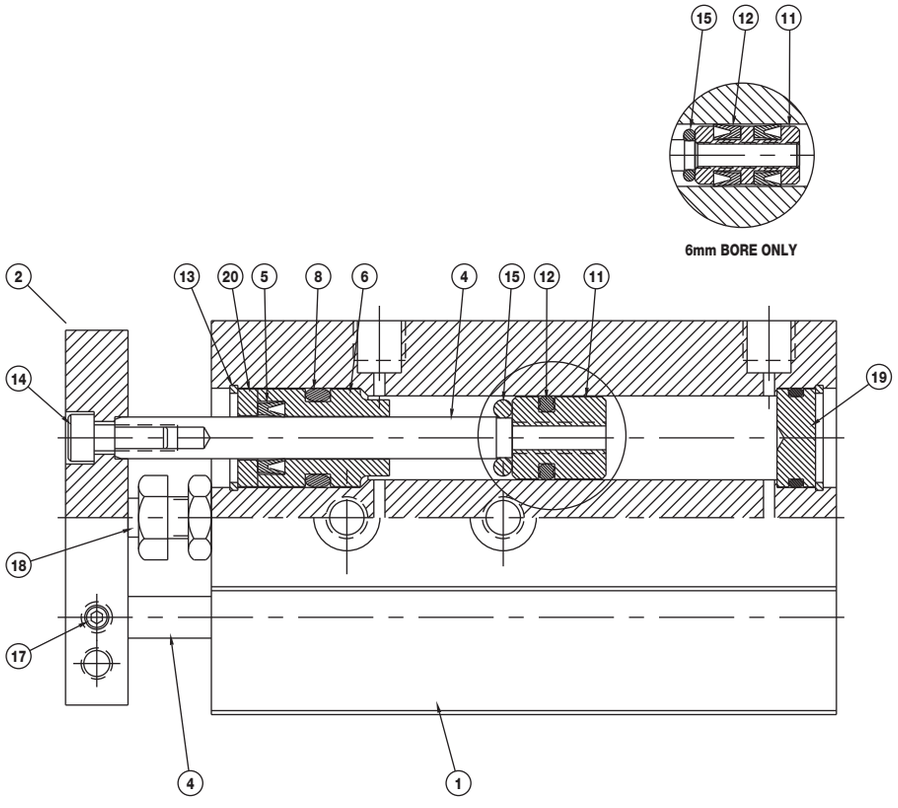
To order, please insert the bore code after the model designation for the desired repair kit. Suffix after bore code indicates seal and ball bushing options.

For Twin Bore cylinders prior to May, 2003, use the same part number except the prefix is designated as K (e.g., K-B-TB-12).

Repair Kit
K2-B-TB-__
K2-B-TB-__-V
K2-B-TBD-__
K2-B-TBD-__-V
K2-B-TB-__-X
K2-B-TB-__-VX
K2-B-TBD-__-X
K2-B-TBD-__-VX
K2-B-TBA-__
K2-B-TBA-__-V

Twin Bore

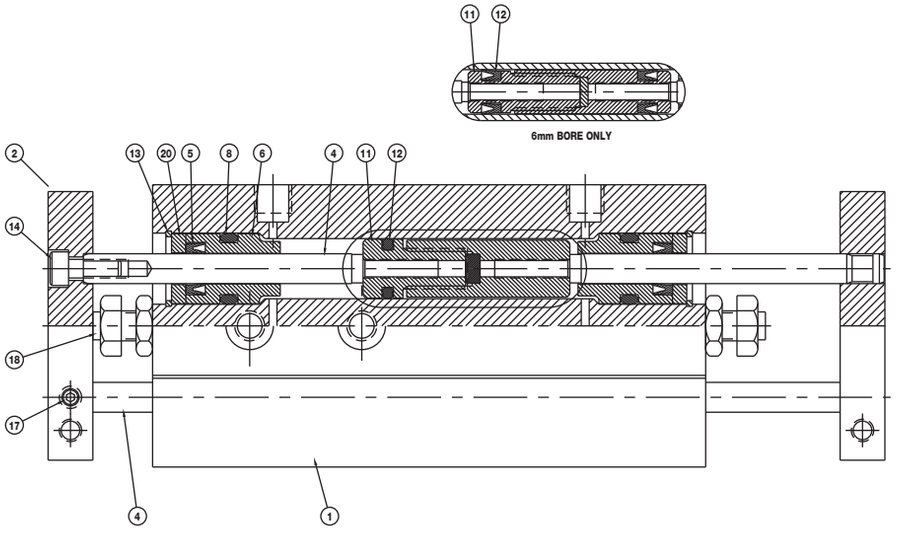
Standard Model 6mm – 8mm Bore



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

Twin Bore

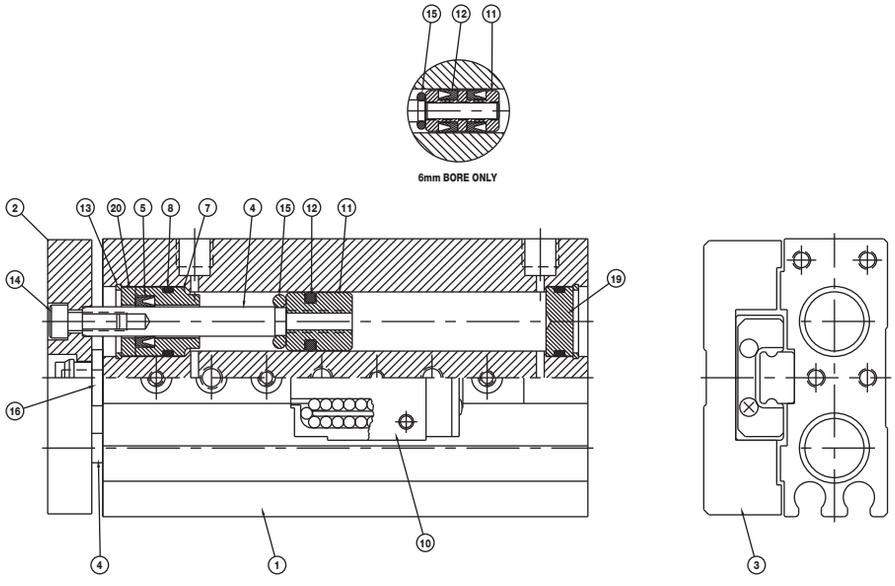
TBD (Double Rod End) 6mm – 8mm Bore



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

Twin Bore

TBA (Air Table Model) 6mm – 8mm Bore

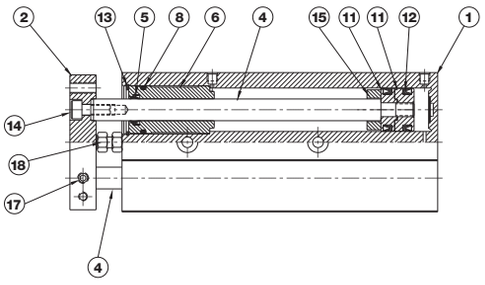


Part #	Description	Material
1	Body	Aluminum - (Anodized over wear surfaces)
2	End Block	Anodized Aluminum
3	Table Plate	Anodized Aluminum
4	Rod	Hard Chrome Plated Carbon Steel
5	Rod Seal	Nitrile
7	Rod Guide	Anodized Aluminum
8	Rod Guide Seal	Nitrile
10	Table Bearing	Stainless Steel Rail + Stainless Steel 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

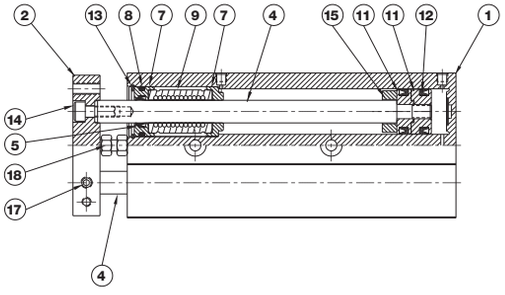
Twin Bore

12mm – 32mm Bore

Standard Model



Ball Bearing Model (Option X)

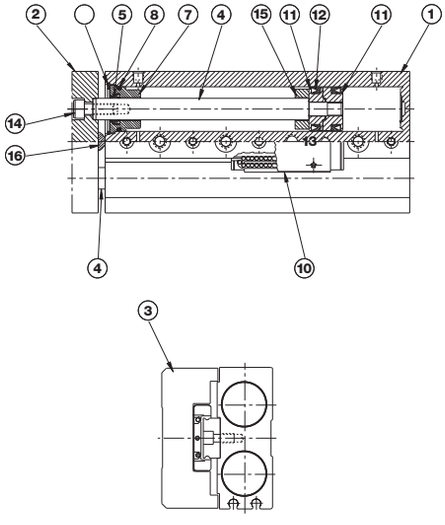


Part List

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

Twin Bore

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



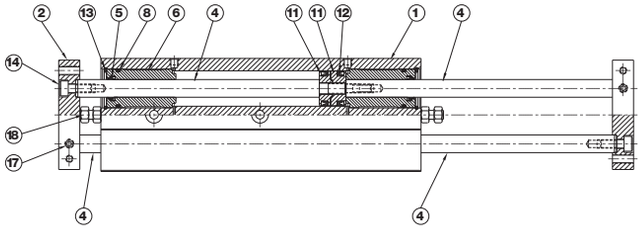
Part List

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

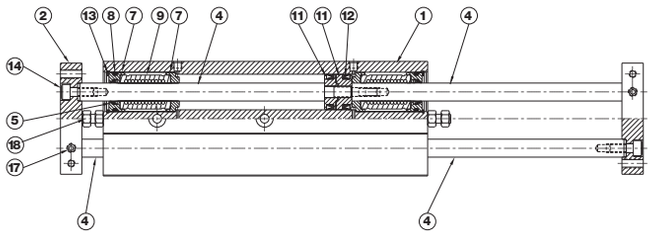
Twin Bore

TBD (Double Rod End) 12mm – 32mm Bore

Standard Model



Ball Bearing Model (Option X)



Part List

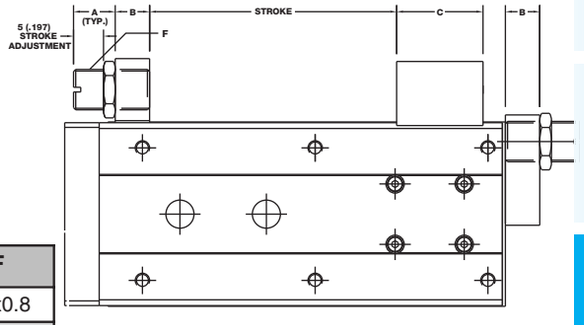
Part #	Description	Material
1	Body	Aluminum - (Anodized over wear surfaces)
2	End Block	Anodized Aluminum
4	Rod	Hard Chrome Plated Carbon Steel
5	Rod Seal/Wiper	Nitrile (Standard) or Fluoroelastomer (High Temperature Option)
6	Rod Guide	White Delrin
7	Rod Guide	Anodized Aluminum
8	Rod Guide Seal	Nitrile (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

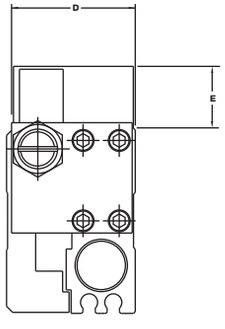
Options

Stroke Adjuster (Options A1, A2, A3)

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

(Option A1 shown)



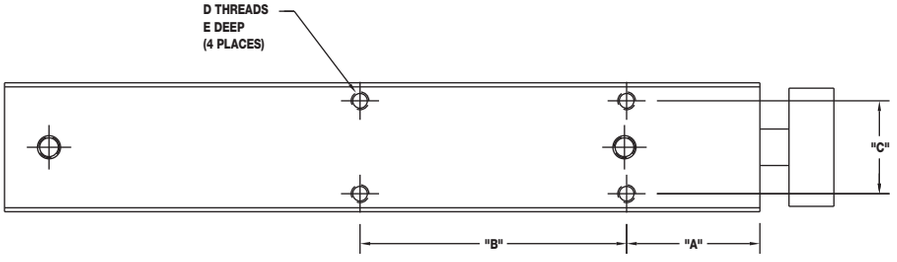


Bore	A	B	C	D	E	F
6	7.7 (0.30)	6 (0.24)	12.5 (0.49)	21.7 (0.85)	9 (0.35)	M5x0.8
8	8 (0.31)	6 (0.24)	14.3 (0.56)	24.6 (0.97)	12.2 (0.48)	M8x1
12	10 (.39)	8 (.31)	18.1 (.71)	30 (1.18)	17 (.67)	M10x1
16	10 (.39)	10 (.39)	21.1 (.83)	37.5 (1.48)	18 (.71)	M12x1
20	10 (.39)	12 (.47)	30 (1.18)	47.5 (1.87)	22 (.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

Options

Side Mounting Holes (Option S)

Use for Models TB and TBD cylinders.

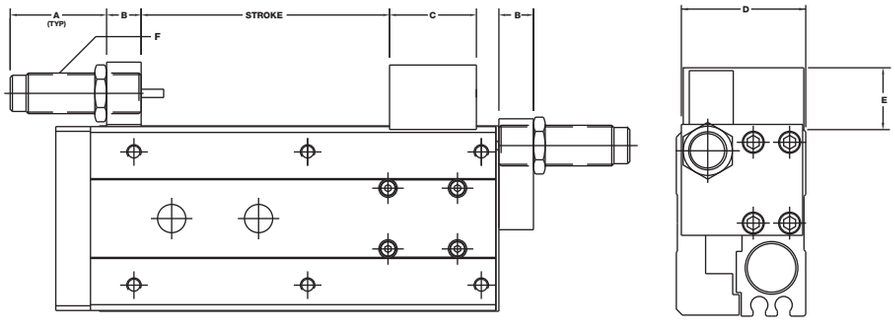


Bore	A	B	Stroke Length	C	D		E
					Standard	Option E	
6mm	10 (0.394)	23 (0.906)	0-10mm	6 (0.236)	M2x0.4	#2-56 UNC	3 (0.118)
		33 (1.299)	11-20mm				
		43 (1.693)	21-30mm				
		53 (2.087)	31-40mm				
		63 (2.480)	41-50mm				
8mm	10 (0.394)	23 (0.906)	0-10mm	7 (0.276)	M2.5x0.45	#3-48 UNC	3 (0.118)
		33 (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				

Options

Shock Absorbers (Option K)

Provides shock absorbtion 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	(.39)	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.

Cylinber Bore Diameter	d(mm)
Operating Pressure	p(bar)
Load on the Actuator	W(kg)
Impact Velocity	v(m / sec)
(impact velocity may be estimated	
at 2 times average velocity.)	
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). Note the "Work Energy calculation varies with mounting orientation, Ewh for horizontal and Ewv for"vertical applications.

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 below. Dampening must be chosen from graphs on page 2.104.

Options

Shock Specifications

Model Bore	Shock Bore (mm)	K_3 Shock Constant	Thread Size	E_t Max Nm per Cycle	$E_t C$ 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 (k_1)

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

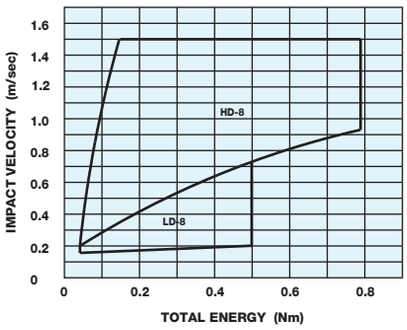
Bore	Dampening		
	Light Duty	Std. Duty	Heavy Duty
8	LD-8	N/A	HD-8
12	LD-12	SD-12	HD-12
16	LD-16	SD-16	HD-16
20	LD-20	SD-20	HD-20
25	LD-25	SD-25	HD-25
32	LD-32	SD-32	HD-32
Order Code	1	2	3

Cylinder Constant (k_2)

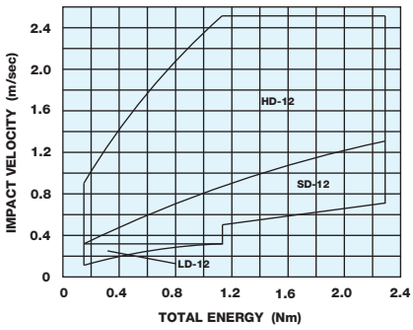
Bore	k
8	10.06
12	22.62
16	40.22
20	62.84
25	98.19
32	160.87

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

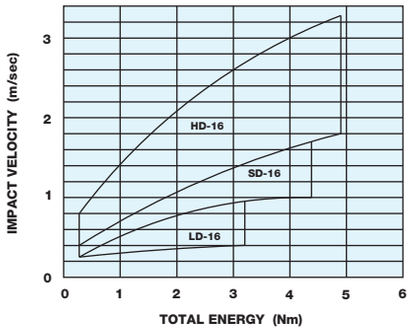
8mm Bore



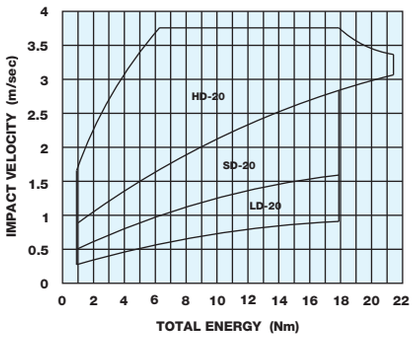
12mm Bore



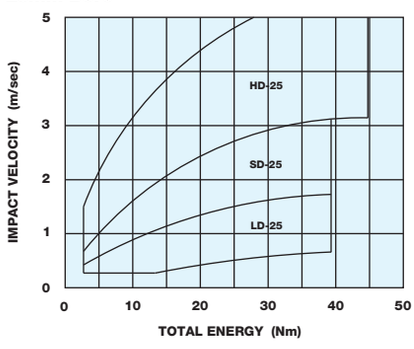
16mm Bore



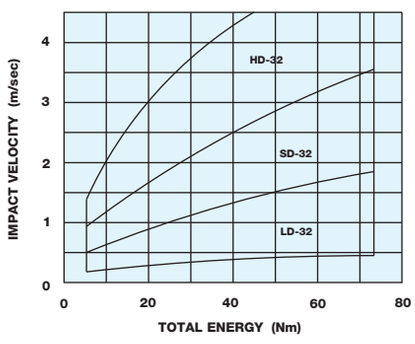
20mm Bore



25mm Bore



32mm Bore



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

Bimba Narrow Profile Air Table Actuators

The 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.

How to Order

Model
NPA - Narrow Profile Air Table

Bore Size
12 - 12mm
20 - 20mm
32 - 32mm

NPA - 20 50 - DEM

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

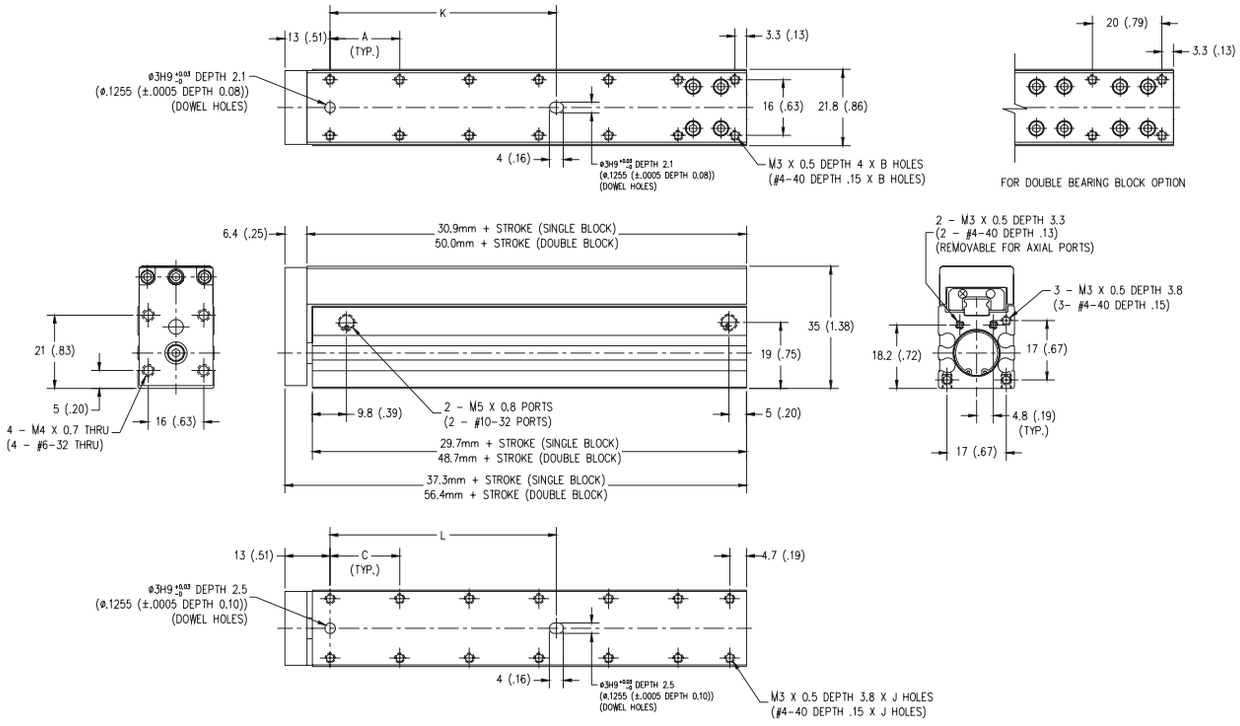
5mm increments

Options		
D	-	Double Carrier Bearing Block
E	-	U.S. Customary Units (inch)
M	-	Magnetic Position Sensing
V	-	High Temperature Operation (-15º to 135°C, 0° to 275°F)

Price List

Bore	Base Price by Stroke				Options		
	5-35 mm	40-65 mm	70-95mm	100-120mm	D	M	V
12mm							
20mm							
32mm							

Dimensions
NPA-12

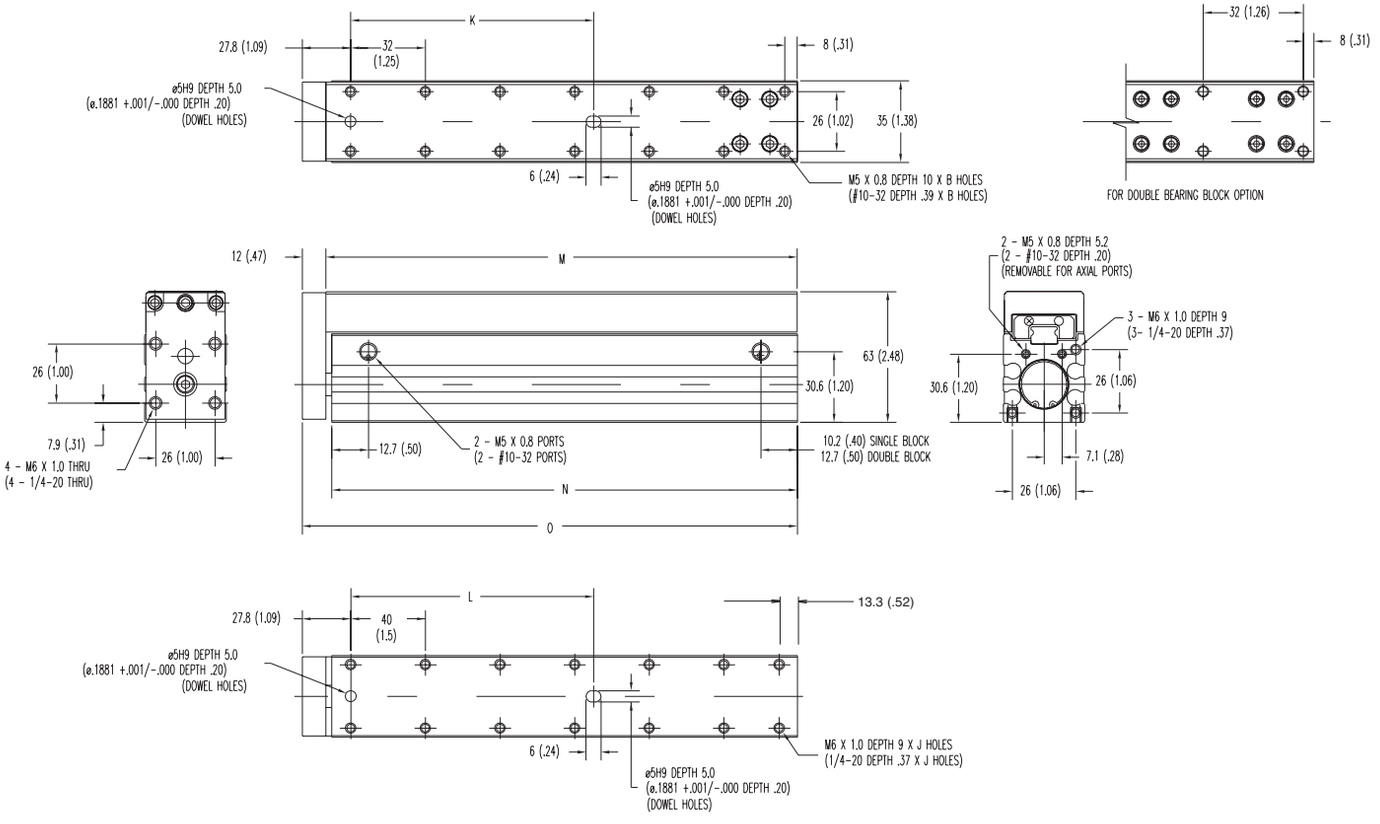


Stroke	A	B	BB*	C	CC*	J	JJ*	K	KK*	L	LL*
5	26 (1.02)	4	6	25 (0.98)	20 (0.79)	4	6	26 (1.02)	45 (1.77)	25 (0.98)	44 (1.73)
10	31 (1.22)	4	6	30 (1.18)	20 (0.79)	4	6	31 (1.22)	50 (1.97)	30 (1.18)	49 (1.92)
15	36 (1.42)	4	6	35 (1.37)	20 (0.79)	4	6	36 (1.42)	55 (2.17)	35 (1.37)	54 (2.12)
20	41 (1.61)	4	6	40 (1.57)	20 (0.79)	4	8	41 (1.61)	60 (2.36)	40 (1.57)	59 (2.32)
25	20 (0.79)	6	8	20 (0.79)	20 (0.79)	6	8	46 (1.81)	65 (2.56)	45 (1.77)	64 (2.51)
30	20 (0.79)	6	8	20 (0.79)	20 (0.79)	6	8	51 (2.01)	65 (2.56)	50 (1.96)	65 (2.56)
35	20 (0.79)	8	8	20 (0.79)	20 (0.79)	8	8	56 (2.20)	65 (2.56)	55 (2.16)	65 (2.56)
40	20 (0.79)	8	8	20 (0.79)	20 (0.79)	8	10	61 (2.40)	65 (2.56)	60 (2.36)	65 (2.56)
45	20 (0.79)	8	10	20 (0.79)	20 (0.79)	8	10	65 (2.56)	65 (2.56)	65 (2.56)	65 (2.56)
50	20 (0.79)	8	10	20 (0.79)	20 (0.79)	8	10	65 (2.56)	65 (2.56)	65 (2.56)	65 (2.56)
55	20 (0.79)	8	10	20 (0.79)	20 (0.79)	8	10	65 (2.56)	65 (2.56)	65 (2.56)	65 (2.56)
60	20 (0.79)	10	10	20 (0.79)	20 (0.79)	10	12	65 (2.56)	65 (2.56)	65 (2.56)	65 (2.56)
65	20 (0.79)	10	12	20 (0.79)	20 (0.79)	10	12	65 (2.56)	65 (2.56)	65 (2.56)	65 (2.56)
70	20 (0.79)	10	12	20 (0.79)	20 (0.79)	10	12	65 (2.56)	65 (2.56)	65 (2.56)	65 (2.56)
75	20 (0.79)	10	12	20 (0.79)	20 (0.79)	10	12	65 (2.56)	65 (2.56)	65 (2.56)	65 (2.56)
80	20 (0.79)	12	12	20 (0.79)	20 (0.79)	12	14	65 (2.56)	65 (2.56)	65 (2.56)	65 (2.56)
85	20 (0.79)	12	14	20 (0.79)	20 (0.79)	12	14	65 (2.56)	65 (2.56)	65 (2.56)	65 (2.56)
90	20 (0.79)	12	14	20 (0.79)	20 (0.79)	12	14	65 (2.56)	65 (2.56)	65 (2.56)	65 (2.56)
95	20 (0.79)	14	14	20 (0.79)	20 (0.79)	12	16	65 (2.56)	65 (2.56)	65 (2.56)	65 (2.56)

*Double letter dimensions represent double bearing block option.

Dimensions

NPA-20



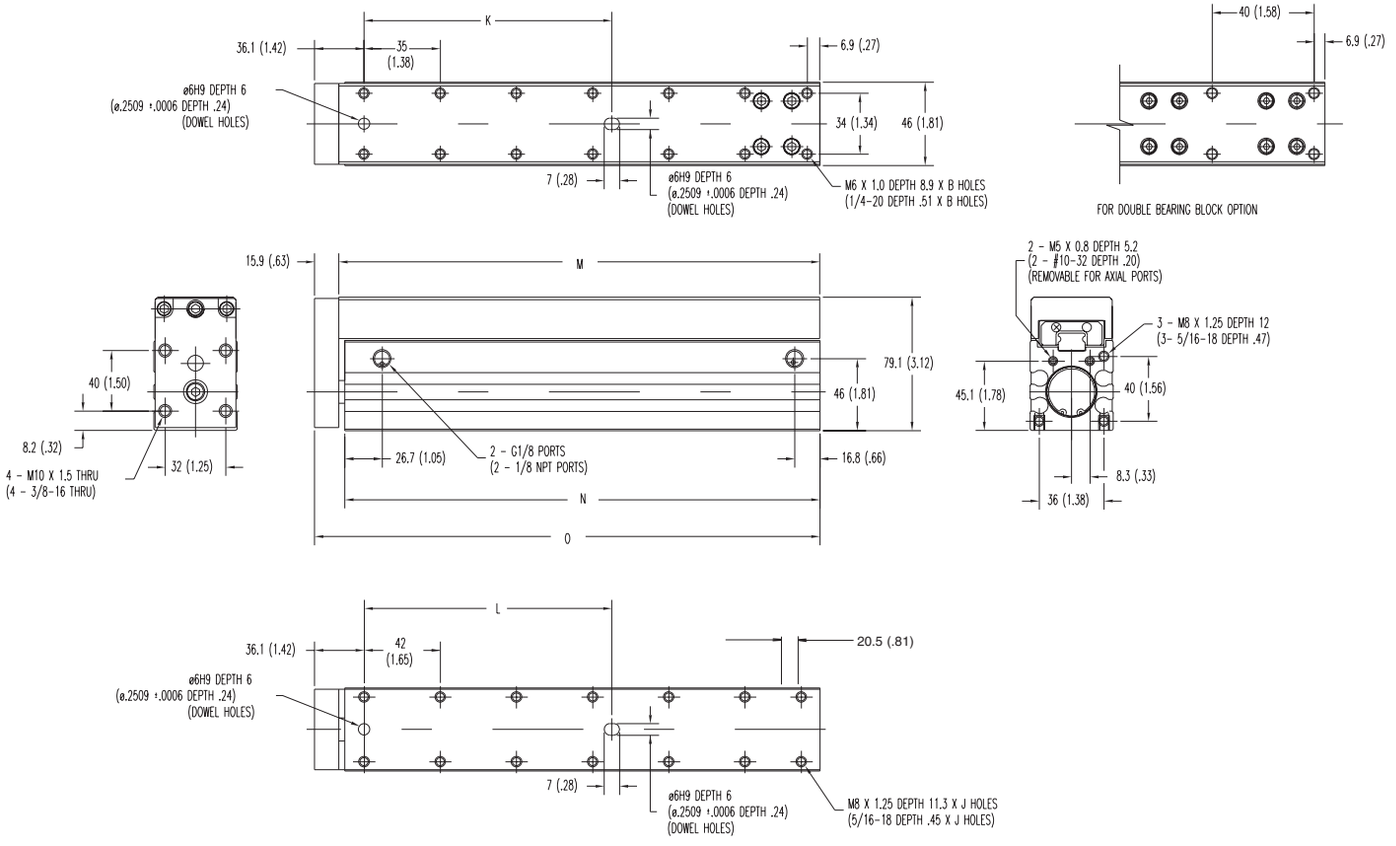
English Dimensions in Parentheses

Double Letter Dimensions represent double bearing block option ("-D")

Stroke	B	BB	J	JJ	K	KK	L	LL	M	MM	N	NN	O	OO
5mm	4	6	4	6	40 (1.58)	50 (1.97)	40 (1.58)	50 (1.97)	64 (2.50)	105 (4.12)	62 (2.42)	103 (4.04)	76 (2.97)	117 (4.60)
10mm	4	6	4	6	40 (1.58)	50 (1.97)	40 (1.58)	60 (2.36)	69 (2.70)	110 (4.32)	67 (2.62)	108 (4.23)	81 (3.17)	122 (4.80)
15mm	4	6	4	6	40 (1.58)	50 (1.97)	40 (1.58)	60 (2.36)	74 (2.90)	120 (4.71)	72 (2.81)	118 (4.63)	86 (3.37)	132 (5.19)
20mm	4	6	4	6	50 (1.97)	50 (1.97)	50 (1.97)	60 (2.36)	79 (3.09)	120 (4.71)	77 (3.01)	118 (4.63)	90 (3.56)	132 (5.19)
25mm	4	8	6	8	50 (1.97)	50 (1.97)	50 (1.97)	60 (2.36)	89 (3.49)	125 (4.91)	87 (3.41)	123 (4.82)	101 (3.96)	137 (5.39)
30mm	4	8	6	8	50 (1.97)	50 (1.97)	50 (1.97)	60 (2.36)	89 (3.49)	130 (5.10)	87 (3.41)	128 (5.02)	101 (3.96)	142 (5.59)
35mm	4	8	6	8	50 (1.97)	50 (1.97)	50 (1.97)	70 (2.76)	94 (3.69)	135 (5.30)	92 (3.60)	133 (5.22)	106 (4.16)	147 (5.78)
40mm	6	8	6	8	50 (1.97)	50 (1.97)	50 (1.97)	70 (2.76)	99 (3.88)	140 (5.50)	97 (3.80)	138 (5.41)	111 (4.35)	152 (5.98)
45mm	6	8	6	8	50 (1.97)	50 (1.97)	50 (1.97)	70 (2.76)	104 (4.08)	150 (5.89)	102 (4.00)	148 (5.81)	116 (4.55)	162 (6.37)
50mm	6	8	6	8	60 (2.36)	60 (2.36)	60 (2.36)	70 (2.76)	109 (4.28)	150 (5.89)	107 (4.19)	148 (5.81)	121 (4.75)	162 (6.37)
55mm	6	10	6	8	60 (2.36)	60 (2.36)	60 (2.36)	70 (2.76)	119 (4.67)	155 (6.09)	117 (4.59)	153 (6.00)	131 (5.14)	167 (6.57)
60mm	6	10	6	10	60 (2.36)	60 (2.36)	60 (2.36)	70 (2.76)	119 (4.67)	160 (6.28)	117 (4.59)	158 (6.20)	131 (5.14)	172 (6.77)
65mm	6	10	8	10	60 (2.36)	60 (2.36)	60 (2.36)	70 (2.76)	124 (4.87)	165 (6.48)	122 (4.78)	163 (6.40)	136 (5.34)	177 (6.95)
70mm	8	10	8	10	60 (2.36)	60 (2.36)	60 (2.36)	70 (2.76)	129 (5.06)	170 (6.68)	127 (4.98)	168 (6.59)	141 (5.53)	182 (7.16)
75mm	8	10	8	10	70 (2.76)	70 (2.76)	70 (2.76)	70 (2.76)	134 (5.26)	180 (7.07)	132 (5.18)	178 (6.99)	146 (5.73)	192 (7.56)
80mm	8	10	8	10	70 (2.76)	70 (2.76)	70 (2.76)	70 (2.76)	139 (5.46)	180 (7.07)	137 (5.37)	178 (6.99)	151 (5.93)	192 (7.56)
85mm	8	12	8	10	70 (2.76)	70 (2.76)	70 (2.76)	70 (2.76)	149 (5.85)	185 (7.27)	147 (5.77)	183 (7.19)	161 (6.32)	197 (7.75)
90mm	8	12	8	10	70 (2.76)	70 (2.76)	70 (2.76)	70 (2.76)	149 (5.85)	190 (7.46)	147 (5.77)	188 (7.38)	161 (6.32)	202 (7.95)
95mm	8	12	8	10	70 (2.76)	70 (2.76)	70 (2.76)	70 (2.76)	154 (6.05)	195 (7.66)	152 (5.96)	193 (7.58)	166 (6.52)	207 (8.15)
100mm	10	12	8	12	70 (2.76)	70 (2.76)	70 (2.76)	70 (2.76)	159 (6.24)	200 (7.86)	157 (6.16)	198 (7.78)	171 (6.71)	212 (8.34)
105mm	10	12	10	12	70 (2.76)	70 (2.76)	70 (2.76)	70 (2.76)	164 (6.44)	210 (8.25)	162 (6.36)	208 (8.17)	176 (6.91)	222 (8.74)
110mm	10	12	10	12	70 (2.76)	70 (2.76)	70 (2.76)	80 (3.15)	169 (6.64)	210 (8.25)	167 (6.56)	208 (8.17)	181 (7.11)	222 (8.74)
115mm	10	12	10	12	70 (2.76)	70 (2.76)	70 (2.76)	80 (3.15)	179 (7.03)	215 (8.45)	177 (6.95)	213 (8.37)	191 (7.50)	227 (8.92)
120mm	10	14	10	12	70 (2.76)	70 (2.76)	70 (2.76)	80 (3.15)	179 (7.03)	220 (8.65)	177 (6.95)	218 (8.56)	191 (7.50)	232 (9.12)

Dimensions

NPA-32

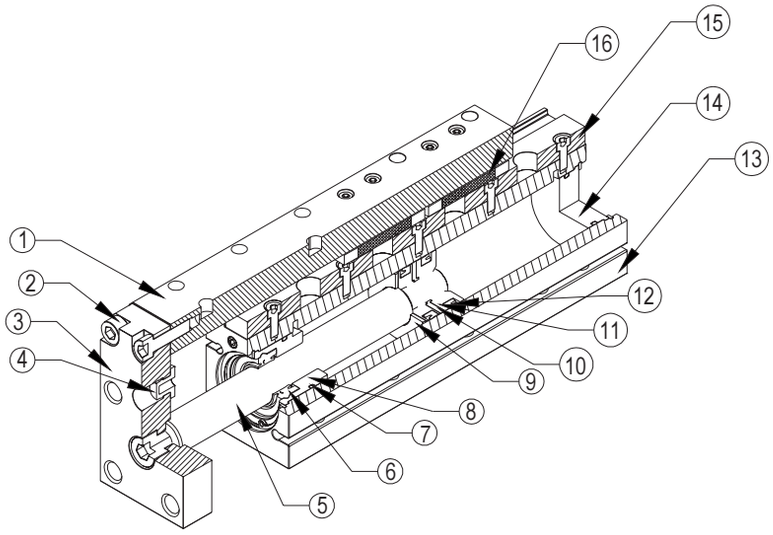


English Dimensions in Parentheses

Double Letter Dimensions represent double bearing block option ("-D")

Stroke	B	BB	J	JJ	K	KK	L	LL	M	MM	N	NN	O	OO
5mm	4	6	4	4	50 (1.97)	50 (1.97)	50 (1.97)	50 (1.97)	80 (3.16)	105 (4.12)	78 (3.08)	102 (4.04)	96 (3.79)	121 (4.75)
10mm	4	6	4	4	50 (1.97)	50 (1.97)	50 (1.97)	50 (1.97)	85 (3.35)	110 (4.32)	83 (3.27)	107 (4.23)	101 (3.98)	126 (4.95)
15mm	4	6	4	6	50 (1.97)	50 (1.97)	50 (1.97)	50 (1.97)	90 (3.55)	120 (4.71)	88 (3.47)	118 (4.63)	106 (4.18)	136 (5.34)
20mm	4	6	4	6	50 (1.97)	50 (1.97)	50 (1.97)	50 (1.97)	95 (3.75)	120 (4.71)	93 (3.67)	118 (4.63)	111 (4.38)	136 (5.34)
25mm	4	6	4	6	50 (1.97)	50 (1.97)	50 (1.97)	50 (1.97)	100 (3.94)	125 (4.91)	98 (3.86)	123 (4.82)	116 (4.57)	141 (5.54)
30mm	4	6	4	6	50 (1.97)	50 (1.97)	50 (1.97)	50 (1.97)	105 (4.14)	130 (5.10)	103 (4.06)	128 (5.02)	121 (4.77)	146 (5.73)
35mm	6	6	4	6	50 (1.97)	50 (1.97)	50 (1.97)	50 (1.97)	110 (4.34)	135 (5.30)	108 (4.26)	133 (5.22)	126 (4.97)	151 (5.93)
40mm	6	6	6	6	60 (2.36)	60 (2.36)	60 (2.36)	60 (2.36)	120 (4.73)	140 (5.50)	118 (4.65)	137 (5.41)	136 (5.36)	156 (6.13)
45mm	6	6	6	6	60 (2.36)	60 (2.36)	60 (2.36)	60 (2.36)	120 (4.73)	145 (5.69)	118 (4.65)	142 (5.61)	136 (5.36)	161 (6.32)
50mm	6	6	6	6	60 (2.36)	60 (2.36)	60 (2.36)	60 (2.36)	125 (4.93)	150 (5.89)	123 (4.85)	147 (5.81)	141 (5.56)	166 (6.52)
55mm	6	8	6	8	60 (2.36)	60 (2.36)	60 (2.36)	60 (2.36)	130 (5.13)	160 (6.28)	128 (5.04)	158 (6.20)	146 (5.76)	176 (6.91)
60mm	6	8	6	8	60 (2.36)	60 (2.36)	60 (2.36)	60 (2.36)	135 (5.32)	160 (6.28)	133 (5.24)	158 (6.20)	151 (5.95)	176 (6.91)
65mm	8	8	6	8	60 (2.36)	60 (2.36)	60 (2.36)	60 (2.36)	140 (5.52)	165 (6.48)	138 (5.44)	163 (6.40)	156 (6.15)	181 (7.11)
70mm	8	8	6	8	60 (2.36)	60 (2.36)	60 (2.36)	60 (2.36)	145 (5.72)	170 (6.68)	143 (5.63)	167 (6.59)	161 (6.35)	186 (7.31)
75mm	8	8	6	8	60 (2.36)	60 (2.36)	60 (2.36)	60 (2.36)	150 (5.91)	175 (6.87)	148 (5.83)	172 (6.79)	171 (6.54)	191 (7.50)
80mm	8	8	8	8	60 (2.36)	60 (2.36)	60 (2.36)	60 (2.36)	160 (6.31)	180 (7.07)	158 (6.22)	177 (6.99)	171 (6.94)	196 (7.70)
85mm	8	10	8	8	60 (2.36)	60 (2.36)	60 (2.36)	60 (2.36)	160 (6.31)	185 (7.27)	158 (6.22)	182 (7.19)	176 (6.94)	201 (7.90)
90mm	8	10	8	10	60 (2.36)	60 (2.36)	60 (2.36)	60 (2.36)	165 (6.50)	190 (7.47)	163 (6.42)	188 (7.38)	181 (7.13)	206 (8.10)
95mm	10	10	8	10	60 (2.36)	60 (2.36)	60 (2.36)	60 (2.36)	170 (6.70)	200 (7.86)	168 (6.62)	198 (7.78)	186 (7.33)	216 (8.49)
100mm	10	10	8	10	76 (2.99)	76 (2.99)	76 (2.99)	76 (2.99)	175 (6.90)	200 (7.86)	173 (6.82)	198 (7.78)	191 (7.53)	216 (8.49)
105mm	10	10	8	10	76 (2.99)	76 (2.99)	76 (2.99)	76 (2.99)	180 (7.09)	205 (8.06)	178 (7.01)	202 (7.97)	196 (7.72)	221 (8.69)
110mm	10	10	8	10	76 (2.99)	76 (2.99)	76 (2.99)	76 (2.99)	185 (7.29)	210 (8.25)	183 (7.21)	207 (8.17)	201 (7.92)	226 (8.88)
115mm	10	12	10	10	76 (2.99)	76 (2.99)	76 (2.99)	76 (2.99)	190 (7.49)	215 (8.45)	188 (7.41)	212 (8.37)	206 (8.12)	231 (9.08)
120mm	10	12	10	10	76 (2.99)	76 (2.99)	76 (2.99)	76 (2.99)	200 (7.88)	220 (8.65)	198 (7.80)	218 (8.56)	216 (8.51)	236 (9.28)

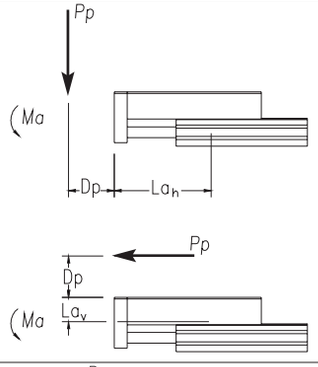
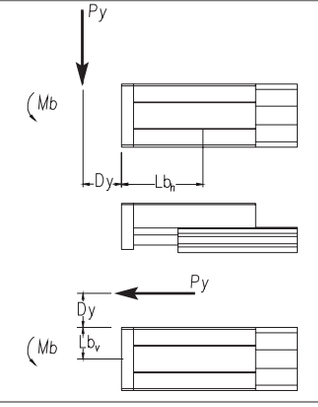
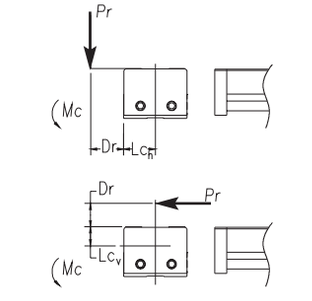
Engineering Specifications



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

Operating Medium: Air
Maximum Operating Pressure: 10 bar (140 psi)
Temperature Range: -10° to 70°C (15° to 160°F)

Engineering Specifications

	$Pp = \frac{Ma \times 1000}{Dp + La}$ *(Newtons)* Dp = Distance from load point to body (mm) La = Moment arm (mm) see chart
	$Py = \frac{Mb \times 1000}{Dy + Lb}$ *(Newtons)* Dy = Distance from load point to body (mm) Lb = Moment arm (mm) see chart
	$Pr = \frac{Mc \times 1000}{Dr + Lc}$ *(Newtons)* 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

The LPA actuator was developed for applications that require precise load guiding, with ultra-tight space constraints. This actuator minimizes thickness with a linear recirculating ball rail located next to the bore.

How to Order and List Prices

Model/Price

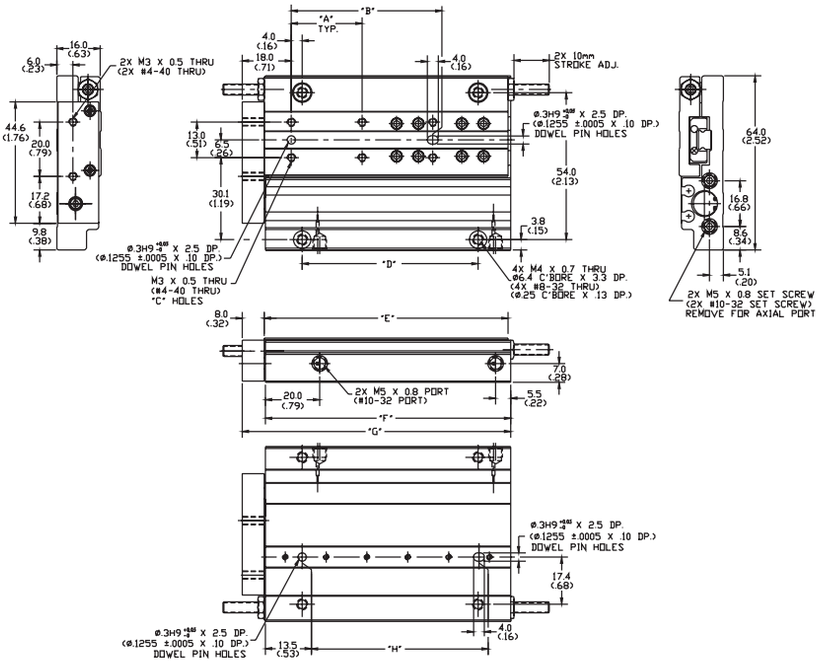
LPA: Low Profile Air Table Actuator

Part Number: LPA-8☐ -options

Stroke Length: 10, 20, 30, 40, 50, 75mm

Options: M (MRS position sensing for MS switch series)
E (US customary-inch)

Dimensions mm (inch)



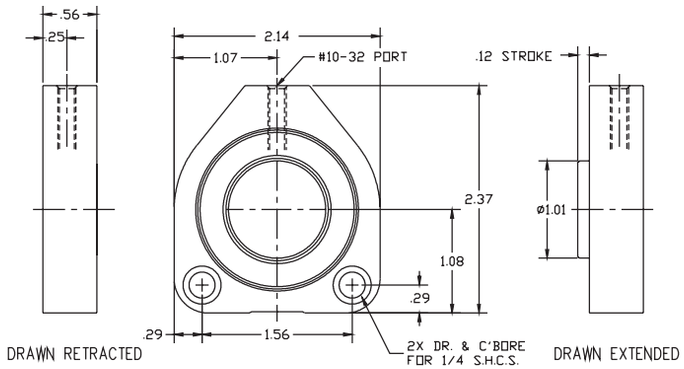
Stroke	A		B		C	D		E		F		G		H	
10	25.0	(0.984)	25.0	(0.984)	4	25.0	(0.984)	49.7	(1.958)	50.2	(1.977)	58.7	(2.312)	30.0	(1.181)
20	25.0	(0.984)	25.0	(0.984)	4	35.0	(1.378)	59.7	(2.352)	60.2	(2.371)	68.7	(2.706)	35.0	(1.378)
30	24.0	(0.945)	48.0	(1.890)	6	45.0	(1.772)	69.7	(2.746)	70.2	(2.765)	78.7	(3.100)	45.0	(1.772)
40	26.0	(1.024)	52.0	(2.048)	6	65.0	(2.559)	89.7	(3.531)	90.2	(3.550)	98.7	(3.885)	65.0	(2.559)
50	32.0	(1.260)	64.0	(2.520)	6	75.0	(2.953)	99.7	(3.925)	100.2	(3.944)	108.7	(4.279)	75.0	(2.953)
75	30.0	(1.181)	90.0	(3.543)	8	100.0	(3.937)	124.7	(4.909)	125.2	(4.928)	133.7	(5.263)	105.0	(4.134)

For engineering specifications, basic operating parameters, materials of construction, loading, and accuracy, refer to TBA-8, page 2.93. For equation constants, use TBA-8 values, except: $L = L_a = 7_c.1$ and $L_{bv} - L_{ch} = 23$

Bimba Diaphragm Cylinders

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.

How to Order and List Prices

Model/Price	Dimensions (inch)
CSS-00119-A Stroke Length: .12" Availability: Stock Item	

Engineering Specifications

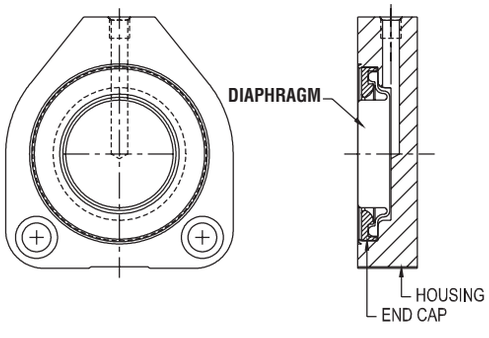
Maximum Operating Pressure:	120 psi
Operating Temperature:	150° F
Lubrication:	Pre-lubricated
Cylinder Body:	Aluminum
Diaphragm:	50 Durometer EPDM with reinforced polyester fabric

Note:

•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).

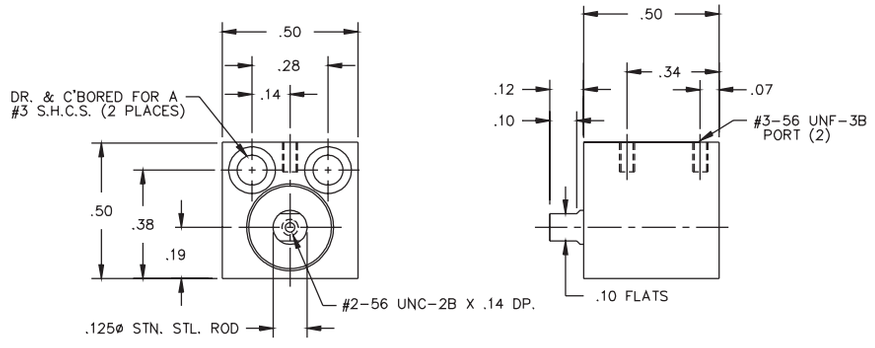
How it Works



Bimba Miniature "Cube" Cylinders

CFS-01011-A is a double-acting, miniature "cube" cylinder (1/2" x 1/2" x 1/2") 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 cyliners are used to clamp wafers during certain operations.

How to Order and List Prices

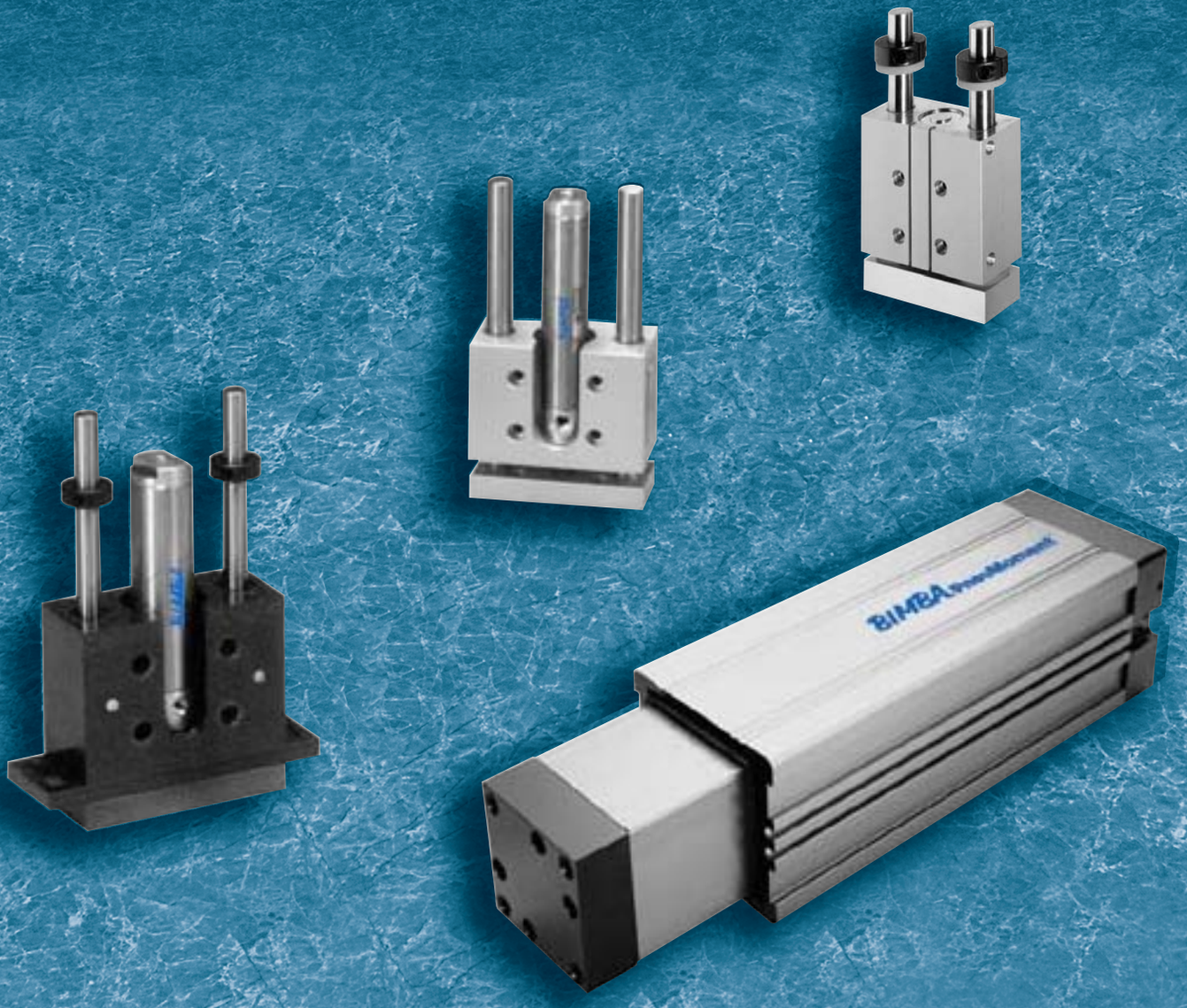
Model Price	Dimensions (inch)
CFS-01011-A Bore Size: .188" Stroke Length: .125" Availability: Stock Item	

Engineering Specifications

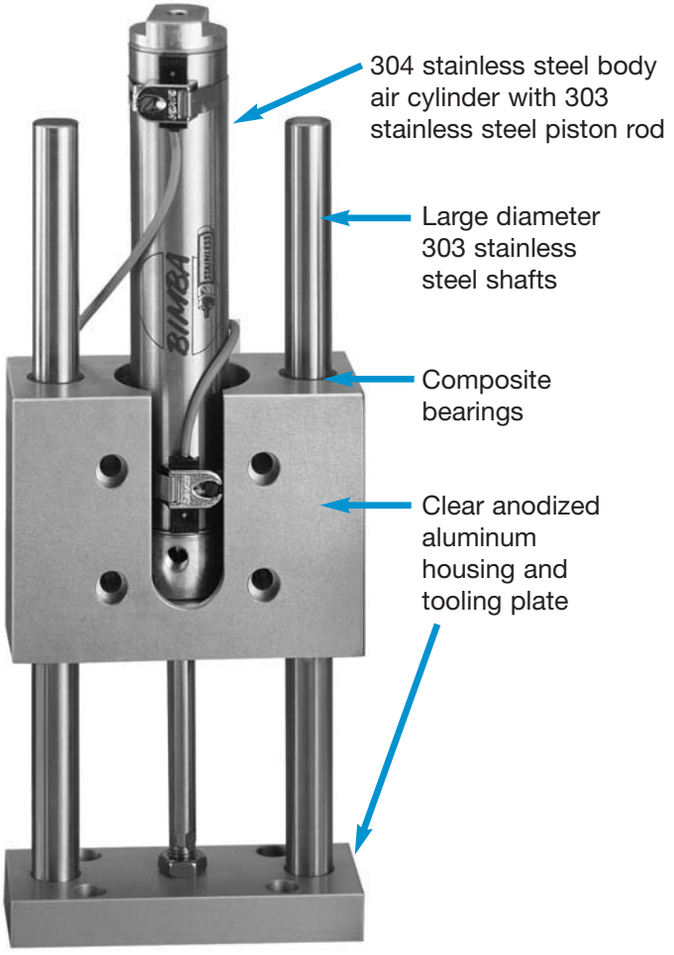
Maximum Operating Pressure:	100 psi
Power Factors:	Extend .028
	Retract .015
Cylinder Body:	Aluminum Alloy
Piston Rod:	303 Stainless Steel
Rod Bearing:	Brass
Weight:	.25 oz. (7.8 grams)
Lubrication:	Silicone Fluid

Notes

Linear Thrusters/PneuMoment



Bimba Linear Thrusters

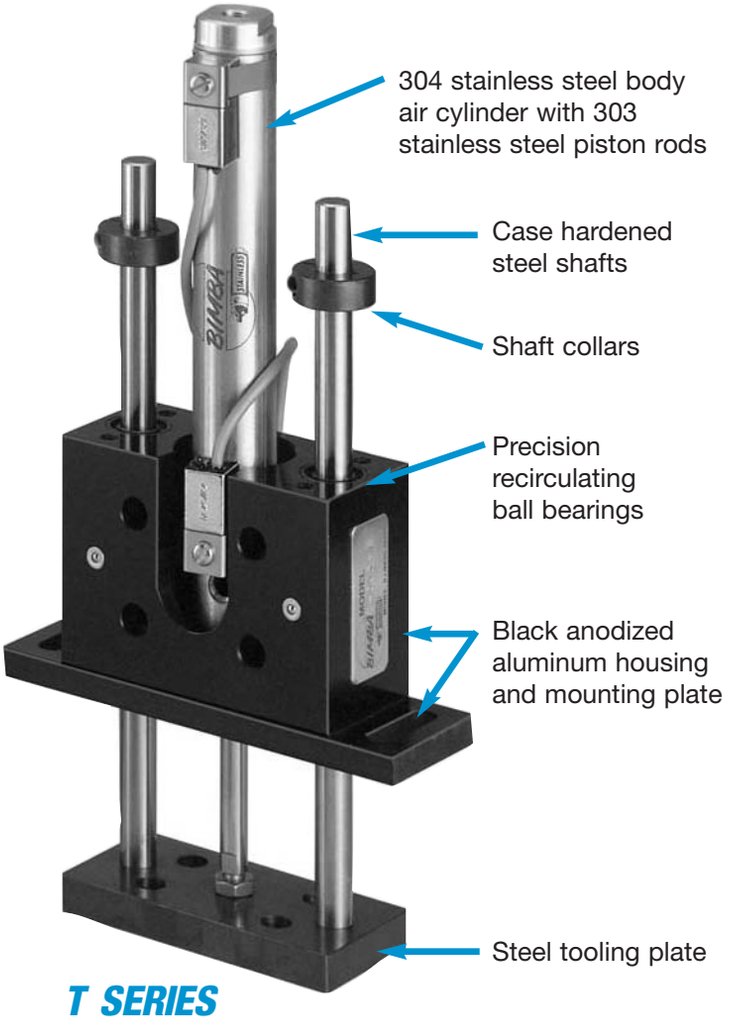


TE SERIES

- Large diameter stainless steel shafts (hard chrome plated carbon steel on 2-1/2" and 3" bores).
- Mounting plate and shaft collars optional.
- High-strength composite bearing made of fiber-imbedded plastic.
- Composite bearing may perform better in certain environments (for example, dust or lint).
- Composite bearing/stainless steel shaft combination is ideal for corrosive environments.
- High load capabilities.

ADVANTAGES

- Bimba stainless steel body air cylinders for long, reliable life.
- Optional magnetic piston for use with Hall Effect or Magnetic Reed Switches. (Hall Effect Switch not available for 9/16" bore.)
- Optional adjustable cushions for smooth deceleration of load at end of stroke. (Not available for 9/16".)
- Optional internal or external bumpers to absorb shock or adjust stroke.
- Easily accessible ports.
- Choice of TE (composite bearing) and T (ball bearing).



T SERIES

- Less friction
- High precision
- Easily accessible lubrication ports
- Mounting plate and shaft collars standard

Bimba Extruded Linear Thrusters

The Bimba Extruded Thruster is a rugged, guided actuator with a cylinder integral to the thruster block. The sleak body incorporates switch mounting, for a clean, space-efficient package.

How to Order

The model number for Extruded Linear Thrusters consists of three alphanumeric clusters. These designate product type, bore size and stroke length, and options.

Please note the following features are standard, and are included in all model numbers: E (inch-series threading), and M (magnet for position sensing).

Model	
ET	- Extruded Thruster Extended Shafts; 4 bushings
ETS	- Extruded Thruster Shafts Flush; 2 bushings
ETD	- Extruded Thruster Double-end; Saddle Mount

Bore Size	
12	- 12mm
16	- 16mm
20	- 20mm
25	- 25mm
32	- 32mm

ET - 16100 - EK12M

Options U.S. Customary Units	
E	Inch Series Porting/Mounting
***Standard; included in all model numbers**	
External Bumpers	
EB	External Bumpers, Retract
EB1	External Bumpers, Extend
EB2	External Bumpers, Both Ends
ETS - EB available only	
No Stroke Reduction with Bumpers	
Extend Bumpers include One Set of Collars	
Shock Absorbers	
K_ _	First _ will be: 1-Both Ends, 2-Extend Only, 3-Retract Only
	Second _ will be: 1-Light Duty, 2-Medium Duty, 3-Heavy Duty
ETS - K3 available only (retract only)	
See Minimum Stroke Note in Stroke Table	
Magnetic Position Sensing	
M	MRS Position Sensing
***Standard; included in all model numbers**	
Alternate Port Location	
P	Ports on Top Surface
Must be specificed if Option X is ordered	
Fluoroelastomer Seals	
V	High Temperature (0 to 275 deg F)
Ball Bushings	
X	Ball Bushings and Hardened Shafts
Must specify Option P with X Option	

Standard Stroke Lengths 5mm Increments to 255mm Exceptions

Bore	ET	ET with Option X (Ball Bearings)	ET with Option K (Shock Absorbers)	ETD with Option X Only 2 Bushings (not 4) when stroke is less than
	Minimum Stroke Length			
12mm	13.5mm	26mm	N/A	26mm
16mm	16mm	26mm	N/A	26mm
20mm	26mm	26mm	N/A	26mm
25mm	31mm	39mm	16mm	39mm
32mm	33mm	42mm	45mm	42mm

List Prices

Model Type	12mm	16mm	20mm	25mm	32mm
ET (extended shafts, 4 bushings)					
add per 5mm stroke					
ETS (shafts flush, 2 bushings)					
add per 5mm stroke					
ETD (double-end, saddle mount)					
add per 5mm stroke					

Options	12mm	16mm	20mm	25mm	32mm
EB (External Bumpers, Retract)					
EB1 (External Bumpers, Extend)					
EB2 (External Bumpers, Both Ends)					
K__ (Shock Absorbers); Per End					
V (High Temperature Seals)					
X (Ball Bushings) ETS					
X (Ball Bushings) ET and ETD					

No Charge Options: P
Included as Standard in Base: E, M

Engineering Specifications

Maximum Operating Pressure	140 psi (10 bar)
Temperature Range	15 to 160 degrees F (-10 to 70 degrees C)
Expected Service Life	1,500 miles (with filtered, lubricated air)
Cylinder Lubrication	PTFE grease

Theoretical Cylinder Forces
FORCE = Power Factor (PF) x Input Pressure
PF x bar = kg; PF x psi = pounds

Bore	Input = PSI		Input = Bar	
	PF Extend	PF Retract	PF Extend	PF Retract
12mm	0.2	0.1	1.1	0.8
16mm	0.3	0.2	2.0	1.5
20mm	0.5	0.4	3.1	2.4
25mm	0.8	0.6	4.9	3.8
32mm	1.2	0.9	8.0	6.0

Tooling Plate Endplay
Maximum Tooling Plate Movement
in Unloaded Condition (values in inches)

ETS; with Standard Bearings

Bore	25mm	50mm	75mm	100mm	125mm	150mm	175mm	200mm	225mm	250mm	275mm
12mm	0.017	0.025	0.033	0.041	0.050	0.058	0.066	0.075	0.083	0.091	0.100
16mm	0.017	0.025	0.033	0.041	0.050	0.058	0.066	0.075	0.083	0.091	0.100
20mm	0.015	0.023	0.030	0.037	0.045	0.052	0.059	0.067	0.074	0.081	0.089
25mm	0.013	0.019	0.024	0.030	0.035	0.041	0.046	0.052	0.057	0.063	0.069
32mm	0.012	0.017	0.022	0.026	0.031	0.036	0.041	0.045	0.050	0.055	0.059

ETS; with Ball Bearings

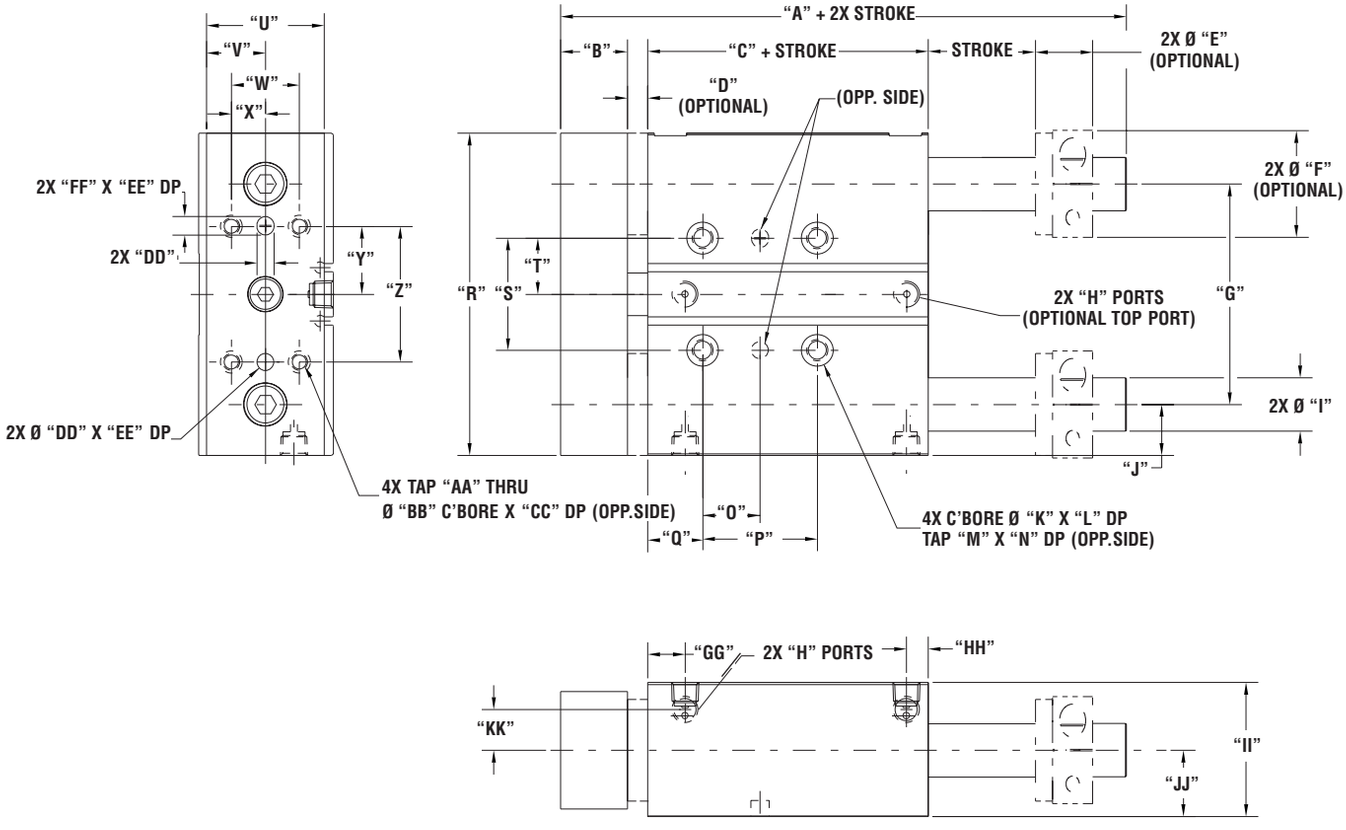
Bore	25mm	50mm	75mm	100mm	125mm	150mm	175mm	200mm	225mm	250mm	275mm
12mm	0.006	0.008	0.011	0.013	0.016	0.018	0.020	0.023	0.025	0.028	0.030
16mm	0.006	0.008	0.011	0.013	0.016	0.018	0.020	0.023	0.025	0.028	0.030
20mm	0.006	0.009	0.011	0.014	0.016	0.019	0.021	0.024	0.027	0.029	0.032
25mm	0.005	0.006	0.008	0.009	0.011	0.013	0.014	0.016	0.018	0.019	0.021
32mm	0.006	0.007	0.009	0.011	0.013	0.015	0.016	0.018	0.020	0.022	0.024

ET and ETD; with Standard Bearings

Bore	25mm	50mm	75mm	100mm	125mm	150mm	175mm	200mm	225mm	250mm	275mm
12mm	0.005	0.005	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
16mm	0.005	0.005	0.005	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
20mm	0.005	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.007
25mm	0.005	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
32mm	0.006	0.006	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007

ET and ETD; with Ball Bearings
Endplay on all ET and ETD Thrusters with Option "X" not to exceed .003"

Dimensions - ET



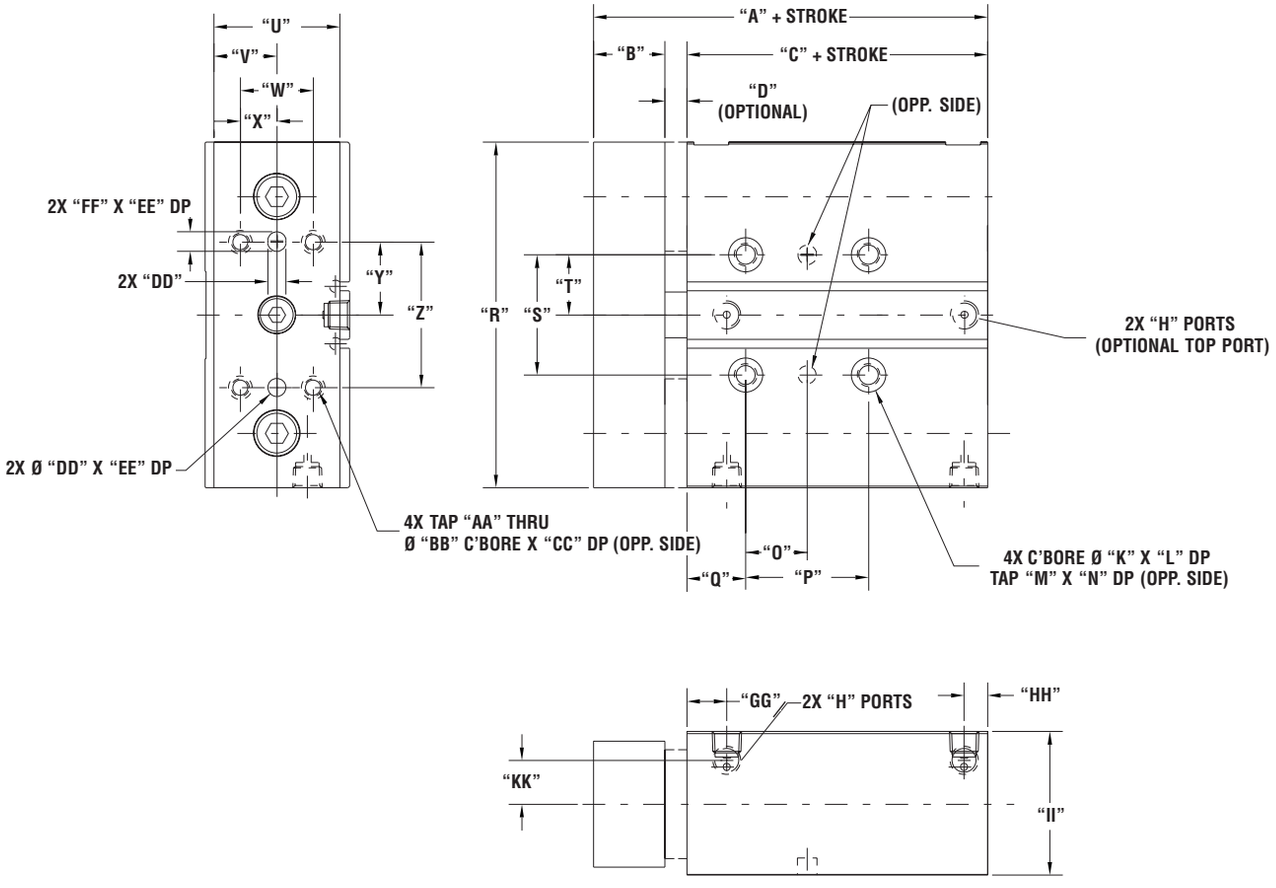
Bore	A	B	C	D	E	F	G	H	I
12mm	3.20	.55	1.66	.25	.60	.95	2.00	#10-32	.39 (10mm)
16mm	3.36	.55	1.81	.25	.60	.95	2.00	#10-32	.39 (10mm)
20mm	3.79	.62	1.91	.25	.68	1.10	2.50	1/8 NPT	.47 (12mm)
25mm	3.90	.79	1.96	.25	.76	1.34	2.75	1/8 NPT	.63 (16mm)
32mm	4.43	.98	2.21	.25	.84	1.57	3.25	1/8 NPT	.79 (20mm)

Bore	J	K	L	M	N	O	P	Q	R	S
12mm	.43	.28	.16	#10-32	.50	.44	.88	.63	2.85	1.00
16mm	.43	.28	.16	#10-32	.50	.53	1.06	.65	2.85	1.00
20mm	.50	.38	.21	1/4-20	.63	.63	1.25	.79	3.50	1.39
25mm	.62	.38	.21	1/4-20	.63	.75	1.50	.79	3.99	1.39
32mm	.75	.47	.26	5/16-18	.77	.84	1.69	.85	4.75	1.65

Bore	T	U	V	W	X	Y	Z	AA	BB	CC
12mm	.50	.86	.43	.50	.25	.50	1.00	#8-32	.25	.20
16mm	.50	.86	.43	.63	.31	.63	1.25	#8-32	.25	.20
20mm	.69	1.10	.55	.75	.38	.75	1.50	#10-32	.28	.20
25mm	.69	1.30	.65	.88	.44	.88	1.75	#10-32	.28	.30
32mm	.82	1.73	.87	1.00	.50	1.00	2.00	1/4-20	.33	.44

Bore	DD	EE	FF	GG	HH	II	JJ	KK
12mm	.16	.14	.20	.48	.19	.98	.45	.37
16mm	.19	.20	.24	.51	.19	1.11	.45	.37
20mm	.19	.20	.24	.57	.32	1.36	.57	.49
25mm	.25	.24	.28	.57	.32	1.49	.73	.50
32mm	.25	.24	.28	.63	.32	1.98	.98	.58

Dimensions - ETS



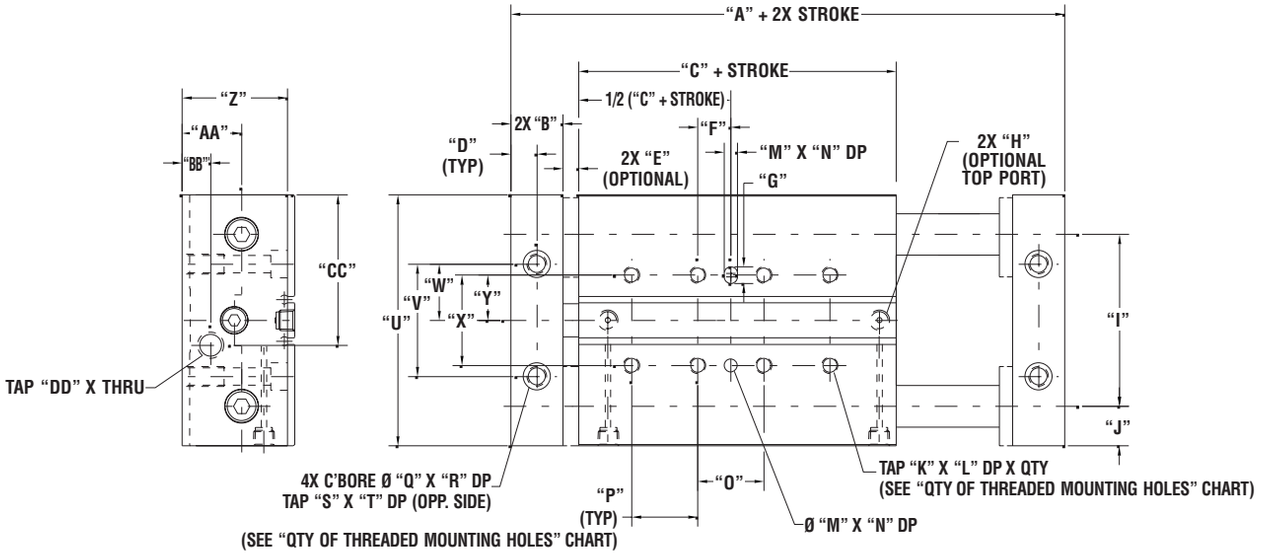
Bore	A*	B	C	D	H	K	L	M	N	O
12mm	2.21	.55	1.66	.25	#10-32	.28	.16	#10-32	.50	.44
16mm	2.36	.55	1.81	.25	#10-32	.28	.16	#10-32	.50	.53
20mm	2.53	.62	1.91	.25	1/8 NPT	.38	.21	1/4-20	.63	.63
25mm	2.75	.79	1.96	.25	1/8 NPT	.38	.21	1/4-20	.63	.75
32mm	3.19	.98	2.21	.25	1/8 NPT	.47	.26	5/16-18	.77	.84

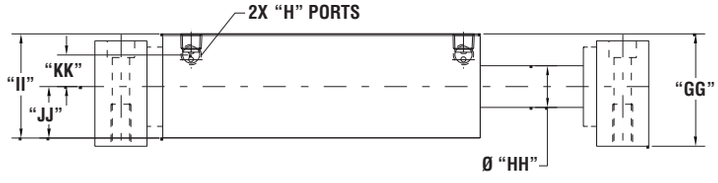
Bore	P	Q	R	S	T	U	V	W	X	Y
12mm	.88	.63	2.85	1.00	.50	.86	.43	.50	.25	.50
16mm	1.06	.65	2.85	1.00	.50	.86	.43	.63	.31	.63
20mm	1.25	.79	3.50	1.39	.69	1.10	.55	.75	.38	.75
25mm	1.50	.79	3.99	1.39	.69	1.30	.65	.88	.44	.88
32mm	1.69	.85	4.75	1.65	.82	1.73	.87	1.00	.50	1.00

Bore	Z	AA	BB	CC	DD	EE	FF	GG	HH	II	KK
12mm	1.00	#8-32	.25	.20	.16	.14	.20	.48	.19	.98	.37
16mm	1.25	#8-32	.25	.20	.19	.20	.24	.51	.19	1.11	.37
20mm	1.50	#10-32	.28	.20	.19	.20	.24	.57	.32	1.36	.49
25mm	1.75	#10-32	.28	.30	.25	.24	.28	.57	.32	1.49	.50
32mm	2.00	1/4-20	.33	.44	.25	.24	.28	.63	.32	1.98	.58

*Optional bumpers (EB) add .25" to overall length

Dimensions - ETD





Bore	A*	B	C	D	E	F	G	H	I
12mm	2.76	.55	1.66	.28	.25	.44	.20	#10-32	2.00
16mm	2.91	.55	1.81	.28	.25	.53	.24	#10-32	2.00
20mm	3.16	.62	1.91	.31	.25	.63	.24	1/8 NPT	2.50
25mm	3.54	.79	1.96	.39	.25	.75	.28	1/8 NPT	2.75
32mm	4.18	.98	2.21	.49	.25	1.69	.28	1/8 NPT	3.25

Bore	J	K	L	M	N	O	P**	Q	R	S
12mm	.43	#10-32	.50	.16	.14	.88	.88	.36	.19	1/4-28
16mm	.43	#10-32	.50	.19	.20	1.06	1.00	.43	.26	5/16-24
20mm	.50	1/4-20	.63	.19	.20	1.25	1.25	.43	.27	5/16-24
25mm	.62	1/4-20	.63	.25	.24	1.50	1.50	.52	.32	3/8-24
32mm	.75	5/16-18	.77	.25	.24	1.69	1.69	.52	.32	3/8-24

Bore	T	U	V	W	X	Y	Z	AA	BB	CC
12mm	.49	2.85	1.31	.66	1.00	.50	.84	.56	.28	1.13
16mm	.50	2.85	1.26	1.00	1.00	.50	.84	.56	.26	1.16
20mm	.68	3.50	1.69	1.25	1.39	.69	1.08	.64	.31	1.31
25mm	.58	3.99	1.76	1.38	1.39	.69	1.28	.95	.35	2.41
32mm	.80	4.75	2.13	1.63	1.65	.83	1.71	1.12	.41	1.83

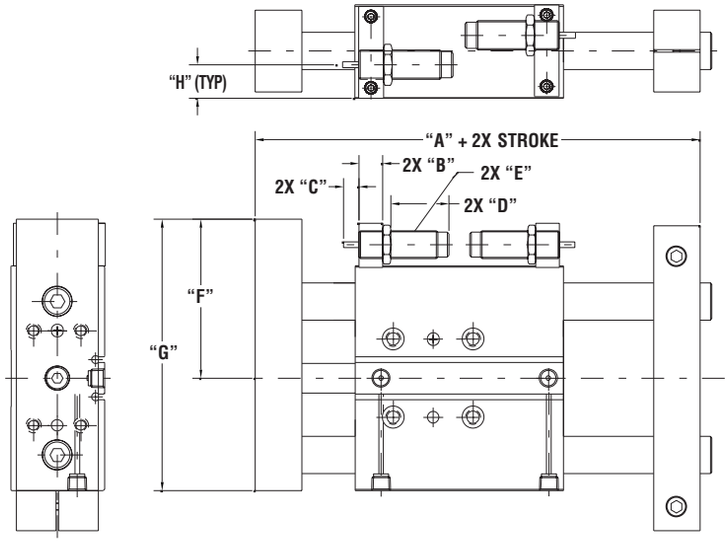
Bore	DD	EE	FF	GG	HH	II	JJ	KK
12mm	M8 x 1.0	.48	.19	1.09	.39 (10mm)	.98	.45	.37
16mm	M8 x 1.0	.51	.19	1.22	.39 (10mm)	1.11	.45	.37
20mm	M10 x 1.0	.57	.32	1.43	.47 (12mm)	1.36	.57	.49
25mm	M12 x 1.0	.57	.32	1.70	.63 (16mm)	1.48	.73	.50
32mm	M14 x 1.0	.63	.32	2.12	.79 (20mm)	1.98	.98	.58

**Quantity of Threaded Mounting Holes

Bore	4	8	12	16	20	24
	For stroke lengths (mm):					
12mm	13.5 - 57.9	58.0 - 102.3	102.4 - 146.8	146.9 - 191.2	191.3 - 235.7	235.8 - 254.0
16mm	16.0 - 69.6	69.7 - 123.6	123.7 - 177.6	177.7 - 231.6	231.7 - 254.0	N/A
20mm	26.0 - 89.3	89.4 - 152.8	152.9 - 216.3	216.4 - 254.0	N/A	N/A
25mm	31.0 - 107.0	107.1 - 183.2	183.3 - 254.0	N/A	N/A	N/A
32mm	33.0 - 118.6	118.7 - 203.6	203.7 - 254.0	N/A	N/A	N/A

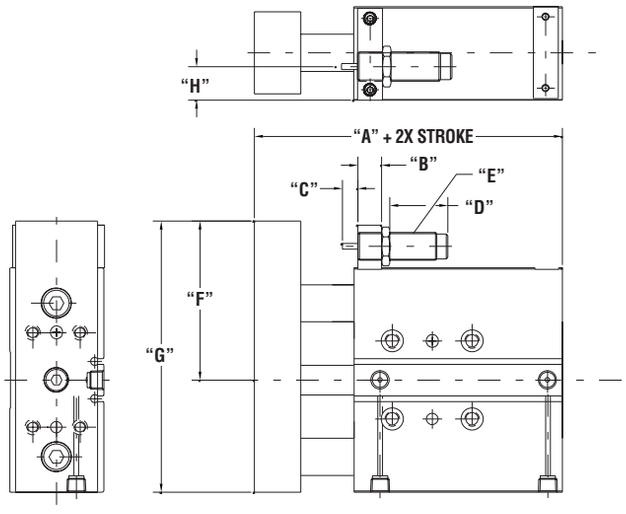
*Optional bumpers (EB, EB1, EB2) add .25" per end to overall length

Dimensions
Options-ET with Shock Absorbers



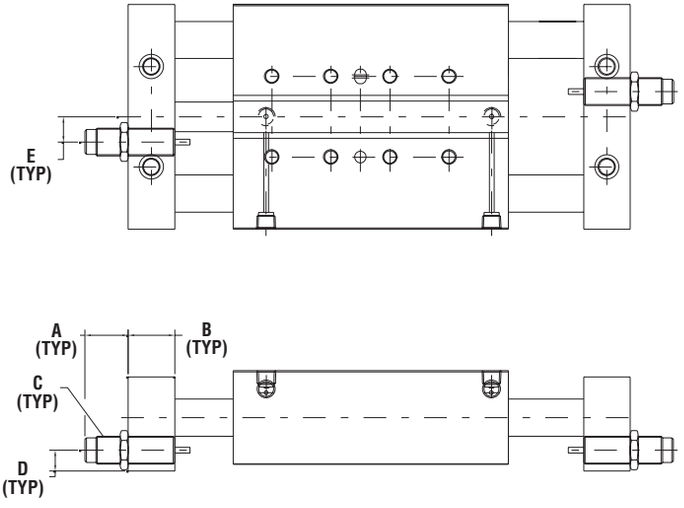
Bore	A	B	C	D	E	F	G	H
12mm	3.20	0.23	0.06	0.89	M8 x 1.0	1.91	3.34	0.20
16mm	3.36	0.23	0.06	0.89	M8 x 1.0	1.91	3.34	0.33
20mm	3.79	0.31	0.11	0.82	M10 x 1.0	2.42	4.17	0.79
25mm	3.90	0.39	0.12	1.57	M12 x 1.0	2.71	4.70	0.36
32mm	4.43	0.47	0.10	2.77	M14 x 1.0	3.23	5.60	0.56

Dimensions
Options-ETS with Shock Absorbers



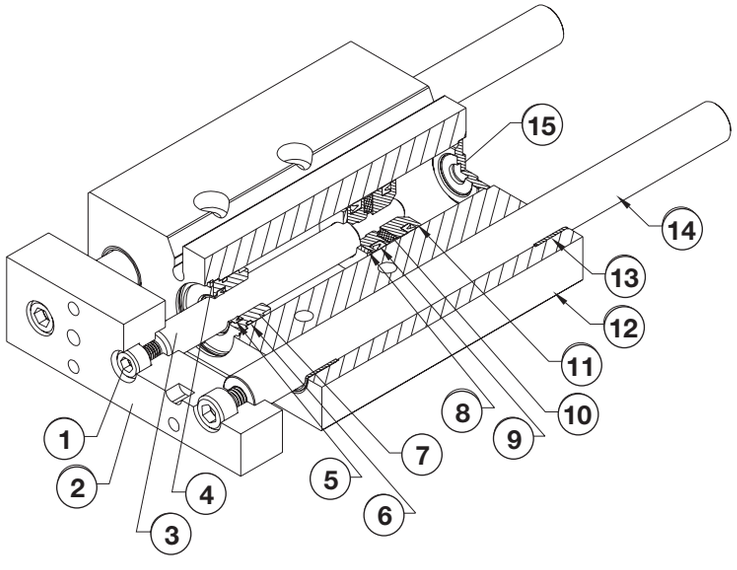
Bore	A	B	C	D	E	F	G	H
12mm	2.46	0.23	0.06	0.89	M8 x 1.0	1.91	3.34	0.20
16mm	2.61	0.23	0.06	0.89	M8 x 1.0	1.91	3.34	0.33
20mm	2.78	0.31	0.11	0.82	M10 x 1.0	2.42	4.17	0.79
25mm	3.00	0.39	0.12	1.57	M12 x 1.0	2.71	4.70	0.36
32mm	3.44	0.47	0.10	2.77	M14 x 1.0	3.23	5.60	0.56

Dimensions
Options-ETD with Shock Absorbers



Bore	A	B	C	D	E
12mm	0.57	0.55	M8 x 1.0	0.28	0.30
16mm	0.57	0.55	M8 x 1.0	0.26	0.27
20mm	0.51	0.62	M10 x 1.0	0.31	0.44
25mm	1.17	0.79	M12 x 1.0	0.35	0.42
32mm	2.25	0.99	M14 x 1.0	0.41	0.55

Components/Materials of Construction

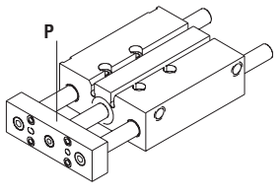


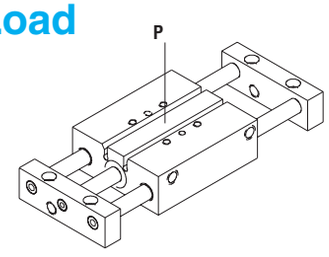
Item #	Description	Material
1	Assembly Bolt	Zinc-Plated Steel
2	Tooling Plate	Anodized Aluminum
3	Piston Rod	Hard Chrome Plated Stainless Steel
4	Retaining Ring	Zinc-Plated Steel
5	Rod Seal	Nitrile (Fluoroelastomer optional)
6	Rod Guide Seal	Nitrile (Fluoroelastomer optional)
7	Rod Guide	Anodized Aluminum
8	Bumper	Urethane
9	Piston Seal	Nitrile (Fluoroelastomer optional)
10	Magnet	Nitrile
11	Piston	Aluminum
12	Body	Anodized Aluminum
13	Guide Bushing	Self-Lubricating Nylon
		Ball Bushings optional
14	Guide Shaft	Hard Chrome Plated Stainless Steel
		Case Hardened Steel with X Option
15	Rear Head	Anodized Aluminum

Basic Repair Kit includes: Piston Seals, Rod Seal, and Rod Guide Seal.
Specify as K-B-ET- (bore size) - V (if applicable)

Kit	Bore				
	12mm	16mm	20mm	25mm	32mm
K-B-ET-__					
K-B-ET-__-V					

Maximum Side Load





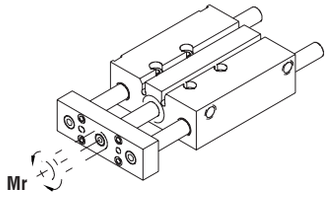
Maximum Load "P" as shown for ET, ETS, ETD
with Standard Bearings (pounds)

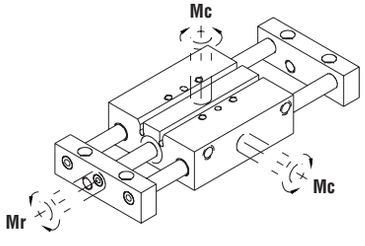
			ETS; by Stroke										
Bore	**ET**	**ETD**	**25mm**	**50mm**	**75mm**	**100 mm**	**125mm**	**150mm**	**175mm**	**200mm**	**225mm**	**250mm**	**275mm**
12mm	19	64	3.5	2.2	1.6	1.3	1.0	0.9	0.8	0.7	0.6	0.6	0.5
16mm	19	64	3.5	2.2	1.6	1.3	1.0	0.9	0.8	0.7	0.6	0.6	0.5
20mm	26	92	5.6	3.7	2.8	2.2	1.8	1.6	1.4	1.2	1.1	1.0	0.9
25mm	43	156	11.1	7.5	5.7	4.6	3.8	3.3	2.9	2.6	2.3	2.1	1.9
32mm	68	255	21.5	15.0	11.6	9.4	7.9	6.8	6.0	5.4	4.9	4.4	4.1

Maximum Load "P" as shown for ET, ETS, ETD
with Ball Bearings, Option "X" (pounds)

For Ball Bearing model, use 2x Load Rating for Standard Bearings in above table.

Maximum Moments





Maximum Radial Moment (Mr) as shown for ET, ETS, ETD
Standard Bearings (inch-pounds)

Standard Bearings

Bore	ET/ETD	ETS
12mm	64	32
16mm	64	32
20mm	115	57
25mm	214	107
32mm	414	207

For Ball Bearing model, use 2x Moment Rating for Standard Bearings in above table.

Maximum Axial (Ma) and Cross (Mc) Moments as shown for ETD
Standard Bearings (inch-pounds)

ETD; by Stroke

Bore	25mm	50mm	75mm	100mm	125mm	150mm	175mm	200mm	225mm	250mm	275mm
12mm	72	104	136	168	200	232	264	296	328	360	392
16mm	77	109	141	173	205	237	269	301	332	365	370
20mm	112	158	203	250	295	341	387	433	478	525	570
25mm	184	262	340	417	495	573	650	729	806	885	960
32mm	309	437	564	690	819	947	1074	1200	1329	1457	1584

For Ball Bearing model, use 2x Moment Rating for Standard Bearings in above table.

How to Order

The model number of all Linear Thrusters consists of three alphanumeric clusters. These designate product type, bore size and stroke length, and options. Please refer to the charts below for an example of model number TE-098-EB1M. This is a 1-1/16" bore, 8" stroke TE series Linear Thruster with extension external bumpers and a magnet for position sensing.

TE-098-EB1M

BORE SIZE	STANDARD STROKE LENGTHS*
02 - 9/16"	1" increments to 6"
04 - 3/4"	1" increments to 12"
09 - 1-1/16"	1" increments to 12"
17 - 1-1/2"	1" increments to 12"
31 - 2"	1" increments to 12"
50 - 2-1/2"	1" increments to 12"
70 - 3"	1" increments to 12"

**Stroke lengths beyond maximum are available; the rear of the cylinder must be supported in horizontal applications.*

OPTIONS

- B - Internal bumpers, both ends[1]
- C - Adjustable cushions, both ends[1]
- D - Dowel pin holes for Transition Plate[2]
- EB1 - External bumpers, extension (one set) (see page 3.14)
- EB2 - External bumpers, both ends (two sets) (see page 3.14)
- K _ _ - Shock absorbers[3]
  - 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
- M - MRS® magnetic position sensing[4]
- H - Tapped holes
- P - Mounting plate (includes 12 tapped holes)
- S - Stainless steel tooling plate and optional shaft collars

[1] Internal bumpers and cushions cannot be ordered in combination. Adjustable cushions are not available for 9/16" bore size.

[2] Transition Plate Applications: Option -H or -P must be ordered. Option-D must also be ordered if dowel pin holes are required. Not available in 2-1/2" and 3" bores with S option. Dowel pin hole locations shown in Appendix.

[3] See Ultran Cylinders, page 5.18 for more information. Shocks not available on 2-1/2" and 3" bores.

[4] Hall Effect Switch not available for 9/16" bore size.

NOTE: TE Series Linear Thruster includes shaft collars only when external bumpers are ordered as an option (see page 3.14). Shaft collars can also be ordered separately as a repair part.

Approximate Power Factors

9/16"	=	0.2
3/4"	=	0.4
1-1/16"	=	0.9
1-1/2"	=	1.7
2"	=	3.1
2-1/2"	=	5.0
3"	=	7.0

For example, a TE-046-EB1M will exert a force of 0.4 times the air line pressure; a TE-173-EB1M will exert a force of 1.7 times the air pressure, etc.

List Prices

Basic Model	Base Price by Bore Size						
	9/16"	3/4"	1-1/16"	1-1/2"	2"	2-1/2"	3"
TE							
Adder per 1" of Stroke							

Options	Adders by Bore Size						
	9/16"	3/4"	1-1/16"	1-1/2"	2"	2-1/2"	3"
B-Internal Bumpers, Both Ends							
C-Adjustable Cushions, Both Ends							
D-Dowel Pin Holes— Standard Tooling Plate							
D-Dowel Pin Holes—Stainless Steel Tooling Plate							
EB1-External Bumpers, Extension (1 set)							
EB1-with S-Option							
EB2-External Bumpers, Both Ends (2 sets)							
EB2-with S-Option							
H-12 Tapped Holes							
K-Shock Absorbers, Per End							
M-MRS Magnetic Position Sensing							
P-Mounting Plate*							
S-Stainless Steel Tooling Plate							

**Option P includes 12 tapped holes (option H)*

Engineering Data

- Rated 250 psi
- Low breakaway friction

Components:

- 303 stainless steel shafts
- Clear anodized aluminum housing and tooling plate
- Plastic composite guide shaft bearings

Cylinder:

- 304 stainless steel body
- High-strength aluminum alloy porting ends
- 303 stainless steel piston rods
- Buna N "U" cup seals
- Sintered bronze rod guide bushing

Options:

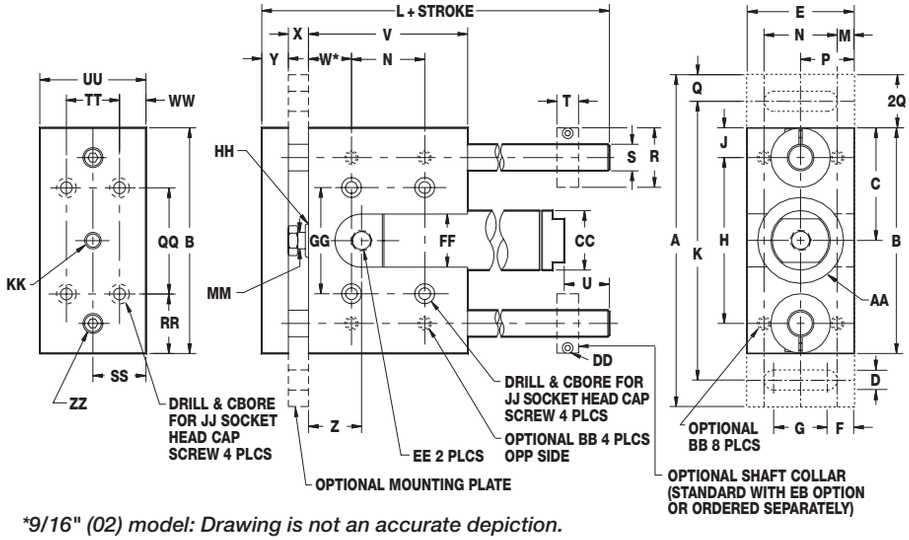
- Internal Buna N or external urethane bumpers
- Patented adjustable cushions*
- Buna N magnet for position sensing

* U.S. Patent nos. 4,794,681 and 4,862,786

Temperature Range:
Buna N seals with a temperature range of -20°F (-25°C) to 200°F (95°C) are standard in all BIMBA air cylinders. High temperature option A seals rated for higher temperature applications are available. If cylinders are operated at temperatures below 0°F for extended time periods, special modifications may be required. Special seal materials are available on request.
With -M option: -20°F to +185°F (-25°C to +85°C).

Lubrication:
Air cylinders are pre-lubricated and sealed at the factory for extensive maintenance-free life. Cylinder life can be lengthened by providing additional lubricant with an air line mist lubricator or direct introduction of oil to the cylinder every 500 hours of operation. Recommended oils are medium to heavy inhibited hydraulic and general purpose oil.

Dimensions (in.)



**9/16" (02) model: Drawing is not an accurate depiction.*

Bore	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q
9/16" (02)	3.50	2.50	1.25	0.22	1.00	0.31	0.38	1.75	0.38	3.00	3.50	0.12	0.75	0.50	0.25
3/4" (04)	4.50	3.00	1.50	0.25	1.25	0.38	0.50	2.12	0.44	3.75	4.25	0.16	0.94	0.62	0.38
1-1/16" (09)	6.25	4.25	2.12	0.38	2.00	0.50	1.00	3.12	0.56	5.25	5.00	0.31	1.38	1.00	0.50
1-1/2" (17)	7.50	5.50	2.75	0.44	2.50	0.59	1.31	4.00	0.75	6.50	6.38	0.38	1.75	1.25	0.50
2" (31)	8.00	6.00	3.00	0.44	3.00	0.75	1.50	4.25	0.88	7.00	7.12	0.50	2.00	1.50	0.50
2-1/2" (50)	11.50	7.50	3.75	0.69	3.50	0.84	1.81	5.37	1.06	9.50	9.75	0.50	2.50	1.75	1.00
3" (70)	13.00	9.00	4.50	0.81	4.50	1.15	2.19	6.50	1.25	11.00	11.50	0.75	3.00	2.25	1.00

Bore	R	S	T	U	V	W	X	Y	Z	AA	BB	CC	DD	EE
9/16" (02)	0.88	0.38	0.34	0.60	2.25	1.25	0.25	0.38	0.86	0.75	8-32	0.62	6-32	10-32
3/4" (04)	1.12	0.50	0.41	0.52	2.50	0.78	0.38	0.50	0.85	1.00	10-32	0.81	8-32	1/8 NPT
1-1/16" (09)	1.31	0.62	0.44	0.98	3.00	0.81	0.38	0.62	1.00	1.50	1/4-20	1.12	10-32	1/8 NPT
1-1/2" (17)	1.50	0.75	0.50	1.57	4.00	1.12	0.50	0.75	1.38	2.00	5/16-18	1.56	1/4-28	1/8 NPT
2" (31)	1.62	0.88	0.50	1.07	4.00	1.00	0.75	1.00	1.60	2.25	5/16-18	2.08	1/4-28	1/4 NPT
21/2" (50)	1.87	1.13	0.50	2.20	6.00	1.75	0.75	1.25	1.45	3.00	3/8-16	2.62	1/4-28	1/4-NPT
3" (70)	2.25	1.38	0.56	3.73	7.00	2.00	1.00	1.50	1.62	3.50	1/2-13	3.12	1/4-28	3/8 NPT

Bore	FF	GG	HH	JJ	KK	MM	QQ	RR	SS	TT	UU	WW	ZZ
9/16" (02)	0.69	1.00	7/16-20	#8	10-32	0.19	1.25	0.63	0.45	0.60	0.90	0.15	#10-32
3/4" (04)	0.94	1.25	5/8-18	#10	1/4-28	0.25	1.50	0.75	0.58	0.75	1.15	0.20	1/4-20
1-1/16" (09)	1.12	1.88	5/8-18	1/4	5/16-24	0.31	2.00	1.12	0.88	1.00	1.75	0.38	5/16-18
1-1/2" (17)	1.12	2.38	3/4-16	5/16	7/16-20	0.44	3.00	1.25	1.12	1.50	2.25	0.38	3/8-16
2" (31)	1.25	2.70	1-1/4-12	5/16	1/2-20	0.62	3.00	1.50	1.38	2.00	2.75	0.38	3/8-16
2-1/2" (50)	1.50	3.50	1 3/8-12	3/8	1/2-20	0.63	3.75	1.88	1.63	2.25	3.25	0.50	1/2-13
3" (70)	1.75	4.20	1 1/2-12	1/2	5/8-18	0.75	4.50	2.25	2.00	2.75	4.00	0.63	3/4-16

Linear Thrusters ordered with adjustable cushions incorporate a side port on rear of cylinder.

Repair Parts

Add the bore size to the basic model number shown below. For the Basic Shaft, specify the stroke length in inches and indicate options -EB1 or -EB2 as applicable. For example, shaft collars for a 1-1/16" bore Linear Thruster Series TE would be SCTE-09.

The Basic Shaft for the same thruster with 8-1/2" stroke would be BSTE-09-8.5. Cylinder repair part number corresponds to number shown on cylinder shipped with Linear Thruster.

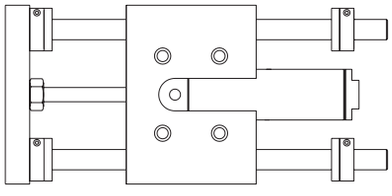
Part #	Description	Quantity
BTE-☐	Shaft Bearing	4
BSTE-☐	-X.XX Basic Shaft	2
EBTE-☐	External Bumper	2 or 4
LT-Bore Stroke-D	Cylinder	1
LT-Bore Stroke-DB	Cylinder	1
LT-Bore Stroke-DM*	Cylinder	1
LT-Bore Stroke-DBM*	Cylinder	1
LTC-Bore Stroke-D	Cylinder	1
LTC-Bore Stroke-DM	Cylinder	1
SCTE-☐	Shaft Collars	2 or 4
TNTE-☐	Cylinder Lock Nut	1

**For 1-1/16" bore use LTE prefix.*

External Bumpers

Use and Dimensional Changes

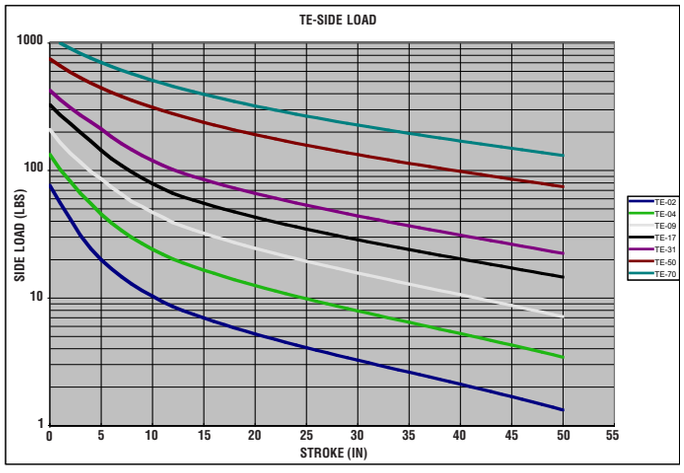
Guide Shaft Extention with Bumpers (in.)	
Bore Size	**Length Adder**
9/16"	0.5
3/4"	0.5
1-1/16"	0.63
1-1/2"	0.75
2"	0.875
2-1/2"	1.38
3"	1.50



Retraction Stroke Reduction with Bumpers (in.)		
Bore Size	**Reduction**	
	Standard	**with Mounting Plate Option**
9/16"	0.34	0.59
3/4"	0.28	0.66
1-1/16"	0.31	0.69
1-1/2"	0.25	0.75
2"	0	0.75
2-1/2"	.25	1.00
3"	.31	1.31

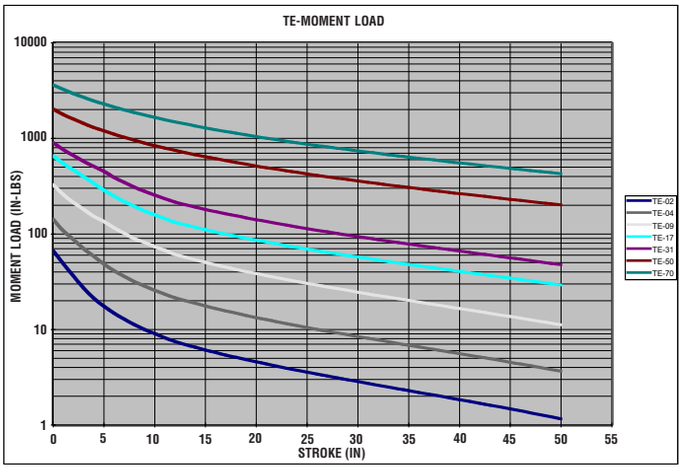
The stroke can be adjusted with external urethane bumpers. These are available on one or both ends (-EB1 and -EB2 options). They are 1/4" thick in all bore sizes, and fit over the guide shafts at the ends of the housing (see illustration). Shaft collars are supplied with each set of bumpers to eliminate movement possible with high loads and velocities. Thus, with -EB1 option, there will be a total of two collars; with -EB2 option, there will be four shaft collars. **Guide shafts are lengthened so stroke on extension isn't affected; however, bumpers reduce the retraction stroke (see charts above).** Higher loads and velocities may dictate the use of external means of deceleration such as shock absorbers.

TE - Maximum Side Loads (lbs.)



	TE-02	TE-04	TE-09	TE-17	TE-31	TE-50	TE-70
0	76.52	133.95	210.00	328.24	425.18	752.44	1000.00
1	55.80	102.00	165.60	273.00	359.17	661.79	999.87
2	41.50	82.00	136.00	233.00	310.00	590.30	905.30
3	31.00	66.00	116.00	199.00	271.00	532.45	826.67
4	24.40	55.02	98.00	170.00	240.00	484.67	760.25
5	19.96	45.50	86.00	144.00	211.67	444.52	703.38
6	16.94	38.78	74.00	124.00	183.91	410.31	654.14
7	14.65	33.77	65.00	109.00	162.33	380.80	611.07
8	12.83	29.78	57.00	97.00	145.22	355.07	573.07
9	11.44	26.71	52.00	87.00	131.26	332.44	539.30
10	10.32	24.11	47.00	79.00	119.66	312.38	509.07
11	9.30	21.99	43.00	72.00	109.74	294.46	481.85
12	8.54	20.16	39.00	66.00	101.38	278.35	457.20
13	7.95	18.81	36.46	62.03	95.03	263.80	434.78
14	7.43	17.61	34.20	58.48	89.66	250.57	414.28
15	6.96	16.53	32.17	55.27	84.80	238.50	395.47
16	6.54	15.57	30.35	52.36	80.39	227.44	378.15
17	6.16	14.70	28.69	49.71	76.36	217.25	362.13
18	5.82	13.90	27.18	47.28	72.67	207.85	347.28
19	5.51	13.18	25.79	45.05	69.26	199.14	333.46
20	5.22	12.51	24.52	42.99	66.12	191.04	320.58
21	4.95	11.89	23.34	41.08	63.20	183.49	308.53
22	4.71	11.32	22.25	39.31	60.49	176.43	297.23
23	4.48	10.79	21.23	37.66	57.96	169.82	286.62
24	4.27	10.30	20.29	36.12	55.59	163.62	276.63
25	4.07	9.84	19.40	34.67	53.37	157.77	267.21
26	3.89	9.41	18.57	33.31	51.28	152.26	258.30
27	3.71	9.00	17.79	32.03	49.32	147.06	249.87
28	3.55	8.62	17.06	30.83	47.46	142.13	241.87
29	3.39	8.25	16.36	29.69	45.70	137.46	234.28
30	3.25	7.91	15.70	28.61	44.04	133.02	227.05
31	3.11	7.59	15.08	27.58	42.46	128.79	220.17
32	2.97	7.28	14.48	26.61	40.96	124.77	213.60
33	2.85	6.98	13.92	25.68	39.52	120.93	207.32
34	2.73	6.70	13.38	24.79	38.16	117.27	201.32
35	2.61	6.43	12.86	23.95	36.85	113.76	195.58
36	2.50	6.18	12.37	23.14	35.60	110.41	190.07
37	2.40	5.93	11.90	22.37	34.41	107.19	184.78
38	2.29	5.69	11.44	21.63	33.26	104.10	179.71
39	2.20	5.47	11.01	20.91	32.16	101.13	174.82
40	2.10	5.25	10.59	20.23	31.10	98.27	170.12
41	2.01	5.04	10.19	19.57	30.08	95.52	165.60
42	1.93	4.83	9.80	18.94	29.10	92.87	161.23
43	1.84	4.64	9.42	18.33	28.15	90.32	157.01
44	1.76	4.45	9.06	17.74	27.24	87.85	152.94
45	1.68	4.26	8.71	17.17	26.35	85.47	149.01
46	1.60	4.09	8.37	16.61	25.50	83.16	145.20
47	1.53	3.91	8.04	16.08	24.67	80.93	141.52
48	1.46	3.75	7.73	15.56	23.87	78.77	137.95
49	1.39	3.58	7.42	15.06	23.09	76.67	134.49
50	1.32	3.43	7.12	14.58	22.34	74.64	131.13

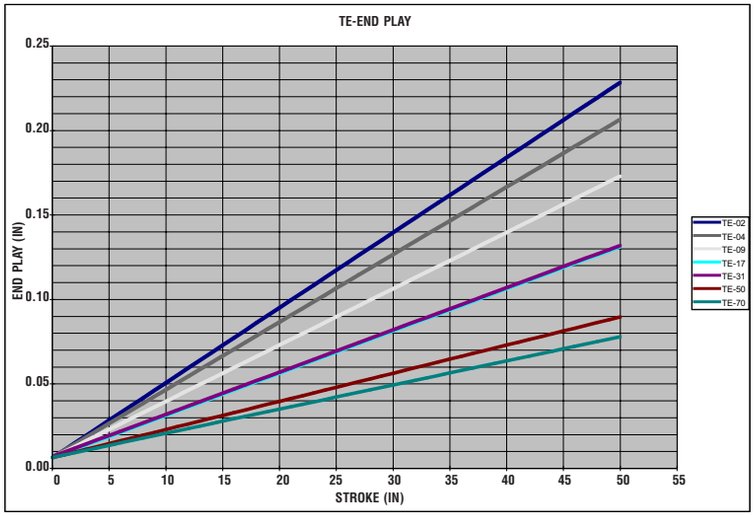
TE - Maximum Moments (in.-lbs.)



	TE-02	TE-04	TE-09	TE-17	TE-31	TE-50	TE-70
0	66.96	142.32	328.12	656.48	903.51	2022.18	3623.75
1	48.83	108.38	258.75	546.00	763.24	1778.57	3249.57
2	36.31	87.13	212.50	466.00	658.75	1586.43	2942.22
3	27.13	70.13	181.25	398.00	575.88	1430.96	2686.67
4	21.35	58.46	153.13	340.00	510.00	1302.54	2470.80
5	17.47	48.34	134.38	288.00	449.80	1194.65	2285.99
6	14.82	41.20	115.63	248.00	390.81	1102.70	2125.94
7	12.82	35.88	101.56	218.00	344.95	1023.39	1985.97
8	11.23	31.64	89.06	194.00	308.59	954.26	1862.49
9	10.01	28.38	81.25	174.00	278.93	893.44	1752.72
10	9.03	25.62	73.44	158.00	254.28	839.52	1654.47
11	8.14	23.36	67.19	144.00	233.20	791.36	1566.00
12	7.47	21.42	60.94	132.00	215.43	748.08	1485.90
13	6.95	19.98	56.97	124.07	201.93	708.96	1413.03
14	6.50	18.71	53.44	116.95	190.52	673.41	1346.42
15	6.09	17.57	50.27	110.54	180.20	640.97	1285.29
16	5.72	16.54	47.41	104.72	170.83	611.24	1228.98
17	5.39	15.62	44.82	99.42	162.27	583.87	1176.92
18	5.09	14.77	42.46	94.56	154.41	558.60	1128.65
19	4.82	14.00	40.30	90.10	147.18	535.18	1083.75
20	4.57	13.29	38.31	85.98	140.50	513.41	1041.87
21	4.34	12.64	36.47	82.17	134.30	493.13	1002.71
22	4.12	12.03	34.76	78.62	128.54	474.16	966.01
23	3.92	11.47	33.18	75.32	123.16	456.40	931.52
24	3.74	10.94	31.70	72.23	118.13	439.72	899.05
25	3.56	10.45	30.32	69.34	113.42	424.01	868.43
26	3.40	9.99	29.02	66.62	108.98	409.21	839.48
27	3.25	9.56	27.80	64.07	104.80	395.21	812.08
28	3.10	9.15	26.65	61.65	100.86	381.97	786.09
29	2.97	8.77	25.56	59.37	97.12	369.41	761.40
30	2.84	8.41	24.53	57.21	93.59	357.48	737.91
31	2.72	8.06	23.56	55.16	90.23	346.14	715.54
32	2.60	7.73	22.63	53.21	87.03	335.33	694.19
33	2.49	7.42	21.74	51.36	83.99	325.01	673.80
34	2.39	7.12	20.90	49.59	81.09	315.16	654.30
35	2.29	6.83	20.10	47.90	78.31	305.74	635.63
36	2.19	6.56	19.33	46.28	75.66	296.71	617.73
37	2.10	6.30	18.59	44.74	73.12	288.06	600.55
38	2.01	6.05	17.88	43.25	70.68	279.76	584.05
39	1.92	5.81	17.20	41.83	68.34	271.78	568.18
40	1.84	5.58	16.55	40.46	66.09	264.10	552.90
41	1.76	5.35	15.92	39.14	63.92	256.71	538.18
42	1.68	5.14	15.31	37.87	61.83	249.59	523.99
43	1.61	4.93	14.73	36.65	59.82	242.73	510.30
44	1.54	4.73	14.16	35.47	57.88	236.09	497.07
45	1.47	4.53	13.61	34.33	56.00	229.69	484.28
46	1.40	4.34	13.08	33.23	54.19	223.49	471.91
47	1.34	4.16	12.57	32.16	52.43	217.50	459.93
48	1.28	3.98	12.07	31.13	50.73	211.69	448.33
49	1.21	3.81	11.59	30.12	49.08	206.06	437.08
50	1.15	3.64	11.12	29.15	47.47	200.60	426.16

Frictional characteristics of TE Series Linear Thrusters deteriorate as stroke length increases.

TE - Tooling Plate End Play (in.)



	TE-02	TE-04	TE-09	TE-17	TE-31	TE-50	TE-70
0	0.006	0.007	0.006	0.006	0.007	0.006	0.006
1	0.011	0.011	0.010	0.009	0.009	0.008	0.008
2	0.015	0.015	0.013	0.011	0.012	0.010	0.009
3	0.019	0.019	0.016	0.014	0.014	0.011	0.011
4	0.024	0.023	0.020	0.016	0.017	0.013	0.012
5	0.028	0.027	0.023	0.019	0.019	0.015	0.014
6	0.033	0.031	0.026	0.021	0.022	0.016	0.015
7	0.037	0.035	0.030	0.024	0.024	0.018	0.016
8	0.042	0.039	0.033	0.026	0.027	0.020	0.018
9	0.046	0.043	0.036	0.029	0.029	0.021	0.019
10	0.051	0.047	0.040	0.031	0.032	0.023	0.021
11	0.055	0.051	0.043	0.034	0.034	0.025	0.022
12	0.059	0.055	0.046	0.036	0.037	0.026	0.024
13	0.064	0.059	0.050	0.039	0.039	0.028	0.025
14	0.068	0.063	0.053	0.041	0.042	0.030	0.026
15	0.073	0.067	0.056	0.044	0.044	0.031	0.028
16	0.077	0.071	0.060	0.046	0.047	0.033	0.029
17	0.082	0.075	0.063	0.049	0.049	0.035	0.031
18	0.086	0.079	0.066	0.051	0.052	0.036	0.032
19	0.091	0.083	0.070	0.054	0.054	0.038	0.034
20	0.095	0.087	0.073	0.056	0.057	0.040	0.035
21	0.099	0.091	0.076	0.059	0.059	0.041	0.036
22	0.104	0.095	0.080	0.061	0.062	0.043	0.038
23	0.108	0.099	0.083	0.064	0.064	0.045	0.039
24	0.113	0.103	0.086	0.066	0.067	0.046	0.041
25	0.117	0.107	0.090	0.069	0.069	0.048	0.042
26	0.122	0.111	0.093	0.071	0.072	0.050	0.044
27	0.126	0.115	0.096	0.074	0.074	0.051	0.045
28	0.131	0.119	0.100	0.076	0.077	0.053	0.046
29	0.135	0.123	0.103	0.079	0.079	0.055	0.048
30	0.139	0.127	0.106	0.081	0.082	0.056	0.049
31	0.144	0.131	0.110	0.084	0.084	0.058	0.051
32	0.148	0.135	0.113	0.086	0.087	0.060	0.052
33	0.153	0.139	0.116	0.089	0.089	0.061	0.054
34	0.157	0.143	0.120	0.091	0.092	0.063	0.055
35	0.162	0.147	0.123	0.094	0.094	0.065	0.056
36	0.166	0.151	0.126	0.096	0.097	0.066	0.058
37	0.171	0.155	0.130	0.099	0.099	0.068	0.059
38	0.175	0.159	0.133	0.101	0.102	0.070	0.061
39	0.179	0.163	0.136	0.104	0.104	0.071	0.062
40	0.184	0.167	0.140	0.106	0.107	0.073	0.064
41	0.188	0.171	0.143	0.109	0.109	0.075	0.065
42	0.193	0.175	0.146	0.111	0.112	0.076	0.066
43	0.197	0.179	0.150	0.114	0.114	0.078	0.068
44	0.202	0.183	0.153	0.116	0.117	0.080	0.069
45	0.206	0.187	0.156	0.119	0.119	0.081	0.071
46	0.211	0.191	0.160	0.121	0.122	0.083	0.072
47	0.215	0.195	0.163	0.124	0.124	0.085	0.074
48	0.219	0.199	0.166	0.126	0.127	0.086	0.075
49	0.224	0.203	0.170	0.129	0.129	0.088	0.076
50	0.228	0.207	0.173	0.131	0.132	0.090	0.078

How to Order

The model number of all Linear Thrusters consists of three alphanumeric clusters. These designate product type, bore size and stroke length, and options. Please refer to the charts below for an example of model number T-046-CM. This is a 3/4" bore, 6" stroke Linear Thruster with adjustable cushions and a magnet for position sensing.

T-046-CM

BORE SIZE	STANDARD STROKE LENGTHS*
02 - 9/16"	1" increments to 6"
04 - 3/4"	1" increments to 12"
09 - 1-1/16"	1" increments to 12"
17 - 1-1/2"	1" increments to 12"
31 - 2"	1" increments to 12"
50 - 2-1/2"	1" increments to 12"
70 - 3"	1" increments to 12"

**Stroke lengths beyond maximum are available; the rear of the cylinder must be supported in horizontal applications.*

OPTIONS

- B - Internal bumpers, both ends[1]
- C - Adjustable cushions, both ends[1]
- D - Dowel pin holes for Transition Plate[2]
- EB1 - External bumpers, extension (one set) (see page 3.20)
- EB2 - External bumpers, both ends (two sets) (see page 3.20)
- K _ _ - Shock absorbers[3]
  - 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
- M - MRS® magnetic position sensing[4]
- NP - No mounting plate
- S - Stainless steel tooling plate, shafts and collars[5]

[1] Internal bumpers and cushions cannot be ordered in combination. Adjustable cushions are not available for 9/16" bore size.

[2] Transition Plate Applications: Option-D must be ordered if dowel pin holes are required. Not available in 2-1/2" and 3" bores with S option. Dowel pin hole locations shown in Appendix.

[3] Not available on 2-1/2" and 3" bores.

[4] Hall Effect Switch not available for 9/16" bore size.

[5] Not available in 2-1/2" and 3" bores.

Approximate Power Factors

9/16"	=	0.2
3/4"	=	0.4
1-1/16"	=	0.9
1-1/2"	=	1.7
2"	=	3.1
2-1/2"	=	5.0
3"	=	7.0

For example, a T-046-CM will exert a force of 0.4 times the air line pressure; a T-173-M will exert a force of 1.7 times the air pressure, etc.

List Prices

Basic Model	Base Price by Bore Size						
	9/16"	3/4"	1-1/16"	1-1/2"	2"	2-1/2"	3"
T							
Adder per 1" of Stroke							

Options	Adders by Bore Size						
	9/16"	3/4"	1-1/16"	1-1/2"	2"	2-1/2"	3"
B-Internal Bumpers, Both Ends							
C-Adjustable Cushions, Both Ends							
D-Dowel Pin Holes— Standard Tooling Plate							
D-Dowel Pin Holes—Stainless Steel Tooling Plate							
EB1-External Bumpers, Extension (1 set)							
EB1-with S-Option							
EB2-External Bumpers, Both Ends (2 sets)							
EB2-with S-Option							
K-Shock Absorbers, Per End							
M-MRS Magnetic Position Sensing							
NP-No Mounting Plate (Deduct from Price)							
S-Stainless Steel Tooling Plate, Shafts and Collars (Base Price)							
Adder Per Inch of Stroke							

Engineering Data

- Rated 250 psi
- Low breakaway friction

Components:

- Case hardened steel shafts
- Steel tooling plate and collars
- Black anodized aluminum housing and mounting plate
- Precision recirculating ball bearings

Cylinder:

- 304 stainless steel body
- High-strength aluminum alloy porting ends
- 303 stainless steel piston rods
- Buna N "U" cup seals
- Sintered bronze rod guide bushing

Options:

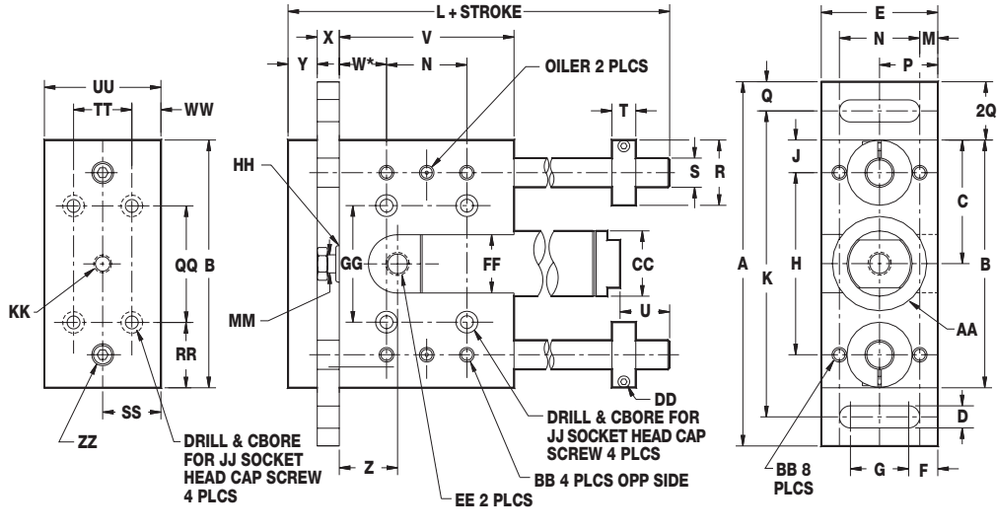
- Internal Buna N or external urethane bumpers
- Patented adjustable cushions*
- Buna N magnet for position sensing

Temperature Range:
Buna N seals with a temperature range of -20°F (-25°C) to 200°F (95°C) are standard in all BIMBA air cylinders. High temperature option A seals rated for higher temperature applications are available. If cylinders are operated at temperatures below 0°F for extended time periods, special modifications may be required. Special seal materials are available on request.
With -M option: -20°F to +185°F (-25°C to +85°C)

Lubrication:
Air cylinders are pre-lubricated and sealed at the factory for extensive maintenance-free life. Cylinder life can be lengthened by providing additional lubricant with an air line mist lubricator or direct introduction of oil to the cylinder every 500 hours of operation. Recommended oils are medium to heavy inhibited hydraulic and general purpose oil.

The two spring-loaded oiler ports on the housing face should also receive several drops of the same oil every 100 hours of operation. For applications that involve rapid cycling, oil these ports more often.

Dimensions



**9/16" (02) model: Drawing is not an accurate depiction.*

Bore	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R
9/16" (02)	3.50	2.50	1.25	0.22	1.00	0.31	0.38	1.75	0.38	3.00	3.50	0.12	0.75	0.50	0.25	0.62
3/4" (04)	4.50	3.00	1.50	0.25	1.25	0.38	0.50	2.12	0.44	3.75	4.12	0.16	0.94	0.62	0.38	0.88
1-1/16" (09)	6.25	4.25	2.12	0.38	2.00	0.50	1.00	3.12	0.56	5.25	4.75	0.31	1.38	1.00	0.50	1.12
1-1/2" (17)	7.50	5.50	2.75	0.44	2.50	0.59	1.31	4.00	0.75	6.50	6.25	0.38	1.75	1.25	0.50	1.31
2" (31)	9.50	7.00	3.50	0.56	4.00	1.22	1.56	5.00	1.00	8.25	7.00	0.94	2.12	2.00	0.63	1.50
2-1/2" 50)	12.50	8.50	4.25	0.63	4.50	1.25	2.00	6.25	1.13	10.50	9.50	0.94	2.63	2.25	1.00	1.75
3" (70)	15.00	11.00	5.50	0.81	6.00	1.41	3.19	8.00	1.50	13.00	11.50	1.00	4.00	3.00	1.00	2.06

Bore	S	T	U	V	W	X	Y	Z	AA	BB	CC	DD	EE	FF
9/16" (02)	0.25	0.28	0.67	2.25	1.25	0.25	0.31	0.86	0.75	8-32	0.62	4-40	10-32	0.69
3/4" (04)	0.38	0.34	0.51	2.50	0.78	0.38	0.38	0.85	0.94	10-32	0.81	6-32	1/8 NPT	0.94
1-1/16" (09)	0.50	0.41	0.85	3.00	0.81	0.38	0.50	1.00	1.62	1/4-20	1.12	8-32	1/8 NPT	1.12
1-1/2" (17)	0.62	0.44	1.44	4.00	1.12	0.50	0.75	1.50	2.12	5/16-18	1.56	10-32	1/8 NPT	1.12
2" (31)	0.75	0.50	0.95	4.00	0.94	0.75	1.00	1.60	3.00	3/8-16	2.08	1/4-28	1/4 NPT	1.25
2-1/2" (50)	1.00	0.50	2.92	6.00	1.69	0.75	1.25	1.48	3.50	3/8-16	2.62	1/4-28	1/4 NPT	1.25
3" (70)	1.25	0.50	3.75	7.00	1.50	1.00	1.50	1.88	4.63	1/2-13	3.12	1/4-28	3/8 NPT	1.25

Bore	GG	HH	JJ	KK	MM	QQ	RR	SS	TT	UU	WW	ZZ
9/16" (02)	1.00	7/16-20	#8	10-32	0.19	1.25	0.62	0.50	0.60	1.00	0.20	N/A
3/4" (04)	1.25	5/8-18	#10	1/4-28	0.25	1.50	0.75	0.62	0.75	1.25	0.25	10-32
1-1/16" (09)	1.88	5/8-18	1/4	5/16-24	0.31	2.00	1.12	1.00	1.00	2.00	0.50	1/4-20
1-1/2" (17)	2.38	3/4-16	5/16	7/16-20	0.437	3.00	1.25	1.25	1.50	2.50	0.50	3/8-16
2" (31)	3.25	1-1/4-12	3/8	1/2-20	0.625	4.00	1.50	1.50	2.00	3.00	0.50	3/8-16
2-1/2" (50)	4.10	1-3/8-12	3/8	1/2-20	0.63	4.75	1.76	2.00	3.00	4.00	N/A	1/2-13
3" (70)	5.25	1-1/2-12	1/2	5/8-18	0.75	6.00	2.50	2.00	3.00	4.00	N/A	3/4-16

Linear Thrusters ordered with adjustable cushions incorporate a side port on rear of cylinder.

External Bumpers

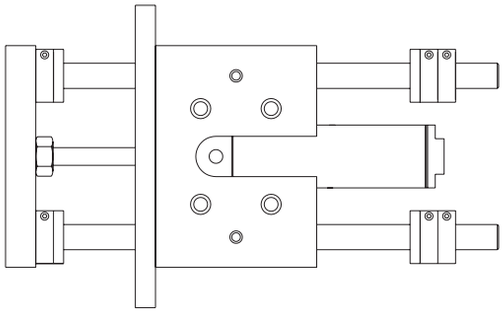
Use and Dimensional Changes

The stroke can be adjusted with external urethane bumpers. These are available on one or both ends (-EB1 and -EB2 options). They are 1/4" thick in all bore sizes, and fit over the guide shafts at the ends of the housing (see illustration). Shaft collars are supplied with each set of bumpers to eliminate movement possible with high loads and velocities. Thus, with -EB1 option, there will be a total of four collars; with -EB2 option, there will be six shaft collars. Flat stainless steel washers are also installed to protect the shaft seals from impact damage. **Guide shafts are lengthened so stroke on extension isn't affected; however, bumpers reduce the retraction stroke if the mounting plate is used in the shipped position (see charts below).** Higher loads and velocities may dictate the use of external means of deceleration such as shock absorbers.

Guide Shaft Extention with Bumpers (in.)	
Bore Size	Length Adder
9/16"	0.5
3/4"	0.5
1-1/16"	0.63
1-1/2"	0.75
2"	0.875
2-1/2"	1.38
3"	1.50

Retraction Stroke Reduction with Bumpers (in.)		
Bore Size	With Mounting Plate	Without Mounting Plate
9/16"	0.56	.31
3/4"	0.62	.24
1-1/16"	0.70	N/A
1-1/2"	0.73	.25
2"	0.81	N/A
2-1/2"	1.06	0.31
3"	1.31	0.31

NOTE: The single set of shaft collars supplied with each Linear Thruster are for setup only. DO NOT use them to limit the stroke or damage can occur.



Repair Parts

Add the bore size to the basic model number shown below. For the Basic Shaft, specify the stroke length in inches and indicate options -EB1 or -EB2 and -S as applicable. For example, shaft seals for a 1-1/16" bore Linear Thruster would be S-09. The Basic Shaft for the same thruster with 8-1/2" stroke would be BS-09-8.5. Cylinder repair part number corresponds to number shown on cylinder shipped with Linear Thruster.

Part #	Description	Quantity
B-☐	Shaft Bearing	4
BS-☐	-X.XX Basic Shaft	2
EB-☐	External Bumper Assembly	2 or 4
LT-Bore Stroke-D	Cylinder	1
LT-Bore Stroke-DB	Cylinder	1
LT-Bore Stroke-DM*	Cylinder	1
LT-Bore Stroke-DBM*	Cylinder	1
LTC-Bore Stroke-D	Cylinder	1
LTC-Bore Stroke-DM	Cylinder	1
S-☐	Shaft Seal	4
SC-☐	Shaft Collars	2, 4 or 6
TN-☐	Cylinder Lock Nut	1

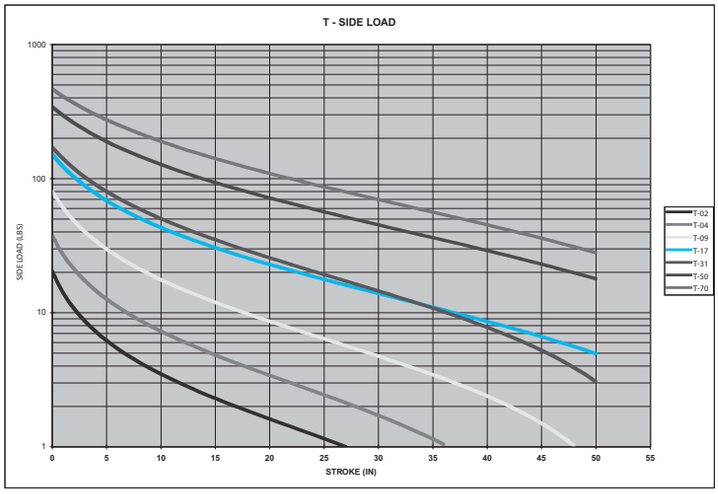
NOTE: We recommend that if bearings are replaced, seals be replaced at the same time.
**For 1-1/16" bore use LTE prefix.*

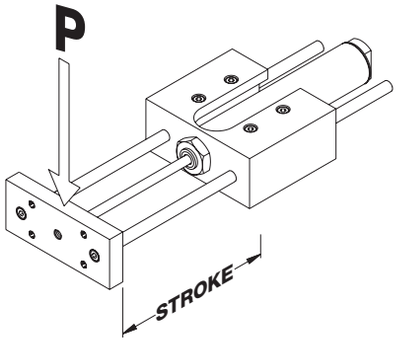
Approximate Weights

(T and TE Series)

Bore	Base Weight (oz.)	Adder per 1" (oz.)	Mounting Plate (oz.)
9/16" (02)	13	1	1
3/4" (04)	32	2.2	2.2
1-1/16" (09)	46	5.7	5
1-1/2" (17)	154	6.3	10
2" (31)	296	8.3	32
Model T			
2-1/2" (50)	586	9.9	191
3" (70)	1048	15.2	408
Model TE			
2-1/2" (50)	400	11.7	137
3" (70)	640	17.6	265

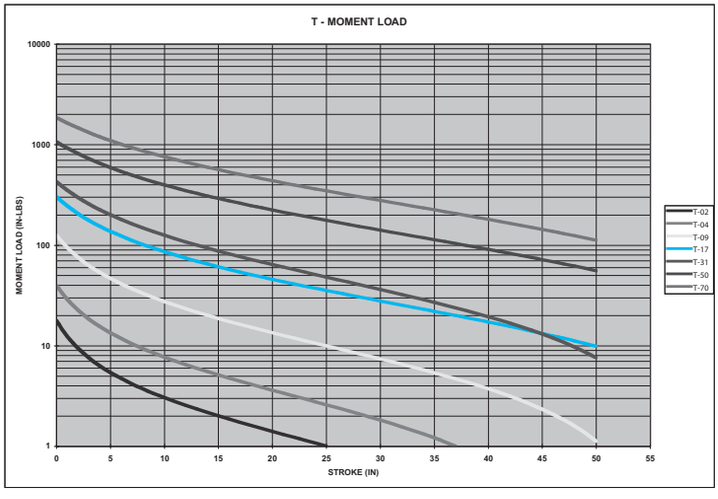
T - Maximum Side Loads (lbs.)

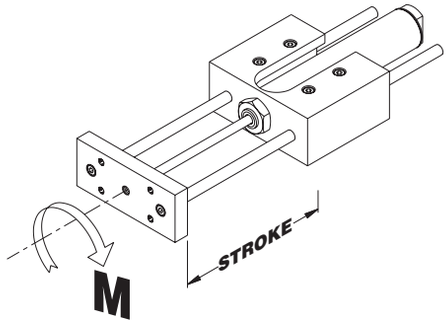




	T-02	T-04	T-09	T-17	T-31	T-50	T-70
0	20.34	37.49	80.50	151.62	171.30	342.37	465.67
1	14.11	27.17	60.61	122.73	140.62	295.93	410.17
2	10.76	21.23	48.46	102.88	118.91	260.13	365.92
3	8.67	17.38	40.26	88.39	102.73	231.67	329.78
4	7.24	14.66	34.34	77.34	90.19	208.50	299.70
5	6.19	12.65	29.87	68.63	80.18	189.25	274.27
6	5.40	11.09	26.37	61.58	72.00	173.00	252.46
7	4.77	9.85	23.54	55.75	65.19	159.10	233.56
8	4.26	8.83	21.22	50.86	59.41	147.06	217.00
9	3.84	7.98	19.27	46.68	54.46	136.52	202.37
10	3.48	7.26	17.61	43.07	50.16	127.22	189.34
11	3.18	6.64	16.17	39.92	46.38	118.95	177.66
12	2.91	6.10	14.92	37.14	43.04	111.54	167.13
13	2.68	5.63	13.82	34.67	40.06	104.85	157.57
14	2.48	5.21	12.83	32.47	37.39	98.80	148.86
15	2.30	4.83	11.96	30.48	34.97	93.28	140.88
16	2.13	4.49	11.16	28.67	32.77	88.23	133.54
17	1.98	4.18	10.44	27.03	30.77	83.58	126.77
18	1.85	3.90	9.79	25.53	28.92	79.30	120.49
19	1.72	3.64	9.18	24.15	27.22	75.33	114.66
20	1.61	3.40	8.63	22.87	25.65	71.64	109.22
21	1.50	3.18	8.11	21.69	24.19	68.20	104.14
22	1.41	2.98	7.64	20.59	22.83	64.99	99.37
23	1.31	2.78	7.19	19.57	21.56	61.97	94.89
24	1.23	2.60	6.78	18.61	20.37	59.14	90.67
25	1.15	2.44	6.39	17.71	19.25	56.48	86.68
26	1.07	2.28	6.02	16.86	18.20	53.96	82.91
27	1.00	2.12	5.67	16.06	17.20	51.58	79.34
28		1.98	5.34	15.31	16.26	49.32	75.94
29		1.84	5.03	14.60	15.36	47.18	72.72
30		1.71	4.74	13.92	14.51	45.14	69.64
31		1.59	4.45	13.28	13.70	43.20	66.71
32		1.47	4.18	12.66	12.93	41.35	63.90
33		1.36	3.93	12.08	12.19	39.58	61.22
34		1.25	3.68	11.52	11.48	37.89	58.64
35		1.14	3.45	10.98	10.80	36.26	56.18
36		1.04	3.22	10.47	10.15	34.70	53.80
37			3.00	9.98	9.52	33.21	51.52
38			2.79	9.50	8.92	31.77	49.33
39			2.59	9.05	8.34	30.38	47.21
40			2.39	8.61	7.78	29.05	45.16
41			2.20	8.19	7.24	27.76	43.19
42			2.02	7.78	6.72	26.51	41.28
43			1.84	7.38	6.21	25.30	39.43
44			1.67	7.00	5.72	24.14	37.64
45			1.50	6.63	5.24	23.01	35.91
46			1.33	6.27	4.78	21.91	34.22
47			1.17	5.92	4.33	20.85	32.59
48			1.02	5.58	3.89	19.82	31.00
49				5.25	3.47	18.82	29.46
50				4.93	3.05	17.84	27.95

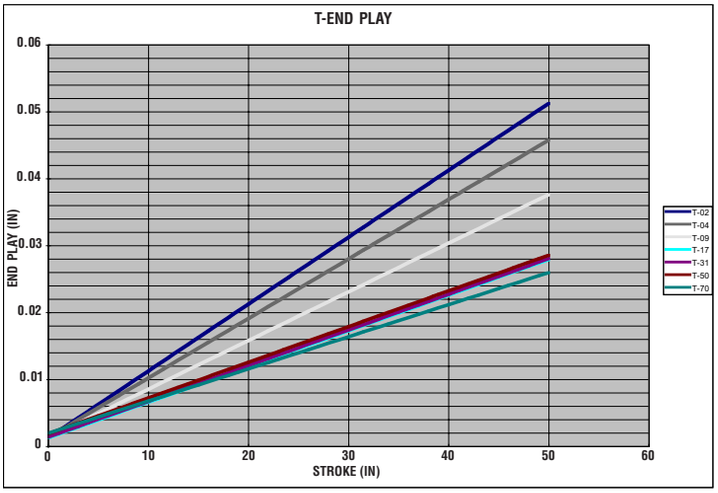
T - Maximum Moments (in.-lbs.)





	T-02	T-04	T-09	T-17	T-31	T-50	T-70
0	17.80	39.83	125.78	303.23	428.25	1069.92	1862.69
1	12.35	28.86	94.70	245.46	351.56	924.78	1640.70
2	9.42	22.56	75.72	205.76	297.28	812.90	1463.66
3	7.59	18.46	62.90	176.78	256.83	723.97	1319.12
4	6.33	15.58	53.66	154.68	225.48	651.55	1198.81
5	5.42	13.44	46.67	137.26	200.46	591.41	1097.07
6	4.72	11.78	41.20	123.16	180.01	540.64	1009.86
7	4.17	10.46	36.79	111.51	162.96	497.18	934.23
8	3.73	9.38	33.16	101.71	148.53	459.55	868.00
9	3.36	8.48	30.11	93.36	136.15	426.62	809.47
10	3.05	7.72	27.51	86.14	125.39	397.56	757.37
11	2.78	7.06	25.27	79.84	115.96	371.71	710.65
12	2.55	6.49	23.31	74.28	107.61	348.55	668.51
13	2.35	5.98	21.59	69.35	100.16	327.67	630.29
14	2.17	5.54	20.05	64.93	93.47	308.74	595.44
15	2.01	5.13	18.68	60.95	87.43	291.49	563.53
16	1.86	4.77	17.44	57.35	81.93	275.71	534.18
17	1.73	4.45	16.32	54.06	76.91	261.19	507.08
18	1.62	4.15	15.29	51.06	72.31	247.80	481.98
19	1.51	3.87	14.35	48.30	68.06	235.40	458.64
20	1.41	3.62	13.48	45.74	64.13	223.87	436.89
21	1.32	3.38	12.68	43.38	60.48	213.12	416.54
22	1.23	3.16	11.93	41.18	57.08	203.08	397.47
23	1.15	2.96	11.24	39.13	53.91	193.66	379.55
24	1.08	2.77	10.59	37.22	50.93	184.82	362.66
25	1.01	2.59	9.98	35.42	48.13	176.49	346.72
26		2.42	9.40	33.72	45.49	168.62	331.64
27		2.26	8.86	32.13	43.00	161.18	317.35
28		2.10	8.35	30.62	40.64	154.13	303.78
29		1.96	7.86	29.19	38.40	147.44	290.87
30		1.82	7.40	27.84	36.27	141.07	278.56
31		1.69	6.96	26.55	34.25	135.01	266.83
32		1.56	6.54	25.33	32.31	129.22	255.61
33		1.44	6.14	24.16	30.47	123.69	244.87
34		1.33	5.75	23.04	28.70	118.39	234.58
35		1.21	5.38	21.97	27.00	113.32	224.70
36		1.11	5.03	20.94	25.37	108.45	215.22
37		1.00	4.69	19.96	23.81	103.77	206.09
38			4.36	19.01	22.30	99.27	197.30
39			4.04	18.10	20.85	94.94	188.83
40			3.74	17.22	19.45	90.77	180.65
41			3.44	16.37	18.10	86.74	172.76
42			3.15	15.56	16.79	82.84	165.12
43			2.87	14.77	15.52	79.08	157.73
44			2.60	14.00	14.29	75.43	150.57
45			2.34	13.26	13.10	71.90	143.63
46			2.08	12.54	11.95	68.48	136.90
47			1.83	11.84	10.82	65.16	130.36
48			1.59	11.17	9.73	61.94	124.00
49			1.36	10.51	8.66	58.80	117.82
50			1.13	9.87	7.63	55.75	111.81

T - Tooling Plate End Play (in.)



	T-02	T-04	T-09	T-17	T-31	T-50	T-70
0	0.001	0.001	0.001	0.001	0.001	0.002	0.002
1	0.002	0.002	0.002	0.002	0.002	0.002	0.002
2	0.003	0.003	0.003	0.002	0.002	0.003	0.003
3	0.004	0.004	0.003	0.003	0.003	0.004	0.003
4	0.005	0.005	0.004	0.003	0.004	0.004	0.004
5	0.006	0.006	0.005	0.004	0.004	0.005	0.004
6	0.007	0.007	0.006	0.004	0.005	0.005	0.005
7	0.008	0.008	0.006	0.005	0.005	0.006	0.005
8	0.009	0.008	0.007	0.006	0.006	0.006	0.006
9	0.010	0.009	0.008	0.006	0.006	0.007	0.006
10	0.011	0.010	0.009	0.007	0.007	0.007	0.007
11	0.012	0.011	0.009	0.007	0.007	0.008	0.007
12	0.013	0.012	0.010	0.008	0.008	0.008	0.008
13	0.014	0.013	0.011	0.008	0.008	0.009	0.008
14	0.015	0.014	0.011	0.009	0.009	0.009	0.009
15	0.016	0.015	0.012	0.009	0.009	0.010	0.009
16	0.017	0.016	0.013	0.010	0.010	0.010	0.010
17	0.018	0.016	0.014	0.010	0.010	0.011	0.010
18	0.019	0.017	0.014	0.011	0.011	0.012	0.011
19	0.020	0.018	0.015	0.011	0.012	0.012	0.011
20	0.021	0.019	0.016	0.012	0.012	0.013	0.012
21	0.022	0.020	0.017	0.012	0.013	0.013	0.012
22	0.023	0.021	0.017	0.013	0.013	0.014	0.013
23	0.024	0.022	0.018	0.014	0.014	0.014	0.013
24	0.025	0.023	0.019	0.014	0.014	0.015	0.014
25	0.026	0.024	0.019	0.015	0.015	0.015	0.014
26	0.027	0.024	0.020	0.015	0.015	0.016	0.014
27	0.028	0.025	0.021	0.016	0.016	0.016	0.015
28	0.029	0.026	0.022	0.016	0.016	0.017	0.015
29	0.030	0.027	0.022	0.017	0.017	0.017	0.016
30	0.031	0.028	0.023	0.017	0.017	0.018	0.016
31	0.032	0.029	0.024	0.018	0.018	0.018	0.017
32	0.033	0.030	0.025	0.018	0.018	0.019	0.017
33	0.034	0.031	0.025	0.019	0.019	0.020	0.018
34	0.035	0.032	0.026	0.019	0.020	0.020	0.018
35	0.036	0.032	0.027	0.020	0.020	0.021	0.019
36	0.037	0.033	0.027	0.020	0.021	0.021	0.019
37	0.038	0.034	0.028	0.021	0.021	0.022	0.020
38	0.039	0.035	0.029	0.022	0.022	0.022	0.020
39	0.040	0.036	0.030	0.022	0.022	0.023	0.021
40	0.041	0.037	0.030	0.023	0.023	0.023	0.021
41	0.042	0.038	0.031	0.023	0.023	0.024	0.022
42	0.043	0.039	0.032	0.024	0.024	0.024	0.022
43	0.044	0.040	0.033	0.024	0.024	0.025	0.023
44	0.045	0.040	0.033	0.025	0.025	0.025	0.023
45	0.046	0.041	0.034	0.025	0.025	0.026	0.024
46	0.047	0.042	0.035	0.026	0.026	0.026	0.024
47	0.048	0.043	0.035	0.026	0.026	0.027	0.025
48	0.049	0.044	0.036	0.027	0.027	0.028	0.025
49	0.050	0.045	0.037	0.027	0.028	0.028	0.026
50	0.051	0.046	0.038	0.028	0.028	0.029	0.026

Bimba Multiple Position Linear Thrusters

Bimba's Multiple Position Linear Thrusters incorporate a double-acting, single rod end cylinder that provides three positions with just one cylinder.

How to Order

T- 09 1/2 - M

PRODUCT TYPE	BORE SIZE	STROKE LENGTHS			OPTIONS
		Stroke A	Stroke B	Standard Strokes and Stroke Maximums	
T - T Series (Ball Bearings) TE - TE Series (Composite Bearings)	02 - 9/16" 04 - 3/4" 09 - 1-1/16" 31 - 2"	0.5 = 1/2" 1 = 1"	0.5 = 1/2" 1 = 1"	1" increments to 12" Stroke A + Stroke B Maximum = 12"	M - MRS® magnetic position sensing

List Prices

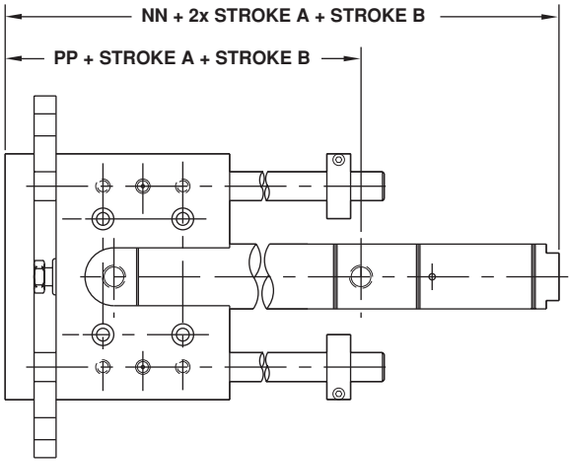
Additional pricing can be found on pages 3.12 and 3.18

Bore	Add to Base	Stroke adder** Total combined stroke adder per inch	
		T	TE
9/16" (02)			
3/4" (04)			
1-1/16" (09)			
1-1/2" (17)			
2" (31)			

***Total combined stroke = (2 x Stroke A) + Stroke B*
Note: Cushions are not available in three-position cylinder

Dimensions

T and TE Series



(T Series shown)

Bore Size	NN	PP
9/16" (02)	4.67	2.80
3/4" (04)	6.11	3.76
1-1/16" (09)	6.62	3.90
1-1/2" (17)	7.62	4.81
2" (31)	9.61	6.14

Note: Additional T and TE dimensions can be found on page 3.13 and 3.19.

Engineering Data

- Rated 250 psi
- Low breakaway friction

Components:

- Case hardened or hard chrome plated carbon steel shafts
- Steel or clear anodized aluminum tooling plate and collars
- Precision recirculating ball bearings or plastic composite

Cylinder:

- 304 stainless steel body
- High-strength aluminum alloy porting ends
- 303 stainless steel piston rods
- Buna N "U" cup seals
- Sintered bronze rod guide bushings

Options:

- Internal Buna N or external urethane bumpers
- Buna N magnet for position sensing

Temperature Range:

Buna N seals with a temperature range of -20°F (-25°C) to 200°F (95°C) are standard in all Bimba air cylinders. High temperature option A seals rated for higher temperature applications are available. If cylinders are operated at temperatures below 0°F for extended time periods, special modifications may be required. Special seal materials are available upon request.

With -M option: -20°F to +185°F (-25°C to +85°C)

Lubrication:

Air cylinders are pre-lubricated and sealed at the factory for extensive maintenance-free life. Cylinder life can be lengthened by providing additional lubricant with an air line mist lubricator or direct introduction of oil to the cylinder every 500 hours of operation. Recommended oil is medium to heavy inhibited hydraulic and general purpose oil.

The two spring-loaded oiler ports on the housing face should also receive several drops of the same oil every 100 hours of operation. For applications that involve rapid cycling, oil these ports more often.

T-700 series incorporates grease fittings.

Linear Thruster Application Checklist

This checklist makes sizing and selecting Bimba actuators easier. Bimba's Engineering Department will assist you by providing a detailed analysis of your application and, based on the information in the application checklist, will help you choose the actuators best suited to your needs.

Step 1. ***Photocopy the sketch and checklist sheets.***

Step 2. ***Complete the sketch and checklist.***

Step 3. ***Mail or fax the sketch and checklist to your local stocking distributor.***

Date: _____

Your Name: _____

Company: _____

Address: _____

Phone: _____

Fax: _____

1. *Type of Linear Thruster selected.*

☐ T Series ☐ TE Series

2. *What is the weight of the load being moved?*

_____(lbs.)

3. *What is the required stroke length?*

_____(in.)

4. *How will the Linear Thruster be mounted?*

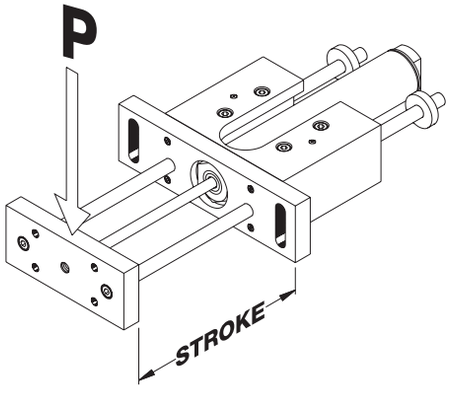
☐ Horizontally.

☐ Vertically, tooling plate at top.

☐ Vertically, tooling plate at bottom.

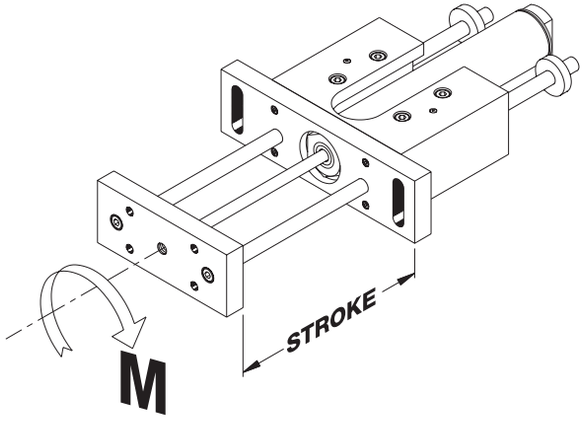
5. *What kind of force does the load place on the tooling plate?*

☐ Side load _____ (lbs)



Maximum Side Load

☐ Moment _____ (lbs)



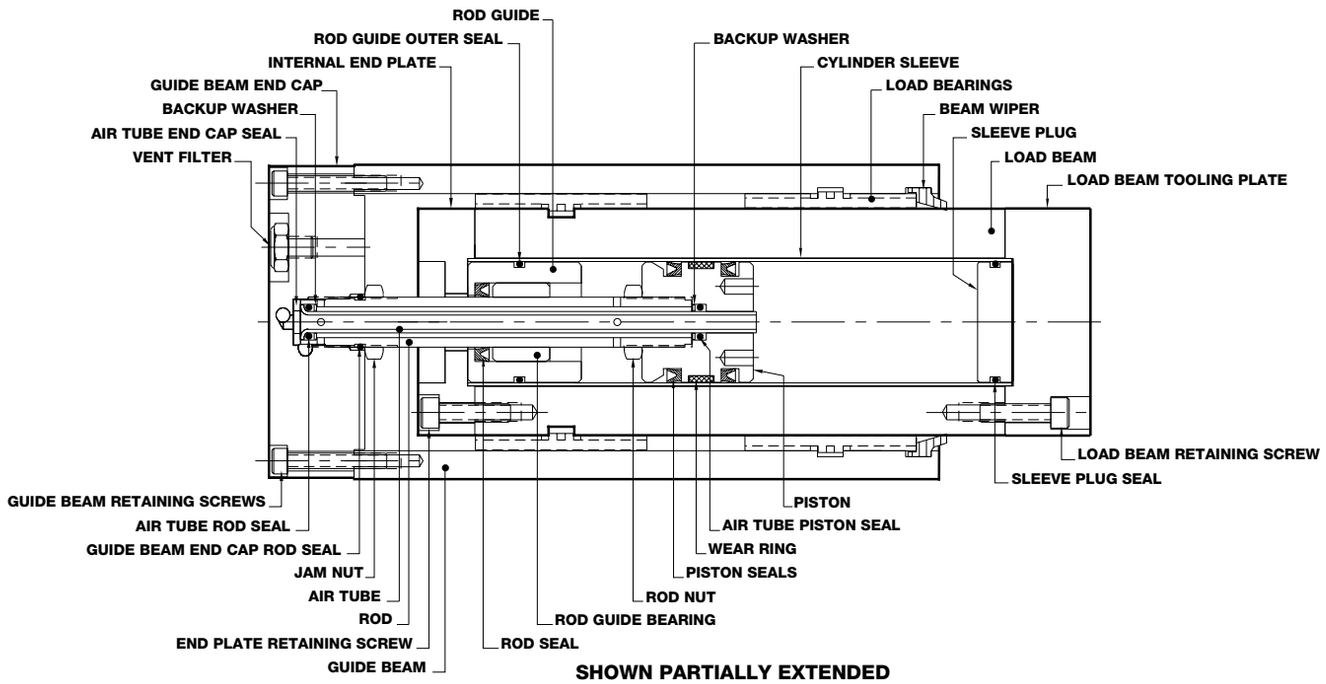
Maximum Moments

ADVANTAGES

The Bimba PneuMoment pneumatic actuator features a revolutionary, compact design that uses conventional pneumatic technology but has the capacity to carry high loads and moments.

The PneuMoment guide beam provides the mounting surface and remains stationary, and the load beam provides the motion, extending and retracting. A stationary piston and rod assembly is attached to the guide beam end cap. The piston rod is a coaxial assembly of two hollow rods which convey air to and from each side of the piston. Air let into one hollow rod pressurizes the chamber at one end of the piston, causing the load beam to extend. Air let into the other rod pressurizes the other end of the piston and causes the load beam to retract.

The PneuMoment has eight flat bearings to support the load beam. These bearings ride on hard anodized, PTFE-impregnated surfaces to allow the PneuMoment to carry heavy loads and large moments. No lubrication is needed for the bearings, although standard air line lubrication should be used to enhance the actuator's seal life.



SHOWN PARTIALLY EXTENDED

FEATURES AND BENEFITS

- Carries high moment loads
- Compact design
- Long life
- Available in U.S. customary units (inches) or metric
- Non-lube bearings
- Built-in track for position sensing switches
- Guide beam end cap ports transmit air or vacuum through the actuator from the guide beam end cap to connect additional automation devices such as grippers
- Corrosion-resistant, hard coat anodized aluminum load and guide beams with PTFE impregnation
- Standard vacuum port for clean room applications
- Standard side or end ports
- Base, front or rear flange mounting

OPTIONS

- Internal or external bumpers
- External shock absorbers for retract and extend strokes
- Internal stroke adjustment – full stroke, retract and extend (1-1/16" and 2" bores only)
- Magnetic Position Sensing
- Auxiliary ports to transmit air or vacuum through the actuator to operate automation devices.

How to Order

The model number consists of three alphanumeric clusters. These designate product type, bore size and stroke length, and options. Please refer to the example and charts below to determine the model number needed. The U.S. customary units (inch) model example shown below include options for external bumpers, magnetic position sensing, auxiliary port and plugs installed in the guide beam end cap ports.

PRODUCT TYPE

PM - U.S. Customary units
PMM - (metric)
(All external fasteners and ports are metric)

PM-096-EBMRY

BORE SIZE*

09 - 1-1/16"
09 - 27mm
17 - 1-1/2"
17 - 38mm
31 - 2"
31 - 50mm
50 - 2-1/2"
50 - 63mm

The above bore sizes are *not directly interchangeable. Refer to dimensional drawing on page 3.29 for details.*

STANDARD STROKE LENGTHS**

1" increments to 6"

25mm increments to 150mm

***Stroke lengths beyond 6" are available up to a maximum of 30" (762mm). Stroke lengths above 15" require application review. Fractional stroke lengths are also available. Consult your distributor for price and availability.*

OPTIONS

A - Internal stroke adjustment, both ends[1]
B - Internal bumpers - both ends
EB - External bumpers - both ends
(Can be used for stroke adjustment)
M - Magnetic position sensing
R - Auxiliary port - air/vacuum[2]
S - Shock absorber - both directions with stroke adjustment
S1 - Shock absorber - extend with stroke adjustment
S2 - Shock absorber - retract with stroke adjustment
Y - Air ports - side[3]

[1] Not required with shock absorber or external bumper. Not available in stroke lengths above 15". (Above 4" on 2" bore). Not available on 2½" bore.

[2] Seals used allow air or vacuum transmitted through the actuator to the load beam tooling plate.

[3] The standard unit offers both end and side ports in the guide beam end cap. The standard unit has flush surface plugs installed in the side ports. PneuMoments ordered with the "Y" option are shipped with the plugs installed in the end ports.

Note - (Stroke lengths 15" and above) Stroke adjustment can be achieved by using External Bumber - Option EB or Shock Absorber - option S, S1, S2. These options will require a modified stop plate to compensate for guide rod deflection.

Clean room applications - The PneuMoment has a vent port on the guide beam end cap. Remove the vent fitting and connect a vacuum line to this port for clean room service.

Option/Combination Availability

Bore	A	B	EB	M	R	S	Y
1-1/16" (27mm)	M,R,Y	M,R,Y	M,R,Y	A,B,EB, R,S,Y	A,B,EB, M,S,Y	M,R,Y	A,B,EB, M,R,S
1-1/2" (38mm)	N/A	M,R,Y	M,R,Y	B,EB, R,S,Y	B,EB, M,S,Y	M,R,Y	B,EB, M,R,S
2" (50mm)	M,R,Y	M,R,Y	M,R,Y	A,B,EB,R,S,Y	A,B,EB,M,S,Y	M,R,Y	A,B,EB,M,R,S,Y
2-1/2" (63mm)	N/A	M,R,Y	M,R,Y	B,EB,R,S,Y	A,B,EB,M,S,Y	M,R,Y	A,B,EB,M,R,S,Y

List Prices

	Base Model PM / PMM		A	B	EB	M	R	S	S1	S2	Y
Base Price	09 (1-1/16")										
	17 (1-1/2")										
	31 - (2")										
	50 - (2-1/2")										
Stroke Adder per inch/ 25mm of stroke	09 (1-1/16")										
	17 (1-1/2")										
	31 - (2")										
	50 - (2-1/2")										

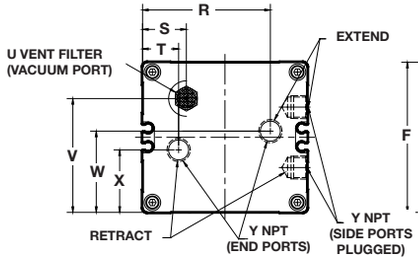
Mounting Accessories for 1-1/16" and 1-1/2" Bores

Description	Model Number	List Price	Model Number	List Price
4 Mounting Clamps with Through Holes (U.S. Customary Units and Metric)	1-1/6" - 1-1/2"		2" - 2-1/2"	
	PM-MC-09		PM-MC-31	
End Flange Brackets with 4 Clamps – Threaded Hole (U.S. Customary Units Only)	PM-EF-09		PM-EF-31	
End Flange Brackets with 4 Clamps – Threaded Hole (Metric)	PMM-EF-09		PMM-EF-31	
End Flange Brackets with 4 Clamps – Through Hole (U.S. Customary Units)	PM-EFT-09		PM-EFT-31	
End Flange Brackets with 4 Clamps – Through Hole (Metric)	PMM-EFT-09		PMM-EFT-31	

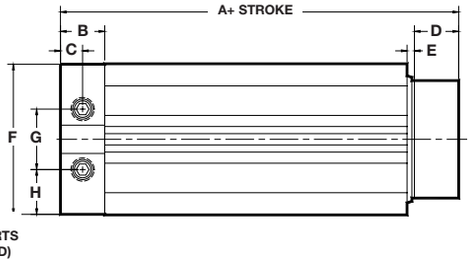
Repair Parts *1-1/16" and 1-1/2" Bores*

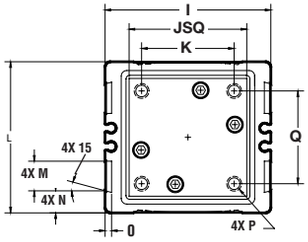
Order #		Part Description	Quantity
Seal Kits 1-1/16" – PMKS-09 1-1/2" – PMKS-17 2" – PMKS-31 2-1/2" – PMKS-50 (US and Metric)		Piston Seals	2
		Air Tube Piston Seal	2
		Rod Guide Inner Seal	1
		Rod Guide Outer Seal	1
		Rod Seal	1
		Sleeve Plug Seal	1
		Beam Wiper	1
		Tube Gasket	1
		Wrench – For Piston Removal	1
1-1/16" 1-1/2"	RD-76758 (U.S. Customary)	Replacement Shock	1
27mm 38mm	RD-68404-M (Metric)	Replacement Shock	1
2" 2-1/2"	RD-80179 (U.S. Customary)	Replacement Shock	1
31mm 50mm	RD-80179-M (Metric)	Replacement Shock	1

Basic Model

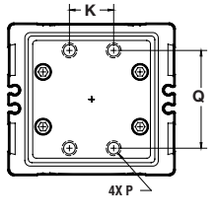


090&170 (1.06&1.50) BOREGUIDEBEAMENDCAP
PRT PLUG CONFIGURATION

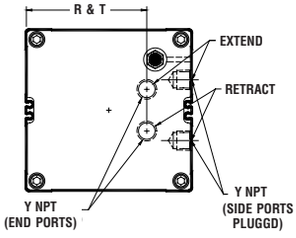




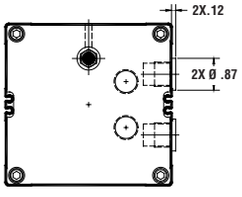
090 (1.06) BORETOOLINGPLATE
BOLT HOLE PATTERN



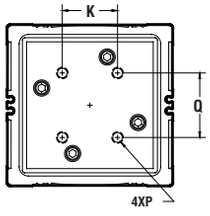
170 (1.50) BORETOOLINGPLATE
BOLT HOLE PATTERN



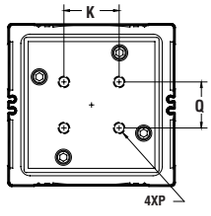
310 & 500 (2.00 & 2.50) BORE GUIDE BEAM END CAP
PORT PLUG CONFIGURATION



63MM BORE GUIDE BEAM END CAP
PORT PLUG CONFIGURATION



310 (2.00) BORETOOLINGPLATE
BOLT HOLE PATTERN



500 (2.50) BORETOOLINGPLATE
BOLT HOLE PATTERN

Bore		A	B	C	D	E	F	G	H	I	J	K	L	M
(09)	1-1/16"	5.75	0.75	0.38	0.75	0.12	2.54	1.02	0.76	2.81	2.00	1.57	2.56	0.50
	27mm	146.0	19.0	9.5	19.0	3.2	64.6	26.0	19.3	71.4	50.7	39.9	65.0	12.7
(17)	1-1/2"	5.88	0.88	0.33	0.75	0.12	2.54	1.17	0.69	2.81	2.00	0.75	2.56	0.50
	38mm	149.4	22.4	8.4	19.0	3.2	64.6	29.7	17.4	71.4	50.7	19.0	65.0	12.7
(31)	2"	10.48	1.19	0.59	1.00	0.12	4.35	1.65	1.35	4.50	3.43	1.50	4.38	1.28
	50mm	266.2	30.1	15.1	25.4	3.2	110.6	41.9	34.4	114.3	87.1	38.1	111.1	32.6
(50)	2-1/2"	10.48	1.19	0.59	1.00	0.12	4.35	1.65	1.35	4.50	3.43	1.50	4.38	1.28
	63mm	266.2	30.1	15.1	25.4	3.2	110.6	41.9	34.4	114.3	87.1	38.1	111.1	32.6

Bore		N	O	P	Q	R	S	T	U	V	W	X	Y
(09)	1-1/16"	0..38	0.11	1/4-20 UNC	1.57	2.17	0.74	0.61	#10-32	1.93	1.38	1.06	1/8 NPT
	27mm	9.5	2.8	M6 x 1.0	39.9	55.0	18.8	15.5	M5x0.8	49.0	35.0	26.9	G 1/8
(17)	1-1/2"	0.38	0.11	1/4-20 UNC	1.66	1.98	1.25	0.81	#10-32	1.93	1.76	0.88	1/4 NPT
	38mm	9.5	2.8	M6 x 1.0	42.1	50.4	31.8	20.5	M5x0.8	49.0	44.8	22.4	G 1/4
(31)	2"	0.50	0.11	5/16-18 UNC	1.75	3.50	3.27	N/A	1/8 NPT	3.55	2.74	1.61	3/8 NPT
	50mm	12.7	2.8	M8 x 1.25	44.5	88.8	83.0	N/A	G 1/8	90.2	69.7	40.9	G 1/4
(50)	2-1/2"	0.50	0.11	5/16-18 UNC	1.25	2.24	3.26	N/A	1/8 NPT	3.43	2.80	1.55	3/8 NPT
	63mm	12.7	2.8	M8 x 1.25	31.8	56.9	82.8	N/A	G 1/8	87.1	71.1	39.5	G 1/4

Ports

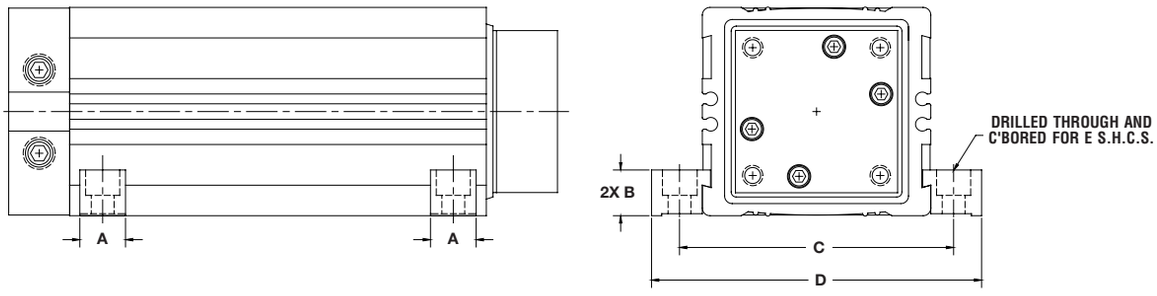
The basic unit offers both end and side ports in the guide beam end cap. The unit is supplied with flush surface plugs installed in the side ports unless the PneuMoment is ordered with the “Y” option. This no charge option has the plugs installed in the end ports.

Vent Filter – Vacuum Port

The vent port can be used to connect a vacuum line. Remove the vent filter and connect a vacuum line to this port for clean room applications.

Mounting Accessories

Mounting Clamps



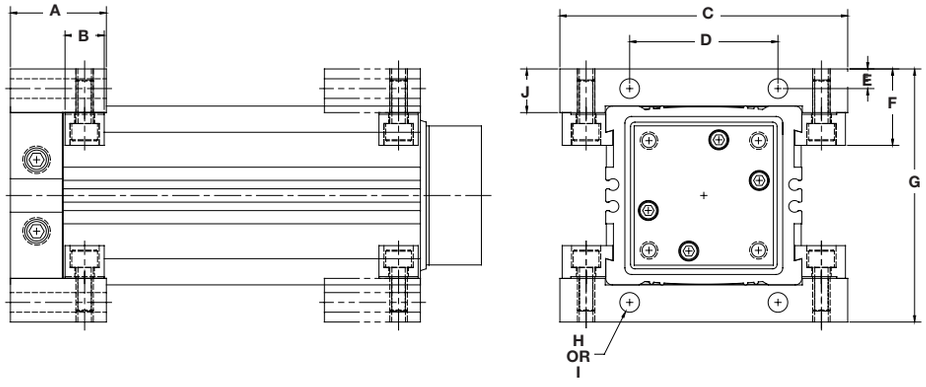
Mounting clamps can be used any time the PneuMoment is mounted to a flat surface. They are supplied with through holes for socket head cap screws. The clamps connect to the channel that runs along the length of the guide beam. Mounting clamps can be located anywhere along the length of the guide beam but we recommend they be as close to the ends as possible with the width of the clamp engaged into the guide beam channel. Mounting clamps are supplied in packets of four. The same clamp is used for U.S. customary unit and metric mountings.

Bore		Part No.	A	B	C	D	E
(09)	1-1/16"-1-1/2"	PM-MC-09	0.56	0.56	3.37	4.06	1/4-20 UNC
	(27mm-38mm)		14.3	14.3	85.6	103.1	M6 x 1.0
(31)	2"-2-1/2"	PM-MC-31	1.50	.69	5.30	6.18	3/8-16 UNC
(50)	(50mm-63mm)		38.1	17.5	134.5	156.9	M10 x 1.5

Mounting Accessories

End Flanges

End flanges can be used to mount the actuator at either end of the guide beam. The clamps connect to the flange bracket using screws and threaded holes. Two flange bracket styles are available; one with through holes and the other with threaded holes. End flanges are supplied in a kit containing two flange brackets and four clamps.



Threaded Holes (U.S. PM-EF-09, Metric PMM-EF-09*) U.S. PM-EF-31, Metric PMM-EF-31
Through Holes (U.S. PM-EFT-09, Metric PMM-EFT-09*) U.S. PM-EFT-31, Metric PMM-EFT-31

Bore	A	B	C	D	E	F	G	H	I	J
1-1/16", 1-1/2"	1.50	0.56	4.12	2.12	0.28	1.06	3.62	0.28	1/4-20 UNC	0.62
(27mm), (38mm)	38.3	14.3	104.8	53.9	7.1	27.0	92.0	7.1	M6 x 1.0	15.9
2" - 2-1/2"	2.74	1.50	6.25	3.82	0.38	1.47	5.88	0.41	3/8-16 UNC	0.92
(50mm), (63mm)	69.6	38.1	158.9	97.1	9.5	37.4	149.2	0.42	M10 x 1.5	23.4

**1-1/16" and 1-1/2" bore sizes use the same End Flange.*
2" and 2-1/2" bore sizes use the same End Flange.

Options

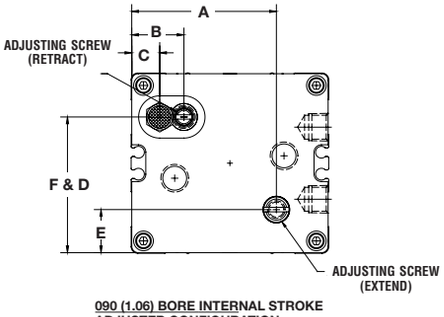
Internal Stroke Adjustment – Option A

Optional internal stroke adjustment screws on the rear of the guide beam end cap limit the stroke in either direction. Each screw limits the stroke in one direction. Approximate adjustment per 1/4 turn – Extend .008", Retract .014" for 1-1/16 (27mm) bore. Extend .021", Retract .025" for 2" (31mm) bore.

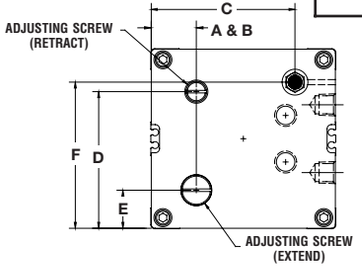
Note: Within the unit's stroke length there are no dimensional limitations for either extend or retract adjustments. Not compatible with shock absorbers, external bumpers or internal bumpers.

Bore		A	B	C	D	E
(09)	1-1/16"	2.06	0.73	0.36	1.94	0.61
	(27mm)	52.2	18.5	9.1	49.3	15.5

Option A – is not available for 1-1/2" and 2-1/2" bore. Use External Bumper – Option EB to achieve stroke adjustment.



090 (1.06) BORE INTERNAL STROKE ADJUSTER CONFIGURATION



310 (2.00) BORE INTERNAL STROKE ADJUSTER CONFIGURATION

Options

Internal Bumpers – Option B

Provides internal bumpers for end of stroke noise reduction in both directions.

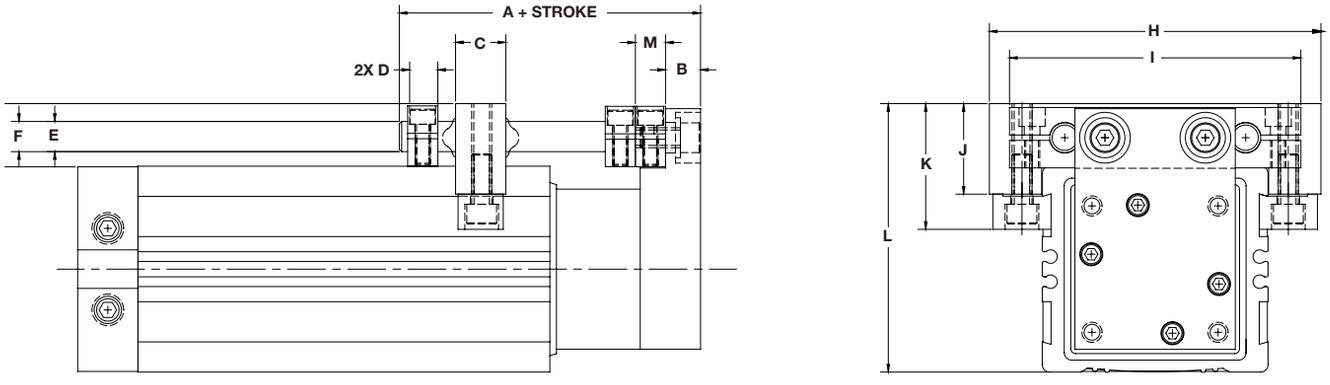
Air Pressure Effect on Stroke

Air Pressure	20 psi	40 psi	60 psi	80 psi
1-1/16", 1-1/2"	-0.77	-0.047	-0.020	0
□ 27mm, 38mm	-19.0mm	-1.2mm	-0.51mm	0
2"	-0.090	-0.080	-0.020	0
□ 50mm	-2.3mm	-2mm	-0.5mm	0
2-1/2"	-0.027	-0.018	-0.010	0
□ 63mm	-0.68mm	-.45mm	-.25mm	0

External Bumpers – Option EB

Optional external bumpers provide both end-of-stroke noise reduction and end-of-stroke adjustment. The external bumper assembly is mounted to the actuator with clamps that connect to the channel that runs along the length of the guide beam.

Note: not compatible with shock absorbers, end flange mounting on the guide beam end, internal stroke adjustment and internal bumpers.



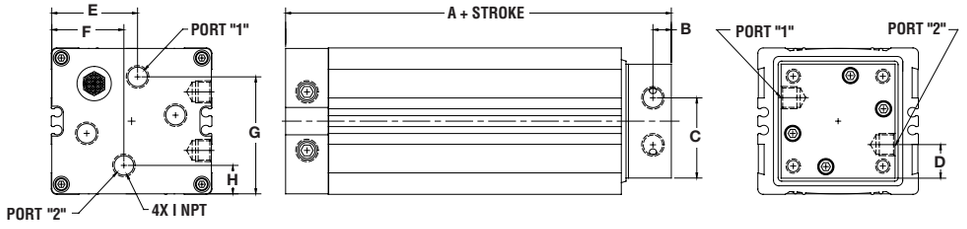
Bore		A	B	C	D	E	F	G	H	I	J	K	L
(09), (17)	1-1/16", 1-1/2"	2.75	0.44	0.62	0.38	0.38	0.73	0.75	4.12	3.62	1.16	1.59	3.37
	(27mm), (38mm)	69.8	11.1	15.9	9.5	9.5	18.5	19.0	104.8	92.0	29.4	40.5	85.6

Bore		A	B	C	D	E	F	G	H	I	J	K	L	M
(31)	2" - 2-1/2"	4.44	0.68	1.54	0.50	0.62	1.56	1.57	6.25	5.69	1.75	2.30	5.95	0.75
(50)	50mm - 63mm	112.8	17.3	39.1	12.7	15.9	39.6	40.0	158.9	144.4	44.3	58.3	151.1	19.1

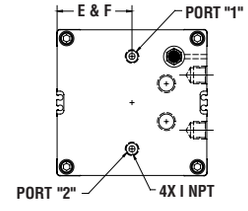
Options

Auxiliary Port-Air/Vacuum – Option R

Optional air/vacuum ports can be supplied to transmit air or vacuum through the actuator to the load beam tooling plate for use by other automation devices.



090 & 170 (1.06 & 1.50) BORE GUIDE BEAM END CAP
AUXILIARY PORT CONFIGURATION



310 & 500 (2.00 & 2.50) BORE GUIDE BEAM END CAP
AUXILIARY PORT CONFIGURATION

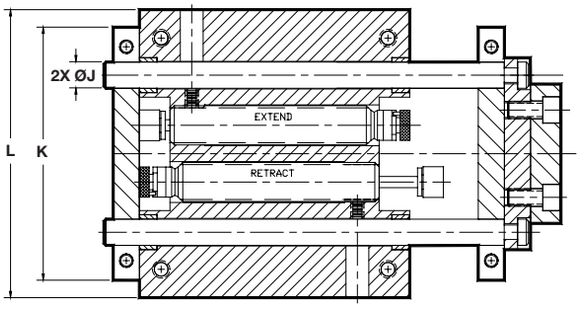
Bore		A	B	C	D	E	F	G	H	I
(09)	1-1/16"	5.75	0.32	1.41	0.59	1.50	1.26	2.05	0.50	1/8 NPT
	(27mm)	146.0	8.2	35.8	14.9	38.1	32.1	52.0	12.6	G 1/8
(17)	1-1/2"	5.88	0.32	1.00	1.00	0.65	2.06	2.02	0.48	1/8 NPT
	(38mm)	149.4	8.2	25.3	25.3	16.5	52.2	51.3	12.2	G 1/8
(31)	2"	10.48	0.50	2.84	0.60	2.24	2.24	3.56	0.80	1/8 NPT
	50mm	266.2	12.7	72.1	15.2	56.9	56.9	90.4	20.2	G 1/8
(50)	2-1/2"	10.48	0.50	1.68	1.76	0.99	3.49	3.43	0.83	1/4 NPT
	63mm	266.2	12.7	42.6	44.7	25.1	88.7	87.1	21.0	G 1/4

Options

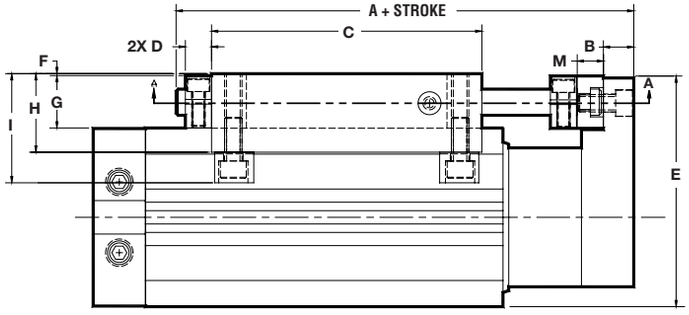
Shock Absorbers – Option S, S1, S2

Optional adjustable shock absorbers are available to control the deceleration of heavier loads as well as limit the stroke of the actuator. The shock absorber assembly is mounted with clamps that connect to the channel that runs along the length of the guide beam. Option S includes two shocks to decelerate loads in both directions. Option S1 provides one shock in the extend direction. Option S2 provides one shock in the retract direction. See page 3.35 to select the proper shock absorber setting for your application.

Note: not compatible with external bumpers, end flange mounting on either end, internal stroke adjustment and internal bumpers.



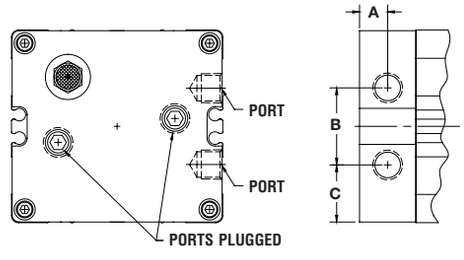
SECTION A-A



Bore		A	B	C	D	E	F	G	H	I	J	K	L	M
(09), (17)	1-1/16", 1-1/2"	5.56	0.44	3.88	0.38	3.37	0.02	0.73	1.16	1.59	0.38	3.62	4.12	N/A
	(27mm), (38mm)	141.2	11.1	98.4	9.5	85.6	0.4	18.5	29.4	40.5	9.5	92.0	104.8	N/A
(31)	2", 2-1/2"	8.17	0.68	5.71	0.50	5.84	0.02	1.56	1.75	2.30	0.62	5.69	6.25	0.75
(50)	(50mm) - (63mm)	207.5	17.3	145.0	12.7	148.4	0.40	39.6	44.3	58.3	15.9	144.4	158.9	19.1

End and Side Ports – Option Y

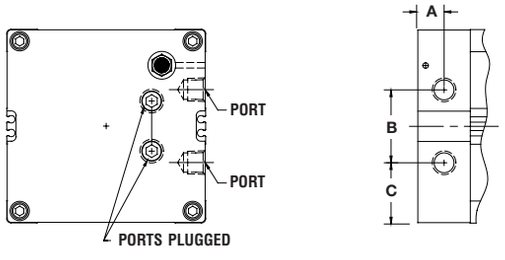
All PneuMoments have both end and side ports in the guide beam end cap. Removable flush port plugs are installed at the factory in the side ports unless the "Y" option is specified. PneuMoments with this option are shipped with plugs installed in the end ports.



090 & 170 (1.06 & 1.50) BORE GUIDE BEAM END CAP
PORT PLUG CONFIGURATION

Extend

Retract



310 & 500 (2.00 & .50) BORE GUIDE BEAM END CAP
PORT PLUG CONFIGURATION

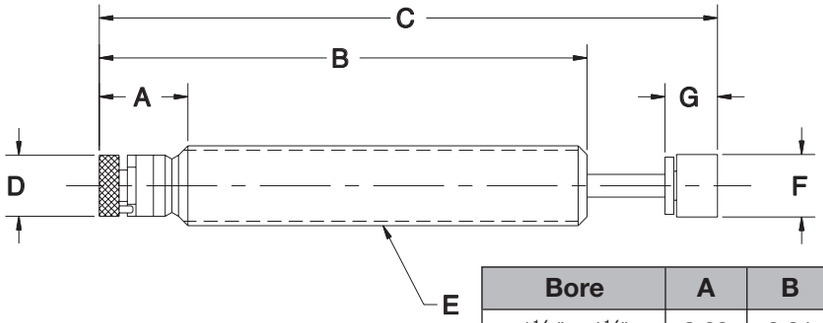
Bore		A	B	C
(09)	1-1/16"	0.38	1.02	0.76
	(27mm)	9.5	26.0	19.3
(17)	1-1/2"	0.33	1.17	0.69
	(38mm)	8.4	29.7	17.4
(31)	2"	0.59	1.65	1.35
	(50mm)	15.1	41.9	34.4
(50)	2-1/2"	0.59	1.65	1.35
	(63mm)	15.1	41.9	34.4

Options

Shock Absorbers – Option S, S1, S2

The load-carrying capabilities of the PneuMoment can be enhanced by the use of external deceleration devices such as shock absorbers. Shocks, when used properly, can also increase actuator life. Use the following data to determine the requirements for your specific application.

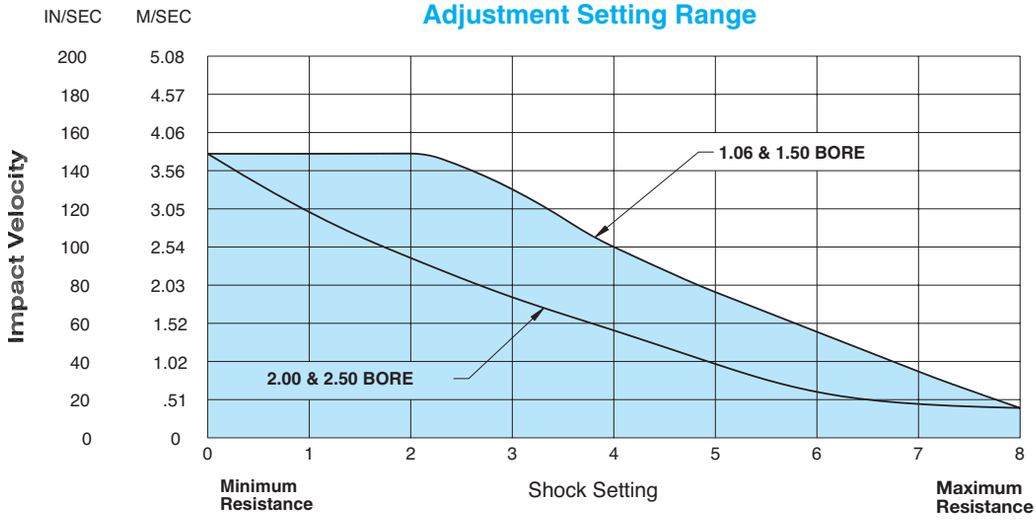
The shock allows multiple deceleration settings. Set the adjustable shock dial to the setting that meets your application.



Bore	A	B	C	D	E	F	G
1 1/16" - 1 1/2"	0.69	3.31	4.36	0.59	9/16-18 UNF	0.5	0.47
27mm-38mm	17.4	84.1	110.7	15.1	M16 x 1.5		11.9
2"-2½	0.58	4.45	6.52	0.88	1-3/8-12UNF	1.22	N/A
50mm-63mm	14.7	113	165.6	22.4	N/C	31	N/A

The shock allows multiple deceleration settings. The blue area represents the range of settings to consider based on velocity. Set the adjustable shock dial to the setting that meets your application.

Adjustment Setting Range



Use this chart to determine the shock absorber's maximum energy levels.

Shock Absorber Specifications											
Bore	Model	Shock Absorber Bore	(S) Stroke	Thread Type	(E_T) Max. Per Hour	(E_T-C) Max. Per Hour	(F_P) Max. Shock Force	Normal Coil Spring Force		(F_D) Max. Propelling Force	Weight
								Extension	Compression		
1-1/16" 1-1/2"	U.S.	.28 in	.5 in	3/4-16UNF-2A	250 in-lbs.	284,000 in-lbs.	775 lbs.	1.25 lbs.	2.75 lbs.	250 lbs.	5 oz.
27mm 38mm	Metric	(7.11mm)	(12.7mm)	M16 x 1.5	(16.95 Nm)	(33,900 Nm)	(2 KN)	(4.44 N)	(9.77 N)	(534 N)	(85 g.)
2"-2-1/2"	U.S.	.63"	1.00"	1-3/8-12UNF-2A	1100 in-lbs.	808,000 in-lbs.	1700 lbs.	9.00"	13.00"	500 lbs.	20 oz.
*31mm 50mm	*Metric	(16.0mm)	(25.4mm)	——	(124.5 Nm)	(91,291.7 Nm)	(7.5 KN)	(40 N)	(57.8 N)	(2224.1 N)	(567 g.)

*Uses U.S. shock for 2" - 2-1/2".

Engineering Specifications

Components:

Guide beam	PTFE-impregnated, hard-coat anodized extruded aluminum
Load beam	PTFE-impregnated, hard-coat anodized extruded aluminum
Guide beam end cap	Black anodized aluminum
Load beam tooling plate	Black anodized aluminum
Load bearings	PTFE-filled polymer
Beam wiper	Urethane
Rod	Welded DOM steel
Air tube	304 stainless steel
Internal end plate	6061 aluminum
Cylinder sleeve	304 stainless steel
Sleeve plug	2011 aluminum
Rod guide	2011 aluminum
Rod guide bearing	Phosphor bronze
Rod nut	Carbon steel-plated
Piston	2011 aluminum
Port plugs	Galvanized steel
Vent filter	Sintered bronze
Sleeve plug seal	Buna-N
Piston seal	Buna-N
Rod guide outer seal	Buna-N
Rod guide seal	Buna-N
Air tube piston seal	Buna-N
Air tube end cap seal	Buna-N
Retaining screws	Grade 8 Alloy Steel

Rated Air Pressure

150 psi (10.34 bar)

Power Factors

1-1/16" bore
Extend .888 x Air Pressure
Retract .734 x Air Pressure

1-1/2" bore
Extend 1.7 x Air Pressure
Retract 1.5 x Air Pressure

2" bore
Extend 3.1 x Air Pressure
Retract 2.65 x Air Pressure

2-1/2" bore
Extend 5.0 x Air Pressure
Retract 4.42 x Air Pressure

Velocity @ 80 psi

1-1/16" bore – 27mm-27 in/sec.
1-1/2" bore – 38mm-27 in/sec.
2" bore – 30 in/sec.
2-1/2" bore – 26 in/sec.
*Special units with increased velocity are available. Contact your Bimba distributor.

Temperature Range:

-20°F to 140°F (-29°C to 60°C)

Breakaway:

Less than 13 psi (.89 bar)

Lubrication:

All Bimba PneuMoment actuators are pre-lubricated with our special HT-99 lubrication and sealed at the factory for extensive maintenance-free life. Actuator life can be extended by providing additional lubricant with an air line mist lubricator. Actuator life is also dependent upon operational temperature, velocity and load. The PTFE-filled plastic bearings are installed “dry” and should require no additional lubrication for the life of the bearing.

Options:

Bumpers (internal & external)	Urethane
Stroke adjusters	303 stainless steel
Shock absorbers	Anodized aluminum end plates, 303 stainless steel guide rods
Auxiliary air tube	303 stainless steel
Magnet	Neodynium

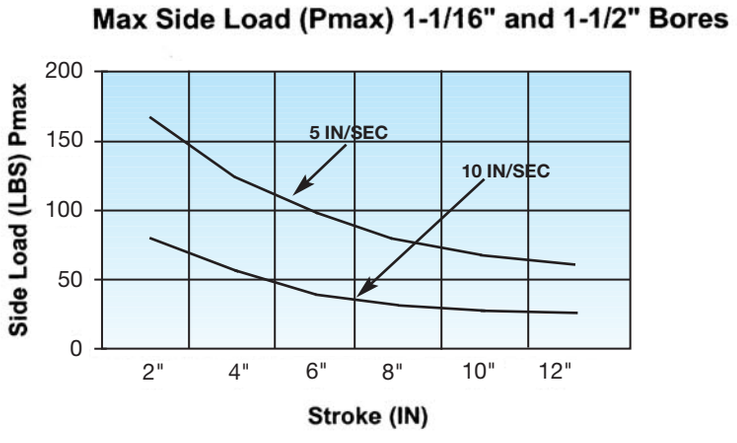
Weights

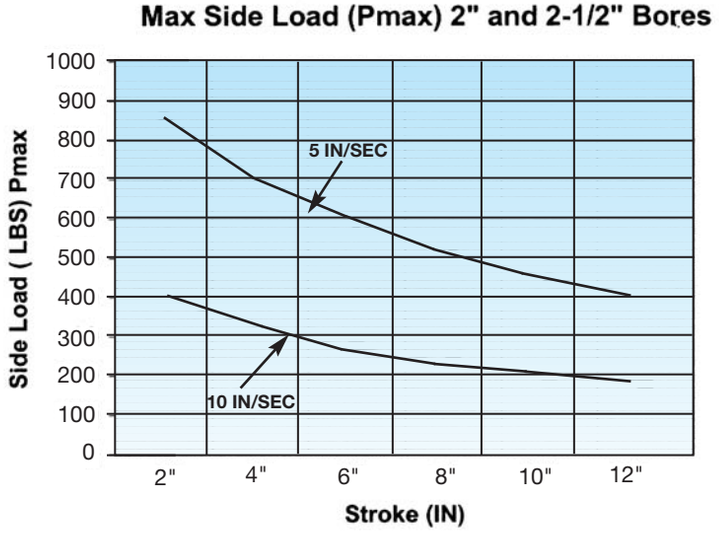
Weights – Pounds (Kilograms)								
Model / Option	1-1/16" (09)		1-1/2" (17)		2" Bore		2-1/2" Bore	
	At 0" Stroke	Adder Per Inch (25mm) of Stroke	At 0" Stroke	Adder Per Inch (25mm) of Stroke	At 0" Stroke	Adder Per Inch of Stroke	At 0" Stroke	Adder Per Inch of Stroke
Standard Model	2.75 (1.25)	0.37 (0.17)	3.30 (1.50)	.44 (.20)	17 lb.	.98 lb.	16.9 lb.	1.12 lb.
Adder for A Option	0.5 (0.23)	0.04 (0.02)	N/A	N/A	.59	.067	N/A	N/A
Adder for B Option	0.01 (0.004)	N/A	0.01 (0.004)	N/A	0.03	N/A	0.03	N/A
Adder for EB Option	1.75 (0.79)	0.06 (0.03)	1.75 (0.79)	0.06 (0.03)	5.47	0.17	5.47	0.17
Adder for R Option	0.15 (0.07)	0.06 (0.03)	0.15 (0.07)	0.06 (0.03)	0.15	0.02	0.15	0.02
Adder for S Option	3.62 (1.64)	0.06 (0.03)	3.62 (1.64)	0.06 (0.03)	9.67	0.17	9.67	0.17
Adder for S1 Option	3.43 (1.56)	0.06 (0.03)	3.43 (1.56)	0.06 (0.03)	8.5	0.17	8.5	0.17
Adder for S2 Option	3.43 (1.56)	0.06 (0.03)	3.43 (1.56)	0.06 (0.03)	8.5	0.17	8.5	0.17

Application Considerations

Maximum Allowable Side Load (Pmax)

These graphs illustrate PneuMoments capability to carry large sides loads. Examples for all four bore sizes are shown. Use the formulas on page 3.39 to calculate the maximum allowable side load using your application perimeters or visit our website and use the PneuMoment sizing program. 80 degree F temperature used for graph calculations.





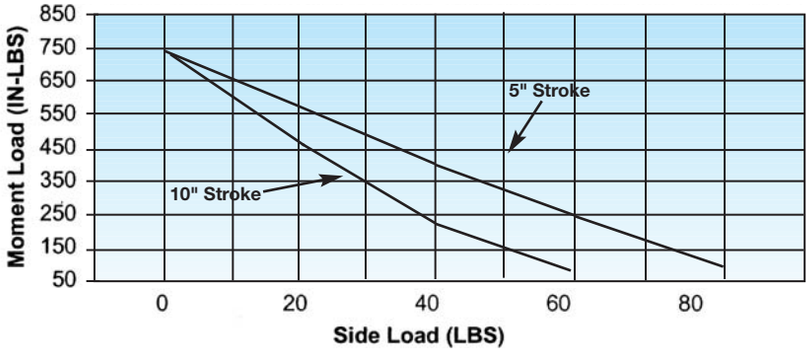
Application Considerations

Combination Side and Moment Load

The following graphs illustrate PneuMoments capability to carry a combination of side and moment load. Examples for all 4 bore sizes are shown. Use the formulas on page 3.39 to calculate the maximum load carrying capabilities for your application or visit our web-site and use the PneuMoment sizing program. 80 degree F temperature used for graph calculations.

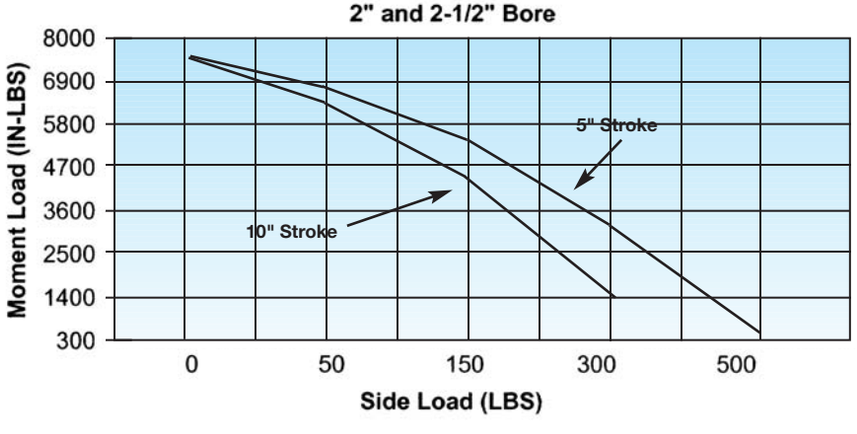
Combination Side and Moment Load

1-1/16" and 1-1/2" Bore



Combination Side and Moment Load

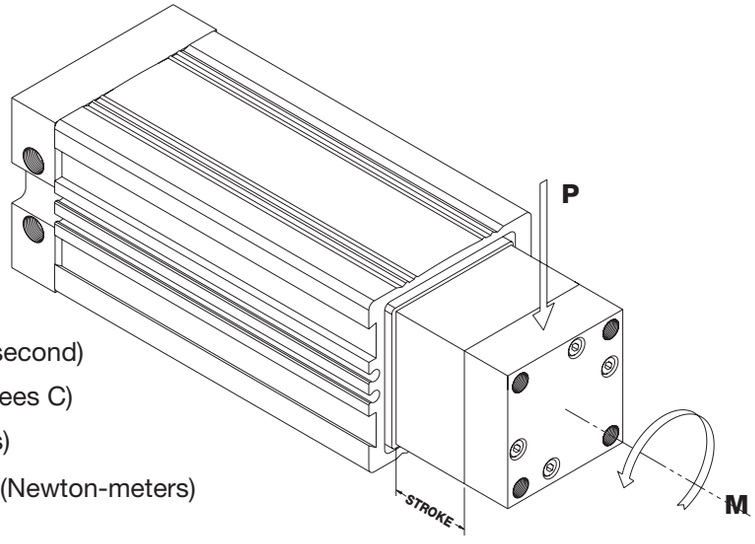
2" and 2-1/2" Bore



Application Considerations

Capability

Use the following formulas to calculate PneuMoment's capability to solve your application requirement.



S_{MAX} = The maximum allowable stress in the bearing material in psi (MPa)

PV = One of the limiting factors of the bearing depending on ambient temperature and cycle velocity.

V = Velocity in feet per minute (meters per second)

T = Ambient temperature in degrees F (degrees C)

P_{MAX} = Maximum side load in pounds (Newtons)

M_{MAX} = Maximum moment load in inch-pounds (Newton-meters)

P = Actual side load in pounds (Newtons)

M = Actual Moment Load in inch-pounds (Newton-meters)

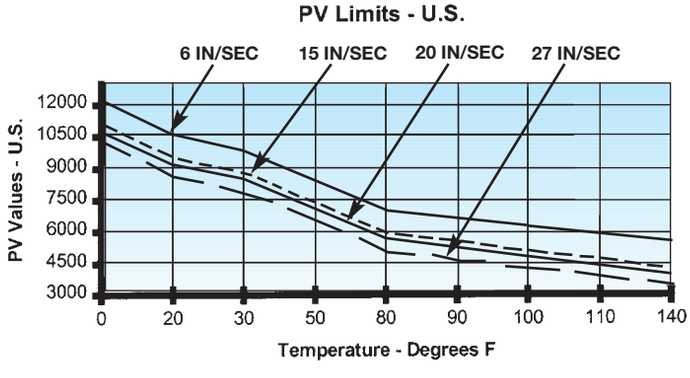
W = Actual load weight in pounds (kilograms)

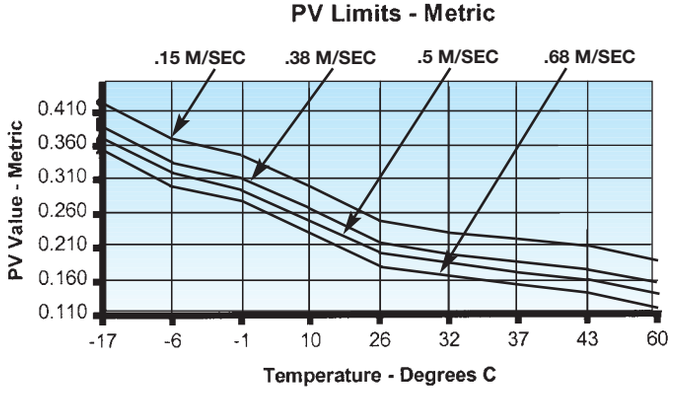
Please note that a sizing program located on our website can perform these calculations for you.

Step One: For all bore sizes - find the PV Value from the charts below or calculate it using the formula:

- **U.S. PV (psi*ft/min.)** = $0.044V^2 - 25.6V + 0.27T^2 - 87T + 12{,}970$
- **Metric PV (MPa*m/s)** = $(1703V^2 - 5039.4V + 0.875T^2 - 125.5T + 10462.5) / 28550$

T = Ambient temperature degrees – F or C





Application Considerations

Step Two: Calculate maximum bearing stress

Smax = PV Limit (U.S. or Metric) / Velocity (ft/min. or n/m²)

All bore sizes use this calculation

Step Three: Calculate maximum Moment Load

1-1/16"(27mm) or 1-1/2"(38mm) bore sizes:
U.S. - **Mmax** (in/lbs.) = 3.165 x Smax
Metric – **Mmax** (nm) = 51.79 x Smax

2"(31mm) or 2-1/2"(50mm) bore sizes:
U.S. - **Mmax** (in/lbs.) = 31.841 x Smax
Metric – **Mmax** (nm) = 515.448 x Smax

Step Four: Calculate maximum Side Load

1-1/16"(27mm) or 1-1/2"(38mm) bore sizes:
U.S. - **Pmax** (lbs.) = (3.281x Smax) / (3.5 + stroke)
Metric – **Pmax** (n) = (53,240 x Smax) / (88.9 + stroke)

2"(31mm) or 2-1/2"(50mm) bore sizes:
U.S. - **Pmax** (lbs.) = (26.416 x Smax) / (6.720 + stroke)
Metric - **Pmax** (n) = (432,423 x Smax) / (170.69 + Stroke)

Applications with both Moment and Side load
If you know the actual Moment load (M) in/lbs. or (nm)

Calculate the allowable Side Load

1-1/16"(27mm) or 1-1/2"(38mm) bore sizes:
U.S. - **Pmax** (lbs.) = (Smax – M / 3.165) x 3.281 / (3.5 + stroke)
Metric – **Pmax** (n) = Smax – M / 51.87) x 53,240 / (88.9 + stroke)

2"(31mm) or 2-1/2"(50mm) bore sizes:
Pmax (lbs.) = (Smax – M / 31.841) x 26.416 / (6.720 + stroke)
Pmax (n) = (Smax – M / 515.448) x 432,423, / (170.69 + stroke)

If you know the actual Side load (P) lbs. Or (n)

Calculate the allowable Moment Load

1-1/16"(27mm) or 1-1/2"(38mm) bore sizes:
Mmax (in/lbs.) = 3.165 x {Smax – [P x (3.5 + stroke) / 3.281]}
Mmax (nm) = 51.87 x {Smax – [P x (88.9 + stroke) / 53,770]}
2"(31mm) or 2-1/2"(50mm) bore sizes:
Mmax (in/lbs.) = 31.841 x {Smax – [P x (6.720 + stroke) / 26.416]}
Mmax (nm) = 515.448 x {Smax –{P x (170.69 + stroke) / 432,423]}

Kinetic Energy

PneuMoment maximum KE rating:

Bore	KE
1-1/16"(27mm) or 1-1/2"(38mm)	.135 (ft./lbs.) – 0.183 (nm)
2"(31mm) or 2-1/2"(63mm)	.270 (ft./lbs.) – 0.366 (nm)

Loads generating a KE factor above these KE values require - Shock Option (S) or other external deceleration devices. To calculate the applications KE rating use the formula $1/2mV^2$; where m is the mass of the load, V is the velocity in ft./sec. or m/s, i.e. 4 in/sec would be expressed as 4/12 or.33 ft./sec.

Additional KE information:

1-1/16"(27mm) or 1-1/2"(38mm)	U.S. m = {W + [0.162 * (3.5 + stroke(in))]} / 32.179 slugs Metric m = {W + [0.028 * (88.9 + stroke(mm))]} / 9.81
2"(31mm) or 2-1/2"(50mm)	U.S. m = {W +[0.916 * (6.72 + stroke(in))]} / 32.179 slugs Metric m = {W + [.1635 * (170.69 + stroke(mm))]} / 9.81
W = actual side load being moved	

Deflection and End Play

Due to the structural integrity of PneuMoment's guide and load beams, deflection at end of stroke is negligible within its maximum loading capabilities. However, bearing clearance between the guide beam and load beam may affect end-of-stroke position. Please contact Bimba if you need additional information.

PneuMoment Stroke Length	1-1/16"(27mm) or 1-1/2"(38mm) 5 lbs. (1.86 kg) load applied	2"(31mm) or 2-1/2" (50mm) 35 lbs. (13.06 kg) load applied
1"	.0083" - (.210mm)	.0025" - (.064mm)
2"	.0110" - (.279mm)	.0040" - (.102mm)
3"	.0140" - (.355mm)	.0045" - (.114mm)
4"	.0174" - (.441mm)	.0055" - (.140mm)
5"	.0210" - (.533mm)	.0075" - (.190mm)
6"	.0251" - (.637mm)	.0095" - (.241mm)
7"	.0294" - (.746mm)	.0110" - (.279mm)
8"	.0341" - (.866mm)	.0125" - (.318mm)
9"	.0391" - (.993mm)	.0140" - (.356mm)
10"	.0444" - (1.12mm)	.0150" - (.381mm)

PneuMoment™ Application Checklist

This checklist makes sizing and selecting Bimba PneuMoment easier. Bimba's Engineering Department will assist you by providing a detailed analysis of your application and, based on the information provided, will help you choose the actuator that best fits your needs.

Step 1. ***Photocopy this page and complete all applicable information.***

Step 2. ***Mail or fax your information to your local stocking distributor.***

Date: _____

Your Name: _____

Company: _____

Address: _____

Phone: _____

Fax: _____

1. How will the cylinder be mounted? (Check all that apply)

☐ Horizontally ☐ Vertically

☐ Base ☐ Rear Flange ☐ Front Flange

2. What is your operating air pressure?

_____ psi _____ (bar)

3. What is the weight of the load being moved?

_____ lbs. _____ (kg.)

4. How far is the center of the load from the surface of the dynamic member?

_____ inches _____ (mm)

5. What is the desired stroke length?

_____ inches _____ (mm)

6. What is the maximum velocity of the load?

_____ ft./second _____ (m/second)

7. Will external deceleration devices be used?

☐ Yes ☐ No

8. Will PneuMoment shock absorbers be used to slow down the load?

☐ Yes ☐ No

9. What is the ambient operating temperature?

_____ °F _____ °C

10. Do you need position sensing?

☐ Yes ☐ No

If yes,

☐ end-of-stroke ☐ mid-stroke

Briefly describe the environment the PneuMoment will be used in:

_____

_____

_____

Application Sketch (include sketch of external guide/support)

Notes

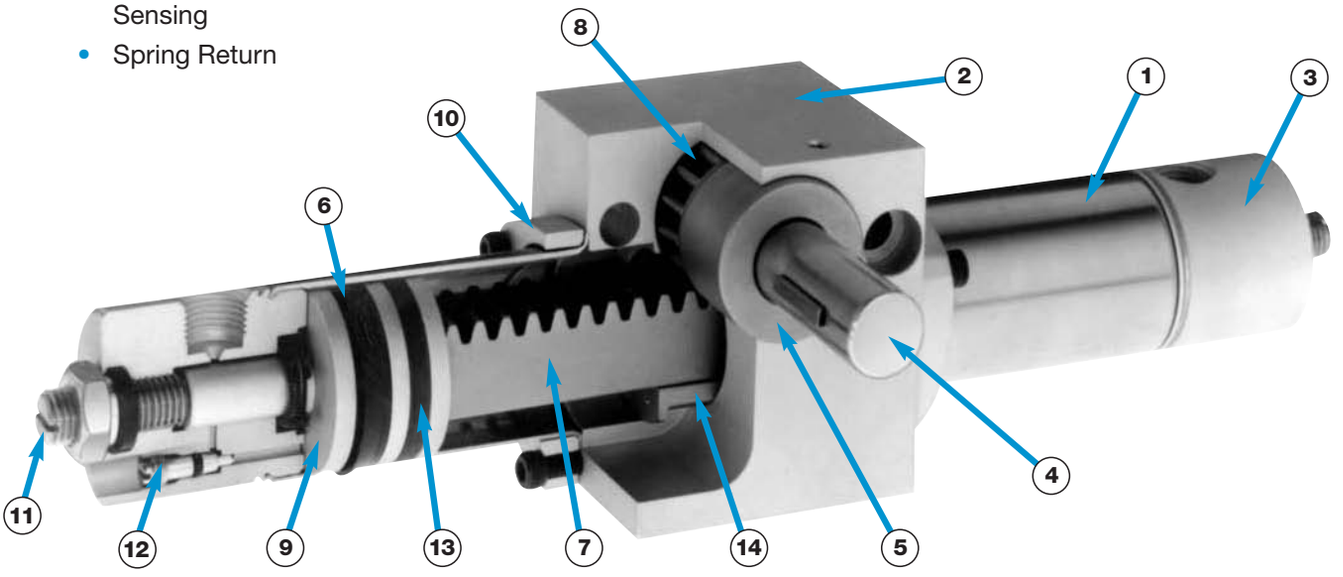
Pneu-Turn Rotary Actuators

Bimba Pneu-Turn Rotary Actuators

TURN TO THE BIMBA PNEU-TURN® ROTARY ACTUATOR FOR THESE QUALITY FEATURES AT A LOWER COST:

The Bimba Pneu-Turn Rotary Actuator is available with these catalog options:

- Angle Adjustment
- Bumpers
- Adjustable Cushions
- Dual Shaft
- Square Key
- MRS® Magnetic Position Sensing
- Spring Return
- Oil Service Seals
- High Temperature Option
- Ball Bearing
- Rear Shaft
- Hardened Shaft
- Anti-backlash Rack



1. **CYLINDER BODIES** – 304 stainless steel for maximum seal life.
2. **ACTUATOR BODY** – High strength, anodized aluminum alloy for maximum corrosion protection.
3. **PORTING ENDS** – High strength, anodized aluminum alloy.
4. **SHAFT** – High strength, 303 stainless steel for maximum wear resistance and long life. (hardened steel optional).
5. **SHAFT BEARINGS** – Self-lubricating, sintered iron copper material for lower friction. (ball bearings optional).
6. **PISTON SEALS** – Buna "N", U-cup type for low breakaway friction and long life.
7. **RACK** – Carbon steel for maximum wear resistance.
8. **PINION** – High strength, alloy steel for greater durability.
9. **PISTON** – High strength, aluminum alloy.
10. **CYLINDER BODY RETAINER RING** – High strength, stainless steel for maximum corrosion protection.
11. **ANGLE ADJUSTMENT** – An option that allows 45° of adjustability each end.
12. **ADJUSTABLE CUSHIONS** – An option that controls deceleration at the end of the rotation.
13. **MRS® MAGNETIC POSITION SENSING** – An option that provides a magnet for sensing position.
14. **RACK SUPPORT** – Sintered brass material for increased load carrying capabilities.

How to Order

The model number of Pneu-Turn Rotary Actuators consists of three alphanumeric clusters. These designate product type, series, angle of rotation and special options. Please refer to the charts below for an example of model number PT-037090-A1DV. This is a 1-1/16" bore, single rack, 90° angle of rotation actuator with angle adjustment on both sides, dual shaft and high temperature option.

PT-037090-A1DV

SERIES – TORQUE FACTOR

006 - 9/16" Bore, Single Rack
014 - 9/16" Bore, Double Rack
017 - 3/4" Bore, Single Rack
033 - 3/4" Bore, Double Rack
037 - 1-1/16" Bore, Single Rack
074 - 1-1/16" Bore, Double Rack
098 - 1-1/2" Bore, Single Rack
196 - 1-1/2" Bore, Double Rack
247 - 2" Bore, Single Rack
494 - 2" Bore, Double Rack
Single Rack see page 4.5
Double Rack see page 4.7

To determine theoretical output torque (in.– lbs.), place a decimal point between the first and second digits of the series number. Then multiply that number by the air line pressure for the approximate torque produced.

For example, a PT-037-090 will produce an output torque of 0.37 times the air line pressure.

ANGLE OF ROTATION

045 - 45°
090 - 90°
180 - 180°
270 - 270°
360 - 360°

Rotation angles up to 1080° are available. See page 4.19 for rotational tolerance.

OPTIONS

A1 - Angle adjustment (both sides)
A2 - Angle adjustment (counterclockwise rotation)
A3 - Angle adjustment (clockwise rotation)
B1 - Bumpers (both sides)
B2 - Bumper (counterclockwise rotation)
B3 - Bumper (clockwise rotation)
C1 - Cushions (both sides)[1]
C2 - Cushion (counterclockwise rotation)[1]
C3 - Cushion (clockwise rotation)[1]
D - Dual shaft
E - Rear shaft (front portion of dual shaft removed; to accommodate hanging axial load)
F - Hardened shaft[2]
G - Polymer grease
K - Square key[3]
M - Magnetic position sensing[4]
N - Low temperature option (-40°F)[8]
Q1 - Internal Flow Control (both sides)[9]
Q2 - Internal Flow Control (counterclockwise rotation only)[9]
Q3 - Internal Flow Control (clockwise rotation only)[9]
R - Ball bearing[2]
S - Seals – oil service[5]
T - Switch track[6]
V - High temperature option (0°F to 400°F)
X - Anti-backlash (for 1-1/16" - 2" bores only)[7]
Z2 - Spring return, side A single rack, bodies A and D double rack
Z3 - Spring return, side B single rack, bodies C and B double rack

Option Combination Availability

Due to design or compatibility restrictions, the following options may **not** be ordered in combination. For example, F and E options are not available in combination.

SERIES \ OPTIONS	A	B	C	D	E	F	N	Q	R*	S	X	Z
9/16" (006)	S	S	N/A	E	D,F,R,X	D,E,K	B,G,M,V	N/A	E	A,B		A,B
9/16" (014)		S	N/A	E	D,F,R,X	D,E,K	B,G,M,V	N/A	E	B		A,B
3/4" (017)	S	C,S	B,Q,S	E	D,F,R,X	D,E,K	B,G,M,Q,V	A,C,N,S	E	A,B,C		A,B
3/4" (033)		C,S	B,Q,S	E	D,F,R,X	D,E,K	B,G,M,Q,V	A,C,N,S	E	B,C		A,B
1-1/16" (037)		C,S	B,Q,S	E	D,F,R,X	D,E,K	B,G,M,Q,V	A,C,N,S	E	B,C	E,F	A,B
1-1/16" (074)		C,S	B,Q,S	E	D,F,R,X	D,E,K	B,G,M,Q,V	A,C,N,S	E	B,C	E,F	A,B
1-1/2" (098)		C,S	B,Q,S	E	D,F,R,X	D,E,K	B,G,M,Q,V	A,C,N,S	E	B,C	E,F	A,B
1-1/2" (196)		C,S	B,Q,S	E	D,F,R,X	D,E,K	B,G,M,Q,V	A,C,N,S	E	B,C	E,F	A,B
2" (247)		C,S	B,Q,S	E	D,F,R,X	D,E,K	B,G,M,Q,V	A,C,N,S	E	B,C	E,F	A,B
2" (494)		C,S	B,Q,S	E	D,F,R,X	D,E,K	B,G,M,Q,V	A,C,N,S	E	B,C	E,F	A,B

**Temperature range of ball bearing option with high temperature option is 0°F to +250°F.*

Options K, M, V – No compatibility restrictions

Option T - "Switch track" should only be ordered with options M or V if the actuator will be operated between -20° to 85° Cj4.9

[1] Not available in Series 006 or 014. See below for option combination availability. See page 4.6 and 4.8 for explanation of clockwise/ counterclockwise.

[2] When ordering option -F, option -R must be ordered. -R option will include dowel pin holes. Dowel pin hole locations shown in Appendix.

[3] 006 and 014 have flat shaft.

[4] Option M can be ordered with option-V, but option M's rating will change to 180°.

[5] Oil service applications require 40 psi at all times or leakage will occur. 1/8 NPT ports provided (orifice omitted) for 9/16" and 3/4" bores. For double rack models, oil service seals and 1/8" ports provided on bodies A and C only.

[6] Option T must be ordered in conjunction with Option M. Option M can be ordered with Option-V, but Option V's rating will change to 180°. See Position Sensing Solutions, page 8.13 for additional switch information.

[7] Option X (Anti-backlash) is available in bore sizes 1-1/16", 1-1/2" and 2", single and double rack - up to 360° rotation. This option eliminates mid-rotational and end of rotation backlash in single rack models. It also eliminates mid-rotational backlash in double rack models. Double rack models do not have end of rotation backlash. All Pneu-Turns with this option include ball bearings Option R. Use this option to provide smooth rotation along with rotational precision.

[8] Low temperature bumpers not available.

[9] 3/4", 1-1/16", 1-1/2", 2" bore only.

List Prices

Bore Size and Type		9/16"		3/4"		1-1/16"		1-1/2"		2"	
		Single (006)	Double (014)	Single (017)	Double (033)	Single (037)	Double (074)	Single (098)	Double (196)	Single (247)	Double (494)
Base Price											
Adder per 45° Rotation											
Angle Adjustment (A1, A2, A3)											
Bumper (B1, B2, B3)											
Cushion (C1, C2, C3)											
Dual Shaft (D)											
Rear Shaft (E)											
Hardened Shaft (F)											
Square Key (K)											
MRS (M)											
Ball Bearing (R)											
Oil Service Seals (S)											
Switch Track (T)	Bore/Rotation	9/16"		3/4"		1-1/16"		1-1/2"		2"	
	45°										
	90°										
	180°										
	270°										
	360°										
High Temperature Option (V) Single Rack											
High Temperature Option (V) Double Rack											
Anti-Backlash Base Option (X)[1]											
Anti-Backlash Adder per 45° Rotation (X)[2]											
Spring Return (Z2, Z3)											
AV Combination											
BV Combination											
CV Combination											
SV Combination											

No charge option -G.
[1] Includes price of option-R, ball bearing option.
[2] Rotational adder replaces the standard adder.

Option N - List Price Adder

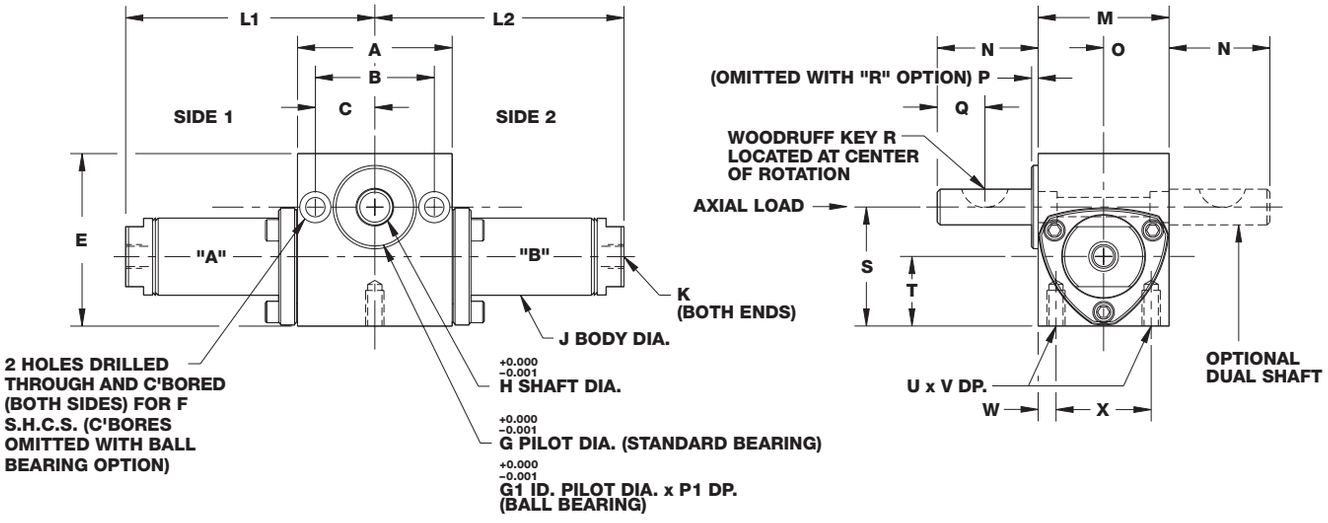
Bore Size	9/16"		3/4"		1-1/16"		1-1/2"		2"	
Type	Single (006)	Double (014)	Single (017)	Double (033)	Single (037)	Double (074)	Single (098)	Double (196)	Single (247)	Double (494)
Base Adder (N)										
Angle Adjustment - Both Sides (A1 with N)										
Angle Adjustment - One Side (A2 or A3 with N)										
Cushions - Both Sides (C1 with N)										
Cushion - One Side (C2 or C3 with N)										

Option Q - List Price Adder

Bore Size	9/16"		3/4"		1-1/16"		1-1/2"		2"	
Type	Single (006)	Double (014)	Single (017)	Double (033)	Single (037)	Double (074)	Single (098)	Double (196)	Single (247)	Double (494)
Internal Flow Control (Q1, Q2, Q3)										

All prices are F.O.B. Monee, Illinois and are subject to change without notice.

Single Rack Models (in.)



L1/L2 dimensions shown in chart on page 4.6.

Bore	A	B	C	E	E (With R Option)	F (C' Bores Omitted with Ball Bearing Option)	G (Std Bearing O.D. Pilot Dia.)
9/16" (006)	1.38	1.00	0.50	1.44	1.44	#8 S.H.C.S.	0.675
3/4" (017)	1.62	1.25	0.62	1.81	1.81	#10 S.H.C.S.	0.875
1-1/16" (037)	1.88	1.44	0.72	2.12	2.19	1/4" S.H.C.S.	0.968
1-1/2" (098)	2.38	1.81	0.90	2.81	2.84	5/16" S.H.C.S.	1.249
2" (247)	3.00	2.38	1.19	3.75	3.75	5/16" S.H.C.S.	1.749

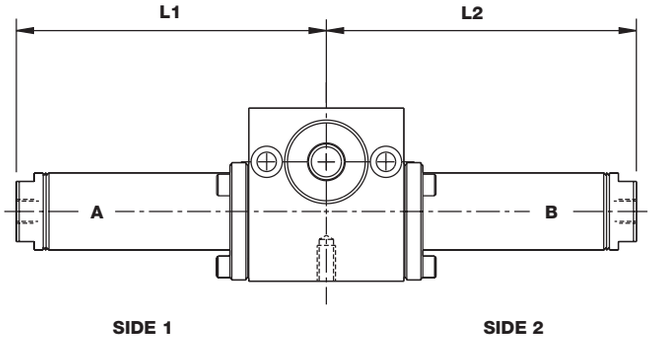
Bore	G1 (Ball Bearing I.D. Pilot)	H	J	K	M	N	O	P	P1
9/16" (006)	0.750	0.250	0.61	#10-32[1]	1.12	0.69	0.56	0.06	0.06
3/4" (017)	0.875	0.375	0.82	#10-32[1]	1.37	1.06	0.69	0.06	0.06
1-1/16" (037)	1.125	0.500	1.12	1/8 NPT	1.75	1.31	0.88	0.06	0.09
1-1/2" (098)	1.375	0.625	1.56	1/8 NPT	2.25	1.38	1.12	0.09	0.09
2" (247)	1.875	0.875	2.08	1/4 NPT	2.56	2.00	1.28	0.11	0.10

Bore	Q	R[2]	S	T	U	V	W	X
9/16" (014)	0.31	#202.5	1.03	0.61	#8-32	0.44	0.19	0.75
3/4" (033)	0.50	#204	1.25	0.73	#10-24	0.38	0.19	1.00
1-1/16" (074)	0.62	#305	1.56	0.88	1/4-20	0.50	0.25	1.25
1-1/2" (196)	0.62	#405	2.09	1.16	5/16-18	0.62	0.31	1.62
2" (494)	0.75	#606	2.56	1.28	5/16-18	0.62	0.28	2.00

[1]Option-S ports are 1/8 NPT
[2]Key dimensions on page 4.9.

Single Rack Options (in.)

(Dimensional variations from standard as shown.)



	9/16" (006)		3/4" (017)		1-1/16" (037)		1-1/2" (098)		2" (247)	
	L1	L2	L1	L2	L1	L2	L1	L2	L1	L2
Adder Per Degree of Rotation	0.0048	0.0048	0.0066	0.0066	0.0073	0.0073	0.0097	0.0097	0.0137	0.0137
Plus One Length Adder Below Per Side										
Base Unit (No Options)	1.52	1.52	1.63	1.63	2.03	2.03	2.34	2.34	2.84	2.84
Bumper Both Sides (B1)	1.64	1.64	1.77	1.77	2.18	2.18	2.49	2.49	3.04	3.04
Bumper CCW Side (B2)	1.52	1.64	1.63	1.77	2.03	2.18	2.34	2.49	2.84	3.04
Bumper CW Side (B3)	1.64	1.52	1.77	1.63	2.18	2.03	2.49	2.34	3.04	2.84
Cushion Both Sides (C1)	N/A	N/A	2.16	2.16	2.66	2.66	2.98	2.98	3.65	3.65
Cushion CCW Side (C2)	N/A	N/A	1.63	2.16	2.03	2.66	2.34	2.98	2.84	3.65
Cushion CW Side (C3)	N/A	N/A	2.16	1.63	2.66	2.03	2.98	2.34	3.65	2.84
Oil Service Seals (S)	1.93	1.93	2.18	2.18	2.34	2.34	2.77	2.77	3.38	3.38
Oil Service with Angle Adjustment (AS)	N/A	N/A	N/A	N/A	2.97	2.97	3.41	3.41	4.19	4.19

Note: Option A- Angle Adjustment and Option M- Magnetic Position Sensing is found on pages 4.9 and 4.10.

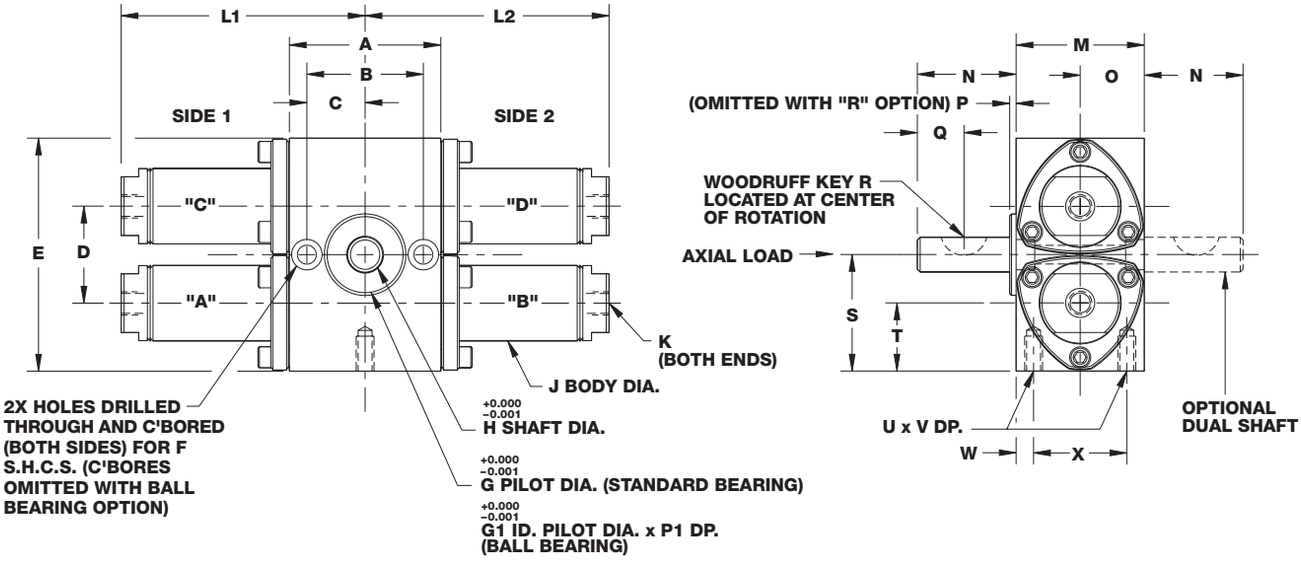
"CCW Side" –
refers to the extreme rotation of the shaft in the counter-clockwise direction as viewed from the mounting pilot side of the actuator.

The location of the optional feature chosen will be on tube B for single rack actuators.

"CW Side" –
refers to the extreme rotation of the shaft in the clockwise direction as viewed from the mounting pilot side of the actuator.

The location of the optional feature chosen will be on tube A for single rack actuators.

Double Rack Models (in.)



Note: Body retainer on 2" bore has 4 corners.
L1/L2 dimensions shown in chart on page 4.8.

Bore	A	B	C	D	E	F (C' Bores Omitted with Ball Bearing Option)	G (Std Bearing O.D. Pilot Dia.)
9/16" (014)	1.38	1.00	0.50	0.83	2.06	#8 S.H.C.S.	0.675
3/4" (033)	1.62	1.25	0.62	1.04	2.50	#10 S.H.C.S.	0.875
1-1/16" (074)	1.88	1.44	0.72	1.36	3.12	1/4" S.H.C.S.	0.968
1-1/2" (196)	2.38	1.81	0.90	1.88	4.19	5/16" S.H.C.S.	1.249
2" (494)	3.00	2.38	1.19	2.56	5.13	5/16" S.H.C.S.	1.749

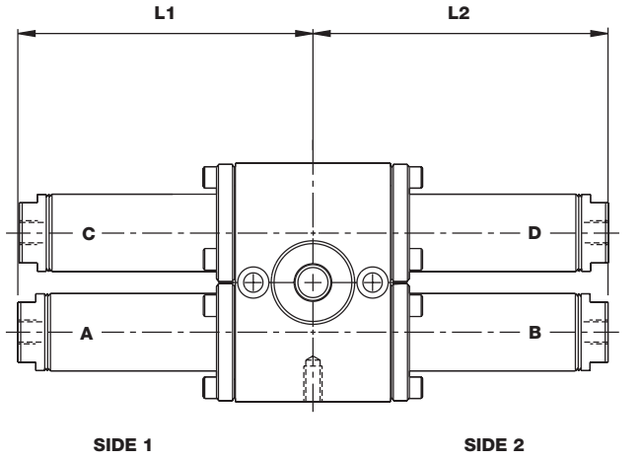
Bore	G1 (Ball Bearing I.D. Pilot)	H	J	K	M	N	O	P	P1
9/16" (014)	0.750	0.250	0.61	#10-32 [1]	1.12	0.69	0.56	0.06	0.06
3/4" (033)	0.875	0.375	0.82	#10-32 [1]	1.37	1.06	0.69	0.06	0.06
1-1/16" (074)	1.125	0.500	1.12	1/8 NPT	1.75	1.31	0.88	0.06	0.09
1-1/2" (196)	1.375	0.625	1.56	1/8 NPT	2.25	1.38	1.12	0.09	0.09
2" (494)	1.875	0.875	2.08	1/4 NPT	2.56	2.00	1.28	0.11	0.10

Bore	Q	R [2]	S	T	U	V	W	X
9/16" (014)	0.31	#202.5	1.03	0.61	#8-32	0.44	0.19	0.75
3/4" (033)	0.50	#204	1.25	0.73	#10-24	0.38	0.19	1.00
1-1/16" (074)	0.62	#305	1.56	0.88	1/4-20	0.50	0.25	1.25
1-1/2" (196)	0.62	#405	2.09	1.16	5/16-18	0.62	0.31	1.62
2" (494)	0.75	#606	2.56	1.28	5/16-18	0.62	0.28	2.00

[1]Option-S ports are 1/8 NPT (bodies "A" and "C" only).
[2]Key dimensions on page 4.9.

Double Rack Options (in.)

(Dimensional variations from standard as shown.)



	9/16" (014)		3/4" (033)		1-1/16" (074)		1-1/2" (196)		2" (494)	
	L1	L2	L1	L2	L1	L2	L1	L2	L1	L2
Adder Per Degree of Rotation	0.0048	0.0048	0.0066	0.0066	0.0073	0.0073	0.0097	0.0097	0.0137	0.0137
Plus One Length Adder Below Per Side										
Base Unit (No Options)	1.52	1.57	1.63	1.68	2.03	2.08	2.34	2.39	2.84	2.89
Bumper Both Sides (B1)	1.64	1.57	1.77	1.68	2.18	2.08	2.49	2.39	3.04	2.89
Bumper CCW Side (B2)	1.64	1.57	1.77	1.68	2.18	2.08	2.49	2.39	3.04	2.89
Bumper CW Side (B3)	1.64	1.57	1.77	1.68	2.18	2.08	2.49	2.39	3.04	2.89
Cushion Both Sides (C1)	N/A	N/A	2.16	1.68	2.66	2.08	2.98	2.39	3.65	2.89
Cushion CCW Side (C2)	N/A	N/A	2.16	1.68	2.66	2.08	2.98	2.39	3.65	2.89
Cushion CW Side (C3)	N/A	N/A	2.16	1.68	2.66	2.08	2.98	2.39	3.65	2.89
Oil Service Seals (S)	1.93	1.57	2.18	1.68	2.34	2.08	2.77	2.39	3.38	2.89
Oil Service with Angle Adjustment (AS)	N/A	N/A	N/A	N/A	2.97	2.08	3.41	2.39	4.19	2.89

"CCW Side" –
refers to the extreme rotation of the shaft in the counter-clockwise direction as viewed from the mounting pilot side of the actuator.

The location of the optional feature chosen will be on tube C for double rack actuators.

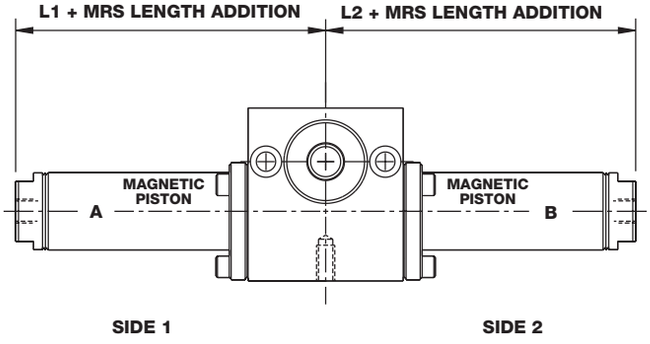
"CW Side" –
refers to the extreme rotation of the shaft in the clockwise direction as viewed from the mounting pilot side of the actuator.

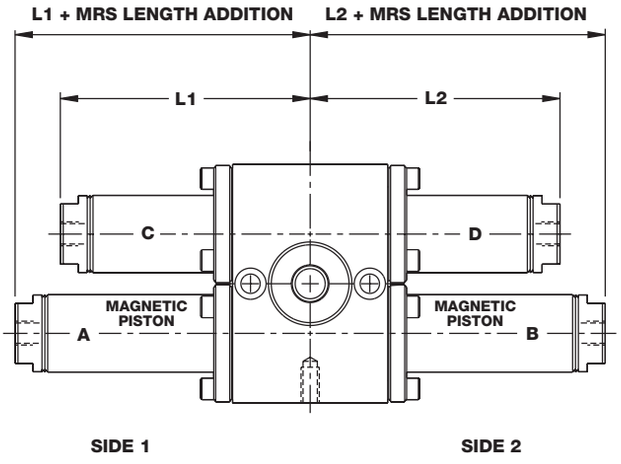
The location of the optional feature chosen will be on tube A for double rack actuators.

Options

MRS® Magnetic Position Sensing

Magnetic pistons are located on the A and B tubes of both the single and double rack rotary actuators, guaranteeing switch operation at any point in the rotation.

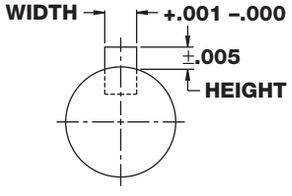




MRS® Length Adder (in.)

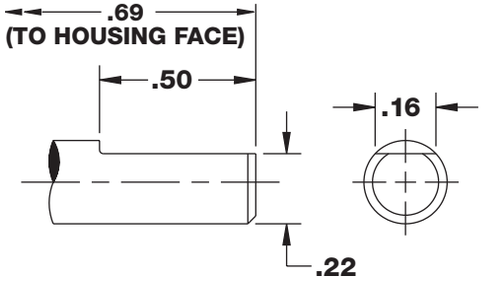
Degrees	006/014	017/033	037/074	098/196	247/494
45°	0.66	0.66	0.75	0.75	0.75
90°	0.55	0.52	0.59	0.53	0.44
180°	0.34	0.22	0.26	0.09	0.00
270°	0.12	0.00	0.00	0.00	0.00
360°	0.00	0.00	0.00	0.00	0.00

Woodruff Key (in.)

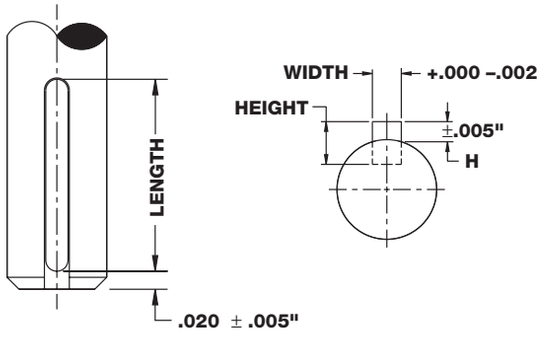


Key No.	Width	Height
202.5	0.0625	0.032
204	0.0625	0.032
305	0.0938	0.047
405	0.1250	0.063
606	0.1875	0.094

Flat Key (in.) (006 and 014)



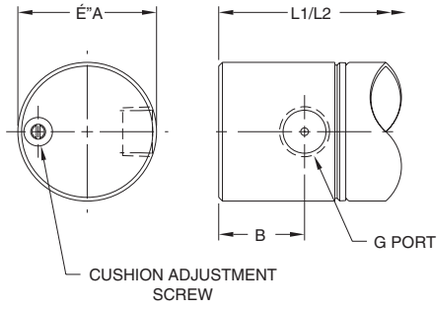
Square Key Option (in.)



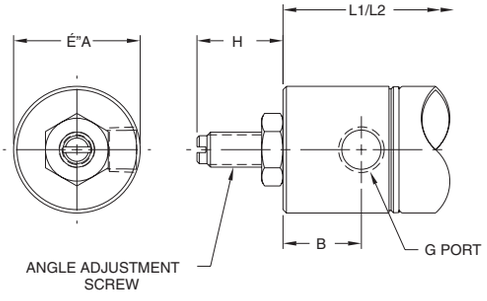
Bore Size	Length	Width	Height	H
3/4" (017 / 033)	.718	.094	.094	.047
1-1/16" (037 / 074)	.797	.125	.125	.063
1-1/2" (098 / 196)	.797	.188	.188	.094
2" (247 / 494)	1.781	.25	.25	.125

Option Dimensions (in.)

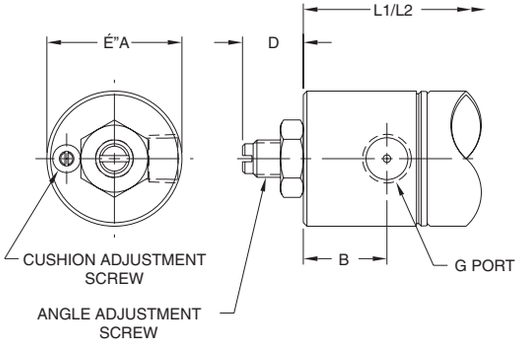
Cushion (C Option)



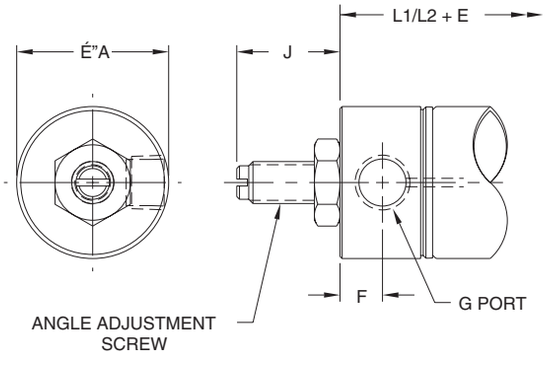
Angle Adjustment with Oil Service Seals (AS Option)



Angle Adjustment with Cushion (AC Option)



Angle Adjustment (A Option)



Bore	A	B	D	E	F	G	H	J
9/16" (006)	0.81	N/A	N/A	0.23	0.24	#10-32	N/A	0.53
9/16" (014)	0.81	N/A	N/A	0.23	0.24	#10-32	N/A	0.53
3/4" (017)	0.87	0.41	0.48	0.22	0.23	#10-32	N/A	0.71
3/4" (033)	0.87	0.41	0.48	0.22	0.23	#10-32	N/A	0.71
1-1/16" (037)	1.11	0.69	0.51	0.40	0.31	1/8 NPT	0.76	0.76
1-1/16" (074)	1.11	0.69	0.51	0.40	0.31	1/8 NPT	0.76	0.76
1-1/2" (098)	1.56	0.77	0.60	0.42	0.34	1/8 NPT	0.94	0.94
1-1/2" (196)	1.56	0.77	0.60	0.42	0.34	1/8 NPT	0.94	0.94
2" (247)	2.08	0.87	0.80	0.53	0.41	1/4 NPT	1.28	1.28
2" (494)	2.08	0.87	0.80	0.53	0.41	1/4 NPT	1.28	1.28

Option N

Low Temperature Seals

Option N - Low Temperature Operation is now available as a standard catalog offering.

Pneu-Turns with seals and lubricant allowing operation to minus 40 degrees F can now be ordered directly from the catalog. Please note when ordering this option that cylinder performance may be affected beginning at temperatures below minus 20 degrees F.

Operational Note: Dry air with a dew point below the lowest temperature the actuator will experience or dry nitrogen is recommended.

Product Availability - 3 business days

Option Q

Internal Flow Control

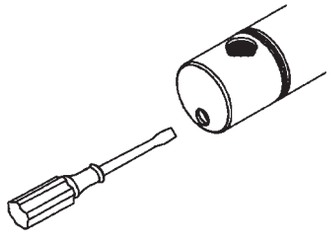
Internal flow control is now available as a standard catalog option in bore sizes 3/4", 1-1/16", 1-1/2", and 2"; both single and double rack models.

Use this option as a space saving feature and to avoid “tampering” associated with externally installed flow controls.

Flow control is achieved using a sealing disk that restricts the flow of air to the port when the piston moves towards the end cap. The restricted air is channeled through a small orifice within the end cap, on its way to the exhaust port. Controlling the flow through this orifice is achieved by adjusting a screw located on the face of the end cap. Single rack units: Clockwise (CW) and counter-clockwise (CCW) rotational flow is controlled using the end cap adjustment screw, opposite the direction of the shaft. Double rack units: CW rotation flow is adjusted using the screw in the lower end cap; CCW rotational flow is adjusted using the screw in the upper end cap. Bore sizes 3/4" and 1-1/16" provide three turns of adjustment. All larger bore sizes provide four turns of adjustment.

Option designators
Q1 - Internal flow control (both sides)
Q2 - Internal flow control (counter-clockwise rotation)
Q3 - Internal flow control (clockwise rotation)

Product Availability - 3 business days



Option Q - Dimensional Variations from Standard (in.)

Single Rack	9/16" (006)		3/4" (017)		1-1/16" (037)		1-1/2" (098)		2" (247)	
	L1	L2	L1	L2	L1	L2	L1	L2	L1	L2
Adder per Degree of Rotation			0.0066	0.0066	0.0073	0.0073	0.0097	0.0097	0.0137	0.0137
Flow Control Both Sides (Q1)	N/A	N/A	2.16	2.16	2.66	2.66	2.98	2.98	3.65	3.65
Flow Control Both Sides (Q2)	N/A	N/A	1.63	2.16	2.03	2.66	2.34	2.98	2.84	3.65
Flow Control Both Sides (Q3)	N/A	N/A	2.16	1.63	2.66	2.03	2.98	2.34	3.65	2.84

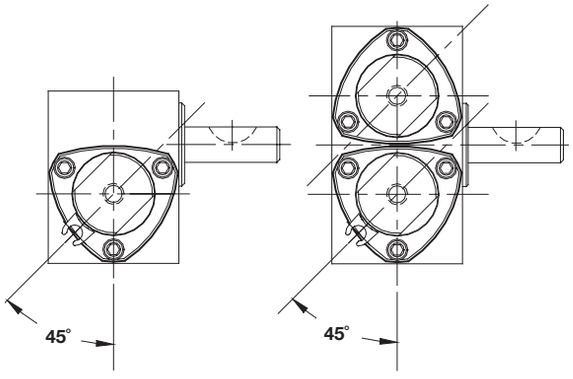
Double Rack	Degree of Rotation Adder Same as Single Rack									
	9/16" (014)		3/4" (033)		1-1/16" (074)		1-1/2" (196)		2" (494)	
	L1	L2	L1	L2	L1	L2	L1	L2	L1	L2
Flow Control Both Sides (Q1)	N/A	N/A	2.16	1.68	2.66	2.08	2.98	2.39	3.65	2.89
Flow Control Both Sides (Q2)	N/A	N/A	2.16	1.68	2.66	2.08	2.98	2.39	3.65	2.89
Flow Control Both Sides (Q3)	N/A	N/A	2.16	1.68	2.66	2.08	2.98	2.39	3.65	2.89

Refer to pages 4.5-4.10 for other standard option dimensional information.

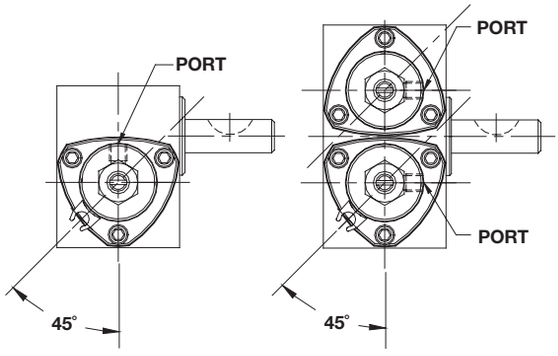
Switch Track (T Option)

Track Locations (All other dimensions remain unchanged)

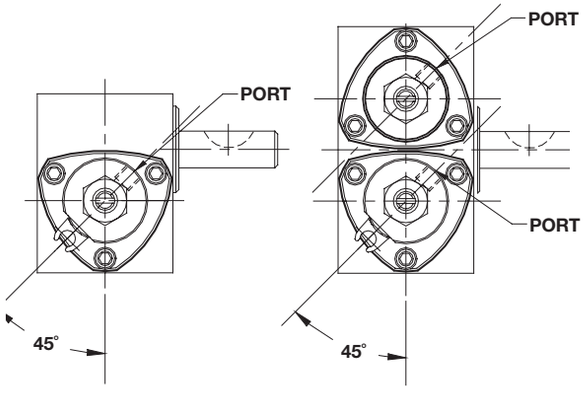
STANDARD "T" ALL BORES



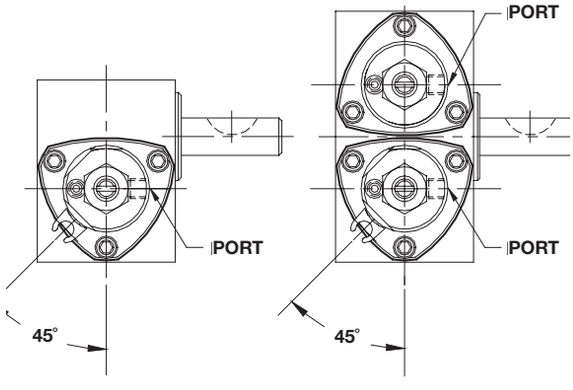
ALL OTHER OPTIONS
ALL BORES EXCEPT 3/4 & 9/16

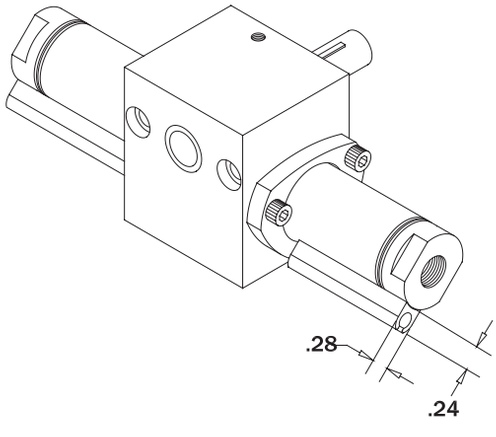


"AT" FOR 3/4 9/16 BORE



"ACT" & "CT" FOR 3/4 BORE



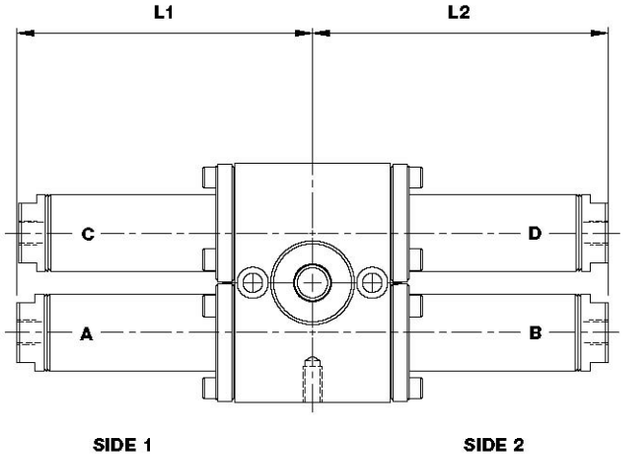


Double Rack Z2 and Z3 Option (in.)

(Dimensional variations from standard as shown.)

Z2 Option
Adder applies to L1 and L2, bodies A and D only

Z3 Option
Adder applies to L1 and L2, bodies C and B only

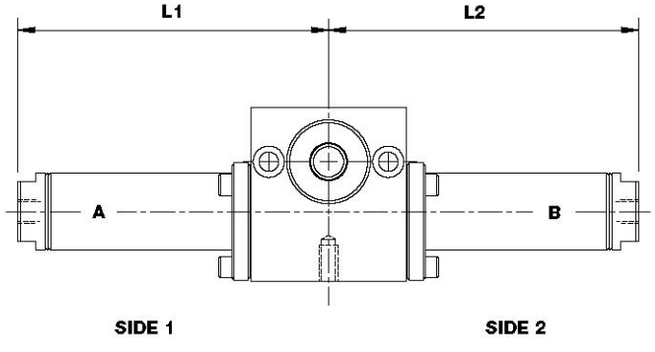


Single Rack Z2 and Z3 Option (in.)

(Dimensional variations from standard as shown.)

Z2 Option
Adder applies to L1 dimension

Z3 Option
Adder applies to L2 dimension



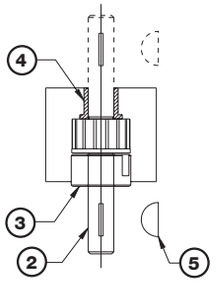
Length Adder for Return Spring Option in Inches, per Body

Bore Size	0-75°	0-90°	0-120°	0-150°	76-150°	91-180°	151-225°	121-240°	181-270°	151-300°	226-300°	241-360°	271-360°	301-360°
9/16"		.688				1.313			1.938				2.563	
3/4"				.750						1.438				2.126
1-1/16"			.813					1.375				1.937		
1-1/2"		.751				1.439			2.127				2.815	
2"	1.262				2.262		2.512				4.450			4.812

	Torque generated by spring (in-lbs.)	
Bore Size	Pre-load	Final
9/16"	0.5	1.0
3/4"	1.0	2.0
1-1/16"	1.0	2.5
1-1/2"	4.0	8.0
2"	12.0	24.0

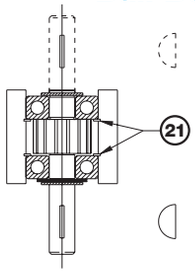
Repair Parts

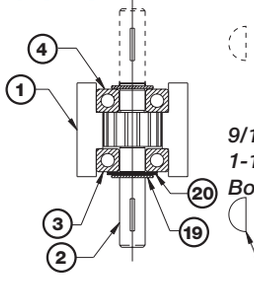
Standard Shaft



Ball Bearing (R) Option

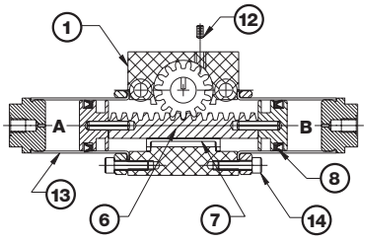
3/4" Bore Model



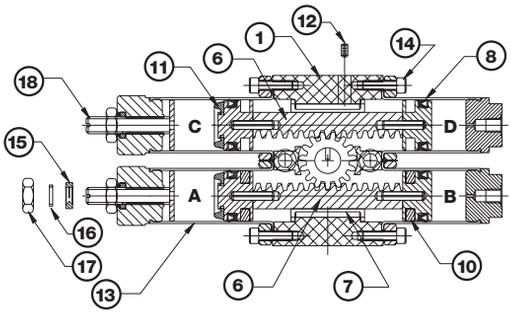


9/16", 1-1/16", 1-1/2", 2" Bore Models

Single Rack Model



Double Rack Model



Repair Parts

No.	Part Description	Quantity Required	
		Single	Double
PT-1	Actuator Body	1	1
PT-2	Shaft/Pinion Assembly	1	1
PT-3	Front Shaft Bearing	1	1
PT-4	Rear Shaft Bearing	1	1
PT-5	Shaft Key	1	1
PT-6	Piston/Rack Assembly (Includes Rack, Roll Pins and 2 Pistons)	1	2
PT-7	Rack Support	1	2
PT-8	Piston Seal[1]	2	4
PT-9	Piston Wear Ring (Required for Oil Service only)	2	2
PT-10	Magnet	2	2
PT-11	Bumper	2	2
PT-12	Bearing Retainer Set Screw	1	1
PT-13	Cylinder Body Assembly (Includes Body, End Cap, and Retainer Ring)	2	4
PT-14	Cylinder Body Retainer Cap Screw[4]	6	12
PT-15	Cylinder Body Thread Seal	2	2
PT-16	Cylinder Body Thread Seal Ring	2	2
PT-17	Cylinder Body Jam Nut	2	2
PT-18	Angle Adjustment Screw	2	2
PT-19	Retaining Ring	2	2
PT-20	Shim Package	1	1
PT-21	Shaft Spacers[2]	1	1

Repair Kits

Bearing Kit (K-A-PT)[3]		
PT-3	Front Shaft Bearing	1
PT-4	Rear Shaft Bearing	1

Shaft Kit (K-S-PT)		
PT-2	Shaft/Pinion Assembly	1
PT-5	Shaft Key	1

Seal Kit (K-L-PT)[1]		
PT-8	Piston Seals	2

[1] *Double Rack Models require two repair kits per rotary actuator.*

Oil Service Option: Single Rack models require four oil service seals or two oil service seal kits. Double Rack models require four oil service seals and two standard seals or two oil service seal kits and one standard seal kit.

[2] *Used on 3/4" bore single and double rack units with Ball Bearing option.*

[3] *Bearing Kit for Ball Bearings includes retaining rings and shim package.*

[4] *2" bore requires 8 or 16.*

HOW TO ORDER

EXAMPLE: Customer needs to replace the upper piston/rack assembly on a PT-033-180-C1DM. Order is placed as:

PT - 6 - 33 - 180 - C1 - CD
A B C D E

A. Repair Kit Part Number
B. Series code - (Bore Size)

English	Metric
**006=06	**011=11
014=14	022=22
**017=17	**027=27
033=33	054=54
**037=37	**060=60
074=74	121=12
**098=98	**161=16
196=19	321=32
**247=24	**404=40
494=49	808=80

* Designates parts common to both Single and Double Rack Models. Use SINGLE Rack series code only.
** Single Rack Model.
# Used on 3/4 inch Bore with Ball Bearing Option.

C. Rotation - Rotation is **only** needed in **PT-6 and PT-13**
D. Options - See Chart Below. Reference **OPTION COMBINATION AVAILABILITY CHART** in catalog for option compatibility. Options A, B and C must designate a 1, 2, or 3 (e.g. A1, B1, C1)
E. Location - For Bodies & Racks on Double Rack Models (**PT-6**, AB or CD) or (**PT-13**, A, B, C, or D)
For Bodies on Single Rack Models (**PT-13**, A or B)

Part No.	Part Description	Options	Location
PT-1	ACTUATOR BODY	only possible option needed **R**	
***PT-2**	SHAFT/PINION ASS'Y	only possible options needed **D, E, F, K, R**	
***PT-3**	FRONT SHAFT BEARING	only possible option needed **R**	
***PT-4**	REAR SHAFT BEARING	only possible option needed **R**	
***PT-5**	SHAFT KEY	only possible option needed **K**	
PT-6	PISTON/RACK ASS'Y	only possible options needed **B, C, M, S, X**	AB or CD
***PT-7**	RACK SUPPORT	only possible option needed **X**	
***PT-8**	PISTON SEAL	only possible options needed **S, V**	
***PT-9**	PISTON WEAR RING	no options	
***PT-10**	MAGNET	no options	
***PT-11**	BUMPER	only possible option needed **V**	
***PT-12**	BEARING RETAINER SET SCREW	no options	
PT-13	BODY ASS'Y	only possible options needed **A, B, C, M, S, T, V**	A,B,C, or D
***PT-14**	BODY RETAINER CAP SCREW	no options	
***PT-15**	BODY THREAD SEAL	only possible option needed **V**	
***PT-16**	BODY THREAD SEAL RING	no options	
***PT-17**	BODY JAM NUT	no options	
***PT-18**	ANGLE ADJ. SCREW	only possible options needed **C, S (A if with S)**	
***PT-19**	RETAINING RING	no options	
***PT-20**	SHIM PACKAGE	no options	
#PT-21	SHAFT SPACERS	no options	
***K-A-PT**	BEARING KIT	only possible option needed **R**	
***K-L-PT**	SEAL KIT	only possible options needed **S, V**	
***K-S-PT**	SHAFT KIT	only possible options needed **D, E, F, K, R**	

Three-Position Pneu-Turn

The Three-Position Pneu-Turn rotary actuators, in all bore sizes; both single and double rack can now be ordered as a standard catalog option.

How to Order

The model number for the Three-Position Pneu-Turn consists of alphanumeric characters. They designate the product; bore size, total rotation, degrees to mid-position, position of the shaft key at the mid-rotational position and options. the example below is for a 1-1/2" bore, single rack model with 225 degrees of total rotation, 45 degrees of rotation to the middle position, the key located at mid-position 8 and angle adjustment on both sides.

PT - 098225/045-8A1

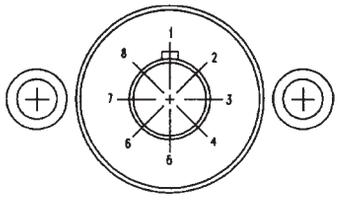
PRODUCT DESIGNATOR

BORE SIZE
SAME AS STANDARD OFFERING

ANGLE OF TOTAL ROTATION

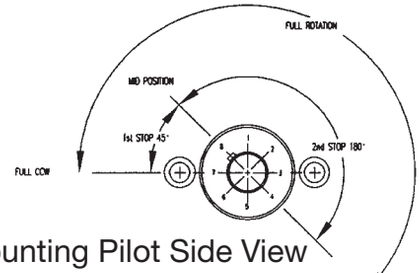
DEGREES TO MID-POSITION

KEY LOCATION
From the graphic below, select the position of shaft key when the shaft is at the middle position



Mounting Pilot Side
*All other key positions are available. Contact your Bimba distributor.

OPTIONS
SAME AS STANDARD OFFERING except T (track) not available



Mounting Pilot Side View

Example of rotation for PT-098225/045-8A1
Shaft Front View

Option Combination Availability

This chart provides the options that ***cannot*** be combined due to design or compatibility restrictions. For example, F and E options ***are not*** available in combination.

Option Series	A	B	C	D	E	F	G	K	M	N	Q	R	S	V	X
9/16" Single	S	N,Q,S	N/A	E,F	D,F,R	D,E,K	N,S	F	N	B,G,M,V	N/A	E	A,B,G	N	N/A
9/16" Double	S	N,Q,S	N/A	E,F	D,F,R	D,E,K	N,S	F	N	B,G,M,V	N/A	E	A,B,G	N	N/A
3/4" Single	Q,S	C,N,S	B,Q,S	E,F	D,F,R	D,E,K	N,S	F	N	B,G,M,Q,V	A,C,N,S	E	A,B,C,G,Q	N	N/A
3/4" Double	Q,S	C,N,S	B,Q,S	E,F	D,F,R	D,E,K	N,S	F	N	B,G,M,Q,V	A,C,N,S	E	A,B,C,G,Q	N	N/A
1-1/16" Single	Q	C,N,S	B,Q,S	E,F	D,F,R,X	D,E,K,X	N,S	F	N	B,G,M,Q,V	A,C,N,S	E	B,C,G,Q	N	E,F
1-1/16" Double	Q	C,N,S	B,Q,S	E,F	D,F,R,X	D,E,K,X	N,S	F	N	B,G,M,Q,V	A,C,N,S	E	B,C,G,Q	N	E,F
1-1/2" Single	Q	C,N,S	B,Q,S	E,F	D,F,R,X	D,E,K,X	N,S	F	N	B,G,M,Q,V	A,C,N,S	E	B,C,G,Q	N	E,F
1-1/2" Double	Q	C,N,S	B,Q,S	E,F	D,F,R,X	D,E,K,X	N,S	F	N	B,G,M,Q,V	A,C,N,S	E	B,C,G,Q	N	E,F
2" Single	Q	C,N,S	B,Q,S	E,F	D,F,R,X	D,E,K,X	N,S	F	N	B,G,M,Q,V	A,C,N,S	E	B,C,G,Q	N	E,F
2" Double	Q	C,N,S	B,Q,S	E,F	D,F,R,X	D,E,K,X	N,S	F	N	B,G,M,Q,V	A,C,N,S	E	B,C,G,Q	N	E,F

Option T - “Switch track” should only be ordered with options M or V if the actuator will be operated between -20˚ to 85˚ C (-4˚ to 185˚ F)

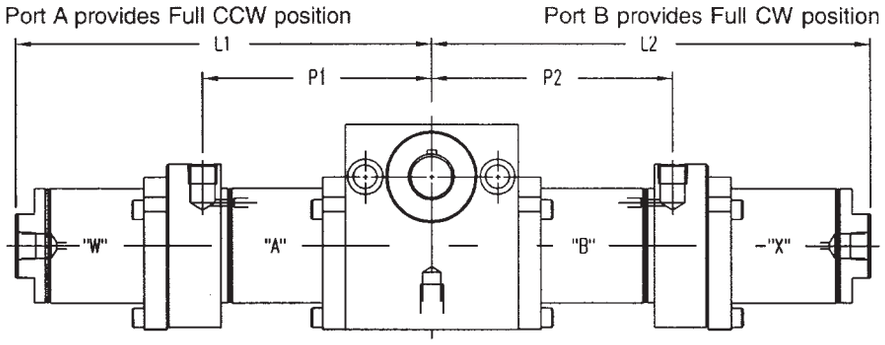
Three-Position List Price Adders

Bore Size	9/16"		3/4"		1-1/16"		1-1/2"		2"	
Type	Single (006)	Double (014)	Single (017)	Double (033)	Single (037)	Double (074)	Single (098)	Double (196)	Single (247)	Double (494)
Three Position Base Adder										
**Adder per 45 degree Rotation										

**The 45-degree rotational adder shown above includes the base and three-position requirement. No additional rotational adder is required.

Option list prices are the same as the standard offering.

Three-Position Pneu-Turn



Ports W and X provide mid-position

Single Rack Model Dimensions

	9/16" (006)				3/4" (017)				1-1/16" (037)			
	P1	P2	L1	L2	P1	P2	L1	L2	P1	P2	L1	LR
Degrees of Full Rotation Adder per degree of rotation	**full rot. 0.0048**	**full rot. 0.0048**	**full rot. 0.0048**	**full rot. 0.0048**	**full rot. 0.0066**	**full rot. 0.0066**	**full rot. 0.0066**	**full rot. 0.0066**	**full rot. 0.0073**	**full rot. 0.0073**	**full rot. 0.0073**	**full rot. 0.0073**
Degree of Stop Rotation Adder per degree of rotation	2nd stop N/A	1st stop N/A	2nd stop 0.0048	1st stop 0.0048	2nd stop N/A	1st stop N/A	2nd stop 0.0066	1st stop 0.0066	2nd stop N/A	1st stop N/A	2nd stop 0.0073	1st stop 0.0073
Base Unit (No Option)	1.41	1.41	2.82	2.82	1.63	1.63	3.05	3.05	2.03	2.03	3.89	3.89
Bumpers Both Sides (B1)	1.53	1.53	3.06	3.06	1.77	1.77	3.33	3.33	2.18	2.18	4.19	4.19
Bumper CCW Side (B2)	1.41	1.53	2.82	3.06	1.63	1.77	3.05	3.33	2.03	2.18	3.89	4.19
Bumper CW Side (B3)	1.53	1.41	3.06	2.82	1.77	1.63	3.33	3.05	2.18	2.03	4.19	3.89
Cushion/Flow Both Sides (C1) (Q1)	N/A	N/A	N/A	N/A	1.63	1.63	3.58	3.58	2.03	2.03	4.51	4.51
Cushion/Flow CCW Side (C2) (Q2)	N/A	N/A	N/A	N/A	1.63	1.63	3.05	3.58	2.03	2.03	3.89	4.51
Cushion/Flow CW Side (C3) (Q3)	N/A	N/A	N/A	N/A	1.63	1.63	3.58	3.05	2.03	2.03	4.51	3.89
Angle Adjustment Both Sides (A1)	1.41	1.41	3.05	3.05	1.63	1.63	3.27	3.27	2.03	2.30	4.28	4.28
Angle Adjustment CCW Side (A2)	1.41	1.41	2.82	3.05	1.63	1.63	3.05	3.27	2.03	2.03	3.89	4.28
Angle Adjustment CW Side (A3)	1.41	1.41	3.05	2.82	1.63	1.63	3.27	3.05	2.03	2.03	4.28	3.89

**Select Magnetic Position Sensing adder from MRS table

	1-1/2" (098)				2" (247)			
	P1	P2	L1	L2	P1	P2	L1	L2
Degrees of Full Rotation Adder per degree of rotation	**full rot. 0.0097**	**rull rot. 0.0097**	**full rot. 0.0097**	**full rot. 0.0097**	**full rot. 0.0137**	**full rot. 0.0137**	**full rot. 0.0137**	**full rot. 0.0137**
Degree of Stop Rotation Adder per degree of rotation	2nd stop N/A	1st stop N/A	2nd stop 0.0097	1st stop 0.0097	2nd stop N/A	1st stop N/A	2nd stop 0.0137	1st stop 0.0137
Base Unit (No Option)	2.28	2.28	4.39	4.39	2.81	2.81	5.13	5.13
Bumpers Both Sides (B1)	2.43	2.43	4.69	4.69	3.01	3.01	5.53	5.53
Bumper CCW Side (B2)	2.28	2.43	4.39	4.69	2.81	3.01	5.13	5.53
Bumper CW Side (B3)	2.43	2.28	4.69	4.39	3.01	2.81	5.53	5.13
Cushion/Flow Both Sides (C1) (Q1)	2.28	2.28	5.03	5.03	2.81	2.81	5.95	5.95
Cushion/Flow CCW Side (C2) (Q2)	2.28	2.28	4.39	5.03	2.81	2.81	5.13	5.95
Cushion/Flow CW Side (C3) (Q3)	2.28	2.28	5.03	4.39	2.81	2.81	5.95	5.13
Angle Adjustment Both Sides (A1)	2.28	2.28	4.80	4.80	2.81	2.81	5.66	5.66
Angle Adjustment CCW Side (A2)	2.28	2.28	4.39	4.80	2.81	2.81	5.13	5.66
Angle Adjustment CW Side (A3)	2.28	2.28	4.80	4.39	2.81	2.81	5.66	5.13

**Select Magnetic Position Sensing adder from MRS table

Note:
Overall length calculator spreadsheet available. Contact the Technical Assistance Center for details.

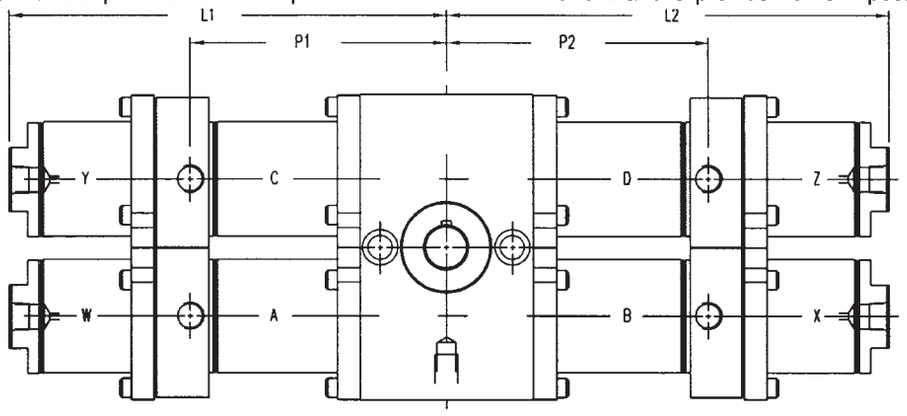
MRS Length Adder (in.)					
Total Rotation Degrees	**006/014**	**017/033**	**037/074**	**098/196**	**247/494**
45˚	0.66	0.66	0.75	0.75	0.75
90˚	0.55	0.52	0.59	0.53	0.44
180˚	0.34	0.22	0.26	0.09	0.00
270˚	0.12	0.00	0.00	0.00	0.00
360˚	0.00	0.00	0.00	0.00	0.00

Single rack overall width calculation: PT-098180/045-8C1--Using the chart above, calculate L1 and L2 dimensions as follows:
L1 = Total rotation (180) * (.0097) Full rotation adder + Degrees to 2nd stop (135) * (.0097) 2nd stop rotation adder + Cushion adder (5.03")
L2 = Total rotation (180) * (.0097) Full rotation adder + Degrees to 1st stop (45) * (.0097) 1st stop rotation adder + Cushion adder (5.03")
[L1 = (1.746" + 1.310" + 5.03") = 8.086"] + [L2 = (1.746" + .437 + 5.03") = 7.213"]; Total width = 8.086" + 7.213" = 15.30"

Three-Position Pneu-Turn

Ports A and D provide Full CCW position

Ports B and C provide Full CW position



Ports W, X, Y, and Z provide mid-position

Double Rack Model Dimensions

	9/16" (014)				3/4" (033)				1-1/16" (074)			
	P1	P2	L1	L2	P1	P2	L1	L2	P1	P2	L1	LR
Degrees of Full Rotation Adder per degree of rotation	**full rot. 0.0048**	**full rot. 0.0048**	**full rot. 0.0048**	**full rot. 0.0048**	**full rot. 0.0066**	**full rot. 0.0066**	**full rot. 0.0066**	**full rot. 0.0066**	**full rot. 0.0073**	**full rot. 0.0073**	**full rot. 0.0073**	**full rot. 0.0073**
*Degrees to longest stop Adder per degree of rotation	stop rot. N/A	stop rot. N/A	stop rot. 0.0048	stop rot. 0.0048	stop rot. N/A	stop rot. N/A	stop rot. 0.0066	stop rot. 0.0066	stop rot. N/A	stop rot. N/A	stop rot. 0.0073	stop rot. 0.0073
Base Unit (No Option)	1.41	1.46	2.82	2.87	1.63	1.68	3.05	3.10	2.03	2.08	3.89	3.94
Bumpers Both Sides (B1)	1.53	1.46	3.06	2.87	1.77	1.68	3.33	3.10	2.18	2.08	4.19	3.94
Bumper CCW Side (B2)	1.53	1.46	3.06	2.87	1.77	1.68	3.33	3.10	218	2.08	4.19	3.94
Bumper CW Side (B3)	1.53	1.46	3.06	2.87	1.77	1.68	3.33	3.10	2.18	2.08	4.19	3.94
Cushion/Flow Both Sides (C1) (Q1)	N/A	N/A	N/A	N/A	1.63	1.68	3.58	3.10	2.03	2.08	4.51	3.94
Cushion/Flow CCW Side (C2) (Q2)	N/A	N/A	N/A	N/A	1.63	1.68	3.58	3.10	2.03	2.08	4.51	3.94
Cushion/Flow CW Side (C3) (Q3)	N/A	N/A	N/A	N/A	1.63	1.68	3.58	3.10	2.03	2.08	4.51	3.94
Angle Adjustment Both Sides (A1)	1.41	1.46	3.05	2.87	1.63	1.68	3.27	3.10	2.03	2.08	4.28	3.94
Angle Adjustment CCW Side (A2)	1.41	1.46	3.05	2.87	1.63	1.68	3.27	3.10	2.03	2.08	4.28	3.94
Angle Adjustment CW Side (A3)	1.41	1.46	3.05	2.87	1.63	1.68	3.27	3.10	2.03	2.08	4.28	3.94

**Select Magnetic Position Sensing adder from MRS table

	1-1/2" (196)				2" (494)			
	P1	P2	L1	L2	P1	P2	L1	L2
Degrees of Full Rotation Adder per degree of rotation	**full rot. 0.0097**	**rull rot. 0.0097**	**full rot. 0.0097**	**full rot. 0.0097**	**full rot. 0.0137**	**full rot. 0.0137**	**full rot. 0.0137**	**full rot. 0.0137**
Degree of Stop Rotation Adder per degree of rotation	stop rot. N/A	stop rot. N/A	stop rot. 0.0097	stop rot. 0.0097	stop rot. N/A	stop rot. N/A	stop rot. 0.0137	stop rot. 0.017
Base Unit (No Option)	2.28	2.33	4.39	4.44	2.81	2.86	5.13	5.18
Bumpers Both Sides (B1)	2.43	2.33	4.69	4.44	3.01	2.86	5.53	5.18
Bumper CCW Side (B2)	2.43	2.33	4.69	4.44	3.01	2.86	5.53	5.18
Bumper CW Side (B3)	2.43	2.33	4.69	4.44	3.01	2.86	5.53	5.18
Cushion/Flow Both Sides (C1) (Q1)	2.28	2.33	5.03	4.44	2.81	2.86	5.95	5.18
Cushion/Flow CCW Side (C2) (Q2)	2.28	2.33	5.03	4.44	2.81	2.86	5.95	5.18
Cushion/Flow CW Side (C3) (Q3)	2.28	2.33	5.03	4.44	2.81	2.86	5.95	5.18
Angle Adjustment Both Sides (A1)	2.28	2.33	4.80	4.44	2.81	2.86	5.66	5.18
Angle Adjustment CCW Side (A2)	2.28	2.33	4.80	4.44	2.81	2.86	5.66	5.18
Angle Adjustment CW Side (A3)	2.28	2.33	4.80	4.44	2.81	2.86	5.66	5.18

**Select Magnetic Position Sensing adder from MRS table

Note:
Overall length calculator spreadsheet available. Contact the Technical Assistance Center for details.

Double rack overall width calculation: PT-196180/045-8C1--Using the chart above, calculate L1 and L2 dimensions as follows:
L1 = Total rotation (180) * (.0097) Full rotation adder + Largest Degrees stop (135) * (.0097) stop rotation adder + Cushion adder (5.03")
L2 = Total rotation (180) * (.0097) Full rotation adder + Largest Degrees stop (135) * (.0097) stop rotation adder + Cushion adder (4.44")
[L1 = (1.746" + 1.310" + 5.03") = 8.086"] + [L2 = (1.746" + 1.310" + 4.44") = 7.496"]; Total width = 8.086" + 7.496" = 15.58"
**Notes - Largest stop rotation is used for double rack models to calculate overall L1 and L2 length. Double rack models - one body on each side will be shorter if the shaft mid-position is not 1/2 of the total rotation, the above calculation still provides the units overall width.

Engineering Specifications

ACTUATOR OPERATION
Rotary action of the Pneu-Turn Rotary Actuator is achieved through the use of a rack and pinion assembly. Just as with a pneumatic or hydraulic cylinder, the speed of rotation may be controlled through the use of flow controls. The action at the end of the rotation can be controlled by the use of adjustable cushions, which are available as an option.

Care should be taken to insure that the inertial force does not exceed the published torque capacity. An external stop may be necessary to avoid exceeding the torque capacity due to inertial loads.

When mounting the Pneu-Turn against the shaft side of the housing, be sure to provide clearance for the pilot diameter to avoid excessive bearing pressure.

For standard models, axial loads must only be applied in the direction indicated on the dimensional drawings. The Dual Shaft or Rear Shaft options can be used to correctly orient tension induced axial loads. With the Ball Bearing option, axial loads can be applied in either direction.

The Angle Adjustment Option will allow 45° of adjustability. If cushions are ordered in conjunction with the angle adjustment option, adjustability will be 10°.

PORT POSITIONING
Ports on the Pneu-Turn may be repositioned to accommodate any air line configuration by loosening the three body retainer screws. Once desired port positions are obtained, tighten screws to specified torque values.

LUBRICATION
The Pneu-Turn Rotary Actuator is pre-lubricated at the factory for extensive, maintenance-free operation. The life of the rotary actuator can be lengthened by providing additional lubrication with an air line mist lubricator or direct introduction of oil to the actuator every 500 hours of operation. Recommended oils for Buna N seals are medium to heavy inhibited hydraulic and general purpose oil. If High Temperature seals, use Dow Corning #710. Other types of prelube are available upon request.
The rack and pinion gear and ball bearings are prelubricated at the factory for extensive, maintenance-free operation. If additional lubrication should be required, use a high grade bearing grease.

WOODRUFF KEY LOCATION
The standard position of the woodruff key is 12 o'clock at the center of rotation.

RATINGS:
Pressure Rating: All Bimba Pneu-Turn Rotary Actuators are rated for 150 PSI air.

Rotation Tolerance: Standard rotation tolerance for 9/16" – 3/4" bore is -0° to 15° and for 1-1/16" – 2" bore is -0° to +10°. Bumper option allows compression under pressure which may exceed tolerance. If higher accuracy desired, please specify angle adjustment.

Temperature Range: Buna N: (Standard) -20°F to +200°F; Option (V) High Temperature seals: 0°F to +400°F. Temperature range of high temperature seals with Ball Bearing option is 0°F to +250°F. If cylinders are operated at temperatures below 0° for extended time periods, special modifications may be required. Special seal materials are available on request.

Backlash:
- Without "X" option, 1-1/2° of Arc Maximum, Double rack actuators have zero backlash at end of rotational stroke
- With "X" option, single rack models have zero mid rotational and end of rotation backlash. Double rack models have zero mid-rotational backlash.

Breakaway: Less than 5 PSI.

Standard Line

Series	9/16"		3/4"		1-1/16"		1-1/2"		2"	
	(006)	(014)	(017)	(033)	(037)	(074)	(098)	(196)	(247)	(494)
Theoretical Torque Capacity (in.-lbs./PSI)	0.068	0.135	0.166	0.331	0.369	0.739	0.982	1.963	2.468	4.935
Bearing Load (Axial) (lbs.)	25	25	25	25	40	40	40	40	80	80
Bearing Load (Radial) (lbs.)	200	200	250	250	300	300	350	350	500	500
Distance Between Bearing Midpoints (in.)	0.77	0.77	0.96	0.96	1.24	1.24	1.70	1.70	1.98	1.98
Maximum Rate of Rotation (@ 100 PSI With No Load)	3000 deg./sec.	3000 deg./sec.	3500 deg./sec.	3500 deg./sec.	2000 deg./sec.	2000 deg./sec.	1500 deg./sec.	1500 deg./sec.	1000 deg./sec.	1000 deg./sec.
Weight (Approximate) (oz.)	6	11.5	11	20.5	21	38	48	89	105	152
Body Retainer Cap Screw Recommended Tightening Torque (in.-lbs.)	10	10	12	12	12	12	20	20	20	20

For Ball Bearing Option, the Following Specifications Apply

Series	9/16"		3/4"		1-1/16"		1-1/2"		2"	
	(006)	(014)	(017)	(033)	(037)	(074)	(098)	(196)	(247)	(494)
Bearing Load (Axial) (lbs.)	55	55	75	75	100	100	110	110	130	130
Bearing Load (Radial) (lbs.)	205	205	270	270	380	380	425	425	740	740
Distance Between Bearing Midpoints (in.)	.72	.72	.96	.96	1.26	1.26	1.71	1.71	1.82	1.82
Weight (Approximate) (oz.)	6	11.5	10.5	20	20.5	37.5	47	88	103	150

Engineering Specifications

Kinetic Energy Capacity

A load connected to the shaft of a Pneu-Turn will produce kinetic energy as it is rotated. This kinetic energy must be absorbed by the Pneu-Turn or other stopping device. If the Pneu-Turn is to stop the load without external devices, then the application kinetic energy must not exceed the maximums noted in the table below.

Maximum Allowable Kinetic Energy (in.-lbs.)

Size	Without Cushions	With Cushions
9/16" (006 / 014)	0.02	N/A
3/4" (017 / 033)	0.04	0.08
1-1/16" (037 / 074)	0.07	0.88
1-1/2" (098 / 196)	0.41	7.80
2" (247 / 494)	1.60	13.00

The kinetic energy developed by your application can be determined by using the equations noted below:

$$KE = 0.5 * I * w^2$$

$$w = 1.20 * (ø / t)$$

LEGEND:

KE = Kinetic energy (in.-lbs.)
I = Moment of inertia (in.-lb.-sec.^{2})
w = Rotational speed (radians/sec.)
ø = Angle of rotation (radians)
t = Time of rotation (sec.)
W = Weight of load (lb.)
g = Acceleration of gravity (386 in./sec.^{2})

Below are examples of attachments, their geometry, and the equation to use to determine the Moment of Inertia.

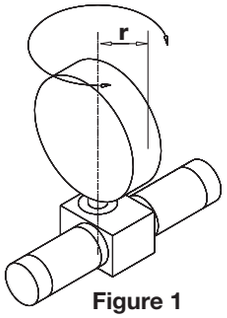


Figure 1

Thin Disc
(mounted on side through center)

$$I = \frac{W}{g} * \frac{r^2}{4}$$

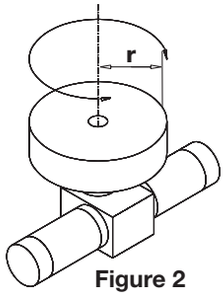


Figure 2

Thin Disc
(centered)

$$I = \frac{W}{g} * \frac{r^2}{2}$$

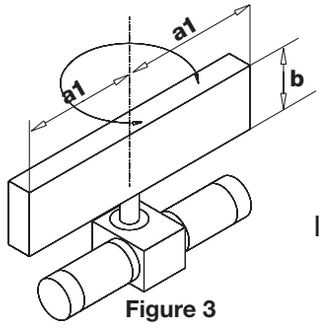


Figure 3

Thin Rectangular Plate
(centered and mounted on side)

$$I = \frac{W}{g} * \frac{(2(a1))^2}{12}$$

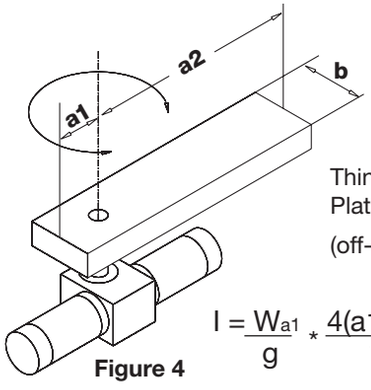


Figure 4

Thin Rectangular Plate
(off-centered)

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

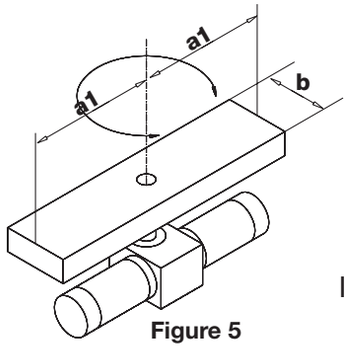


Figure 5

Thin Rectangular Plate
(centered)

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

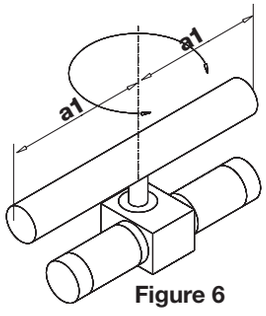


Figure 6

Slender Rod
(centered)

$$I = \frac{W}{g} * \frac{(2(a1))^2}{12}$$

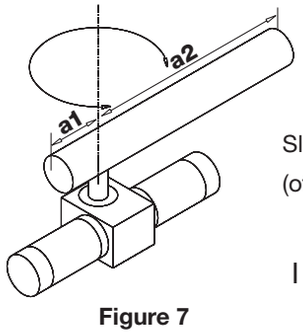


Figure 7

Slender Rod
(off-centered)

$$I = \frac{W_{a1}}{g} * \frac{a1^2}{3} + \frac{W_{a2}}{g} * \frac{a2^2}{3}$$

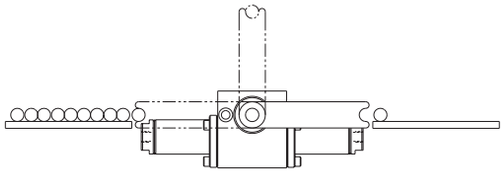
Application Possibilities

Picture the possibilities. Consider the many benefits of using the Bimba Pneu-Turn Rotary Actuator:

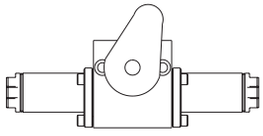
• Compact, Space-Saving Design • Lightweight • Corrosion Resistant Components • Low Cost

Now, using the pictures on this page as a springboard, you can understand that the applications are limitless. All you need is your imagination and a Bimba Pneu-Turn Rotary Actuator.

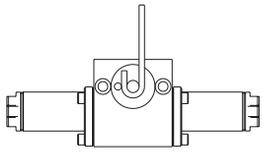
Transferring



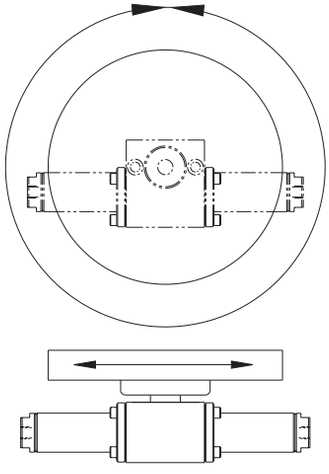
Camming



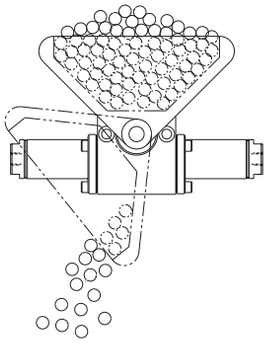
Bending (Tube or Wire)



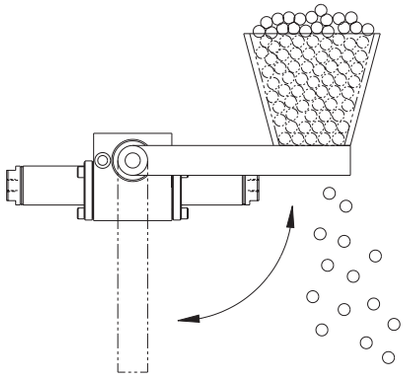
Indexing



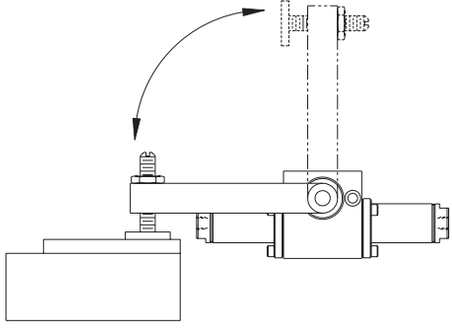
Unloading



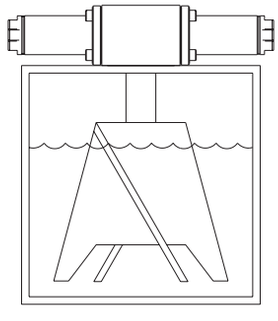
Opening/Closing



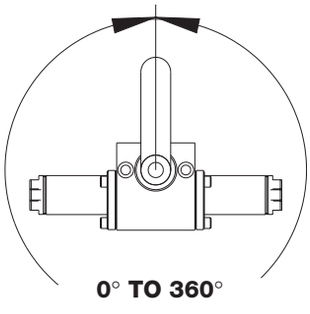
Clamping



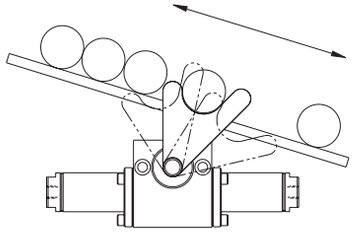
Mix/Agitate



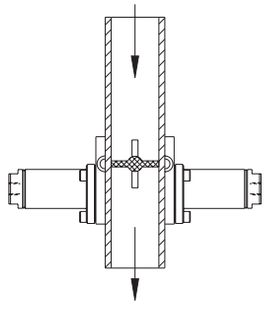
Turning



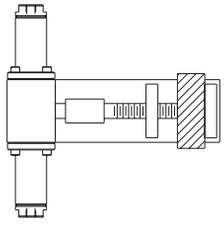
Feeding



Valve Actuator



Screw/Clamping



Pneu-Turn Application Checklist

This checklist makes sizing and selecting Bimba actuators easier. Bimba's Engineering Department will assist you by providing a detailed analysis of your application and, based on the information in the application checklist, will help you choose the actuators best suited to your needs.

Step 1. ***Photocopy the sketch and checklist sheets.***

Step 2. ***Complete the sketch and checklist.***

Step 3. ***Mail or fax the sketch and checklist to your local stocking distributor.***

Date: _____

Your Name: _____

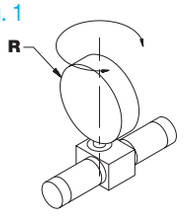
Company: _____

Address: _____

Phone: _____

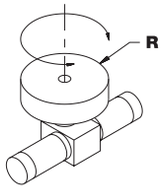
Fax: _____

Fig. 1



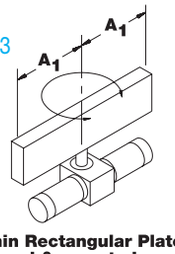
Thin Disc (mounted on side through center)

Fig. 2



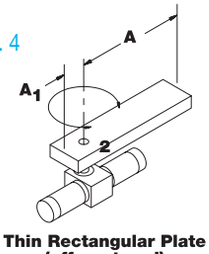
Thin Disc: (centered)

Fig. 3



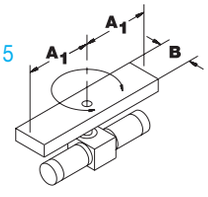
Thin Rectangular Plate (centered & mounted on side)

Fig. 4



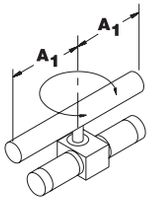
Thin Rectangular Plate (off-centered)

Fig. 5



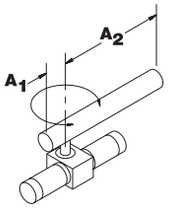
Thin Rectangular Plate (centered)

Fig. 6



Slender Rod (centered)

Fig. 7



Slender Rod (off-centered)

Request Pneu-Turn model number recommended by Engineering? Yes _____ No _____

If no, Pneu-Turn model number to be used in your application: _____

Air _____ psi Hydraulic _____ psi

Torque Required:

0 – 15 in-lbs. 75 – 100 in-lbs.
15 – 35 in-lbs. 200 – 500 in-lbs.
35 – 75 in-lbs. other: _____

Application closest to (circle one):

Fig. 1 Fig. 2 Fig. 3 Fig. 4 Fig. 5 Fig. 6 Fig. 7

Dimensions applicable to your lever arm:

Radius _____ in. A1 _____ in.
A2 _____ in. B _____ in.

Weight and material of lever arm and attachments:

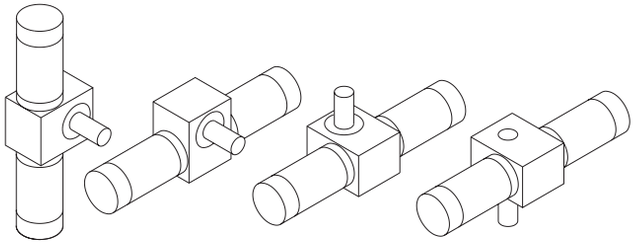
_____ lbs. _____ oz. material: _____

Load to be moved by the lever arm:

_____ lbs. _____ oz.

Distance from the center of the load to the center of the shaft: _____ in.

Shaft Mounted: (shaft, cylinders)



(horiz., vert.) (horiz., horiz.) (vert. (up), horiz.) (vert. (down) horiz.)

Axial loading? Yes _____ No _____

If yes, direction with reference to pushing or pulling the standard shaft: _____

Rotation of lever arm: _____ degrees

Time needed to move load in one direction:

_____ secs. Opposite direction _____ secs.

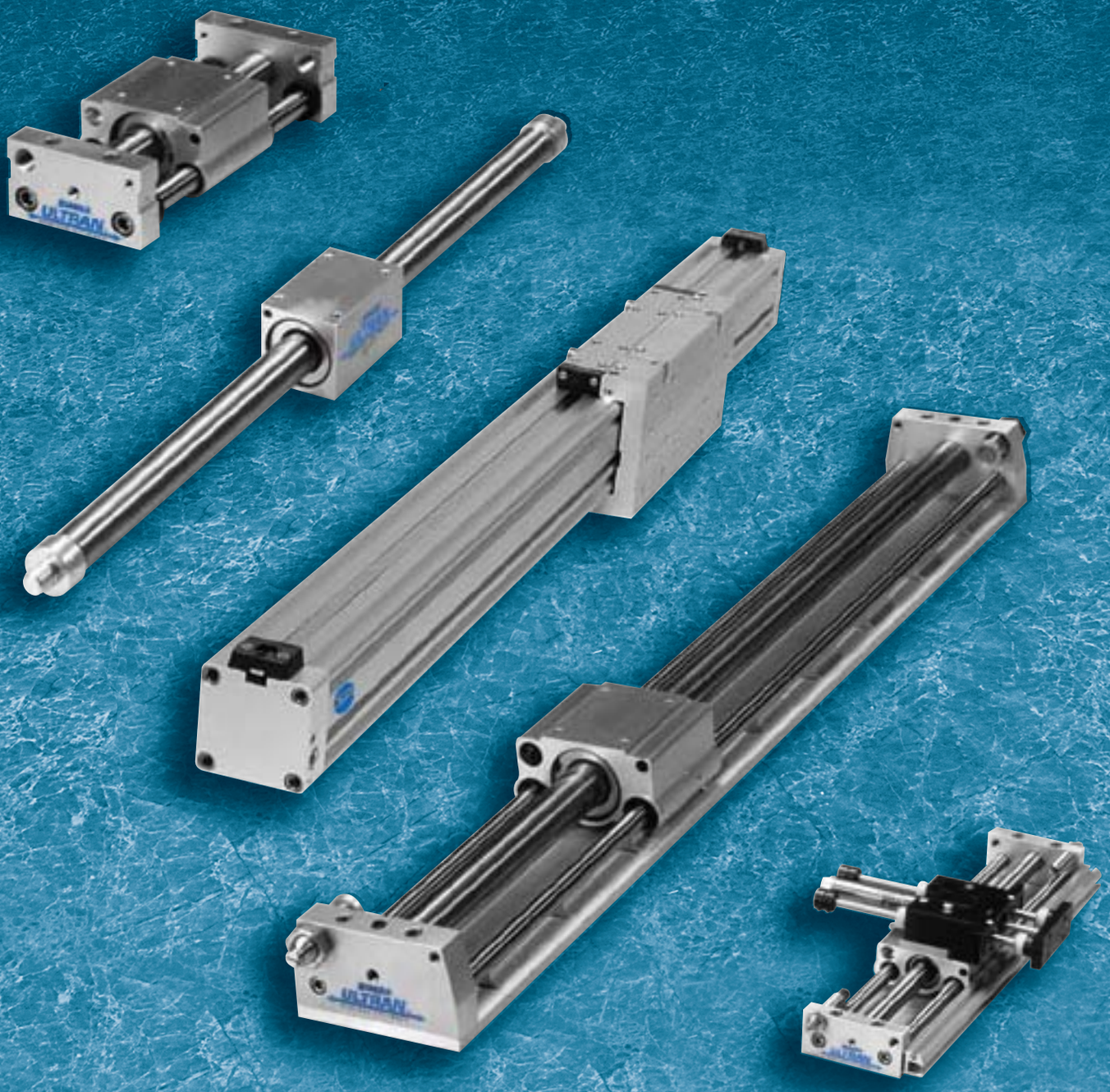
May cushions be used to slow the load at the end of stroke?

Yes _____ No _____

May external stops be used if deemed necessary?

Yes _____ No _____

Ultran Cylinders

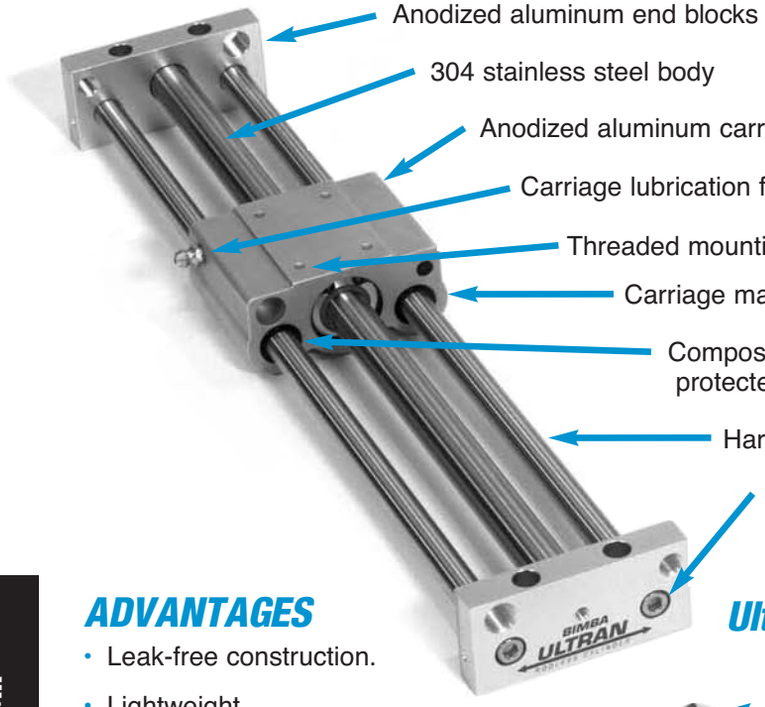


Bimba Ultran Cylinders

SPACE SAVINGS OF ALMOST 50% IN MOST MODELS

Two Models:

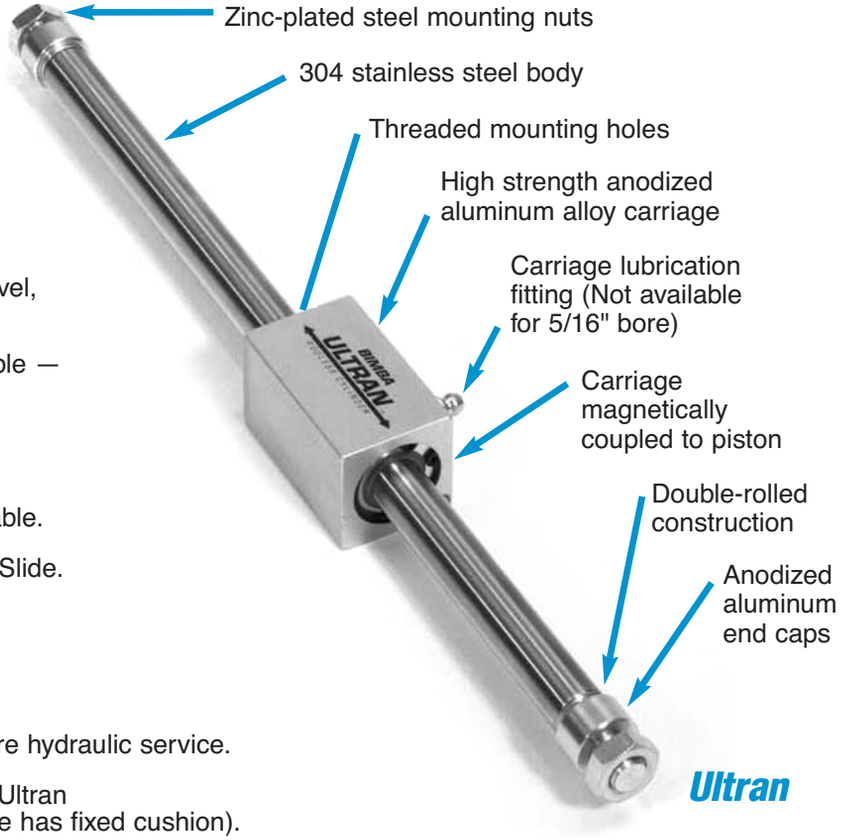
- ***Ultran Slide for self-guided motion***
- ***Ultran for unguided or externally guided applications.***



Ultran Slide

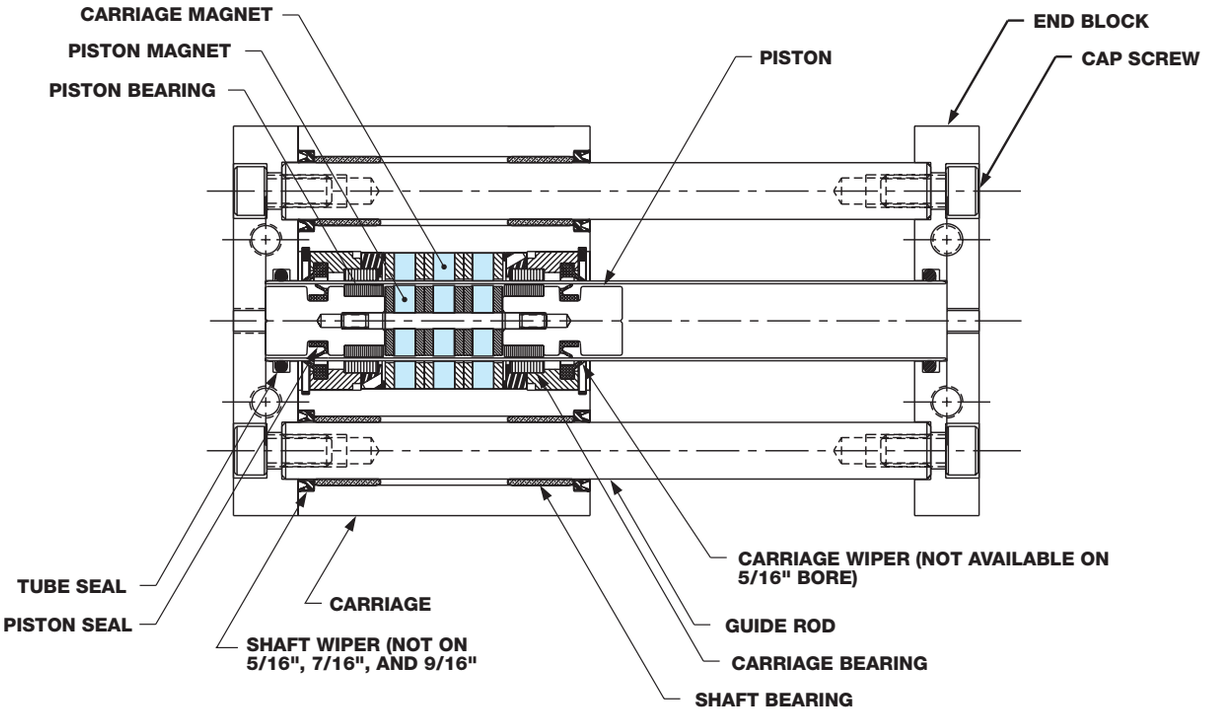
ADVANTAGES

- Leak-free construction.
- Lightweight.
- Piston seals are internally lubricated for long life.
- Special rare earth magnet configuration for high magnetic coupling strengths.
- 304 stainless steel body and “U” cup seals for lower dynamic friction.
- Prelubricated for miles of maintenance-free travel, with easily-accessible carriage lubrication port.
- Two magnetic coupling strength options available — Ultran Gold and Ultran Silver.
- Shock absorbers to decelerate loads (not available for 5/16" and 7/16" bore Ultran).
- Optional 1-inch stroke length adjustment available.
- Midstroke position sensing available for Ultran Slide. End-of-stroke sensing available for all models.
- Optional bumpers to reduce noise.
- Floating mount available for Ultran.
- Oil service seal option available for low pressure hydraulic service.
- Optional adjustable cushions or axial ports on Ultran (not available for 5/16" or 7/16" bore, 9/16" bore has fixed cushion).

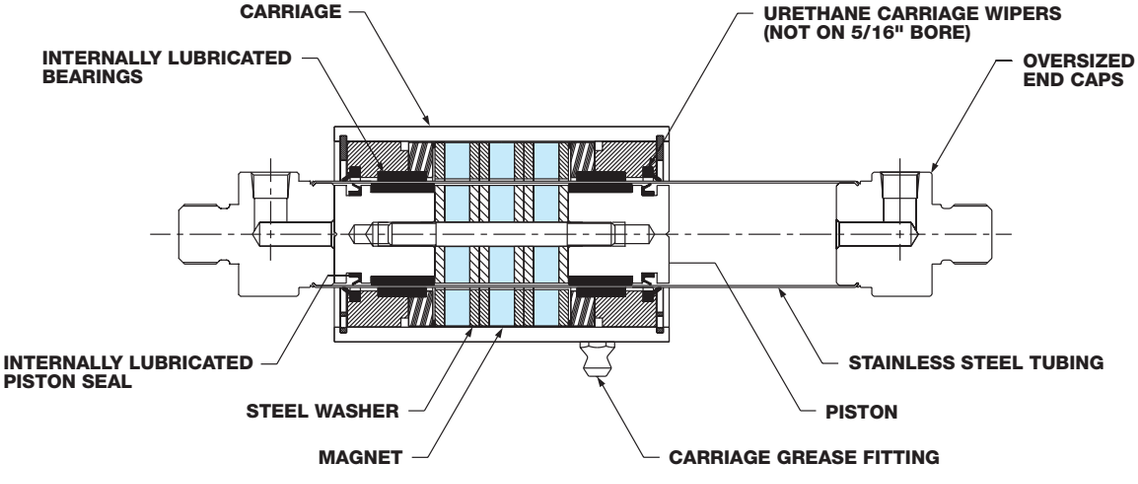


Ultran

Ultran Slide



Ultran



The cutaway drawings above show how the Bimba magnetically-coupled Ultran rodless cylinder works. Three magnets are located on the carriage. Three matching magnets are on the piston. (For 5/16" bore, five magnets are used.) These magnets form a strong bond that holds the carriage and piston together. When the cylinder is actuated, the piston and carriage move back and forth as one unit.

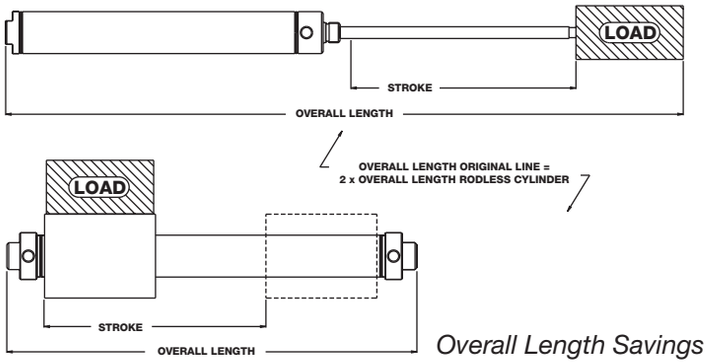
The magnetic attraction between the magnets determines a cylinder's magnetic coupling strength.

The Bimba Ultran rodless cylinder provides one of the highest coupling strengths available. This means it can carry higher loads without causing the piston to uncouple from the carriage. Bimba also offers two magnetic coupling strength options (Gold and Silver) to suit a wide variety of applications. The Silver option uses two sets of magnets instead of three. (For 5/16" bore, four sets of magnets are used.)

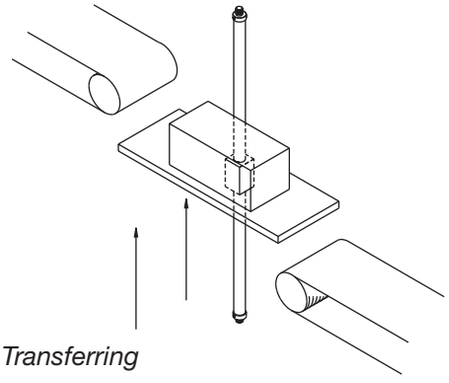
Bimba offers a model with built-in guides (Ultran Slide) and an unguided unit (Ultran).

Application Possibilities

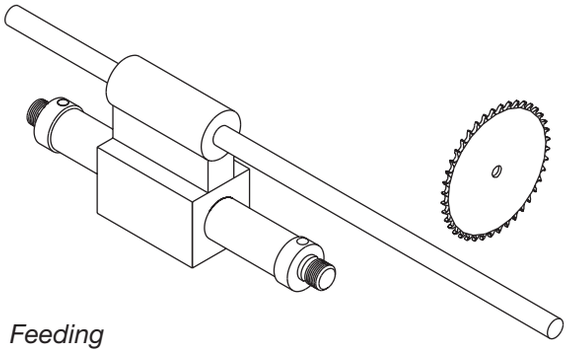
Save space and streamline your design with the Bimba Ultran rodless cylinder.



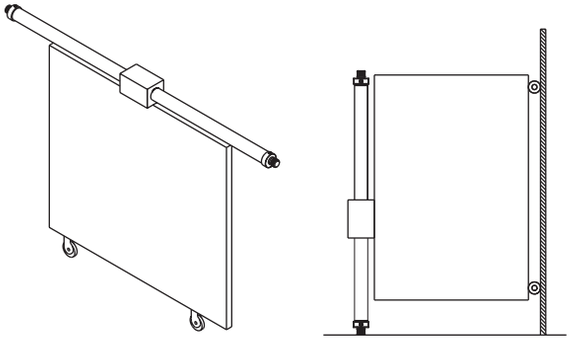
Overall Length Savings



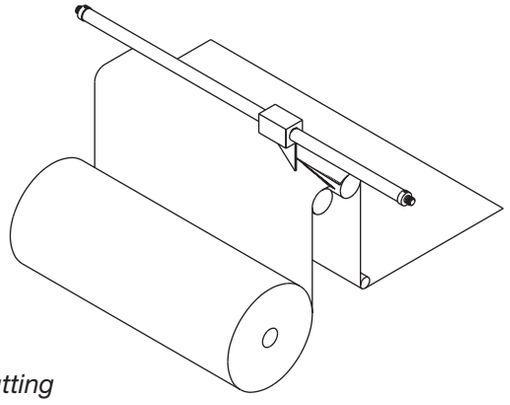
Transferring



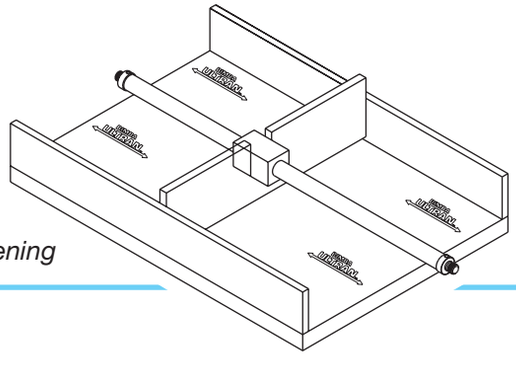
Feeding



Door Opening



Cutting



Silk Screening

How to Order

The model number of all Ultran Slide cylinders consists of three alphanumeric clusters. These designate product type, bore size and stroke length, and options. Please refer to the charts below for an example of model number UGS-1723.375-A1T.

This is a 1-1/2" bore, 23.375" stroke Ultran Slide rodless cylinder with Ultran Gold coupling strength, with stroke adjustment on one end, and a track for mounting switches.

UGS -1723.375-A1T

TYPE

UGS-Ultran Slide, Gold coupling strength

USS-Ultran Slide,* Silver coupling strength

BORE SIZE

007	-	5/16"
01	-	7/16"
02	-	9/16"
04	-	3/4"
06	-	7/8"
09	-	1-1/16"
12	-	1-1/4"
17	-	1-1/2"
31	-	2"

STROKE LENGTH

STANDARD	MAXIMUM
1/4" to 15" (007)	25"
1/4" to 20" (01)	30"
1/4" to 30" (02)	40"
1/4" to 30" (04)	40"
1/4" to 40" (06)	50"
1/4" to 60" (09)	70"
1/4" to 60" (12)	70"
1/4" to 60" (17)	85"
1/4" to 60" (31)	100"

OPTIONS

A	-	Stroke adjustment (both ends)
A1	-	Stroke adjustment (on end 1)
A2	-	Stroke adjustment (on end 2)
B	-	Bumpers (both ends)[1]
B1	-	Bumpers (on end 1)
B2	-	Bumpers (on end 2)
D	-	Dowel pin holes for Transition Plates[2]
L	-	Remove guide rod wipers in 3/4" - 2" bores
S	-	Seals – oil service (low pressure hydraulic service)
T	-	Switch track
U	-	Switch track for miniature switch
Y	-	Alternate port (both ends)
Y1	-	Alternate port (on end 1)
Y2	-	Alternate port (on end 2)

[1] Increases overall dimension. Internal bumpers reach full compression at 80 psi. External bumpers will not contact carriage until internal bumpers are fully compressed.

[2] Transition Plate Applications: Option -D must be ordered if dowel pin holes are required. Not available on all bore sizes. Refer to Related Products/Transition Plates, page 9.22-9.35 for details. Hole locations shown in Related Products/Appendix, page 9.39.

**Specify silver coupling strengths for lower breakaway application requirements. Use caution as decoupling can occur at pressures less than 100 PSI. Refer to the engineering specifications on page 5.10 for details.*

Combination Availability

SIZES \ OPTIONS	A	B	D	S	T, U	Y
FOR ALL SIZES	D,S,T,Y	D,T,Y	A,B,D,S,T,Y	A,D,T,Y	A,B,D,S,Y	A,B,D,S,T

Note: Option -A can be ordered with option -B if they are ordered on different ends, i.e., A1B2 or A2B1.

Location

See diagram on page 5.7 for location of End 1 and End 2.

List Prices

Bore	Base Model		Adder per inch of stroke*	Options						
	UGS	USS		A Stroke Adjustment (per end)	B Bumpers (per end)	D Dowel Pin Holes	S Oil Service Seals	T Switch Track (Base)	T Adder per inch of stroke	Y Alternate Port (per end)
5/16" (007)										
7/16" (01)										
9/16" (02)										
3/4" (04)										
7/8" (06)										
1-1/16" (09)										
1-1/4" (12)										
1-1/2" (17)										
2" (31)										

**Longer than standard stroke lengths incur additional charge. Consult your distributor for details.*
No charge option - L

Accessories

Bore	Shock Absorbers				Stroke Adjustment		*Stop Collar	
	Model			Price (each)	Model		Model	Price
	Light	Standard	Heavy					
5/16" (007)	LS-02	SS-02	HS-02		USA-01		N/A	
7/16" (01)								
9/16" (02)	LS-04	SS-04	HS-04		USA-02		USC-04	
3/4" (04)					USA-04			
7/8" (06)	LS-09	SS-09	HS-09		USA-09		USC-09	
1-1/16" (09)								
1-1/4" (12)	LS-17	SS-17	HS-17		USA-17		USC-17	
1-1/2" (17)								
2" (31)	LS-31	SS-31	HS-31		USA-31		USC-31	

**The Ultran Slide Cylinder needs to be increased by the B dimension in order to maintain intended stroke length. The overall length increases by the same amount. The A dimension indicates maximum amount of stroke adjustment attainable. See Related Products, page 9.20 for dimensions.*

Dimensions (in.)

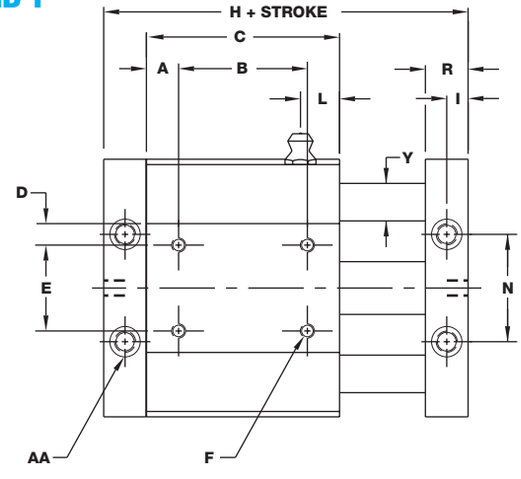
Bore	A	B	C	D	E	F	G	H	I	J	K
5/16" (007)	0.344	1.062	1.750	0.141	0.469	4-40 UNC	1.062	2.750	0.250	0.188	0.438
7/16" (01)	0.344	1.188	1.875	0.125	0.750	6-32 UNC	1.062	2.875	0.250	0.188	0.406
9/16" (02)	0.375	1.500	2.250	0.250	1.000	8-32 UNC	1.438	3.250	0.250	0.312	0.531
3/4" (04)	0.562	1.750	2.875	0.312	1.375	10-24 UNC	1.832	4.125	0.312	0.312	0.664
7/8" (06)	0.500	2.125	3.125	0.188	1.625	10-24 UNC	2.062	4.625	0.375	0.375	0.688
1-1/16" (09)	0.500	2.500	3.500	0.375	1.750	1/4-20 UNC	2.313	5.000	0.375	0.250	0.750
1-1/4" (12)	0.562	2.750	3.875	0.318	2.125	1/4-20 UNC	2.687	5.875	0.500	0.500	0.750
1-1/2" (17)	0.500	3.500	4.500	0.500	2.500	5/16-18 UNC	3.188	6.500	0.500	0.750	0.906
2" (31)	1.188	5.000	7.375	0.500	3.250	1/2-13 UNC	4.312	10.375	0.750	0.813	1.312

Bore	L	M	N	P	Q	R	S	V	W	X	X/X
5/16" (007)	N/A	N/A	0.750	N/A	0.188	0.500	2.000	0.215	0.215	1.000	0.562
7/16" (01)	0.395	0.788	0.938	0.288	0.219	0.500	2.312	0.218	0.220	1.000	0.562
9/16" (02)	0.455	0.982	1.250	0.297	0.250	0.500	3.000	0.406	0.281	1.375	0.749
3/4" (04)	0.572	1.239	1.625	0.234	0.313	0.625	3.375	0.406	0.313	1.750	0.957
7/8" (06)	0.635	1.438	1.625	0.225	0.375	0.750	3.750	0.500	0.438	2.000	1.063
1-1/16" (09)	0.706	1.549	1.875	0.172	0.375	0.750	4.250	0.594	0.375	2.250	1.188
1-1/4" (12)	0.750	1.562	2.125	0.162	0.375	1.000	4.812	0.656	0.562	2.625	1.375
1-1/2" (17)	0.756	1.736	2.500	0.109	0.438	1.000	6.000	1.000	0.906	3.125	1.625
2" (31)	1.500	2.688	3.250	0.000	0.250	1.500	8.000	1.125	0.938	4.250	2.188

Bore	Y	Z	AA	BB	CC	DD	EE	AAA	EEE
5/16" (007)	0.312	1.312	#6	5/16-24 UNF	3/8-32 UNEF	10-32	10-32 UNF	0.750	0.315
7/16" (01)	0.375	1.562	#10	5/16-24 UNF	3/8-32 UNEF	10-32	1/4-28 UNF	0.750	0.322
9/16" (02)	0.438	2.000	#10	5/16-24 UNF	7/16-28 UNEF	10-32	1/4-28 UNF	0.750	0.500
3/4" (04)	0.500	2.518	1/4	5/16-24 UNF	7/16-28 UNEF	1/8 NPT	5/16-24 UNF	1.080	0.625
7/8" (06)	0.625	2.750	1/4	5/16-24 UNF	1/2-20 UNF	1/8 NPT	5/16-24 UNF	1.375	0.625
1-1/16" (09)	0.750	3.062	5/16	5/16-24 UNF	1/2-20 UNF	1/8 NPT	3/8-24 UNF	1.375	0.750
1-1/4" (12)	0.812	3.500	5/16	5/16-24 UNF	3/4-16 UNF	1/8 NPT	3/8-24 UNF	1.750	0.750
1-1/2" (17)	1.000	4.500	3/8	5/16-24 UNF	3/4-16 UNF	1/8 NPT	7/16-20 UNF	1.750	0.750
2" (31)	1.500	5.750	3/4	5/16-24 UNF	1-12 UNF	1/4 NPT	7/8-9 UNC	3.125	1.000

NOTE: H+ stroke tolerance for stroke lengths less than 42" is +/- 0.032"
For stroke lengths greater than 42" the tolerance is +0.104/-0.047".

END 1



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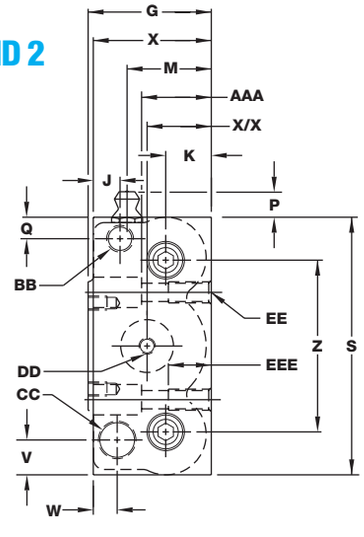
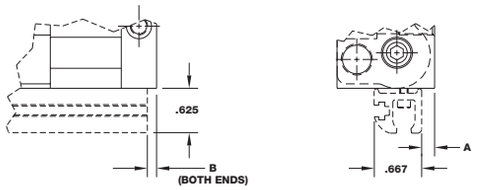


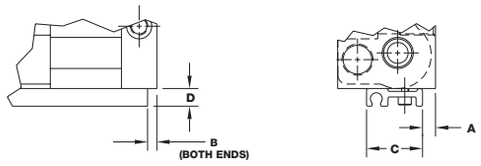
Options

Switch Track for Miniature Switches

Option T



Option U

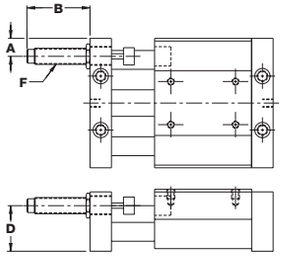


Bore	A	B	C	D
5/16" (007)	0.000	0.024	0.787	0.299
7/16" (01)	0.000	0.023	0.787	0.248
9/16" (02)	0.188	0.625	0.787	0.248
3/4" (04)	0.563	0.125	0.787	0.248
7/8" (06)	0.784	0.117	0.787	0.248
1-1/16" (09)	1.125	0.125	0.655	0.367
1-1/4" (12)	1.250	0.242	0.655	0.367
1-1/2" (17)	1.500	0.250	0.655	0.367
2" (31)	2.596	0.492	0.655	0.367

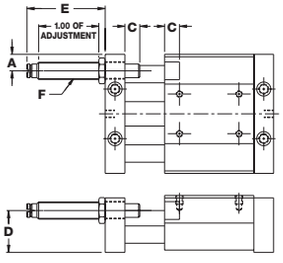
Shock Absorber/Stroke Adjustment (in.)

Bore	A	B	C	D	E	F
5/16" (007)	0.215	0.750	0.000	0.785	1.093	3/8-32 UNEF
7/16" (01)	0.218	0.750	0.000	0.780	1.093	3/8-32 UNEF
9/16" (02)	0.406	1.460	0.375	1.094	1.594	7/16-28 UNEF
3/4" (04)	0.406	1.335	0.375	1.438	1.469	7/16-28 UNEF
7/8" (06)	0.500	2.490	0.375	1.562	1.438	1/2-20 UNF
1-1/16" (09)	0.594	2.490	0.375	1.875	1.438	1/2-20 UNF
1-1/4" (12)	0.656	2.890	0.500	2.062	1.500	3/4-16 UNF
1-1/2" (17)	1.000	2.890	0.562	2.219	1.438	3/4-16 UNF
2" (31)	1.125	3.500	0.562	3.312	1.563	1-12 UNF

Shock Absorber



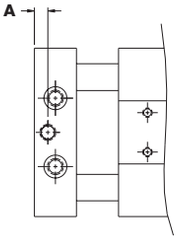
Stroke Adjustment



Note: Do not let the shock absorbers bottom out. The shock should not be used as a stroke adjuster. A stop collar is needed for the shock if stroke adjustment is required.

Alternate Port (in.)

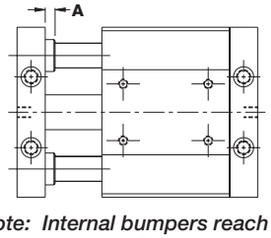
Bore	A
5/16" (007)	0.162
7/16" (01)	0.150
9/16" (02)	0.162
3/4" (04)	0.188
7/8" (06)	0.312
1-1/16" (09)	0.312
1-1/4" (12)	0.500
1-1/2" (17)	0.500
2" (31)	0.750



Note: 3/4" port size is 10-32, all other sizes are same as standard.

Bumper Adder (per end) (in.)

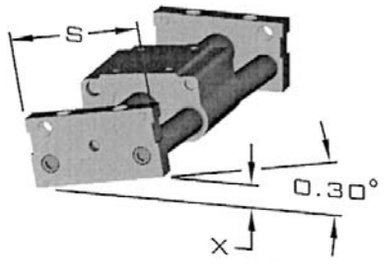
Bore	A
5/16" (007)	0.157
7/16" (01)	0.157
9/16" (02)	0.281
3/4" (04)	0.281
7/8" (06)	0.312
1-1/16" (09)	0.312
1-1/4" (12)	0.312
1-1/2" (17)	0.312
2" (31)	0.312



Note: Internal bumpers reach full compression at 80 psi. External bumpers will not contact carriage until internal bumpers are fully compressed.

Ultran Slide Mounting Instructions

Improper mounting of the Ultran slide could result in binding and/or excess breakaway. As a rule of thumb, the end blocks should be mounted flat with no more than 0.30˚ of differential misalignment end-to-end (including both end blocks, i.e., 0.30˚ on one end block if other end block is square. If both end blocks are out of square, the total between them cannot exceed 0.30˚. The x dimension represents how much displacement 0.30˚ represents using 0.0175" per inch per degree of misalignment.)



The following table shows the S dimension (End Block width dimension as found in the catalog) for all bore sizes:

Model	S in (mm)	x in (mm)
007 (5/16" Bore)	2,000 (50.8)	0.010 (0.25)
01 (7/16" Bore)	2.312 (58.7)	0.012 (0.30)
02 (9/16" Bore)	3.000 (76.2)	0.016 (0.40)
04 (3/4" Bore)	3.375 (85.7)	0.018 (0.46)
06 (7/8" Bore)	3.750 (95.3)	0.020 (0.51)
09 (1-1/16" Bore)	4.250 (108.0)	0.022 (0.56)
12 (1-1/4" Bore)	4.812 (122.2)	0.025 (0.64)
17 (1-1/2" Bore)	6.000 (152.4)	0.031 (0.79)
31 (2" Bore)	8.000 (203.2)	0.042 (1.07)

For example:

- A Model 007 (5/16" bore) has a S dimension of 2.00". 0.30˚ of misalignment would yield approximately 0.010" of differential misalignment from end-to-end before binding and/or excess breakaway would occur.

- A Model 17 (1-1/2" Bore) has a S dimension of 6.00". 0.30˚ of misalignment would yield approximately 0.031” of differential misalignment from end-to-end before binding and/or excess breakaway would occur.

Engineering Specifications

Pressure Rating: 100 psi (Air or Hydraulic)
Temperature Range: 0° to 170°F
Breakaway: Ultran Slide Gold Coupling Strength - Less than 30 psi
Ultran Slide Silver Coupling Strength - Less than 25 psi

Magnetic Coupling Strength (lbs.)

Cylinder Bore	Ultran Gold (UGS)	Ultran Silver (USS)
5/16" (007)	13	8
7/16" (01)	20	10
9/16" (02)	29	16
3/4" (04)	61	33
7/8" (06)	102	55
1-1/16" (09)	127	74
1-1/4" (12)	190	110
1-1/2" (17)	270	150
2" (31)	552	332

Weight (lbs.)

Cylinder Bore	(0" Stroke)		Adder per 1"
	(UGS)	(USS)	
5/16" (007)	0.24	0.23	0.05
7/16" (01)	0.52	0.51	0.08
9/16" (02)	1.44	1.38	0.10
3/4" (04)	2.70	2.58	0.13
7/8" (06)	3.61	3.49	0.21
1-1/16" (09)	5.66	5.47	0.28
1-1/4" (12)	7.38	7.12	0.35
1-1/2" (17)	14.48	13.90	0.49
2" (31)	38.48	37.17	1.13

Lubrication

The Ultran rodless cylinder is prelubricated at the factory. The life of the cylinder can be greatly lengthened by providing additional lubrication with an air line mist lubricator or direct introduction of oil to the cylinder every 100 linear miles of travel. Recommended oils are medium to heavy (20 to 30 weight). The carriage should also be lubricated every 100 linear miles with a high grade of bearing grease. Other types of prelubrication are available upon request. Guide shafts are self lubricating and require no external lubricants. The lubricant used by the factory can be ordered as part number MS-2861-14OZ. The lubricant is packaged in a 14 OZ grease gun cartridge.

Repairs

Bimba recommends that the Ultran Slide be returned to the factory for repairs. However, the following parts and kits are available for the Ultran Slide rodless cylinder.

PART	Cylinder Bore Size								
	5/16" (007)	7/16" (01)	9/16" (02)	3/4" (04)	7/8" (06)	1-1/16" (09)	1-1/4" (12)	1-1/2" (17)	2" (31)
Shaft bearing	RD-50644	RD-50645	RD-48996	RD-48997	RD-50646	RD-48998	RD-50647	RD-48999	RD-50648
Shaft wiper	N/A	N/A	RD-22720	RD-23079	RD-15679	RD-23086	RD-50656	RD-16174	RD-50657
Tube seal	RD-1476	RD-22653	RD-13012	RD-1078	RD-10050	RD-48874	RD-50769	RD-1147	RD-50770
Carriage bearing	RD-51006	RD-51007	RD-41631	RD-41633	RD-51433	RD-41635	RD-51434	RD-41637	RD-51438
Carriage wiper	N/A	RD-49806	RD-47191	RD-47192	RD-49805	RD-47193	RD-49804	RD-47194	RD-49803
Piston bearing	N/A	N/A	RD-41632	RD-41634	RD-51435	RD-41636	RD-51436	RD-41638	RD-51439
Piston seal	RD-13970-T	RD-13435-T	RD-45616	RD-45621	RD-50651	RD-45622	RD-50652	RD-45623	RD-50653
Piston bumper	RD-50468	RD-50469	RD-33072	RD-33073	RD-33073	RD-33071	RD-33071	RD-33076	RD-36326
Shaft bumper	RD-50802	RD-50803	RD-50279	RD-50280	RD-50804	RD-50281	RD-50805	RD-50282	RD-50806
Shaft washer	RD-50797	RD-50798	RD-50283	RD-50284	RD-50799	RD-50285	RD-50800	RD-50286	RD-50801
Body[1]	KUB-007	KUB-01	KUB-02	KUB-04	KUB-06	KUB-09	KUB-12	KUB-17	KUB-31
Guide Rods[1]	KUG-007	KUG-01	KUG-02	KUG-04	KUG-06	KUG-09	KUG-12	KUG-17	KUG-31
Switch Track[1]-T	KUT-007	KUT-01	KUT-02	KUT-04	KUT-06	KUT-09	KUT-12	KUT-17	KUT-31
Switch Track[1]-U	KUU-007	KUU-01	KUU-02	KUU-04	KUU-06	KUU-09	KUU-12	KUU-17	KUU-31
Repair kit[2]	KU-007	KU-01	KU-02	KU-04	KU-06	KU-09	KU-12	KU-17	KU-31

[1] *Option-B must be included at the end of part number if bumpers are being used with the Ultran Slide. (i.e., KUT-007-B)*

[2] *Includes required quantity of all except bumpers, oil service piston seals, bodies, guide rods and switch track, which are sold separately. Consult your local stocking Bimba distributor for prices.*

Size/Application Considerations

Each bore size of the Bimba Ultran Slide rodless cylinder has specific load carrying capabilities. These capabilities can be enhanced by ordering external shock absorbers. Shock absorbers will also increase cylinder life when used properly. Use the following procedures to determine the requirements for specific applications.
NOTE: Exceeding the load can cause the carriage and piston to decouple.

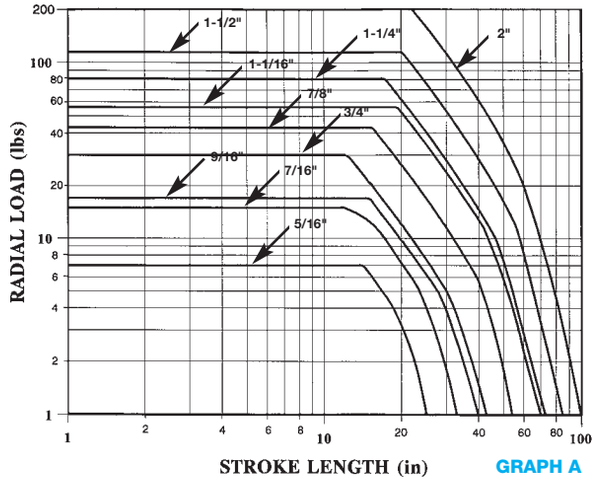
1. *Check side load or radial load requirements.* Graph A, Side Load/Radial Load vs. Stroke Length, shows the maximum load the cylinder will support for a specific bore size and stroke length.

2. *Check axial load requirements.* Graph B, Axial Load vs. Moment Arm, shows the maximum load the cylinder will support for a specific bore size and stroke length. Use the illustrations and formulas beside the graph to determine the load on the Ultran Slide.

3. External Shock Absorbers. If your load requirements fall above the curve for the specific bore size, external shock absorbers may allow you to decelerate the load. Choose from Graphs M through DD - *Velocity versus Load for Related Products, page 9.17-9.19* for your bore size.

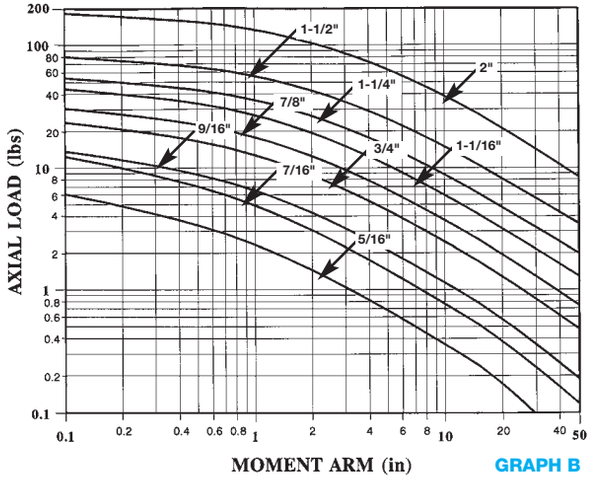
4. Maximum Velocity. If cylinder speed will exceed 20 in/sec or cycle rate will exceed 15 per minute, special application considerations may be required. Please consult your local distributor.

SIDE/RADIAL LOAD vs **STROKE LENGTH**



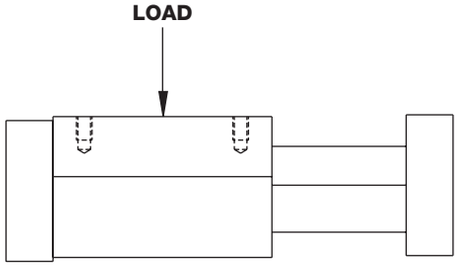
GRAPH A

AXIAL LOAD vs **MOMENT ARM**



GRAPH B

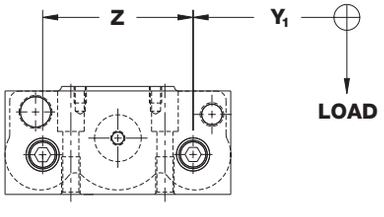
RADIAL LOAD



SEE GRAPH A

SIDE LOAD

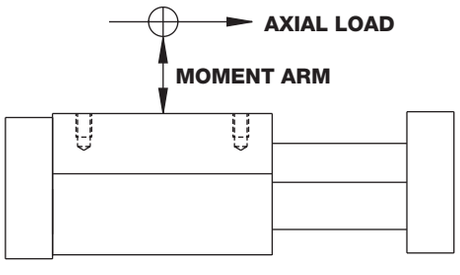
SIDE LOAD = 2 x LOAD($\frac{Y_1}{Z}$ + 1)



Cylinder Bore	Z
5/16" (007)	1.312
7/16" (01)	1.562
9/16" (02)	2.000
3/4" (04)	2.518
7/8"(06)	2.750
1-1/16" (09)	3.062
1-1/4" (12)	3.500
1-1/2" (17)	4.500
2" (31)	5.750

SEE GRAPH A

AXIAL LOAD



SEE GRAPH B

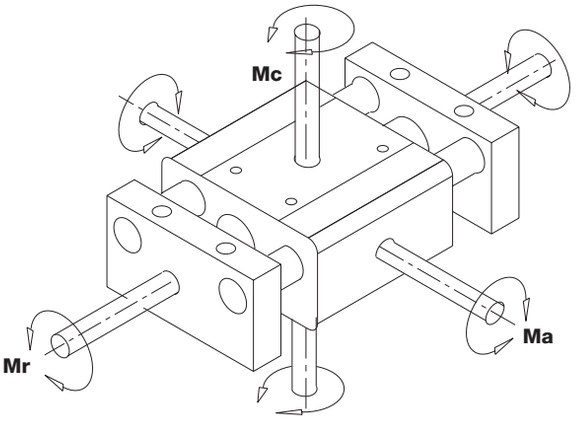
Size/Application Considerations

Moments About the Carriage:

The table below gives the maximum allowable moment an Ultran Slide will support. There are three different directions that the moment can be applied (see Sketch A).

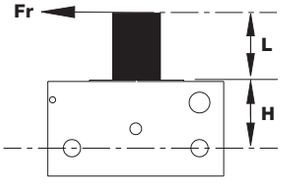
Maximum Allowable Moment (in-lb)

Bore	Radial	Axial	Cross	H
	Mr max.	Ma max.	Mc max.	
5/16" (007)	2.3	5.2	5.2	0.625
7/16" (01)	4.9	9.4	9.4	0.656
9/16" (02)	6.6	17.2	17.2	0.906
3/4" (04)	11.1	37.5	37.5	1.168
7/8" (06)	14.3	68.4	68.4	1.374
1-1/16" (09)	19.5	89.1	89.1	1.563
1-1/4" (12)	26.5	160	160	1.937
1-1/2" (17)	40.4	250	250	2.281
2" (31)	67.0	800	800	3.000



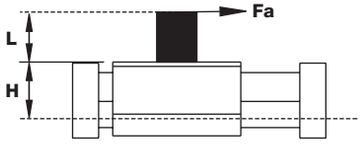
SKETCH A

Radial Moment



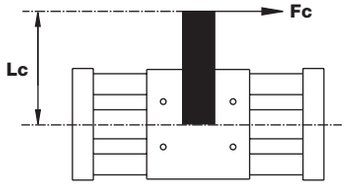
SKETCH B

Axial Moment



SKETCH C

Cross Moment



SKETCH D

Sketches B, C, and D demonstrate how a force is applied to a moment arm to produce the moments shown in Sketch A. Use the equations below to determine the actual moments created by your application. The results of each calculated moment should be compared to the maximums listed in the table. (If the actual moments are greater than the listed maximums, then the load and moments should be evaluated using the next larger Ultran Slide.)

$$\text{Radial Moment} = Mr = Fr \times (L+H)$$
$$\text{Axial Moment} = Ma = Fa \times (L+H)$$
$$\text{Cross Moment} = Mc = Fc \times (Lc)$$

An Ultran Slide can withstand compound moments but the maximum allowable will be determined by the total percentage of the axial, radial and cross moments. The equation below will determine the compound moment percent based on the total moments. The compound moment percent must not be greater than 100. (If the compound moment percent is greater than 100, then the load and moments should be evaluated using the next larger Ultran Slide.)

$$M_{\text{compound}\,\%} = 100 \times \left(\frac{Mr}{Mr_{\max}} + \frac{Ma}{Ma_{\max}} + \frac{Mc}{Mc_{\max}} \right) \leq 100\%$$

How to Order

The model number of all Ultran rodless cylinders consists of three alphanumeric clusters. These designate product type, bore size and stroke length, and options. Please refer to the charts below for an example of model number US-1766.375-A1B1F.

This is a 1-1/2" bore, 66.375" stroke, rodless cylinder with Ultran Silver coupling strength, with stroke adjustment on one end, bumpers on one end, and a floating mount bracket.

US -1766.375-A1B1F

TYPE

UG-Ultran Rodless, Gold coupling strength

US-Ultran Rodless, Silver coupling strength*

BORE SIZE

007	-	5/16"
01	-	7/16"
02	-	9/16"
04	-	3/4"
06	-	7/8"
09	-	1-1/16"
12	-	1-1/4"
17	-	1-1/2"
31	-	2"

STROKE LENGTH

STANDARD	MAXIMUM
1/4" to 30" (007)	30"
1/4" to 40" (01)	50"
1/4" to 40" (02)	90"
1/4" to 80" (04)	120"
1/4" to 80" (06)	120"
1/4" to 80" (09)	120"
1/4" to 80" (12)	120"
1/4" to 80" (17)	120"
1/4" to 80" (31)	120"

OPTIONS

A	-	Stroke adjustment (both ends)
A1	-	Stroke adjustment (on end 1)
A2	-	Stroke adjustment (on end 2)
B	-	Bumpers (both ends)
B1	-	Bumpers (on end 1)[1]
B2	-	Bumpers (on end 2)
C	-	Cushions (both ends)*[2]
C1	-	Cushions (on end 1)*
C2	-	Cushions (on end 2)*
F	-	Floating mount bracket[3]
K	-	Pivot (both ends)
K1	-	Pivot (on end 1)
K2	-	Pivot (on end 2)
P	-	Axial ports both ends
P1	-	Axial port (on end 1)
P2	-	Axial port (on end 2)
S	-	Seals – oil service (low pressure hydraulic service)

[1]80 PSI required to reach full stroke due to bumper compression.

[2]Not available for 5/16" and 7/16" bores. 9/16" bore has fixed cushions, other sizes have adjustable cushions.

[3]For use when application requirements dictate a non-parallel or floating interface with the ultran carriage to prevent binding between the ultran and external guiding systems. Refer to page 5.16 for dimensions.

The 9/16" bore fixed cushion operates like an air spring. A small amount of air is trapped behind the piston to help slow it down. Since there is no air bleed-off, this air will remain trapped behind the piston until the cylinder is cycled. A minimum of 40 psi is needed to move the cylinder to full stroke. If air pressure is removed from the front side of the piston, the trapped air will act like a spring and move the piston away from the end cap about 3/16 of an inch.

See left column for option combination availability and location.

Combination Availability

SIZES \ OPTIONS	A	B	C	F	K	P	S
5/16"(007) 7/16"(01)	B,F,S	A,F,K,P	N/A	A,B,K,P,S	B,F,S	B,F,S	A,F,K,P
ALL OTHER SIZES	B,F,S	A,F,K,P	F,K	A,B,C,K,P,S	B,C,F,S	B,F,S	A,F,K,P

Location

See diagram on page 5.15 for location of End 1 and End 2. Incompatible options cannot be ordered on the same end (see combination availability chart above).

**Specify silver coupling strengths for lower breakaway application requirements. Use caution as decoupling can occur at pressures less than 100 PSI. Refer to the engineering specifications on page 5.20 for details.*

List Prices

Cylinder Bore Size	Base Model		Adder per inch of stroke*	Options						
	UG	US		A Stroke Adjustment (per end)	B Bumpers (per end)	C Cushions (per end)	F Floating Mount Bracket	K Pivot (per end)	P Axial Ports	S Oil Service Seals
5/16" (007)										
7/16" (01)										
9/16" (02)										
3/4" (04)										
7/8" (06)										
1-1/16" (09)										
1-1/4" (12)										
1-1/2" (17)										
2" (31)										

** Longer than standard stroke lengths incur additional charge. Consult your distributor for details.*

Cylinder Bore Size	Shock Absorbers				Shock Absorber Switch Brackets		Stop Collar	
	Model			Price	Model	Price	Model	Price
	Light	Standard	Heavy					
5/16" (007)	N/A	N/A	N/A		N/A		N/A	
7/16" (01)					N/A			
9/16" (02)	LS-02	SS-02	HS-02		BU-02		USC-04	
3/4" (04)	LS-04	SS-04	HS-04		BU-04			
7/8" (06)	LS-09	SS-09	HS-09		BU-06		USC-09	
1-1/16" (09)					BU-09			
1-1/4" (12)	LS-17	SS-17	HS-17		BU-12		USC-17	
1-1/2" (17)					BU-17			
2" (31)	LS-31	SS-31	HS-31		BU-31		USC-31	

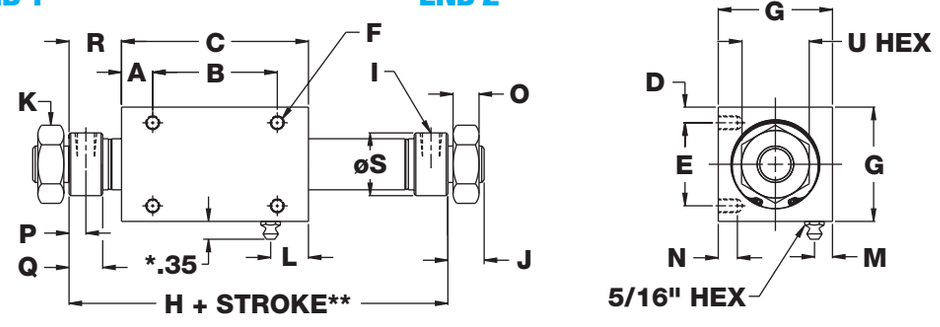
Cylinder Bore Size	Mounting Block		Floating Mount Bracket	
	Model	Price	Model	Price
5/16" (007)	MB-007		FM-007	
7/16" (01)	MB-01		FM-01	
9/16" (02)	MB-02		FM-02	
3/4" (04)	MB-04		FM-04	
7/8" (06)	MB-06		FM-06	
1-1/16" (09)	MB-09		FM-09	
1-1/4" (12)	MB-12		FM-12	
1-1/2" (17)	MB-17		FM-17	
2" (31)	MB-31		FM-31	

Dimensions (in.)

Bore	A	B	C	D	E	F	G	H	I	J
5/16" (007)	0.344	1.062	1.750	0.141	0.469	4-40 UNC	0.750	3.014	10-32	0.368
7/16" (01)	0.344	1.188	1.875	0.125	0.750	6-32 UNC	1.000	3.139	10-32	0.438
9/16" (02)	0.375	1.500	2.250	0.188	1.000	8-32 UNC	1.375	3.514	10-32	0.438
3/4" (04)	0.562	1.750	2.875	0.188	1.375	10-24 UNC	1.750	4.875	1/8 NPT	0.625
7/8" (06)	0.500	2.125	3.125	0.188	1.625	10-24 UNC	2.000	5.125	1/8 NPT	0.625
1-1/16" (09)	0.500	2.500	3.500	0.250	1.750	1/4-20 UNC	2.250	5.500	1/8 NPT	0.625
1-1/4" (12)	0.562	2.750	3.875	0.250	2.125	1/4-20 UNC	2.625	5.875	1/8 NPT	0.875
1-1/2" (17)	0.500	3.500	4.500	0.312	2.500	5/16-18 UNC	3.125	6.500	1/8 NPT	0.875
2" (31)	1.188	5.000	7.375	0.500	3.250	1/2-13 UNC	4.250	10.000	1/4 NPT	1.000

Bore	K	L	M	N	O	P	Q	R	S	U
5/16" (007)	5/16-24 NUT	N/A	N/A	0.125	0.188	0.203	0.406	0.632	0.625	0.500
7/16" (01)	7/16-20 NUT	0.395	0.312	0.125	0.250	0.203	0.406	0.632	0.704	0.688
9/16" (02)	7/16-20 NUT	0.455	0.312	0.220	0.250	0.203	0.406	0.632	0.755	0.688
3/4" (04)	5/8-18 NUT	0.572	0.375	0.312	0.375	0.315	0.630	1.000	0.985	0.938
7/8" (06)	5/8-18 NUT	0.635	0.375	0.375	0.375	0.315	0.630	1.000	1.110	0.938
1-1/16" (09)	5/8-18 NUT	0.706	0.500	0.375	0.375	0.315	0.630	1.000	1.297	0.938
1-1/4" (12)	3/4-16 NUT	0.750	0.375	0.500	0.420	0.315	0.630	1.000	1.545	1.125
1-1/2" (17)	3/4-16 NUT	0.756	0.750	0.520	0.420	0.315	0.630	1.000	1.735	1.125
2" (31)	1-1/4-12 NUT	1.500	0.750	0.750	0.500	0.438	0.875	1.312	2.312	1.875

END 1 **END 2**



** Grease fitting on 2" bore is recessed.*
*** See page 5.16 for option length adders.*

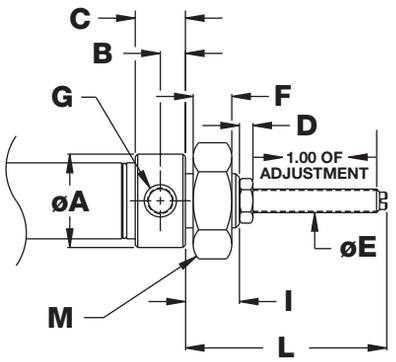
Options

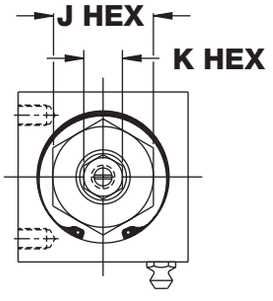
Stroke Adjustment Dimensions (in.)

Bore	A	B	C	D	E	F
5/16" (007)	0.625	0.203	0.406	0.094	6-40 UNF	0.188
7/16" (01)	0.704	0.203	0.406	0.109	10-32 UNF	0.250
9/16" (02)	0.755	0.203	0.406	0.109	10-32 UNF	0.250
3/4" (04)	0.985	0.315	0.630	0.156	1/4-28 UNF	0.375
7/8" (06)	1.110	0.315	0.630	0.188	5/16-24 UNF	0.375
1-1/16" (09)	1.297	0.315	0.630	0.188	5/16-24 UNF	0.375
1-1/4" (12)	1.545	0.315	0.630	0.220	3/8-24 UNF	0.420
1-1/2" (17)	1.735	0.315	0.630	0.220	3/8-24 UNF	0.420
2" (31)	2.312	0.438	0.875	0.250	7/16-20 UNF	0.500

Bore	G	I	J	K	L	M
5/16" (007)	10-32	0.368	0.500	0.188	1.795	5/16-24 NUT
7/16" (01)	10-32	0.438	0.688	0.313	1.469	7/16-20 NUT
9/16" (02)	10-32	0.438	0.688	0.313	1.469	7/16-20 NUT
3/4" (04)	1/8-NPT	0.625	0.938	0.438	1.905	5/8-18 NUT
7/8" (06)	1/8-NPT	0.625	0.938	0.438	1.943	5/8-18 NUT
1-1/16" (09)	1/8-NPT	0.625	0.938	0.438	1.943	5/8-18 NUT
1-1/4" (12)	1/8-NPT	0.875	1.125	0.563	2.115	3/4-16 NUT
1-1/2" (17)	1/8-NPT	0.875	1.125	0.563	2.115	3/4-16 NUT
2" (31)	1/4-NPT	1.000	1.875	0.688	2.278	1-1/4-12 NUT

Stroke Adjustment





Stroke Adjustment Length Adder (in.)

Bore	5/16" (007)	7/16" (01)	9/16" (02)	3/4" (04)	7/8" (06)	1-1/16" (09)	1-1/4" (12)	1-1/2" (17)	2" (31)
Add to overall length: (per end)	0.044	0.060	0.060	0.060	0.080	0.080	0.110	0.110	0.120

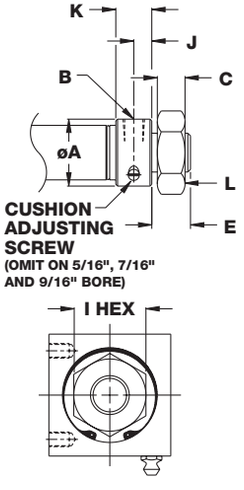
Bumper Length Adder (in.)

Bore	5/16" (007)	7/16" (01)	9/16" (02)	3/4" (04)	7/8" (06)	1-1/16" (09)	1-1/4" (12)	1-1/2" (17)	2" (31)
Add to overall length: (per end)	0.095	0.120	0.120	0.140	0.140	0.150	0.150	0.150	0.200

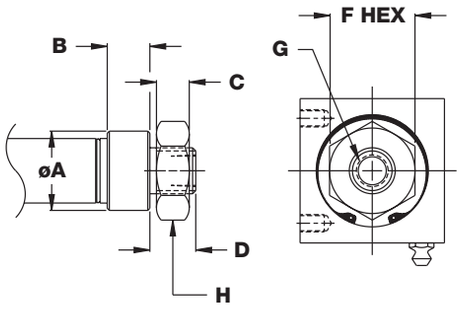
Cushions *(Not available for 5/16" and 7/16" bores)* (in.)

Bore	A	B	C	E	I	J	K	L
9/16" (02)	0.755	10-32	0.250	0.438	0.688	0.203	0.406	7/16-20 NUT
3/4" (04)	0.985	1/8 NPT	0.375	0.625	0.938	0.315	0.630	5/8-18 NUT
7/8" (06)	1.110	1/8 NPT	0.375	0.625	0.938	0.315	0.630	5/8-18 NUT
1-1/16" (09)	1.297	1/8 NPT	0.375	0.625	0.938	0.315	0.630	5/8-18 NUT
1-1/4" (12)	1.545	1/8 NPT	0.420	0.875	1.125	0.315	0.630	3/4-16 NUT
1-1/2" (17)	1.735	1/8 NPT	0.420	0.875	1.125	0.315	0.630	3/4-16 NUT
2" (31)	2.312	1/4 NPT	0.500	1.000	1.875	0.438	0.875	1-1/4-12 NUT

Note: There is no length adder for the cushion option.



Options



Axial Ports (in.)

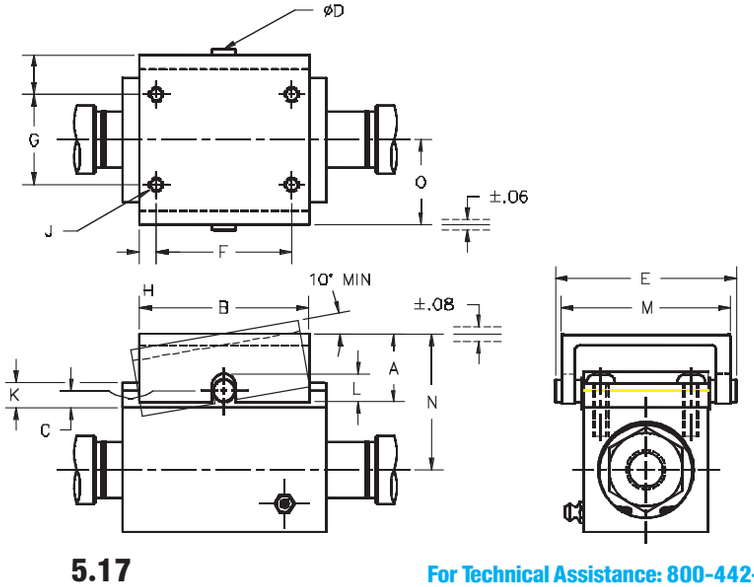
Bore	A	B	C	D	F	G	H
5/16" (007)	0.625	0.406	0.188	0.368	0.500	10-32	5/16-24 NUT
7/16" (01)	0.704	0.406	0.250	0.438	0.688	10-32	7/16-20 NUT
9/16" (02)	0.755	0.406	0.250	0.438	0.688	10-32	7/16-20 NUT
3/4" (04)	0.985	0.630	0.375	0.625	0.938	1/8 NPT	5/8-18 NUT
7/8" (06)	1.110	0.630	0.375	0.625	0.938	1/8 NPT	5/8-18 NUT
1-1/16" (09)	1.297	0.630	0.375	0.625	0.938	1/8 NPT	5/8-18 NUT
1-1/4" (12)	1.545	0.630	0.420	0.875	1.125	1/8 NPT	3/4-16 NUT
1-1/2" (17)	1.735	0.630	0.420	0.875	1.125	1/8 NPT	3/4-16 NUT
2" (31)	2.312	0.875	0.500	1.000	1.875	1/4 NPT	1-1/4-12 NUT

Note: There is no length adder for the Axial port option.

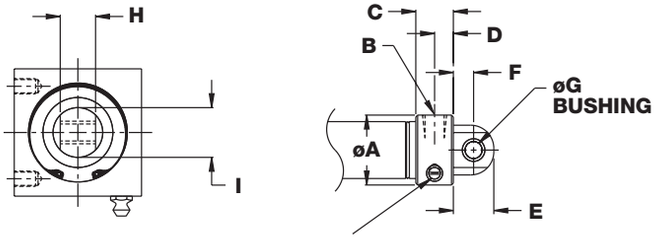
Floating Mount Bracket (in.)

Bore	A	B	C	D	E	F	G	H	I	J	K
5/16" (007)	0.532	1.438	0.188	0.187	1.317	1.062	0.469	0.188	0.360	4-40 UNC	0.236
7/16" (01)	0.625	1.688	0.188	0.249	1.646	1.188	0.750	0.250	0.383	6-32 UNC	0.248
9/16" (02)	0.750	1.875	0.188	0.249	2.005	1.500	1.000	0.188	0.437	8-32 UNC	0.278
3/4" (04)	0.875	2.375	0.250	0.312	2.442	1.750	1.375	0.312	0.459	10-24 UNC	0.340
7/8" (06)	0.938	2.750	0.312	0.374	2.849	2.125	1.625	0.312	0.547	10-24 UNC	0.421
1-1/16" (09)	1.062	3.000	0.312	0.374	3.068	2.500	1.750	0.250	0.594	1/4-20 UNC	0.421
1-1/4" (12)	1.125	3.562	0.375	0.437	3.599	2.750	2.125	0.406	0.672	1/4-20 UNC	0.484
1-1/2" (17)	1.188	4.250	0.375	0.437	4.068	3.500	2.500	0.375	0.719	5/16-18 UNC	0.484
2" (31)	1.938	6.500	0.500	0.624	6.000	5.000	3.250	0.750	1.250	1/2-13 UNC	0.634

Bore	L	M	N	O
5/16" (007)	0.250	1.188	1.019	1.019
7/16" (01)	0.312	1.516	1.206	1.206
9/16" (02)	0.312	1.875	1.518	0.938
3/4" (04)	0.375	2.312	1.861	1.156
7/8" (06)	0.438	2.719	2.080	1.359
1-1/16" (09)	0.438	2.937	2.330	1.469
1-1/4" (12)	0.500	3.469	2.612	1.734
1-1/2" (17)	0.500	3.937	2.924	1.969
2" (31)	0.688	5.750	4.268	2.875



Options



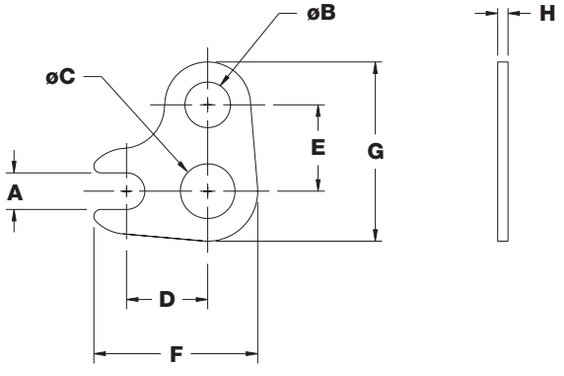
CUSHION OPTION ONLY CUSHION ADJUSTMENT SCREW LOCATION FOR 04, 06, 09, 12, 17, AND 31 BORES

Pivot Option (in.)

Bore	A	B	C	D	E	F	G	H	I
5/16" (007)	0.625	10-32	0.406	0.203	0.368	0.212	0.127	0.243	0.375
7/16" (01)	0.704	10-32	0.406	0.203	0.437	0.250	0.157	0.305	0.500
9/16" (02)	0.755	10-32	0.406	0.203	0.437	0.250	0.157	0.305	0.500
3/4" (04)	0.985	1/8- NPT	0.630	0.315	0.625	0.344	0.253	0.368	0.750
7/8" (06)	1.110	1/8- NPT	0.630	0.315	0.625	0.344	0.253	0.368	0.750
1-1/16" (09)	1.297	1/8- NPT	0.630	0.315	0.625	0.344	0.253	0.368	0.875
1-1/4" (12)	1.545	1/8- NPT	0.630	0.315	0.875	0.500	0.378	0.493	1.000
1-1/2" (17)	1.735	1/8- NPT	0.630	0.315	0.875	0.500	0.378	0.493	1.125
2" (31)	2.312	1/4- NPT	0.876	0.438	1.000	0.500	0.439	0.868	1.375

Accessories

Shock Absorber/ Switch Bracket (For 9/16" bore and larger only)



Shock Absorber/Switch Bracket (Not available for 5/16" and 7/16" bores) *(in.)*

Bore	A	B	C	D	E	F	G	H
9/16" (02)	0.320	0.399	0.442	0.710	0.755	1.433	1.568	0.090
3/4" (04)	0.320	0.478	0.629	0.910	0.900	1.820	1.900	0.120
7/8" (06)	0.320	0.556	0.629	0.875	1.116	1.785	2.179	0.120
1-1/16" (09)	0.320	0.556	0.629	0.910	1.047	1.820	2.110	0.120
1-1/4" (12)	0.320	0.793	0.754	0.375	1.437	2.410	2.812	0.120
1-1/2" (17)	0.320	0.793	0.754	1.450	1.453	2.485	2.828	0.120
2" (31)	0.320	1.005	1.254	2.230	2.290	3.640	4.165	0.224

A - *Slot for Switch*

B - *Hole for Shock Absorber*

C - *Hole for Cylinder*

Mounting Block (in.)

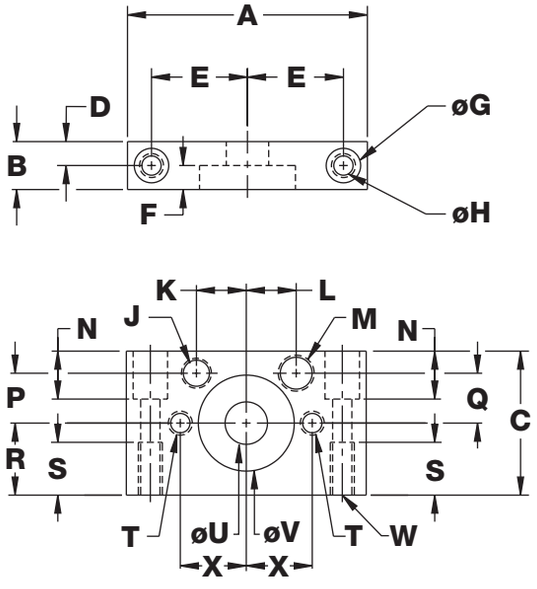
Bore	A	B	C	D	E	F	G	H	J	K	L
5/16" (007)	2.000	0.375	0.875	0.188	0.813	0.250	0.272	0.159	5/16-24 UNF	0.500	N/A
7/16" (01)	2.500	0.500	1.125	0.250	0.938	0.250	0.357	0.213	5/16-24 UNF	0.562	N/A
9/16" (02)	2.500	0.500	1.500	0.250	1.000	0.250	0.354	0.213	5/16-24 UNF	0.520	0.520
3/4" (04)	3.500	0.750	1.875	0.375	1.312	0.375	0.422	0.272	5/16-24 UNF	0.671	0.671
7/8" (06)	3.500	0.750	2.125	0.375	1.375	0.375	0.422	0.273	5/16-24 UNF	0.789	0.789
1-1/16" (09)	4.000	0.750	2.500	0.375	1.563	0.375	0.515	0.332	5/16-24 UNF	0.893	0.893
1-1/4" (12)	5.000	1.000	2.875	0.500	2.000	0.443	0.609	0.391	5/16-24 UNF	1.062	1.016
1-1/2" (17)	5.000	1.000	3.375	0.500	2.000	0.443	0.609	0.391	5/16-24 UNF	1.240	1.240
2" (31)	8.500	1.500	4.500	0.750	3.250	1.000	1.187	0.779	5/16-24 UNF	1.625	1.607

J - Hole for Switch

M- Hole for Shock Absorber

Bore	M	N	P	Q	R	S	T	U	V	W	X
5/16" (007)	N/A	0.312	0.250	N/A	0.438	0.315	6-40 UNF	0.318	0.776	6-40 UNF	0.594
7/16" (01)	N/A	0.380	0.375	N/A	0.563	0.380	1/4-28 UNF	0.442	0.995	1/4-28 UNF	0.688
9/16" (02)	3/8-32 UNEF	0.500	0.520	0.520	0.750	0.500	1/4-28 UNF	0.442	1.000	1/4-28 UNF	0.688
3/4" (04)	7/16-28 UNEF	0.625	0.671	0.671	0.938	0.500	5/16-24 UNF	0.629	1.375	5/16-24 UNF	0.938
7/8" (06)	1/2-20 UNF	0.625	0.789	0.789	1.063	0.750	5/16-24 UNF	0.629	1.375	5/16-24 UNF	0.938
1-1/16" (09)	1/2-20 UNF	0.875	0.893	0.893	1.250	0.750	3/8-24 UNF	0.629	1.375	3/8-24 UNF	1.125
1-1/4" (12)	3/4-16 UNF	1.125	1.062	1.016	1.438	1.125	7/16-20 UNF	0.754	1.625	7/16-20 UNF	1.375
1-1/2" (17)	3/4-16 UNF	1.375	1.240	1.240	1.688	1.000	7/16-20 UNF	0.753	1.625	7/16-20 UNF	1.375
2" (31)	1-12 UNF	1.625	1.625	1.607	2.250	1.500	7/8-9 UNC	1.380	2.750	7/8-9 UNC	2.125

Mounting Block



Engineering Specifications

Pressure Rating: 100 psi (Air or Hydraulic)
Temperature Range: 0° to 170°F
Breakaway: Ultran Gold Coupling Strength - Less than 25 psi
Ultran Silver Coupling Strength - Less than 20 psi

Magnetic Coupling Strength (lbs.)

Cylinder Bore	Ultran Gold (UGS)	Ultran Silver (USS)
5/16" (007)	13	8
7/16" (01)	20	10
9/16" (02)	29	16
3/4" (04)	61	33
7/8" (06)	102	55
1-1/16" (09)	127	74
1-1/4" (12)	190	110
1-1/2" (17)	270	150
2" (31)	552	332

Lubrication

The Ultran rodless cylinder is prelubricated at the factory. The life of the cylinder can be greatly lengthened by providing additional lubrication with an air line mist lubricator or direct introduction of oil to the cylinder every 100 linear miles of travel. Recommended oils are medium to heavy.
The carriage should also be lubricated every 100 linear miles with a high grade of bearing grease. Other types of prelubrication are available upon request. The lubricant used by the factory can be ordered as part number MS-2861-14OZ. the lubricant is packaged in a 14 OZ grease gun cartridge.

Repairs

The Ultran rodless cylinder must be returned to the factory for repairs.

Weight (lbs.)

Cylinder Bore	Base Weight (0" Stroke)		Adder per 1"
	(UG)	(US)	
5/16" (007)	0.10	0.09	0.006
7/16" (01)	0.22	0.21	0.01
9/16" (02)	0.56	0.51	0.01
3/4" (04)	1.18	1.11	0.02
7/8" (06)	1.54	1.42	0.02
1-1/16" (09)	2.54	2.34	0.03
1-1/4" (12)	3.16	2.90	0.03
1-1/2" (17)	6.36	5.76	0.05
2" (31)	16.46	15.15	0.07

Size/Application Considerations

Each bore size for the Bimba Ultran rodless cylinder has specific load carrying capabilities. These capabilities can be enhanced by externally supporting the load or by ordering the internal cushion option or external shock absorbers. The load should always be guided and supported for optimum life. Cushions or shock absorbers will also increase cylinder life when used properly. Use the following procedures to determine the requirements for specific applications.

NOTE: Exceeding the load can cause the carriage and piston to decouple.

1. *Check radial load requirements.* Graph C, *Radial Load vs. Stroke Length,* shows the maximum radial load the cylinder will support for a specific bore size and stroke length. If your radial load requirements fall above the curve, the load must be externally supported.

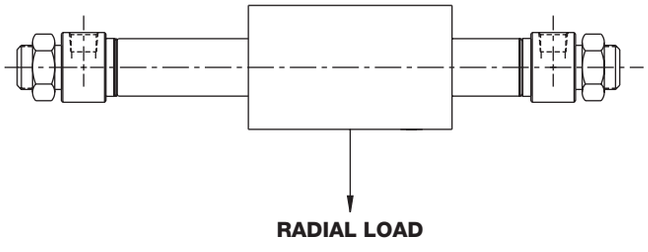
2. *Check axial load requirements.* Graph D, *Axial Load vs. Moment Arm,* shows the maximum axial load the cylinder will support for a specific bore size and moment arm length. If your axial load requirements fall above the curve for the specific bore size, the load must be externally supported.

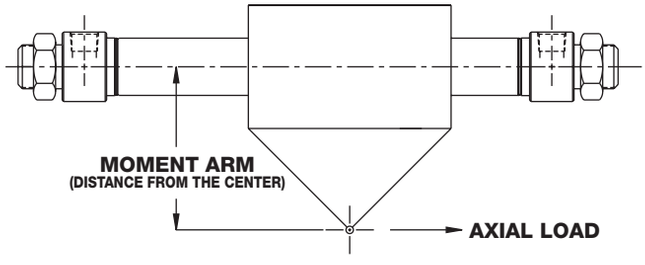
3. *Check End-of-Stroke Velocity and Load Requirements*. From Graphs E through H, *Velocity vs. Load,* choose the graph for your Ultran model and mounting position. If your velocity and load requirements fall above the curve for the specific bore size, you will need internal cushions or external shock absorbers to decelerate the load without causing the carriage and piston to decouple.

4. Maximum Velocity. If cylinder speed will exceed 20 in/sec or cycle rate will exceed 15 per minute, special application considerations may be required. Please consult your local distributor.

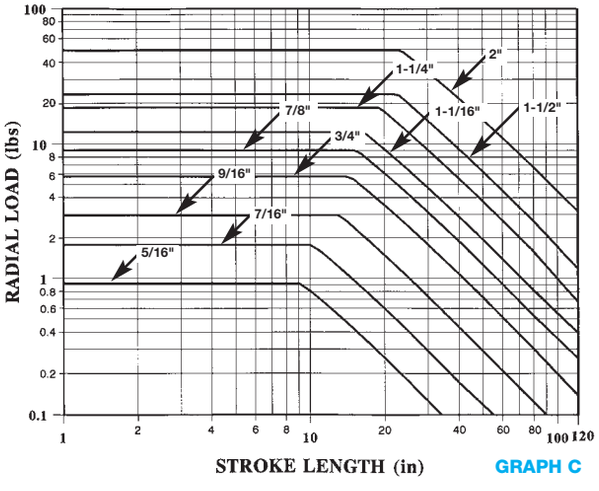
Internal Cushions. From Graphs I through L, *Velocity vs. Load for Cushions,* choose the graph for your Ultran model and mounting position. If your velocity and load requirements fall above the curve for the specific bore size, you will need external shock absorbers to decelerate the load.

External Shock Absorbers. Choose from Graphs EE through RR (Related Products, page 9.17-9.19), *Velocity vs. Load for Shock Absorbers*, for your bore size. Choose model LS, SS or HS based on your velocity and load.



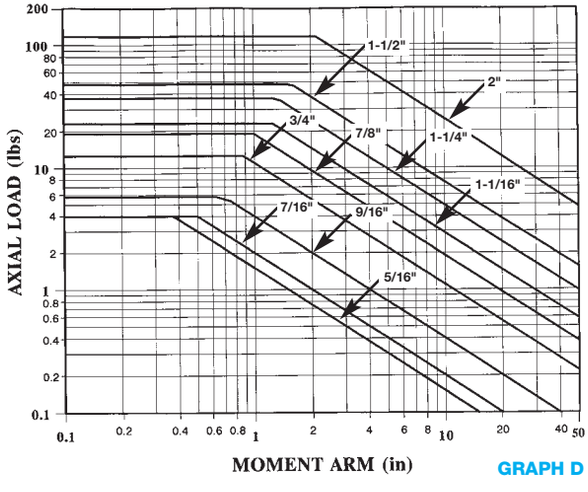


RADIAL LOAD vs **STROKE LENGTH***



GRAPH C

AXIAL LOAD vs **MOMENT ARM**

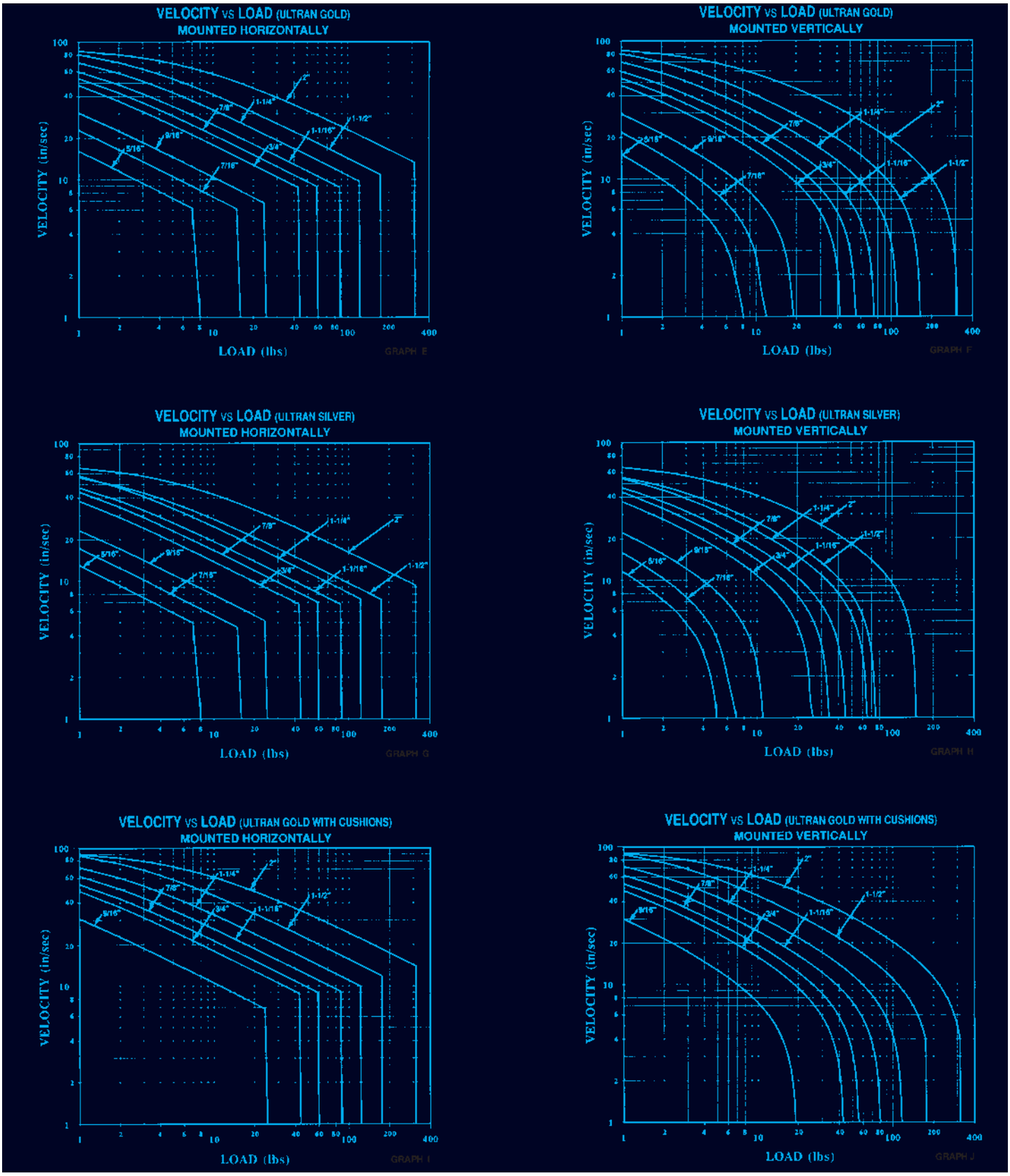


GRAPH D

**Stud mount only. Consult factory if pivot mounted.*

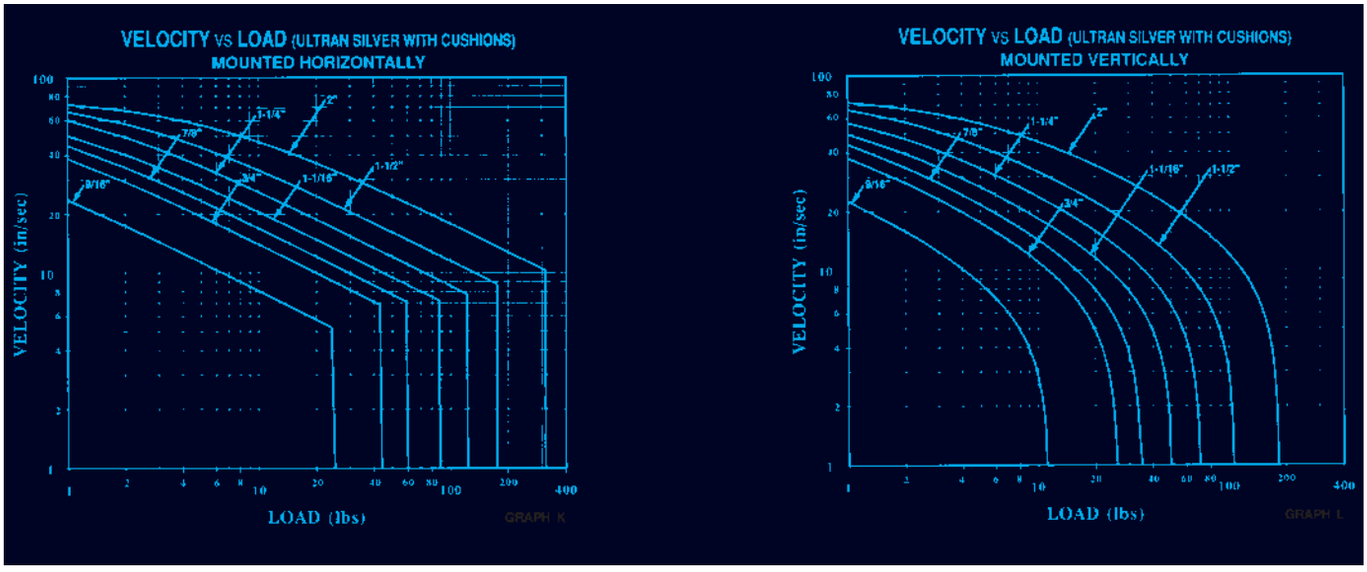
Velocity vs. Load for Basic Ultran Models

Note: Velocities in excess of 20 in./sec. require application review by Bimba.



Velocity vs. Load for Basic Ultran Models

Note: Velocities in excess of 20 in./sec. require application review by Bimba.

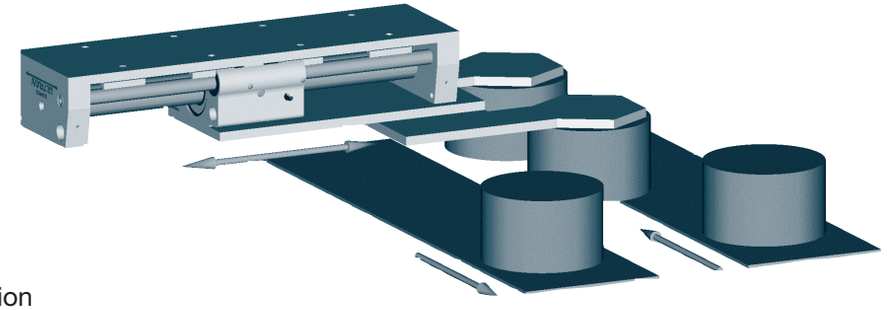


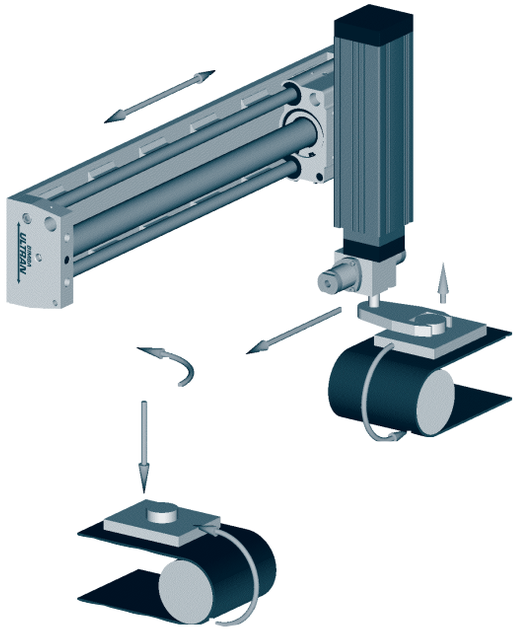
Bimba Ultran High Load Slides

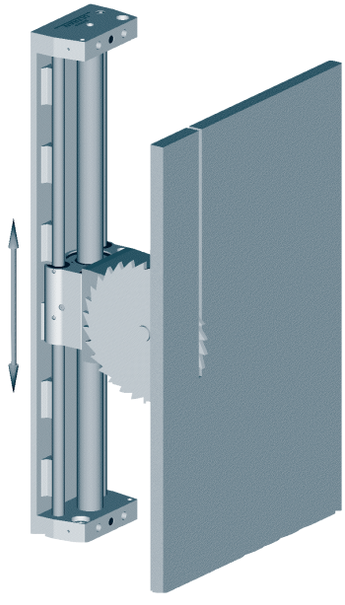
Provides high load carrying capability within an Ultran Slide Cylinder. The unit incorporates a ball bearing system offering large load bearing capabilities with greater carriage precision.

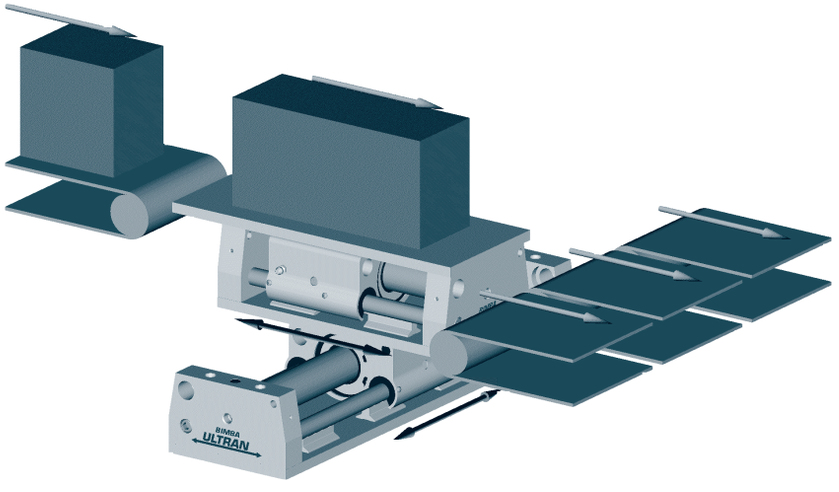
ADVANTAGES

- Large load bearing capabilities.
- Greater carriage precision.
- Leak-free construction.
- Piston seals are internally lubricated for long life.
- Special rare earth magnet configuration for high magnetic coupling strengths.
- 304 stainless steel body and “U” cup seals for lower dynamic friction.
- Prelubricated for miles of maintenance-free travel, with easily-accessible carriage lubrication port.
- Shock absorbers to decelerate loads.
- Optional 1-inch stroke length adjustment available.
- Midstroke position sensing available. End-of-stroke sensing available for all models.
- Optional bumpers to reduce noise.
- Oil service seal option available for low pressure hydraulic service.









How to Order

The model number for High Load Ultran cylinders consists of three alphanumeric clusters. These designate product type, bore size and stroke length, and options. Please refer to the charts below for an example of model number UHL-12 25.75-A1T. This is a 1-1/4" bore, 25.75" stroke High Load Ultran rodless cylinder with stroke adjustment on one end and a track for mounting switches.

PRODUCT TYPE	BORE SIZE	STANDARD STROKE LENGTHS
UHL - High Load Ultran Slide	09 - 1-1/16" 12 - 1-1/4" 17 - 1-1/2"	6" to 132" Available in 1/4" increments[1]

UHL-1225.75-A1T

OPTIONS		
A	-	Stroke adjustment (both ends)
A1	-	Stroke adjustment (on end 1)
A2	-	Stroke adjustment (on end 2)
B	-	Bumpers (both ends)
B1	-	Bumpers (on end 1)
B2	-	Bumpers (on end 2)
S	-	Seals - Oil service (low pressure hydraulic service)
T	-	Switch track
U	-	Switch track for miniature switches
Y	-	Alternate port (both ends)
Y1	-	Alternate port (on end 1)
Y2	-	Alternate port (on end 2)

Note: All options are compatible, except bumpers (option B) and oil service seals (option S).

Dowel pin holes are standard on 1-1/16" (09) and 1-1/2" (17) bore cylinder. Not available on 1-1/4" (12) bore cylinder.

[1] *Contact your authorized Bimba distributor if smaller stroke increments are required for your application.*

List Prices

Bore	Base Price	Adder per inch of stroke	Options					
			A Stroke Adjustment (per end)	B Bumpers (per end)	S Oil Service Seals	T & U Switch Track (Base)	T & U Adder per inch of stroke	Y Alternate Port (per end)
UHL-09								
UHL-12								
UHL-17								

Dowel Pin holes are standard on 1-1/2" (17) bore cylinder and are not available on 1-1/4" (12) bore cylinder.

Accessories

Bore	Shock Absorber		Stroke Adjustment	
	Model	Price	Model	Price
1-1/16" (09)	AS-09		UHSA-09	
1-1/4" (12)	AS-17		UHSA-12	
1-1/2" (17)	AS-17		UHSA-17	

High Load Ultran Slides requiring shock absorbers with stop collars for stroke adjustment or a larger kinetic energy rating should use the following shock absorber.

Bore	Shock Absorber		Stop Collar*	
	Model	Price	Model	Price
1-1/16" (09)	HS-09		USC-09	
1-1/4" (12)	HS-17		USC-17	
1-1/2" (17)	HS-17		USC-17	

**The Ultran Slide Cylinder needs to be increased by the B dimension in order to maintain intended stroke length. The overall length increases by the same amount. The A dimension indicates maximum amount of stroke adjustment attainable. See Related Products, page 9.20 for dimensions.*

Dimensions (in.)

Bore	A	B	C	D	E	F	G	H	I	J	K
1-1/16" (09)	0.500	0.706	2.500	3.500	5.000	0.375	1.750 *	1.750	1/4-20 UNC	0.375	0.750
1-1/4" (12)	0.562	0.750	2.750	3.875	5.875	0.318	2.125	1.938	1/4-20 UNC	0.500	1.000
1-1/2" (17)	0.500	0.756	3.500	4.500	6.500	0.500	2.500	2.250	5/16-18 UNC	0.520	1.000

Bore	L	M	N	O	P	Q	R	S	T	U	V
1-1/16" (09)	0.500	0.250	0.375	5/16-24 UNF	1/8 NPT	1/2-20 UNF	0.594	0.375	2.300	3.062	4.250
1-1/4" (12)	0.625	0.306	0.514	5/16-24 UNF	1/8 NPT	3/4-16 UNF	0.742	0.563	1.660	3.500	5.000
1-1/2" (17)	0.625	0.559	0.486	5/16-24 UNF	1/8 NPT	3/4-16 UNF	0.992	0.906	1.917	4.500	6.000

Bore	W	X	Y	Z	AA	BB	CC	II	DD	EE
1-1/16" (09)	0.172	0.375	1.125	1.563	1.922	2.625	2.688	#10	0.252	0.420
1-1/4" (12)	0.109	0.375	1.125	1.750	1.938	3.000	3.062	#10	—	—
1-1/2" (17)	0.140	0.375	1.281	2.000	2.109	3.500	3.562	1/4"	—	—

*Note: The 09 base plate mounting holes are 1.56" apart. Other bore sizes have carriage mounting holes and base plates mounting holes in line as shown.

Mounting Hole Calculation for 1-1/16" bore

$$JJ = \frac{KK - (INT(\frac{KK}{4}) \times 4)}{2}$$

If Result < 1.60, use:

$$JJ = \frac{KK - [(INT(\frac{KK}{4}) - 1) \times 4)]}{2}$$

Where KK = (E + Stroke) and INT is integer.

Mounting Hole Calculation for 1-1/4" and 1-1/2" bores

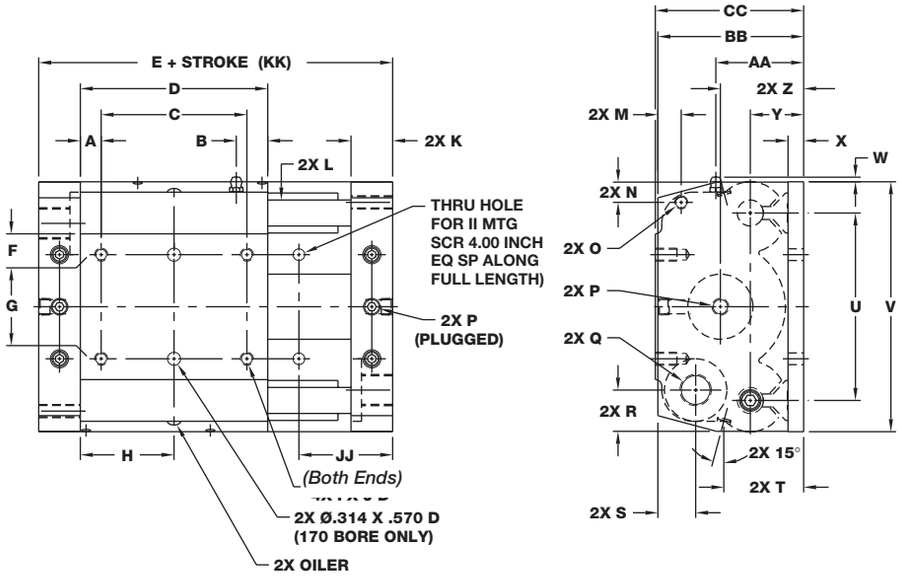
$$JJ = \frac{KK - (INT(\frac{KK}{4}) \times 4)}{2}$$

If Result < 1.85, use:

$$JJ = \frac{KK - [(INT(\frac{KK}{4}) - 1) \times 4)]}{2}$$

Where KK = (E + Stroke) and INT is integer.

END 1



Ports

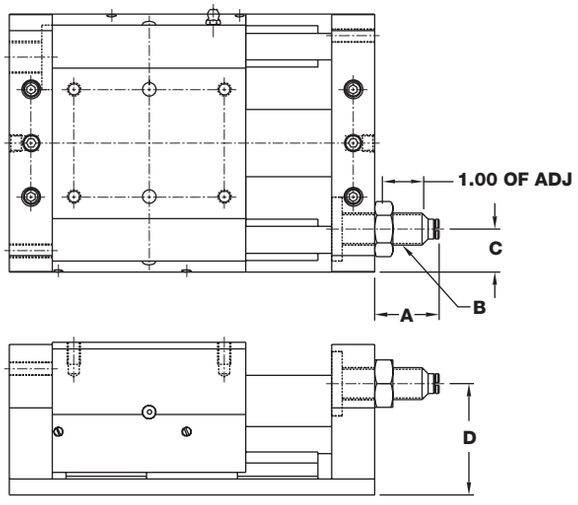
The Base Model High Load Ultran Slide offers both axial and alternate port locations. The base unit comes with flush surface plugs installed on top of the End Blocks unless the “Y” option is specified. This no charge option has the plugs installed on the side of the End Blocks.

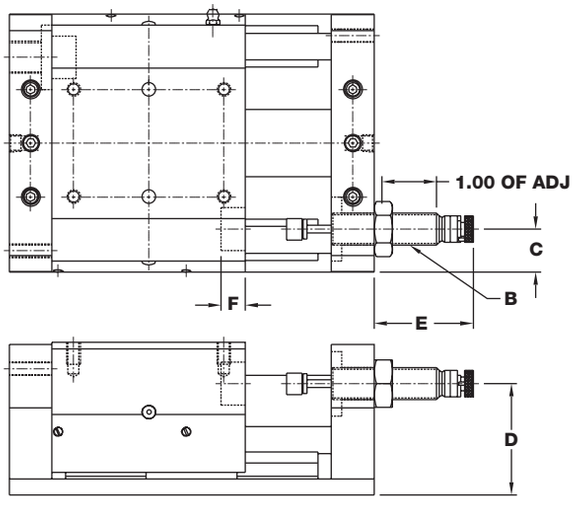
Options

Shock Absorber/Stroke Adjustment (in.)

Bore	A	B	C	D	E	F
1-1/6" (09)	1.562	1/2-20 UNF	0.594	2.250	2.060	0.465
1-1/4" (12)	1.750	3/4-16 UNF	0.742	2.438	2.312	0.550
1-1/2" (17)	1.750	3/4-16 UNF	0.992	2.594	2.312	0.550

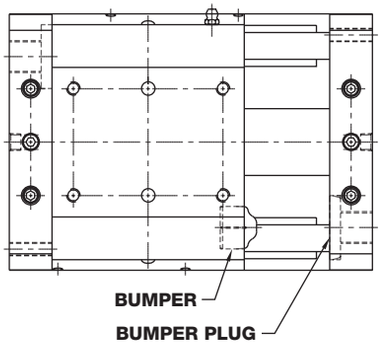
Note: Do not let the shock absorbers bottom out. The shock should not be used as a stroke adjuster. An optional stop collar is needed if stroke adjustment is required.





Bumper Compression

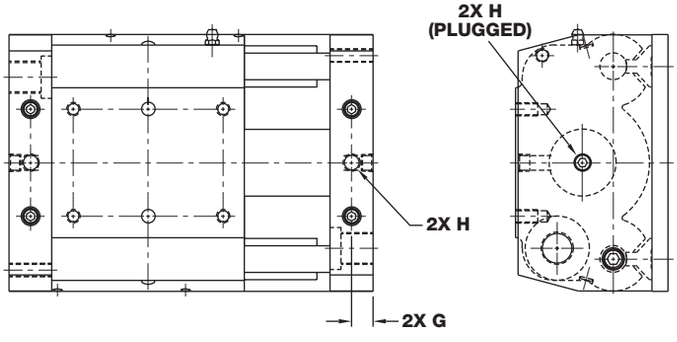
Bore	Pressure
1-1/16" (09)	80 psi
1-1/4" (12)	80 psi
1-1/2" (17)	60 psi



The Bumper option does not add overall length to the cylinder. However, the unit will not go full stroke until the specified pressure in table above is applied to the cylinder. If full stroke is required at a pressure less than that specified above, the stroke adjustment option may be utilized in combination with the bumper option to obtain full stroke. i.e., If 5 inches of stroke is required at 40 psi, order a 5.5 inch stroke unit with the Stroke Adjustment Option and adjust the stroke down to 5 inches.

Alternate Port (in.)

Bore	G	H
1-1/16" (09)	0.375	1/8 NPT
1-1/4" (12)	0.500	1/8 NPT
1-1/2" (17)	0.500	1/8 NPT

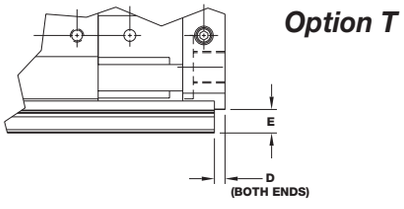


The Base Model High Load Ultran Slide offers both axial and alternate port locations. The base unit comes with flush surface plugs installed in the top ports of the End Blocks unless the “Y” option is specified. This no charge option has the plugs installed in the End Block side ports.

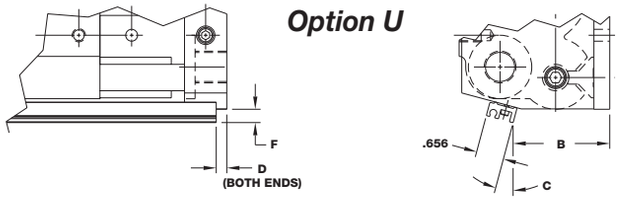
Options

Switch Track for Miniature Switches

Option T



Option U



Bore	A	B	C	D	E	F
1-1/16" (09)	1.497	1.494	0°	0.125	0.531	0.272
1-1/4" (12)	1.999	1.954	10°	0.242	0.522	0.267
1-1/2" (17)	2.356	2.289	15°	0.250	0.577	0.327

Engineering Specifications

Operating Medium: Air or hydraulic

Pressure Rating: 100 psi

Temperature Range: 0°F to +170°F

Breakaway: Less than 25 psi

Lubrication

All Bimba High Load Ultran Slide actuators are pre-lubricated internally and externally with our special bearing grade grease. The guide shafts are pre-lubricated with a lightweight oil. The cylinder's life can be extended by providing additional lubrication with an air line mist lubricator and by lubricating the carriage every 100 miles with a high grade bearing grease. The guide shafts should be lubricated periodically with a lightweight oil. Do not over oil – there is an internal wick to retain the lightweight oil.

Repairs

The High Load Ultran Slide actuators must be returned to the factory for repairs.

Components

Carriage	Anodized aluminum
End Block	Anodized aluminum
Guide Shaft	Case-hardened steel
Base Plate	Anodized aluminum
Guide Shaft Support	Anodized aluminum
End Block Screws	Stainless steel
Guide Shaft Screws	Black oxide carbon steel
Carriage Retaining Rings	Plated carbon steel
Body Wiper	Urethane
Guide Shaft Bearing	Ball bearings in plastic housing
Port Plug	Carbon steel
Bearing Retaining Screw	Stainless steel

Options

Bumpers (Internal & External)	Urethane
Stroke Adjuster Screw	Stainless steel
Shock Absorbers	Anodized aluminum end plates, 303 stainless steel guide rods
Bumper Plug	Anodized aluminum
Stroke Adjuster Bumper Plate	Anodized aluminum
Switch Track	Anodized aluminum

Magnetic Coupling Strength (lbs.)

Bore Size	Strength
1-1/16" (09)	127
1-1/4" (12)	190
1-1/2" (17)	270

Weights (lbs.)

Bore Size	Base Weight (0" Stroke)	Adder per 1"
1-1/16" (09)	5.43	0.23
1-1/4" (12)	7.87	0.44
1-1/2" (17)	14.1	0.45
Option Adders for 1-1/16"		
A Option Adder	0.19	N/A
A1 Option Adder	0.1	N/A
A2 Option Adder	0.1	N/A
B Option Adder	0.01	N/A
Option Adders for 1-1/4" and 1-1/2"		
A Option Adder	2.67	N/A
A1 Option Adder	1.33	N/A
A2 Option Adder	1.33	N/A
B Option Adder	0.01	N/A

Size / Application Considerations

Each bore size of the High Load Ultran Slide has specific load-carrying capabilities. Shock absorbers can extend cylinder life when used properly. See subsequent section on shock absorbers to calculate maximum allowable kinetic energy before a shock absorber is required.

Use the following procedures to determine the requirements for specific applications.
NOTE: Exceeding the recommended loads can result in improper cylinder function: piston/carriage de-coupling, unacceptable deflections, etc.

1. Check the loading condition requirements and find that condition below. See sketches A and B for illustration of loading conditions.
2. Depending on the loading condition, use the appropriate chart, graph or formula to help determine maximum allowable loads and/or moment arms.

*Table 1. Maximum Allowable Loads and Moments**

Bore	Maximum Load			Maximum Moment		
	Radial (lbs.)	Pull Off (lbs.)	Side (lbs.)	Axial (Ma) (in-lbs.)	Radial (Mr) (in-lbs.)	Cross (Mc) (in-lbs.)
1-1/16" (09)	1440	992	1440	1111	435	1613
1-1/4" (12)	2480	220	992	261	385	1178
1-1/2" (17)	2480	992	1984	1488	2232	2976

** Dynamic Ratings*

The values shown in Table 1 are the maximum allowable loads for the load carrying system. To achieve these values, the base plate must be fully supported along its full length and the load must be equally distributed among all four bearings. For best results, your application analysis should determine maximum loading on each bearing. **Do not exceed 20 in./sec. velocity or 15 cycle/minute cycle rate; the internal piston bearings will heat up and cause sluggish motion.**

Radial Load and Pull-off Load

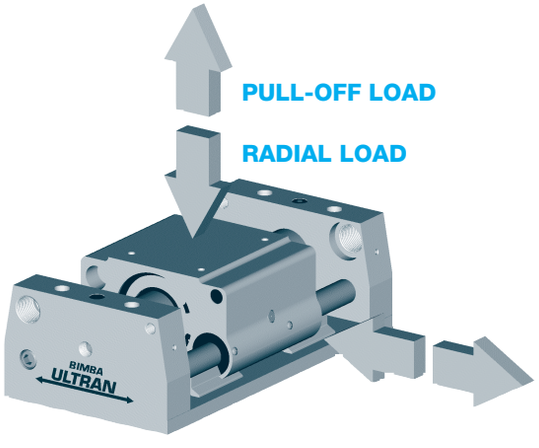
A load applied perpendicular to both the base plate and to the direction of actuation. Load directed toward the base plate represents the maximum loading capacity of the system. Load directed away from the base plate reduces the system's load rating to approximately 40% of maximum radial loading. This is what's called the "pull-off" capacity.

In this loading condition, the maximum radial load-carrying capability is 620 pounds per bearing. The maximum "pull-off" load in the same mounting condition is 248 pounds per bearing.

Side Load

A load that is applied parallel to the base plate, but perpendicular to the direction of actuation. Depending on bore size, the maximum side load will be at least 20% less than the maximum radial loading capacity.

In this loading condition, the maximum load carrying capability is 496 pounds per bearing. Only two bearings are used to calculate the load carrying capability of the 1-1/4" bore unit.



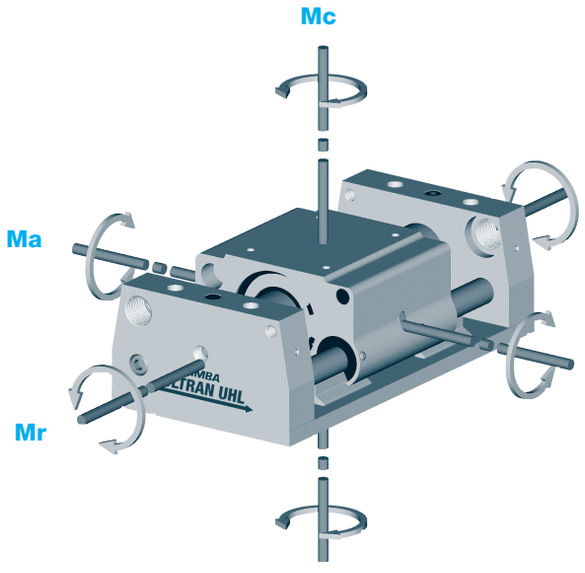
SKETCH A

Size / Application Considerations

Radial Moment Load (Mr)
An unbalanced radial or side load applied to the system. The center of the radial load must be outside the span of the guide shafts, or the center of the side load must be at some point other than the center of the guide shafts to cause a radial moment loading condition.

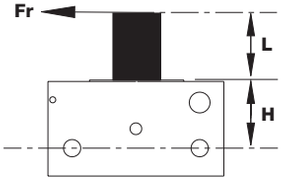
Axial Moment Load (Ma)
An axial (same as the direction of actuation) load applied to the system, where the center of the load is at some point other than the center of the guide shafts. The load must also be between the span of the guide shafts to be a pure axial moment loading condition.

Cross Moment Load (Mc)
An axial load applied to the system, where the center of the load is at some point outside of the span of the guide shafts.



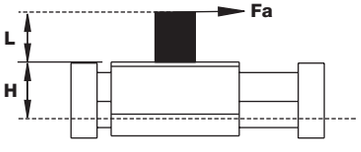
SKETCH B

Radial Moment



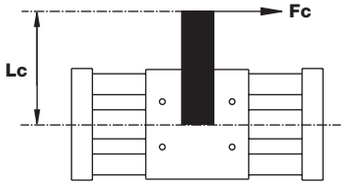
SKETCH C

Axial Moment



SKETCH D

Cross Moment



SKETCH E

Sketches C, D, and E demonstrate how a force is applied to a moment arm to produce the moments shown in Sketch B. Use the equations below to determine the actual moments created by your application. The results of each calculated moment should be compared to the maximums listed in the table. (If the actual moments are greater than the listed maximums, then the load and moments should be re-evaluated.)

$$\text{Radial Moment} = Mr = Fr \times (L+H)$$
$$\text{Axial Moment} = Ma = Fa \times (L+H)$$
$$\text{Cross Moment} = Mc = Fc \times (Lc)$$

A High Load Ultran Slide can withstand compound moments but the maximum allowable will be determined by the total percentage of the axial, radial and cross moments. The equation below will determine the compound moment percent based on the total moments. The compound moment percent must not be greater than 100. (If the compound moment percent is greater than 100, then the load and moments should be re-evaluated.)

$$M_{compound\%} = 100 \times \left(\frac{Mr}{Mr\ max} + \frac{Ma}{Ma\ max} + \frac{Mc}{Mc\ max} \right) \leq 100\%$$

Size / Application Considerations

Unsupported Loads

If your application does not fully support the base plate, refer to Graphs 1-3. Graph 1, “Load vs. Span” displays the maximum load allowable with a maximum 0.005" deflection.

If your application allows for greater deflections, refer to Graphs 2 and 3, “Deflection vs. Span”. Use the following steps to determine resultant loads or deflections pertinent to your application.

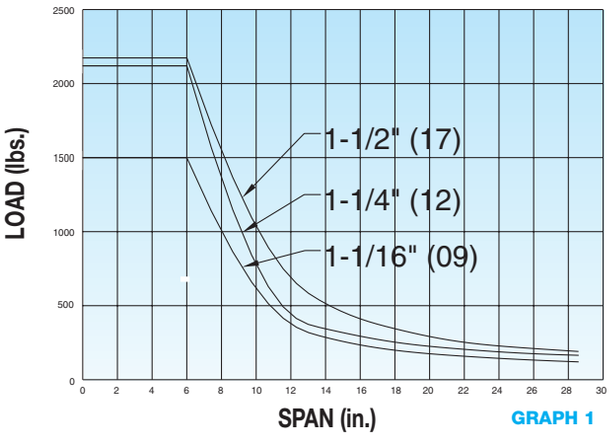
1. If you know the length (span) that the base plate will be supported, find that span on the X-Axis of the graph. From this point, go up to the approximate location that best represents your weight or load. Across to the left from this point where it intersects the Y-Axis identifies what deflection can be expected between the supported points.

2. If you know the maximum amount of deflection that your application can tolerate, find this deflection on the Y-Axis of the graph. Once you locate the desired deflection, go across to the approximate location that best represents your weight or load. Directly under this point on the X-Axis is the recommended span length.

If your application combines radial and moment loads, or exceeds the deflections from Graphs 2 and 3, consult your authorized Bimba distributor to determine if the application is feasible.

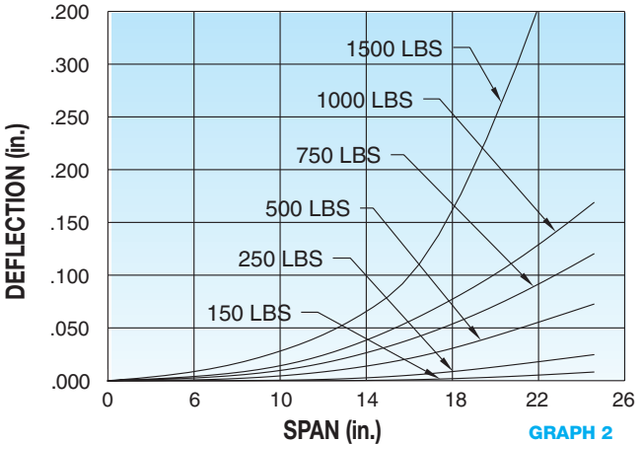
NOTE: Velocities exceeding 20 in./sec. or 15 cycle/minute require review by Bimba.

LOAD vs **SPAN**



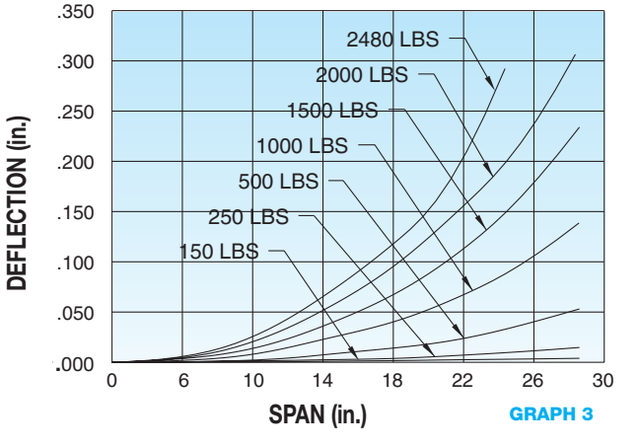
GRAPH 1

(1-1/16" Bore)
DEFLECTION vs **SPAN**



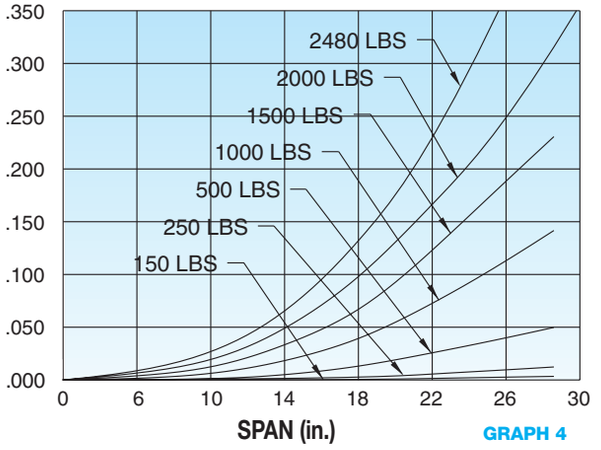
GRAPH 2

(1-1/4" Bore)
DEFLECTION vs **SPAN**



GRAPH 3

(1-1/2" Bore)
DEFLECTION vs **SPAN**

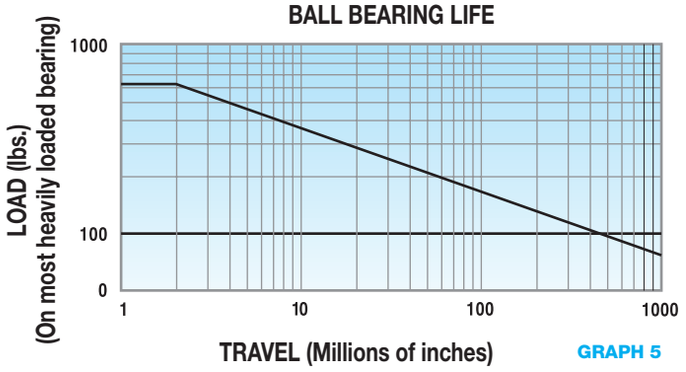


GRAPH 4

Bearing Life

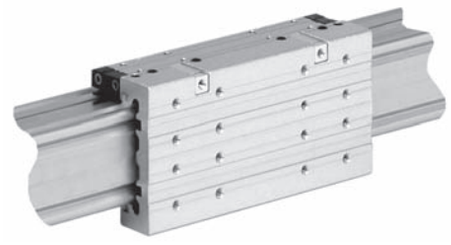
The life of the ball bearing bushings are primarily affected by the amount of load it is required to carry. This can be best illustrated by Graph 4 below.

BALL BEARING LIFE

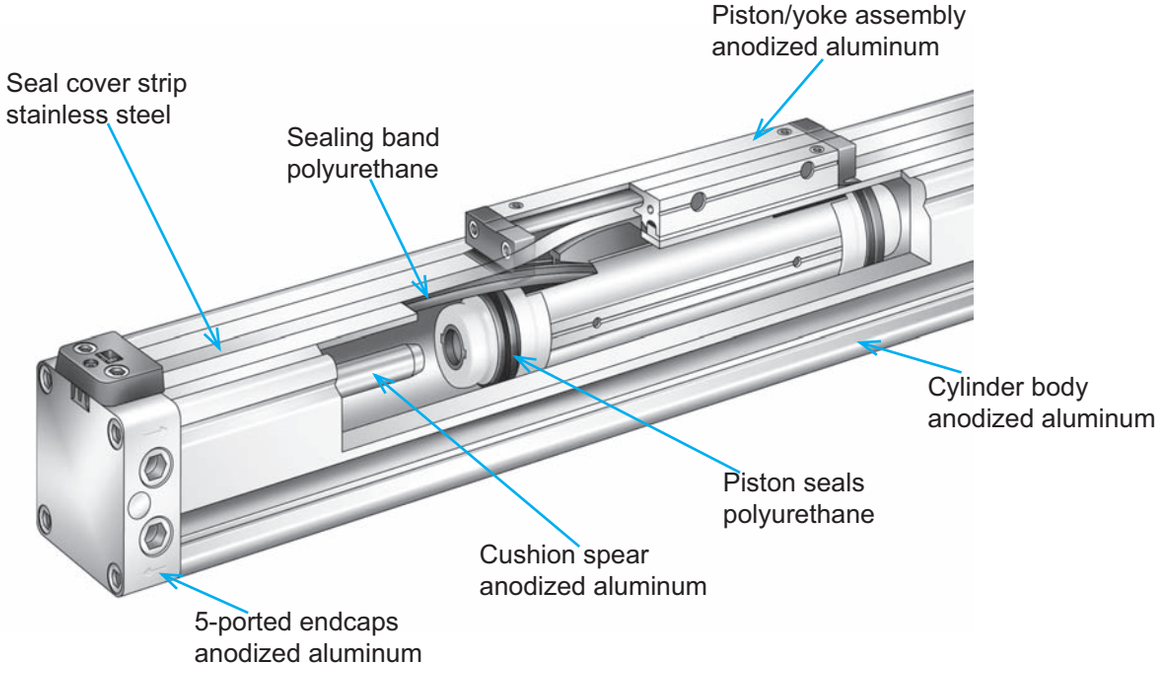


GRAPH 5

Bimba Ultran Band Rodless Cylinders



- The Bimba Ultran Band is a mechanically-coupled rodless cylinder, providing overall length savings in excess of 40% vs. traditional cylinders.
- Specially engineered sealing strip out performs all other band sealing systems on the market.
- Stainless steel cover strip protects the sealed area and prolongs band life.
- Bore sizes range from 18mm to 63mm in basic model as well as with additional guiding.
- All models are switch-ready and come standard with finely adjustable cushioning.
- Unique five-ported endcaps provide maximum plumbing flexibility

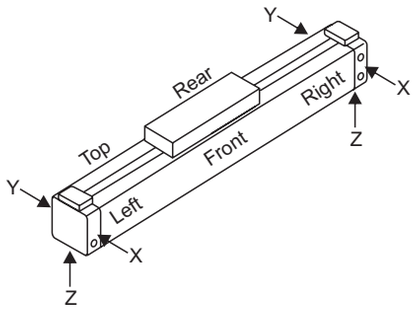


How to Order

Model Type	
UB	Ultran Band
UBS	Ultran Band, Side Guide
UBM	Ultran Band, Metric
UBSM	Ultran Band, Metric, Side Guide

Options	
1	Single End Porting (RH) (X, Y positions only)
2	Single End Porting (LH) (X, Y positions only)
3	Double End Porting (X, Y, or Z positions)
X	Side Front Port Position
Y	Side Rear Port Position
Z	Bottom Port Position
C	Adjustable Cushions
M	MRS Position Sensing

UB - 2512 - 1XCM



Bore Size	
18	18mm
25	25mm
32	32mm
40	40mm
50	50mm
63	63mm

Stroke Length
1" increments to 120" max. (UB, UBS)
25mm increments to 3000mm max. (UBM, UBSM)

Notes:
Must specify port function and location.
All models have cushions; include “C” in all part numbers.
All models include magnet and are switch-ready; include “M” in all part numbers.
For port positioning, use diagram above.
Example Model Number Above: Ultran Band, 25mm bore, 12 inch stroke, single-end porting on right end, ports on front side, cushions, and magnet.

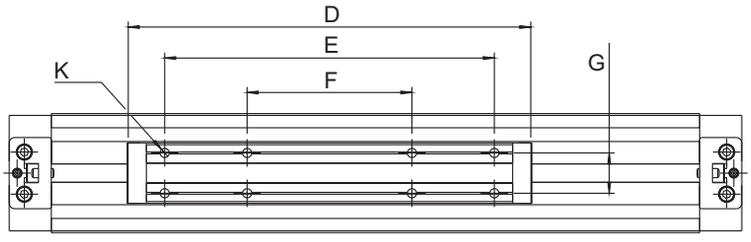
List Prices

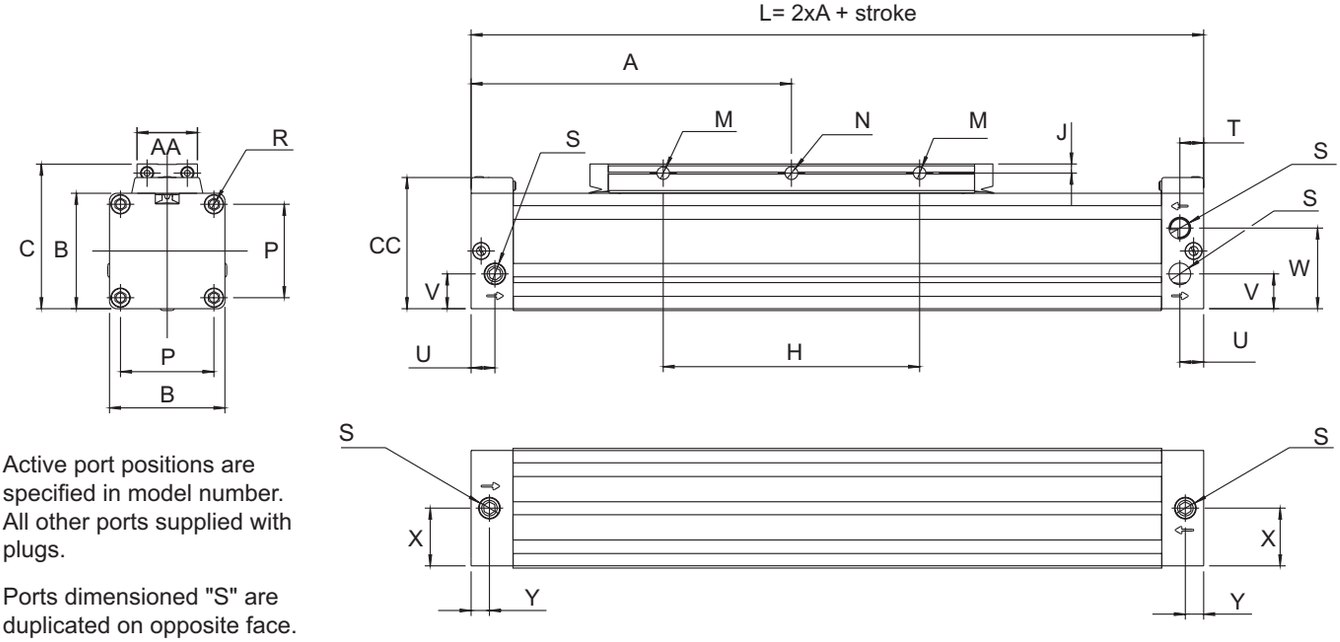
Base Model	18mm	25mm	32mm	40mm	50mm	63mm
UB, UBM						
UBS, UBSM						
Add per inch of stroke* or per 25mm of stroke						

*Strokes in excess of 48" (915mm) up to 120" (3000mm), add List

Cushions (C) and Magnet (M) are standard and must be included in all model numbers.
Port position must be specified on every model number.
No additional charge for C, M or port positioning.
Fractional strokes are priced to the next standard increment.

Basic Model (UB, UBM)





Active port positions are specified in model number. All other ports supplied with plugs.

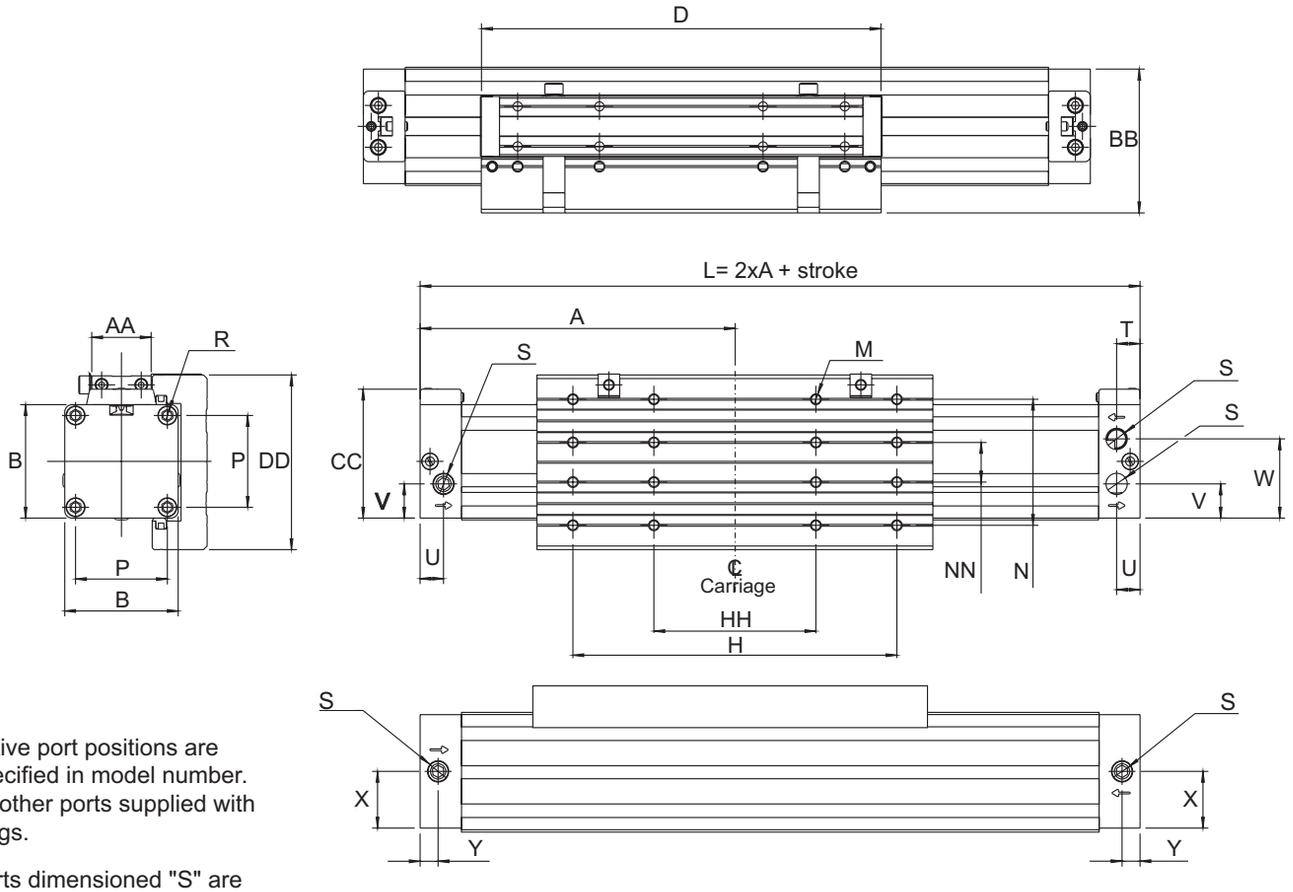
Ports dimensioned "S" are duplicated on opposite face.

Dimensions mm (inch)

Bore Size	A	AA	B	C	CC	D	E	F	G	H	J	K
18mm	80 (3.15)	15.5 (0.61)	30 (1.18)	39 (1.54)	36.5 (1.44)	103 (4.06)	75 (2.95)	-	10 (0.39)	50 (1.97)	3 (0.12)	M3x7 (#4-48x0.28)
25mm	100 (3.94)	20 (0.79)	42 (1.65)	53 (2.09)	50.2 (1.98)	131 (5.16)	100 (3.94)	50 (1.97)	13 (0.51)	70 (2.76)	3.5 (0.14)	M4x7 (#8-36x0.28)
32mm	120 (4.72)	25 (0.98)	52 (2.05)	65 (2.56)	60.2 (2.37)	171 (6.73)	140 (5.51)	70 (2.76)	16 (0.63)	100 (3.94)	4.5 (0.18)	M5x9 (#10-32x0.35)
40mm	150 (5.91)	33 (1.3)	63 (2.48)	79 (3.11)	71.6 (2.82)	220 (8.66)	180 (7.09)	90 (3.54)	22 (0.87)	140 (5.51)	5 (0.2)	M6x10 (1/4-28x0.39)
50mm	180 (7.09)	42 (1.65)	78 (3.07)	96 (3.78)	86.6 (3.41)	280 (11.02)	220 (8.66)	110 (4.33)	29 (1.14)	180 (7.09)	6.5 (0.26)	M8x12.5 (5/16-24x0.49)
63mm	215 (8.46)	54 (2.13)	93 (3.66)	113.5 (4.47)	101.6 (4)	333 (13.11)	280 (11.02)	140 (5.51)	40 (1.57)	230 (9.06)	8 (0.31)	M8x15 (5/16-24x0.59)

Bore Size	OM	ON	P	R	Port S	T	U	V	W	X	Y
18mm	3.4 (0.13)	3.5 (0.14)	23.5 (0.93)	M3x8 (#4-48x0.31)	M5 (10-32)	9.5 (0.37)	9.5 (0.37)	9.3 (0.37)	20.7 (0.81)	15 (0.59)	6.5 (0.26)
25mm	4.4 (0.17)	4.5 (0.18)	33 (1.3)	M4x10 (#8-36x0.39)	G1/8 (1/8 NPT)	7 (0.28)	13 (0.51)	13.5 (0.53)	28.5 (1.12)	21 (0.83)	7.0 (0.28)
32mm	5.3 (0.21)	5.5 (0.22)	41 (1.61)	M5x11 (#10-32x0.43)	G1/8 (1/8 NPT)	7 (0.28)	7 (0.28)	15.5 (0.61)	36.5 (1.44)	26 (1.02)	9.0 (0.35)
40mm	6.8 (0.27)	7 (0.28)	51 (2.01)	M6x13 (1/4-28x0.51)	G1/4 (1/4 NPT)	13 (0.51)	13 (0.51)	19 (0.75)	44 (1.73)	31.5 (1.24)	10 (0.39)
50mm	6.8 (0.27)	7 (0.28)	63 (2.48)	M8x13 (5/16-24x0.51)	G1/4 (1/4 NPT)	12 (0.47)	12 (0.47)	21 (0.83)	50 (1.97)	39 (1.54)	12 (0.47)
63mm	8.8 (0.35)	9 (0.35)	78 (3.07)	M8x13 (5/16-24x0.51)	G3/8 (3/8 NPT)	13 (0.51)	12 (0.47)	23 (0.91)	61.5 (2.42)	46.5 (1.83)	12 (0.47)

Side Guide Model (UBS, UBSM)



Active port positions are specified in model number. All other ports supplied with plugs.

Ports dimensioned "S" are duplicated on opposite face.

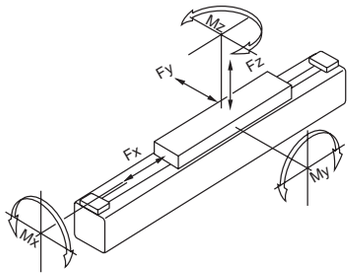
Dimensions mm (inch)

Bore Size	A	AA	B	BB	CC	D	DD	H	HH	M	N
18mm	80 (3.15)	15.5 (0.61)	30 (1.18)	39 (1.54)	36.5 (1.44)	103 (4.06)	50 (1.97)	75 (2.95)	-	M3X7 (#4-48x0.28)	35 (1.38)
25mm	100 (3.94)	20 (0.79)	42 (1.65)	53 (2.09)	50.2 (1.98)	131 (5.16)	66 (2.6)	100 (3.94)	50 (1.97)	M4x7 (#8-36x0.28)	45 (1.77)
32mm	120 (4.72)	25 (0.98)	52 (2.05)	65 (2.56)	60.2 (2.37)	171 (6.73)	80 (3.15)	140 (5.51)	70 (2.76)	M5x9 (#10-32x0.35)	55 (2.17)
40mm	150 (5.91)	33 (1.3)	63 (2.48)	79 (3.11)	71.6 (2.82)	220 (8.66)	97 (3.82)	180 (7.09)	90 (3.54)	M6x10 (1/4-28x0.39)	70 (2.76)
50mm	180 (7.09)	42 (1.65)	78 (3.07)	96 (3.78)	86.6 (3.41)	280 (11.02)	116 (4.57)	220 (8.66)	110 (4.33)	M8x12.5 (5/16-24x0.49)	85 (3.35)
63mm	215 (8.46)	54 (2.13)	93 (3.66)	113.5 (4.47)	101.6 (4)	333 (13.11)	136 (5.35)	280 (11.02)	140 (5.51)	M8x15 (5/16-24x0.59)	105 (4.13)

Bore Size	NN	P	R	Port S	T	U	V	W	X	Y
18mm	10 (0.39)	23.5 (0.93)	M3x8 (#4-48x0.31)	M5 (#10-32)	9.5 (0.37)	9.5 (0.37)	9.3 (0.37)	20.7 (0.81)	15 (0.59)	6.5 (0.26)
25mm	13 (0.51)	33 (1.30)	M4x10 (#8-36x0.39)	G1/8 (1/8 NPT)	7 (0.28)	13 (0.51)	13.5 (0.53)	28.5 (1.12)	21 (0.83)	7 (0.28)
32mm	16 (0.63)	41 (1.61)	M5x11 (#10-32x0.43)	G1/8 (1/8 NPT)	7 (0.28)	7 (0.28)	15.5 (0.61)	36.5 (1.44)	26 (1.02)	9 (0.35)
40mm	22 (0.87)	51 (2.01)	M6x13 (1/4-28x0.51)	G1/4 (1/4 NPT)	13 (0.51)	13 (0.51)	19 (0.75)	44 (1.73)	31.5 (1.24)	10 (0.39)
50mm	29 (1.14)	63 (2.48)	M8x13 (5/16-24x0.51)	G1/4 (1/4 NPT)	12 (0.47)	12 (0.47)	21 (0.83)	50 (1.97)	39 (1.54)	12 (0.47)
63mm	40 (1.57)	78 (3.07)	M8x13 (5/16-24x0.51)	G3/8 (3/8 NPT)	13 (0.51)	12 (0.47)	23 (0.91)	61.5 (2.42)	46.5 (1.83)	12 (0.47)

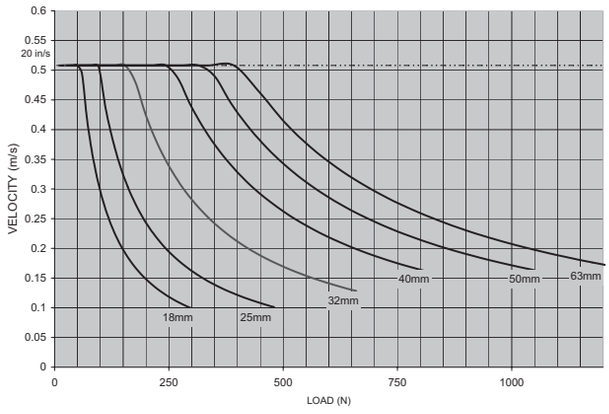
Engineering Data

Basic Model (UB, UBM)

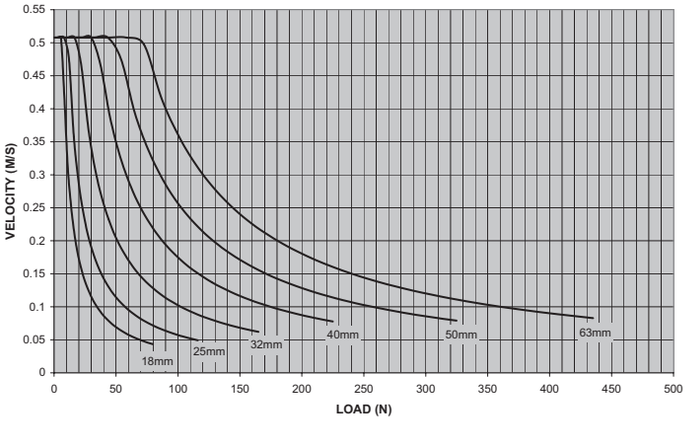


Bore Size	Maximum Moment, Nm (in-lb)		
	Mx	My	Mz
18mm	1 (8.8)	3 (26.5)	3 (26.5)
25mm	2 (17.7)	13 (115)	13 (115)
32mm	3.5 (31)	25 (221.2)	25 (221.2)
40mm	5.5 (48.7)	40 (354)	40 (354)
50mm	10 (88.5)	65 (575.2)	65 (575.2)
63mm	16 (141.6)	100 (885)	100 (885)

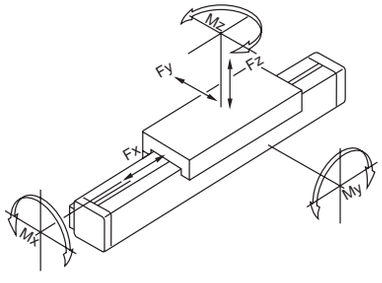
Load (Fz) vs. Velocity



Load (Fy) vs. Velocity



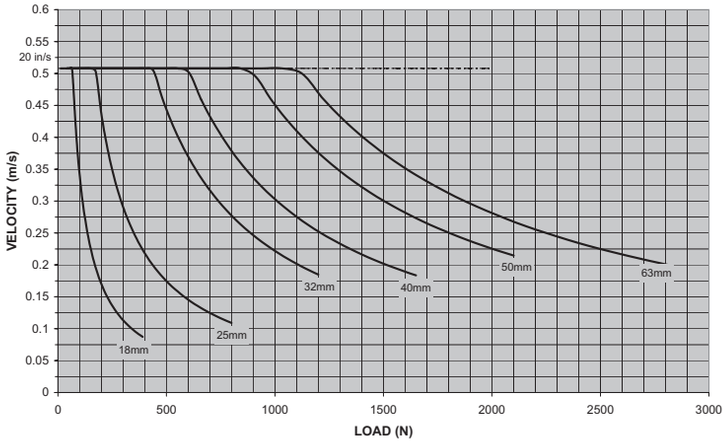
Side Guide Model (UBS, UBSM)



Bore Size	Maximum Moment, Nm (in-lb)		
	Mx	My	Mz
18mm	3.5 (31)	6 (53.1)	6 (53.1)
25mm	10 (88.5)	20 (177)	20 (177)
32mm	25 (221.2)	45 (398.2)	45 (398.2)
40mm	40 (354)	75 (663.7)	75 (663.7)
50mm	80 (708)	150 (1327.4)	150 (1327.4)
63mm	110 (973.5)	250 (2212.4)	250 (2212.4)

Nx 0.225 = LB
m/sec x 39.4 = in/sec

Load (Fy or Fz) vs. Velocity



Engineering Data

Kinetic Energy

Term	Description	S.I. Units	U.S. Units
KE	Kinetic energy	N-m	in-lb.
W	Weight of applied load	kg	lb.
k	Bore constant	kg	lb.
V	Maximum velocity*	M/sec	in/sec

*Note: Maximum velocity, or impact velocity, is typically = 2 x average velocity

Using S.I. Units

$KE = 1/2 \times (W + k) \times V^2$

Bore Size	UB, UBM	UBS, UBSM	UB, UBM UBS, UBSM	UBS, UBSM	
	Bore Constant (k) (kg)		Max KE no shocks* (N-m)	Max KE with shocks (N-m)	Max KE/hr with shocks (N-m/hr)
18mm	0.07	0.16	0.56	27	33894
25mm	0.15	0.33	1.70	27	33894
32mm	0.30	0.62	4.52	27	33894
40mm	0.55	1.15	8.20	192	75698
50mm	1.02	1.99	12.35	192	75698
63mm	1.73	3.09	15.46	192	75698

Using U.S. Units

$KE = 1/773 \times (W + k) \times V^2$

Bore Size	UB, UBM	UBS, UBSM	UB, UBM UBS, UBSM	UBS, UBSM	
	Bore Constant (k) (lb.)		Max KE no shocks* (in-lb.)	Max KE with shocks (in-lb.)	Max KE/hr with shocks (in-lb./hr)
18mm	0.15	0.35	4.96	239	299947
25mm	0.33	0.73	15.04	239	299947
32mm	0.66	1.37	40.00	239	299947
40mm	1.21	2.53	72.57	1699	669894
50mm	2.25	4.38	109.29	1699	669894
63mm	3.81	6.81	136.81	1699	669894

*Note: Any application where velocity exceeds 0.5 m/sec (20 in/sec) requires shock absorbers

General Specifications

Pressure Rating:	2 to 8 bar (30 to 110 psi), dry filtered air
Breakaway:	15 psi or less (UB, UBM)
	30 psi or less (UBS, UBSM)
Leakage:	100 sccm or less
Operating Temperature:	20°C to 80°C (-4°F to 175°F)
Expected Service Life:	1,000 linear miles
Lubrication:	Silicone grease

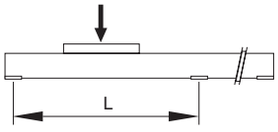
Accessories

Center Supports (UBCS-__)

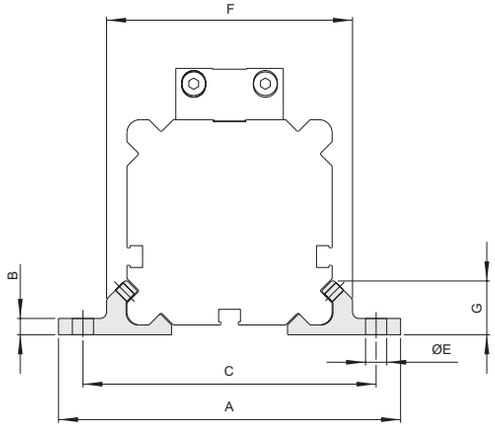
Kit includes: 2 supports and mounting hardware

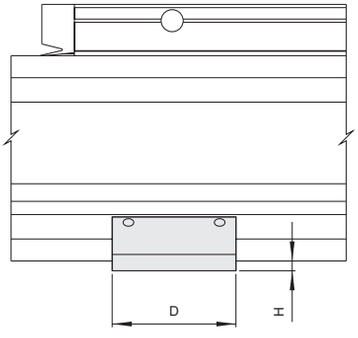
Additional cylinder support is needed for cylinder span and load combinations as shown in table.

Bore Size
18 - 18mm
25 - 25mm
32 - 32mm
40 - 40mm
50 - 50mm
63 - 63mm



Bore Size	Distance L mm (inch) with 0.5mm deflection						
	250N (56 lb.)	500N (112 lb.)	750N (169 lb.)	1000N (225 lb.)	1500N (337 lb.)	2000N (450 lb.)	2500N (562 lb.)
18mm	700 (28)	-	-	-	-	-	-
25mm	1100 (43)	1350 (53)	700 (28)	-	-	-	-
32mm	1400 (55)	1100 (43)	950 (37)	850 (33)	-	-	-
40mm	1600 (63)	1300 (51)	1150 (45)	1050 (41)	900 (35)	-	-
50mm	2050 (81)	1700 (67)	1550 (61)	1350 (53)	1150 (45)	1050 (41)	-
63mm	2450 (96)	2050 (81)	1850 (73)	1700 (67)	1550 (61)	1350 (53)	1250 (49)





Dimensions mm (inch)

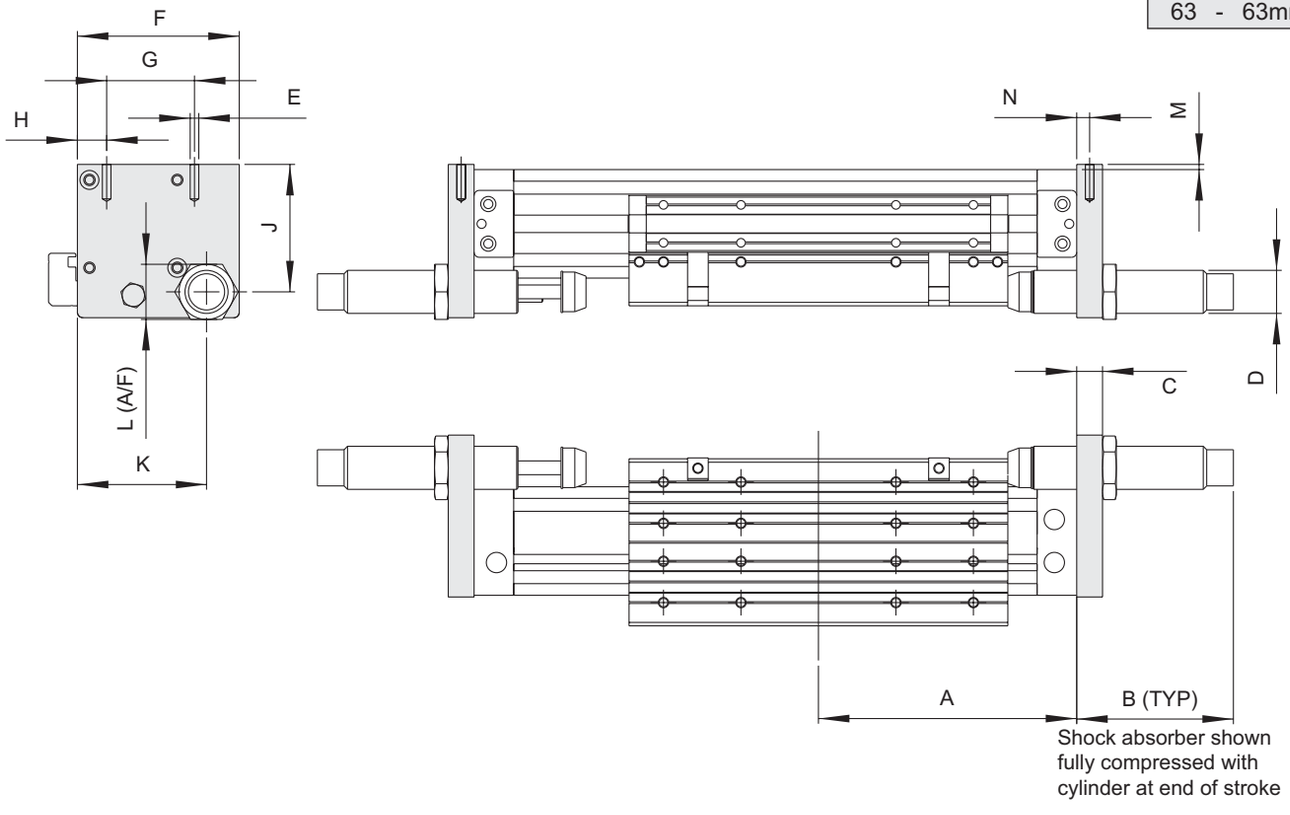
Bore Size	A	B	C	D	ØE	F	G	H
18mm	56 (2.20)	2.5 (0.10)	46 (1.81)	23 (0.91)	4.3 (0.17)	36.5 (1.44)	8.3 (0.33)	2.0 (0.08)
25mm	70 (2.76)	3.5 (0.14)	60 (2.36)	28 (1.10)	5.3 (0.21)	50.0 (1.97)	11.0 (0.43)	2.0 (0.08)
32mm	85 (3.35)	4.0 (0.16)	73 (2.87)	33 (1.30)	5.3 (0.21)	61.5 (2.42)	13.8 (0.54)	3.0 (0.12)
40mm	105 (4.13)	4.5 (0.18)	90 (3.54)	38 (1.50)	6.5 (0.26)	75.0 (2.95)	16.5 (0.65)	3.0 (0.12)
50mm	122 (4.80)	5.0 (0.20)	106 (4.17)	43 (1.69)	8.5 (0.33)	91.0 (3.58)	19.0 (0.75)	3.0 (0.12)
63mm	144 (5.67)	6.0 (0.22)	125 (4.92)	48 (1.89)	8.5 (0.33)	107 (4.21)	22.0 (0.87)	4.5 (0.18)

Accessories

Shock Absorber Bracket (UBSB-__; UBMSB-__)

Kit includes: 2 brackets and mounting hardware.

Bore Size
18 - 18mm
25 - 25mm
32 - 32mm
40 - 40mm
50 - 50mm
63 - 63mm



Shock absorber shown fully compressed with cylinder at end of stroke

Dimensions mm (inch)

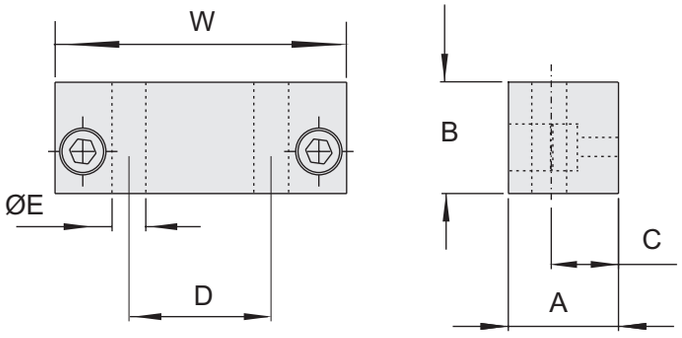
Bore Size	A	B	C	D	E	F	G	H	J	K	L	M	Shock Absorber P/N
18mm	80 (3.15)	62 (2.44)	8 (0.31)	M14x1.5 (1/2-20)	M3x10 (#4-40)	44.5 (1.75)	23.5 (0.93)	9 (0.35)	37 (1.46)	36.5 (1.44)	17 (0.67)	2 (0.08)	SSM-27 (SS-09)
25mm	100 (3.94)	56 (2.2)	10 (0.39)	M14x1.5 (1/2-20)	M4x10 (#8-32)	58 (2.28)	33 (1.3)	13.5 (0.53)	50 (1.97)	50 (1.97)	17 (0.67)	2 (0.08)	SSM-27 (SS-09)
32mm	120 (4.72)	56 (2.2)	12 (0.47)	M14x1.5 (1/2-20)	M5x12 (10-24)	71 (2.79)	41 (1.61)	15.5 (0.61)	61.5 (2.42)	61 (2.4)	17 (0.67)	2 (0.08)	SSM-27 (SS-09)
40mm	150 (5.91)	91 (3.58)	15 (0.59)	M25x1.5 (1-12)	M6x15 (1/4-20)	94 (3.70)	51 (2.01)	17 (0.67)	74 (2.91)	75 (2.95)	32 (1.26)	3 (0.12)	SSM-50 (SS-31)
50mm	180 (7.09)	91 (3.58)	15 (0.59)	M25x1.5 (1-12)	M8x20 (5/16-18)	103 (4.06)	63 (2.48)	23.5 (0.93)	90 (3.54)	89 (3.5)	32 1.26)	3 (0.12)	SSM-50 (SS-31)
63mm	215 (8.46)	82.5 (3.25)	15 (0.59)	M25x1.5 (1-12)	M8x20 (5/16-18)	119.5 (4.7)	78 (3.07)	21 (0.83)	107 (4.21)	105.5 (4.15)	32 (1.26)	4.5 (0.18)	SSM-50 (SS-31)

Accessories

Mounting Block (UBMB-__, UBMMB-__)

Kit includes: 2 blocks, 4 bolts to attach to cylinder.

Bore Size
18 - 18mm
25 - 25mm
32 - 32mm
40 - 40mm
50 - 50mm
63 - 63mm



Dimensions mm (inch)

Bore Size	A	B	C	D	ØE	W
18mm	10 (0.39)	14.5 (0.57)	5 (0.2)	14 (0.55)	4.5 (0.18)	30 (1.18)
25mm	15 (0.59)	17 (0.67)	7.5 (0.3)	22 (0.87)	5.5 (0.22)	42 (1.65)
32mm	15 (0.59)	20 (0.79)	7.5 (0.3)	23.5 (0.93)	7 (0.28)	52 (2.05)
40mm	15 (0.59)	23 (0.91)	7.5 (0.3)	30 (1.18)	9 (0.35)	63 (2.48)
50mm	16 (0.63)	26 (1.02)	8 (0.31)	39 (1.54)	9 (0.35)	78 (3.07)
63mm	20 (0.79)	27.5 (1.08)	10 (0.39)	52 (2.05)	11 (0.43)	93 (3.66)

List Prices

Kits	18mm	25mm	32mm	40mm	50mm	63mm
UBMB-__						
UBSB-__; UBMSB-__						
UBCS-__						
Shock Absorbers						
Metric	SSM-27			SSM-50		
Inch	SS-09			SS-31		

Basic Repair Kits

Kits include: all seals, sealing band, cover strip, all assembly hardware.
Two kits are offered; one for strokes up to 3m stroke and one for strokes 3-6m.

Example: Basic repair kit for UB-2536-1XCM = RK9N0253

Kits for Stroke 0-3m (0-118")		Kits for Strokes 3-6m (118" +)	
Seal Kit (3m) NPT (inch)	List	Seal Kit (6m) NPT (inch)	List
RK9N0183		RK9N0186	
RK9N0253		RK9N0256	
RK9N0323		RK9N0326	
RK9N0403		RK9N0406	
RK9N0503		RK9N0506	
RK9N0633		RK9N0636	

Kits for Stroke 0-3m (0-118")		Kits for Strokes 3-6m (118" +)	
Seal Kit (3m) Metric	List	Seal Kit (6m) Metric	List
RK9Y0183		RK9Y0186	
RK9Y0253		RK9Y0256	
RK9Y0323		RK9Y0326	
RK9Y0403		RK9Y0406	
RK9Y0503		RK9Y0506	
RK9Y0633		RK9Y0636	

Position Sensing Switches

List Prices

Switch Model Numbers		Description	List Price
18mm bore only	25mm-63mm bores		
MSK	UBSK	GMR, Sinking, 3m cable (NPN)	
MSC	UBSC	GMR, Sourcing, 3m cable (PNP)	
MR	UBR	Reed, 3m cable	
MSKQ	UBSKQ	GMR, Sinking, M8 quick connect (NPN)	
MSCQ	UBSCQ	GMR, Sourcing, M8 quick connect (PNP)	
MRQ	UBRQ	Reed, M8 quick connect	

All prices are F.O.B. Monee, Illinois, and are subject to change without notice.

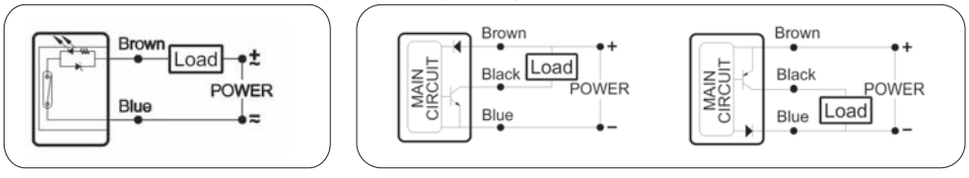
Switch Specifications (25mm-63mm Bores)*

Characteristic	UBR	UBSK	UBSC
Switching Logic	SPST N/O	Solid State Output Normally Open	
Sensor Type	Reed Switch	NPN Current Sinking	PNP Current Sourcing
Operating Voltage	5~240V DC/AC	5~28V DC	
Switching Current	100mA max	200mA max	
Switching Power	10W max	6W max	
Current consumption	- -	20mA max @24V (Active)	18mA max @ 24V (Active)
Voltage Drop	2.5V max @ 40mA DC	0.5V @ 200mA max (resistive Load)	
Leakage Current	- -	0 .01mA max	
Indicator	Red LED	Red LED	Green LED
Sensitivity	60 Gauss	40 Gauss	
Max Switching Frequency	1000 Hz	1000 Hz	
Temp Range	-10 ~ 70 deg C	-10 ~ 70 deg C	
Shock	30G	50G	
Vibration	9G	9G	
Enclosure Protection	IP67	IP67	
Circuit Protection	N one	Reverse Source Polarity; Surge suppression	

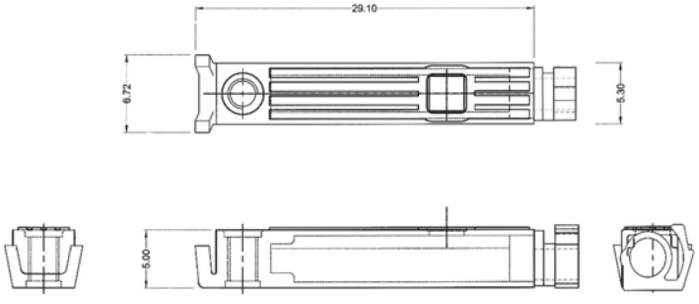
*For specifications on 18mm bore switches MS/MR, and Quick Connect mating cables, see catalog FL-06, Related Products Section.

Wiring Diagram

(UBR) (UBSK) (UBSC)



Magnetic Sensor Dimensional Data



Bimba Ultran Rodless Cylinders Checklist

Ultran, High Load Ultran, and Ultran Band

This checklist makes sizing and selecting Bimba actuators easier. Bimba's Engineering Department will assist you by providing a detailed analysis of your application and, based on the information in the application checklist, will help you choose the actuators best suited to your needs.

Step 1. ***Photocopy the sketch and checklist sheets.***

Step 2. ***Complete the sketch and checklist.***

Step 3. ***Mail or fax the sketch and checklist to your local stocking distributor.***

Date: _____

Your Name: _____

Company: _____

Address: _____

Phone: _____

Fax: _____

Description of Application _____

_____

_____

1. *How will the cylinder be mounted?*

☐ Horizontally ☐ Vertically

If horizontal, is load above or below the cylinder?

☐ Above ☐ Below

2. *What is the required stroke length?*

_____ (in.)

3. *What is the weight of the load being moved?*

_____ (lbs.)

4. *How fast will the cylinder be cycling?*

_____ (cycles/second)

5. *How far is the center of the load from the cylinder (moment arm per sketch)?*

a. Ultran _____ (in.)
b. Ultran Slide _____ (in.)
c. High Load Ultran _____ (in.)
d. Ultran Band _____ (in.)

(See pages 5.11, 5.21, 5.31, 5.37 moment arm)

6. *What is the cylinder's velocity at the end-of-stroke?*

_____ (in./second)

7. *Do you need position sensing?*

☐ Yes ☐ No

If yes:

☐ end of stroke (or) ☐ mid-stroke

8. *Will the cylinder be used under harsh environmental conditions?*

If yes, please explain _____

_____

_____

_____

_____

9. *For High-Load Ultran Applications – Will the base plate be fully supported?*

☐ Yes ☐ No

If not, what is the desired span length?

_____ (in.)

Additional Notes: _____

_____

_____

_____

_____

_____

_____

_____

Notes

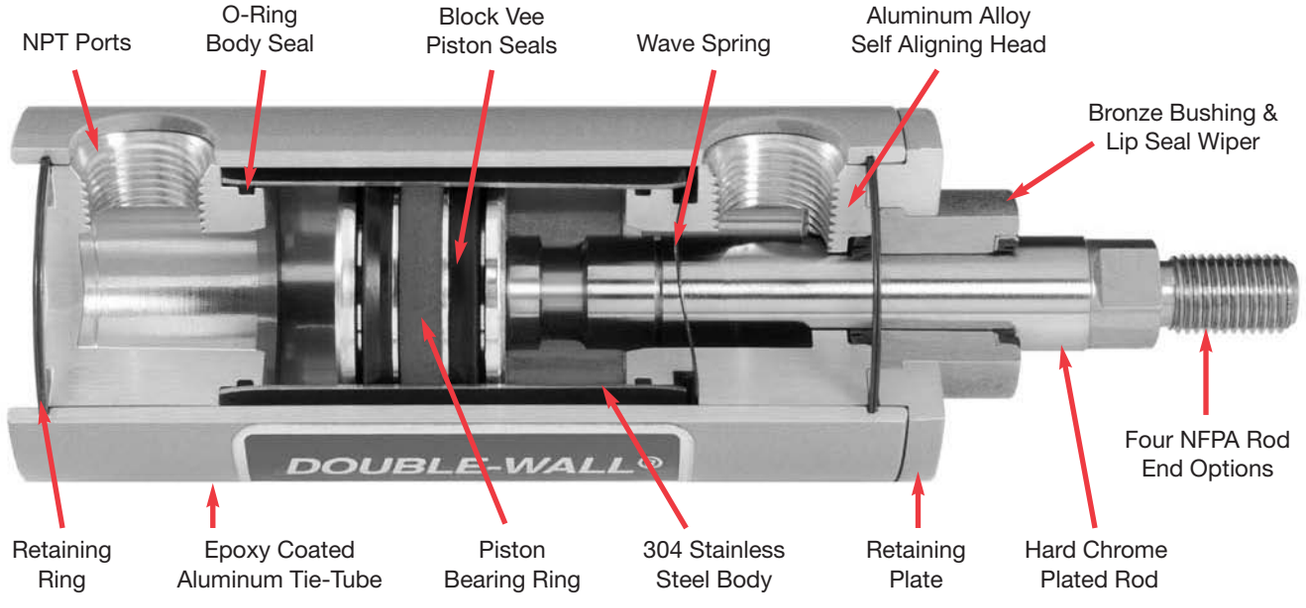
Notes

Notes

Double-Wall Cylinders / Repairable Stainless Steel Cylinders

The Bimba Double-Wall® Cylinder Does It All !

One Basic cylinder converts into six NFPA mounting styles.



How to Order

The Model Number for Double-Wall® cylinders consists of three alphanumeric clusters. These designate product type, bore size and stroke length, and options (options are written in the following order: rod end options, and special options with extra extension last). Mounting kits must be ordered as a separate item, and are shown with their respective bore sizes starting on page 6.6. Please refer to the charts below for an example of model number DWC-1710-2V. This is a 1-1/2" bore, 10" stroke, Double-Wall cushioned cylinder with a small male one piece rod end and high temperature option.

DWC – 17 10 – 2 V

DOUBLE-WALL TYPE	
DW	Double Acting
DWC	Double Acting, Cushions Both Ends
DWF	Double Acting, Front Head Cushion
DWR	Double Acting, Rear Cushion
DWD	Double Acting, Double Rod End
DWDC	Double Acting, Double Rod End, Cushions Both Ends
DWDS	Double Acting, Double Rod End, Cushion One End
DWM (C, F, R)	Double Acting, Magnetic Position Sensing (Cushion Optional)
DWDM (C, F, R)	Double Rod End, Magnetic Position Sensing (Cushion Optional)
DW(M)N (C, F, R)	Nose Mount, 1-1/2" and 2" Bores Only (Cushion and Magnet Optional)
DWD(M)N (C, F, R)	Nose Mount, Double Rod End, 1-1/2" and 3" Bores Only (Cushion and Magnet Optional)

BORE SIZE	
17	1½"
31	2"
50	2½"
83	3¼"
125	4"

STROKE LENGTH	
0.5	½"
1	1"
2	2"
2.5	2½"
Etc.	

OPTIONS	
G	Polymer Grease Lubrication
DPX.XX	Dual Piston (see page 6.11 (specify stop length) for details)
V	High Temperature Seals (300° F Maximum)
EEX.XX	Extra Rod Extension (Add to end of model number)
AXX	Alternate Cushion Screw Locations (Locations Available: 2 and 3 for head end, 6 and 7 for cap end) See dimensional drawing of cylinder for port locations.
SR	Stainless Steel Rod

ROD END STYLE	
2	Small Male, One Piece
2S	Small Male Stud (Rolled Threads)
1	Large Male, One Piece
4	Female Threads
4C	Small Male, One Piece, Coarse Thread *(1½", 2" & 2½" Bores Only)*
5C	Large Male, One Piece, Coarse Thread *(1½", 2" & 2½" Bores Only)*
NT	No Threads

(See page 6.5 for dimensions)

List Prices

Basic Model	Base Price	Stroke Adder[1] (per inch)	Mounting Options	Options						
			2S - Small Male Stud	C Per end (Prefix C)	DP[2]	EE (each 1/2" each end)	M (Prefix M)	SR	V	V (with cushions per end)[3]
1-1/2" Bore										
DW - 17										
DWD - 17										
DWN - 17										
DWDN - 17										
2" Bore										
DW-31										
DWD-31										
DWN-31										
DWDN-31										
2-1/2" Bore										
DW-50										
DWD-50										
3-1/4" Bore										
DW-83										
DWD-83										
4" Bore										
DW-125										
DWD-125										

No charge options - 2, 1, 4, 4C, 5C, NT, G, AXX.

[1] Consult factory for pricing on fractional strokes and strokes greater than 24".

[2] Pricing based on total stroke, see page 6.11 for details on total stroke.

[3] Price includes cushion adder.

Mounting Kits

Model	1-1/2"	2"	2-1/2"	3-1/4"	4"
MSL -					
MEL -					
MC -					
MP -					
MFFA (Aluminum)					
MFFS (Steel)					
MFRA (Aluminum)					
MFRS (Steel)					

Repair Kits

Kit Number	Bore Size				
	1-1/2"	2"	2-1/2"	3-1/4"	4"
K-A					
K-B					
K-C					
K-D					
K-P-M					
HT-99-7CC					
MAG-G-3CC					

See pages 6.13-6.14 for details.
Consult factory for pricing on individual repair parts.

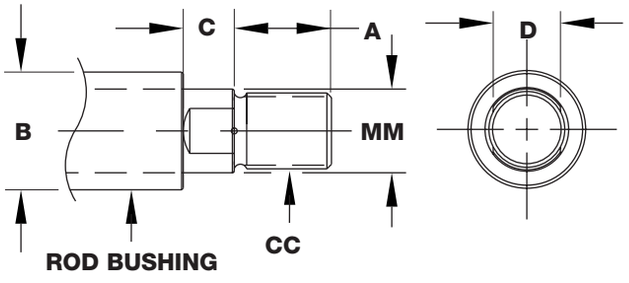
Accessories

Models	Description	List Price
1-1/2", 2" and 2-1/2" bores		
ARE-1	Rod Eye	
ARC-1	Rod Clevis	
APB-1	Pivot Bracket	
ACB-1	Clevis Bracket	
ARS-1	Rod Stud	
APP-1	Pivot Pin	
D-154	Rod Nut	
D-98	Rod Nut	
D-17920	Nose mount foot bracket	
D-1331	Nose mount mounting nut	

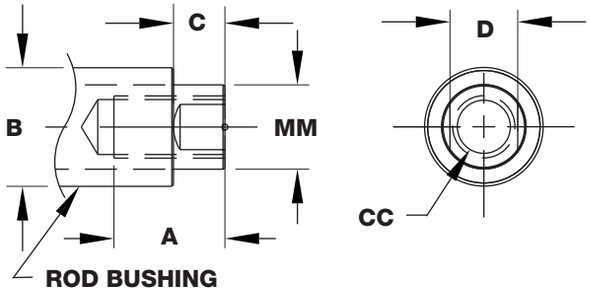
Models	Description	List Price
3-1/4" and 4" bores		
ARE-2	Rod Eye	
ARC-2	Rod Clevis	
APB-2	Pivot Bracket	
ACB-2	Clevis Bracket	
ARS-2	Rod Stud	
APP-2	Pivot Pin	
D-3556	Rod Nut	
D-2545	Rod Nut	
D-17920	Nose mount foot bracket	
D-1331	Nose mount mounting nut	

Dimensions (in.)

Rod Thread – 2, 2S, 1, 4C, 5C



Rod Thread – 4



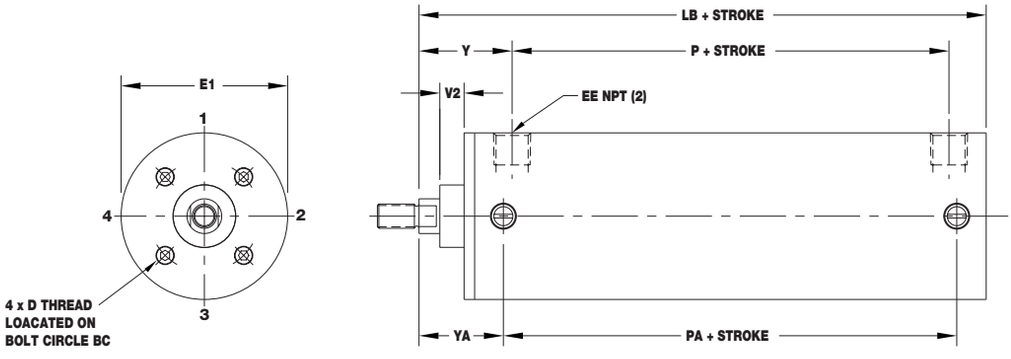
Rod End (1½", 2" and 2½" Bores)

Rod End Style	A	B	C	CC	D	MM
2	.75	1.12	.38	7/16-20 UNF	.5	.62
2S	.75	1.12	.38	7/16-20 UNF	.5	.62
1	.75	1.12	.38	1/2-20 UNF	.5	.62
4 (tapped)	.75	1.12	.38	7/16-20 UNF	.5	.62
4C	1.25	1.00	.19	1/2-13 UNC	.5	.62
5C	1.25	1.00	.19	5/8-11 UNC	.5	.62

Rod End (3¼", 4" Bores)

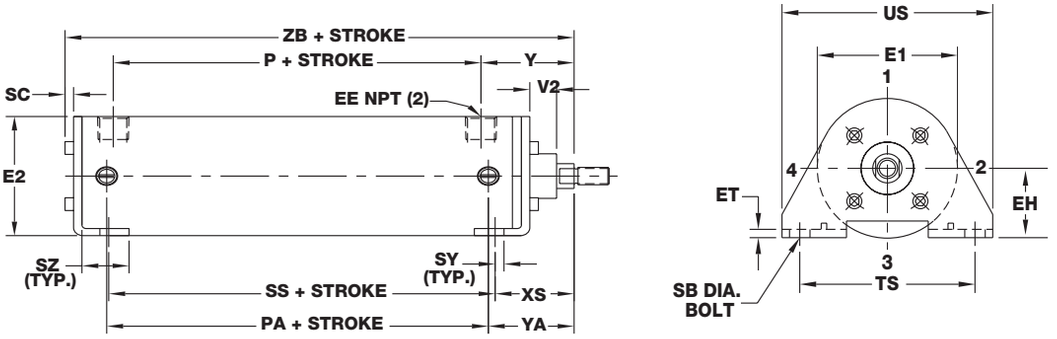
Rod End Style	A	B	C	CC	D	MM
2	1.12	1.5	.5	3/4-16 UNF	.88	1.00
2S	1.12	1.5	.5	3/4-16 UNF	.88	1.00
1	1.12	1.5	.5	7/8-14 UNF	.88	1.00
4 (tapped)	1.12	1.5	.5	3/4-16 UNF	.88	1.00

Double-Wall (no mounting)



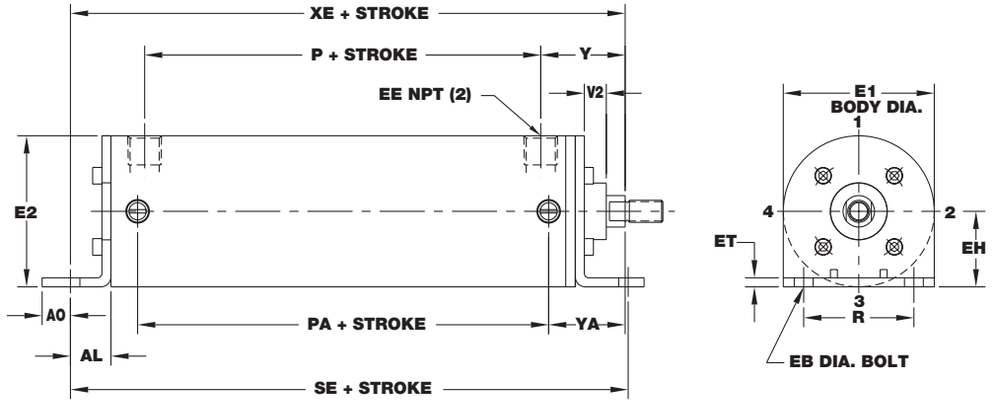
Bore	LB	P	Y	V2	EE	YA	PA	E1	D	D depth	BC
1-1/2"	4.62	2.28	1.67	.44	3/8 NPT	1.52	2.58	2.00	#6-32	0.51	1.48
2"	4.62	2.28	1.67	.44	3/8 NPT	1.52	2.58	2.34	#8-32	0.66	1.75
2-1/2"	4.75	2.41	1.67	.44	3/8 NPT	1.52	2.70	2.94	#10-24	0.69	2.00
3-1/4"	5.63	2.62	2.19	.74	1/2 NPT	2.00	3.00	3.69	5/16-18	0.75	2.83
4"	5.63	2.62	2.19	.74	1/2 NPT	2.00	3.00	4.44	5/16-18	0.75	2.83

Side Lug Mount (NFPA MS-2) (in.)



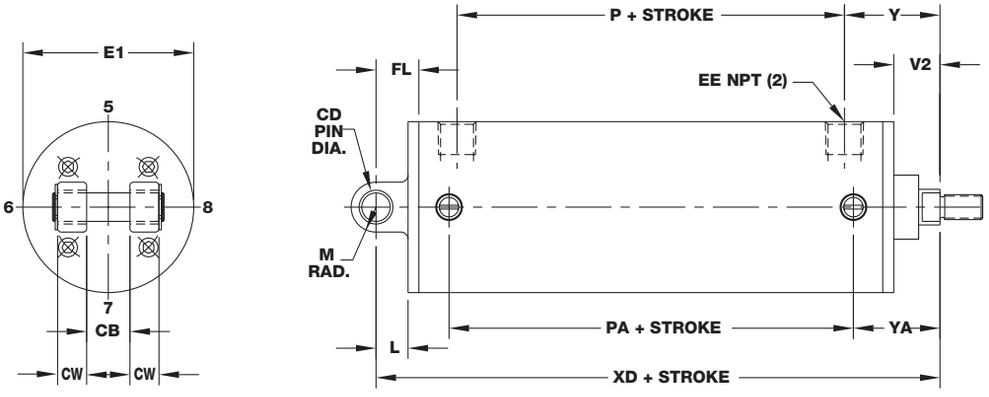
Bore	Kit	ZB	P	SS	PA	V2	Y	EE	SY	XS	YA	SC	E2	SZ	US	E1	EH	ET	TS	SB
1-1/2"	MSL-17	4.90	2.28	2.87	2.58	.31	1.67	3/8 NPT	0.19	1.38	1.52	.14	2.00	1.00	3.51	2.00	1.00	.13	2.75	.38
2"	MSL-31	4.92	2.28	2.87	2.58	.31	1.67	3/8 NPT	0.19	1.38	1.52	.16	2.34	1.00	4.01	2.34	1.25	.13	3.25	.38
2-1/2"	MSL-50	5.12	2.41	3.00	2.70	.26	1.67	3/8 NPT	0.19	1.38	1.52	.19	3.00	1.00	4.51	2.94	1.49	.18	3.75	.38
3-1/4"	MSL-83	6.11	2.62	3.25	3.00	.49	2.19	1/2 NPT	0.16	1.88	2.00	.23	3.75	1.25	5.76	3.69	1.87	.25	4.75	.50
4"	MSL-125	6.17	2.62	3.25	3.00	.43	2.19	1/2 NPT	0.16	1.88	2.00	.23	4.50	1.25	6.51	4.44	2.24	.31	5.50	.50

End Lug Mount (NFPA MS-7) (in.)



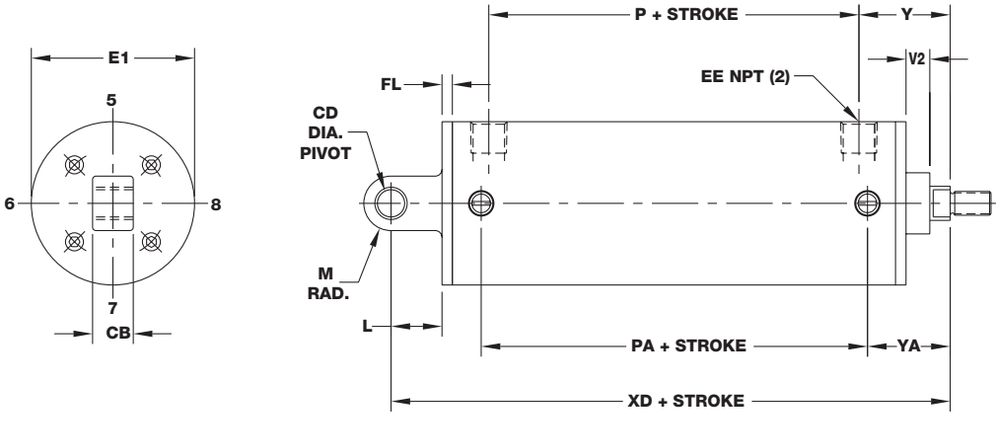
Bore	Kit	XE	P	PA	SE	V2	Y	EE	YA	AO	AL	E2	E1	EH	ET	EB	R
1-1/2"	MEL-17	5.38	2.28	2.58	5.12	.31	1.67	3/8 NPT	1.52	.26	.75	2.00	2.00	1.00	.13	.25	1.43
2"	MEL-31	5.56	2.28	2.58	5.50	.31	1.67	3/8 NPT	1.52	.32	.94	2.34	2.34	1.25	.13	.31	1.84
2-1/2"	MEL-50	5.81	2.41	2.70	5.88	.26	1.67	3/8 NPT	1.52	.30	1.07	3.00	2.94	1.49	.18	.31	2.19
3-1/4"	MEL-83	6.50	2.62	3.00	6.00	.49	2.19	1/2 NPT	2.00	.38	1.18	3.75	3.69	1.87	.25	.38	2.76
4"	MEL-125	6.63	2.62	3.00	6.25	.43	2.19	1/2 NPT	2.00	.37	1.32	4.50	4.44	2.24	.31	.38	3.32

Clevis Mount (NFPA MP-1) (in.)



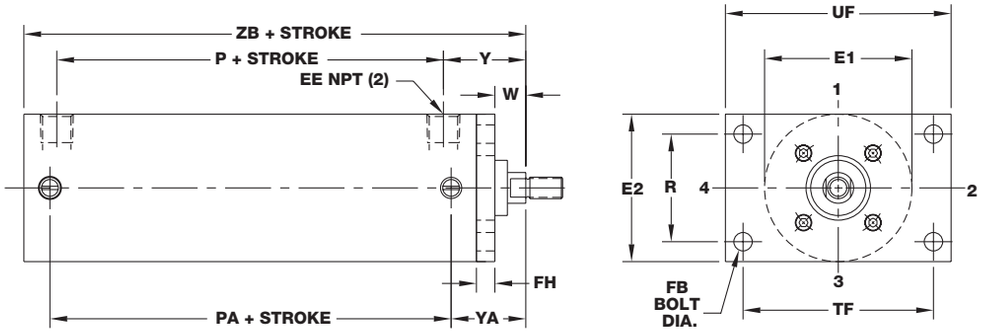
Bore	Kit	P	PA	XD	Y	V2	EE	YA	FL	CD	M	L	E1	CB	CW
1-1/2"	MC-17	2.28	2.58	5.38	1.67	.82	3/8 NPT	1.52	.75	.50	.44	.56	2.00	.76	.51
2"	MC-31	2.28	2.58	5.38	1.67	.82	3/8 NPT	1.52	.75	.50	.44	.56	2.34	.76	.51
2-1/2"	MC-50	2.41	2.70	5.50	1.67	.82	3/8 NPT	1.52	.75	.50	.50	.56	2.94	.76	.51
3-1/4"	MC-83	2.62	3.00	6.88	2.19	1.24	1/2 NPT	2.00	1.26	.75	.69	.88	3.69	1.26	.62
4"	MC-125	2.62	3.00	6.88	2.19	1.24	1/2 NPT	2.00	1.26	.75	.69	.88	4.44	1.26	.62

Pivot Mount (NFPA MP-4) (in.)



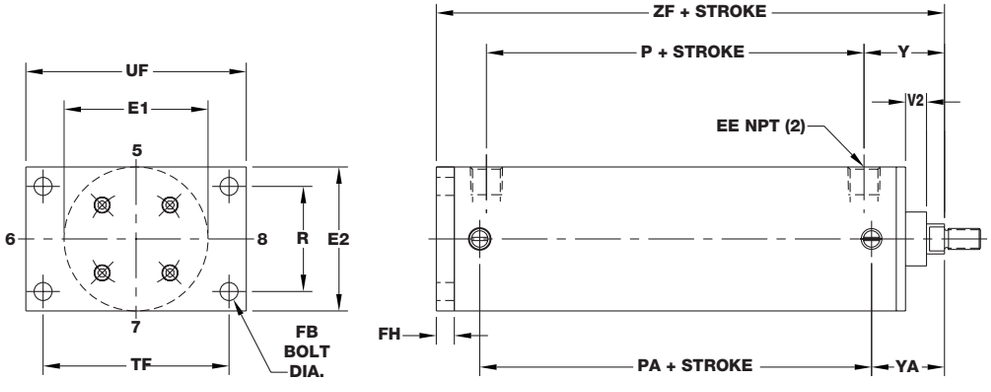
Bore	Kit	P	PA	XD	Y	V2	EE	YA	FL	CD	M	L	E1	CB
1-1/2"	MP-17	2.28	2.58	5.75	1.67	.44	3/8 NPT	1.52	.19	.50	.50	.93	2.00	.75
2"	MP-31	2.28	2.58	5.75	1.67	.44	3/8 NPT	1.52	.19	.50	.50	.93	2.34	.75
2-1/2"	MP-50	2.41	2.70	5.87	1.67	.44	3/8 NPT	1.52	.19	.50	.50	.93	2.94	.75
3-1/4"	MP-83	2.62	3.00	7.50	2.19	.74	1/2 NPT	2.00	.50	.75	.69	1.38	3.69	1.25
4"	MP-125	2.62	3.00	7.50	2.19	.74	1/2 NPT	2.00	.50	.75	.69	1.38	4.44	1.25

Front Flange Mount (NFPA MF-1) (in.)



Bore	Kit	ZB	P	PA	Y	W	EE	YA	FH	UF	E1	E2	R	TF	FB
1-1/2"	MFFA-17 MFFS-17	4.62	2.28	2.58	1.67	.63	3/8 NPT	1.52	.38	3.38	2.00	2.00	1.43	2.75	.25
2"	MFFA-31 MFFS-31	4.62	2.28	2.58	1.67	.63	3/8 NPT	1.52	.38	4.12	2.34	2.50	1.84	3.38	.31
2-1/2"	MFFA-50 MFFS-50	4.75	2.41	2.70	1.67	.63	3/8 NPT	1.52	.38	4.62	2.94	3.00	2.19	3.88	.31
3-1/4"	MFFA-83 MFFS-83	5.63	2.62	3.00	2.19	.75	1/2 NPT	2.00	.62	5.50	3.69	3.75	2.76	4.69	.38
4"	MFFA-125 MFFS-125	5.63	2.62	3.00	2.19	.75	1/2 NPT	2.00	.62	6.25	4.44	4.50	3.32	5.44	.38

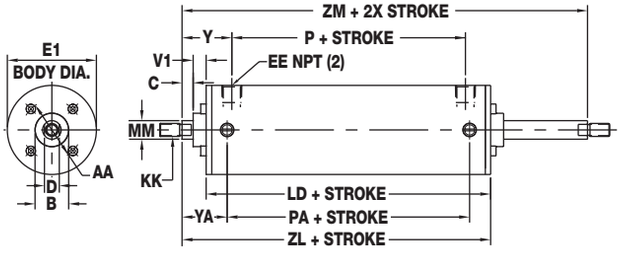
Rear Flange Mount (NFPA MF-2) (in.)



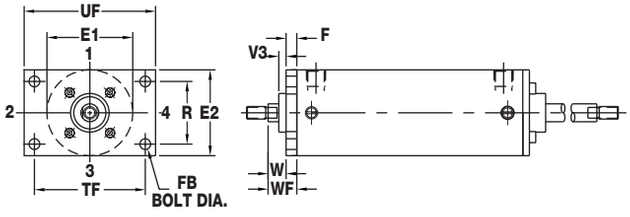
Bore	Kit	ZF	P	PA	Y	V2	EE	YA	FH	UF	E1	E2	R	TF	FB
1-1/2"	MFRA-17 MFRS-17	5.00	2.28	2.58	1.67	.44	3/8 NPT	1.52	.38	3.38	2.00	2.00	1.43	2.75	.25
2"	MFRA-31 MFRS-31	5.00	2.28	2.58	1.67	.44	3/8 NPT	1.52	.38	4.12	2.34	2.50	1.84	3.38	.31
2-1/2"	MFRA-50 MFRS-50	5.12	2.41	2.70	1.67	.44	3/8 NPT	1.52	.38	4.62	2.94	3.00	2.19	3.88	.31
3-1/4"	MFRA-83 MFRS-83	6.25	2.62	3.00	2.19	.74	1/2 NPT	2.00	.62	5.50	3.69	3.75	2.76	4.69	.38
4"	MFRA-125 MFRS-125	6.25	2.62	3.00	2.19	.74	1/2 NPT	2.00	.62	6.25	4.44	4.50	3.32	5.44	.38

Double End Rod Cylinder Series DWD (in.)

Basic Double-End Rod Cylinder

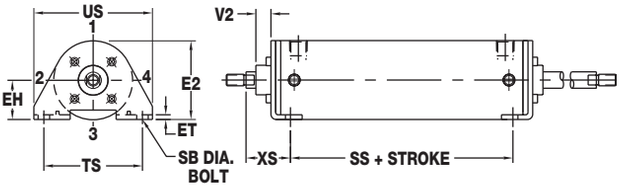


Flange Mount (NFPA MF-1)



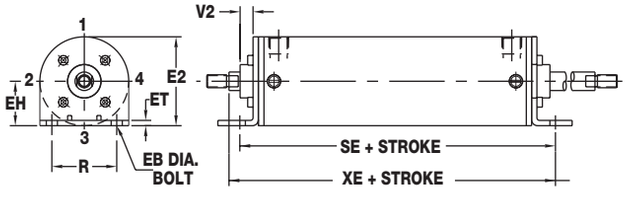
Mounting Kit # MFF (See page 6.4 for pricing)

Side Lug Mount (NFPA MS-2)



Mounting Kit # MSL (See page 6.4 for pricing)

End Lug Mounts (NFPA MS-7)



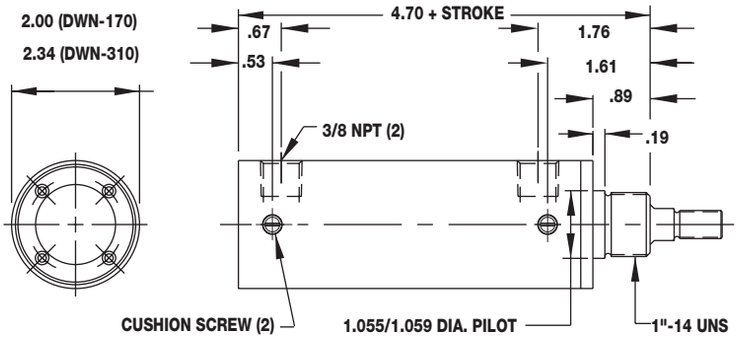
Mounting Kit # MEL (See page 6.4 for pricing)

Bore	AA	B	C	D	EB	EE	EH	ET	E1	E2	F	FB	KK	LD	MM	P	PA	R
1-1/2"	1.48	1.124	.38	.56	.25	3/8	1.00	.13	2.00	2.00	.38	.25	7/16-20	4.16	.62	2.44	2.74	1.43
2"	1.75	1.124	.38	.56	.31	3/8	1.25	.13	2.34	2.50	.38	.31	7/16-20	4.16	.62	2.44	2.74	1.84
2-1/2"	2.00	1.124	.38	.56	.31	3/8	1.49	.18	2.94	3.00	.38	.31	7/16-20	4.16	.62	2.44	2.74	2.19
3-1/4"	2.83	1.499	.50	.88	.38	1/2	1.87	.25	3.69	3.75	.62	.38	3/4-16	4.64	1.00	2.75	3.12	2.76
4"	2.83	1.499	.50	.88	.38	1/2	2.24	.31	4.44	4.50	.62	.38	3/4-16	4.64	1.00	2.75	3.12	3.32
BORE	**SB**	**SE**	**SS**	**TF**	**TS**	**UF**	**US**	**V1**	**V2**	**V3**	**W**	**WF**	**XE**	**XS**	**Y**	**YA**	**ZL**	**ZM**
1-1/2"	.38	5.46	3.22	2.75	2.75	3.38	3.51	.44	.31	.25	.62	1.00	5.72	1.38	1.67	1.52	4.96	5.77
2"	.38	5.84	3.22	3.38	3.25	4.12	4.01	.44	.31	.25	.62	1.00	5.90	1.38	1.67	1.52	4.96	5.77
2-1/2"	.38	6.10	3.22	3.88	3.75	4.62	4.51	.44	.26	.25	.62	1.00	6.03	1.38	1.67	1.52	4.96	5.77
3-1/4"	.50	6.26	3.51	4.69	4.75	5.50	5.76	.74	.49	.25	.75	1.37	6.76	1.88	2.19	2.00	5.89	7.13
4"	.50	6.51	3.51	5.44	5.50	6.25	6.51	.74	.43	.25	.75	1.37	6.89	1.88	2.19	2.00	5.89	7.13

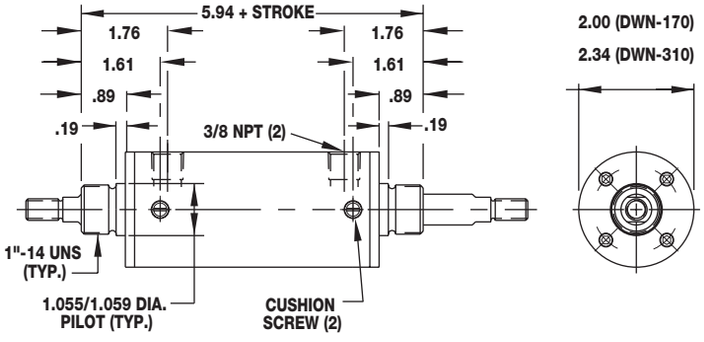
Note: When ordering Cushions Both Ends specify DWDC – One End DWDS, See page 6.3.
EE will provide extra extension on both ends.

Double-Wall® Front Nose Mounting (in.)

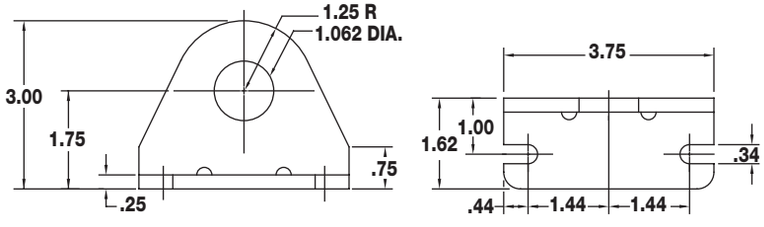
Single End Rod



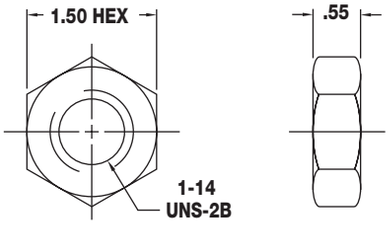
Double End Rod



Foot Bracket (D-17920) Accessory for Nose Mount



Mounting Nut (D-1331)



Double-Wall Engineering Specifications

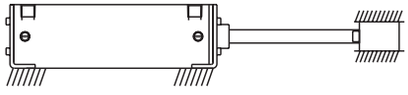
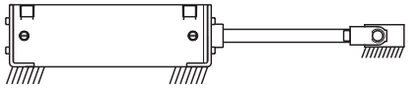
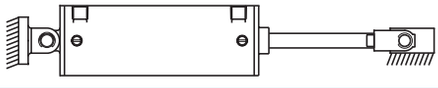
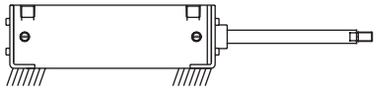
Tie Tube:	Epoxy coated Aluminum
Cylinder Body:	Smooth 304 stainless steel
Piston Rod:	Hard Chrome Plated standard; 303 stainless optional
Seals:	Buna N Standard; High Temperature Fluoroelastomer optional
Lubrication:	HT-99 standard; Polymer grease option
Temperature:	-20° to 200° F standard; 0° to 300° F with high temperature option
Pressure Rating:	200 psi; 150 psi with high temperature option
Life:	1400 miles of travel when lubricated (Lubrication every 500 miles recommended
Stroke Maximum:	72" (strokes beyond 72" require an application review)

Double-Wall® Long Stroke Cylinder Selection

Application of ***Long Stroke Cylinders*** are controlled by two factors: column strength of piston rod and mounting configuration. ***Dual Piston*** construction provides needed additional bearing surface through the cycle of the cylinder.

Dual Pistons consist of mounting two pistons on the rod, separated a calculated distance to provide the required stop length. Available in one inch increments, required stop lengths are determined from mounting class and stroke information.

Determining Mounting Class

		Mounting Style	Rod End Connection
Class 1		Side Lug End Lug Flange	Rigidly guided, pivoted
Class 2		Side Lug End Lug Flange	Pivoted, supported but not rigidly guided
Class 3		Pivot Clevis	Pivoted, supported
Class 4		Side Lug End Lug Flange	Free end unguided and unsupported

Dual Piston Stop Length Calculation

Select mounting class. Move over to the column showing a stroke length equal to or less than required. Figure at top of column is required Dual Piston stop length. Examples: Class 2, 62" stroke length = 2" stop length. Class 3, 62" - 5" stop length. All lengths shown here are in inches.

Mounting Class	Dual Piston – Stop Length Required											
	1	2	3	4	5	6	7	8	9	10	11	12
1	64	88	110	130								
2	46	62	78	93	108	122	136					
3	25	34	43	51	59	67	74	81	88	95	101	108
4	16	22	28	28	40	46	51	56	61	66	70	74

Net (effective) stroke stop length = Gross stroke of cylinder. Mounting dimensions are determined from gross stroke. Consult your local distributor for Dual Piston Pricing.

Column Strength Limitations

Select mounting class, rod diameter, and stroke length in inches: read maximum push force in pounds for that combination. Where no values is shown, the rod is safe for the maximum rated cylinder push force.

Rod Diameter/ Inches Stroke	Class 1		Class 2		Class 3		Class 4	
	5/8"	1"	5/8"	1"	5/8"	1"	5/8"	1"
10							820	
15					820		360	2390
20					460		200	1340
25					290	1940	130	860
30			820		200	1340	90	600
40	820		460		110	750	50	330
50	540		290	1940	70	480	30	210
60	360	2390	200	1340	50	330	20	150

Weights

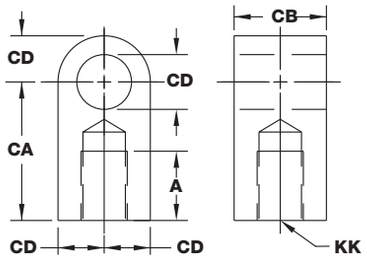
Approximate Weights (lbs.)		
Bore	Base Weight	Adder per inch of stroke
1-1/2" (17)	1.36	0.19
2" (31)	1.81	0.22
2-1/2" (50)	2.9	0.31
3-1/4" (83)	5.62	0.51
4" (125)	7.5	0.57

Accessories

Rod Eye

Bore	Part #
1 1/2 - 2 1/2	ARE-1
3 1/4 - 4	ARE-2

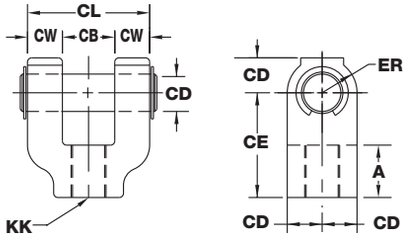
(For -2 Rod End style only)



Rod Clevis

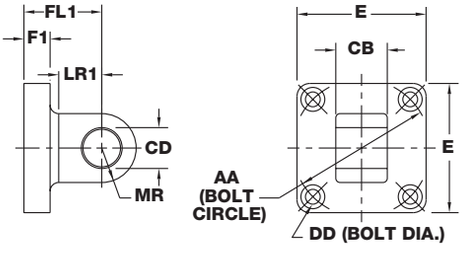
Bore	Part #
1 1/2 - 2 1/2	ARC-1
3 1/4 - 4	ARC-2

(Nickel Steel) Includes Case Hardened Pin (For -2 Rod End style only)



Pivot Bracket

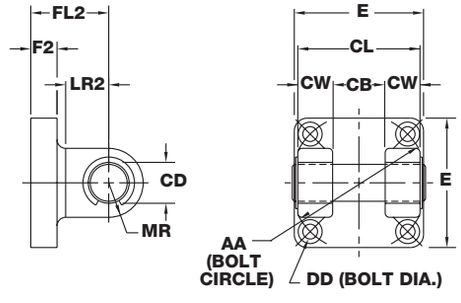
Bore	Part #
1 1/2 - 2 1/2	APB-1
3 1/4 - 4	APB-2



Clevis Bracket

Bore	Part #
1 1/2 - 2 1/2	ACB-1
3 1/4 - 4	ACB-2

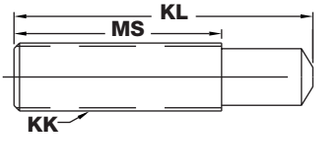
(Includes Case Hardened Pin)



Rod Stud

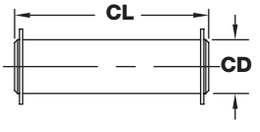
(Rolled Threads)

Bore	Part #
1 1/2 - 2 1/2	ARS-1
3 1/4 - 4	ARS-2

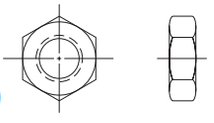


Case Hardened Pivot Pin with Rings

Bore	Part #
1 1/2 - 2 1/2	APP-1
3 1/4 - 4	APP-2



Hex Nut (in.)



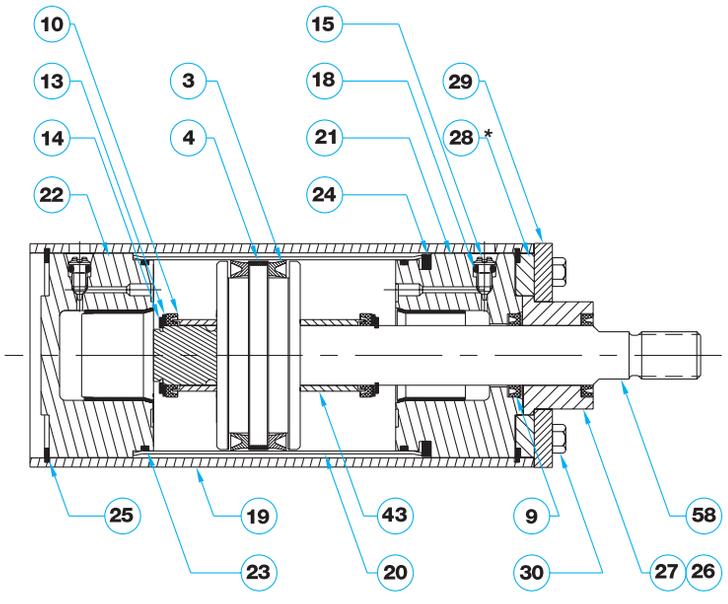
Part	Hex	THD	THK
D-154	0.69	7/16"-20	0.25
D-98	0.75	1/2"-20	0.31
D-3556	1.12	3/4"-16	0.42
D-2545	1.31	7/8"-14	0.48

Accessories Dimensions (in.)

Bore	A	AA	CA	CB	CD	CE	CW	CL	DD			
1-1/2", 2", 2-1/2"	0.75	2	1.5	0.75	0.5	1.5	0.5	1.75	0.19			
3-1/4", 4"	1.12	2.83	2.06	1.25	0.75	2.38	0.62	2.5	0.312			
Bore	**E**	**ER**	**F1**	**F2**	**FL1**	**FL2**	**KK**	**KL**	**LR1**	**LR2**	**MR**	**MR**
1-1/2", 2", 2-1/2"	1.88	0.59	0.38	0.38	1.12	1.12	7/16" - 20	2.12	0.745	0.745	0.5	1.5
3-1/4", 4"	2.75	0.84	0.5	0.38	1.88	1.25	3/4" - 16	3.27	1.1	0.85	0.68	2.25

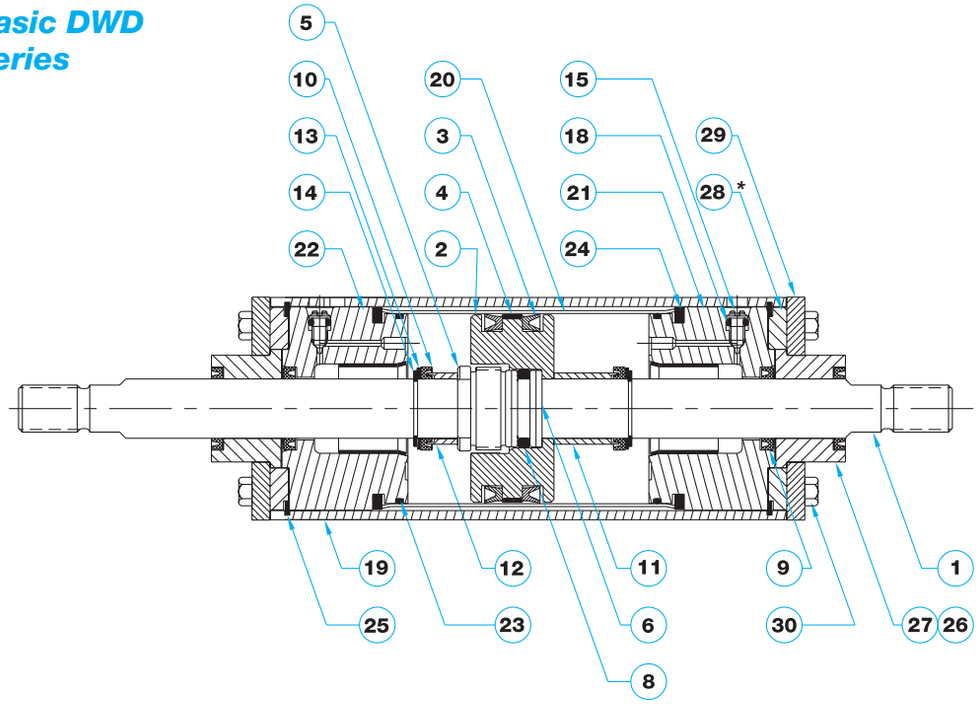
How to Order Repair Parts & Kits

Basic DW Series



** Used in most mounting kits and on all 3¼" and 4" bore basic cylinders.*

Basic DWD Series



** Used on all 3-1/4" and 4" bore basic cylinders.*

Individual Repair Parts and Kits are listed on page 6.14. When ordering, indicate the quantity desired, the part number or kit designation, and the cylinder model number on which the part is to be used. For example, a Cushion Adjusting Screw for a 1-1/2" bore, 10" stroke, Double-Wall cylinder, Cushioned Both Ends, and a Small Male One Piece Rod End, would be ordered as follows:

	Quantity	Part or Kit Number	Model Number
	1	*P-15*	*DWC-1710-2*
A Basic Repair Kit for the same cylinder would be:	*1*	*K-B*	*DWC-1710-2*

See page 6.14 for Repair Parts and page 6.4 for Repair Kits Pricing.

Repair Parts List

No.	Part Description	Quantity by Model Type						
		DW	DWF	DWR	DWC	DWD	DWDF	DWDC
P-1	Rod					1	1	1
P-2	Piston					1	1	1
P-3	Piston Seal	2	2	2	2	2	2	2
P-4	Piston Bearing Ring	1	1	1	1	1	1	1
P-5	Free Thread Nut*					1	1	1
P-6	Free Thread Ring*					4	4	4
P-8	O-Ring (Free Thread)*					1	1	1
P-9	Rod Seal*	1	1	1	1	2	2	2
P-10	Cushion Seal*		1	1	2		1	2
P-11	Cushion Sleeve (Head End)*						1	1
P-12	Cushion Sleeve (Cap End)*							1
P-13	Cushion B/U Washer*		1	1	2		1	2
P-14	Cushion Retaining Ring*		1	1	2		1	2
P-15	Cushion Adjusting Screw		1	1	2		1	2
P-18	O-Ring (Cushion Screws)*		1	1	2		1	2
P-19	Tie-Tube	1	1	1	1	1	1	1
P-20	Stainless Steel Body	1	1	1	1	1	1	1
P-21	Head	1	1	1	1	2	2	2
P-22	Cap	1	1	1	1			
P-23	O-Ring (Stainless Steel Body)	2	2	2	2	2	2	2
P-24	Wave Spring	1	1	1	1	2	2	2
P-25	Retaining Ring (Tie-Tube)	2	2	2	2	2	2	2
P-26	Rod Wiper (w/o Bushing)*	1	1	1	1	2	2	2
P-27	Rod Wiper Bushing Assembly*	1	1	1	1	2	2	2
P-28	Spacer	1	1	1	1	2	2	2
P-29	Retaining Plate	1	1	1	1	2	2	2
P-30	Screw (Ret. Plate)	4	4	4	4	8	8	8
P-43	Cushion Sleeve		1	1	2			
P-58	Piston/Rod Assembly	1	1	1	1			
HT-99-7CC	Lubrication	1	1	1	1	1	1	1
Mag-G-3CC	Polymer Grease Lubricant	1	1	1	1	1	1	1

** Parts and kits that are common to multiple bore sizes, which are available in two sizes: 1-1/2", 2", 2-1/2" bores are designated as –S. 3-1/4", 4" bores are designated as –L.*

Repair Kits

Basic Repair Kit (K-B-_) Includes:		
P-25	Retaining Ring (Tie-Tube)	2
P-23	O-ring	2
P-24	Wave Spring	1
P-3	Piston Seal	2
P-4	Piston Bearing Ring	1
DWD Basic Repair Kit (K-D-_) Includes:		
P-25	Retaining Ring (Tie-Tube)	2
P-23	O-ring	2
P-24	Wave Spring	2
P-3	Piston Seal	2
P-4	Piston Bearing Ring	1

Cushion Repair Kit (K-C-_) Includes:		
P-10	Cushion Seal	1
P-13	Cushion B/U Washer	1
P-14	Cushion Retaining Ring	1
P-15	Cushion Adjusting Screw	1
P-18	O-Ring (Cushion Screws)	1
Rod Seal Repair Kit (K-A-_) Includes:		
P-27	Rod Wiper Bushing Assembly	1
P-9	Rod Seal	1
MRS Piston Repair Kit (K-P-M-_) Includes:		
P-33	Piston Seal Assembly	1
P-34	Magnet	1
P-4	Piston Bearing Ring	1

Important Double-Wall® Information

Piston Rod Diameter – 5/8" and 1" diameter rods are standard. These rods are made of high strength steel and are suitable for most applications. On long stroke, high thrust applications caution should be exercised and the column strength and stop length chart on page 6.11 should be reviewed.

Material – Hard chrome plated rods are supplied as standard on all models except 1-1/2" MRS, which are 303 stainless steel. Special materials such as 303 stainless steel are available on request.

Rod End Options – Bimba offers six popular NFPA rod end styles (see page 6.5). Bimba considers the one-piece male style #2, as the primary standard rod end. A small male rod stud, style #2S, is also offered as a standard option. The stud is made from 125,000 P.S.I. min. yield steel and is roll threaded for increased strength. Special rod ends with different thread lengths, pitch and class are available upon request.

Cushions – The Double-Wall® offers exclusive Stainless-Cushions®, type 304 stainless steel sleeves which enhance cushion performance and life. The cushion seal is contained on the piston rod for easy inspection and replacement when necessary. Air cushions may be specified on either or both ends without changing the cylinder's overall length.

The cushion design allows for a flush mounted adjustment screw even in the fully open setting. Unless otherwise specified, cushioned models are shipped with the adjustment screws located in positions 4 and 8 as shown on the cylinder dimensional drawings.

Adjustment screws may be ordered in other than standard positions at no additional charge. Simply add these designations as the last digits of the model number:

A2 – Head Adjustment Screw – Position 2

A3 – Head Adjustment Screw – Position 3

A6 – Cap Adjustment Screw – Position 6

A7 – Cap Adjustment Screw – Position 7

A26 – Adjustment Screws – Positions 2 and 6

A37 – Adjustment Screws – Positions 3 and 7

Mountings – Double-Wall cylinders utilize easy to assemble "bolt on" mounting kits. Basic cylinders (less mountings) and mounting kits are ordered and shipped as separate items. All necessary hardware is contained in the kit. The clevis mounting kit for example contains the clevis cap, pivot pin, retaining rings, and mounting cap screws.

The clevis and pivot caps are high strength aluminum die castings and have oil-filled bronze bushings. Side and end lug kits contain brackets which are stamped from high strength steel. Flange kits are offered in both steel and aluminum. All mountings are epoxy coated.

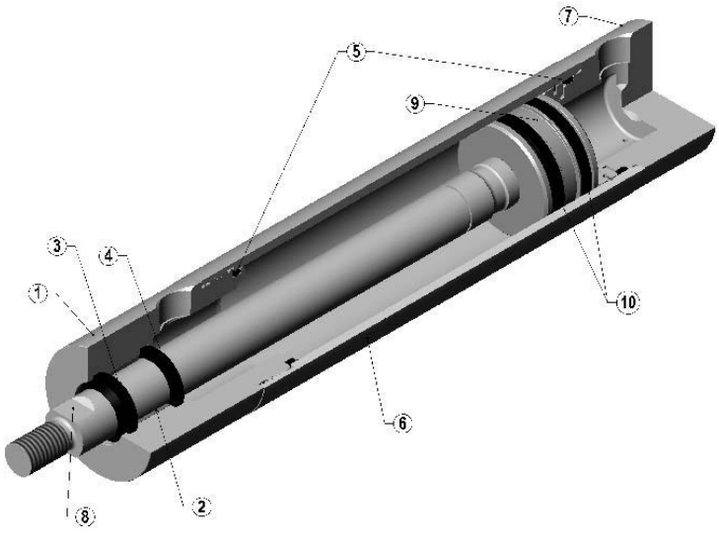
"Bolt on" Double-Wall mounting kits give your local BIMBA Distributor inventory versatility allowing him to stock Basic cylinders of various popular strokes and bores without comitting them exclusively to one mounting style. This means greater "off the shelf" availability for you.

Delivery – Ordering standard cylinders with the primary standard style #2 rod end will allow you to take advantage of a substantial local Distributor stock of Double-Wall cylinders. A very large stock of cushioned (both ends) and non-cushioned finished cylinders is always maintained at our Monee, Illinois plant. In addition we maintain a vast inventory of finished heads, caps, rods, etc. for quick assembly of your optional feature or non-standard stroke requirement.

Specials – Bimba Manufacturing welcomes the opportunity to custom design a cylinder to meet your exact specifications and requirements. As a leading manufacturer of custom special cylinders, we can provide the engineering expertise to help you with whatever design problem you face. We also maintain a specials department within our manufacturing facilities to assure you of the most expedient delivery possible. Please contact your local Bimba Distributor or Customer Service Department with details of your special requirement.

Component Description

1. Rod Guide: Corrosion resistant 303 stainless steel is ideal for washdown applications. Designed specifically to reduce sharp edges and corners and provide a smooth transition to the cylinder body eliminating catch points for contamination and to allow ease in cleaning. Tapped holes are provided to allow easy mounting of USDA approved secondary wiper retainer as an option.
2. Rod Bushing: Material is PTFE (Polytetrafluoroethylene) for extended life, larger bores (5", 6", 8") utilize an acetal bushing.
3. Rod Wiper: A Urethane rod wiper is standard (high temperature material is optional) and offers resistance to a wide variety of washdown chemicals. Larger bores offer a PTFE rod wiper as standard.
4. Rod Seal: Nitrile rod seal (high temperature material is optional) is pressure activated and wear compensating for long life.
5. Body Seal: Nitrile material is standard (high temperature material is optional).
6. Body: Thick walled 316 stainless steel offers superior corrosion resistance and is designed to minimize gaps with the mating end caps where contamination can build up.
7. Rear Head: Corrosion resistant 303 stainless steel is ideal for washdown applications. Designed specifically to reduce sharp edges and corners and provide a smooth transition to the cylinder body eliminating catch points for contamination and to allow ease in cleaning. Optional tapped holes allow for easy mounting of NFPA rear pivot or rear clevis mounting brackets.



8. Piston Rod: Ground and roller burnished 303 stainless steel for maximum corrosion resistance.
9. Piston: Precision machined from aluminum (optional bearing strip) may also be ordered in stainless steel for internal corrosion resistance when required.
10. Piston Seals: Nitrile material is standard, high temperature material is optional. Seals are pressure activated and wear compensating.
11. Lubricant: Food Grade (H1) Grease.

Operating Specifications

Temperature: -20° to 200°F standard; 0° to 400°F with V option
Stroke Maximum: 24" (strokes beyond 24" require an application review)
Operating Pressure: 200 psi maximum

USDA Accepted
(Option U, see page 6.17 and 6.20)

EQUIPMENT ACCEPTANCE CERTIFICATE

The issuance of this form is based on U.S. Department of Agriculture, Dairy Grading Branch, Equipment Design Review Section, evaluation of the equipment listed above for compliance with:

USDA Dairy Equipment Guidelines

How to Order

Bore Size
1-1/2"
2"
2-1/2"
3-1/4"
4"
5"
6"
8"

Options	
B -	Bumpers[1]
FC -	Fixed Cushions[5]
KK3 -	Female Rod Thread[2]
M -	Magnetic Piston[5]
NT -	Non-threaded Rod[5]
P -	Prox. Switch Both Ends[5]
TW -	Piston Bearing Strip[3 5]
SP -	303 Stainless Steel Piston[5]
U -	USDA Approved Options[4]
V -	High Temperature Seals
EE -	Extra Rod Extension

RS - 1-1/2X4 - MP2 U

Stroke
4 = 4"
(0 - 24")

Mounting Styles	
MXO -	Tapped Both Ends
MXF -	Tapped Front
MXR -	Tapped Rear
MP2 -	Clevis Rear
MP4 -	Pivot Rear

Option Notes:
Option (B) Bumpers and Option (FC) Cushions are not a valid combination.
Option (B) Bumpers and Option (P) Prox. Switches are not a valid combination.
If Option (B) and Option (V) are ordered in combination, the standard Bumper material will be used in bore sizes 5, 6, and 8".
Option (M) Magnetic Piston and Option (V) High Temperature Seals should be specified for chemical compatibility requirements only. The piston magnet is nitrile based, hence the temperature rating remains at 200 degrees F.

List Prices

Bore	Tapped Both Ends (MXO)	Tapped Front (MXF)	Tapped Rear (MXR)	Rear Clevis (MP2)	Rear Pivot (MP4)	Adder per 1" Stroke	Bumpers Both Ends (B)[1]	Fixed Cushions (FC)[5]	Magnetic Piston (M)[5]	Prox Switches (P)[5]	Piston Bearing Strip (TW)[3 5]	303 SS Piston (SP)[5]	USDA Options (U)[4]	High Temp Seals (V)	Extra Rod Ext. (EE)
1-1/2" (17)															
2" (31)															
2-1/2" (50)															
3-1/4" (83)															
4" (125)															
5"															
6"															
8"															

[1]Bumper adds 1/4" to overall length in bores 1-1/2" to 4". Bumper adds 1/2" in bores 5" to 8".
[2]Other rod ends available upon request. See page 6.21.
[3]Standard with Stainless Piston Option.
[4]USDA Approved option includes an external wiper as required by the USDA. The cylinder rod length will automatically increase by the amount required to accommodate the seal retaining bracket. See page 6.20.
[5]The following options do not affect length: Fixed Cushions (FC), Magnetic Piston (M), Non-threaded Rod (NT), Proximity Switches (P), Piston Bearing Strip (TW), and 303 Stainless Steel Piston (SP).

No Charge: (KK3) Female Rod Threads
(NT) Non-threaded Rod

Accessories (All Stainless Steel)

Alignment Couplers 100 psi air (max.) Operating Pressure				
Part No.		Threads	Jam Nuts Part No.	
AC250-SS		1/4"-28	D-344-SS	
AC312-SS		5/16"-24	D-746-SS	
AC375-SS		3/8"-24	D-801-SS	
AC437-SS		7/16"-20	D-154-SS	
AC500-SS		1/2"-20	D-98-SS	
AC625-SS		5/8"-18	D-9-SS	
AC750-SS		3/4"-16	D-3556-SS	
AC875-SS		7/8"-14	D-2545-SS	
AC1000-SS		1"-14	D-1331-SS	
AC1250-SS		1-1/4"-12	D-92067-SS	

Clevis Brackets		
Part No.	Pin Dia.	
RS-CB500	1/2"	
RS-CB750	3/4"	
RS-CB1000	1"	
RS-CB1375	1-3/8"	

Clevis Pins		
Part No.	Pin Dia.	
RS-CP500	1/2"	
RS-CP750	3/4"	
RS-CP1000	1"	
RS-CP1375	1-3/8"	

Eye Brackets		
Part No.	Pin Dia.	
RS-EB500	1/2"	
RS-EB750	3/4"	
RS-EB1000	1"	
RS-EB1375	1-3/8"	

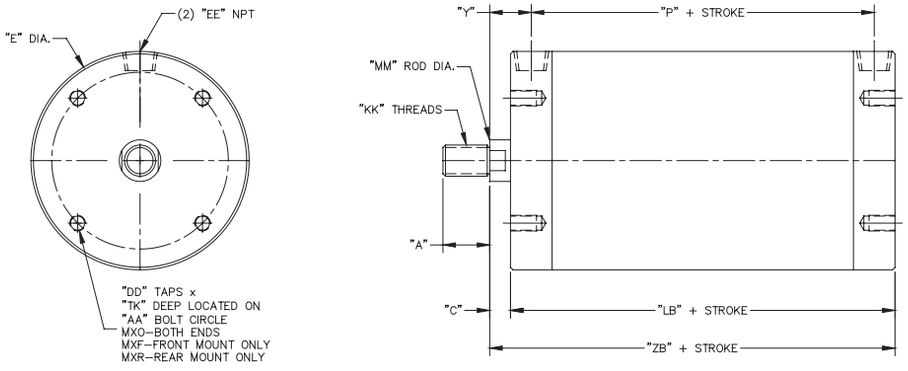
Foot Brackets*		
Part No.	Bore	
RS-FB150	1-1/2"	
RS-FB200	2"	
RS-FB250	2-1/2"	
RS-FB325	3-1/4"	
RS-FB400	4"	
RS-FB500	5"	
RS-FB600	6"	
RS-FB800	8"	

*Must be ordered with MXO cylinder
Pair, fasteners included

Rod Clevis		
Part No.	Threads	
RS-RC437	7/16"-20	
RS-RC500	1/2"-20	
RS-RC750	3/4"-16	
RS-RC1000	1"-14	
RS-RC1250	1-1/4"-12	

Rod Eye		
Part No.	Threads	
RS-RE437	7/16"-20	
RS-RE500	1/2"-20	
RS-RE750	3/4"-16	
RS-RE1000	1"-14	
RS-RE1250	1-1/4"-12	

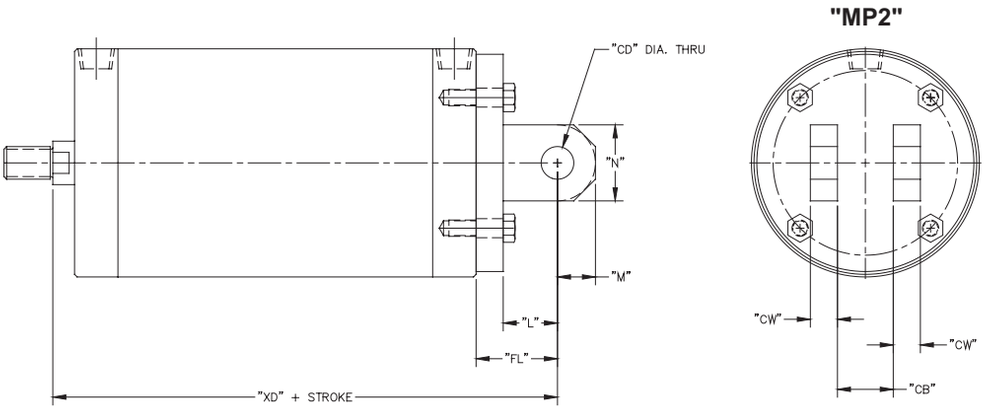
Dimensions for Mounting Styles MXO, MXR, MXF (inches)



Bore	Rod Diameter	A	AA	C	DD	E Dia.	EE NPT	KK	LB	MM	TK	Y	P	ZB
1-1/2"	5/8"	3/4	1.45	.56	10-24	1.75	3/8	7/16-20	5.21	5/8	.33	1.99	3.16	5.77
2"	5/8"	3/4	1.85	.56	10-24	2.25	3/8	7/16-20	5.45	5/8	.38	1.94	3.15	6.01
2-1/2"	5/8"	3/4	2.15	.56	1/4-20	2.75	3/8	7/16-20	5.95	5/8	1/2	1.93	3.39	6.51
3-1/4"	1"	1-1/8	2.62	.64	5/16-18	3.50	1/2	3/4-16	7.43	1	5/8	2.64	3.83	8.07
4"	1"	1-1/8	3.25	.64	3/8-16	4.25	1/2	3/4-16	7.43	1	3/4	2.52	3.93	8.07
5"	1"	1-1/8	4.25	.50	3/8-16	5.25	1/2	3/4-16	5.75	1	5/8	1.00	4.75	6.25
6"	1-3/8"	1-5/8	5.00	.63	1/2-13	6.25	1/2	1-14	5.75	1-3/8	7/8	1.13	4.75	6.38
8"	1-3/8"	1-5/8	6.50	.63	5/8-11	8.38	1/2	1-14	5.88	1-3/8	1	1.13	4.88	6.50

Note: Oversized rods are available in 5", 6", and 8" bore in each mounting style. Please contact distributor.

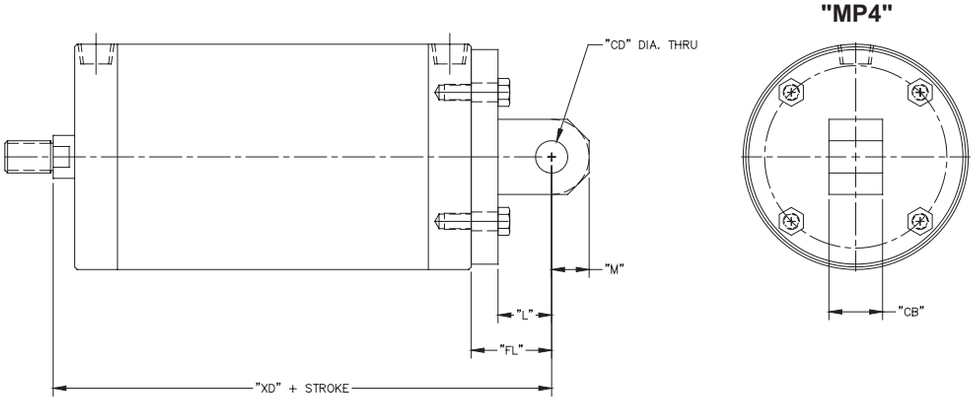
Clevis Mount (MP2) (inches)



Bore	Rod Diameter	CB	CD	CW	FL	L	M	N	XD
1-1/2"	.63	.75	.50	.49	1.13	.75	.35	.70	6.90
2"	.63	.75	.50	.50	1.13	.75	.40	.80	7.14
2-1/2"	.63	.75	.50	.50	1.13	.75	.40	.80	7.64
3-1/4"	1.00	1.25	.75	.63	1.88	1.25	.60	1.00	9.94
4"	1.00	1.25	.75	.63	1.88	1.25	.75	1.40	9.94
5"	1.00	1.25	.75	.63	1.88	1.25	.88	1.75	8.13
6"	1.38	1.50	1.00	.75	2.25	1.50	1.00	2.00	8.63
8"	1.38	1.50	1.00	.75	2.25	1.50	1.00	3.50	8.75

Note: Oversized rods are available in 5", 6", and 8" bore in each mounting style. Please contact distributor.

Pivot Mount (MP4) (inches)

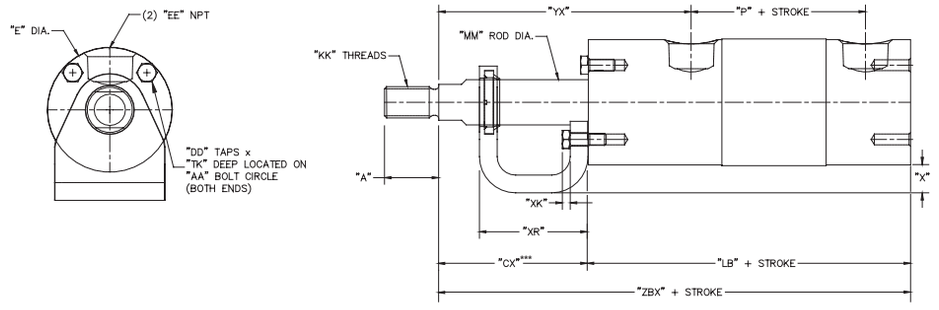


Bore	Rod Diameter	CB	CD	FL	L	M	N	XD
1-1/2"	.63	.75	.50	1.13	.75	.35	.70	6.90
2"	.63	.75	.50	1.13	.75	.40	.80	7.14
2-1/2"	.63	.75	.50	1.13	.75	.40	.80	7.64
3-1/4"	1.00	1.25	.75	1.88	1.25	.60	1.00	9.94
4"	1.00	1.25	.75	1.88	1.25	.75	1.40	9.94
5"	1.00	1.25	.75	1.88	1.25	.88	1.75	8.13
6"	1.38	1.50	1.00	2.25	1.50	1.00	2.00	8.63
8"	1.38	1.50	1.00	2.25	1.50	1.00	3.50	8.75

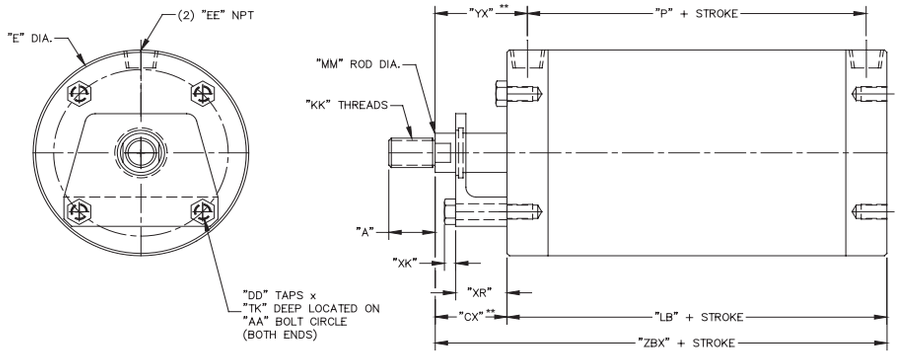
Note: Oversized rods are available in 5", 6", and 8" bore in each mounting style. Please contact distributor.

USDA Approved Option "U" (inches)

1-1/2" to 4" Bores



5", 6", and 8" Bores



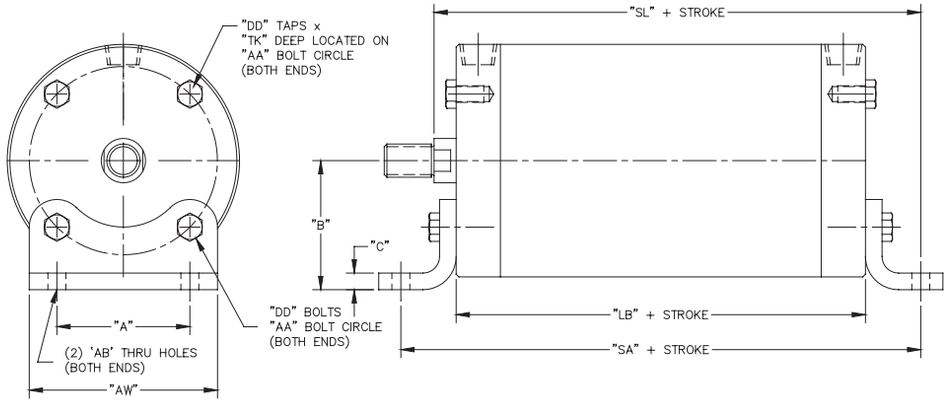
External Wiper (Option U) Dimensions

Bore	Rod Diameter	A	AA	CX	DD	E Dia.	EE NPT	KK	LB	MM	TK	YX	P	XR	XK	ZBX	X
1-1/2"	.63	3/4	1.45	2.06	8-32	1-3/4	3/8	7/16-20	5.21	5/8	.33	3.49	3.16	1.50	.10	7.27	.38
2"	.63	3/4	1.85	2.06	10-24	2-1/4	3/8	7/16-20	5.45	5/8	.38	3.44	3.15	1.50	.12	7.51	.50
2-1/2"	.63	3/4	2.15	2.06	1/4-20	2-3/4	3/8	7/16-20	5.95	5/8	1/2	3.43	3.39	1.50	.17	8.01	.26
3-1/4"	1.00	1-1/8	2.62	2.14	5/16-18	3-1/2	1/2	3/4-16	7.43	1	5/8	4.14	3.83	1.50	.24	9.57	.25
4"	1.00	1-1/8	3.25	2.14	3/8-16	4-1/4	1/2	3/4-16	7.43	1	3/4	4.02	3.93	1.50	.27	9.57	.25
5"	1.00	1-1/8	4.25	1.75	3/8-16	5-1/4	1/2	3/4-16	5.75	1	5/8	2.25	4.75	1.25	.27	7.50	N/A
6"	1.38	1-5/8	5.00	1.88	1/2-13	6-1/4	1/2	1-14	5.75	1-3/8	7/8	2.38	4.75	1.25	.36	7.63	N/A
8"	1.38	1-5/8	6.50	1.88	5/8-11	8-3/8	1/2	1-14	5.88	1-3/8	1	2.38	4.88	1.25	.44	7.75	N/A

Note: The USDA-approved option "U" includes an external wiper as required by the USDA. Cylinder rod length is increased as shown. Oversized rods are available in 5", 6", and 8" bore in each mounting style. Please contact distributor.

Examples of "U" Option Mounting Bracket

Foot Bracket Accessory (inches)

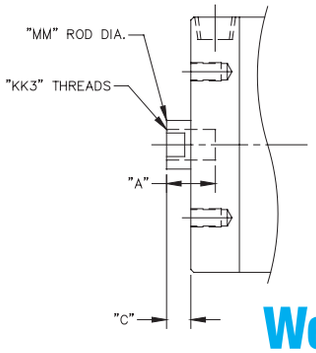


RS Series Foot Mounting Brackets

Bore	Foot Bracket Kit	A	AB	AW	B	C	DD	AA	LB	TK	SA	SL
1-1/2"	RS-FB150	1.03	3/16	1.52	1.25	1/4	8-32	1.45	5.21	.38	6.62	6.46
2"	RS-FB200	1.31	7/32	1.81	1.62	1/4	10-24	1.85	5.45	.38	7.58	7.07
2-1/2"	RS-FB250	1.55	9/32	2.30	1.64	1/4	1/4-20	2.15	5.95	1/2	7.90	7.48
3-1/4"	RS-FB325	1.86	11/32	2.86	2.00	1/4	5/16-18	2.62	7.43	5/8	9.74	9.23
4	RS-FB400	2.30	13/32	3.50	2.38	1/4	3/8-16	3.25	7.43	3/4	10.05	9.39
5"	RS-FB500	3.00	11/16	4.50	2.88	3/16	3/8-16	4.25	5.75	5/8	8.50	7.63
6"	RS-FB600	4.00	13/16	5.50	3.38	3/16	1/2-13	5.00	5.75	7/8	8.50	7.75
8"	RS-FB800	5.00	13/16	7.00	4.44	1/4	5/8-11	6.50	5.88	1	9.50	8.31

Notes: Foot bracket mounting kits include two brackets and eight stainless steel screws.
Can only be applied to MXO mounting styles.

Female Piston Rod End (Option KK3)



Bore	MM Rod Diameter	KK3	A (Thread Depth)	C
1-1/2", 2", 2-1/2"	5/8" Standard	7/16-20	3/4	.56
3-1/4", 4"	1" Standard	3/4-16	1-1/8	.64
5"	1" Standard	3/4-16	1-1/8	.50
6", 8"	1-3/8" Standard	1-14	1-5/8	.63

Weights of Cylinders

Approximate Weights (lbs.)		
Bore	Base Weight	Adder per inch of stroke
1-1/2"	2.82	0.27
2"	5.25	0.33
2-1/2"	8.92	0.39
3-1/4"	20.63	0.61
4"	30.20	0.70
5"	24.10	0.84
6"	36.45	1.12
8"	69.80	1.80

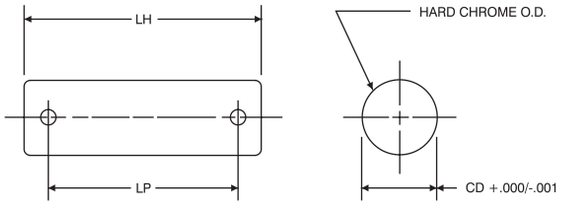
Stainless Steel Accessories (inches)

Clevis Pin

Part No.	CD(+.000/ -.001)	LH	LP
RS-CP500	1/2	2-1/4	1-15/16
RS-CP750	3/4	3	2-23/32
RS-CP1000	1	3-1/2	3-7/32
RS-CP1375	1-3/8	5	4-1/4

Clevis Pin sold with (2) S.S. Cotter Pins

CLEVIS PIN (INCLUDES COTTER PINS)



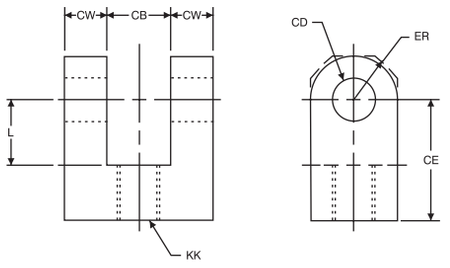
(Clevis Pins sold with (2) S.S. Cotter Pins)

Rod Clevis

Part No.	CB	CD	CE	CW	ER	KK	L
RS-RC437	3/4	1/2	1-1/2	1/2	1/2	7/16-20	3/4
RS-RC500						1/2-20	
RS-RC750	1-1/4	3/4	2-3/8	5/8	3/4	3/4-16	1-1/4
RS-RC1000	1-1/2	1	3-1/8	3/4	1	1-14	1-1/2

Clevis Pins sold separately

ROD CLEVIS



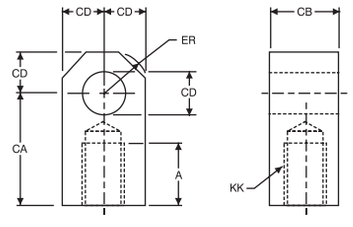
(Clevis Pins sold separately from Rod Clevis)

Rod Eye

Part No.	A	CA	CB	CD	ER	KK
RS-RE437	3/4	1-1/2	3/4	1/2	5/8	7/16-20
RS-RE500						1/2-20
RS-RE750	1-1/8	2-1/16	1-1/4	3/4	7/8	3/4-16
RS-RE1000	1-5/8	2-13/16	1-1/2	1	1-3/16	1-14

Clevis Pins sold separately

ROD EYE



(Clevis Pins sold separately from Rod Eyes)

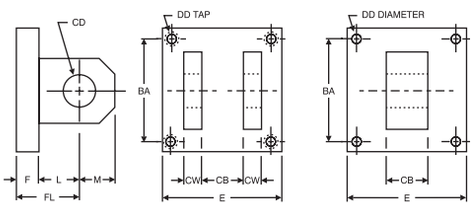
Clevis Brackets and Eye Brackets

Part No.	BA	CB	CD	CW	DD	E	F	FL	L	M
Clevis Brackets										
RS-CB500	1-5/8	3/4	1/2	1/2	3/8-24	2-1/2	3/8	1-1/8	3/4	5/8
RS-CB750	2-9/16	1-1/4	3/4	5/8	1/2-20	3-1/2	5/8	1-7/8	1-1/4	3/4
RS-CB1000	3-1/4	1-1/2	1	3/4	5/8-18	4-1/2	3/4	2-1/4	1-1/2	1
RS-CB1375	3-13/16	2	1-3/8	1	5/8-18	5	7/8	3	2-1/8	1-3/8
Eye Brackets										
RS-EB500	1-5/8	3/4	1/2	N/A	13/32	2-1/2	3/8	1-1/8	3/4	1/2
RS-EB750	2-9/16	1-1/4	3/4		17/32	3-1/2	5/8	1-7/8	1-1/4	3/4
RS-EB1000	3-1/4	1-1/2	1		21/32	4-1/2	3/4	2-1/4	1-1/2	1
RS-EB1375	3-13/16	2	1-3/8		21/32	5	7/8	3	2-1/8	1-3/8

Clevis Pins sold separately.

Mounted to machine to interface with rod end access, and MP2/MP4.

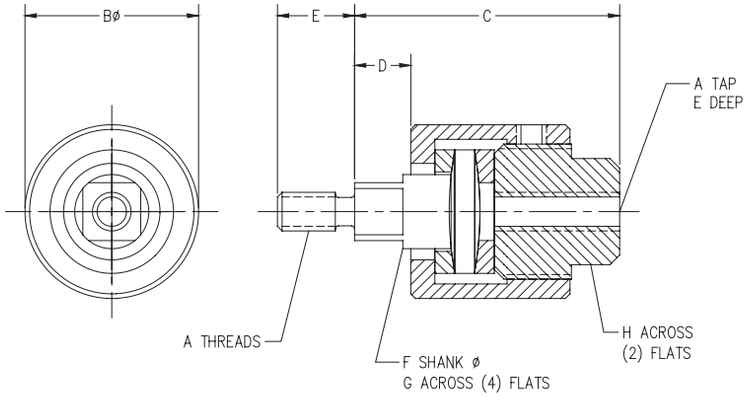
CLEVIS BRACKET **EYE BRACKET**



(Clevis Pins sold separately from Clevis & Eye Brackets)

Stainless Steel Accessories

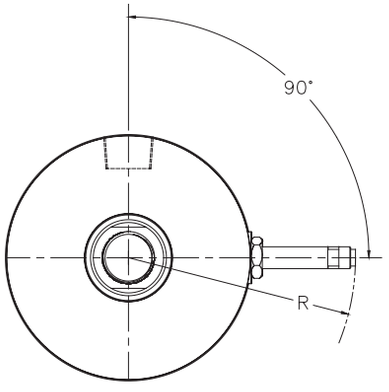
Stainless Steel Alignment Couplers (inches)



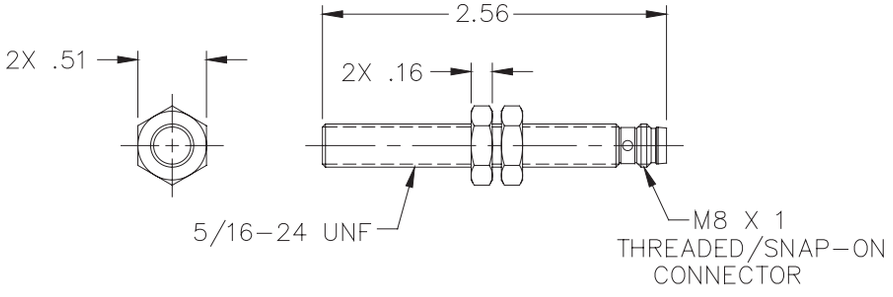
Part Number	A	B	C	D	E	F	G	H	Maximum Pull at Yield (lbs.)
AC250-SS	1/4-28	1-1/8	1-3/4	3/8	1/2	1/2	3/8	11/16	225
AC312-SS	5/16-24	1-1/8	1-3/4	3/8	1/2	1/2	3/8	11/16	375
AC375-SS	3/8-24	1-1/8	1-3/4	3/8	1/2	1/2	3/8	11/16	575
AC437-SS	7/16-20	1-1/4	2	7/16	3/4	5/8	1/2	13/16	800
AC500-SS	1/2-20	1-1/4	2	7/16	3/4	5/8	1/2	13/16	1100
AC625-SS	5/8-18	1-1/4	2	7/16	3/4	5/8	1/2	13/16	1750
AC750-SS	3/4-16	1-3/4	2-5/16	7/16	1-1/8	31/32	13/16	1-1/8	2600
AC875-SS	7/8-14	1-3/4	2-5/16	7/16	1-1/8	31/32	13/16	1-1/8	3550
AC1000-SS	1-14	2-1/2	2-15/16	7/16	1-5/8	1-11/32	1-5/32	1-5/8	4800
AC1250-SS	1-1/4-12	2-1/2	2-15/16	7/16	1-5/8	1-11/32	1-5/32	1-5/8	7600

Examples of Specials Capability

Proximity Switch Option Dimensions (Option P)



Bore Size	Dimension R
1-1/2"	3.04"
2"	3.04"
2-1/2"	3.04"
3-1/4"	3.19"
4"	3.19"
5"	N/A
6"	N/A
8"	N/A



Specifications

Output:	PNP Sourcing Output, normally open
Load Current:	100mA max.
Leakage Current:	10uA max.
Voltage Drop:	2 VDC
Short Circuit and Overload Protection:	yes
Reverse Polarity Protection:	yes
Supply Voltage:	10-30 VDC
LED:	yes
Current Consumption:	15mA
Repeatability:	0.010º (.25mm)
Hysteresis:	5%
Response Time:	330uS
Electromagnetic Compatibility Compliance:	NEMA ICS5-1996
Protection Class:	IP67
Ambient Temperature:	-14ºF to 158ºF (-25ºC to 70ºC)
Housing Material:	Stainless steel
Sensing Face:	Crastin
Approvals:	UL-General Purpose CSA-General Purpose FM-Nonincendive

Notes

Notes

Position Control System Products

Bimba Position Feedback Cylinders

The Bimba Position Feedback Cylinder provides continuous position sensing in a lightweight, small-bore air cylinder.

Ideal for applications where magnetic position sensing is impractical, where variations in cylinder speed or stroke are needed, or where an operation requires constant monitoring of cylinder position.

Advantages

- Highly accurate: infinite resolution, linearity of ± 1 percent of full stroke, ± 0.001” mechanical repeatability.
- Less than 0.75” longer than conventional magnetic piston cylinders.
- Reduces weight and size.
- Repairable.
- Internally-lubricated seals.
- Standard wipers and piston bearing strips for long cylinder life.
- Optional bumpers.
- Choice of standard 6" lead wire or 3-pin connector.
- Electronic controllers available for dual set point and scalable analog output applications.
- Rear head cap can be rotated for optimal positioning of lead or connector.

This section contains Bimba's Position Feedback Products. These products are ideal for applications that require increased flexibility and adaptability. They are perfect for automated assembly processes that require quick changeovers or for mass customized product assembly.

The Position Feedback Cylinder (Model PFC) is a linear pneumatic actuator that contains an internal LRT (Linear Resistive Transducer). The PFC can be used for measuring and gauging, positioning, and "on-the-fly" applications. Combine the PFC with the Bimba Pneumatic Control System Model PCS, Digital Panel Meter Model DPM, or the Electronic Controller described below to maximize performance.

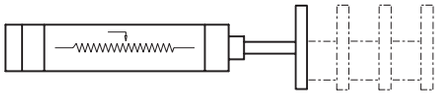
The PneuTurn rotary actuator with position feedback (Model PTF) is a rotary rack and pinion actuator that has a rotary potentiometric feedback transducer attached to the output shaft. The PTF can be combined with Bimba's Pneumatic Control System Model PCS described below for closed loop rotary positioning.

The Pneumatic Control System (PCS) is a closed loop pneumatic motion control system that controls the position of the PFC rod or the PTF shaft. The system includes the control electronics and valves necessary to accurately control any Bimba position feedback actuator.

The Digital Panel Meter (Model DPM) is a digital panel meter that has a 16 bit A/D converter and built in microprocessor. When combined with the PFC, the repeatability is 0.001 inch per inch of stroke. The DPM is great for accurate measuring and gauging applications. It is easily calibrated to indicate actual displacement and includes multiple programmable set point outputs. Recommended applications include Go/No Go in-process quality control verification, part identification, and dimensional verification.

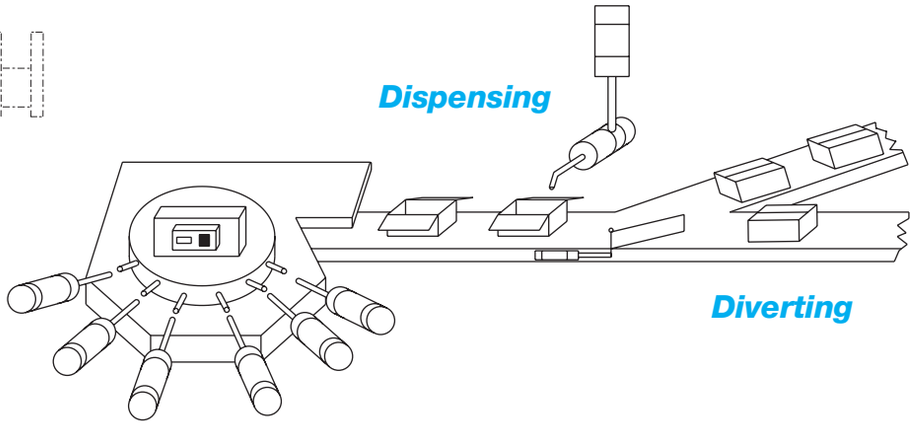
The Electronic Controllers can be used for applications that require accuracy larger than +\- 0.030". It has 10 VDC transducer excitation and fast responding scalable analog output capability. It is good for applications that use controllers that do not have the required PFC input impedance of 1 Mohm.

Applications



Positioning

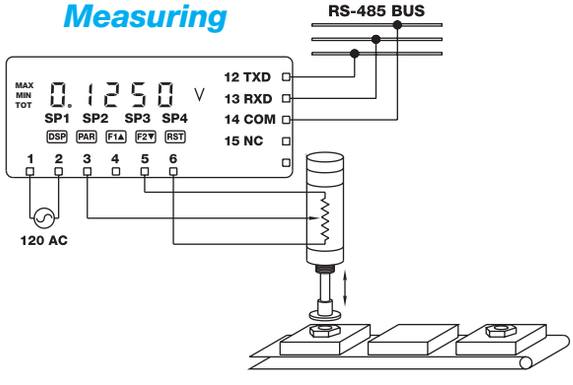
Dispensing

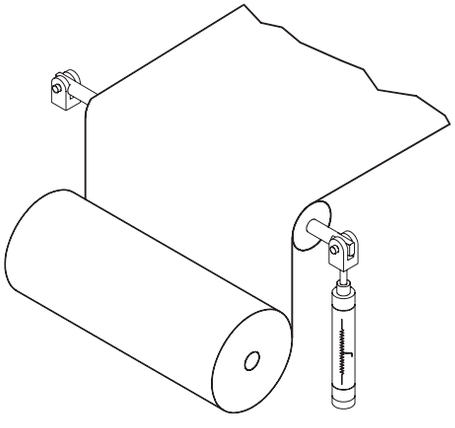


Diverting

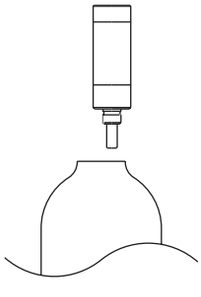
Inspection

Measuring

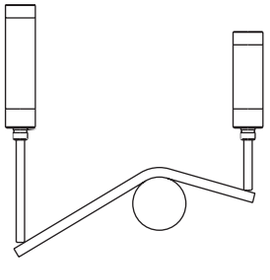




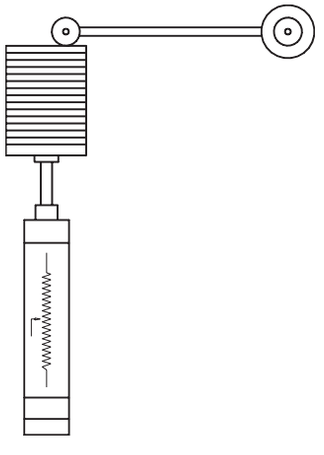
Web Guide



Verification

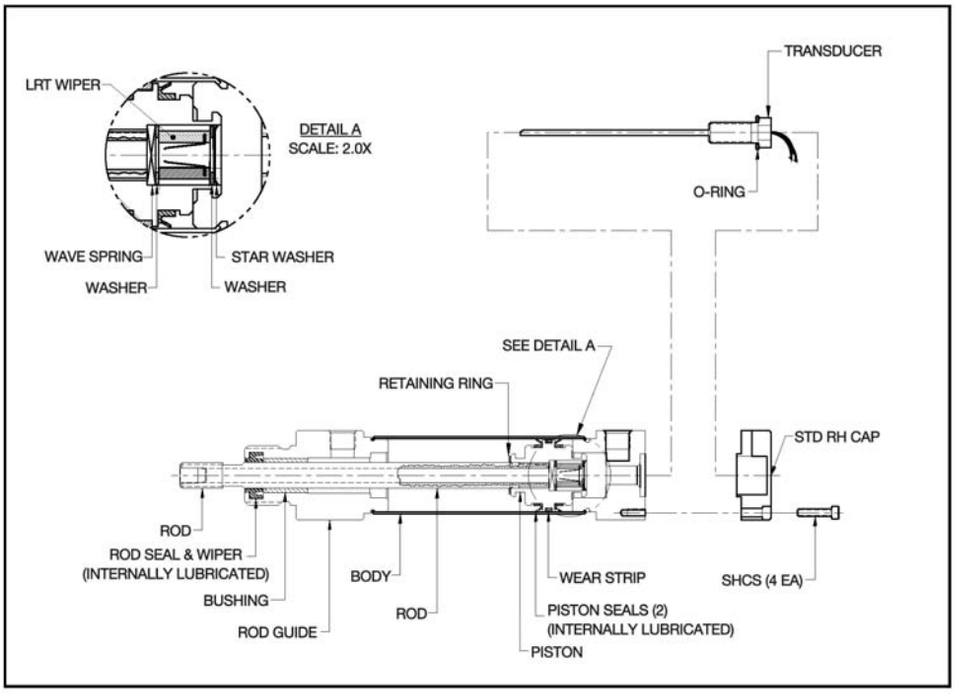


Process Acceptance



Stacker

How it Works



The *Bimba Position Feedback Cylinder* contains a Linear Resistive Transducer (LRT) or potentiometer mounted in the cylinder rear head. The LRT probe, which has a resistive element on one side and a collector strip on the other, is inside the cylinder rod. A wiper assembly is installed in the piston. As the piston moves, an electrical circuit is created between the resistive element and collector strip. A variable resistance (approximately 1KΩ per inch of stroke) proportional to piston position in the cylinder is produced by the cylinder. Consult www.bimba.com/techctr/techcenter.htm for a table of nominal resistance values at full extend and full retract for various strokes and options.

The cylinder can be easily setup to produce an analog signal compatible with 0-10 VDC PLC analog inputs.

The accuracy of an LRT is determined by three factors: resolution, linearity and repeatability.

Resolution refers to the smallest change that can be detected on the LRT. The Bimba LRT has infinite resolution, and can be divided into as many parts as the electronics allow. For example, with a 12-bit, 4096-part controller, the stroke could be divided into 4096 parts. When 10 VDC are placed on a 10" cylinder, the smallest detectable increment would be 10 VDC ÷ 4096 = 2.4 millivolts or 0.0024". Resolution is stroke sensitive, i.e., the longer the stroke, the less resolution.

Linearity refers to the maximum deviation of the output voltage to a straight line. The Bimba LRT's linearity is ± 1 percent of stroke.

Repeatability is the ability of the LRT to provide the same output voltage relative to a unique cylinder position each time the cylinder is cycled. Mechanical repeatability of the Bimba Position Feedback Cylinder is ± 0.001".

How to Order

The model number of all Position Feedback Cylinders consists of three alphanumeric clusters. These designate product type, bore size and stroke length, and mounting style and options. Please refer to the charts below for an example of model number **PFC-0912-BFP**. This is an 1-1/16" bore, 12" stroke Position Feedback Cylinder with block front mounting and a plug connector.

PFC-0912-BFP

BORE SIZE
09 - 1-1/16"
17 - 1-1/2"
31 - 2"
50 - 2-1/2"
70 - 3"

STANDARD STROKE LENGTHS
1 = 1"
1.25 = 1.25"
Standard Strokes:
1", 2", 4", 6", 8", 12", 18" and 24"

MOUNTING	
Blank	Front nose
BF	Block front
X	Universal mount

OPTIONS	
B	Bumpers
EE	0.375 - 3/8" extra rod extension, etc.
L	Low friction[1]
P	Plug connector

[1] Low friction option includes special seals and lubrication. Rod Wiper is omitted.

Approximate Power Factors

1-1/16"	=	0.9
1-1/2"	=	1.7
2"	=	3.1
2-1/2"	=	5.0
3"	=	7.0

For example, a PFC-0912-BFP will exert a force of 0.9 times the air line pressure; a PFC-506-XB will exert a force of 5.0 times the air line pressure, etc.

List Prices

Bore	Base	Stroke Adder (per inch)	Mounting		Options			
			B F Block Front	X Universal	B Bumpers	EE Extra Extension (per inch)	L* Low Friction	P** Plug Connectors
1-1/16" (09)								
1-1/2" (17)								
2" (31)								
2-1/2" (50)								
3" (70)								

** Specify Option L for motion Control Applications with the PCS Control System.*

Accessories

Bore	Mounting Nut	Mounting Bracket	Rod Clevis	Pivot Bracket
1-1/16" (09)	D-2545	D-8316	D-8310-A	D-8322-A
1-1/2" (17)	D-8484	D-8318	D-8311-A	D-8324-A
2" (31)	D-508	D-8319	D-8313-A	D-8325-A
2-1/2" (50)	D-2540	D-8320	D-8314-A	D-8326-A
3" (70)	D-5379	D-19127	D-8314-A	D-8326-A

See Original Line section for Accessory Prices.

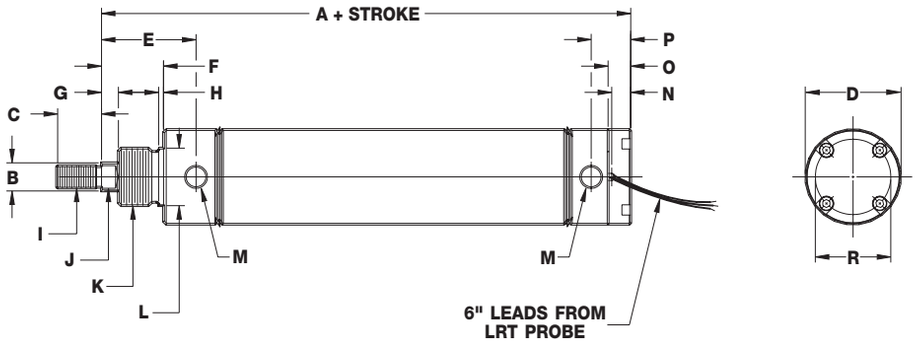
Control Units

Model	Price
120AC4-20MA	
120AC0-10DC	
12/24DC4-20MA	
12/24DC0-10DC	
DPM	
DPMA	
DPMS	
DPM-485	
DPM-232	
DPM-DNET	
DPM-A	
DPM-R	

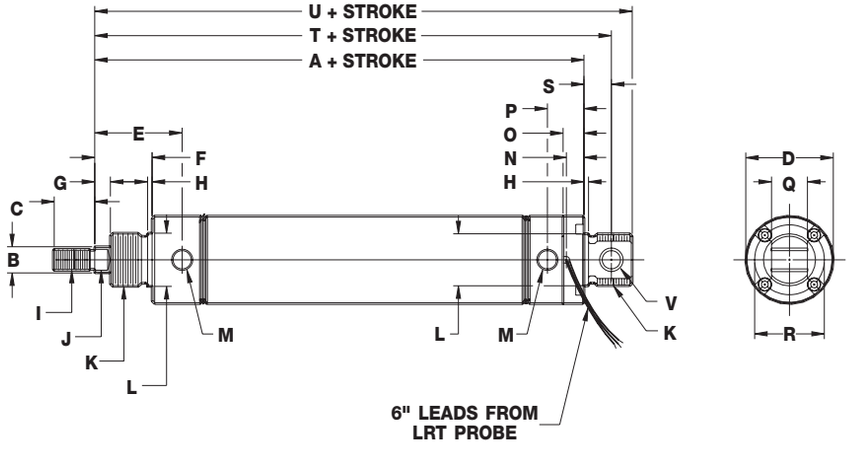
***Cables (required for plug connector - P option)*

Model	Description	Price
C4-S	Straight Female Shielded Cordset IP67, 2m	
C4X-S	Straight Female Shielded Cordset IP67, 5m	
C5	Right Angle Female Shielded Cordset IP67, 2m	
C5X	Right Angle Female Shielded Cordset IP67, 5m	

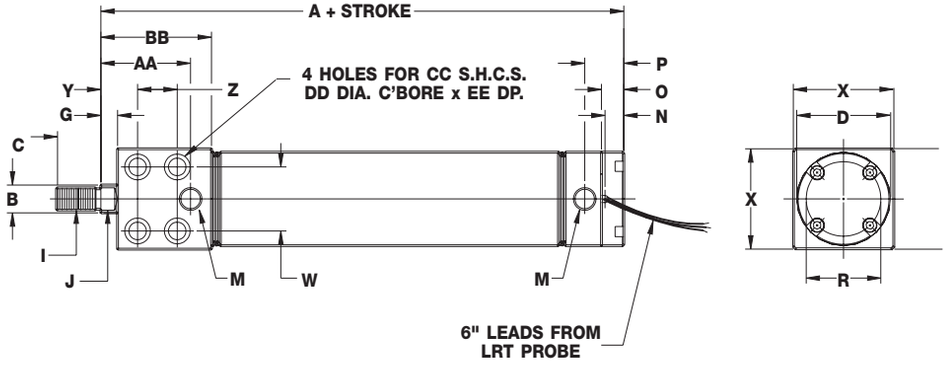
Nose Mount



Universal Mount (for stud or pivot). Includes bushing.



Block Mount



Note: Mounting holes farthest from rod end are omitted for -L option for 11/16" bore.

Dimensions (in.)

	1-1/16" Bore (09)	1-1/2" Bore (17)	2" Bore (31)	2-1/2" Bore (50)	3" Bore (70)
A	4.59	4.88	5.72	6.41	6.78
B	Ø 0.38	Ø 0.50	Ø 0.63	Ø 0.75	Ø 0.75
C	0.63	0.88	1.00	1.25	1.25
D	Ø 1.31	Ø 1.58	Ø 2.09	Ø 2.58	Ø 3.13
E	1.75 / Option L 1.52	1.72	2.10	2.28	2.53
F	1.06	1.13	1.38	1.50	1.69
G	0.31	0.31	0.38	0.44	0.44
H	0.08	0.09	0.11	0.13	0.13
I	3/8-24 UNF	7/16-20 UNF	1/2-20 UNF	5/8-18 UNF	5/8-18 UNF
J	0.31	0.44	0.50	0.63	0.63
K	7/8-14 UNF	1-1/8-12 UNF	1-1/4-12 UNF	1-3/8-12 UNF	1-1/2-12 UNF
L	Ø 0.87	Ø 1.12	Ø 1.25	Ø 1.37	Ø 1.62
M	1/8 NPT	1/4 NPT	1/4 NPT	3/8 NPT	3/8 NPT
N	0.36	0.36	0.42	0.48	0.55
O	0.44	0.44	0.50	0.56	0.63
P	0.84	0.81	0.88	1.12	1.88
Q	0.62	0.74	0.86	0.99	0.99
R	Ø 1.09	Ø 1.36	Ø 1.67	Ø 2.06	Ø 2.44
S	0.47	0.56	0.66	0.75	0.81
T	5.06	5.44	6.38	7.16	7.60
U	5.44	5.91	6.88	7.78	8.22
V	Ø 0.31	Ø 0.38	Ø 0.44	Ø 0.50	Ø 0.50
W	0.88	1.25	1.44	1.88	2.25
X	1.38	1.75	2.25	2.75	3.25
Y	0.75	0.69	0.75	0.88	0.94
Z	0.88	0.75	1.00	1.25	1.38
AA	1.63 / Option L 1.52	1.68	1.75	2.13	2.31
BB	2.03	2.00	2.41	2.72	2.91
CC	#10	1/4	3/8	7/16	1/2
DD	Ø 0.33	Ø 0.41	Ø 0.58	Ø 0.67	Ø 0.77
EE	0.20	0.25	0.39	0.45	0.52

Bumper Length Adder: 0.25”

Bimba Position Feedback Cylinder Rod Lock

How to Order

The model number for all Position Feedback Cylinder Rod Lock actuators consists of three alphanumeric clusters. These designate product type, bore size and stroke length, and mounting style and options.

Please refer to the charts below for an example of model number PFCL-0912-XP. This is a 1-1/16" bore by 12 inch stroke with an Optional Plug Connector and Low Friction seals.

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

Description
Position Feedback Cylinder with Integral Rod Lock

Standard Stroke Lengths
1 = 1"
1.25 = 1.25"
Standard Strokes: 1", 2", 4", 6", 8", 12", 18" and 24"

Options
B - Bumper
EE - Extra Extention
P - Plug Connector

Mounting Style
Blank - Block Front
X - Universal Mount

PFCL - 09 12 - X P

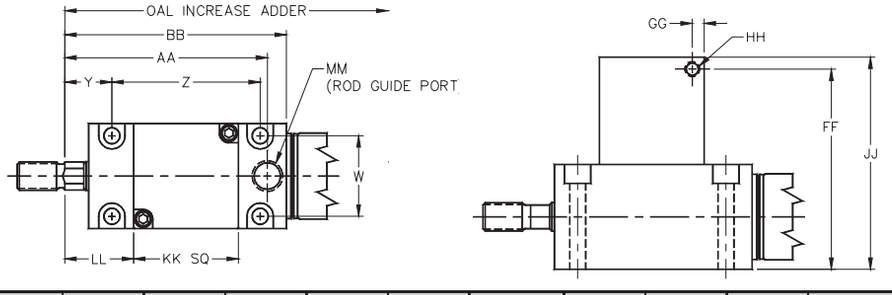
Notes: Low Friction seals on the piston are standard on the PFCL.
Rod Wiper is included on PFCL to keep out any contaminates.
Only available in Block Front Mounting on the Rod Guide.

List Prices

Bore	Base	Stroke Adder (per inch)	Mounting	Options		
			X Universal	B Bumpers	EE Extra Extension (per inch)	P Plug Connector
1-1/16" (09)						
1-1/2" (17)						
2" (31)						
2-1/2" (50)						
3" (70)						

Refer to page 7.7 for accessory, control units, and cable pricing.

Dimensions*

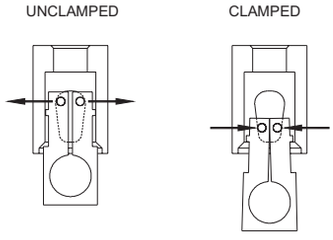


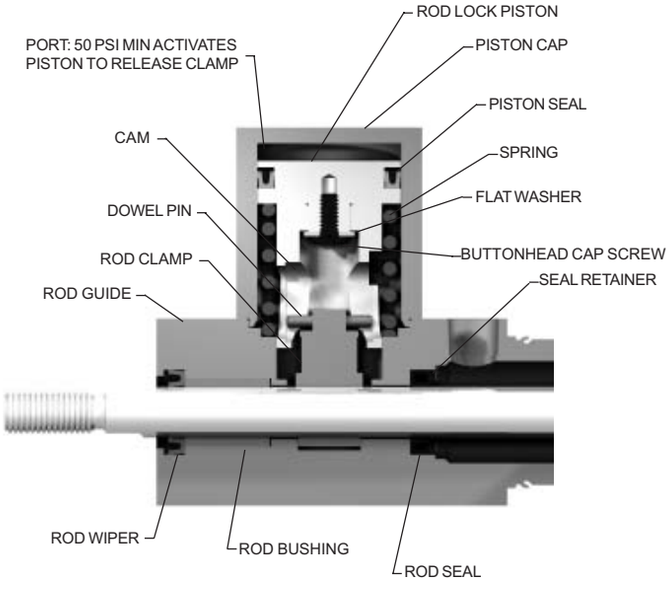
Bore	W	Y	Z	AA	BB	FF	GG	HH	JJ	KK	LL	MM	OAL Increase Adder
1-1/16" (09)	1.06	.62	1.95	2.66	2.91	2.62	.16	#10-32	2.78	1.38	.90	1/8 NPT	1.08
1-1/2" (17)	1.25	.64	2.75	3.36	3.68	3.13	.25	1/8 NPT	3.38	1.75	1.14	1/4 NPT	1.68
2" (31)	1.62	.82	3.13	3.97	4.34	4.20	.38	1/8 NPT	4.45	2.25	1.26	1/4 NPT	1.94
2-1/2" (50)	1.88	.87	3.62	4.62	5.05	5.34	.33	1/4 NPT	3.67	2.75	1.31	3/8 NPT	2.33
3" (70)	2.25	.90	4.17	5.17	5.59	5.86	.50	1/4 NPT	6.28	3.25	1.35	3/8 NPT	2.69

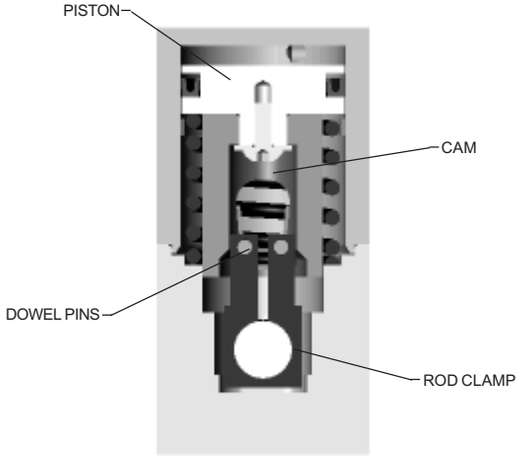
*All other dimensions are same as standard PFC.

How it Works

- Dowel pins ride in the cam groove.
- When air pressure is present, piston actuates and dowel pins follow cam to open position, allowing piston rod to travel freely through clamp.
- In absense of pressure, the spring actuates piston and dowels follow to closed position, activating the rod clamp.







Engineering Specifications*

Operating Medium:	Air
Operating Pressure:	50psi minimum (to actuate lock piston) 125psi maximum
Temperature Range:	-20 to +200 degrees F
Lubrication:	HT-99
Cylinder Body:	304 stainless steel
Rod Guide:	Aluminum
Cap:	Anodized aluminum
Piston and Rod Seal:	Buna-N
Rod and Pivot Bushing:	Sintered bronze
Piston Rod:	Hard chrome plated carbon steel
Expected Service Life:	5 million cylinder actuations 1 million lock actuations

*PFC specifications are on page 7.15.

Rod Lock Holding Forces

Bore	Holding Force (Pounds)
3/4" (04)	40
1-1/16" (09)	90
1-1/2" (17)	170
2" (31)	310
2-1/2" (50)	500
3" (70)	700

Operating Guidelines/Product Precautions

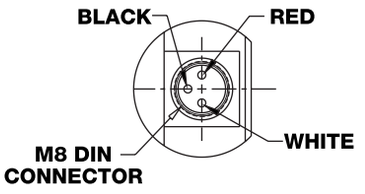
- The Rod Lock is not a safety device.
- Do not use for intermediate stopping; the cylinder is designed to prevent drift from a stationary position.
- Load weight must not exceed the stated holding force for the cylinder.
- Do not release rod lock if full pressure is present on either extend or retract. Uncontrolled motion will result that could damage internal components or cause personal harm.

Options

3-pin Connector

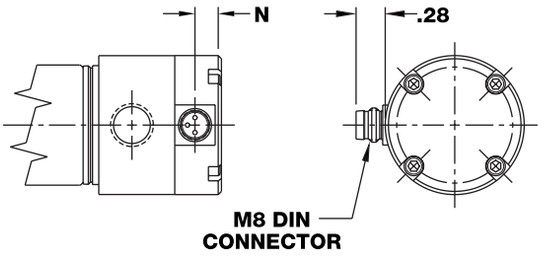
Wire Colors

WIRES	6" LEADS	PLUG
Input	Red	Blue
Ground	Black	Black
Output	White	Brown

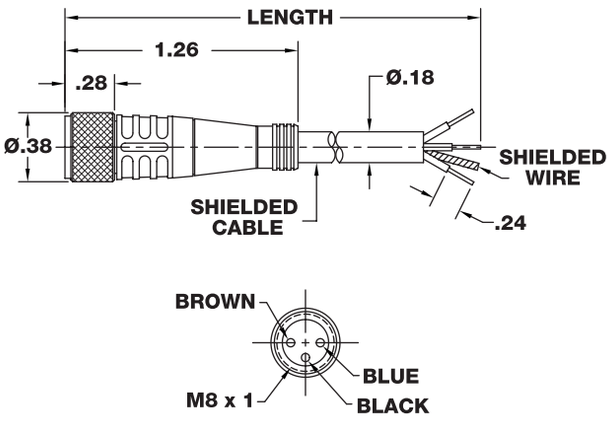


Dimensions (in.)

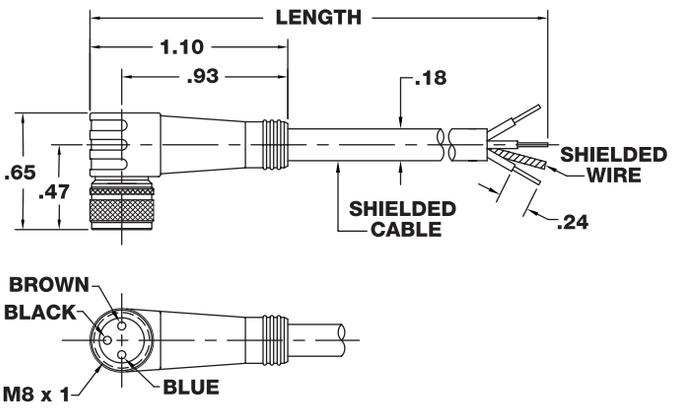
Bore	N
09	0.25
17	0.25
31	0.31
50	0.38
70	0.44



Straight-Models C4-S (2m), C4X-S (5m).



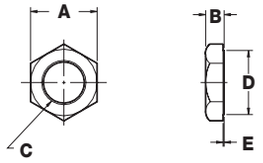
Right Angle-Models C5 (2m), C5X (5m)



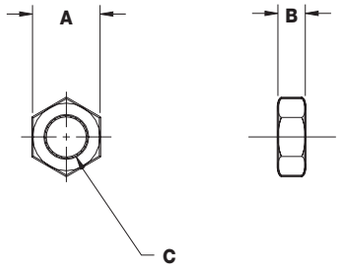
Cable: 24 AWG PVC insulated, fine stranded copper conductors, with Gray PVC jacket

Accessories (in.)

Mounting Nuts



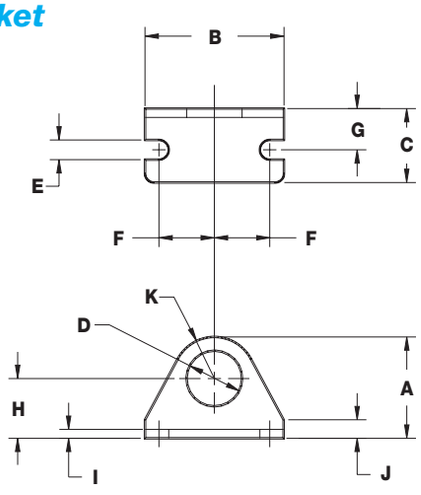
Model D-2540



Models D-2545
D-8484
D-508
D-5379

Bore	Model	A	B	C	D	E
1-1/16" (09)	D-2545	1.31	0.48	7/8-14 UNF-2B	N/A	N/A
1-1/2" (17)	D-8484	1.69	0.61	1-1/8-12 UNF-2B	N/A	N/A
2" (31)	D-508	1.88	0.50	1-1/4-12 UNF-2B	1.81	0.03
2-1/2" (50)	D-2540	1.88	0.50	1-3/8-12 UNF-2B	1.81	0.03
3" (70)	D-5379	2.25	0.50	1-1/2-12 UNF-2B	2.25	0.02

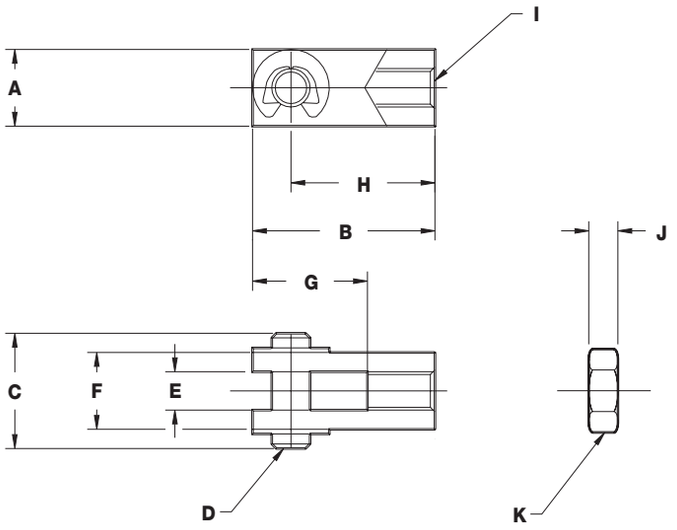
Mounting Bracket



Bore	Model	A	B	C	D	E	F	G	H	I	J
1-1/16" (09)	D-8316	1.75	2.12	1.16	0.875	0.28	0.78	0.66	1.00	0.16	0.32
1-1/2" (17)	D-8318	2.19	2.75	1.44	1.125	0.34	1.06	0.81	1.25	0.19	0.38
2" (31)	D-8319	2.44	3.00	1.59	1.25	0.34	1.19	0.91	1.38	0.22	0.44
2-1/2" (50)	D-8320	2.81	3.75	1.88	1.312	0.41	1.50	1.06	1.62	0.25	0.50
3" (70)	D-19127	3.14	4.38	1.62	1.625	0.34	1.75	1.00	1.89	0.25	0.89

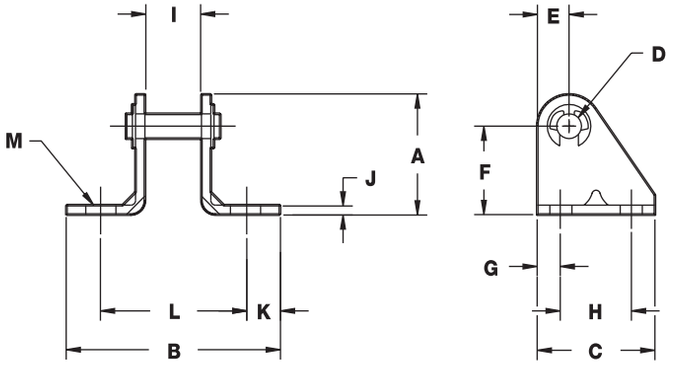
Accessories (in.)

Rod Clevis



Bore	Model	A	B	C	D	E	F	G	H	I	J	K
1-1/16" (09)	D-8310-A	0.62	1.69	0.88	0.312	0.31	0.62	0.94	1.38	3/8-24 THD	0.22	3/8-24 HEX NUT
1-1/2" (17)	D-8311-A	0.75	2.00	1.03	0.375	0.38	0.75	1.12	1.62	7/16-20 THD	0.25	7/16-20 HEX NUT
2" (31)	D-8313-A	0.88	2.31	1.14	0.438	0.44	0.88	1.31	1.88	1/2-20 THD	0.31	1/2-20 HEX NUT
2-1/2" (50) & 3" (70)	D-8314-A	1.00	2.75	1.38	0.50	0.50	1.00	1.50	2.25	5/8-18 THD	0.38	5/8-18 HEX NUT

Pivot Bracket



Bore	Model	A	B	C	D	E	F	G	H	I	J	K	L	M
1-1/16" (09)	D-8322-A	1.31	2.38	1.31	0.312	0.31	1.00	0.25	0.81	0.62	0.16	0.31	1.75	0.28
1-1/2" (17)	D-8324-A	1.62	3.00	1.62	0.375	0.38	1.25	0.31	1.00	0.75	0.19	0.44	2.13	0.34
2" (31)	D-8325-A	1.81	3.25	1.81	0.438	0.44	1.38	0.31	1.19	0.88	0.25	0.44	2.38	0.34
2-1/2" (50) & 3" (70)	D-8326-A	2.12	4.00	2.12	0.50	0.50	1.62	0.38	1.38	1.00	0.25	0.62	2.75	0.41

Engineering Specifications

Repeatability:	±0.001"Cylinder Only. *Refer to specifications in the following sections for positioning or measuring repeatability. Power supply ripple and A/D error may reduce repeatability when PFC is utilized with industrial control systems.*
Nonlinearity:	± 1 percent of full stroke
Resolution:	Infinite
Signal Input:	10 VDC typical
Input Impedance Required:	1 MOhm
Signal Output:	> 0 to slightly less than FS signal input *(The internal electrical stroke is slightly larger than the mechanical stroke of cylinder)*
Maximum speed:	25 in./sec.
Rated Life of LRT Wiper:	1,000[1] miles of travel
Rated Life of Probe:	10 million cycles[1]
Air Requirements:	Filtered to 5 micron with 0 degree dewpoint recommended. Moisture inside cylinder will cause output signal fluctuation.
Pressure Rating:	150 psi
Temperature Rating:	0° to 200°F[2]
Interface:	6" standard leads or optional 8mm DIN connector
Cylinder Body:	304 stainless steel
Piston Rod:	Hard chrome plated carbon steel with blackened threads and wrench flats
Rod Bushing:	Sintered bronze
End Caps:	Anodized Aluminum alloy
Piston Seal:	Internally lubricated urethane (standard) Internally lubricated Buna (L option)
Rod Wiper:	Internally lubricated Buna N (omitted on L option)
Rod Seal:	Internally lubricated Buna N (N/A on standard model)

[1] Higher velocities increase wear rate.

[2] Special low temperature lubrication is required for positioning applications using option L seals below 35°F.

ESTIMATED CYLINDER WEIGHTS (LBS)					
	1-1/16"	1-1/2"	2	2-1/2"	3
PFC-	0.44	0.88	2.02	2.78	3.62
PFC-X	0.49	0.96	2.14	2.96	3.85
PFC-BF	0.54	1.07	2.28	3.02	4.08
ADDER WT/IN	0.06	0.10	0.15	0.20	0.29

Repair Parts

PART	DESCRIPTION
RPFC-Bore Stroke-Options*	Replacement Cylinder
RD-53129-Stroke-Options**	Replacement Probe

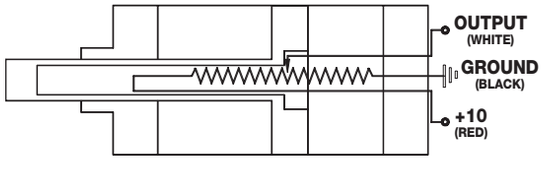
** Only options required are BF, B, and L as Rear Cap is not included.*
*** Only option required for replacement probe is Option P.*

How to Order

Add the bore size, stroke and options needed to the basic model number shown above for a replacement cylinder.

Add the stroke length to the basic model number shown above for a replacement probe. For example, a replacement probe for a 6" stroke Position Feedback Cylinder would be ordered as a RD-53129-6.

LRT CIRCUIT DIAGRAM

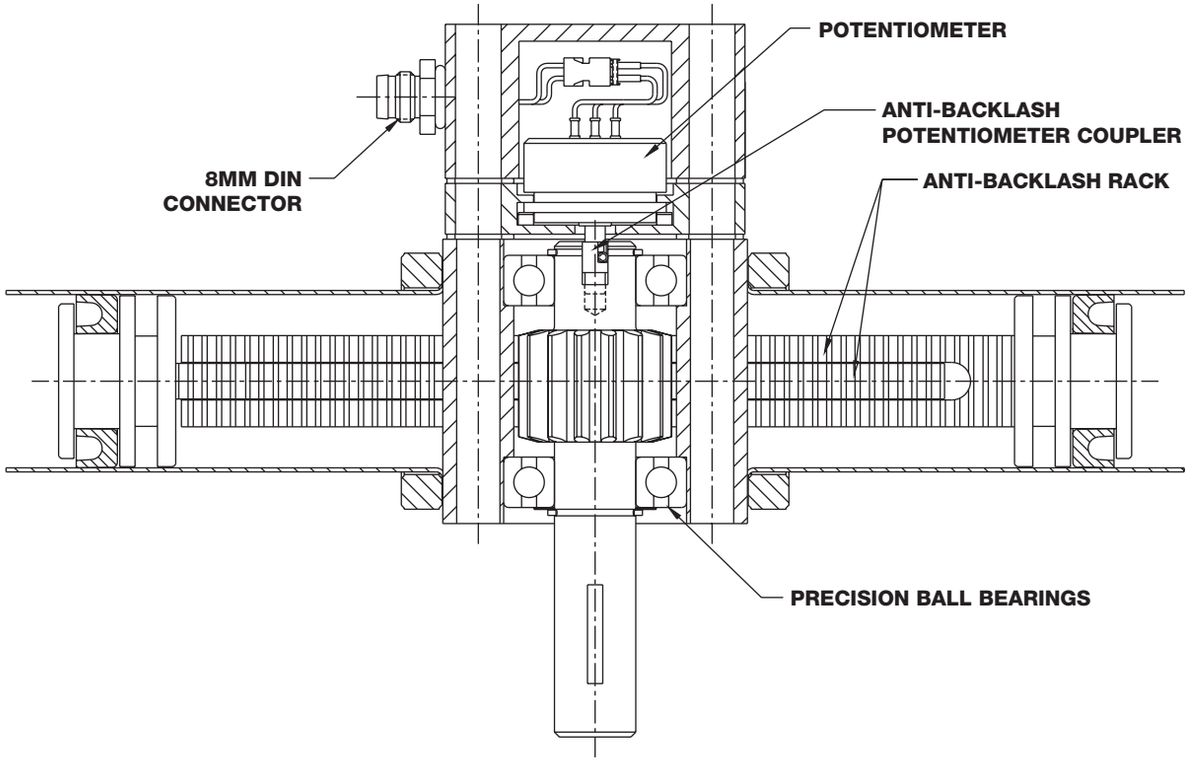


STROKE = 0; OUTPUT VOLTAGE = 0 VOLTS
STROKE = FULL; OUTPUT VOLTAGE = 10 VOL

How it Works

Pneu-Turn® Position Feedback Rotary Actuator - Model PTF

The Bimba Pneu-Turn® position feedback rotary actuator (PTF) provides continuous shaft position sensing. Standard features include shaft ball bearings and the elimination of mid-rotational backlash. Use the Bimba PTF in conjunction with Bimba's Pneumatic Control System (PCS) to achieve rotary shaft positioning accuracy within ±0.5°.



How to Order

The model number of the Pneu-Turn rotary actuator with shaft position feedback capabilities consist of three alphanumeric clusters. These designate product type, series, angle of rotation, and special options. Please refer to the charts below for an example of model number PTF-098180-A1H1. This is a 1-1/2" bore, single rack, 180° angle of rotation actuator with angle adjustment on both sides and the plug connector located on the clockwise side.

PTF-098 180 - A1H1

SERIES - TORQUE FACTOR

098 - 1-1/2" Bore, Single Rack
196 - 1-1/2" Bore, Double Rack
247 - 2" Bore, Single Rack
494 - 2" Bore, Double Rack

PTF base units include ball bearing and anti-backlash options.

To determine theoretical output torque (in-lbs.), place a decimal point between the first and second digits of the series number. Then multiply that number by the air line pressure for the approximate torque produced.

For example, a PT-098 will produce an output torque of .98 times the air line pressure.

STANDARD ANGLE OF ROTATION

045 - 45°
090 - 90°
180 - 180°
325 - 325°

Larger rotational angles are available. Contact your Bimba distributor.

OPTIONS

A1 - Angle adjustment, both sides
A2 - Angle adjustment, counterclockwise rotation
A3 - Angle adjustment, clockwise rotation
B1 - Bumpers, both sides
B2 - Bumpers, counterclockwise rotation
B3 - Bumpers, clockwise rotation
C1 - Cushion, both sides[1]
C2 - Cushion, counterclockwise rotation[1]
C3 - Cushion, clockwise rotation[1]
G - Magnalube® G lubrication
H1 - Plug connector, clockwise side
H2 - Plug connector, back of plate
H3 - Plug connector, bottom of plate
K - Square key
M - MRS® magnetic position sensing
S - Seals, oil service[2]
V - High temperature option (0°F to 250°F)[3]

[1] Cushions will reduce positioning accuracy.

[2] Oil service not recommended for applications at pressures less than 40 psi.

[3] Ball bearing units with high temperature option is 0°F to 250°F.

® Magnalube is a registered trademark of Carleton Stuart Corporation.

Option Combination Availability

Due to design or compatibility restrictions, the following options may **not** be ordered in combination. For example, C (Cushions) and B (Bumpers) are not available in combination.

Option / Series	A	B	C	K	M	S	V
1-1/2" (098)	N/A	C,S	B,S	N/A	V	B,C	M
1-1/2" (196)	N/A	C,S	B,S	N/A	V	B,C	M
2" (247)	N/A	C,S	B,S	N/A	V	B,C	M
2" (494)	N/A	C,S	B,S	N/A	V	B,C	M

Note: Temperature range of ball bearing units with high temperature option is 0ºF to +250ºF.

List Prices

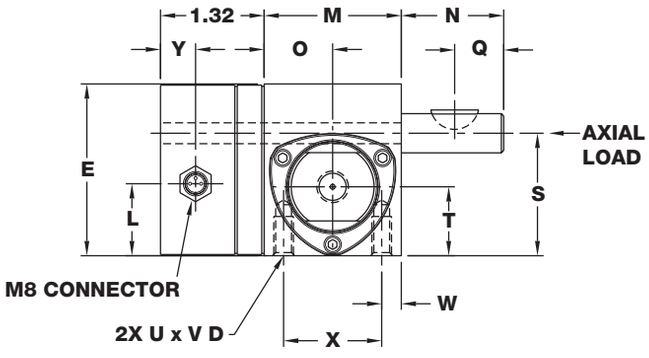
Bore Size and Type	1-1/2"		2"	
	Single (098)	Double (196)	Single (247)	Double (494)
Base Price				
Adder per 45° Rotation				
Angle Adjustment (A1, A2 ,A3)				
Bumper (B1, B2, B3)				
Cushion (C1, C2, C3)				
Square Key (K)				
MRS (M)				
Oil Service Seals (S)				
High Temperature Option (V) Single Rack				
High Temperature Option (V) Double Rack				
AV Combination				
BV Combination				
CV Combination				
SV Combination				

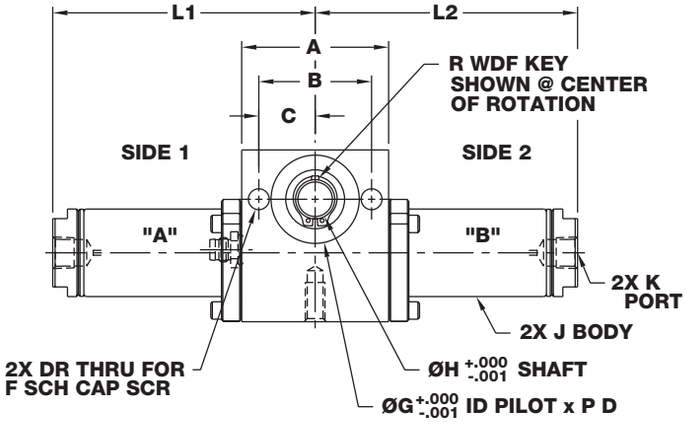
No charge options - G, H1, H2, H3.

Cables

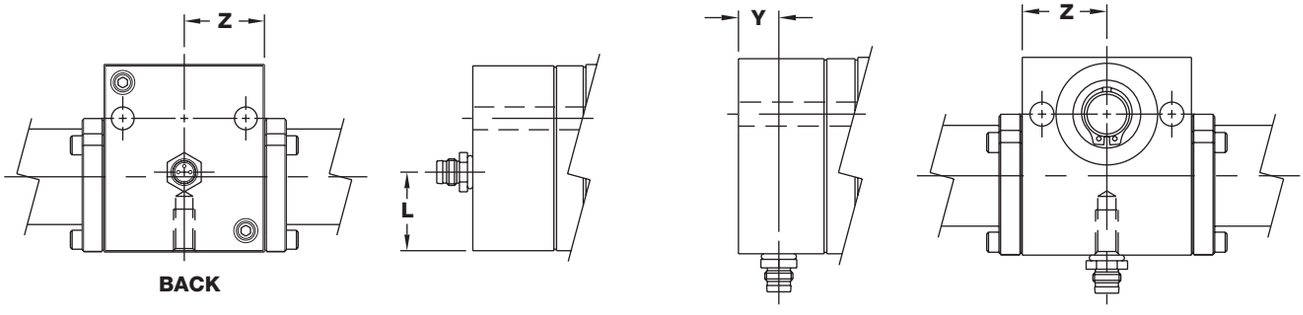
Model	Description	Price
C4-S	Straight female cordset, 2m, IP67, shielded	
C4X-S	Straight female cordset, 5m, IP67, shielded	
C5-S	Right angle female cordset, 2m, IP67, shielded	
C5X-S	Right angle female cordset, 5m, IP67, shielded	

Single Rack Models (in.)





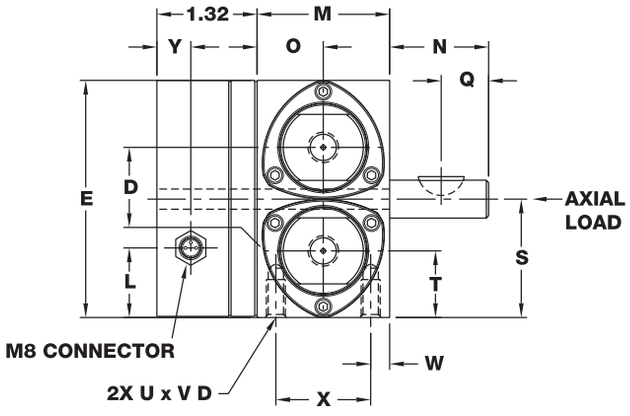
Plug connector shown in standard position.
The H1 option dimensionally positions the connector on the clockwise rotation side.

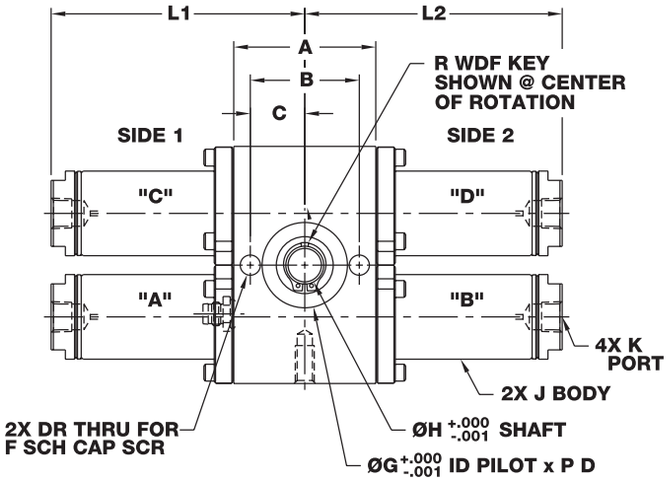


Bore	A	B	C	E	F	G (Ball Bearing I.D. Pilot)	H	J	K	L	M
1-1/2" (098)	2.38	1.81	0.90	2.84	5/16" S.H.C.S.	1.375	0.625	1.56	1/8 NPT	1.449	2.25
2" (247)	3.00	2.38	1.19	3.75	5/16" S.H.C.S.	1.875	0.875	2.08	1/4 NPT	1.918	2.56

Bore	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1-1/2" (098)	1.38	1.12	0.09	0.62	#405	2.09	1.15	5/16-18	0.62	0.31	1.62	0.45	1.19
2" (247)	2.00	1.28	0.10	0.75	#606	2.56	1.28	5/16-18	0.62	0.28	2.00	0.45	1.50

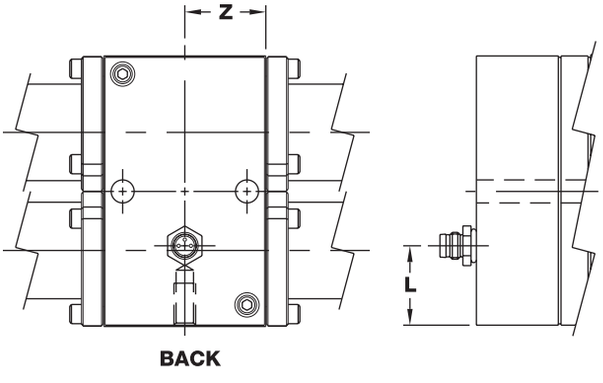
Double Rack Models (in.)



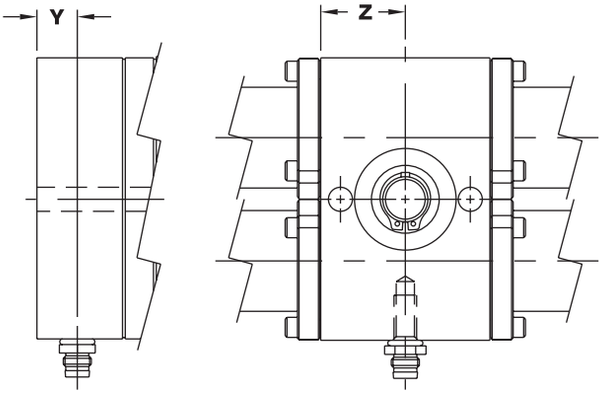


Plug connector shown in standard position.
The H1 option dimensionally positions the connector on the clockwise rotation side.

H2 Option



H3 Option

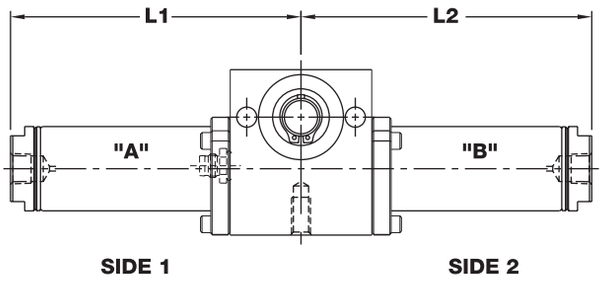


Bore	A	B	C	D	E	F	G (Ball Bearing I.D. Pilot)	H	J	K	L	M
1-1/2" (196)	2.38	1.81	0.90	1.88	4.19	5/16" S.H.C.S.	1.375	0.625	1.56	1/8 NPT	1.449	2.25
2" (494)	3.00	2.38	1.19	2.56	5.13	5/16" S.H.C.S.	1.875	0.875	2.08	1/4 NPT	1.918	2.56

Bore	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1-1/2" (196)	1.38	1.12	0.09	0.62	#405	2.09	1.15	5/16-18	0.62	0.31	1.62	0.45	1.19
2" (494)	2.00	1.28	0.10	0.75	#606	2.56	1.28	5/16-18	0.62	0.28	2.00	0.45	1.50

Single Rack Options (in.)

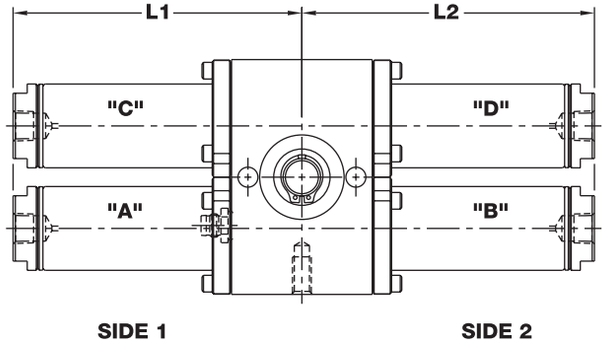
(Dimensional variations from standard as shown)



	1-1/2" (098)		2" (247)	
	L1	L2	L1	L2
Adder per Degree of Rotation	0.0097	0.0097	0.0137	0.0137
Base Unit (No Options)	2.34	2.34	2.84	2.84
Bumper Both Sides (B1)	2.49	2.49	3.04	3.04
Bumper CCW Side (B2)	2.34	2.49	2.84	3.04
Bumper CW Side (B3)	2.49	2.34	3.04	2.84
Cushion Both Sides (C1)	2.98	2.98	3.65	3.65
Cushion CCW Side (C2)	2.34	2.98	2.84	3.65
Cushion CW Side (C3)	2.98	2.34	3.65	2.84
Oil Service Seals (S)	2.77	2.77	3.38	3.38
Oil Service with Angle Adjustment (AS)	3.41	3.41	4.19	4.19

Double Rack Options (in.)

(Dimensional variations from standard as shown)



	1-1/2" (098)		2" (247)	
	L1	L2	L1	L2
Adder per Degree of Rotation	0.0097	0.0097	0.0137	0.0137
Base Unit (No Options)	2.34	2.39	2.84	2.89
Bumper Both Sides (B1)	2.49	2.39	3.04	2.89
Bumper CCW Side (B2)	2.49	2.39	3.04	2.89
Bumper CW Side (B3)	2.49	2.39	3.04	2.89
Cushion Both Sides (C1)	2.98	2.39	3.65	2.89
Cushion CCW Side (C2)	2.98	2.39	3.65	2.89
Cushion CW Side (C3)	2.98	2.39	3.65	2.89
Oil Service Seals (S)	2.77	2.39	3.38	2.89
Oil Service with Angle Adjustment (AS)	3.41	2.39	4.19	2.89

"CCW Side" –
refers to the extreme rotation of the shaft in the counter-clockwise direction as viewed from the mounting pilot side of the actuator.

The location of the optional feature chosen will be on tube B for single rack models and tube C for double rack models.

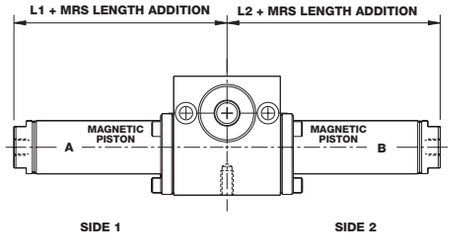
"CW Side" –
refers to the extreme rotation of the shaft in the clockwise direction as viewed from the mounting pilot side of the actuator.

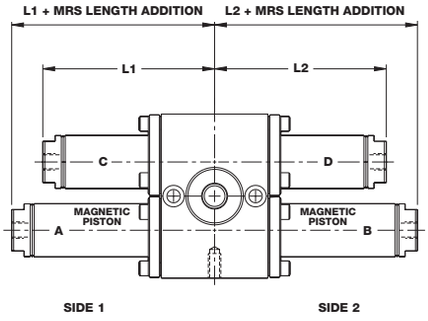
The location of the optional feature chosen will be on tube A for both single and double rack models.

Options

MRS® Magnetic Position Sensing

Magnetic pistons are located on the A and B tubes of both the single and double rack rotary actuators, guaranteeing switch operation at any point in the rotation.

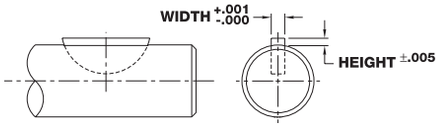




MRS® Length Adder (in.)

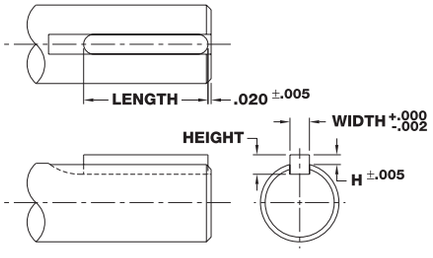
Degrees	098/196	247/494
45°	0.75	0.75
90°	0.53	0.44
180°	0.09	0.00
325°	0.00	0.00

Woodruff Key (in.)



Key No.	Width	Height
405	0.1250	0.063
606	0.1875	0.094

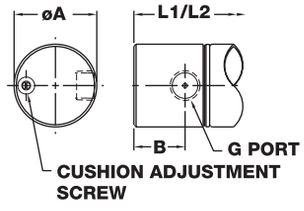
Square Key (in.)



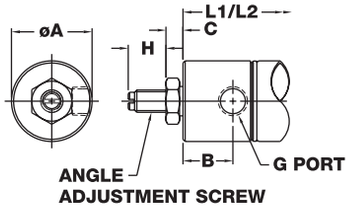
Bore Size	Length	Width	Height	H
1-1/2" (098/196)	0.797	0.188	0.188	0.094
2" (247/494)	1.781	0.250	0.250	0.125

Option Dimensions

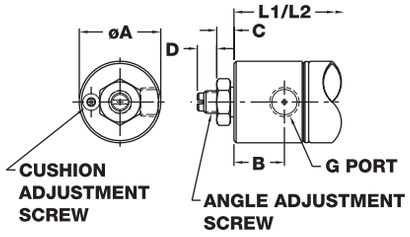
Cushion (C Option) (in.)



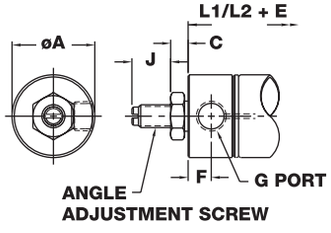
Angle Adjustment with Oil Service Seals (AS Option) (in.)



Angle Adjustment with Cushion (AC Option) (in.)



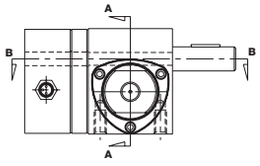
Angle Adjustment (A Option) (in.)

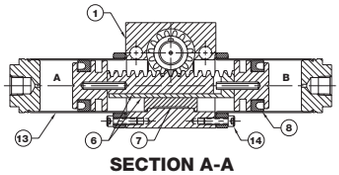


Bore	A	B	C	D	E	F	G	H	J
1-1/2" 098 and 196	1.56	0.77	0.27	0.33	0.42	0.34	1/8 NPT	0.67	0.67
2" 247 and 494	2.08	0.87	0.31	0.49	0.53	0.41	1/4 NPT	0.97	0.97

Repair Parts

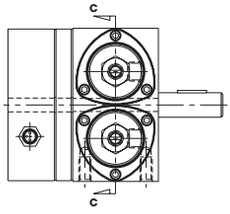
Single Rack Model

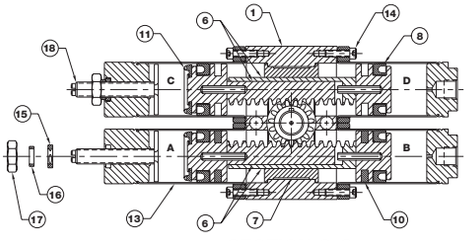




SECTION A-A

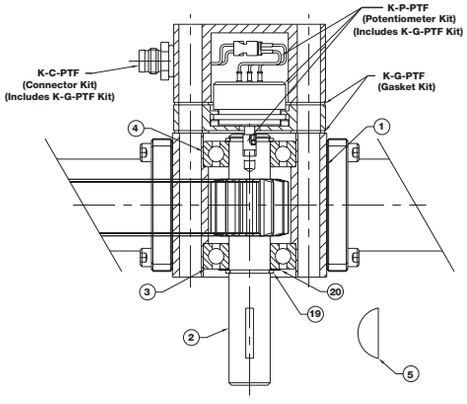
Double Rack Model





SECTION C-C

Ball Bearing® Option



SECTION B-B

Repair Parts

No.	Part Description	Quantity Required	
		Single	Double
PT-1-R	Actuator Body	1	1
PTF-2	Shaft/Pinion Assembly	1	1
PT-3-R	Front Shaft Ball Bearing	1	1
PT-4-R	Rear Shaft Ball Bearing	1	1
PT-5	Shaft Key	1	1
PT-7-X	Rack Support	1	2
PTF-8	Piston Seal[1]	2	4
PT-9	Piston Wear Ring (Required for Oil Service only)	2	2
PT-10	Magnet	2	2
PT-11	Bumper	2	2
PT-13	Cylinder Body Assembly (Includes Body, End Cap, and Retainer Ring)	2	4
PT-14	Cylinder Body Retainer Cap Screw[2]	6	12
PT-15	Cylinder Body Thread Seal	2	2
PT-16	Cylinder Body Thread Seal Ring	2	2
PT-17	Cylinder Body Jam Nut	2	2
PT-18	Angle Adjustment Screw	2	2
PT-19	Retaining Ring	2	2
PT-20	Shim Package	1	1

[1] *Double Rack Models require two repair kits per rotary actuator. Oil Service Option: Single Rack models require four oil service seals or two oil service seal kits. Double Rack models require four oil service seals and two standard seals or two oil service seal kits and one standard seal kit.*

[2] *2" bore requires 8 or 16.*

Repair Kits

Bearing Kit (K-A-PT-R)		
PT-3-R	Front Shaft Ball Bearing	1
PT-4-R	Rear Shaft Ball Bearing	1

Shaft Kit (K-S-PTF)		
PTF-2	Shaft/Pinion Assembly	1
PT-5	Shaft Key	1

Seal Kit (K-L-PTF)		
PTF-8	Piston Seals	2

Gasket Kit (K-G-PTF)	
Gasket	1

Connector Kit (K-C-PTF)	
Connector Assy.	1
Gasket	2

Potentiometer Kit (K-P-PTF)	
Pin Header	1
Potentiometer Assy.	1
Potentiometer Coupler	1
Gasket	2

Engineering Specifications

Repeatability:	± 0.01° (of potentiometer itself)
Nonlinearity:	± .88° (± 0.25% of 340±4°)
Resolution:	Infinite
Signal Input:	10 VDC typical
Input Impedance Required:	100 Kohm
Signal Output:	0 to 10 VDC FS (depends on FS mechanical rotation)
Rated Life of Potentiometer:	10 million cycles
Temperature Coefficient:	± 600 ppm/°C
Electrical Rotation:	340° ±4°

General Specifications

Rotary action of the Pneu-Turn rotary actuator is achieved through the use of a rack and pinion assembly. Just as with any hydraulic or pneumatic cylinder, the speed of rotation may be controlled through the use of flow controls. The PTF may also be controlled with Bimba's Pneumatic Control System, Model PCS.

Care should be taken to insure that the inertial force does not exceed the published torque capacity.

Port Positioning

Ports on the PTF may be repositioned to accommodate any air line configuration by loosening the three body retainer screws. Once desired port positions are obtained, screws must be tightened to specified torque values in the table below.

Lubrication

The PTF is prelubricated at the factory for extensive, maintenance free operation. The life of the rotary actuator can be lengthened by providing additional lubrication with an air line mist lubricator or direct introduction of the oil to the actuator every 500 hours of operation. Recommended oils for Buna N seals are medium to heavy inhibited hydraulic or general purpose oil.

The rack and pinion gear and ball bearings are prelubricated at the factory for extensive maintenance free operation. If additional lubrication is required, use a high grade bearing grease.

Woodruff Key Location

The standard position of the woodruff key is 12 o'clock at the center of rotation.

Ratings

Pressure Rating: 150 psi air or oil with S Option

Rotation Tolerance:
1-1/16" - 2" bore is -0° to +10°. The Angle Adjustment Option allows 45° of adjustability. If cushions are ordered in conjunction with the angle adjustment option, adjustability will be 10°.

Temperature Range: Standard Seals: -20° to 200° F; V Option High Temp seals: 0° to 250°.

Note: If used for positioning applications, it is recommended to use low temperature lubricant for temperatures less than 35°F.

Backlash: Both single and double rack models have zero mid-rotational and end of rotation backlash.

Breakaway: Less than 3 psi.

Series	1-1/2"		2"	
	(098)	(196)	(247)	(494)
Theoretical Torque Capacity (in-lbs/PSI)	0.982	1.963	2.468	4.935
Bearing Load (Axial lbs)	110	110	130	130
Bearing Load (Radial lbs)	425	425	740	740
Distance between bearing midpoints (in)	1.71	1.71	1.82	1.82
Maximum rate of rotation (@ 100 PSI with no load)	1500 deg/sec	1500 deg/sec	1000 deg/sec	1000 deg/sec
Weight (approximate oz)	47	88	103	150
Body Retainer cap screw recommended tightening torque (in-lbs)	20	20	20	20

How It Works

Bimba Pneumatic Control System Model PCS

The Bimba Pneumatic Control System (Model PCS) is designed to control any pneumatic Bimba position feedback actuator. This includes the Position Feedback Cylinder (PFC) for linear motion and the Position Feedback Pneu-Turn (PTF) for rotary motion. The system is a closed-loop electronic controller with pneumatic valves that can accurately position the actuator rod or shaft and hold it in position with a high degree of accuracy and force. The system accomplishes the long term goal of using pneumatic technology to accurately stop and hold the rod or shaft at any desired position.

The standard PCS accepts a 0-10 VDC or 4-20 mA analog command signal. The command signal is used as a reference to move to and hold a specific position. For example, if the application has a stroke of 10 inches (i.e., the electrical zero and span is set for a 10 inch stroke), then a 1 volt change in the command voltage is equal to a 1 inch movement. Similarly, a change in command signal of 0.005 of a volt equals a position change of 0.005 of an inch for the same 10 inch stroke application. If the application has a stroke of 5 inches, a change of 1 volt in the command signal represents a 1/2" inch movement. For rotary applications, the convention is similar. If the application has a rotation of 180 degrees, then a 1 volt change in the command signal is equal to 18 degrees of rotation.

The system utilizes the feedback from the actuator to close the control loop. The control loop compares the system's command signal (the 0-10 VDC or 4-20mA input command signal) to the feedback signal from the actuator. The difference between the command and feedback is referred to as the error term. When the error term is zero, all valves close, trapping air on both sides of the actuator piston. (The error term is considered to be zero when it is within the deadband range. The deadband range is an adjustable range that determines the final repeatability of the system. The Application Sizing chart located later in this section shows recommended deadband ranges for given application parameters.) This holds the rod or shaft at it's commanded position. If some force or weight attempts to move the rod or shaft out of the commanded position, the system will react by increasing the restoring force eventually to full supply pressure, if necessary. Likewise, if the command signal changes, the system will respond to make the feedback equal the command signal.

There are four adjustments on the PCS system, adjustable via four trim pots. They include the Zero, Span, Decel, and Deadband adjustments. The Zero and Span adjustments allow you to set the zero and full scale position of the actuator to match the input (command) signal. The Decel and Deadband adjustments are used to optimize the performance of the system based on application parameters. These adjustments are described in detail in the Operating Manual, which is included with each system.

The actual accuracy/repeatability of the movements will depend on many factors, including signal noise, load, velocity, supply pressure, supply voltage, and application friction. Refer to the Application Sizing charts found later in this section for detailed information regarding sizing and suggestions for your application.

How to Order

The model number for all Pneumatic Control Systems consist of three alpha numeric clusters. These designate product type, flow size, and options. Please refer to the charts below for an example of model number PCS-1-Q. This is a system with a Cv of 0.02 and the Quick Connect connector option.

PCS-1-Q

PNEUMATIC CONTROL SYSTEM

FLOW TYPE

1 - Cv = 0.02
2 - Cv = 0.04
3 - Cv = 0.08
5 - Cv = 0.10
7 - Cv = 0.11
8 - Cv = 0.25

OPTIONS

Blank - No cables or connectors
N - No enclosure
Q - Quick connect receptacles (cables sold separately)

This initial offering covers 1-1/16" (09) through 2" (31) bore size Position Feedback Cylinders. Larger flow PCS Systems are available for the larger bore sizes Refer to TRD Position Control System Product Catalog or contact Bimba for further details. Refer to the Position Feedback Cylinder section (page 7.6) and the Position Feedback Pneu-Turn section (page 7.17) for ordering information regarding either actuator. Ensure that the Position Feedback Cylinder -L option is specified for motion control applications.

*The Cv values are approximated. The velocities for the different systems are shown in the sizing recommendations table.

Note: All PCS units can accept 0-10 VDC or 4-20 mA signals (jumper selectable).

List Prices

Model	Base	Options	
		N	Q
PCS-1			
PCS-2			
PCS-3			
PCS-5			
PCS-7			
PCS-8			

Accessories

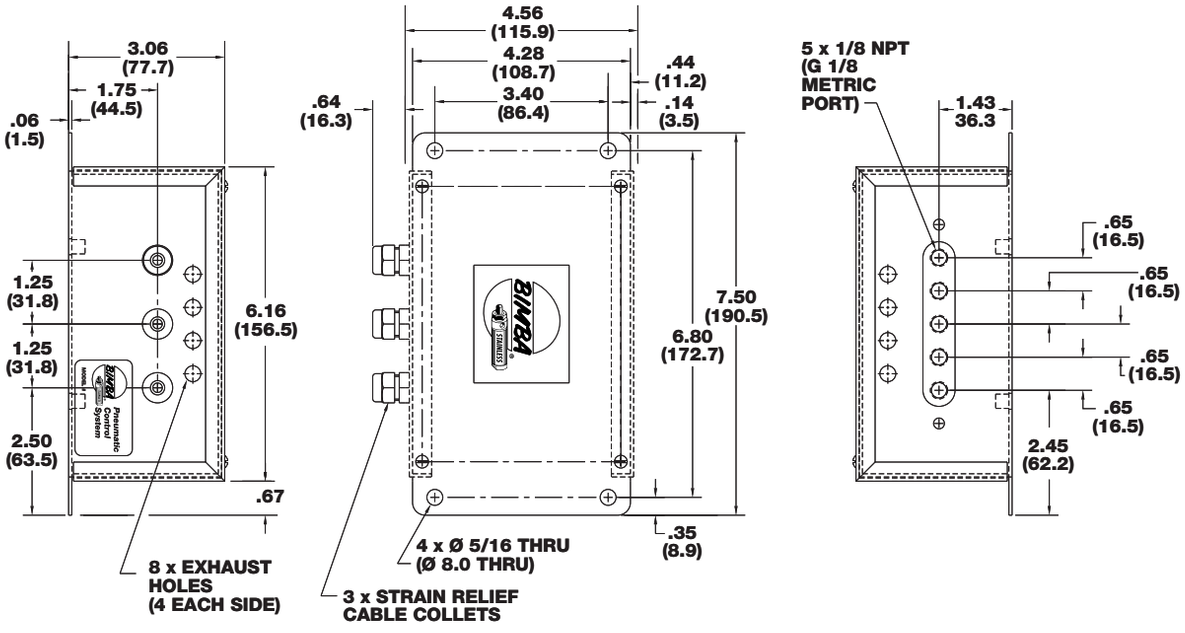
Part Number	Description	Price
PCS-CBL-PWR	2 meter Power Cable for Quick Connect Option	
PCS-CBL-PWR-X	5 meter Power Cable for Quick Connect Option	
PCS-CBL-CMD	2 meter Command Signal Cable for Quick Connect Option	
PCS-CBL-CMD-X	5 meter Command Signal Cable for Quck Connect Option	
PCS-CBL-FBK	2 meter Feedback Cable for Quick Connect Option	
PCS-CBL-FBK-X	5 meter Feedback Cable for Quick Connect Option	

One power, command and feedback cable required if option Q is purchased.

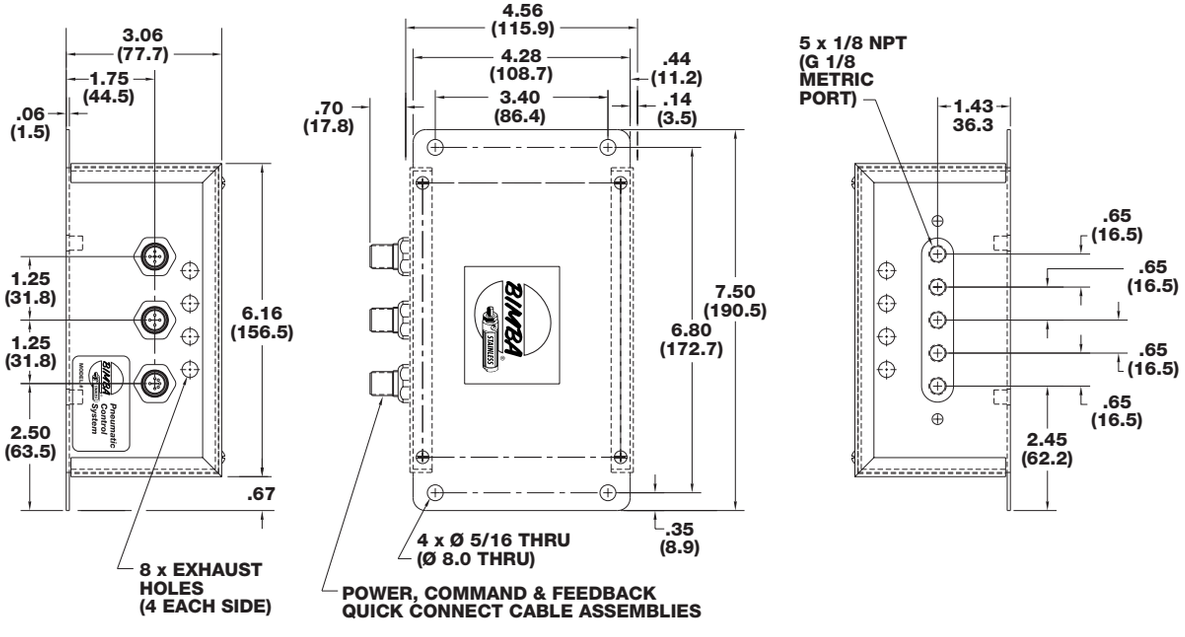
Dimensions

Shown in inches (millimeters)

Enclosure



Option Q
(Quick Connect Receptacal)



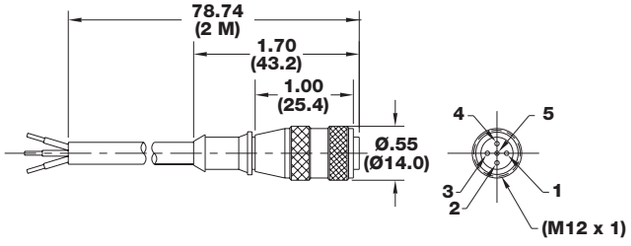
Dimensions

Shown in inches (millimeters)

Quick Connect Cables

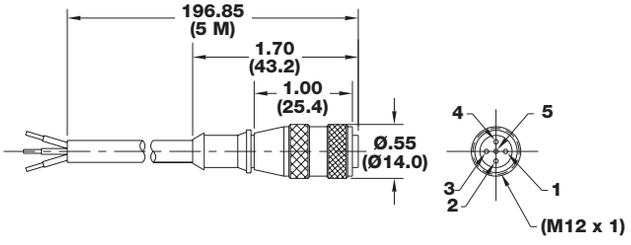
PCS-CBL-PWR

SPECIFICATIONS
5 CONDUCTORS OF 22 AWG LEADS RATED TO 250 V AT 4 AMPS
SHIELDED



PCS-CBL-PWR-X

SPECIFICATIONS
5 CONDUCTORS OF 22 AWG LEADS RATED TO 250 V AT 4 AMPS
SHIELDED



PCS-CBL-PWR Wire Color Codes

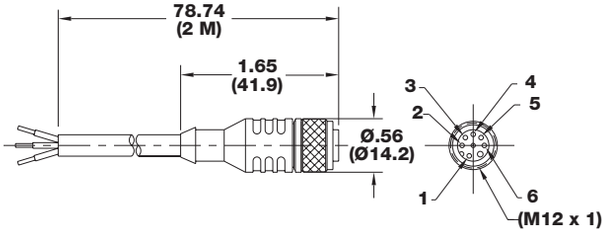
Color	Pin	Description
Brown	1	Positive
White	2	N/C
Blue	3	Negative
Black	4	N/C
Green/ Yellow	5	N/C

PCS-CBL-CMD Wire Color Codes

Color	Pin	Description
Brown	1	Input
White	2	@ Position
Blue	3	Ground
Black	4	Current Position
Grey	5	N/C
Pink	6	N/C

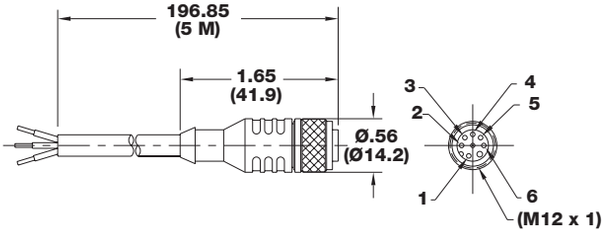
PCS-CBL-CMD

SPECIFICATIONS
6 CONDUCTORS OF 24 AWG LEADS RATED TO EITHER 30 VAC OR 36 VDC AT 4 AMPS
SHIELDED



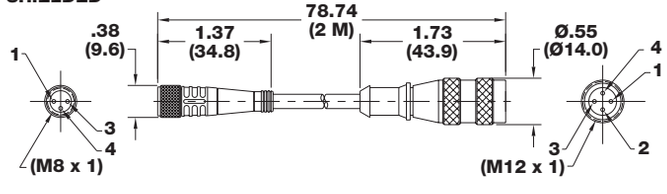
PCS-CBL-CMD-X

SPECIFICATIONS
6 CONDUCTORS OF 24 AWG LEADS RATED TO EITHER 30 VAC OR 36 VDC AT 4 AMPS
SHIELDED



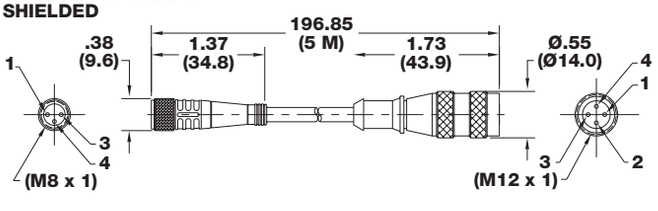
PCS-CBL-FBK

SPECIFICATIONS
3 CONDUCTORS OF 24 AWG LEADS RATED TO 120 V AT 4 AMPS
SHIELDED



PCS-CBL-FBK-X

SPECIFICATIONS
3 CONDUCTORS OF 24 AWG LEADS RATED TO 120 V AT 4 AMPS
SHIELDED

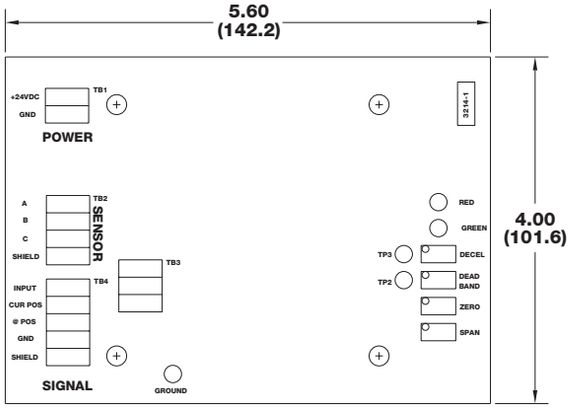


Dimensions

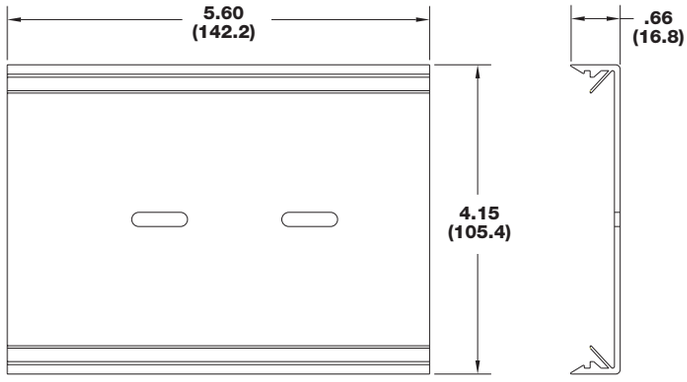
Shown in inches (millimeters)

Option N (No Enclosure)
PCS – 1, 2, 3

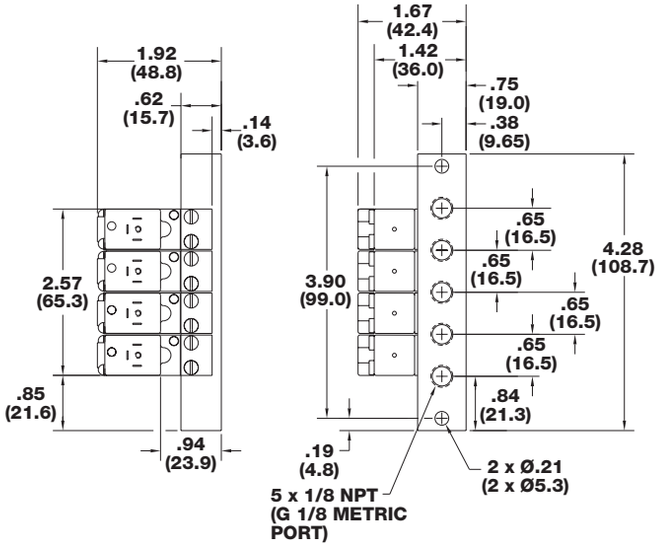
PC Board



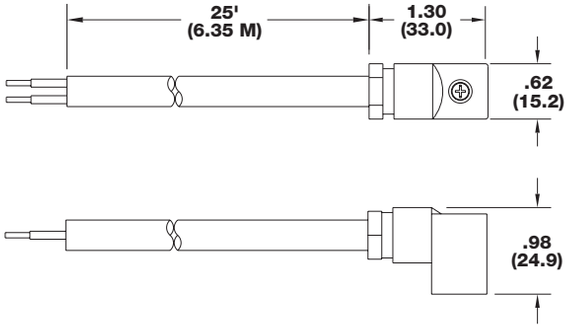
Snap Track



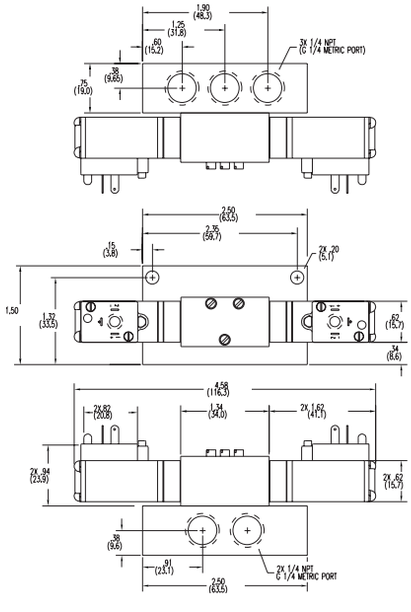
Valve/Manifold



Valve Cable



PCS – 4, 5, 6, 7



Specifications

Description	Specification
Zero Adjustment	50% of total full scale output between both adjustments
Span Adjustment	
DECEL Adjustment	Approximately 0.5 to 13.5 volts
Deadband Adjustment	Approximately 0.005 to 0.500 volts
@ Position	Discrete output that sinks to ground when within deadband zone. **20mA Maximum**
Current Position	0 to 10 VDC signal, 1M ohm input impedence required for input device. Scaled with zero and span adjustments
Operation at Power Loss	All valves close at power loss
Input Supply Voltage	23.5 to 24.5 VDC, 1 amp
Operating Pressure	70 to 80 psig
Air Requirement	Regulated and filtered to 5 micron
Operational Temperature Range	0 to 100 degrees F (Electronics\PC Board)
Reverse Polarity Protected	
Overvoltage Protected	

Application Sizing and "Rules of Thumb"

PFC Cylinder/PCS Valve System Matching and Sizing Recommendations[1]

Bore Size	PCS Model	Stroke Range	Maximum Payload @ Average Velocity (lbs.)	Maximum Average Velocity without overshoot (in/sec)	Maximum External Friction (lbs.)	Zero Friction Deadband Width per inch of stroke	1/2 Maximum Friction Deadband Width per inch of stroke	Maximum Friction Deadband Width per inch of stroke	Minimum Step (in.)
1-1/16" (PFC-09)	PCS-1	2" to 7"	1	2.75	0	0.005"	N/A	N/A	0.08
1-1/16" (PFC-09)	PCS-1	8" to 24"	30	4.00	5	0.004"	0.008"	0.016"	0.2-0.39
1-1/2" (PFC-17)	PCS-1	1" to 3"	2	2.50	0	0.0025"	N/A	N/A	0.04
1-1/2" (PFC-17)	PCS-2	4" to 24"	50	5.50	10	0.002"	0.004"	0.008"	2 times deadband
2" (PFC-31)	PCS-2	1" to 2"	4	2.75	0	0.005"	N/A	N/A	2 times deadband
2" (PFC-31)	PCS-3	3" to 24"	90	6.50	20	0.0015"	0.003"	0.006"	2 times deadband
2-1/2" (PFC-50)	PCS-5	3" to 24"	120	2.00	35	0.009"	0.006"	0.006"	2 times deadband
3" (PFC-70)	PCS-7	3" to 24"	200	2.00	50	0.004"	0.004"	0.006"	2 times deadband
3-1/4"	PCS-7	5" to 24"	235	2.00	60	0.004"	0.004"	0.006"	2 times deadband
4"	PCS-7	3" to 4"	360	2.00	90	0.008"	N/A	N/A	2 times deadband
4"	PCS-8	5" to 25"	360	2.00	90	0.004"	0.004"	0.006"	2 times deadband

[1] *If your application requires lower velocities or payloads, you may be able to reduce the minimum recommended deadband setting, or if your deadband requirements can accommodate a large range, you may be able to increase your payload higher than the recommended values.*

Application Sizing Cont.

Assumptions used for Sizing Values recommendations:

- Values shown in sizing table are with no overshoot. If overshoot is acceptable for your application, the deadband may possibly be less than specified. However, be sure your system cannot go unstable.
- PFC cylinder with Option L is used. (Option L has very low friction seals. The standard PFC utilizes a rod wiper which increases friction significantly, which will have adverse effects on positioning capabilities).
- 80 psi air supply.
- Minimum of 23.5 VDC provided to the PCS.
- Clean Command Signal for Main Control. (<5mV noise/ripple)
- Leak free system (The system will actually perform well with some system leakage, however, the best performance is with no leakage).
- Hard air lines (nylon) between the valves and the actuator.
- No backlash in the system.
- Horizontally guided load. The system can handle vertical or inclined loads and still meet the minimum deadband specified above, however, the velocity may be effected by up to 40%.
- Short air lines allow for better accuracy.

Typical "Rules of Thumb":

- Deviations from the recommended parameters, such as air pressure, power supply voltage, external friction, etc, will negatively effect system performance. However, the system may still perform adequately for your application.
- Applications with loads less than 10% of actuator capacity and strokes greater than 4 inches will yield better repeatability than the minimum deadband shown in the sizing table above.
- Reducing actuator velocity by use of Flow Controls may enable the deadband to be adjusted tighter for a given application. The Flow Controls must be inserted into the exhaust ports of the valve manifold, NOT in the actuator.
- Oversizing the actuator for a given application typically yields better repeatability.
- Generically, following are relative influences on velocity:
  - As Mass increases, Velocity decreases (up to 20%)
  - As Friction increases, Velocity decreases (up to 20%)
  - As Pressure decreases, Velocity decreases (up to 20%)
- Increased Friction decreases repeatability. Maximum external friction should not exceed 20% of the maximum rated payload. Any external friction in the application will degrade system performance. Ensure the system is aligned properly to any guiding systems. Misalignment will cause external application friction.
- A borderline solution can be effective through any/all of the following:
  - sacrificing performance in one area for another,
  - limiting velocity with external flow controls,
  - employing a small central portion of a longer probe,
  - using a larger bore cylinder.
- The PCS system is not suited for applications where accurate velocity control is needed by controlling the rate of command signal change. Flow controls can be used if lower velocities are required.

Do not allow the PCS valves to stay on for prolonged time periods unless the valves are well ventilated, as they may overheat potentially causing damage to the valves.

Application Sizing

PTF Cylinder and PCS Valve System Matching and Sizing Recommendations

Single Rack Model

PTF Single Rack Models Valve Sizing Recommendations						
Bore	Valve	Rotation	Minimal Deadband	Maximum Torque	Average Velocity	Minimum Step
1-1/2"	PCS-1	45° - 325°	28 mV	27 in.-lb.	150° per sec.	2 times deadband
2"	PCS-2	45° - 325°	28 mV	70 in. - lbs.	150° per sec.	2 times deadband

Double Rack Model

PTF Double Rack Models Valve Sizing Recommendations						
Bore	Valve	Rotation	Minimal Deadband	Maximum Torque	Average Velocity	Minimum Step
1-1/2"	PCS-2	45° - 325°	28 mV	55 in.-lb.	150° per sec.	2 times deadband
2"	PCS-3	45° - 325°	28 mV	135 in. - lbs.	150° per sec.	2 times deadband

If your application requires lower velocities or payloads, you may be able to reduce the minimum recommended deadband setting, or if your deadband requirements can accommodate a large range, you may be able to increase your payload higher than the recommended values.

**Testing was performed with an offset load in a vertical direction. Performance will improve with a balanced payload and the plane of motion is horizontal.

Deadband voltage conversion to shaft displacement

- The following formula can be used to convert the deadband voltage to displacement:

w = 1/10V * t , where w = deadband width, V = voltage reading from the PCS, t = full scale travel of the actuator (Note: for PTF rotary actuators with total rotation less than 180° always make t = 180)

Example: If the deadband is set for 30mV (0.03 of a volt) for a 180° actuator, the width of the deadband zone will be 1/10 * .028 * 180 = ±0.50°.

Specification Comments

- PTF Feedback signal 0 to 10 VDC only.
- Bearing Loads - Maximum Axial and Radial loads are identical to the standard Pneu-Turn with the ball bearing option.
- Maximum Allowable Kinetic Energy is identical to the standard Pneu-Turn with Cushions.
- Refer to the PCS New Product Bulletin for additional PTF performance information.

Application

Example

The following section will review two examples, one example shows a PFC application, and the second example shows a PTF rotary example.

PFC Example

Let's say we have just finished the installation procedure for a Bimba PFC Cylinder with 10 inches of stroke, and are using a 0-10 VDC input command signal. There is a retracted hard stop at 1.5 inches of cylinder stroke and an extended hard stop at the 9.0 inches of cylinder stroke.

Therefore:

- After adjusting the Span setting, 10 volts is equivalent to 9.0 inches of cylinder rod extension.
- After adjusting the Zero setting, 1.5 inches of cylinder rod extension will equal 0 volts.

Therefore, 0 to 10 volts covers the 7.5 inch (9.0" - 1.5") range of motion .

Using the following formula:

The command signal can be translated into actuator displacement with the following formula:

$$CS = d * R / t + Z$$

where:

CS = the command signal required to achieve a desired position

d = the displacement the desired position is from the zero position

R = the full range of the command signal

t = full scale travel of the actuator (Note: for PTF rotary actuators with total rotation less than 180° always make t = 180)

Z = the command signal for the zero position

Application

To command the PFC to go to a position that is 2.0 inches extended from the retracted hard stop, the command signal would be calculated as follows:

CS = 2 x 10/7.5 + 0 = 2.667 VDC Command Input Signal

If a 4-20 mA signal is used, the command input signal would be calculated as follows:

CS = 2 x 16/7.5 + 4 = 8.267 mA Command Input Signal

*Note: The positional repeatability of the system will be determined by the Deadband adjustment. If the deadband was adjusted to +\– 20mV in this example, the system would position to the 2 inch position within +\– 0.015" (w =0.1 (V) * t).*

PTF Example

Let's say we have just finished the installation procedure for a Bimba PTF Rotary actuator with 200 degrees of rotation, and a 0-10 VDC command input signal. There is a zero rotational hard stop at 10 degrees of rotation and a full scale rotational hard stop at 190 degrees of rotation.

Therefore:

- After adjusting the Span setting, 10 volts is equivalent to 190 degrees of rotation.
- After adjusting the Zero setting, 10 degrees of rotation will equal 0 volts.

Therefore, 0 to 10 volts covers 180 degrees (190 - 10) of motion .

To command the actuator shaft to rotate to a position that is 45 degrees rotated from the zero hard stop, the command voltage would be calculated as follows:

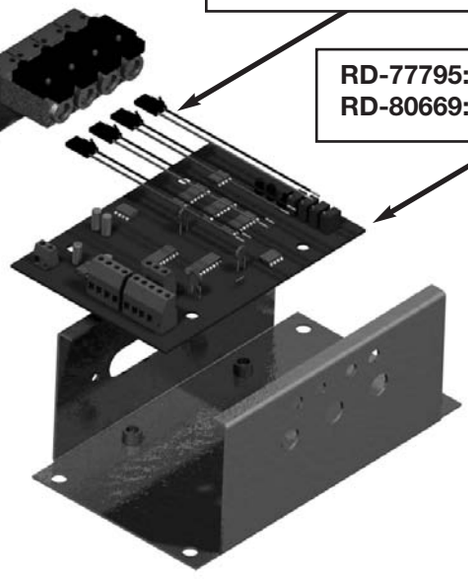
CS = 45 x 10/180 + 0 = 2.50 VDC Input Command Signal

If a 4-20 mA input command signal is used, the command input would be calculated as follows:

CS = 45 x 16/180 + 4 = 8 mA Command Input Signal

*Note: The positional repeatability of the system will be determined by the Deadband adjustment. If the deadband was adjusted to +\– 20mV in this example, the system would position to the 45 degree position within +\– 0.36 degrees (w = 0.1 (V) * t).*

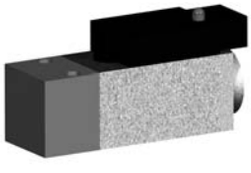
PCS Repair Parts Breakdown



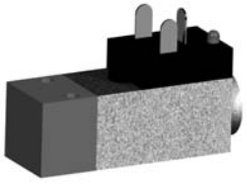
RD-82635: GRN/BLK Electronic Wire Harness
RD-82636: RED/BLK Electronic Wire Harness

RD-77795: PCS-1 thru PCS-3 PC Board
RD-80669: PCS-4 thru PCS-8 PC Board

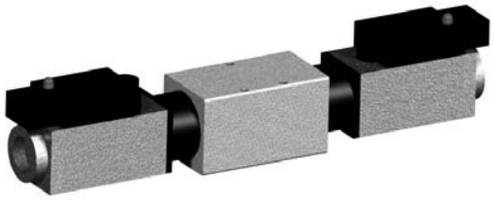
RD-82480: PCS-1 Valve Manifold Assy
RD-82481: PCS-2 Valve Manifold Assy
RD-82482: PCS-3 Valve Manifold Assy



RD-78913: PCS-1 Std Valve
RD-78915: PCS-2 Std Valve
RD-78917: PDCS Std Valve



RD-78914: PCS-1 DIN Valve
RD-78916: PCS-2 DIN Valve
RD-78918: PDCS DIN Valve



RD-80670: PCS-4 Thru PCS-8 Std. Valve Assy

Note: *The PCS-4 thru PCS-8 systems use the same valve, the difference is the orifice sizes in the manifold.*

Repair Parts

Part Number	Description	List Price
RD-77795	PCS 1 thru 3 PC Board	
RD-80262	PCS 1 thru 3 PC Board-Option C	
RD-80669	PCS 4 thru 8 PC Board	
RD-77296	500 Ohm Plug in Resistor for Option C	
RD-77796	Snap Track for Option N	
RD-77797	Option N Cable (each)	
RD-82635	Grn/Blk Electronic Wire Harness	
RD-82636	Red/Blk Electronic Wire Harness	
RD-78913	PCS-1 Valve (Std Electronic Connector)	
RD-78914	PCS-1 Valve (DIN Connector Option N)	
RD-78915	PCS-2 Valve (Std Electronic Connector)	
RD-78916	PCS-2 Valve (DIN Connector Option N)	
RD-78917	PCS-3 Valve (Std Electronic Connector)	
RD-78918	PCS-3 Valve (DIN Connector Option N)	
RD-78919	PCS -1, -2, -3 Valve Mainfold**	
RD-82480	PCS-1 Valve Manifold Assembly (Std)*	
RD-82481	PCS-2 Valve Manifold Assembly (Std)*	
RD-82482	PCS-3 Valve Manifold Assembly (Std)*	
RD-77798	PCS-1 Valve Manifold Assembly (DIN)*	
RD-77799	PCS-2 Valve Manifold Assembly (DIN)*	
RD-77800	PCS-3 Valve Manifold Assembly (DIN)*	
RD-80670	PCS-4 THRU 8 Valve (Electronic Connector)	
RD-80671	PCS-4 THRU 8 Valve (DIN Connector)	
RD-80672	PCS-4 Std. Manifold**	
RD-80673	PCS-5 Std. Manifold**	
RD-80674	PCS-6 Std. Manifold**	
RD-80675	PCS-7 Std. Manifold**	
RD-82634	PCS-8 Std. Manifold**	
RD-80676	PCS-4 Manifold Option N	
RD-80677	PCS-5 Manifold Option N	
RD-80678	PCS-6 Manifold Option N	
RD-80679	PCS-7 Manifold Option N	
RD-82633	PCS-8 Manifold Option N	

*Includes four valve mounted on the manifold
** Includes one manifold and no valves

DPM Series Application

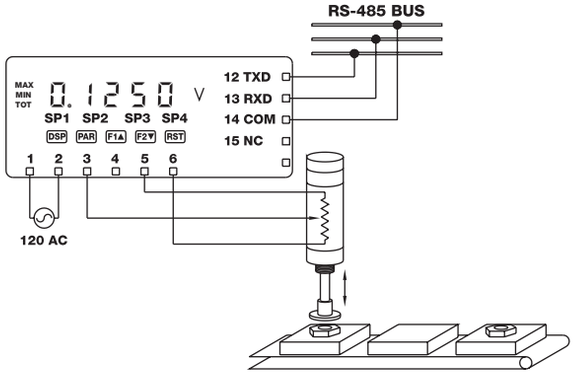
Bimba Digital Panel Meter Model DPM Application Example

The DPM controller is ideal for measuring and gauging applications. The measurement repeatability, when combined with the PFC, is 0.001 inch per inch of stroke. The DPM supplies the PFC with a very accurate excitation voltage and has a 16 bit A/D converter. The DPM/PFC combination can be used as a Go/No Go gauge for in process quality control, among other things. A typical application follows:

Desired Result: In line process control verification to determine if parts meet required specifications.

Example One

The DPM is used in conjunction with a PFC cylinder to verify part specifications during an assembly process, ensuring quality of parts. RS-485 communications are used to monitor the PFC displacement remotely from the DPM. (The RS-485 protocol allows up to 32 devices to be connected to one port, and is less susceptible to signal noise since the analog to digital conversion is done in the DPM controller, utilizing the same power supply and ground planes as the PFC.) This information will be read by a PLC. The PLC determines what should be done to the part based on the displacement values read. (i.e., Send part on to the next process, or divert to rework station.) Use the DPM/PFC combination to verify if nuts are present and tightened correctly by checking the height of the nut. Calibrate the DPM using four calibration points-zero, LCL (lower control limit), UCL (upper control limit), and full scale. Refer to the Quick Start Guide, or the DPM manual shipped with each



control unit for instructions. Configure the PLC with an RS-485 communication port. Program the PLC ladder logic according to your particular application. The ladder logic can be written to accommodate different sets of specifications for different product lines, making set up for the different products much easier and less time consuming.

Example Two

Read the programmable alarm outputs of the DPM from a PLC input card. The DPM outputs can be used to determine if a part measures to the proper tolerance or not. Alarm output one can be programmed to turn on at the upper control limit (UCL) of the part specification, and alarm output two can be programmed to turn on at the lower control limit (LCL) of the part specification. When the PFC is extended to measure the part, the PLC can read the DPM setpoint alarm outputs to determine if the part conforms to the proper specifications. After the PFC is extended against the part, the PLC reads the DPM outputs. If no setpoint alarm turns on, this means that the PFC displacement is above the UCL, and the part is too big. If setpoint alarm one is on, this means that the part is in the good tolerance zone. If both setpoint alarms are on, this means that the part is either too small, or the part is not present.

Model DPM – 1/8 DIN Universal DC Input Panel Meter

Bimba Model DPM Digital Set Point Controller

The Bimba DPM may be used with the Position Feedback Cylinder. The controller provides a digital LED readout that may be calibrated to indicate the position of the cylinder in desired units. The PFC/DPM combination is ideal for measuring and gauging applications. The controller includes the following features:

- *PFC Compatible Excitation and Input Impedance*
- *120 VAC Input Voltage*
- *16 Point Calibration Feature for Increased PFC Linearity*
- *Max and Min Reading Memory*
- *5 Digit Display*
- *Programmable Function Keys*
- *Optional Serial Communication, Including RS-232, RS-485 and DeviceNet®*
- *Optional Analog Card with 16 bit Resolution*
- *NEMA 4X/IP65 Sealed Front Bezel*
- *CE Compliant*
- *Fast Input and Output Rates-Programmable*

General Description

The DPM embodies many features and performance capabilities to suit a wide range of indication requirements. The meter employs advanced technology for stable, drift free readout, while incorporating features that provide flexibility now and in the future with Plug-in option cards. The option cards afford the opportunity to easily configure the meter for the needs of the present while providing an upward migration path as control and indication needs evolve.

The DPM provides a precision excitation compatible for Bimba's PFC. 16-point input scaling feature improves PFC linearity if necessary. The meter provides a Max and Min reading memory with programmable capture time. The capture time is used to prevent detection of false max and min readings which may occur during start-up or unusual process events.

The signal totalizer (integrator) can be used to compute a time-input product. This can be used to provide a readout of totalized flow, calculate service intervals of motors and pumps, etc. The totalizer can also accumulate batch weighing operations.

The DPM comes standard with four sourcing setpoint outputs. The setpoint alarms can be configured in modes to suit a variety of control and alarm requirements.

- High and low absolute, high and low deviation and band acting
- Balanced or unbalanced hysteresis
- On and off delay timers
- Auto reset or latching modes
- Reverse phase output and/or panel indicator
- Selection of alternate list of setpoint values

Optional accessory cards also facilitate bus communications. These include RS232, RS485 and DeviceNet. Readout values and setpoint alarm values can be controlled through the bus. Additionally, the meter has features that allow a remote computer to directly control the outputs of the meter. This is useful during commissioning phases and diagnostic use. With a communication card installed, set-up software allows configuration from a PC. The configuration data can be saved to a file for later recall. Contact Bimba for information if required.

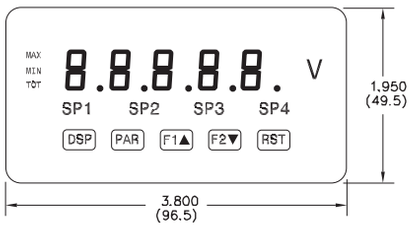
Once the meter has been initially configured, the parameter list may be locked out from further modification in it's entirety or only the setpoint values can be made accessible.

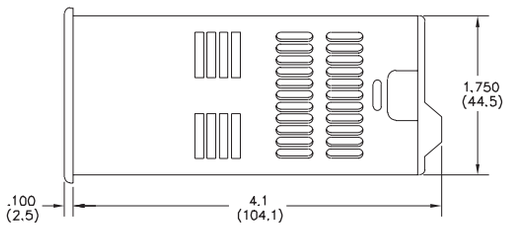
The meter has been specifically designed for harsh industrial environments. With NEMA4 X/IP65 sealed bezel and extensive testing of noise effects to CE requirements, the meter provides a tough and reliable local readout.

CAUTION: Read complete instructions prior to installation and operation of the unit.

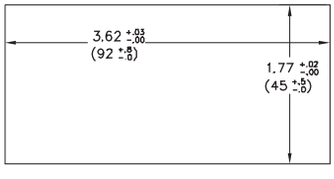
CAUTION: Risk of electric shock.

Dimensions "In Inches (mm)"





PANEL CUT-OUT



Note: Recommended minimum clearance (behind the panel) for mounting clip installation is 2.1" (53.4) H x 5.5" (140) W.

DPM Specifications

1. **DISPLAY**: 5 digit, 0.56" red LED, (-19999 to 99999)
2. **POWER**: 85 to 250 VAC, 50/60 Hz, 15 VA
   Isolation: 2300 Vrms for 1 min. to all inputs and outputs.
3. **ANNUNCIATORS:**
   MAX - max readout selected
   MIN - min. readout selected
   TOT - totalizer readout selected, flashes when total overflows
   SP1 - setpoint alarm 1 is active
   SP2 - setpoint alarm 2 is active
   SP3 - setpoint alarm 3 is active
   SP4 - setpoint alarm 4 is active
   Units Label - software controlled units label backlight
4. **KEYPAD**: 3 programmable function keys, 5 keys total
5. **A/D CONVERTER**: 16 bit resolution
6. **UPDATE RATES**:
   A/D conversion rate: 20/readings sec
   Step response: 200 msec. max. to within 99% of final readout value (digital filter and internal zero correction disabled)
   700 msec. max. (digital filter disabled, internal zero correction enabled).
   The meter periodically (every 12 seconds) imposes a 500 msec delay to compensate for internal zero drift. If the delay affects applications where step response is critical, it can be defeated. Set the display update to 20/sec to disable. In this case, add a zero error of 0.1% FS over the 0 to 50°C range.
   Display update rate: 1 to 20 updates/sec
   Setpoint output on/off delay time: 0 to 3275 sec
   Analog output update rate: 0 to 10 sec
   Max./Min. capture delay time: 0 to 3275 sec
7. **RANGE OVERLOAD RESPONSE**:
   Display flashes [OLOL] at approximately 105% above range
   Display flashes [ULUL] at approximately -5% below range
8. **DPM PFC INPUT**:

Accuracy* (18 to 28C)	Accuracy* (0 to 50C)	Impedance/ Compliance	Max Continuous Overload	Resolution
0.03% of reading +3 mV	0.12% of reading + 4 mV	1.066 Mohm	300 V	1mV

* After 20 minute warm-up. Accuracy is specified in two ways: Accuracy over an 18 to 28°C and 10 to 75% RH environment; and accuracy over a 0 to 50°C and 0 to 85%RH (non-condensing environment). Accuracy over the 0 to 50°C range includes the temperature coefficient effect of the meter.

9. **EXCITATION POWER**:
   9V ±4% initial value regulated, 130 mA max.
10. **LOW FREQUENCY NOISE REJECTION**:
    Normal Mode: > 60 dB @ 50 or 60 Hz ±1%, digital filter off
    Common Mode: >100 dB, DC to 120 Hz
11. **USER INPUTS (Logic Level)**: Three software defined user inputs, jumper selectable for sink/source logic
    Max. Continuous Input: 30 VDC

INPUT STATE	SINKING INPUTS (DEFAULT) 22 KΩpull-up to +5 V	SOURCING INPUTS 22 KΩ pull-down
Active	V_{IN} < 0.7 VDC	V_{IN} > 2.5 VDC
Inactive	V_{IN} > 2.5 VDC	V_{IN} < 0.7 VDC

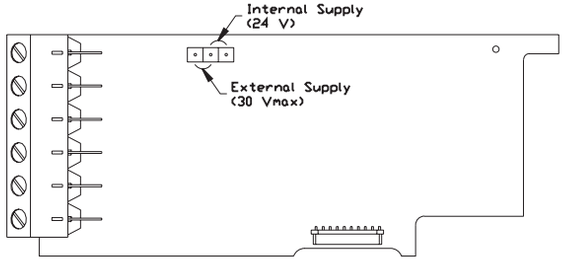
Isolation To Sensor Input Common: Not isolated

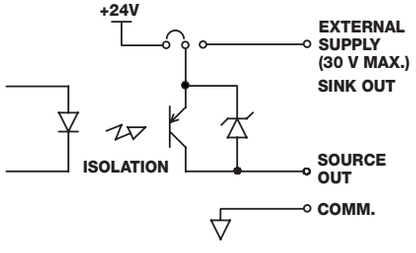
12. **TOTALIZER**:
    Time Base: second, minute, hour, or day
    Time Accuracy: 0.01% typical
    Decimal Point: 0 to 0.0000
    Scale Factor: 0.001 to 65.000
    Low Signal Cut-out: -19,999 to 99,999
    Total: 9 digits, display alternates between high order and low order readouts
13. **CUSTOM LINEARIZATION**:
    Data Point Pairs: Selectable from 2 to 16
    Display Range: -19,999 to 99,999
    Decimal Point: 0 to 0.0000
14. **SERIAL COMMUNICATIONS**: (RS232 or RS485)
    Isolation To Sensor & User Input Commons:
    500 Vrms for 1 min.
    Working Voltage: 50 V
    Not Isolated from all other commons.
    Data: 7/8 bits
    Baud: 300 to 19200
    Parity: no, odd or even
    Bus Address: selectable 0 to 99, Max. 32 meters per line (RS485)
    Transmit Delay: Selectable for 2 to 50 msec or 50 to 100 msec (RS485)
15. **ANALOG OUTPUT** :
    Types: 0 to 20 mA, 4 to 20 mA or 0 to 10 VDC
    Isolation To Sensor & User Input Commons: 500 Vrms for 1 min.
    Working Voltage: 50 V
    Not Isolated from all other commons.
    Accuracy: 0.17% of FS (18 to 28°C); 0.4% of FS (0 to 50°C)
    Resolution: 1/3500
    Compliance: 10 VDC: 10 KΩ load min.
    20 mA: 500 W load max.
16. ***Quad Sourcing Open Collector:***
    (Standard with DPM):

QUAD SOURCING OUTPUT FIELD TERMINALS

20	– EXTERNAL SUPPLY
21	– 01 SRC.
22	– 02 SRC.
23	– 03 SRC.
24	– 04 SRC.
25	– COMMON

Type: Four isolated sourcing PNP transistors.
Isolation To Sensor & User Input Commons: 500 Vrms for 1 min.
Working Voltage: 50 V
Not Isolated from all other commons.
Rating: Internal supply: 24 VDC ± 10%, 30 mA max. total all four outputs.
External supply: 30 VDC max., 100 mA max. each output.

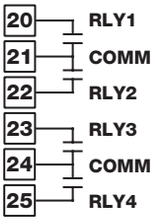




DPM Specifications Cont.

Optional Quad Relay Card:
(Optional Accessory Card DPM-R):

QUAD RELAY OUTPUT FIELD TERMINALS



Type: Four FORM-A relays
Isolation To Sensor & User Input Commons: 2300 Vrms for 1 min.
Contact Rating: One Relay Energized: 3 amps @ 250 VAC or 30 VDC (resistive load), 1/10 HP @120 VAC, inductive load. Total current with all four relays energized not to exceed 4 amps
Life Expectancy: 100K cycles min. at full load rating. External RC snubber extends relay life for operation with inductive loads.

17. **ENVIRONMENTAL CONDITIONS**:
Operating Temperature Range: 0 to 50°C (0 to 45°C with all three plug-in cards installed)
Storage Temperature Range: -40 to 60°C
Operating and Storage Humidity: 0 to 85% max. non-condensing
Altitude: Up to 2000 meters
18. **CERTIFICATIONS AND COMPLIANCES**:
ELECTROMAGNETIC COMPATIBILITY

Notes:
1. Self-recoverable loss of performance during EMI disturbance at 10 V/m: Measurement error less than 2% of full scale.

For operation without loss of performance:
Mount unit in a metal enclosure (Buckeye SM7013-0 or equivalent)
Route power and I/O cables in metal conduit connected to earth ground.

Refer to the Application Guide for additional EMC information.

Immunity to EN 50082-2

electrostatic discharge	EN 61000-4-2	level 3; 8 Kv air
electromagnetic RF fields	EN 61000-4-3	level 3; 10 V/m [1] 80 MHz - 1 GHz
fast transients (burst)	EN 61000-4-4	level 4; 2 Kv I/O level 3; 2 Kv power
RF conducted interference	EN 61000-4-6	level 3; 10 V/rms 150 KHz - 80 MHz
simulation of cordless telephones	ENV 50204	level 3; 10 V/m 900 MHz ±5 MHz 200 Hz, 50% duty cycle

Emissions to EN 50081-2

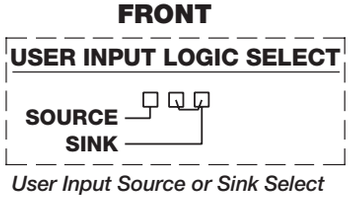
RF interference	EN 55011	enclosure class A power mains class A

19. **CONNECTIONS**: High compression cage-clamp terminal block
Wire Strip Length: 0.35" (9 mm)
Wire Gauge Capacity: One 14 AWG solid or Two 18 AWG
20. **CONSTRUCTION**: This unit is rated for NEMA 4X/IP65 indoor use. IP20 Touch safe. Installation Category II, Pollution Degree 2. One piece bezel/case. Flame resistant. Synthetic rubber keypad. Panel gasket and mounting clip included.
21. **WEIGHT**: 10.4 oz. (295 g)

Safety Summary

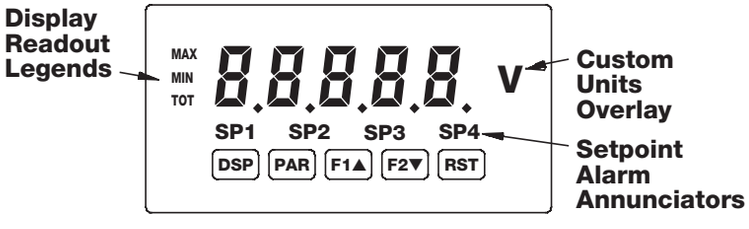
All safety related regulations, local codes and instructions that appear in the manual or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
Do not use this unit to directly command motors, valves, or other actuators not equipped with safeguards. To do so can be potentially harmful to persons or equipment in the event of a fault to the unit.

Jumper Link Functions



User Input Source or Sink Select

Front Panel

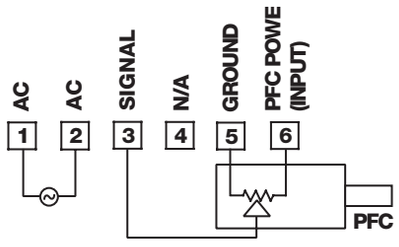


KEY	DISPLAY MODE OPERATION
DSP	Index display through max/min/total/input readouts
PAR	Access parameter list
F1▲	Function key #1; hold for 3 seconds for Second Function #1
F2▼	Function key #2; hold for 3 seconds for Second Function #2
RST	Reset (function key)

PROGRAMMING MODE OPERATION

Quit programming and return to display mode
Store selected parameter and index to next parameter
Increment selected parameter value
Decrement selected parameter value
Hold with F1▲, F2▼ to scroll value by x1000

Basic Connections



Note: Option card field connections are supplied with the card.

Wire Colors

Wires	6" Leads	Plug
Input	Red	Blue
Ground	Black	Black
Output	White	Brown

Custom Units Overlay

The meter has a backlighted units indicator that can be customized to the application. The backlight is turned on by programming the "b-LIt" parameter. Overlays are available in the Units Label Kit. To install an overlay, remove the unit from the case. Select the label and apply it to the label frame, noting that the label must be aligned accurately. Install the label frame to the display board in the alignment holes located on the right side of the display.

Plug-In Cards

The meter has three plug-in card slots. Each slot is dedicated to a specific function. These functions are:

• Setpoint Outputs • Analog Outputs • Communication Option

The plug-in cards can be used in any combination, however, it is only possible to use one type of card from each category. Cards can be installed initially, or at a later date as system needs arise.

Devicenet Plug-In Card

A DeviceNet communication port can be added to the meter. DeviceNet is a high level bus protocol based upon the CAN specification. The protocol allows the integration of devices of different types and manufacturers within a common communication framework.

Analog Output Plug-In Card

The analog output is available as a Plug-in card. Either the 20 mA or the 10 V output can be used. The output can be scaled independent of the input range. Reverse acting output is possible by reversing the scaling point positions. Other features are selectable update rate and output source selection.

RS485 Plug-In Card

An RS485 communication port can be added with a Plug-in card. RS485 offers multi-drop bus communications. All devices connect in parallel on a 485 bus. Only one device is permitted to transmit at any one time, while all other devices are in receive mode.The meter controls the bus when it transmits data, otherwise the meter is in the receive mode.

RS232 Plug-In Card

An RS232 communication port can be installed with a Plug-in card. RS232 is intended to allow only 2 devices to communicate to each other (i.e., printer or computer). For more information, See DPM Serial Application Guide.

Inputs

Voltage Inputs

The Bimba PFC uses the ±20V range (default).

Scaling

The meter has been factory calibrated on all ranges as a basic multimeter (voltmeter/ammeter/ohmmeter). The basic meter readout can then be post scaled to read out in the process units (level, flow, temperature, etc.). The meter provides two ways in which to scale the display:

Key-in: Key in the input and display scaling points using known data.

Apply: Apply the actual input value and key in the corresponding display value. The meter records the input value applied.

For processes that require linearity compensation, up to 16 scaling points can be used for correction. The scaling range is extended up to five digits of resolution with selectable display rounding factors.

Input Features

A unique adaptive input filter is used. Whenever the difference between one reading and the next is less than the filter band value, the input is filtered. When the difference exceeds the filter band value, the input is not filtered. This avoids the usual compromise between using a relative high time constant for good noise rejection and using a low time constant filter for quick step response.

The readout can be corrected for process zero errors with an offset value. A tare function zeros the readout via a function operation.

Function Keys and User Inputs

The Function Keys and User inputs can be programmed to perform specific meter control operations. Function Keys #1 and #2 each have two types of functions, primary and secondary. The primary function is executed the instant the key is pressed. Holding the key for three seconds executes the second function. If the key is not held for 3 seconds, the second function is not executed. To implement a hidden key, program no function for the primary and program the desired function for the second.

The three user inputs can be selected for sinking or sourcing logic.

Max and Min Reading Detection

The meter records the maximum (max) and minimum (min) process inputs. Conditions such as valve activation, sudden change in material flow rate, etc., can result in false peaks which are not reflective of the true maximum and minimum of the process. In this case, Max and Min capture delay times can be used to prevent the detection of false maximums and minimums.

Basic Connections

Parameter Lock Mode

A user input can be used to lock the parameter list.When the user input is active, the meter is in the protected parameter mode, where it is only possible to access the setpoint values and the security code.

It is possible to lock the parameter list without using a user input as a program lock function. In this case, set the security code to a non-zero value. With a non-zero security value set, press the PAR Key to view the programmed setpoint values. The security code requires a “key” value to gain access to the full parameter list.

Installation

The DPM meets NEMA 4X/IP65 requirements for indoor use when properly installed. The unit is intended to be mounted into an enclosed panel. Prepare the panel cutout to the dimensions shown in the Dimensions drawing. Remove the panel latch and cardboard sleeve from the unit and discard the cardboard sleeve. Slide the panel gasket over the rear of the unit to the back of the bezel. The unit should be installed fully assembled. Insert the unit into the panel cutout. While holding the unit in place, push the panel latch over the rear of the unit so that the tabs of the panel latch engage in the slots on the case. The panel latch should be engaged in the farthest forward slot possible. To achieve a proper seal, tighten the latch screws evenly until the unit is snug in the panel (Torque to approximately 7 in-lbs [79N-cm]). Do not over-tighten the screws.

Ordering Information

Model Number	Description	List Prices
DPM	Base Unit - Includes Excitation, Quad Solid State Outputs	
DPMA	Base Unit with Analog Card	
DPMS	Base Unit with RS-485 Serial Output	
DPM-485	RS-485 Plug-In Accessory Card	
DPM-232	RS-232 Plug-In Accessory Card	
DPM-DNET	DeviceNet Plug-In Accessory Card	
DPM-A	Analog Plug-In Accessory Card	
DPM-R	Quad Form A 120 VAC Relay Plug-In Accessory Card	

Electronic Controller

The Bimba Electronic Controllers provide 10 VDC regulated power to the Position Feedback Cylinder. Four models are available for AC or DC input and voltage or current output. Each controller offers both dual set point and scaled analog output functions. The controllers are strictly analog in nature and are **not** closed loop motion controllers.

The Bimba electronic controller is ideal for applications where:

- The main system controller being used to interface with the PFC does not have the required 1 Mohm input impedance.
- The application requires a fast responding scalable analog output signal.
- Accuracy is not a key consideration (± 0.030" or higher).
- The customer desires to cycle between two variable set points without needing to stop and hold a position.

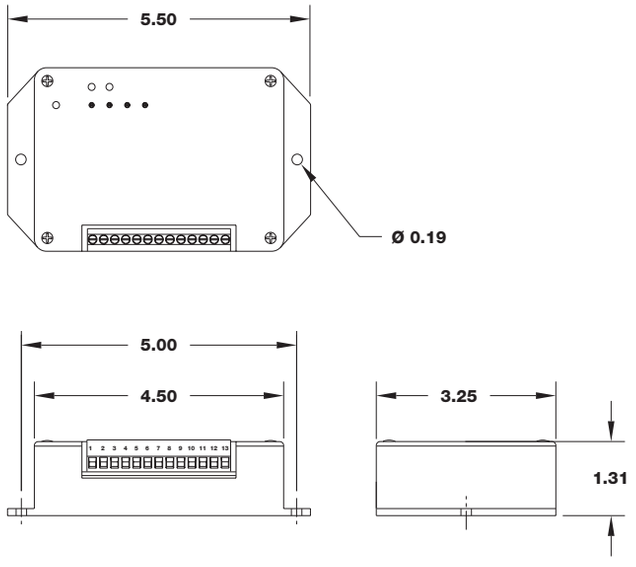
Typical applications include web tensioning or dancer arm control. The Bimba electronic controller would be used as an interface between the PFC cylinder and the customers web tensioning or dancer arm controller.

Model	Input Power	Scalable Output
120AC4-20mA	120 VAC	4 - 20 mA
120AC0-10DC	120 VAC	0 - 10 VDC
12/24DC4-20mA	12-24 DC	4 - 20 mA
12/24DC0-10DC	12-24 DC	0 -10 VDC

List Prices

Model	Price
120AC4-20MA	
120AC0-10DC	
12/24DC4-20MA	
12/24DC0-10DC	

Dimensions



Electronic Controller Specifications

Auxiliary Power Requirement:
AC Models ..... 100 to 135 VAC (115 VAC Input)
200 to 270 VAC (230 VAC Input)
DC Models ..... 11.8 to 26 VDC (12/24 VDC Input)

Power Requirement:
AC Models ..... 5 VA maximum (120 to 230 VAC)
DC Models ..... 1.2 VA maximum (12 VDC)
2.4 VA Max (24 VDC)

Frequency Range ..... 50/60 HZ
Transducer Excitation Voltage ..... 10 VDC (Nominal)
Electrical Connections ..... 13 position Euro Style terminal block

Dielectric Strength:
AC Models ..... 2000 VAC (All Inputs to all Outputs)
2000 VAC (Terminals to case)
DC Models ..... 2000 VAC (All Inputs to relay Outputs)
2000 VAC (terminals to Case)
Note: The Negative power supply connection is common to the analog signal output.

Transient Protection ..... All inputs and outputs are designed to withstand transient energy levels normally associated with Category III service locations as defined by IEC 644. Industrial installations that are typical of this environment would include most distribution, feeder or branch circuit connections that are not located at the immediate service entrance.

Shipping Weight ..... Approx. 12 oz.
Operating Temperature Range ..... (-30°C to +70°C) -22°F to 160° F
(0°C to +70°C) 32°F to 160° F for 12 VDC Operation
Storage Temperature Range ..... (-40°C to +85°C) -40°F to 185° F
Enclosure Dimensions ..... 1.31" H x 5.50" W x 3.25" D

Electronic Controller Specifications

Position Feedback Control Module

Unless noted otherwise:

Ambient Temperature	=	(25°C) 77°F Nominal
Aux Power (AC Models)	=	120 VAC, 60 HZ
Aux Power (DC Models)	=	24 VDC

Relay Outputs

Control Limit Set Point Range ..... 2 independent adjustments settable from 0 to 100% of cylinder stroke

Temperature Influence on Control Limits .....±0.01% stroke /°C (-30°C to +70°C)

Output Contact Ratings .....5 A, 250 VAC, 0.8 power factor (general use)
5 A, 30 VDC (resistive)
360 VA, 240V, 0.4 power factor (Pilot Duty)

Output Contact Configuration.....2 independent form C (SPDT) relays
Each relay has a corresponding control limit set point adjustment

Response Time (Excluding Bounce)

Operate Time	=	8 mS TYP/12 mS maximum
Release Time	=	4mS TYP/6 mS maximum

Mechanical Life ..... 20,000,000 operations minimum

Analog Outputs

Output Load Specifications ..... 0 to 10 VDC @ 10 mA maximum
4 to 20 mA @ 500 Ω maximum loop resistance
350 Ω for 12 VDC input

Zero Offset Adjustment Range ..... ±5V (10 VDC output)
±8mA (4 to 20 mA output)

Gain Adjustment Range .....From 0.5 to 2.0 times input signal

Output Limits ..... 13v typical (10 VDC output)
25mA typical (4 to 20 mA output)

Temperature Influence on Analog Output ..... <±0.02% Full Scale Output /°C (-30°C to +70°C)

Output Ripple ..... <0.2% of Full Scale Output

Response Time (0 to 90% of final value)

0 to 10 VDC	=	2mS TYP/3 mS maximum
4 to 20 mA	=	2 mS TYP/3 mS maximum

Position Feedback Cylinder (PFC) And Pneumatic Control System (PCS) Application Checklist

Note: Use the separate Checklist for the Position Feedback Pneu-Turn (PTF)

Step 1. ***Photocopy the sketch and checklist sheet***
Step 2. ***Complete the sketch and checklist***
Step 3. ***Mail or fax the sketch and checklist to your local stocking distributor***

Name:_____Date_____

Company name:_____

Address:_____

Phone:_____ Fax:_____

Request PFC model number recommended by engineering:
Yes_____ No_____
If no, what is the PFC model to be used in your application?:_____
Operational temperature range:_____ °F to_____°F
Used in a wash down environment?: Yes_____ No_____
If yes, what chemicals are present?:_____

FILL OUT THIS SECTION FOR PFC MEASURING APPLICATIONS

Measurement repeatability required:_____**in.**
Stroke needed (1" minimum, 24" maximum)_____**in.**

Output signal preference:
Analog 0 to 10 VDC_____
Analog 4 to 20 mA_____
Quad souring open collector (PNP)_____
Relay(s): Yes_____ Number of relays:_____

Contact rating:
0 to 250 VAC_____
0 to 30 VDC_____

Digital:
RS232_____
RS485_____
Device net_____

FILL OUT THIS SECTION FOR POSITION APPLICATIONS UTILIZING THE PCS PNEUMATIC MOTION CONTROL SYSTEM

Describe application: _____

_____

_____

_____

_____

Position repeatability:_____

Bimba PFC/PCS Application Checklist

Payload Mass:_____

Estimated Coef. of friction:_____

Velocity required:_____

Timing required:_____

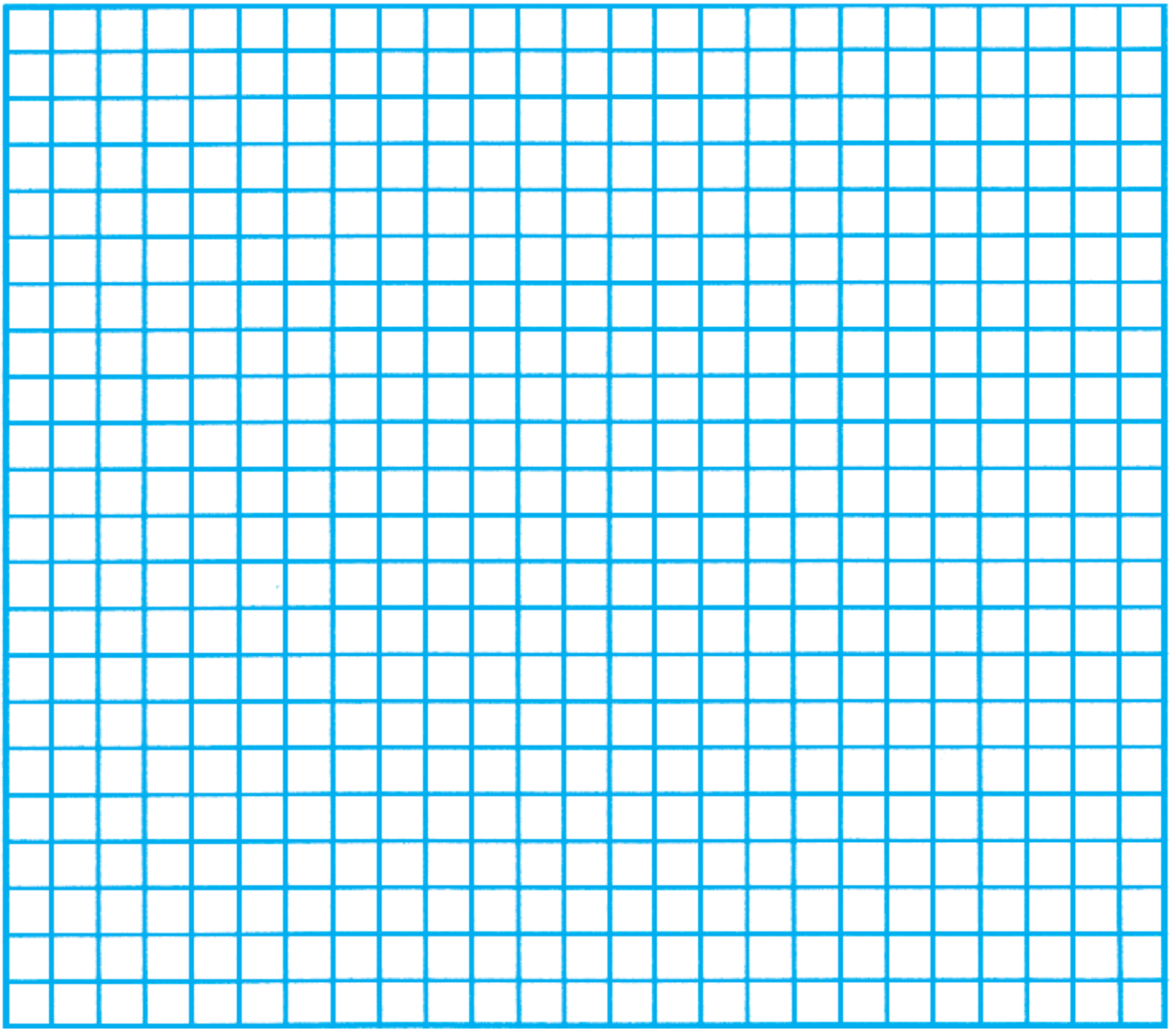
Air pressure available:_____***Application orientation:*** Vertical_____Horizontal_____

Weight and material of load: Material_____Weight_____lb._____oz.

Stroke needed (1" minimum, 24" maximum)_____

Is there any External Friction in the application? Yes_____ No_____

Application Sketch



Pneu-Turn Position Feedback Application Checklist

This checklist makes sizing and selecting Bimba actuators easier. Bimba's Engineering Department will assist you by providing a detailed analysis of your application and, based on the information in the application checklist, will help you choose the actuators best suited to your needs.

Step 1. ***Photocopy the sketch and checklist sheets.***

Step 2. ***Complete the sketch and checklist.***

Step 3. ***Mail or fax the sketch and checklist to your local stocking distributor.***

Date: _____

Your Name: _____

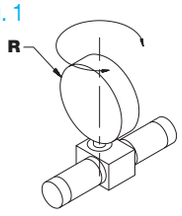
Company: _____

Address: _____

Phone: _____

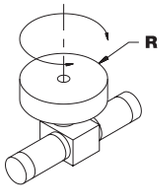
Fax: _____

Fig. 1



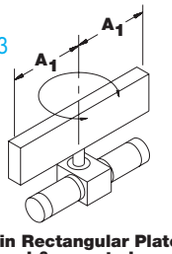
Thin Disc (mounted on side through center)

Fig. 2



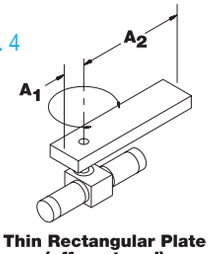
Thin Disc: (centered)

Fig. 3



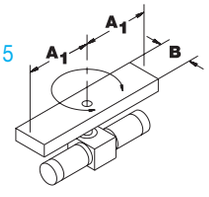
Thin Rectangular Plate (centered & mounted on side)

Fig. 4



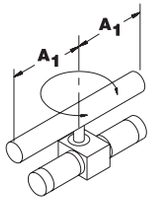
Thin Rectangular Plate (off-centered)

Fig. 5



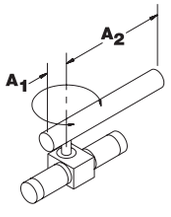
Thin Rectangular Plate (centered)

Fig. 6



Slender Rod (centered)

Fig. 7



Slender Rod (off-centered)

Request Pneu-Turn model number recommended by Engineering? Yes _____ No _____

If no, Pneu-Turn model number to be used in your application: _____

Air _____ psi Repeatablity Required _____ Degrees

Torque Required:

0 – 15 in-lbs. 75 – 100 in-lbs.
15 – 35 in-lbs. 200 – 500 in-lbs.
35 – 75 in-lbs. other: _____

Application closest to (circle one):

Fig. 1 Fig. 2 Fig. 3 Fig. 4 Fig. 5 Fig. 6 Fig. 7

Dimensions applicable to your lever arm:

Radius _____ in. A1 _____ in.
A2 _____ in. B _____ in.

Weight and material of lever arm and attachments:

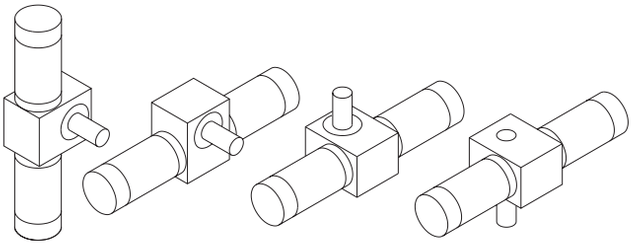
_____ lbs. _____ oz. material: _____

Load to be moved by the lever arm:

_____ lbs. _____ oz.

Distance from the center of the load to the center of the shaft: _____ in.

Shaft Mounted: (shaft, cylinders)



(horiz., vert.) (horiz., horiz.) (vert. (up), horiz.) (vert. (down) horiz.)

Axial loading? Yes _____ No _____

If yes, direction with reference to pushing or pulling the standard shaft: _____

Rotation of lever arm: _____ degrees

Time needed to move load in one direction:

_____ secs. Opposite direction _____ secs.

Notes

Notes

Position Sensing Solutions

Bimba Position Sensing Solutions

Bimba offers pre-tested Position Sensing Solutions for Bimba actuators. Our solutions provide a cost effective interface between the pneumatic actuators and electrical control systems. Our pre-tested solutions also eliminate costly, time-consuming design and fabrication required if switches are purchased separately and provide an aesthetically pleasing installation.

In this catalog section you will find both traditional Bimba switches as well as newer generations of Bimba switches to allow for maximum flexibility to fit your application.

The switches perform the same functions as conventional limit switches. They can be used as position indicators, cycle counters, or to confirm operation.

All Bimba switches are designed to sense a magnet that is incorporated into the piston of the cylinder. Magnets are standard in Bimba MRS cylinders, but must be purchased as an option on other Bimba actuators.

A variety of outputs are offered for each switch family including PNP (transistor sourcing), NPN (transistor sinking), normally open contacts, and higher power triac.

Actuator application data such as operating window and hysteresis for actuator/switch combinations is offered on page 8.25 of this catalog.

A Sensing Application section concerning how the switches work, helpful application tips, and sensing terms is located on page 8.27.

The Switch Selection Chart on page 8.3 can be used to choose switches for an actuator to insure mounting and sensing compatibility.

Benefits of the Magnetic Reed Switch

- Compact
- Lower cost
- Easy to mount on a variety of Bimba actuators
- Able to mount several switches on one actuator
- LED available in many models for ease of positioning and troubleshooting
- Many models:
  - Low, medium and high current models, AC or DC, and triac-type switches for inductive kickback or inrush current.
  - Track- and band-mounted models
  - Choice of pigtail leads in two lengths or quick connect with two cable length options.

Benefits of the Solid State Switch

- Compact
- Solid state reliability — no moving parts means longer life, no contact bounce
- Easy to mount on a variety of Bimba actuators
- Able to mount several switches on one actuator
- LED for ease of positioning and troubleshooting
- Reverse polarity and overvoltage protection
- Available with pigtail leads (in two lengths) or quick connect (with two cable length options)
- Faster signal speeds

Switch Selection Chart

Switch Type	Base Part Number	General Description	Original Line Original Line with Rod Lock	Double-Wall	EF/Twist Clamp Twin Bore/ET Pneu-Moment Stopper/ LPA/NPA	Flat-1 Flat-II	PneuTurn	Linear Thruster	Ultran	Ultran Slide High Load Ultran	Repairable Stainless Steel All Stainless OL	Ultran Band	ISO 6431
Track Mounted	HC	PNP, LED				X				X6			
	HK	NPN, LED				X				X6			
	MR	Reed, 4mm round, LED	X3		X		X3	X3		X5		X7	
	MS	PNP or NPN, 4mm round, LED	X3		X		X3	X3		X5		X7	
	MSC	PNP, 4mm round, LED	X3		X		X3	X3		X5		X7	
	MSK	NPN, 4mm round, LED	X3		X		X3	X3		X5		X7	
	MRS-.027	Reed, 2 wire, No LED	X1										
	MRS-.087	Reed, 2 wire, no LED	X2							X6			
	MRS-1.5	Triac, 2 wire, no LED, 1.5 amp, AC only	X2										
	MRS-1.5-S	Triac, 2 wire, No LED, 1.5 amp, AC only	X1										
	MRS-AB	Reed, Square slot, LED											X
	HSC-AB	PNP, Square slot, LED											X
	HSK-AB	NPN, Square slot, LED											X
	UBR	Reed, Square slot, LED										X8	
	UBSC	PNP, Square slot, LED										X8	
	UBSK	NPN, Square slot, LED										X8	
Band Mounted	HSC	PNP, LED	X				X	X4					
	HSK	NPN, LED	X				X	X4					
	MSS	PNP/NPN, 2 wire LED	X								X		
	MRS-.087-B	Reed, 2 wire, no LED, 10 watts	X	X			X	X					
	MRS-.087-BL	Reed, 3 wire, LED, 9 watts	X	X			X	X					
	MRS-.087-PBL	Reed, 2 wire, LED, 2.5 watts	X	X			X	X					
	MRS-1.5-B	Triac, 2 wire, No LED, 1.5 amp, AC only	X	X			X	X					
	R10	Reed, 2 wire, LED	X								X		
	RAC	Reed, 2 wire, LED, 200 watts, AC only	X								X		
	R10P	Reed, 2 wire, LED, 150 watts	X								X		
End of Stroke (Ultran)	RSU-1	Reed, 2 wire, no LED, 10 watts							X	X			
	PCQ	PNP, Proximity, LED							X	X			
	PKQ	NPN, Proximity, LED							X	X			

X1 - MRS Series with -Z option 9/16" and 3/4" bore only
X2 - MRS Series with -Z option 1-1/16" through 2" bore only
X3 - "T" option required
X4 - Not for use with 9/16" bore
X5 - "U" option required
X6 - "T" option required
X7 - 18mm bore only
X8 - 25mm through 63mm bore only

Cables (Compatible with all Bimba Switches with the "Q" Option)

Part Number	Description
C4	Straight M8 Female Connector, Threaded or Snap Tight Connection with 2 Meter Cable
C4-S	Straight M8 Female Connector, Threaded or Snap Tight Connection with 2 Meter Shielded Cable
C4X	Straight M8 Female Connector, Threaded or Snap Tight Connection with 5 Meter Cable
C4X-S	Straight M8 Female Connector, Threaded or Snap Tight Connection with 5 Meter Shielded Cable
C5-S	Right Angle M8 Female Connector, Threaded or Snap Tight Connection with 2 Meter Shielded Cable
C5X-S	Right Angle M8 Female Connector, Threaded or Snap Tight Connection with 5 Meter Shielded Cable

Switch Specifications

Switch Type	Base Part Number	General Description	Sensor Type	Output Type	Operating Voltage (V)	Actuating Time	Maximum Load Current	Reverse Polarity Protection	Over-voltage Protection	Transient Protection	Temperature Rating	Enclosure
Track Mounted	HC	PNP, LED	GMR	Sourcing, PNP	4.5 to 30 VDC	0.001 mS	150 mA	Yes	Yes	Yes	-25°C to 85°C	IP67
	HK	NPN, LED	GMR	Sinking, NPN	4.5 to 30 VDC	0.001 mS	150 mA	Yes	Yes	Yes	-25˚C to 85˚C	IP67
	MR	Reed, 4mm round, LED	Reed	Normally Open Contact	3 to 120 VAC, 3 to 24 VDC	1.0 mS	50 mA	No	No	No	-25˚C to 70˚C	IP67
	MS	PNP or NPN, 4mm round, LED	GMR	Auto Con! gure, Sinking or Sourcing	5 to 24 VDC	1.0 mS	50 mA	Yes	Yes	Yes	-20˚C to 85˚C	IP67
	MSC	PNP, 4mm round, LED	GMR	Sourcing, PNP	5 to 24 VDC	0.1 mS	50 mA	Yes	Yes	Yes	-25˚C to 85˚C	IP67
	MSK	NPN, 4mm round, LED	GMR	Sinking, NPN	5 to 24 VDC	0.1 mS	50 mA	Yes	Yes	Yes	-25˚C to 85˚C	IP67
	MRS-.027	Reed, 2 wire, no LED	Reed	Normally Open Contact	28 V max, AC or DC	1.0 mS	250 mA	No	No	No	-25˚C to 85˚C	IP65
	MRS-.087	Reed, 2 wire, no LED	Reed	Normally Open Contact	200 V max, AC or DC	1.0 mS	500 mA	No	No	No	-25˚C to 85˚C	IP65
	MRS-1.5	Triac, 2 wire, no LED, 1.5 amp, AC only	Reed	Triac	12 to 230 V, AC only	2.0 mS	1.5 A	No	No	No	-25˚C to 85˚C	IP65
	MRS-1.5-S	Triac, 2 wire, no LED, 1.5 amp, AC only	Reed	Triac	12 to 230 V, AC only	2.0 mS	1.5 A	No	No	No	-25˚C to 85˚C	IP65
	MRS-AB	Reed, Square slot, LED	Reed	Normally Open Contact	10 to 120 V, AC or DC	1.0 mS	100 mA	No	No	No	-10˚C to 70˚C	IP67
	HSC-AB	PNP, Square slot, LED	Hall Effect	Sourcing, PNP	10 to 30 VDC	1.0 mS	100 mA	Yes	Yes	Yes	-10˚C to 70˚C	IP67
	HSK-AB	NPN, Square slot, LED	Hall Effect	Sinking, NPN	10 to 30 VDC	1.0 mS	100 mA	Yes	Yes	Yes	-10˚C to 70˚C	IP67
	UBR	Reed, Square slot, LED	Reed	Normally Open Contact	5 to 240 V, AC or DC	1.0 mS	100 mA	No	No	No	-10˚C to 70˚C	IP67
	UBSC	PNP, Square slot, LED	GMR	Sourcing, PNP	5 to 28 VDC	1.0 mS	200 mA	Yes	Yes	Yes	-10˚C to 70˚C	IP67
	UBSK	NPN, Square slot, LED	GMR	Sinking, NPN	5 to 28 VDC	1.0 mS	200 mA	Yes	Yes	Yes	-10˚C to 70˚C	IP67
Band Mounted	HSC	PNP, LED	GMR	Sourcing, PNP	4.5 to 30 VDC	0.001 mS	150 mA	Yes	Yes	Yes	-25˚C to 85˚C	IP67
	HSK	NPN, LED	GMR	Sinking, NPN	4.5 to 30 VDC	0.001 mS	150 mA	Yes	Yes	Yes	-25˚C to 85˚C	IP67
	MSS	PNP/NPN, 2 wire LED	Hall Effect	Auto Configure, Sinking or Sourcing	5 to 24 VDC	0.002 mS	300 mA	Yes	Yes	Yes	-20˚C to 70˚C	IP67
	MRS-.087-B	Reed, 2 wire, no LED, 10 watts	Reed	Normally Open Contact	200 V max, AC or DC	1.0 mS	500 mA	No	No	No	-25˚C to 85˚C	IP65
	MRS-.087-BL	Reed, 3 wire, LED, 9 watts	Reed	Normally Open Contact	6 to 24 V, AC or DC	1.0 mS	500 mA	No	No	No	-25˚C to 85˚C	IP65
	MRS-.087-PBL	Reed, 2 wire, LED, 2.5 watts	Reed	Normally Open Contact	3 to 120 V, AC or DC	1.0 mS	20 mA	No	No	No	-25˚C to 85˚C	IP65
	MRS-1.5-B	Triac, 2 wire, no LED, 1.5 amp, AC only	Reed	Triac	12 to 230 VAC	2.0 mS	1.5 A	No	No	No	-25˚C to 85˚C	IP65
	R10	Reed, 2 wire, LED	Reed	Normally Open Contact	120 V, AC or DC	1.0 mS	400 mA	No	No	No	-20˚C to 70˚C	IP67
	RAC	Reed, 2 wire, LED, 200 watts, AC only	Reed	Triac	12 to 240 VAC	2.0 mS	800 mA	No	No	No	-20˚C to 70˚C	IP67
	R10P	Reed, 2 wire, LED, 150 watts	Reed	Normally Open Contact	120 V, AC or DC	1.0 mS	150 mA				-20˚C to 70˚C	IP67
End of Stroke (Ultran)	RSU-1	Reed, 2 wire, no LED, 10 watts	Reed	Normally Open Contact	200 VDC	1.0 mS	500 mA	No	No	No	-25˚C to 85˚C	IP65
	PCQ	PNP, Proximity, LED	Inductive	Sourcing, PNP	10 to 30 VDC	0.33 mS	100 mA	Yes	Yes	Yes	-25˚C to 70˚C	IP67
	PKQ	NPN, Proximity, LED	Inductive	Sinking, NPN	10 to 30 VDC	0.33 mS	100 mA	Yes	Yes	Yes	-25˚C to 70˚C	IP67

Quick Connect Cable Specifications

Contact Carrier Material: PA 6-GV (Nylon)
Molded Connector Head: Polyurethane (PUR)
Contact Material: Gold plated brass
Current Rating: 4.0 A
Voltage Rating: 125 V @ 4A
Jacket Material: Polyvinyl Chloride (PVC)
Conductors: 3 x 24 AWG
Temperature Range: -40˚ F to 200˚ F (-40˚ C to 90˚ C)
Protection Class: NEMA 1, 3, 4, 6, 13 and IEC IP67
Insulation Resistance: 10^9

Wire Color Codes

Generally the wire colors for Bimba switches conform to **CENELEC EN 50 044** wiring standard. All switches with the “Q” option used with Bimba cables conform to the standard which is: Brown – Positive, Blue – Ground, and Black – Output. Some legacy switches do not conform to the standard as indicated in the catalog and documentation provided with the switch.

Important Note: 2 wire switches use only the brown and blue wires. (Some legacy switches use red and black). Do not connect the blue and brown wires across the power supply without a load in series the switch, it will be destroyed by the short circuit.

Switch Selection

Band Mounted Solid State Switches
HSC and HSK

Compatible and Tested for use with:
Original Line Cylinders, Pneu-Turn Rotary Actuators, and Linear Thrusters

BAND SIZE	
Bore Size	**Band Size**
No Band	Blank
9/16" (14mm)	02
3/4" (19mm)	04
7/8"	06
1-1/16" (27mm)	09
1-1/4"	12
1-1/2" (38mm)	17
1-3/4"	24
2" (50mm)	31
2-1/2"	50
3"	70

Part Numbers and List Prices

Part Number	Description	List Price
HSC	Sourcing Switch (PNP) ,LED, 30VDC, 150mA with 24" Pigtail Leads, No Band	
HSC-□□[1]	Sourcing Switch (PNP), LED, 30VDC, 150mA with 24" Pigtail Leads, Band Included	
HSCQ	Sourcing Switch (PNP), LED, 30VDC, 150mA with M8 Male Connector, No Band	
HSCQ-□□[1]	Sourcing Switch (PNP), LED, 30VDC, 150mA with M8 Male Connector, Band Included	
HSCQC	Sourcing Switch (PNP), LED, 30VDC, 150mA with M8 Male Connector and 2m Mating Cable, No Band	
HSCQC-□□[1]	Sourcing Switch (PNP), LED, 30VDC, 150mA with M8 Male Connector and 2m Mating Cable, Band Included	
HSCQCX	Sourcing Switch (PNP), LED, 30VDC, 150mA with M8 Male Connector and 5m Mating Cable, No Band	
HSCQCX-□□[1]	Sourcing Switch (PNP), LED, 30VDC, 150mA with M8 Male Connector and 5m Mating Cable, Band Included	
HSCX	Sourcing Switch (PNP), LED, 30VDC, 150mA with 144" Pigtail Leads, No Band	
HSCX-□□[1]	Sourcing Switch (PNP), LED, 30VDC, 150mA with 144" Pigtail Leads, Band Included	
HSK	Sinking Switch (NPN), LED, 30VDC, 150mA with 24" Pigtail Leads, No Band	
HSK-□□[1]	Sinking Switch (NPN), LED, 30VDC, 150mA with 24" Pigtail Leads, Band Included	
HSKQ	Sinking Switch (NPN), LED, 30VDC, 150mA with M8 Male Connector, No Band	
HSKQ-□□[1]	Sinking Switch (NPN), LED, 30VDC, 150mA with M8 Male Connector, Band Included	
HSKQC	Sinking Switch (NPN), LED, 30VDC, 150mA with M8 Male Connector and 2m Mating Cable, No Band	
HSKQC-□□[1]	Sinking Switch (NPN), LED, 30VDC, 150mA with M8 Male Connector and 2m Mating Cable, Band Included	
HSKQCX	Sinking Switch (NPN), LED, 30VDC, 150mA with M8 Male Connector and 5m Mating Cable, No Band	
HSKQCX-□□[1]	Sinking Switch (NPN), LED, 30VDC, 150mA with M8 Male Connector and 5m Mating Cable, Band Included	
HSKX	Sinking Switch (NPN), LED, 30VDC, 150mA with 144" Pigtail Leads, No Band	
HSKX-□□[1]	Sinking Switch (NPN), LED, 30VDC, 150mA with 144" Pigtail Leads, Band Included	

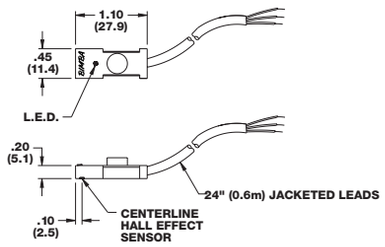
[1]Replace boxes with with band size.

Example Part Number with band size from table: HSC-02 is an HSC switch with a band for 9/16î or 14 mm cylinder

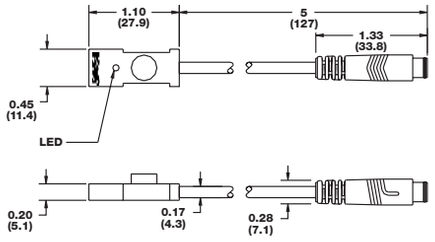
Band Mounted Solid State Switches

HSC and HSK

Dimensions



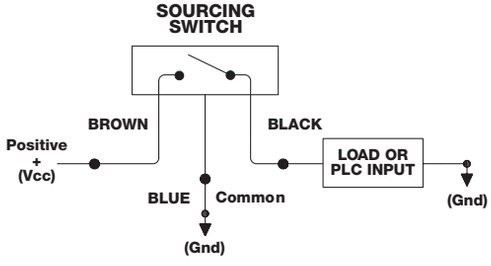
HSC, HSK



HSCQ, HSKQ

Wiring Diagrams

Typical Solid State Sourcing Configuration for HSC Models (PNP)

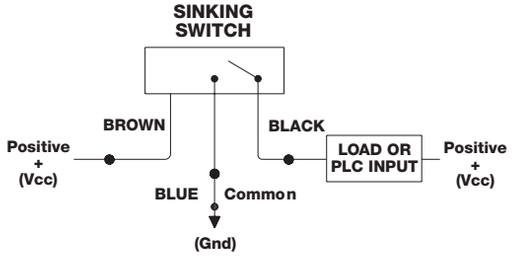


HSC, HC

Basic Circuit Layout for Programmable Logic Controllers (PLC) and Normally Off Relays and Solenoids

CAUTION: Shorting black wire to ground will damage switch

Typical Solid State Sinking Configuration for HSK Models (NPN)

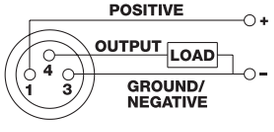


HSK, HK

Basic Circuit Layout for Programmable Logic Controllers (PLC) and Normally Off Relays and Solenoids

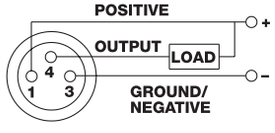
CAUTION: Shorting black wire to supply voltage will damage switch

8mm Male Connector Sourcing Solid State Switch



HSCQ, HCQ

8mm Male Connector Sinking Solid State Switch

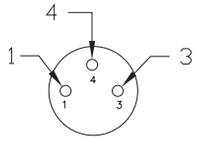


HSKQ, HKQ

Pin and Wire Assignments for Quick Connect

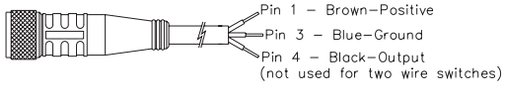
Switch “Q” Option Male Connector

Face View of M8 ***Male*** Connector

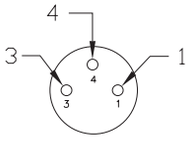


C4 and C5 Cable ***Female*** Connector

Side View of M8 ***Female*** Connector



Face View of M8 ***Female*** Connector



Switch Selection

Heavy Duty Band Mounted Switches

MRS-.087-B, MRS-.087-PB, and MRS-1.5-B

Compatible and Tested for use with:

Original Line Cylinders, Pneu-Turn Rotary Actuators, Linear Thrusters, and Double-Wall Cylinders

BAND SIZE	
Bore Size	**Band Size**
No Band	Blank
9/16" (14mm)	02
3/4" (19mm)	04
7/8"	06
1-1/16" (27mm)	09
1-1/4"	12
1-1/2" (38mm)	17
1-3/4"	24
2" (50mm)	31
2-1/2"	50
3"	70

Part Numbers and List Prices

Part Number	Description	List Price
MRS-.087-B	Reed Switch, 2 wire, No LED, 200 V, 500mA, 24" Pigtail Leads, No Band	
MRS-.087-B-□□[1]	Reed Switch, 2 wire, No LED, 200 V, 500mA, 24" Pigtail Leads, Band Included	
MRS-.087-BQ	Reed Switch, 2 wire, No LED, 200 V, 500mA, M8 Male Connector, No Band	
MRS-.087-BQ-□□[1]	Reed Switch, 2 wire, No LED, 200 V, 500mA, M8 Male Connector, Band Included	
MRS-.087-BQC	Reed Switch, 2 wire, No LED, 200 V, 500mA, M8 Male Connector, 2m Mating Cable, No Band	
MRS-.087-BQC-□□[1]	Reed Switch, 2 wire, No LED, 200 V, 500mA, M8 Male Connector, 2m Mating Cable, Band Included	
MRS-.087-BQCX	Reed Switch, 2 wire, No LED, 200 V, 500mA, M8 Male Connector, 5m Mating Cable, No Band	
MRS-.087-BQCX-□□[1]	Reed Switch, 2 wire, No LED, 200 V, 500mA, M8 Male Connector, 5m Mating Cable, Band Included	
MRS-.087-XB	Reed Switch, 2 wire, No LED, 200 V, 500mA, 144" Pigtail Leads, No Band	
MRS-.087-XB-□□[1]	Reed Switch, 2 wire, No LED, 200 V, 500mA, 144" Pigtail Leads, Band Included	
MRS-.087-BL	Reed Switch, 3 wire, LED, 24 V, 500mA, 24" Pigtail Leads, No Band	
MRS-.087-BL-□□[1]	Reed Switch, 3 wire, LED, 24 V, 500mA, 24" Pigtail Leads, Band Included	
MRS-.087-BLQ	Reed Switch, 3 wire, LED, 24 V, 500mA, M8 Male Connector, No Band	
MRS-.087-BLQ-□□[1]	Reed Switch, 3 wire, LED, 24 V, 500mA, M8 Male Connector, Band Included	
MRS-.087-BLQC	Reed Switch, 3 wire, LED, 24 V, 500mA, M8 Male Connector, 2m Mating Cable, No Band	
MRS-.087-BLQC-□□[1]	Reed Switch, 3 wire, LED, 24 V, 500mA, M8 Male Connector, 2m Mating Cable, Band Included	
MRS-.087-BLQCX	Reed Switch, 3 wire, LED, 24 V, 500mA, M8 Male Connector, 5m Mating Cable, No Band	
MRS-.087-BLQCX-□□[1]	Reed Switch, 3 wire, LED, 24 V, 500mA, M8 Male Connector, 5m Mating Cable, Band Included	
MRS-.087-XBL	Reed Switch, 3 wire, LED, 24 V, 500mA, 144" Pigtail Leads, No Band	
MRS-.087-XBL-□□[1]	Reed Switch, 3 wire, LED, 24 V, 500mA, 144" Pigtail Leads, Band Included	
MRS-.087-PBL	Reed Switch, 2 wire, LED, 120 V, 20mA, 24" Pigtail Leads, No Band	
MRS-.087-PBL-□□[1]	Reed Switch, 2 wire, LED, 120 V, 20mA, 24" Pigtail Leads, Band Included	
MRS-.087-PBLQ	Reed Switch, 2 wire, LED, 120 V, 20mA, M8 Male Connector, No Band	
MRS-.087-PBLQ-□□[1]	Reed Switch, 2 wire, LED, 120 V, 20mA, M8 Male Connector, Band Included	
MRS-.087-PBLQC	Reed Switch, 2 wire, LED, 120 V, 20mA, M8 Male Connector, 2m Mating Cable, No Band	
MRS-.087-PBLQC-□□[1]	Reed Switch, 2 wire, LED, 120 V, 20mA, M8 Male Connector, 2m Mating Cable, Band Included	
MRS-.087-PBLQCX	Reed Switch, 2 wire, LED, 120 V, 20mA, M8 Male Connector, 5m Mating Cable, No Band	
MRS-.087-PBLQCX-□□[1]	Reed Switch, 2 wire, LED, 120 V, 20mA, M8 Male Connector, 5m Mating Cable, Band Included	
MRS-.087-PXBL	Reed Switch, 2 wire, LED, 120 V, 20mA, 144" Pigtail Leads, No Band	
MRS-.087-PXBL-□□[1]	Reed Switch, 2 wire, LED, 120 V, 20mA, 144" Pigtail Leads, Band Included	
MRS-1.5-B	Reed Switch, 2 wire, No LED, 12 to 230V AC only, 1.5A 24" Pigtail Leads, No Band	
MRS-1.5-B-□□[1]	Reed Switch, 2 wire, No LED, 12 to 230V AC only, 1.5A, 24" Pigtail Leads, Band Included	
MRS-1.5-XB	Reed Switch, 2 wire, No LED, 12 to 230V AC only, 1.5A, 144" Pigtail Leads, No Band	
MRS-1.5-XB-□□[1]	Reed Switch, 2 wire, No LED, 12 to 230V AC only, 1.5A, 144" Pigtail Leads, Band Included	

[1]Replace boxes with with band size.

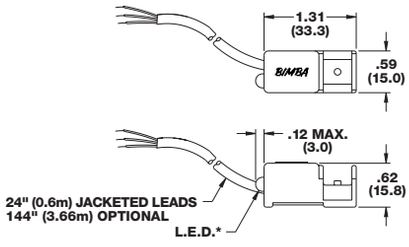
Example Part Number with band size from table: HSC-02 is an HSC switch with a band for 9/16" or 14 mm cylinder.

Heavy Duty Band Mounted Switches

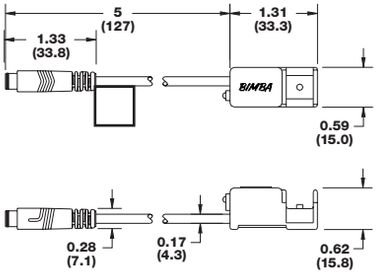
MRS-.087-B, MRS-.087-PB, and MRS-1.5-B

Dimensions

MRS-.087-B
MRS-.087-BL
MRS-.087-PBL
MRS-1.5-B

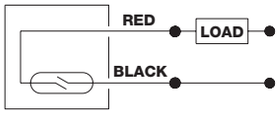


MRS-.087-BQ
MRS-.087-BLQ
MRS-.087-PBLQ

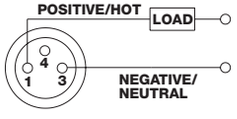


Wiring Diagrams

MRS-.087-B

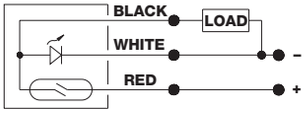


MRS-.087-BQ
MRS-.087-PBLQ

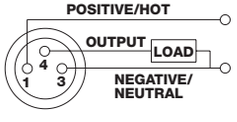


8mm Male Connector

MRS-.087-BL

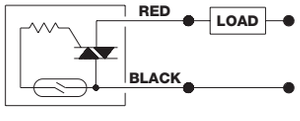


MRS-.087-BLQ

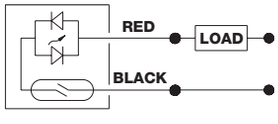


8mm Male Connector

MRS-1.5-B



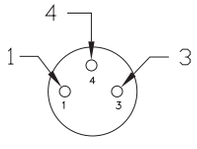
MRS-.087-PBL



Pin and Wire Assignments for Quick Connect

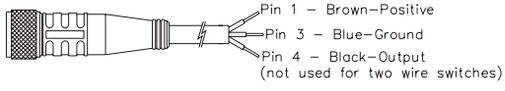
Switch “Q” Option Male Connector

Face View of M8 ***Male*** Connector

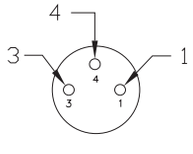


C4 and C5 Cable ***Female*** Connector

Side View of M8 ***Female*** Connector



Face View of M8 ***Female*** Connector



Switch Selection

High Illumination and High Power Band Mounted Switches
MSS, R10, R10P, RAC

Compatible and Tested for use with:
Original Line Cylinders, All Stainless Original Line Cylinders, Pneu-Turn Rotary Actuators, Linear Thrusters, Double-Wall Cylinders, and Repairable Stainless Steel Cylinders

Part Numbers and List Prices

Part Number	Description	List Price
MSS	Sourcing or Sinking Switch, 2 wire, High Illumination Body, 24 VDC, 300mA, 24" Pigtail Leads	
MSSQ	Sourcing or Sinking Switch, 2 wire, High Illumination Body, 24 VDC, 300mA, M8 Male Connector	
MSSQC	Sourcing or Sinking Switch, 2 wire, High Illumination Body, 24 VDC, 300mA, M8 Male Connector with 2m Mating Cable	
MSSQCX	Sourcing or Sinking Switch, 2 wire, High Illumination Body, 24 VDC, 300mA, M8 Male Connector with 5m Mating Cable	
MSSX	Sourcing or Sinking Switch, 2 wire, High Illumination Body, 24 VDC, 300mA, 120" Pigtail Leads	
R10	Reed Switch, 2 wire, High Illumination Body, 120 V, 400mA, 24" Pigtail Leads	
R10Q	Reed Switch, 2 wire, High Illumination Body, 120 V, 400mA, M8 Male Connector	
R10QC	Reed Switch, 2 wire, High Illumination Body, 120 V, 400mA, M8 Male Connector with 2m Mating Cable	
R10QCX	Reed Switch, 2 wire, High Illumination Body, 120 V, 400mA, M8 Male Connector with 5m Mating Cable	
R10X	Reed Switch, 2 wire, High Illumination Body, 120 V, 400mA, 120" Pigtail Leads	
R10P	Reed Switch with Transient and Overvoltage Protection, 2 wire, High Illumination Body, 120 V, 150mA, 24" Pigtail Leads	
R1OPQ	Reed Switch with Transient and Overvoltage Protection, 2 wire, High Illumination Body, 120 V, 150mA, M8 Male Connector	
R10PQC	Reed Switch with Transient and Overvoltage Protection, 2 wire, High Illumination Body, 120 V, 150mA, M8 Male Connector with 2m Mating Cable	
R10PQCX	Reed Switch with Transient and Overvoltage Protection, 2 wire, High Illumination Body, 120 V, 150mA, M8 Male Connector with 5m Mating Cable	
R10PX	Reed Switch with Transient and Overvoltage Protection, 2 wire, High Illumination Body, 120 V, 150mA, 120" Pigtail Leads	
RAC	High Current Reed Switch, 2 wire, No LED, 240 V AC only , 800mA, 24" Pigtail Leads	
RACX	High Current Reed Switch, 2 wire, No LED, 240 V AC only , 800mA, 120" Pigtail Leads	
USB25[1]	Mounting band for cylinders up to 2-1/2" bore	
USB50[1]	Mounting band for cylinders with 2-1/2" bore up to 5" bore	
USB80[1]	Mounting band for cylinders with greater than 5" bore	

[1]All switches above are band mounted, band is ordered separately.

High Illumination and High Power Band Mounted Switches

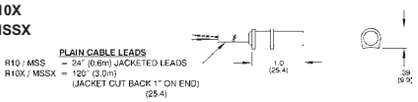
MSS, R10, R10P, RAC

Compatible and Tested for use with:

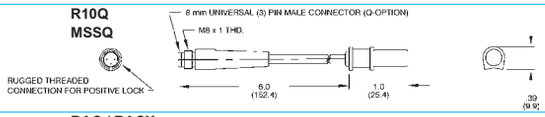
Original Line Cylinders, All Stainless Original Line Cylinders, Pneu-Turn Rotary Actuators, Linear Thrusters, Double-Wall Cylinders, and Repairable Stainless Steel Cylinders

Dimensions

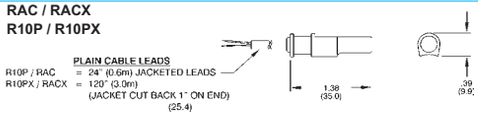
R10 / R10X
MSS / MSSX



R10Q
MSSQ

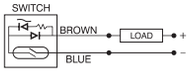


RAC / RACX
R10P / R10PX



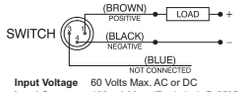
Wiring Diagrams

R10 / R10X
Miniature Reed Switch, Cable Type,
(2 Wire Switch)



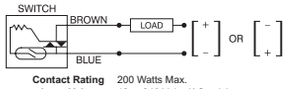
Input Voltage 110 Volts Max. DC, 120 Volts Max. AC
Maximum Load Current 400 mA Max. (Resistive) @ 25°C (77°F)
150 mA Max. (Resistive) @ 70°C (158°F)

R10Q
Miniature Reed Switch, 8mm Male Quick Connect,
(2 Wire Switch)



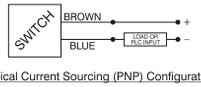
Input Voltage 60 Volts Max. AC or DC
Maximum Load Current 400 mA Max. (Resistive) @ 25°C (77°F)
150 mA Max. (Resistive) @ 70°C (158°F)

RAC / RACX
High Power AC Reed Switch, Cable Type,
(2 Wire Switch)

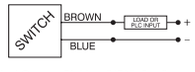


Contact Rating 200 Watts Max.
Input Voltage 12 to 240 Volts (AC only)
Minimum Load Current 80 mA
Maximum Load Current 800 mA

MSS / MSSX
Miniature Solid State Switch, Cable Type,
(2 Wire Switch)

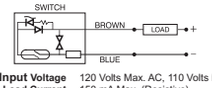


Typical Current Sourcing (PNP) Configuration



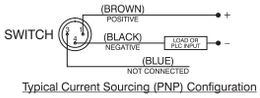
Typical Current Sinking (NPN) Configuration

R10P / R10PX
Miniature Reed Switch, Cable Type,
Circuit Protected (2 Wire Switch)

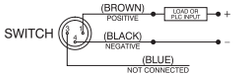


Input Voltage 120 Volts Max. AC, 110 Volts Max. DC
Maximum Load Current 150 mA Max. (Resistive)
Circuit Protection
Varistor 138 Volts
Choke 680 µH

MSSQ
Miniature Solid State Switch, 8mm Male Quick Connect,
(2 Wire Switch)



Typical Current Sourcing (PNP) Configuration

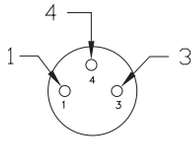


Typical Current Sinking (NPN) Configuration

Pin and Wire Assignments for Quick Connect

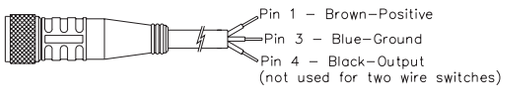
Switch "Q" Option Male Connector

Face View of M8 ***Male*** Connector

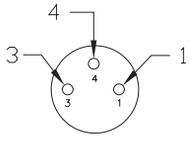


C4 and C5 Cable ***Female*** Connector

Side View of M8 ***Female*** Connector



Face View of M8 ***Female*** Connector



Switch Selection

Track Mounted Solid State Switches
HC and HK

Compatible and Tested for use with:
Flat-1 Cylinders, Square Flat-1 Cylinders, Flat-II Cylinders, Square Flat-II Cylinders, and Ultran Rodless Actuators (with -T option)

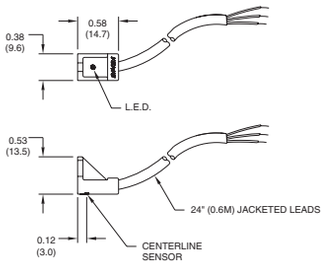
Part Numbers and List Prices

Part Number	Description	List Price
HC	Sourcing Switch (PNP), LED, 30VDC, 150mA with 24" Pigtail Leads	
HCQ	Sourcing Switch (PNP), LED, 30VDC, 150mA with M8 Male Connector	
HCQC	Sourcing Switch (PNP), LED, 30VDC, 150mA with M8 Male Connector and 2m Mating Cable	
HCQCX	Sourcing Switch (PNP), LED, 30VDC, 150mA with M8 Male Connector and 5m Mating Cable	
HCX	Sourcing Switch (PNP), LED, 30VDC, 150mA with 144" Pigtail Leads	
HK	Sinking Switch (NPN), LED, 30VDC, 150mA with 24" Pigtail Leads	
HKQ	Sinking Switch (NPN), LED, 30VDC, 150mA with M8 Male Connector	
HKQC	Sinking Switch (NPN), LED, 30VDC, 150mA with M8 Male Connector and 2m Mating Cable	
HKQCX	Sinking Switch (NPN), LED, 30VDC, 150mA with M8 Male Connector and 5m Mating Cable	
HKX	Sinking Switch (NPN), LED, 30VDC, 150mA with 144î Pigtail Leads	

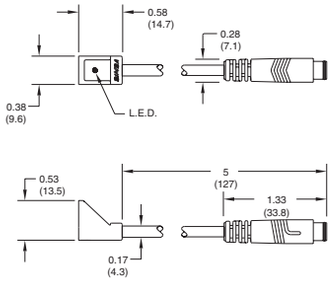
Track Mounted Solid State Switches

HC and HK

Dimensions



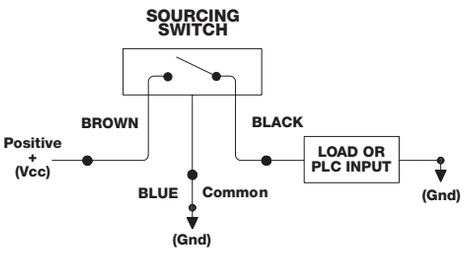
HC, HK



HCQ, HKQ

Wiring Diagrams

Typical Solid State Sourcing Configuration for HC Models (PNP)

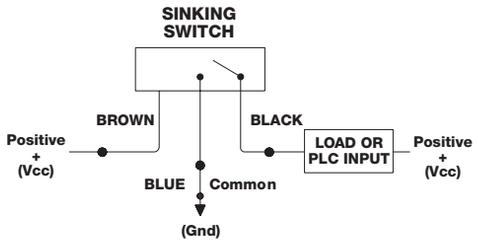


HSC, HC

Basic Circuit Layout for Programmable Logic Controllers (PLC) and Normally Off Relays and Solenoids

CAUTION: Shorting black wire to ground will damage switch

Typical Solid State Sinking Configuration for HK Models (NPN)

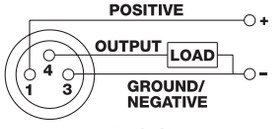


HSK, HK

Basic Circuit Layout for Programmable Logic Controllers (PLC) and Normally Off Relays and Solenoids

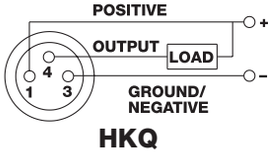
CAUTION: Shorting black wire to supply voltage will damage switch

8mm Male Connector Sourcing Solid State Switch



HCQ

8mm Male Connector Sinking Solid State Switch

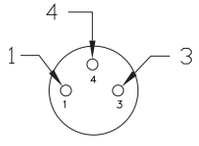


HKQ

Pin and Wire Assignments for Quick Connect

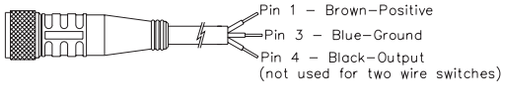
Switch “Q” Option Male Connector

Face View of M8 ***Male*** Connector

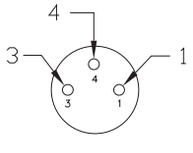


C4 and C5 Cable ***Female*** Connector

Side View of M8 ***Female*** Connector



Face View of M8 ***Female*** Connector



Switch Selection

Mini Round Track Mounted Switches
MR, MS, MSC, and MSK

Compatible and Tested for use with:
Original Line Cylinders, Pneu-Turn Rotary Actuators, Linear Thrusters (-T option required), Ultran Band Cylinders (18mm bore only), Extruded Flat, Twist Clamp, Twin Bore, Stopper Cylinders, Extruded Flat Lift Table, Narrow Profile Air Table, and Low Profile Air Table

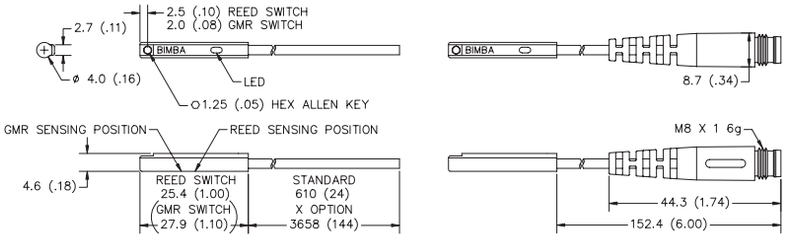
Part Numbers and List Prices

Part Number	Description	List Price
MR	Reed Switch, 2 wire, LED, 120 V, 50mA, 24" Pigtail Leads	
MRQ	Reed Switch, 2 wire, LED, 120 V, 50mA, with M8 Male Connector	
MRQC	Reed Switch, 2 wire, LED, 120 V, 50mA, with M8 Male Connector and 2m Mating Cable	
MRQCX	Reed Switch, 2 wire, LED, 120 V, 50mA, M8 Male Connector and 5m Mating Cable	
MRX	Reed Switch, 2 wire, LED, 120 V, 50mA, with 144" Pigtail Leads	
MS	Auto Configure, PNP or NPN, 3 wire, LED, 30VDC, 50mA with 24" Pigtail Leads	
MSQ	Auto Configure, PNP or NPN, 3 wire, LED, 30VDC, 50mA with M8 Male Connector	
MSQC	Auto Configure, PNP or NPN, 3 wire, LED, 30VDC, 50mA with M8 Male Connector and 2m Mating Cable	
MSQCX	Auto Configure, PNP or NPN, 3 wire, LED, 30VDC, 50mA with M8 Male Connector and 5m Mating Cable	
MSX	Auto Configure, PNP or NPN, 3 wire, LED, 30VDC, 50mA with 144" Pigtail Leads	
MSC	Sourcing Switch (PNP), LED, 30VDC, 50 mA with 24î Pigtail Leads	
MSCQ	Sourcing Switch (PNP), LED, 30VDC, 50 mA with M8 Male Connector	
MSCQC	Sourcing Switch (PNP), LED, 30VDC, 50 mA with M8 Male Connector and 2m Mating Cable	
MSCQCX	Sourcing Switch (PNP), LED, 30VDC, 50 mA with M8 Male Connector and 5m Mating Cable	
MSCX	Sourcing Switch (PNP), LED, 30VDC, 50 mA with 144" Pigtail Leads	
MSK	Sinking Switch (NPN), LED, 30VDC, 50 mA with 24" Pigtail Leads	
MSKQ	Sinking Switch (NPN), LED, 30VDC, 50 mA with M8 Male Connector	
MSKQC	Sinking Switch (NPN), LED, 30VDC, 50 mA with M8 Male Connector and 2m Mating Cable	
MSKQCX	Sinking Switch (NPN), LED, 30VDC, 50 mA with M8 Male Connector and 5m Mating Cable	
MSKX	Sinking Switch (NPN), LED, 30VDC, 50 mA with 144" Pigtail Leads	

Mini Round Track Mounted Switches

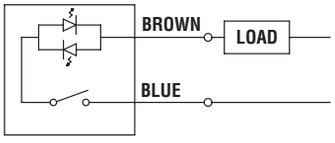
MR, MS, MSC, and MSK

Dimensions



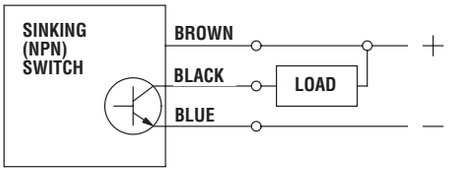
Wiring Diagrams

MR, MRX, MRQ (Reed Switch)

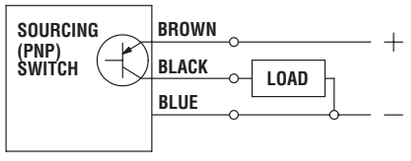


Note: On Quick Connect reed switch models, connect only the Blue and Brown wires on the mating cable and cut back the Black wire. **Do Not** connect switch to a mating cable that has been previously wired for a 3 wire solid state switch, as it will short the MRQ switch.

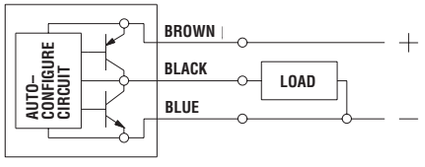
MSK, MSKX, MSKQ (Sinking, Solid State)



MSC, MSCX, MSCQ (Sourcing, Solid State)



MS, MSX, MSQ

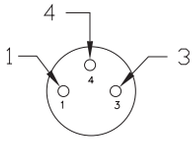


Color Codes	
Brown	(+) Positive
Black	Output
Blue	(-) Negative

Pin and Wire Assignments for Quick Connect

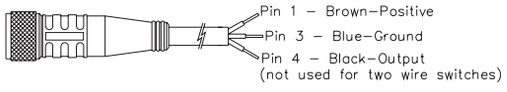
Switch "Q" Option Male Connector

Face View of M8 ***Male*** Connector

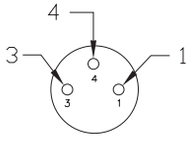


C4 and C5 Cable ***Female*** Connector

Side View of M8 ***Female*** Connector



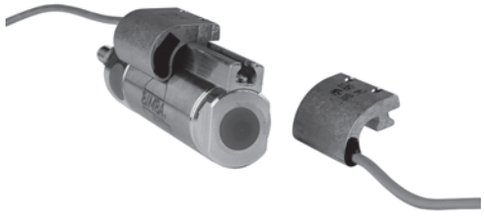
Face View of M8 ***Female*** Connector



Switch Selection

Heavy Duty Track Mounted Switches
MRS-.027, MRS-.087, and MRS-1.5-S

Compatible and Tested for use with:
Original Line Cylinders and MRS Series Cylinders with -Z option



Part Numbers and List Prices

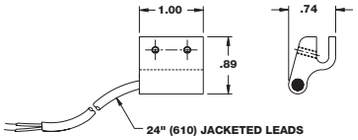
Part Number	Description	List Price
MRS-.027[1]	Reed Switch, 2 wire, No LED, 28 V, 250mA, 24" Pigtail Leads	
MRS-.027-Q[1]	Reed Switch, 2 wire, No LED, 28 V, 250mA, with M8 Male Connector	
MRS-.027-QC[1]	Reed Switch, 2 wire, No LED, 28 V, 250mA, with M8 Male Connector and 2m Mating Cable	
MRS-.027-QCX[1]	Reed Switch, 2 wire, No LED, 28 V, 250mA, with M8 Male Connector and 5m Mating Cable	
MRS-.087[2]	Reed Switch, 2 wire, No LED, 200 V, 500mA, 24" Pigtail Leads	
MRS-.087-Q[2]	Reed Switch, 2 wire, No LED, 200 V, 500mA, with M8 Male Connector	
MRS-.087-QC[2]	Reed Switch, 2 wire, No LED, 200 V, 500mA, with M8 Male Connector and 2m Mating Cable	
MRS-.087-QCX[2]	Reed Switch, 2 wire, No LED, 200 V, 500mA, with M8 Male Connector and 5m Mating Cable	
MRS-1.5[2]	Reed Switch, 2 wire, No LED, 230 V AC only , 1.5A, 24" Pigtail Leads	
MRS-1.5-S[1]	Reed Switch, 2 wire, No LED, 230 V AC only , 1.5A, 24" Pigtail Leads	

[1]MRS Series with -Z option 9/16" and 3/4" bore only
[2]MRS Series with -Z option 1-1/16" through 2" bore only

Heavy Duty Track Mounted Switches
MRS-.027, MRS-.087, and MRS-1.5-S

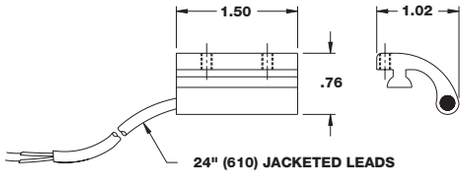
Dimensions

MRS-.027



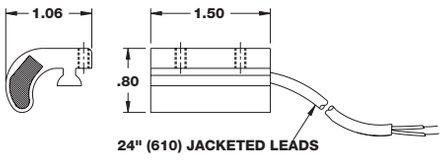
To order longer leads, specify D-12660-A-lead length in inches. Consult BIMBA distributor or factory for prices.

MRS-.087



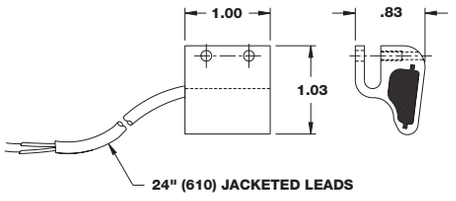
To order longer leads, specify D-7000-A-lead length in inches. Consult BIMBA distributor or factory for prices.

MRS-1.5



To order longer leads, specify D-7001-A-lead length in inches. Consult BIMBA distributor or factory for prices.

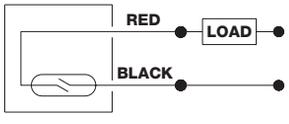
MRS-1.5-S



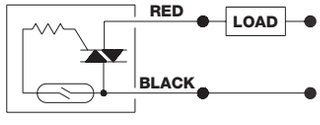
To order longer leads, specify D-16312-A-lead length in inches. Consult BIMBA distributor or factory for prices.

Wiring Diagrams

MRS-.027
MRS-.087



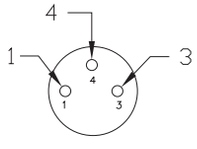
MRS-1.5
MRS-1.5-S



Pin and Wire Assignments for Quick Connect

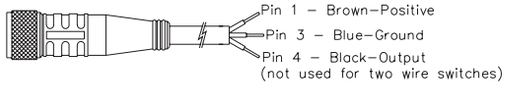
Switch “Q” Option Male Connector

Face View of M8 ***Male*** Connector

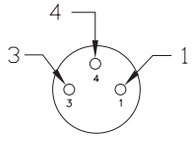


C4 and C5 Cable ***Female*** Connector

Side View of M8 ***Female*** Connector



Face View of M8 ***Female*** Connector



Switch Selection

5mm Square Track Mounted Switches
HSC-AB, HSK-AB, and MRS-AB

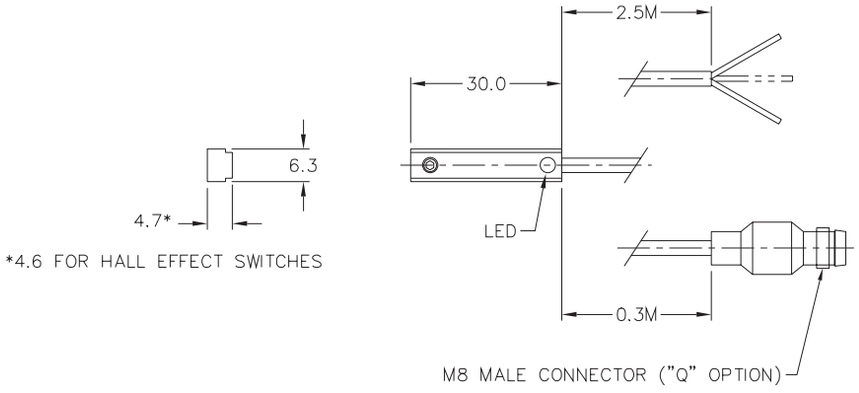
Compatible and Tested for use with:
ISO-6431 Cylinders

Part Numbers and List Prices

Part Number	Description	List Price
MRS-AB	Reed Switch, 2 wire, LED, 120 V, 100mA, 24" Pigtail Leads	
MRS-ABQ	Reed Switch, 2 wire, LED, 120 V, 100mA, with M8 Male Connector	
MRS-ABQC	Reed Switch, 2 wire, LED, 120 V, 100mA, with M8 Male Connector and 2m Mating Cable	
MRS-ABQCX	Reed Switch, 2 wire, LED, 120 V, 100mA, M8 Male Connector and 5m Mating Cable	
HSC-AB	Sourcing Switch (PNP), LED, 30VDC, 100mA with 24" Pigtail Leads	
HSC-ABQ	Sourcing Switch (PNP), LED, 30VDC, 100mA with M8 Male Connector	
HSC-ABQC	Sourcing Switch (PNP), LED, 30VDC, 100mA with M8 Male Connector and 2m Mating Cable	
HSC-ABQCX	Sourcing Switch (PNP), LED, 30VDC, 100mA with M8 Male Connector and 5m Mating Cable	
HSK-AB	Sinking Switch (NPN), LED, 30VDC, 100mA with 24" Pigtail Leads	
HSK-ABQ	Sinking Switch (NPN), LED, 30VDC, 100mA with M8 Male Connector	
HSK-ABQC	Sinking Switch (NPN), LED, 30VDC, 100mA with M8 Male Connector and 2m Mating Cable	
HSK-ABQCX	Sinking Switch (NPN), LED, 30VDC, 100mA with M8 Male Connector and 5m Mating Cable	

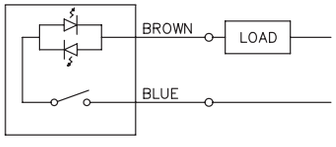
5mm Square Track Mounted Switches
HSC-AB, HSK-AB, and MRS-AB

Dimensions

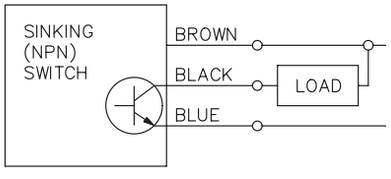


Wiring Diagrams

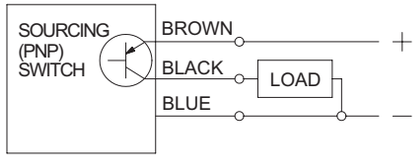
MRS-AB



HSK-AB



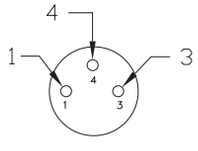
MSC, MSCX, MSCQ (Sourcing, Solid State)



Pin and Wire Assignments for Quick Connect

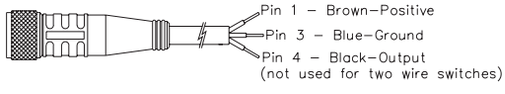
Switch "Q" Option Male Connector

Face View of M8 ***Male*** Connector

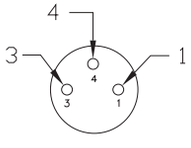


C4 and C5 Cable ***Female*** Connector

Side View of M8 ***Female*** Connector



Face View of M8 ***Female*** Connector



Switch Selection

5mm Square Track Mounted Switches
UBR, UBSC, and UBSK

Compatible and Tested for use with:
Ultran Band Cylinders (25mm to 63mm bore sizes)

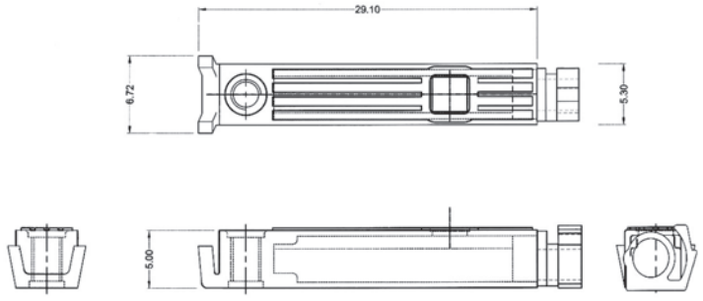
Part Numbers and List Prices

Part Number	Description	List Price
UBR	Reed Switch, 2 wire, LED, 240 V, 100mA, 24" Pigtail Leads	
UBRQ	Reed Switch, 2 wire, LED, 240 V, 100mA, with M8 Male Connector	
UBRQC	Reed Switch, 2 wire, LED, 240 V, 100mA, with M8 Male Connector and 2m Mating Cable	
UBRQCX	Reed Switch, 2 wire, LED, 240 V, 100mA, M8 Male Connector and 5m Mating Cable	
UBSC	Sourcing Switch (PNP), LED, 28VDC, 200mA with 24" Pigtail Leads	
UBSCQ	Sourcing Switch (PNP), LED, 28VDC, 200mA with M8 Male Connector	
UBSCQC	Sourcing Switch (PNP), LED, 28VDC, 200mA with M8 Male Connector and 2m Mating Cable	
UBSCQCX	Sourcing Switch (PNP), LED, 28VDC, 200mA with M8 Male Connector and 5m Mating Cable	
UBSK	Sinking Switch (NPN), LED, 28VDC, 200mA with 24" Pigtail Leads	
UBSKQ	Sinking Switch (NPN), LED, 28VDC, 200mA with M8 Male Connector	
UBSKQC	Sinking Switch (NPN), LED, 28VDC, 200mA with M8 Male Connector and 2m Mating Cable	
UBSKQCX	Sinking Switch (NPN), LED, 28VDC, 200mA with M8 Male Connector and 5m Mating Cable	

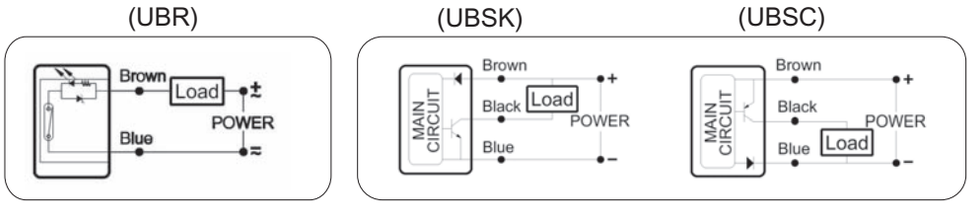
5mm Square Track Mounted Switches
UBR, UBSC, and UBSK

Dimensions

Magnetic Sensor Dimensional Data



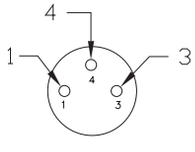
Wiring Diagrams



Pin and Wire Assignments for Quick Connect

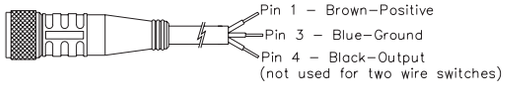
Switch “Q” Option Male Connector

Face View of M8 ***Male*** Connector

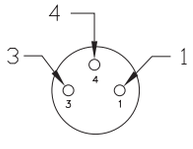


C4 and C5 Cable ***Female*** Connector

Side View of M8 ***Female*** Connector



Face View of M8 ***Female*** Connector



Switch Selection

Ultran End of Stroke Switches
PCQ, PKQ, RSU-1

Compatible and Tested for use with:
Ultran Rodless Cylinders

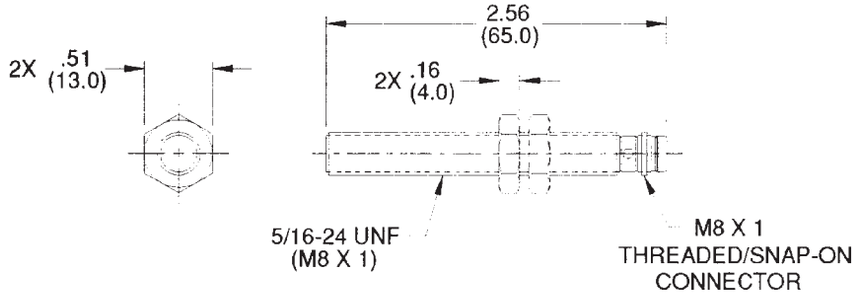
Part Numbers and List Prices

Part Number	Description	List Price
PCQ	5/16-24 Threaded Barrel Type Inductive Proximity Sensor with Sourcing (PNP) Output, M8 Male Connector	
PKQ	5/16-24 Threaded Barrel Type Inductive Proximity Sensor with Sinking (NPN) Output, M8 Male Connector	
RSU-1	5/16-24 Threaded Barrel Type Magnetic Reed Sensor with Normally Open Contact Output, 24" pigtail leads	
RSU-1-Q	5/16-24 Threaded Barrel Type Magnetic Reed Sensor with Normally Open Contact Output, M8 Male Connector	
PCQC	5/16-24 Threaded Barrel Type Inductive Proximity Sensor with Sourcing (PNP) Output, M8 Male Connector and 2m Mating Cable	
PKQC	5/16-24 Threaded Barrel Type Inductive Proximity Sensor with Sinking (NPN) Output, M8 Male Connector and 2m Mating Cable	
RSU-1-QC	5/16-24 Threaded Barrel Type Magnetic Reed Sensor with Normally Open Contact Output, M8 Male Connector and 2m Mating Cable	
PCQCX	5/16-24 Threaded Barrel Type Inductive Proximity Sensor with Sourcing (PNP) Output, M8 Male Connector and 5m Mating Cable	
PKQCX	5/16-24 Threaded Barrel Type Inductive Proximity Sensor with Sinking (NPN) Output, M8 Male Connector and 5m Mating Cable	
RSU-1-QCX	5/16-24 Threaded Barrel Type Magnetic Reed Sensor with Normally Open Contact Output, M8 Male Connector and 5m Mating Cable	

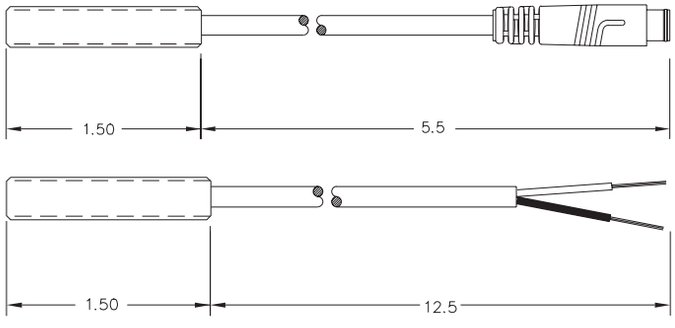
Ultran End of Stroke Switches

PCQ, PKQ, RSU-1

Dimensions

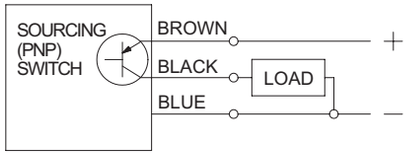


RSU-1

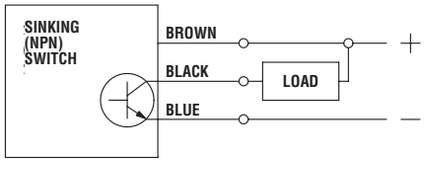


Wiring Diagrams

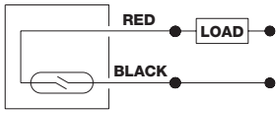
MSC, MSCX, MSCQ (Sourcing, Solid State)



PKQ



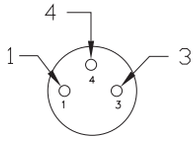
RSU-1



Pin and Wire Assignments for Quick Connect

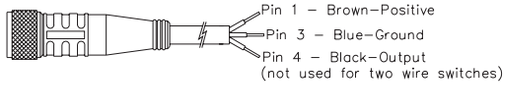
Switch “Q” Option Male Connector

Face View of M8 ***Male*** Connector

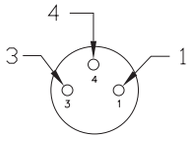


C4 and C5 Cable ***Female*** Connector

Side View of M8 ***Female*** Connector



Face View of M8 ***Female*** Connector



Switch Selection

M8 Female Quick Connect Cables
C4 and C5

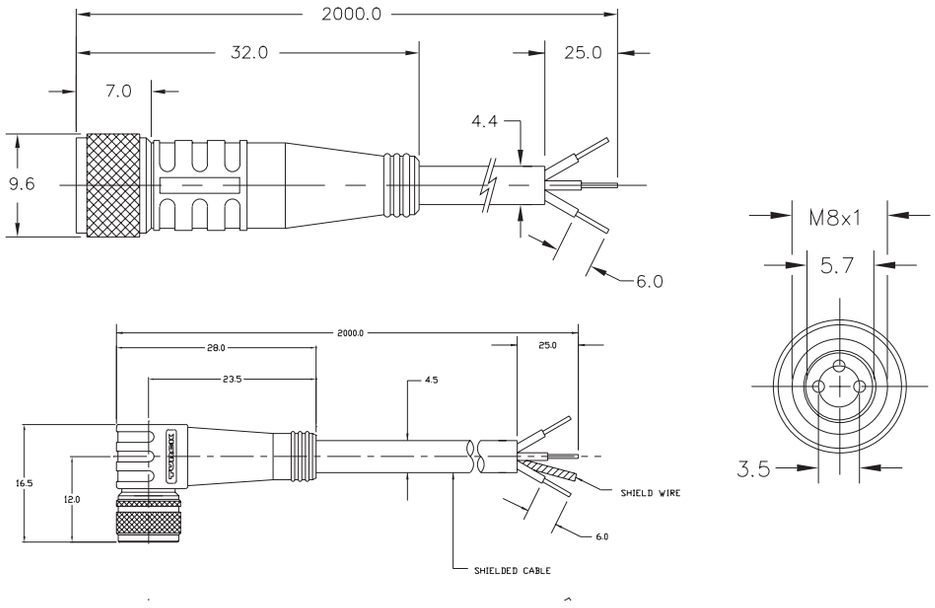
Compatible and Tested for use with:
All Bimba Actuators with "Q" Option

Part Numbers and List Prices

Part Number	Description	List Price
C4	Straight M8 Female Connector, Threaded or Snap Tight Connection with 2 Meter Cable	
C4-S	Straight M8 Female Connector, Threaded or Snap Tight Connection with 2 Meter Shielded Cable	
C4X	Straight M8 Female Connector, Threaded or Snap Tight Connection with 5 Meter Cable	
C4X-S	Straight M8 Female Connector, Threaded or Snap Tight Connection with 5 Meter Shielded Cable	
C5-S	Right Angle M8 Female Connector, Threaded or Snap Tight Connection with 2 Meter Shielded Cable	
C5X-S	Right Angle M8 Female Connector, Threaded or Snap Tight Connection with 5 Meter Shielded Cable	

M8 Female Quick Connect Cables
C4 and C5

Dimensions

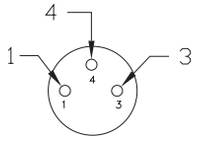


Wiring Diagrams

Pin and Wire Assignments for Quick Connect

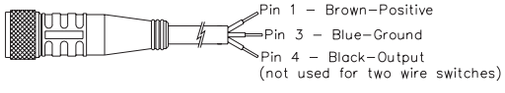
Switch “Q” Option Male Connector

Face View of M8 ***Male*** Connector

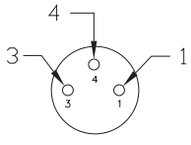


C4 and C5 Cable ***Female*** Connector

Side View of M8 ***Female*** Connector



Face View of M8 ***Female*** Connector



Switch Application Information

Actuator Application Data

Hysteresis and Operating Windows

Hysteresis

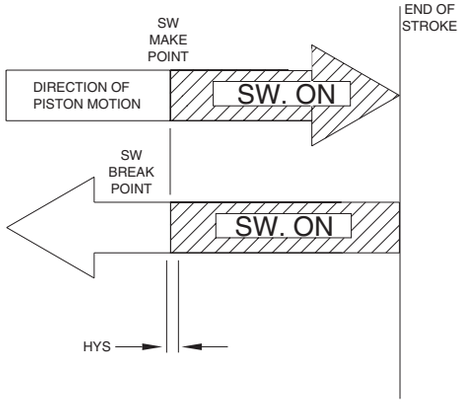
Bimba Solid State switches are subject to hysteresis. Hysteresis is the difference in magnetic field strength needed to initiate switch operation versus the field strength needed to sustain switch operation. The effect is that the switch break point will be different from the switch make point in the piston travel.

Operating Window

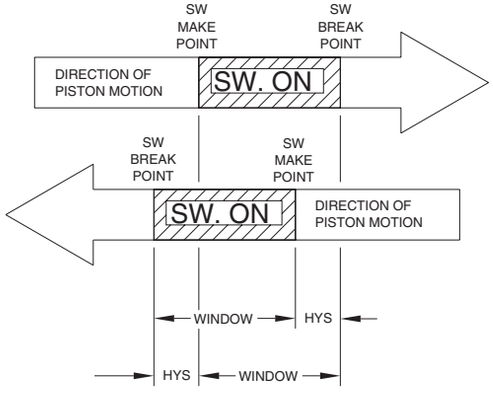
The operating window is the distance the piston travels while the switch is in the "ON" state, and includes the hysteresis action. For the Solid State Switch, hysteresis is greater on one side of the operating window because this switch is sensitive to only one side of the magnet.

For high speed equipment, the time duration of the switch signal may be critical. The time duration is a function of the operating window length and the speed of operation of the actuator. It is calculated by dividing the minimum travel in the operating window by the piston speed, taking into account the hysteresis effect. The illustrations and chart below show the operating windows for the Solid State Switch.

END OF STROKE OPERATION



MID STROKE OPERATION



Switch Application Information

Original Line Cylinders with Indicated Switches

Bore Size		MR, MS, MSC, MSK			HSC, HSK			MRS-.087 & MRS-1.5			MRS-.027 & MRS-1.5-S		
		Operating Window	Maximum Hysteresis	Repeat-ability	Operating Window	Maximum Hysteresis	Repeat-ability	Operating Window	Maximum Hysteresis	Repeat-ability	Operating Window	Maximum Hysteresis	Repeat-ability
007	5/16"	0.250"	0.040"	±0.010"			±0.015"						
01	7/16"	0.275"	0.040"	±0.010"			±0.015"						
02	9/16"	0.350"	0.040"	±0.010"	0.290"	0.040"	±0.015"	0.350"	0.040"	±0.015"	0.345"	0.015"	±0.015"
04	3/4"	0.375"	0.045"	±0.010"	0.310"	0.040"	±0.015"	0.350"	0.040"	±0.015"	0.345"	0.015"	±0.015"
06	7/8"	0.425"	0.045"	±0.010"	0.320"	0.040"	±0.015"	0.350"	0.040"	±0.015"			
09	1-1/16"	0.450"	0.045"	±0.010"	0.330"	0.040"	±0.015"	0.350"	0.040"	±0.015"			
12	1-1/4"	0.450"	0.050"	±0.010"	0.340"	0.040"	±0.015"	0.440"	0.040"	±0.015"			
17	1-1/2"	0.450"	0.050"	±0.010"	0.350"	0.040"	±0.015"	0.440"	0.040"	±0.015"			
24	1-3/4"	0.450"	0.050"	±0.010"	0.350"	0.040"	±0.015"	0.440"	0.040"	±0.015"			
31	2”	0.450"	0.050"	±0.010"	0.360"	0.040"	±0.015"	0.440"	0.040"	±0.015"			
50	2-1/2"	0.450"	0.050"	±0.010"	0.370"	0.040"	±0.015"	0.440"	0.040"	±0.015"			
70	3"	0.500"	0.050"	±0.010"	0.380"	0.040"	±0.015"	0.440"	0.040"	±0.015"			

Flat Cylinders with Track Mounted Switches

HK, HC, MR, MS, MSC, and MSK

Bore Size		Operating Window	Maximum Hysteresis	Repeat-ability
02	9/16”	0.250”	0.040”	±0.015”
04	3/4”	0.300”	0.040”	±0.015”
09	1 1/16”	0.300”	0.040”	±0.015”
17	1 1/2”	0.300”	0.040”	±0.015”
31	2”	0.325”	0.040”	±0.015”
50	2 1/2”	0.325”	0.040”	±0.015”
70	3”	0.375”	0.040”	±0.015”
125	4”	0.400”	0.040”	±0.015”

Pneu-Turn Rotary Actuators with Indicated Switches

Bore Size		MR, MS, MSC, MSK			HSC, HSK			MRS-.087 -B		
		Operating Window	Maximum Hysteresis	Repeat-ability	Operating Window	Maximum Hysteresis	Repeat-ability	Operating Window	Maximum Hysteresis	Repeat-ability
02	9/16"	73°	8°	±2°	84°	7°	±3°	62°	9°	±3°
04	3/4"	57°	7°	±1.5°	61°	5°	±2°	51°	7°	±2°
09	1-1/16"	57°	6°	±1.5°	55°	5°	±2°	54°	9°	±2°
17	1-1/2"	47°	5°	±1°	41°	4°	±2°	40°	6°	±2°
31	2"	33°	4°	±0.75°	29°	3°	±1°	30°	5°	±1°

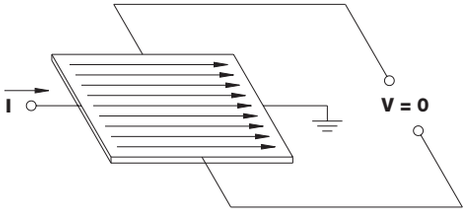
Switch Application Information

Bimba Solid State Switch

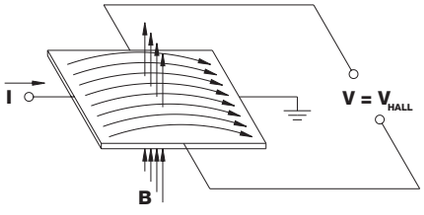
This is a three-wire, solid state device recommended for low current DC loads such as interfacing with a programmable controller. It provides compact, reliable sensing for virtually infinite life. An LED indicator light illuminates when switching occurs. Models are available in current sinking (NPN) and current sourcing (PNP) models. Either can be used for loads such as counters and solid state relays. Selection of sinking or sourcing models depends on the requirements of the programmable controller.

How it works:

The Bimba Solid State Switch is based on giant magnetoresistive (GMR) technology, which was first developed in 1988. It includes 4 Solid State resistors (2 active, 2 shielded), each of which has many thin layers of magnetorsistive material. In each layer, the electrons are oriented opposite the adjacent layer, providing a great deal of resistance to electrical flow. The presence of a magnetic field overcomes the magnetic coupling between the adjacent layers, causing parallel alignment of magnetic moments between layers, and resistance drops significantly. By connecting the 4 resistors in a classic Wheatstone bridge configuration, the voltage across a single resistor is doubled, providing a linear output. This voltage is then amplified, and sent to a comparator that switches the sensor output when it detects that a minimum magnetic field strength is present. High voltage transistors provide TTL-compatible output rated at 25 milliamps. The switch includes reverse polarity, overvoltage and transient protection.



PRINCIPLE OF SOLID STATE (NO MAGNETIC FIELD)



PRINCIPLE OF SOLID STATE (MAGNETIC FIELD PRESENT)

Sinking vs. Sourcing

Bimba offers both sinking and sourcing Solid State Switch models.

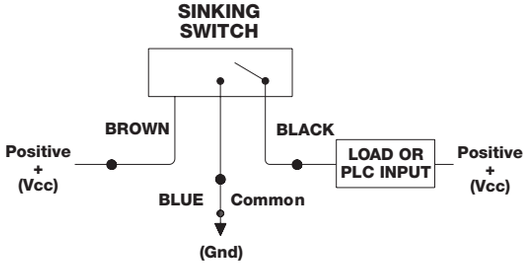
Sinking switches are applied to the **negative** side of a load. When the switch is activated, the negative (ground) is connected, completing the circuit.

Sourcing switches are applied to the **positive** side of a load. When the switch is activated, power is connected, completing the circuit.

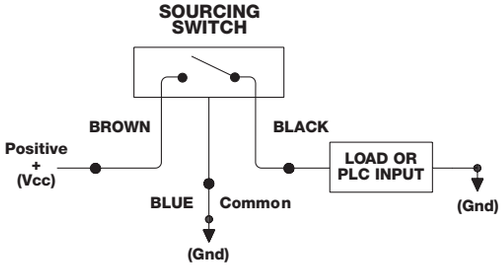
The model needed will be determined by a number of factors, including:

- Company standards.
- PLC input cards. (You may have sinking input cards available or your PLC only has a sinking type. Be aware that for some PLC manufacturers, sourcing input cards require a sinking switch or sinking input cards require a sourcing switch; check the specifications to clarify.)
- Type of circuit. PLC manufacturers typically filter input modules that use sourcing field devices and use unfiltered input modules with sinking field devices.

Typical Solid State Sinking Configuration (NPN)



Typical Solid State Sourcing Configuration (PNP)



Switch Application Information

Helpful Hints

- Be sure your actuator has a magnet option.
- Be sure to match your Solid State Switches to the proper circuits, i.e., sinking switches for sinking circuits and sourcing switches for sourcing circuits.
- Be sure to choose the correct input voltage for the switch ratings.
- Don't try to use a switch with a low current output to drive a high power circuit.
- If you have a high speed application, be sure your load circuitry doesn't have a high signal delay (some circuits have filters which cause signal delays).

Bimba has technical bulletins that describe the following situations:

1. Contact Protection (transient suppression for Reed Switches) for inductive or capacitive load switching.
2. "Or" logic operation for Solid State Switches connected in Parallel.
3. "And" logic operation for Solid State Switches connected in Series.

Call 1-800-44-BIMBA to speak to our Technical Assistance Center and request a copy at no charge or visit our website at www.bimba.com and click Tech Center.

Glossary

Actuating Time Average — Average time to close contacts on a reed switch.

Solid State — Solid State switching device activated by magnetic field.

Hysteresis — The difference (in distance) between the spot where the switch turns "on" when the piston moves in one direction, and when the switch turns "off" when the piston moves in the opposite direction. This difference occurs because it takes more magnetic force to turn the switch "on" than it does to keep it on.

Inductive Load — The characteristic of an electrical load or device that enables it to store energy while operating and to return that energy to the circuit, as electricity, when the current is turned off, i.e., solenoids.

Input Current — The amount of current needed to power switch.

Inrush Current — Initial current draw from inductive loads. May be two or three times the rated holding current for such devices.

Kickback, Inductive — Occurs when inductive loads are switched off. This may cause transients that can damage reed switches.

MRS — Magnetic Reed Switch is a mechanical switch activated by magnetic field.

Off-state Leakage — Amount of current flow to output in the off state.

Operating Window — See charts. The active window that the sensor will be in the "on" state.

R-C Network — A filter network that combines a resistor and capacitor in series across a reed switch, that filters the switch from inductive kickback or transients.

Response — Same as turn on/off time or actuating time average.

Reverse Polarity Protection — Protects switch damage caused by switching the positive and negative leads.

Self-Commutation — A condition inherent in triac switching devices. Self-commutation occurs when transients cause the triac to momentarily turn on, even though a magnetic field is not present.

Signal Repeatability — Range at which switch will turn on or off, given the same physical switching point.

Sinking — Term used for device that switches a load to ground (NPN).

Sourcing — Term used for device that switches power supply to load (PNP).

Triac — A solid state device used to switch inductive AC loads.

Turn On/Off Time — The amount of time it takes to turn on or off a Solid State device.

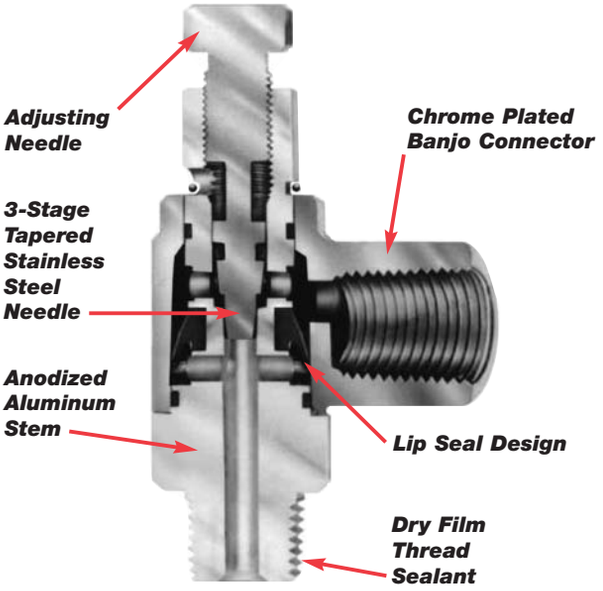
Notes

Notes

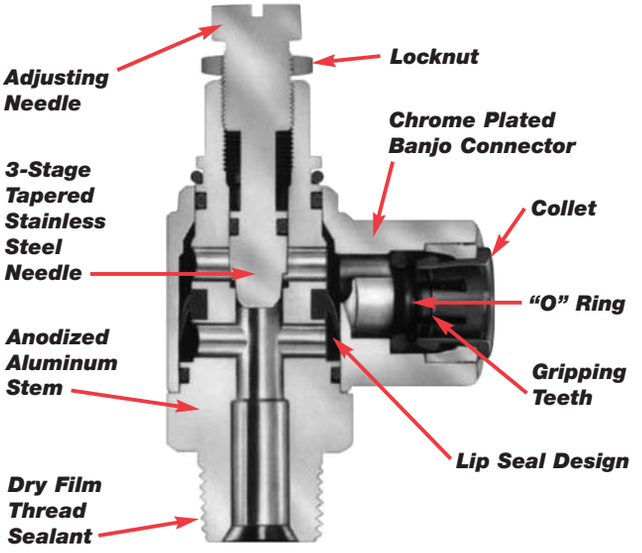
Related Products

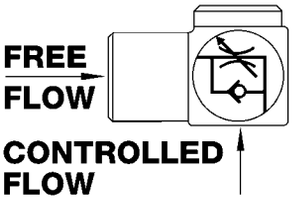
Bimba Flow Controls

FCP

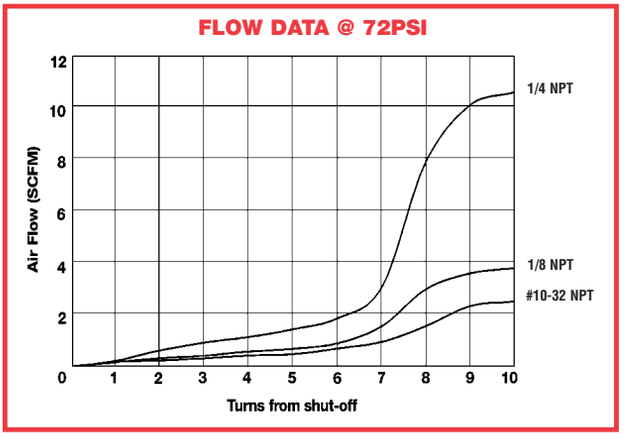


FQP

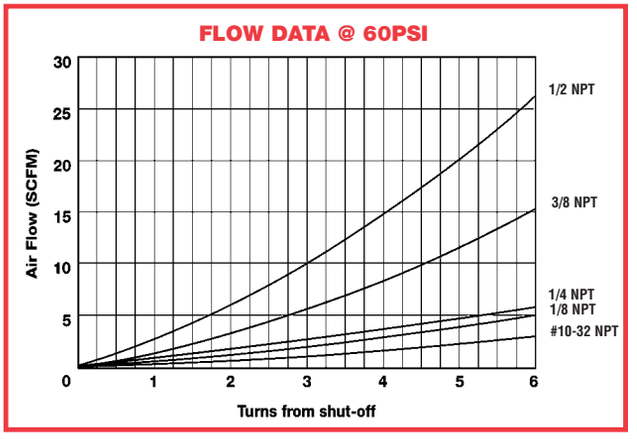




FQPS Series

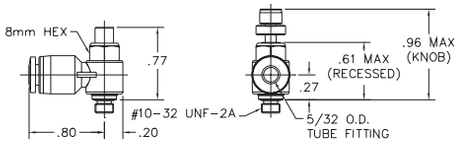


FQP & FCP Series

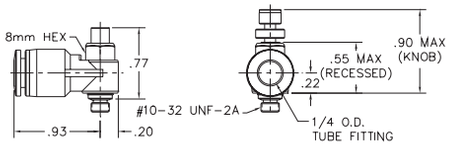


Bimba Miniature Quik-Flo® Flow Controls - FQPS Series

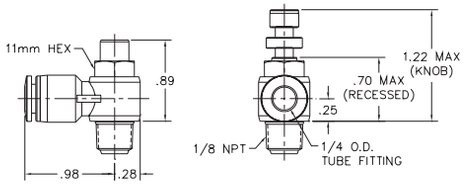
For 10-32 port, 5/32" OD tubing	FQPS1	FQPS1K



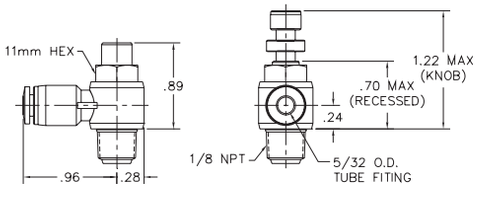
For 10-32 port, 1/4" OD tubing	FQPS12	FQPS12K



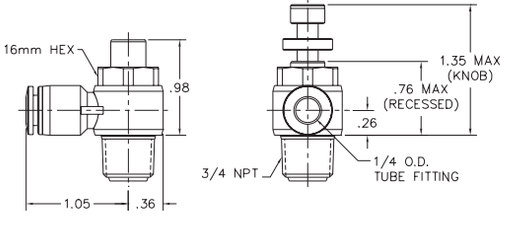
For 1/8 port, 1/4" OD tubing	FQPS2	FQPS2K



For 1/8 port, 5/32" OD tubing	FQPS21	FQPS21K



For 1/4 port, 1/4" OD tubing	FQPS44	FQPS44K



Materials:

Adjusting knob and thread:
brass
(RoHS approved)

Body:
Thermoplastic Polymer

Tubing:
Nylon and polyurethane tubing

Maximum Operating Pressure:

150 PSI air only

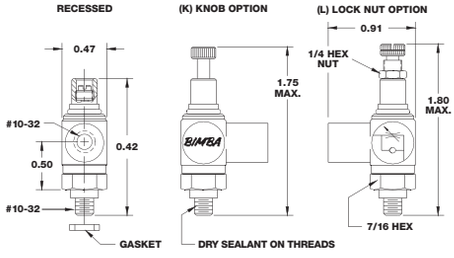
Operating Temperature Range:

30°F to 140°F
(0°C to 60°C)

Bimba Flow Controls- FCP Series

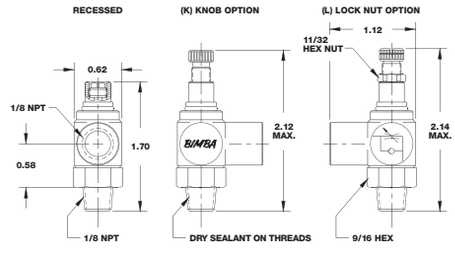
FCP1 FCP1K FCP1L — *For 10-32 port*





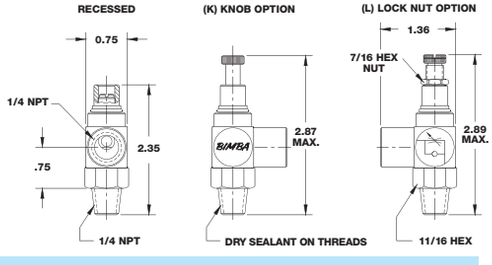
FCP2 FCP2K FCP2L — *For 1/8 port*





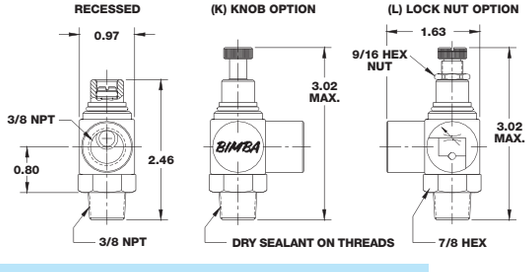
FCP4 FCP4K FCP4L — *For 1/4 port*





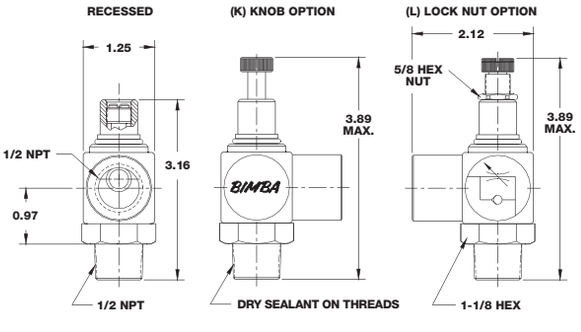
FCP6 FCP6K FCP6L — *For 3/8 port*





FCP8 FCP8K FCP8L — *For 1/2 port*





Materials:

Banjo Connector:
Chrome plated, zinc die cast

Banjo Retaining Ring:
Zinc plated steel

Stem:
High strength anodized aluminum alloy

Adjusting Needle:
Stainless steel

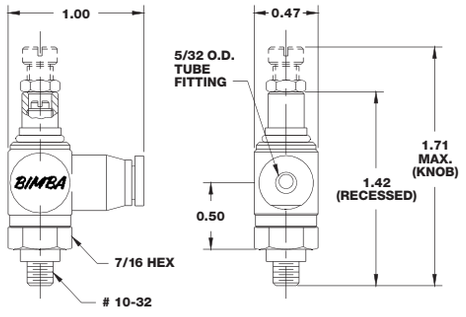
"O" Rings and Lip Seal:
Buna N

Maximum Operating Pressure:
150 PSI Air Only

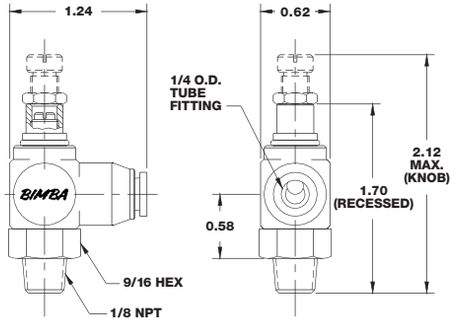
Operating Temperature Range:
-20 degrees to +200 degrees F (-25°C to +95°C)

Bimba Quik-Flo® Flow Controls- FQP Series

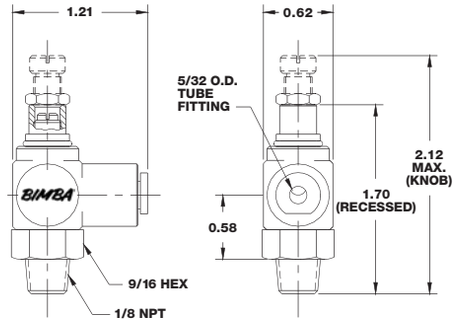
For 10-32 port, 5/32" OD tubing — **FQP1** — **FQP1K**

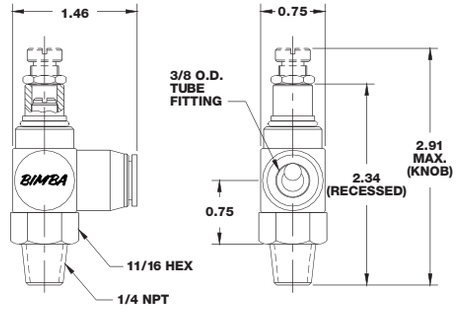
For 1/8 port, 1/4" OD tubing — **FQP2** — **FQP2K**

For 1/8 port, 5/32" OD tubing — **FQP21** — **FQP21K**

For 1/4 port, 3/8" OD tubing — **FQP4** — **FQP4K**

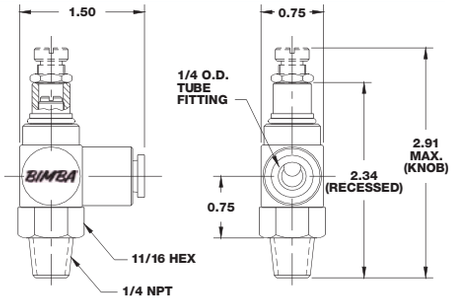
CV Factors for Bimba Flow Controls

The following estimated CV factors apply to Bimba Flow Controls in both the FCP and FQP Series.

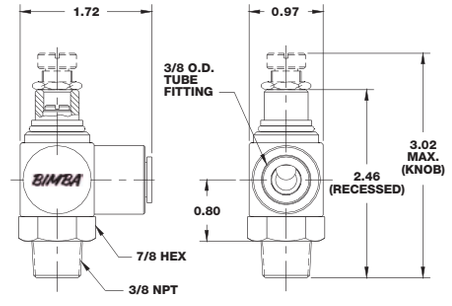
Models	Free Flow	Controlled Flow
FCP1, FCP1K, FCP1L, FQP1, FQP1K	0.12	0.09
FCP2, FCP2K, FCP2L, FQP21L, FQP2, FQP2K, FQP21K	0.24	0.21
FCP4, FCP4K, FCP4L, FQP4, FQP4K, FQP44, FQP44K	0.50	0.44
FCP6, FCP6K, FCP6L, FQP6, FQP6K	0.91	0.73
FCP8, FCP8K, FCP8L, FQP8, FQP8K	1.33	1.19

Bimba Quik-Flo® Flow Controls: FQP Series

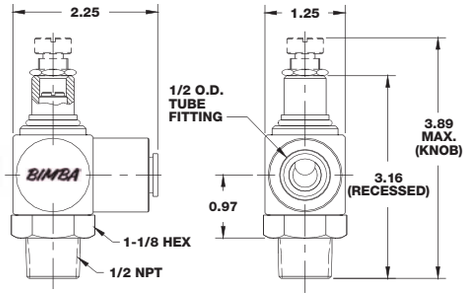
FQP44 **FQP44K** ***For 1/4 port, 1/4" OD tubing***



FQP6 **FQP6K** ***For 3/8 port, 3/8" OD tubing***



FQP8 **FQP8K** ***For 1/2 port, 1/2" OD tubing***



Materials:

Banjo Connector:
Chrome plated, zinc die cast

Banjo Retaining Ring:
Zinc plated steel

Stem:
High strength anodized aluminum alloy

Adjusting Needle:
Stainless steel

"O" Rings and Lip Seal:
Buna N

Collet:
Acetal copolymer

Gripping teeth:
Stainless steel

Collet Retainer
(if applicable):
Brass

Locknut:
416 Stainless Steel

Tube Types:
All plastic tubing, including nylon and polyethylene

Maximum Operating Pressure:
150 PSI Air Only

Operating Temperature Range:
14 degrees to +167 degrees F (-25° to +75°C)

Bimba Needle Valves

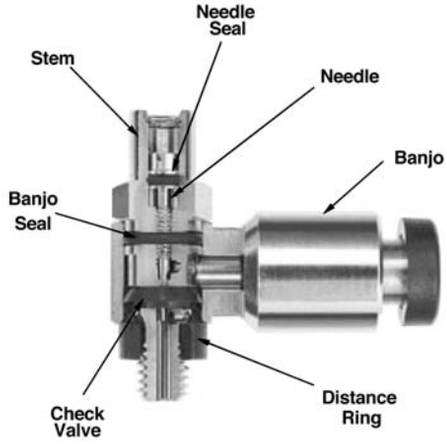
Bimba offers a range of Quik-Flo® Needle Valves, allowing for controlled flow of both the air intake and exhaust through the same valve. A needle valve can control a double acting cylinder's extension and retraction by controlling the volume of air entering the cylinder and the volume of air leaving the cylinder.

For additional dimensional information, reference Quik-Flo® Flow Controls on pages 9.2 and 9.3. For example, reference FQP1 for QNV1 dimensions.

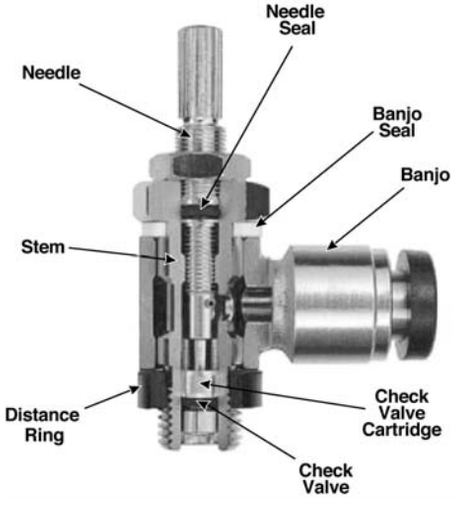
Model	Price	Tube Size	Port Size	Cv
QNV1		5/32"	#10-32	.09
QNV1K		5/32"	#10-32	.09
QNV2		1/4"	1/8" NPT	.21
QNV2K		1/4"	1/8" NPT	.21
QNV44		1/4"	1/4" NPT	.44
QNV44K		1/4"	1/4" NPT	.44
QNV6		3/8"	3/8" NPT	.73
QNV6K		3/8"	3/8" NPT	.73

Specifications

Fluid	Air
Maximum Operating Pressure	10 Bar (145 PSI)
Minimum Operating Pressure	0.1 Bar (1.5 PSI)
Temperature Range	-10° to +80°C (-14° to +176°F)



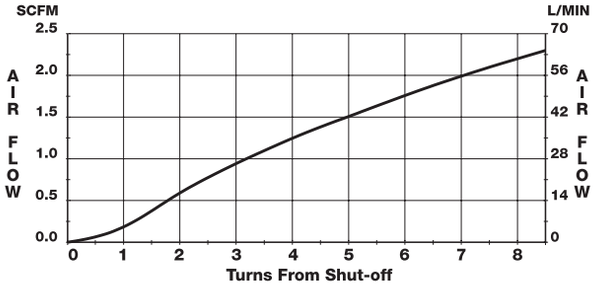
Material Specifications For M5	
Banjo	Nickel Plated Brass
Stem	Nickel Plated Brass
Needle	Nickel Plated Brass
Check Valve	NBR (Buna-N)
Needle Seal	NBR (Buna-N)
Banjo Seal	NBR (Buna-N)
Distance Ring	Reinforced Nylon



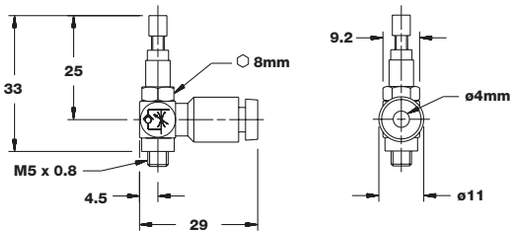
Material Specifications For G1/8" & G1/4"	
Banjo	Nickel Plated Brass
Stem	Nickel Plated Brass
Needle	Nickel Plated Brass
Check Valve	NBR (Buna-N)
Check Valve Cartridge	Brass
Needle Seal	NBR (Buna-N)
Banjo Seal	Reinforced Nylon
Distance Ring	Reinforced Nylon

M5 Port Mounted Flow Control Valves

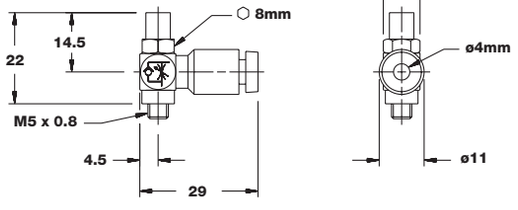
M5 Controlled Flow Chart (at 5 Bar)
Maximum Free Flow Capacity 91-122 l/min



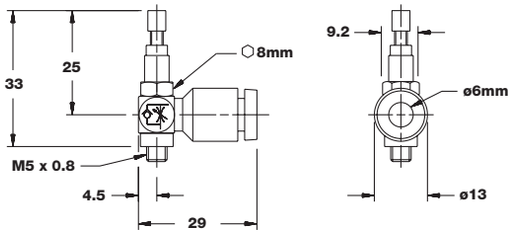
For M5 port,
FCPM-1-Q4-L
4mm OD tubing
2mm ID tubing



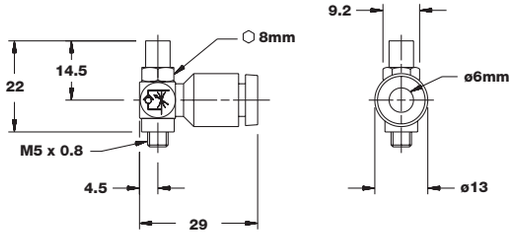
For M5 port,
4mm OD tubing
2mm ID tubing
FCPM-1-Q4-R



For M5 port,
FCPM-1-Q6-L
6mm OD tubing
4mm ID tubing

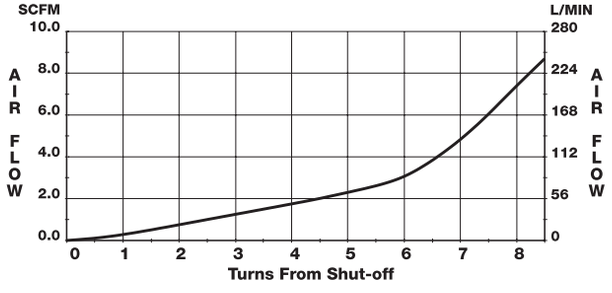


For M5 port,
6mm OD tubing
4mm ID tubing
FCPM-1-Q6-R



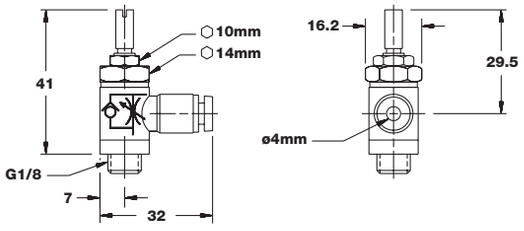
G1/8 Port Mounted Flow Control Valves

G1/8 Controlled Flow Chart (at 5 Bar)
Maximum Free Flow Capacity 110-334 l/min

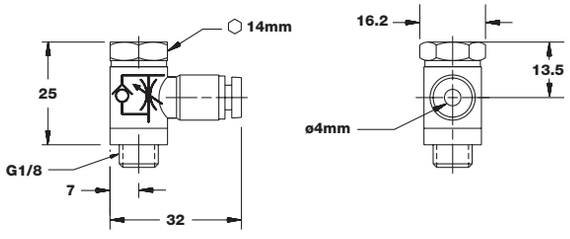


Bimba Metric Flow Controls: FCPM Series

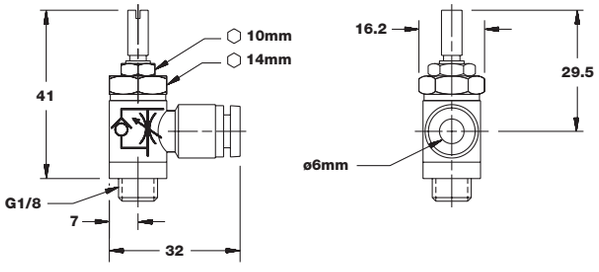
For G1/8 port,
FCPM-2-Q4-L
4mm OD tubing
2mm ID tubing



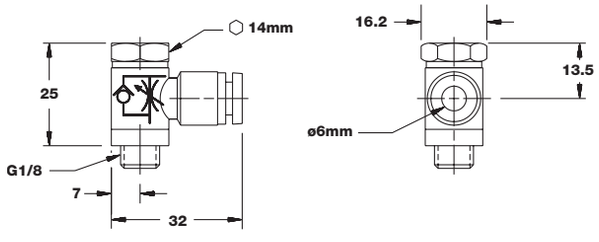
For G1/8 port,
4mm OD tubing
2mm ID tubing
FCPM-2-Q4-R



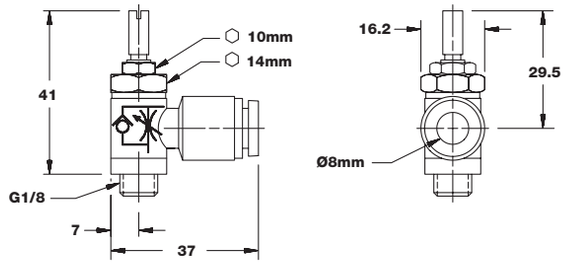
For G1/8 port,
FCPM-2-Q6-L
6mm OD tubing
4mm ID tubing



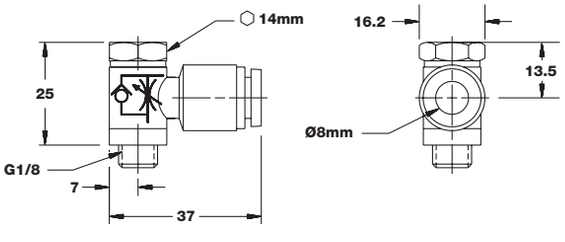
For G1/8 port,
6mm OD tubing
4mm ID tubing
FCPM-2-Q6-R



For G1/8 port,
8mm OD tubing
6mm ID tubing
FCPM-2-Q8-L

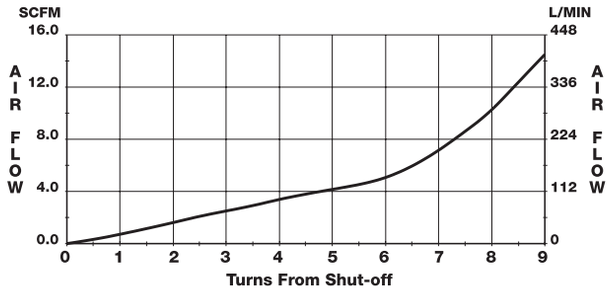


For G1/8 port,
8mm OD tubing
6mm ID tubing
FCPM-2-Q8-R

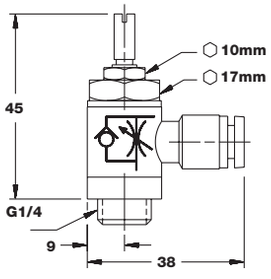


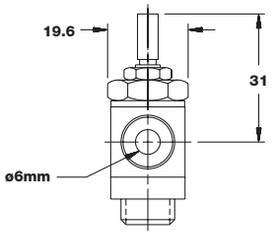
G1/4 Port Mounted Flow Control Valves

G1/4 Controlled Flow Chart (at 5 Bar)
Maximum Free Flow Capacity 394-634 l/min

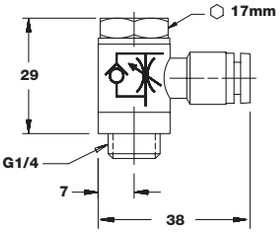


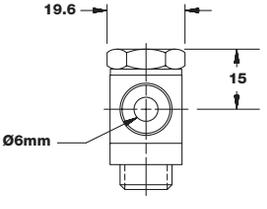
For G1/4 port,
FCPM-4-Q6-L
6mm OD tubing
4mm ID tubing



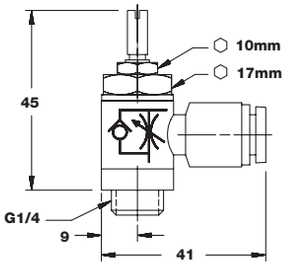


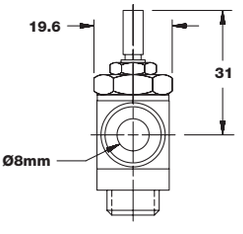
For G1/4 port,
6mm OD tubing
4mm ID tubing
FCPM-4-Q6-R



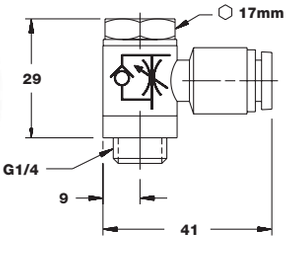


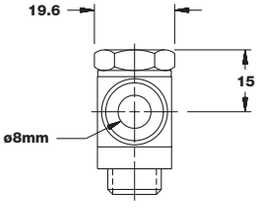
For G1/4 port,
FCPM-4-Q8-L
8mm OD tubing
6mm ID tubing





For G1/4 port,
8mm OD tubing
6mm ID tubing
FCPM-4-Q8-R

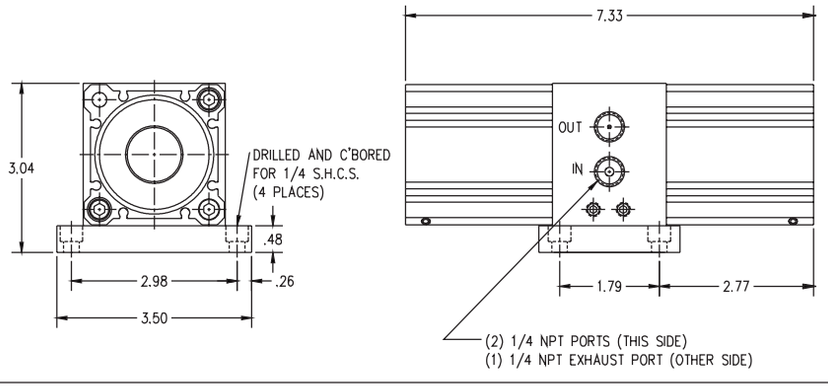




Basic 2:1 Air Booster

Bimba Basic 2:1 Air Boosters are designed to amplify inadequate air pressure applications. The unit is a self-contained design of integral valve components that reciprocate pistons to double the output pressure. Increasing the output air pressure will increase the output force of a pneumatic cylinder where space constraints exist.

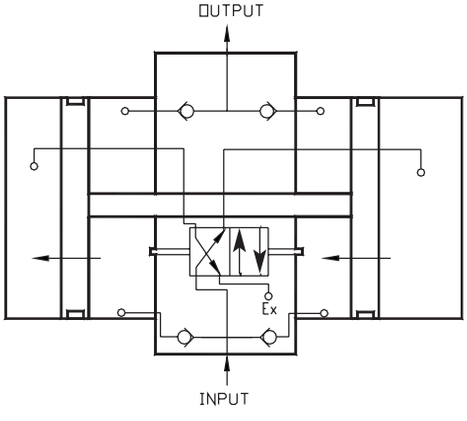
How to Order and List Prices

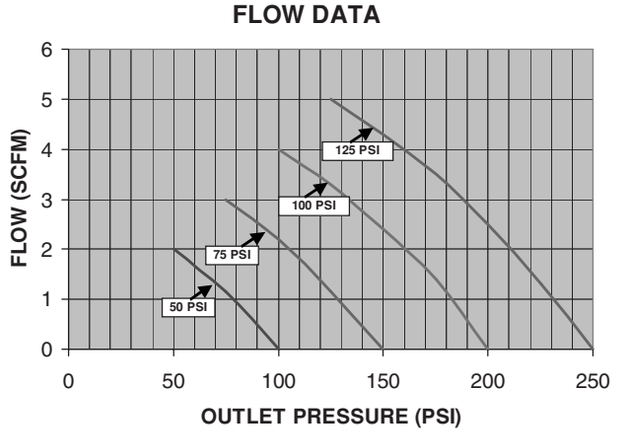
Model/Price	Dimensions (inch)
Model Number: CSS-00118-A List Price: Availability: Stock Item	

Engineering Specifications

Maximum Input Pressure:	125 psi
Operating Temperature:	15˚ to 160˚ F
Lubrication:	HT-99 oil
Bodies and Center Section:	Aluminum; Hard Coat with PTFE
Mounting Plate:	Anodized Aluminum
Estimated Charge Time:	28 seconds per 1 gallon reservoir

Note: Bimba Air Boosters are designed for intermittent duty usage such as maintaining pressure in an air reservoir. Continuous cycling decreases seal life.



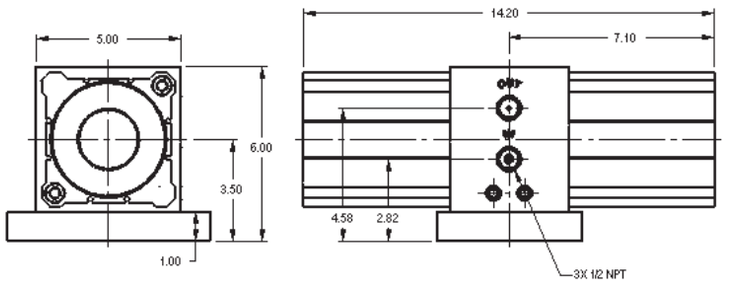


Bimba Air-to-Air Booster Cylinders

High Flow 2:1 Air Booster

The Bimba High Flow 2:1 Air Booster doubles the air pressure at a greater flow rate than our basic booster model. The unit is a self-contained system of integral valve components that reciprocate pistons to increase the output pressure. This is a compact solution to deliver the output force required of a pneumatic cylinder under limited space conditions.

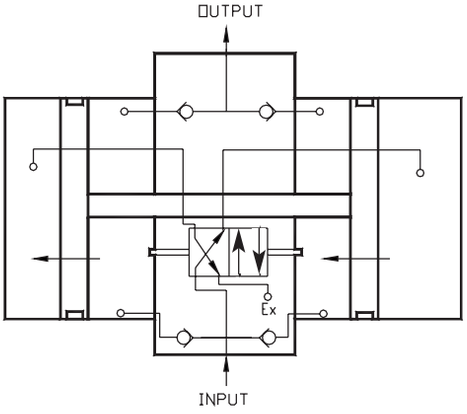
How to Order and List Prices

Model/Price	Dimensions (inch)
Model Number: CSS-00416-A List Price: Availability: Stock Item	 (2) 1/2" NPT PORTS (THIS SIDE) (1) 1/2" NPT EXHAUSE PORT (OTHER SIDE)

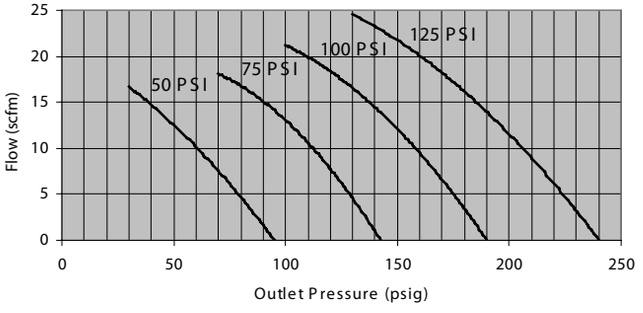
Engineering Specifications

Maximum Input Pressure:	125 psi
Operating Temperature:	15° to 160° F
Lubrication:	HT-99 oil
Bodies and Center Section:	Aluminum; Hard-Coat with PTFE
Mounting Plate:	Anodized Aluminum

Note: Bimba Air Boosters are designed for intermittent duty usage such as maintaining pressure in an air reservoir. Continuous cycling decreases seal life.



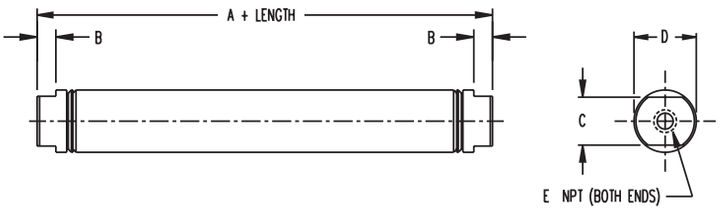
FLOW DATA



Bimba Air Reservoirs

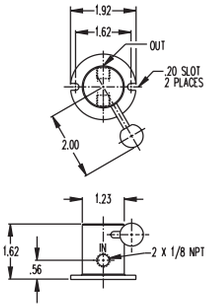
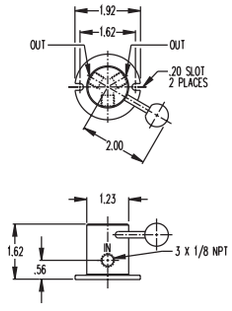
- Type 304 Stainless Steel Body
- Rated 250 PSI
- Aluminum Alloy Porting Ends

☐ Enter Stroke Length as 3rd Digit



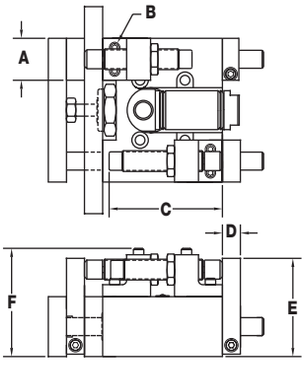
BORE	MODEL NO.	VOL. (CU. IN.)	A	B	C	D	E	PRICE
3/4"	**D-1022-A-☐** *Standard Lengths:* 1", 2", 3", 4" Maximum Length – 32" *Base Weight: .10* *Adder Per Inch of Stroke: .015*	.39 cu. in. plus .44 per inch of length	1.938	.187	.625	.813	1/8" NPT	
1-1/16"	**D-1500-A-☐** *Standard Lengths:* 1", 2", 3", 4", 5", 6" Maximum Length – 32" *Base Weight: .13* *Adder Per Inch of Stroke: .025*	.99 cu. in. plus .89 per inch of length	2.375	.187	.875	1.125	1/8" NPT	
1-1/4"	**D-27715-A-☐** *Standard Lengths:* 1", 2", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12", 13", 14", 15", 16" Maximum Length – 32" *Base Weight: .20* *Adder Per Inch of Stroke: .04*	1.38 cu. in. plus 1.22 per inch of length	1.38	.250	.875	1.333	1/8" NPT	
1-1/2"	**D-5096-A-☐** *Standard Lengths:* 1", 2", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12", 13", 14", 15", 16" Maximum Length – 32" *Base Weight: .30* *Adder Per Inch of Stroke: .04*	1.91 cu. in. plus 1.77 per inch of length	2.250	.250	.875	1.562	1/8" NPT	
2"	**D-2485-A-☐** *Standard Lengths:* 1", 2", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12", 13", 14", 15", 16" Maximum Length – 32" *Base Weight: .60* *Adder Per Inch of Stroke: .075*	4.22 cu. in. plus 3.14 per inch of length	2.875	.312	1.250	2.080	1/4" NPT	
2-1/2"	**D-11846-A-☐** *Standard Lengths:* 1", 2", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12", 13", 14", 15", 16", 17", 18", 19", 20", 21", 22", 23", 24" Maximum Length – 32" *Base Weight: .90* *Adder Per Inch of Stroke: .09*	7.04 cu. in. plus 4.91 per inch of length	2.875	.312	1.750	2.610	1/4" NPT	
3"	**D-17469-A-☐** *Standard Lengths:* 1", 2", 3", 4", 5", 6", 7", 8", 9", 10", 11", 12", 13", 14", 15", 16", 17", 18", 19", 20", 21", 22", 23", 24" Maximum Length – 32" *Base Weight: 1.7* *Adder Per Inch of Stroke: .13*	9.90 cu. in. plus 7.07 per inch of length	3.19	.312	2.00	3.125	3/8" NPT	

3 and 4 Way Disc Air Valves

MODEL/PRICE	DESCRIPTION/WEIGHT (lbs.)	DIMENSIONS
MODEL 3MV8 	***3 Way Disc Air Valve*** *– Operates single acting cylinders. Full ⅛" orifice – ⅛" NPT inlet and outlet ports. To operate, a precision lapped disc is rotated through 60° by means of a ball handle which will hold set position. To repair, remove handle and retaining ring.* *Weight: .22*	
MODEL 4MV8 	***4 Way Disc Air Valve*** *– Operates double acting cylinders. Ball handle will rotate through 120° and will hold set position – ⅛" NPT ports are located 120° apart – orifice ⅛" diameter. To repair, remove handle and retaining ring.* *Weight: .22*	

Shock Absorber Dimensions

Linear Thruster Cylinders



Bore	A	B	C	D	E	F
9/16" (02)	0.75	#6-32	1.14	0.25	1.65	1.88
3/4" (04)	0.88	#6-32	2.37	0.38	2.05	2.13
1-1/16" (09)	1	#8-32	3.68	0.38	2.87	3
1-1/2" (17)	1.25	#10-32	4.47	0.5	3.75	4
2" (31)	1.5	1/4-20	4.75	0.75	4.50 (TE) 5.50 (T)	4.75 (TE) 5.75 (T)

How to Size a Shock Absorber

Selecting the proper shock absorber model is accomplished using the shock absorber graph given for each Thruster bore. The intersection of the total energy per stroke "E_T", and velocity at shock absorber contact "V", indicates the proper shock absorber model. E_T is calculated by the equation given below using values determined for:

P	=	Air pressure (PSI)
V	=	Velocity at impact (in/sec)
S	=	Stroke of the Thruster (in)
W_U	=	Load attached to the Thruster mounting plate (lbs.)
C	=	Cycles per hour
SF	=	Shock factor
TF1	=	Thruster factor #1
TF2	=	Thruster factor #2
TF3	=	Thruster factor #3

E_T (Total energy) equals the sum of E_K (Kinetic energy) and E_W (Work energy)
Note the Work energy calculation varies with mounting position, E_{WH} Horizontal, or E_{WV} Vertical.

$E_K = ((W_U + (TF2 + (TF3 \times S))) / 772) \times V^2$ .....(Kinetic energy, in-lbs)

$E_{WH} = TF1 \times SF \times P$.....(Work energy, in-lbs) **HORIZONTAL**

$E_{WV} = ((TF1 \times P) + W_U + (TF2 + (TF3 \times S))) \times SF$ .....(Work energy, in-lbs) **VERTICAL**

$E_T = E_K + E_W$.....(Total energy per stroke, in-lbs)

$E_TC = E_T \times C$.....(Total energy per hour, in-lbs/hr)

E_T and E_TC .....must not exceed maximum listed in specifications

Example: determine the proper shock absorber for a model T-046 Thruster mounted vertically with an attached load of 15 lbs., operating air pressure of 80 PSI, and a velocity of 20 in/sec., at a cycle rate of 3,600 per hour.

P	=	80 PSI
V	=	20 in/sec
S	=	6 in
W_U	=	15 lbs
C	=	3,600 cycles / hr

From the charts for a 3/4" bore "T" series Thruster

SF	=	0.410
TF1	=	0.442
TF2	=	0.632
TF3	=	0.063
E_K	=	$((15 \text{ lbs} + (0.632 + (0.063 \times 6 \text{ in}))) / 772) \times (20 \text{ in/sec})^2$ .....E_K = 8.30 in-lbs
E_{WV}	=	$((0.442 \times 80 \text{ PSI}) + 15 \text{ lbs} + (0.632 + (0.063 \times 6 \text{ in}))) \times 0.410$ .....E_{WV} = 21.06 in-lbs
E_T	=	$E_K + E_{WV}$ = 29.36 in-lbs ..... $E_TC = E_T \times C$ = 105,685 in-lbs/hr

Checking specifications chart: both E_T and E_TC are less than maximum.

And per sizing graph for a model T-04: 29.36 in-lbs total energy at 20 in/sec velocity, use a heavy duty model HS-04 shock absorbers.

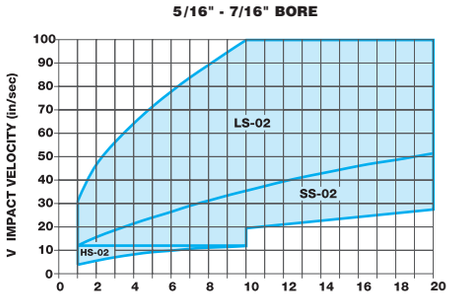
T Series Thruster Calculation Constants

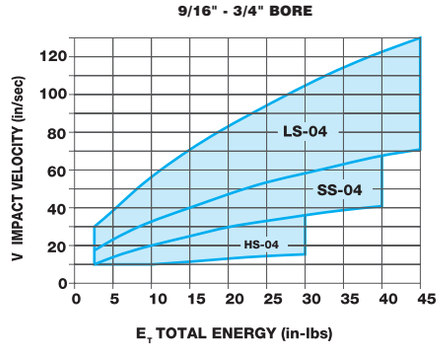
Model T					
Factor	9/16"	3/4"	1-1/16"	1-1/2"	2"
SF	0.250	0.410	0.630	0.880	1.000
TF1	0.249	0.442	0.887	1.767	3.142
TF2	0.310	0.632	1.675	3.874	7.444
TF3	0.028	0.063	0.111	0.174	0.250
(E_T) Max. in.-lbs. per cycle	20	45	190	400	650
(E_T - C) max. in.-lbs. per hour	36,000	125,000	300,000	475,000	622,000

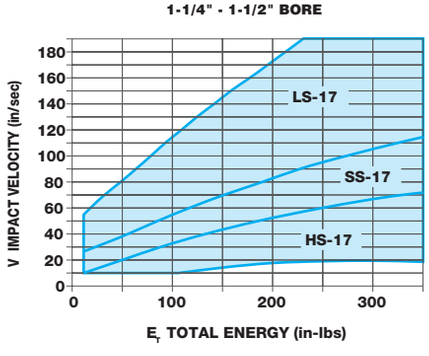
TE Series Thruster Calculation Constants

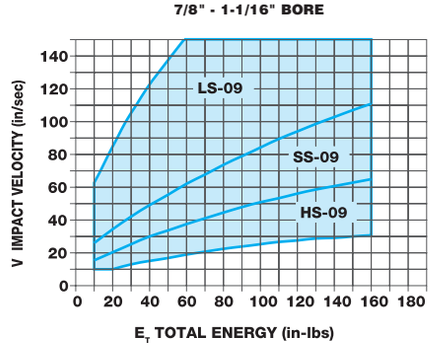
Model TE					
Factor	9/16"	3/4"	1-1/16"	1-1/2"	2"
SF	0.250	0.410	0.630	0.880	1.000
TF1	0.249	0.442	0.887	1.767	3.142
TF2	0.434	0.905	2.075	4.033	6.754
TF3	0.063	0.111	0.174	0.250	0.340
(E_T) Max. in.-lbs. per cycle	20	45	190	400	650
(E_T - C) max. in.-lbs. per hour	36,000	125,000	300,000	475,000	622,000

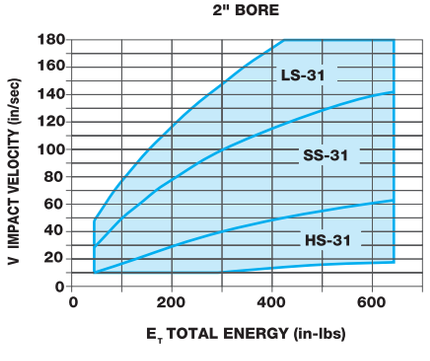
Velocity vs. Load for Shock Absorbers











Shock Absorber Dimensions

Ultran Slide and Ultran Rodless Cylinders

For each model, dimensions and engineering specifications are the same for Light, Standard, and Heavy Duty Shock Absorbers. (LS, SS and HS model numbers).

Shock Absorber Selection Guide

Bore	Ultran	Ultran Slide
5/16" (007)	N/A	☐ S-02
7/16" (01)		
9/16" (02)	☐ S-02	☐ S-04
3/4" (04)	☐ S-04	
7/8" (06)	☐ S-09	☐ S-09
1-1/16" (09)		
1-1/4" (12)	☐ S-17	☐ S-17
1-1/2" (17)		
2" (31)	☐ S-31	☐ S-31

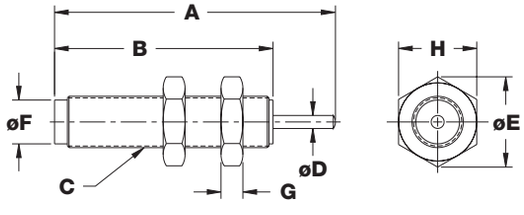
Note: Do not let shock absorbers bottom out. The shock should not be used as a stroke adjuster. A stop collar is needed for the shock if stroke adjustment is required.

Dimensions (in.)

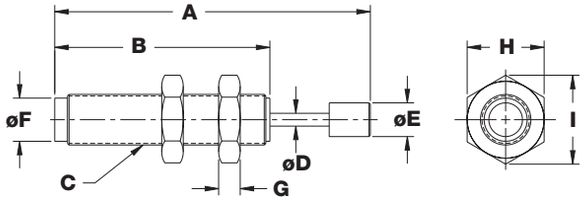
Model	A	B	C	D	E	F	G	H	I
☐ S-02	1.39	1.13	3/8-32 UNEF	0.12	N/A	0.32	0.09	0.50	0.58
☐ S-04	2.74	1.96	7/16-28 UNEF	0.12	0.40	0.39	0.16	0.56	0.65
☐ S-09	4.25	3.24	1/2-20 UNF	0.16	0.44	0.43	0.12	0.63	0.72
☐ S-17	5.38	3.89	3/4-16 UNF	0.19	0.50	0.64	0.18	0.94	1.08
☐ S-31	7.93	5.00	1-12 UNF	0.31	0.88	1.22	0.18	1.30	1.30

Model (LS, SS, HS)

☐ S-02



☐ S-04, ☐ S-09, ☐ S-17, ☐ S-31



Engineering Specifications

Model	Shock Absorber Bore	(S) Stroke Inches	Thread Type	(E_T) Max. In-Lbs. Per Cycle	(E_T-C) Max. In-Lbs. Per Hour	(F_p) Max Shock Force Lbs.	Nominal Coil Spring Force		(F_D) Max. Propelling Force (Lbs.)	Model Weight (Oz.)
							Extension (Lbs.)	Compression (Lbs.)		
☐ S-02	0.28	0.25	3/8-32 UNEF	20	36,000	160	0.65	1.13	20	0.4
☐ S-04	0.25	0.41	7/16-28 UNEF	45	125,000	225	0.7	1.6	50	2
☐ S-09	0.28	0.63	1/2-20 UNF	190	300,000	500	1	3.6	120	3
☐ S-17	0.44	0.88	3/4-16 UNF	400	475,000	700	2	6.8	200	7
☐ S-31	0.56	1.56	1-12 UNF	1,700	670,000	1,700	4	11	500	16

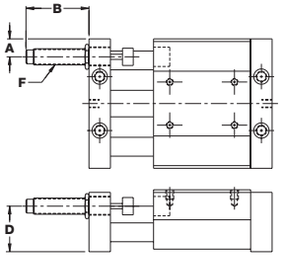
Shock Absorber Dimensions

Shock Absorber/Stroke Adjustment (in.)

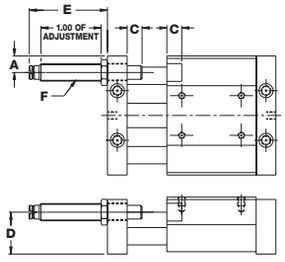
Bore	A	B	C	D	E	F
5/16" (007)	0.215	0.750	0.000	0.785	1.093	3/8-32 UNEF
7/16" (01)	0.218	0.750	0.000	0.780	1.093	3/8-32 UNEF
9/16" (02)	0.406	1.460	0.375	1.094	1.594	7/16-28 UNEF
3/4" (04)	0.406	1.335	0.375	1.438	1.469	7/16-28 UNEF
7/8" (06)	0.500	2.490	0.375	1.562	1.438	1/2-20 UNF
1-1/16" (09)	0.594	2.490	0.375	1.875	1.438	1/2-20 UNF
1-1/4" (12)	0.656	2.890	0.500	2.062	1.500	3/4-16 UNF
1-1/2" (17)	1.000	2.890	0.562	2.219	1.438	3/4-16 UNF
2" (31)	1.125	3.500	0.562	3.312	1.563	1-12 UNF

Note: Do not let the shock absorbers bottom out. The shock should not be used as a stroke adjuster. A stop collar is needed for the shock if stroke adjustment is required.

Shock Absorber



Stroke Adjustment



How to Size a Shock Absorber

Selecting the proper shock absorber model is accomplished using the shock absorber graph given for each Ultran bore. The intersection of the total energy per stroke "E_T", and velocity at shock absorber contact "V", indicates the proper shock absorber model. E_T is calculated by the equation given below using values determined for:

P	=	Air pressure (PSI)
V	=	Velocity at impact (in/sec)
W_U	=	Load attached to the Ultran mounting plate (lbs.)
C	=	Cycles per hour
SF	=	Shock factor
UF1	=	Ultran factor #1
UF2	=	Ultran factor #2

E_T (Total energy) equals the sum of E_K (Kinetic energy) and E_W (Work energy) Note the Work energy calculation varies with mounting position, E_{WH} Horizontal, or E_{WV} Vertical.

$E_K = ((W_U + UF2) / 772) \times V^2$ .....(Kinetic energy, in-lbs)

$E_{WH} = UF1 \times SF \times P$ .....(Work energy, in-lbs) **HORIZONTAL**

$E_{WV} = ((UF1 \times P) + W_U + UF2) \times SF$ .....(Work energy, in-lbs) **VERTICAL**

Example: determine the proper shock absorber for a model Ultran Slide mounted vertically with an attached load of 15 lbs., operating air pressure of 80 PSI, and a velocity of 20 in/sec., at a cycle rate of 3,600 per hour.

P	=	80 PSI
V	=	20 in/sec
S	=	6 in
W_U	=	15 lbs
C	=	3,600 cycles / hr

From the charts for a 3/4" bore Ultran Slide

SF	=	0.410
UF1	=	0.442
UF2	=	1.565
E_K	=	(15 lbs + 1.565) / 772) x (20 in/sec)^2 .....E_K = 8.56 in-lbs
E_{WV}	=	((0.442 x 80 PSI) + 15 lbs + 1.565 x 0.410 .....E_{WV} = 21.29 in-lbs
E_T	=	$E_K + E_{WV}$ = 29.85 in-lbs ..... $E_TC = E_T \times C$ = 107,457 in-lbs/hr

Checking specifications chart: both E_T and E_TC are less than maximum.

And per sizing graph for a model UGS-04: 21.29 in-lbs total energy at 20 in/sec velocity, use a heavy duty model HS-04 shock absorbers.

Ultran Slide

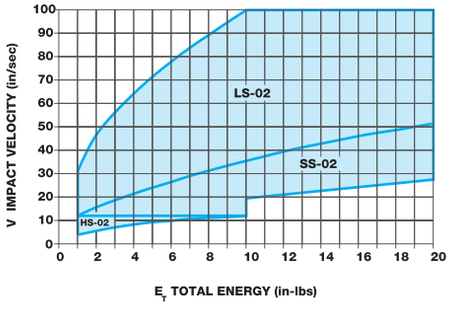
Bore	007	01	02	04	06	09	12	17	31
SF	0.250	0.250	0.410	0.410	0.630	0.630	0.880	0.880	1.560
UF1	0.077	0.150	0.249	0.442	0.601	0.887	1.227	1.767	3.142
UF2	0.285	0.385	0.805	1.565	2.195	3.140	4.750	7.530	24.380
E_T	20	20	45	45	190	190	400	400	1,700
E_T-C	36,000	36,000	125,000	125,000	300,000	300,000	475,000	475,000	670,000

Ultran Standard

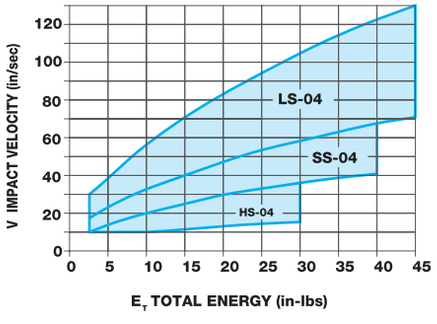
Bore	007	01	02	04	06	09	12	17	31
SF	N/A	N/A	0.250	0.410	0.630	0.630	0.880	0.880	1.560
UF1	N/A	N/A	0.249	0.442	0.601	0.887	1.227	1.767	3.142
UF2	N/A	N/A	0.485	1.060	1.585	2.285	3.500	5.845	16.965
E_T	N/A	N/A	20	45	190	190	400	400	1,700
E_T-C	N/A	N/A	36,000	125,000	300,000	300,000	475,000	475,000	670,000

Velocity vs. Load for Shock Absorbers

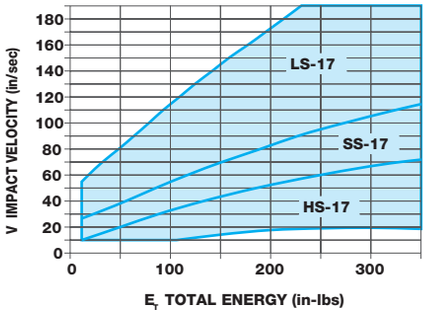
5/16" - 7/16" BORE



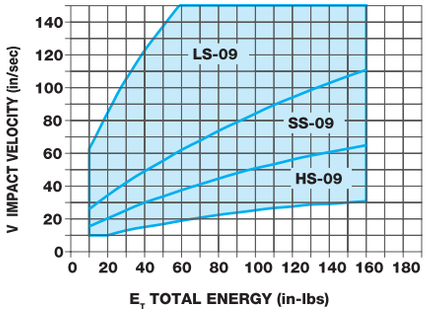
9/16" - 3/4" BORE



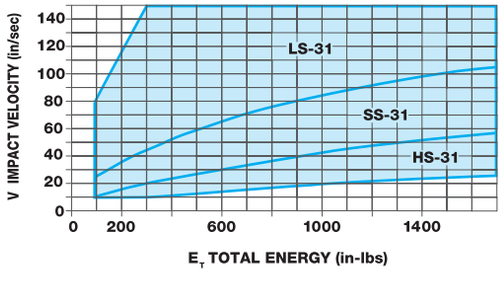
1-1/4" - 1-1/2" BORE



7/8" - 1-1/16" BORE



2" BORE



**Ultran Maximum Velocity*
20 inches per second or cycle rate
not to exceed 15 per minute

Shock Absorbers

High Load Ultran Cylinders

Shock Absorbers

Shock Absorbers can be used to decelerate loads or to absorb excess Kinetic Energy.

Calculating Kinetic Energy

When a load is being moved by the High Load Ultran, kinetic energy is generated. This energy must be absorbed either by the High Load Ultran or by some external device. If the energy is to be absorbed by the High Load Ultran, then the energy must not exceed 3.5 foot-pounds (42 inch-pounds).

Kinetic energy is defined by the formula $1/2mV^2$, where **m** is the mass of the load being moved and **V** is the speed at which the load is moving upon impact.

m is defined as **W/g**, where **W** is the known weight of the load including the weight of the carriage, and **g** is acceleration due to gravity. **V** is defined in feet per second.

Considering Total Energy

In addition to the energy generated by the moving load, other external (propelling) forces must be considered to ensure the proper use of the shock absorber. See Table 3 (page 9.21) for maximum force information. Propelling forces are those forces generated by cylinder air pressure, springs, gravity, etc. Once the energy generated by these forces is determined, it must be added to the kinetic energy generated by the moving load to determine total energy (E_T) to be absorbed by the shock (see example below).

Selecting Shock Absorber Setting

The shock absorber offered for the High Load Ultran Slide is adjustable. This means that the shock absorber is capable of decelerating loads over a range of velocities. Use Graph 5 to determine the appropriate setting for your application. Some adjustment to this setting may be required to achieve the desired deceleration rate. Table 3 shows the shock absorber ratings.

For Example (Total Energy):

Operating a UHL-17 at 60 psi in a horizontal application, carrying a 100-pound load at 10 inches per second end-of-stroke velocity, the total energy, E_T, is determined as follows.

1. **Determine kinetic energy generated by the moving load using the formula, KE = 1/2 mV^2.**

   m = (W + weight of carriage)/g =

   (7.5 + 100)/32.179 = 3.34 lbm

   V = 10 in/sec = 0.833 feet per second

   KE = 1/2 * 3.34 * 0.833^2 = 1.16 foot-pounds or

   13.92 inch-pounds (1.16 x 12 inches)

Table 2.

Bore	Carriage Weight
1-1/4" (12)	3.9 lbs.
1-1/2" (17)	7.5 lbs.

2. **Determine the propelling forces and their respective energy.**

   Force (F) = piston area * air pressure = 1.76 * 60 = 106 pounds

   Energy (E) = F * stroke of shock = 106 * 0.5 = 53 inch-pounds

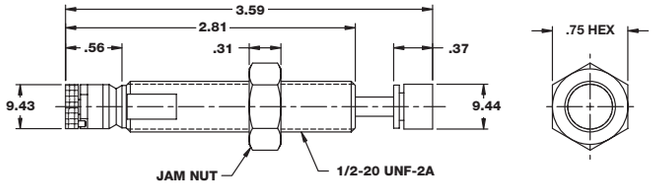
3. **Total Energy (E_T) = 53 + 13.92 = 66.92 inch-pounds**

Note: If the total energy (E_T) of your application exceeds the allowable maximum of 100 inch-pounds for the adjustable shock absorber, the standard HS-17 shock absorber may be used. Refer to page 9.19 for specifications.

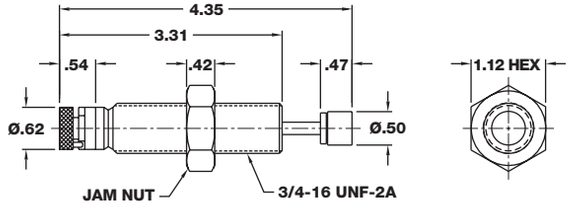
Shock Absorber

High Load Ultran

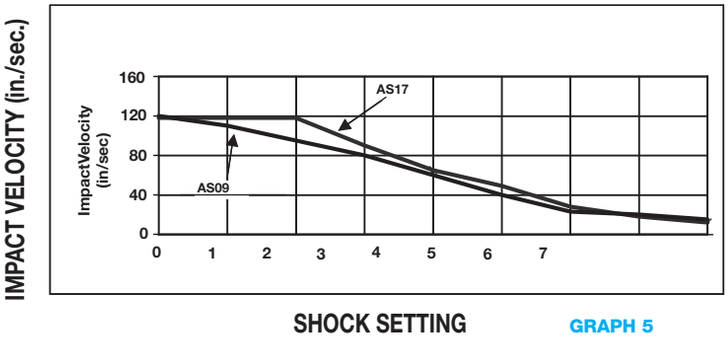
Dimensions (in.)
1-1/16" bore



Dimensions (in.)
1-1/2" bore



Shock Absorber Adjustment Range



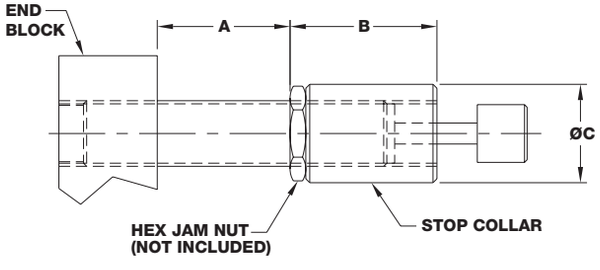
GRAPH 5

Table 3. Shock Absorber Ratings

Model	Shock Absorber Bore	(S) Stroke	Thread Type	(E_T) Max. In-Lb. Per Cycle	(E_T-C) Max. In-Lb. Per Cycle	(F_P) Max. Shock Force	Normal Coil Spring Force		(F_D) Max. Propelling Force	Weight
							Extension	Compression		
AS-09	.25	.38	1/2"-20 UNF	50	178,000	200	.8	1.7	8	2
AS-17	.28	.5	3/4"-16 UNF	100	284,000	300	1.5	2.0	150	5

Stop Collar

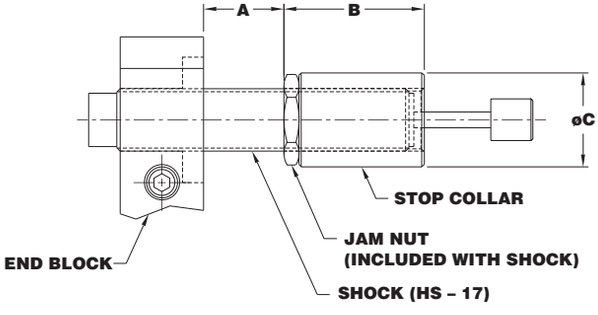
Ultran Slide & Ultran Rodless Cylilnders



Model	A	B	øC
USC-04	1.0	.91	.63
USC-09	1.5	1.12	.69
USC-17	2.0	1.68	1.12
USC-31	3.0	1.93	1.50

Note: The Ultran Stroke Length needs increased by the B dimension in order to maintain intended stroke length. The overall length increases by the same amount. The A dimension indicates maximum amount of stroke adjustment attainable. The Hex Jam Nut is included with the shock absorber.

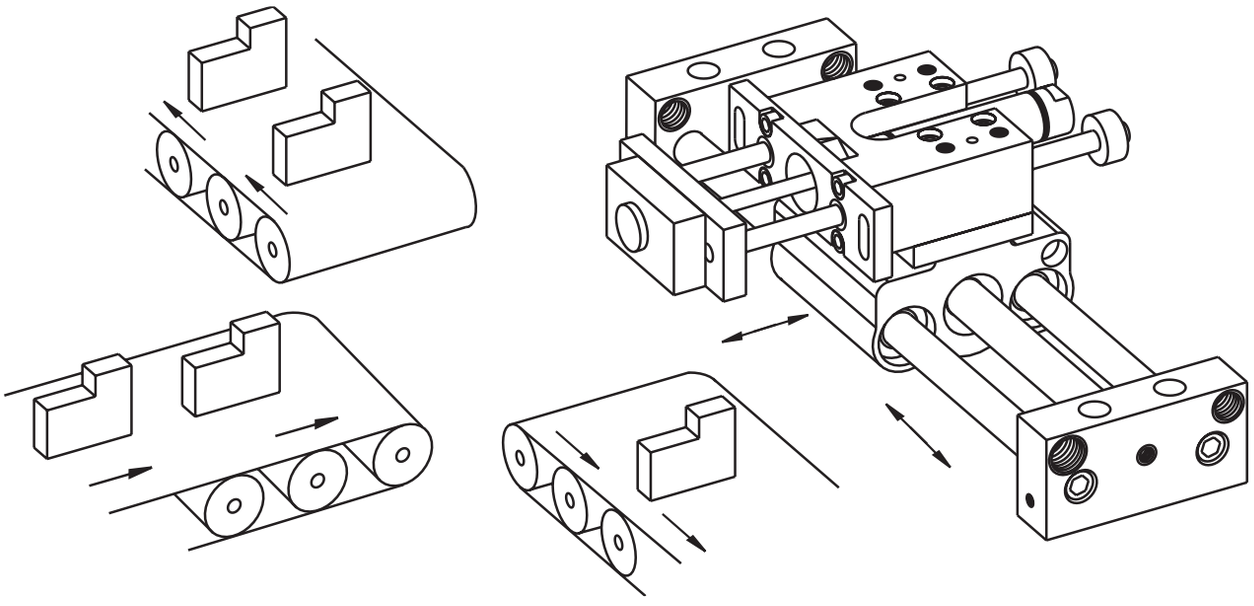
High Load Ultran



Model	A	B	øC
USC-09	.96	1.12	ø1.69
USC-17	.96	1.68	ø1.12

Note: The High Load Ultran Slide needs increased by the B dimension in order to maintain intended stroke length. The overall length increases by the same amount. The A dimension indicates maximum amount of stroke adjustment attainable.

Aluminum plates that couple Bimba actuators – Ultran® rodless cylinders, Pneu-Turn® rotary actuators, and Linear Thrusters – into a variety of multi-axis configurations.



The customer's attachment reads a bar code on the product to determine the required paint scheme. The Ultran Slide Rodless Cylinder and Linear Thruster picks the item off the incoming conveyor and places it on the appropriate out-going one.

How to Choose a Transition Plate

Page 9.23 shows how to build the Transition Plate model numbers.

Choose the configuration (base product and coupled product) that best suits your application and turn to that section. It will describe the valid bore size combinations and provide basic dimensions, weights and prices for those Transition Plates. It will also show alignment of the products to help you determine the outside dimensions of your configuration, and provide information on the options you may need to include when ordering your actuators. Unless otherwise noted, all Transition Plates are designed for mounting hole center to center alignment.

Note: Actuators can be coupled together in the bore size combinations noted in each section. However, critical engineering specifications must be met for each specific application. In addition, for a precision positioning system, the deflection of the components should be compensated for by incorporating external adjustments into the system design. See page 9.32 and the engineering specifications for the individual actuators for more information. Or, complete the Application Checklist on page 9.35 and fax it to your Bimba distributor if you'd like us to size your application.

How to Order

The model number of all Transition Plates consists of two alphanumeric clusters. The first cluster designates product type, base product and bore size of the base product. The second cluster designates coupled product and bore size of the coupled product, mounting orientation, and an optional character for dowel pins. Please refer to the charts below for an example of model number TPU17-T09PD. This is a transition plate for a 1-1/2" bore Ultran rodless cylinder that will be coupled to a 1-1/16" bore Linear Thruster (ball bearing), in a perpendicular orientation, with dowel pins.

TYPE

TP - Transition Plate

BASE PRODUCT

U - Ultran Slide Rodless Cylinder
T[1] - Linear Thruster, Ball Bearing
TE[1] - Linear Thruster, Composite Bearing
PT[2] - Pneu-Turn Rotary Actuator
PM - PneuMoment (Imperial)[3]
PMM - PneuMoment (Metric)[3]

BASE PRODUCT BORE SIZE[3]

02 - 9/16"
04 - 3/4"
09 - 1-1/16"
17 - 1-1/2"
31 - 2"

TPU17 - T09PD

COUPLED PRODUCT

U - Ultran Rodless Cylinder
T[1] - Linear Thruster, Ball Bearing
TE[1] - Linear Thruster, Composite Bearing
PT[2] - Pneu-Turn Rotary Actuator
PM - PneuMoment (Imperial)
PMM - PneuMoment (Metric)

COUPLED PRODUCT BORE SIZE

02 - 9/16"
04 - 3/4"
09 - 1-1/16"
17 - 1-1/2"
31 - 2"

(FOR PNEU TURN)

006 - 9/16" Single rack
014 - 9/16" Double rack
017 - 3/4" Single rack
033 - 3/4" Double rack
037 - 1-1/16" Single rack
074 - 1-1/16" Double rack
098 - 1-1/2" Single rack
196 - 1-1/2" Double rack
247 - 2" Single rack
494 - 2" Double rack

MOUNTING ORIENTATION[3]

A - Axial (parallel)
P - Perpendicular

DOWEL PIN[3]

No # - No Dowel Pin
D - Dowel Pin

Note: See sections on specific configurations for more information on valid product combinations.

[1] *As shown on the following pages, use the "T" designation for either T or TE Series Linear Thruster, except where the TE is specifically called out.*

[2] *Pneu Turn Rotary Actuator must be ordered with both the ball bearing (-R) and the hardened shaft (-F) options.*

[3] *PneuMoment to PneuMoment only. Mounting orientation and dowel pin do not apply. Only available for the 1-1/16" bore.*

Transition Plates are attached to the base and coupled products with socket head cap screws and socket set screws. Screws are included with the Transition Plate. Dowel pins can be ordered as an option for ease of assembly and/or improved shear loading.

Linear Thruster (Base Product) to Pneu-Turn Rotary Actuator (Coupled Product)

SHAFT PARALLEL*

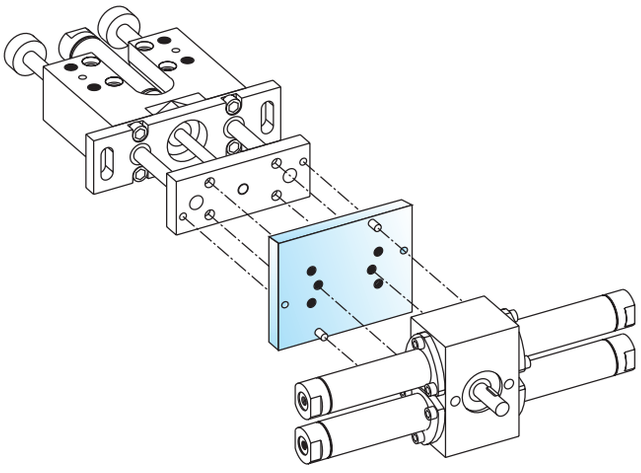
Pneu-Turn Rotary Actuator	Linear Thruster				
		9/16" (02)	3/4" (04)	1-1/16" (09)	1-1/2" (17)	2" (31)
	9/16" single rack (006) double rack (014)	TPT02-PT006A TPT02-PT014A	TPT04-PT006A TPT04-PT014A			
	3//4" single rack (017) double rack (033)		TPT04-PT017A TPT04-PT033A	TPT09-PT017A TPT09-PT033A		
	1-1/16" single rack (037) double rack (074)			TPT09-PT037A TPT09-PT074A	TPT17-PT037A TPT17-PT074A	
	1-1/2" single rack (098) double rack (196)				TPT17-PT098A TPT17-PT196A	TPT31-PT098A TPTE31-PT098A TPT31-PT196A TPTE31-PT196A
	2" single rack (247)) double rack (494)					TPT31-PT247A TPTE31-PT247A TPT31-PT494A TPTE31-PT494A

Note: Use model numbers shown for both T and TE Series Linear Thrusters through 1-1/2" bore; 2" bore requires specific call-out of TE as shown. Screws and dowel pins (if ordered) are included with the Transition Plate.

Model Number	Dimensions			Weight (includes screws) (lbs)	List Price	List Price with Dowel Pins (-D Option)
	Length (in)	Width (in)	Thickness (in)			
TPT02-PT006A TPT02-PT014A	2.50	2.00	0.28	0.14		
TPT04-PT006A TPT04-PT014A	3.00	2.00	0.28	0.17		
TPT04-PT017A TPT04-PT033A	3.00	2.50	0.36	0.26		
TPT09-PT017A TPT09-PT033A	4.00	2.50	0.36	0.35		
TPT09-PT037A TPT09-PT074A	4.00	3.12	0.47	0.58		
TPT17-PT037A TPT17-PT074A	5.38	3.00	0.47	0.74		
TPT17-PT098A TPT17-PT196A	5.38	4.25	0.72	1.61		
TPT31-PT098A TPT31-PT196A	6.75	4.25	0.72	2.02		
TPT31-PT247A TPT31-PT494A	6.75	5.00	0.72	2.38		
TPTE31-PT098A TPTE31-PT196A	5.75	4.25	0.72	1.72		
TPTE31-PT247A TPTE31-PT494A	5.75	5.00	0.72	2.03		

Linear Thruster (Base Product) to Pneu-Turn Rotary Actuator (Coupled Product)

SHAFT PARALLEL*



Dowel Pins

In addition to ordering a Transition Plate with dowel pin option, dowel pin options must be selected for your Linear Thruster (-D option); and the ball bearing (-R) and hardened shaft (-F) options must be selected for your Pneu-Turn Rotary Actuator (the ball bearing option includes dowel pin holes). For example, your order would include:

T-096-DM
PT-033180-FMR
TPT09-PT017AD

This provides: a 1-1/16" bore, 6" stroke Linear Thruster with dowel pin holes and a magnetic piston; a single rack 3/4" bore, 180° Pneu-Turn with hardened shafts, magnetic piston, and ball bearing (with dowel pin holes); and the appropriate Transition Plate with dowel pins. Refer to individual actuator sections for dowel pin option pricing.

Pneu-Turn Rotary Actuator (Base Product) to Linear Thruster (Coupled Product)

SHAFTS PERPENDICULAR*

Linear Thruster	Pneu-Turn Rotary Actuator					
		9/16" (006 or 014)	3/4" (017 or 033)	1-1/16" (037 or 074)	1-1/2" (098 or 196)	2" (247 or 494)
	9/16" (02)	TPPT02-T02P				
	3/4" (04)		TPPT04-T04P	TPPT09-T04P		
	1-1/16" (09)			TPPT09-T09P	TPPT17-T09P	
	1-1/2" (17)				TPPT17-T17P	TPPT31-T17P
	2" (31)					TPPT31-T31P TPPT31-TE31P

Note: Two plates are needed for this configuration. Both plates will be included if part number TPPT □ - T □ P *is ordered. If needed, part* TPPT □ *can be ordered separately. Use model numbers shown for both T and TE Series Linear Thrusters through 1-1/2" bore; 2" bore requires specific call-out of TE as shown.*

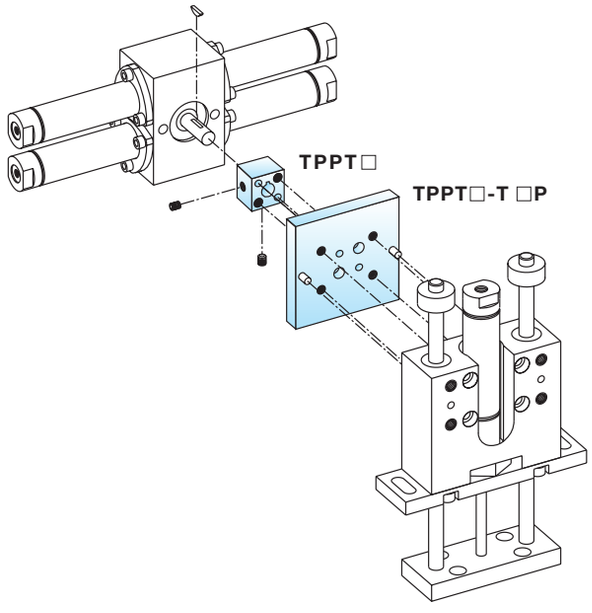
Note: Screws and dowel pins (if ordered) are included with the Transition Plate.

Model Number	Dimensions			Weight (includes screws) (lbs)	List Price	List Price with Dowel Pins (-D Option)
	Length (in)	Width (in)	Thickness (in)			
TPPT02-T02P	2.00	2.00	0.28	0.15		
(includes TPPT02)	0.62	0.62	0.50	0.04		
TPPT04-T04P	2.50	2.25	0.36	0.28		
(includes TPPT04)	0.75	0.75	0.75	0.08		
TPPT09-T04P	3.50	3.00	0.47	0.67		
(includes TPPT09)	1.00	1.00	0.94	0.19		
TPPT09-T09P	3.50	3.00	0.47	0.67		
(includes TPPT09)	1.00	1.00	0.94	0.19		
TPPT17-T09P	4.50	4.25	0.72	1.82		
(includes TPPT17)	1.50	1.50	0.94	0.47		
TPPT17-T17P	4.50	4.25	0.72	1.84		
(includes TPPT17)	1.50	1.50	0.94	0.47		
TPPT31-T17P	4.50	4.25	0.72	1.84		
(includes TPPT31)	1.50	1.50	1.12	0.47		
TPPT31-T31P	6.00	3.00	0.72	1.76		
(includes TPPT31)	1.50	1.50	1.12	0.47		
TPPT31-TE31P	5.25	3.00	0.72	1.60		
(includes TPPT31)	1.50	1.50	1.12	0.47		

Note: The key on the Pneu-Turn shaft is mounted in the 12 o'clock position, therefore, rotation of the Linear Thruster will be equal in the clockwise and counterclockwise directions. Please order sufficient angle of rotation, angle adjustment option or a Pneu-Turn rotary actuator with the key mounted in a special position as required for your application.

Pneu-Turn Rotary Actuator (Base Product) to Linear Thruster (Coupled Product)

SHAFTS PERPENDICULAR*



***Shown is 9/16" (02) bore Linear Thruster. Bolt pattern for this size only is offset 1/2" from center axis of housing.**

Dowel Pins

In addition to ordering a Transition Plate with dowel pin option, the ball bearing (-R) and hardened shaft (-F) options must be selected for your Pneu-Turn Rotary Actuator (the -R option includes dowel pin holes), and the dowel pin option (-D) must be selected for your Linear Thruster. For example, your order would include:

PT-247180-FMR
T-096-DM
TPPT31-T17PD

This provides: a single rack 2" bore, 180° Pneu-Turn with hardened shafts magnetic piston, and ball bearing (with dowel pin holes); a 1-1/2" bore, 6" stroke Linear Thruster with dowel pin holes and magnetic piston; and the appropriate Transition Plate with dowel pins. Refer to individual actuator sections for dowel pin option pricing.

Toleranced Clearance Hole Sizes	
TPPT02	.1270/.1280
TPPT04	.1895/.1905
TPPT09	.2520/.2530
TPPT17	.3145/.3155
TPPT31	.3145/.3155

Note: Dowel pins to attach part TPPT□ are not provided, although clearance holes are available for dowel pins.

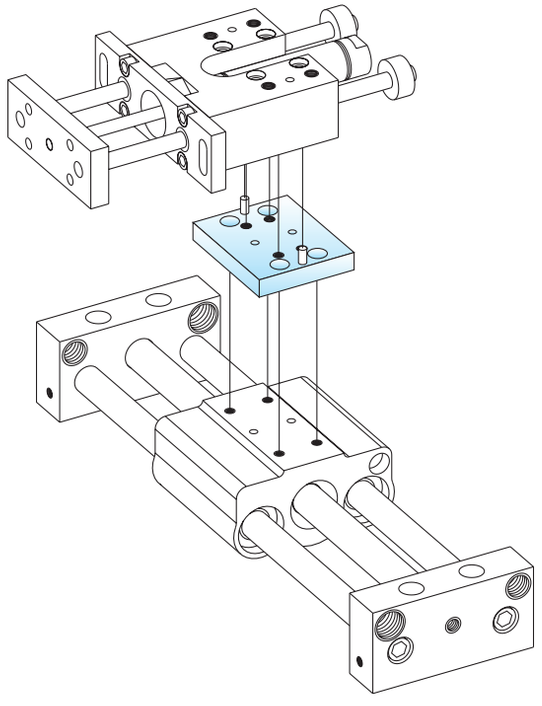
Ultran Rodless Cylinder (Base Product) to Linear Thruster (Coupled Product)

MOUNTED PERPENDICULAR*

Linear Thruster	Ultran Rodless Cylinder				
		9/16" (02)	3/4" (04)	1-1/16" (09)	1-1/2" (17)
	9/16" (02)	TPU02-T02P			
	3/4" (04)		TPU04-T04P	TPU09-T04P	
	1-1/16" (09)			TPU09-T09P	TPU17-T09P
	1-1/2" (17)				TPU17-T17P

Note: Use model numbers shown for both T and TE Series Linear Thrusters.
Screws and dowel pins (if ordered) are included with the Transition Plate.

Model Number	Dimensions			Weight (includes screws) (lbs)	List Price	List Price with Dowel Pins (-D Option)
	Length (in)	Width (in)	Thickness (in)			
TPU02-T02P	2.00	2.00	0.28	0.11		
TPU04-T04P	2.50	2.25	0.36	0.20		
TPU09-T04P	3.50	3.00	0.47	0.48		
TPU09-T09P	3.50	3.00	0.47	0.48		
TPU17-T09P	4.50	4.25	0.72	1.35		
TPU17-T17P	4.50	4.25	0.72	1.35		



Dowel Pins

In addition to ordering a Transition Plate with dowel pin option, dowel pin options must be selected for your Ultran rodless cylinder and Linear Thruster (-D option). For example, your order would include:

UGS-0915-ADT
T-096-DM
TPU09-T09PD

This provides: a 1-1/16" bore, 15" stroke Ultran Slide with gold coupling strength, stroke adjustment on both ends, dowel pin holes and switch track; a 1-1/16" bore, 6" stroke, Linear Thruster with dowel pin holes and a magnetic piston; and the appropriate Transition Plate with dowel pins. Refer to individual actuator sections for dowel pin option pricing.

*Shown is 9/16" (02) bore Linear Thruster. Bolt pattern for this size only is offset 1/2" from center axis of housing.

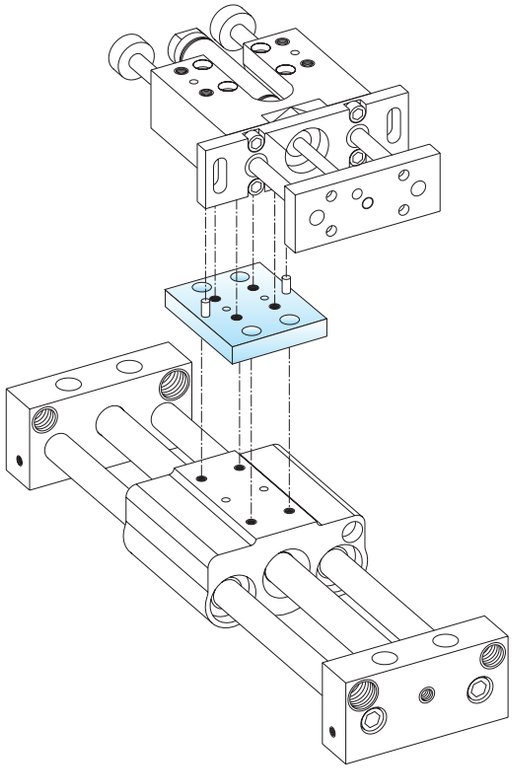
Ultran Rodless Cylinder (Base Product) to Linear Thruster (Coupled Product)

MOUNTED PARALLEL*

Linear Thruster	Ultran Rodless Cylinder				
		9/16" (02)	3/4" (04)	1-1/16" (09)	1-1/2" (17)
	9/16" (02)	TPU02-T02A			
	3/4" (04)		TPU04-T04A	TPU09-T04A	
	1-1/16" (09)			TPU09-T09A	TPU17-T09A
	1-1/2" (17)				TPU17-T17A

Note: Use model numbers shown for both T and TE Series Linear Thrusters.
Screws and dowel pins (if ordered) are included with the Transition Plate.

Model Number	Dimensions			Weight (includes screws) (lbs)	List Price	List Price with Dowel Pins (-D Option)
	Length (in)	Width (in)	Thickness (in)			
TPU02-T02A	2.00	2.00	0.28	0.11		
TPU04-T04A	2.50	2.25	0.36	0.20		
TPU09-T04A	3.50	3.00	0.47	0.48		
TPU09-T09A	3.50	3.00	0.47	0.48		
TPU17-T09A	4.50	4.25	0.72	1.35		
TPU17-T17A	4.50	4.25	0.72	1.35		



Dowel Pins

In addition to ordering a Transition Plate with dowel pin option, dowel pin options must be selected for your Ultran rodless cylinder and Linear Thruster (-D option). For example, your order would include:

UGS-0915-ADT
T-096-DM
TPU09-T09AD

This provides: a 1-1/16" bore, 15" stroke Ultran Slide with gold coupling strength, stroke adjustment on both ends, dowel pin holes and switch track; a 1-1/16" bore, 6" stroke, Linear Thruster with dowel pin holes and a magnetic piston; and the appropriate Transition Plate with dowel pins. Refer to individual actuator sections for dowel pin option pricing.

*Shown is 9/16" (02) bore Linear Thruster. Bolt pattern for this size only is offset 1/2" from center axis of housing.

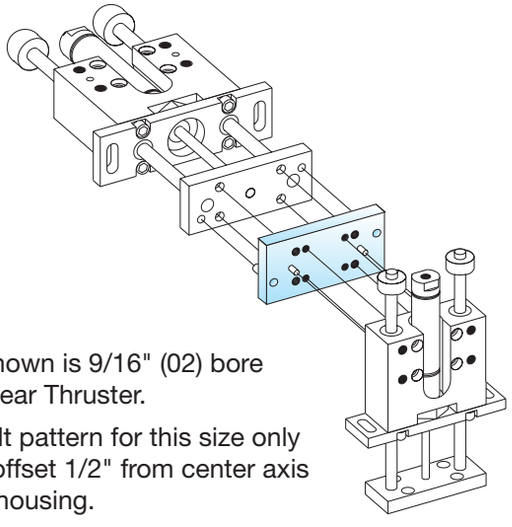
Linear Thruster(Base Product) to Linear Thruster (Coupled Product)

MOUNTED PERPENDICULAR*

Linear Thruster	Linear Thruster					
		9/16" (02)	3/4" (04)	1-1/16" (09)	1-1/2" (17)	2" (31)
	9/16" (02)	TPT02-T02P	TPT04-T02P			
	3/4" (04)		TPT04-T04P	TPT09-T04P		
	1-1/16" (09)			TPT09-T09P	TPT17-T09P	
	1-1/2" (17)				TPT17-T17P	TPT31-T17P TPTE31-T17P
	2" (31)					TPT31-T31P TPTE31-TE31P

Note: Use model numbers shown for both T and TE Series Linear Thrusters through 1-1/2" bore; 2" bore requires specific call-out of TE as shown. Screws and dowel pins (if ordered) are included with the Transition Plate.

Model Number	Dimensions			Weight (includes screws) (lbs)	List Price	List Price with Dowel Pins (-D Option)
	Length (in)	Width (in)	Thickness (in)			
TPT02-T02P	2.50	1.50	0.28	0.10		
TPT04-T02P	3.00	1.50	0.36	0.16		
TPT04-T04P	3.00	1.50	0.36	0.16		
TPT09-T04P	4.25	2.00	0.47	0.39		
TPT09-T09P	4.25	2.00	0.47	0.39		
TPT17-T09P	5.50	3.00	0.72	1.16		
TPT17-T17P	5.50	3.00	0.72	1.16		
TPT31-T17P	7.00	3.00	0.97	2.00		
TPT31-T31P	7.00	4.50	0.97	2.99		
TPTE31-T17P	6.00	3.00	0.97	1.71		
TPTE31-TE31P	6.00	4.50	0.97	2.57		



*Shown is 9/16" (02) bore Linear Thruster.

Bolt pattern for this size only is offset 1/2" from center axis of housing.

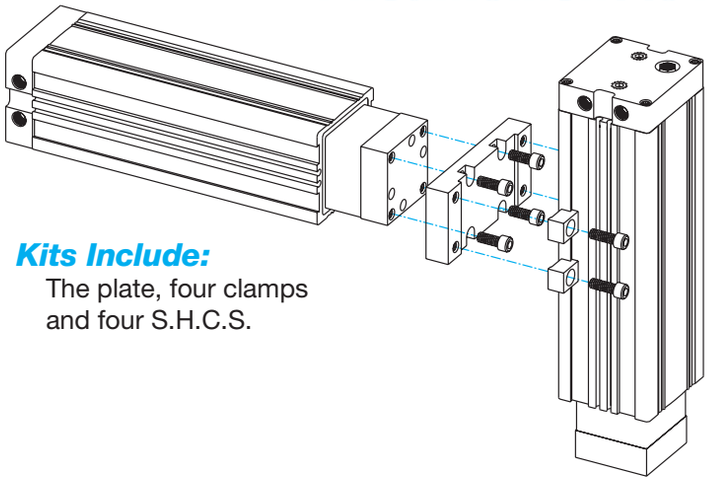
Dowel Pins

In addition to ordering a Transition Plate with dowel pin option, dowel pin options must be selected for your Linear Thrusters (-D option). For example, your order would include:

T-096-DM
T-042-DM
TPT09-T04PD

This provides: a 1-1/16" bore, 6" stroke Linear Thruster with dowel pin holes and a magnetic piston; a 3/4" bore, 2" stroke Linear Thruster with dowel pin holes and magnetic piston; and the appropriate Transition Plate with dowel pins. Refer to individual actuator sections for dowel pin option pricing.

PneuMoment to PneuMoment



Kits Include:
The plate, four clamps and four S.H.C.S.

Mounting Kits

Model Number	List Price	
TPPM09-PM09	Imperial	
TPPMM09-PMM09	Metric	

Components

Plates:
Anodized aluminum alloy.
Part TPPT☐ , for Rotary Actuator to Linear Thruster configuration, is 303 stainless steel.

Socket head cap screws and socket set screws:
Heat treated high alloy Grade 8 carbon steel with black oxide coating.

Dowel pins:
Hardened and ground carbon steel alloy with black oxide coating.

Recommended Seating Torque

Recommended Seating Torque in Inch/Pounds		
Nominal Diameter-Threads per Inch	Socket Head Cap Screws	Socket Set Screws
8-32	20	15
10-24	35	25
1/4-20	60	50
5/16-18	125	100
3/8-16	225	N/A

List Prices for Dowel Pin Options for Actuators

Pneu-Turn Rotary Actuator Hardened Shaft* (-F Option)	
9/16"	
3/4"	
1-1/16"	
1-1/2"	
2"	

Will include dowel pin holes.
**Must also be ordered with Ball Bearing -R Option*

Ultran Slide Dowel Pin Holes (-D Option)	
9/16"	
3/4"	
1-1/16"	
1-1/2"	

Linear Thruster Dowel Pin Holes (-D Option) T or TE Series		
	Standard Tooling Plate	Stainless Steel Tooling Plate Option
9/16"		
3/4"		
1-1/16"		
1-1/2"		
2"		

Sizing a Multi-Axis Configuration

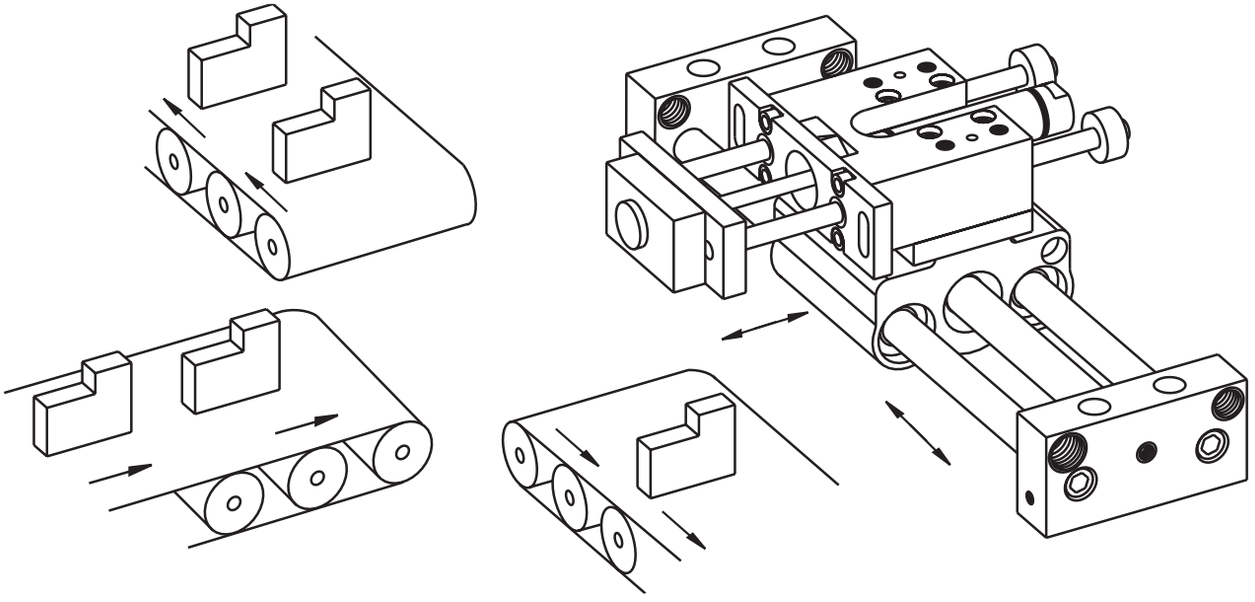
General Comments:

Selection of the actuators and the transition plates that connect them is the most important part of engineering a motion system. To begin the sizing of individual actuators into a complete motion system, you should begin at your attachment or item to move. As you select the type of Bimba product to use, be sure to reference the size and engineering data in this bulletin and in the individual product catalogs. We recommend the following method:

1. Determine the weight and center of gravity of your attachment or item to move.
2. Determine the best actuator to be connected to your attachment or item to create the desired movement.
3. Determine the size of the actuator by referencing the engineering data in this catalog and in the specific product catalog. Select the product by its load, moment, torque, and speed capability as compared to those required by your application. Remember to add in any loads, moments or torques created by any attached actuators.
4. Select the next actuator that will create movement you need.
5. Continue with steps 3 through 5 until all the motion requirements are satisfied.

In the case of a precision positioning system, the deflection of the components should be compensated for by incorporating external adjustments into the system design.

Sizing Example:



Sizing a Multi-Axis Configuration

An example of a motion system is shown on page 9.32 using an Ultran Slide rodless cylinder combined with a Linear Thruster by means of a Transition Plate. The application requires a product to be painted in one of two paint colors. The product coming down the conveyor is identified by a bar code which indicates the required paint color. The Linear Thruster extends to the end of its six inch stroke and picks the product by means of a vacuum system. The Linear Thruster retracts three inches before the Ultran Slide begins to move in the direction of one of the two outgoing conveyors. The slide must move eight inches in either direction from its center position to place the product on an outgoing conveyor which will send it to a specific paint booth.

To begin the sizing, we will start with the item that is to be moved. Each product weighs 5 lbs. and has flat surfaces that allow a vacuum gripper to grasp and lift it from the incoming conveyor. The center of gravity of the product is three inches from the grip surface and in the middle of the product width and height. The vacuum gripper weighs 1 lb. and has a center of gravity that is .75 inch from the tooling plate surface and in the middle of its width and height. The gripper is mounted on the center of the Linear Thruster tooling plate. A Linear Thruster with a six-inch stroke is chosen to move the product. The combined weight of the product and gripper is 6 lbs. Comparing the 6-lb. load to the maximum side load table for a standard Linear Thruster with a six-inch stroke, a 3/4 inch bore unit has the capability of 11.09 lbs. This should be sufficient to handle the 6 lb. load and take into account any light, unforeseen loads. Since the product and gripper will be centered on the tooling plate, there are no radial moments. The 3/4 inch bore Linear Thruster will be chosen as the coupled unit.

An Ultran Slide was chosen to move the Linear Thruster, vacuum gripper and product into position on an outgoing conveyor. The 3/4 inch bore Linear Thruster will be fastened to the center of the Ultran Slide carriage by means of a Transition Plate. The Ultran Slide must carry the load of the Transition Plate (0.20 lb.), Linear Thruster (2.82 lbs.), the gripper (1 lb.), and the product (5 lbs.) The total weight the Ultran Slide will move is 9.02 lbs. Comparing this to the maximum allowable radial loads for 16-inch stroke Ultran Slides, a 3/4 inch bore unit can carry approximately a 20-lb. load. The Linear Thruster is fully extended when it picks the product from the incoming conveyor, then retracts three inches before the Ultran begins to move toward an out-going conveyor. In this case, the dynamic side loading conditions on the Ultran Slide will be determined when the Linear Thruster has retracted three inches (see drawing on page 9.34). Since the Linear Thruster has retracted to half of its stroke length, the guide shafts are extending the same amount from each side of the Linear Thruster body. In this case there is no side load because of the guide rods. The actual side load created by the product, gripper, and Linear Thruster are found by rearranging and solving the equation found on page 9.34 and then comparing the result to the 20 lb. limit.

Sizing a Multi-Axis Configuration

(Calculations for page 9.33 example)

Side Load = ΣActual Load* [2* [(Y_1/Z+ 1]]

Actual Loads: product - 5 lbs.
gripper - 1 lb.
Linear Thruster tooling plate - .40 lb.

Side Load = 5 lbs. * [2* [(8.25 in./2.518 in.) + 1]] +
1 lb. * [2* [(4.50 in./2.518 in.) + 1]] +
.40 lb. * [2* [(3.56 in./2.518 in.) + 1]]

Side Load 3/4" bore = 50.25 lbs.

This side load is greater than the 20-lb. maximum for a side loading condition on a 3/4 bore Ultran Slide. The next larger Ultran Slide, 1-1/16" inch bore, has a side load capability of approximately 55 lbs. This Slide will be reviewed for the side load condition using the equation above.

Side Load1-1/16 bore = 42.48 lbs.

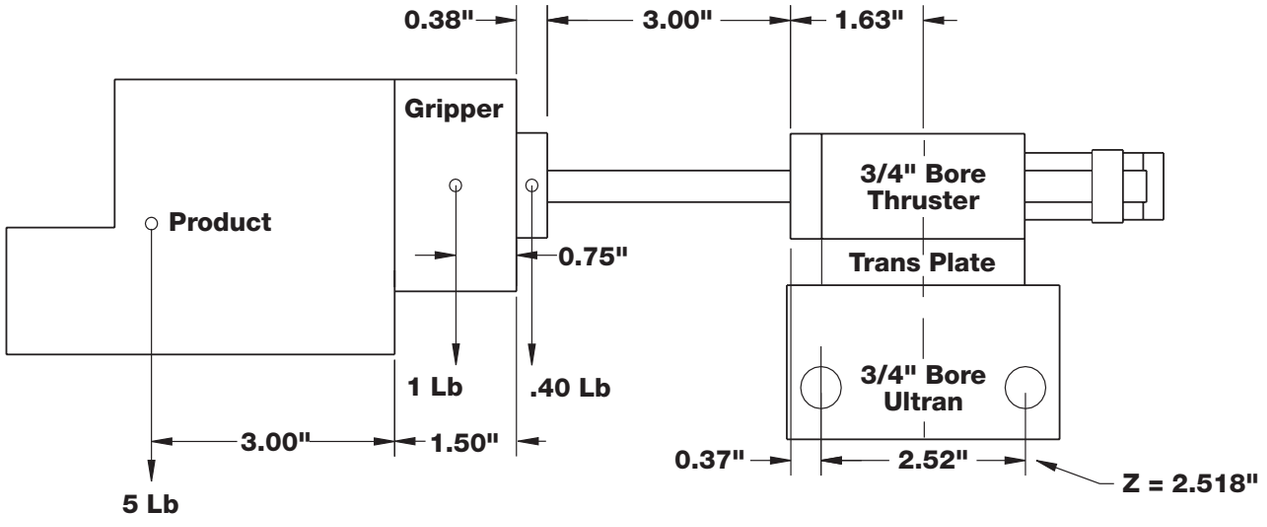
This side load is within the capability of an 1-1/16 inch bore Ultran Slide and this unit will be chosen as the base unit.

Other considerations in choosing a model include:

1. The need for a Hall Effect switch that will signal a controller when the Linear Thruster has retracted three inches. Also, external bumpers will be used to soften the impact at end-of-stroke.
2. Hall Effect Switches will be used for end-of-stroke and mid-stroke signalling on the Ultran Slide rodless cylinder.
3. Dowel pins will be used with the Transition Plate.

Thus, the products selected will be:

Linear Thruster	T-046-EB2MD
Ultran Slide rodless cylinder	USS-0916-TD
Transition Plate	TPU09-T04PD



Actuators Coupled with Transition Plates Application Checklist

This checklist makes sizing and selecting Bimba actuators easier. Bimba's Engineering Department will assist you by providing a detailed analysis of your application and, based on the information in the application checklist, will help you choose the actuators best suited to your needs.

Step 1. ***Photocopy the sketch and checklist sheets.***

Step 2. ***Complete the sketch and checklist.***

Step 3. ***Mail or fax the sketch and checklist to your local stocking distributor.***

Date: _____

Your Name: _____

Company: _____

Address: _____

Phone: _____

Fax: _____

1. *Bimba actuators selected.*

Base: _____

Coupled: _____

Coupled: _____

_____ : _____

2. *What is the weight of the load being moved?*

_____

3. *What will be the speed of the actuators at the end of their movement?*

Base: _____ in./sec.

Coupled: _____ in./sec.

Coupled: _____ in./sec.

4. *What air pressure is available for the system?*

_____ PSI

5. *In what kind of environment will the system be used (clean industrial, outdoor, wood dust, temperature, etc.)?*

_____

_____

_____

_____

_____

_____

6. *How fast will the actuators be cycling?*

Base: _____ cycles/sec.

Coupled: _____ cycles/sec.

Coupled: _____ cycles/sec.

_____ : _____ cycles/sec.

7. *Will you need magnetic position sensing of the products?*

	Yes	No
Base:	☐	☐
Coupled:	☐	☐
Coupled:	☐	☐
_____:	☐	☐

8. *Explain the sequence of movement you have in mind for the system.*

_____

_____

_____

_____

_____

_____

_____

_____

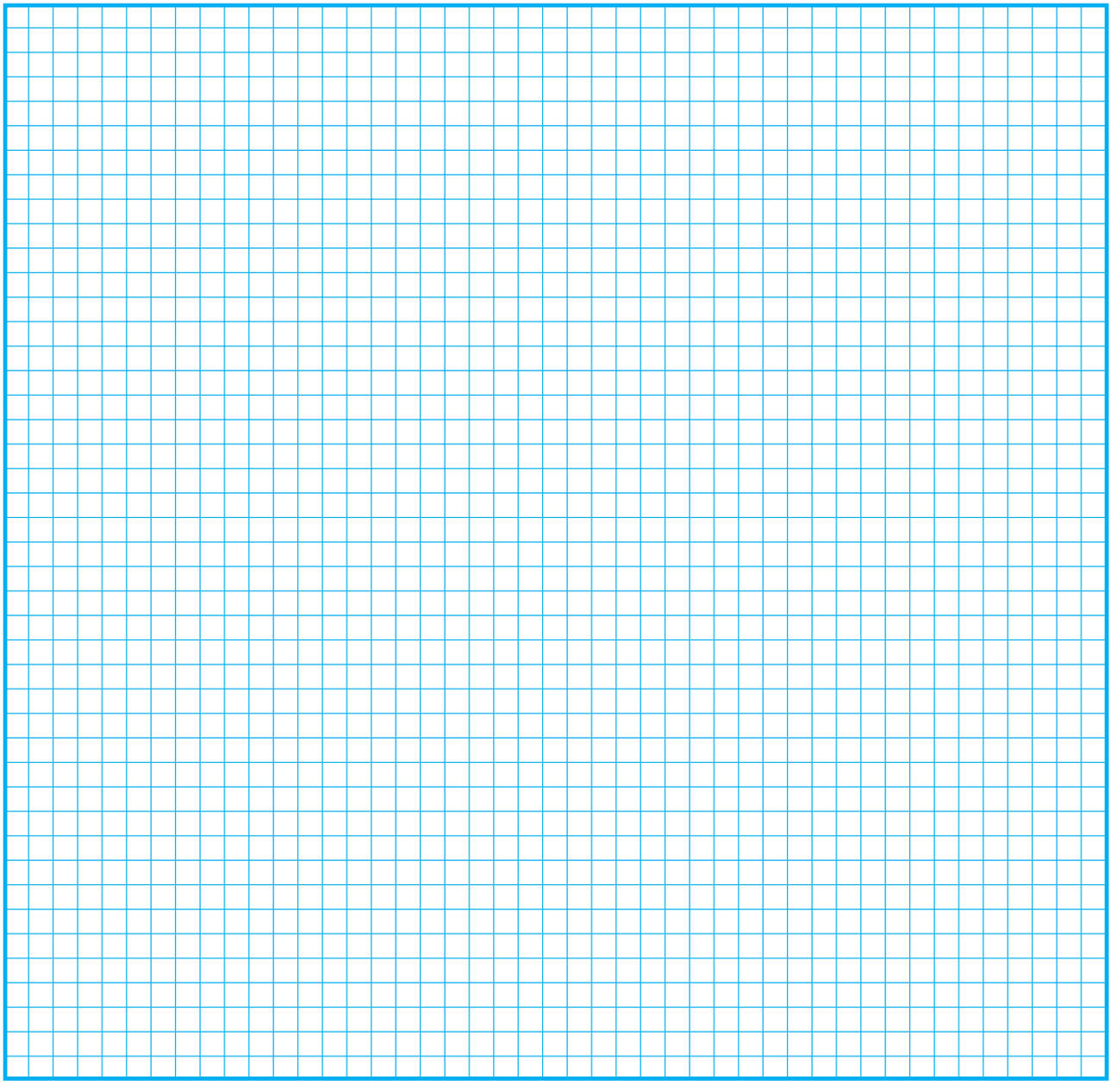
_____

_____

Application Sketch

Please include in your sketch:

1. Your choice of Bimba actuators.
2. How you intend to combine them.
3. The item you intend to attach or move.
4. The distance you want the items to move.
5. The location of any external stops or cushioning devices.
6. The weight and approximate center of gravity of the attachments.
7. Any additional forces, moment arms, or torques that the system will encounter.

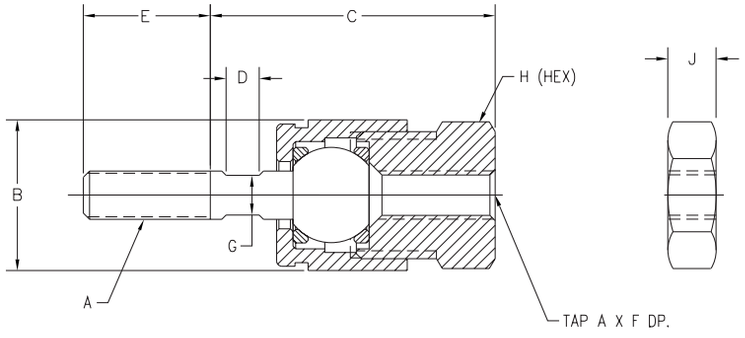


Features and Advantages

- Bimba's miniature coupler design allows excellent freedom of movement on the three new, miniature sizes; #5-40 through #10-32 sizes.
- The miniature couplers allow up to 20 degrees of spherical movement and 0.02" lateral allowance with only .002" of axial play and are manufactured from high tensile, hardened and blackened steel components.
- Larger sizes are available, from 1/4"-28 to 1"-14, with 1 degree of spherical movement and 1/16" of lateral allowance.
- The alignment allowances can eliminate the need for expensive precision machining in rigidly mounted applications.
- Alignment couplers help reduce binding and simplify field alignment problems, enhancing cylinder performance and reducing seal and bearing wear.
- An innovative design to resist vibrational loosening is available on sizes 5/16"-24 and larger. In the ACH style coupler, a slot is milled through the tapped mounting threads. Two socket head cap screws are strategically placed to allow the coupler to be clamped to the rod, offering a superior strength connection.

Dimensions

Models #5-40 through #10-32



Model*	A	B	C	D	E	F
AC5-40	#5-40	15/32"	31/32"	1/8"	3/8"	3/8"
AC8-32	#8-32	17/32"	31/32"	1/8"	3/8"	3/8"
AC10-32	#10-32	19/32"	1-1/8"	1/8"	1/2"	1/2"

Model*	G	H	J	Maximum Pull at Yield (lbs.)	Alignment Allowance		Weight (oz.)	List Price Standard	List Price Stainless Steel
					Lateral	Spherical			
AC5-40	1/8"	3/8"	1/8"	200	0.02	20°	0.3		
AC8-32	1/8"	7/16"	1/8"	650	0.02	10°	0.5		
AC10-32	5/32"	1/2"	1/8"	1200	0.02	10°	0.8		

List price includes one jam nut

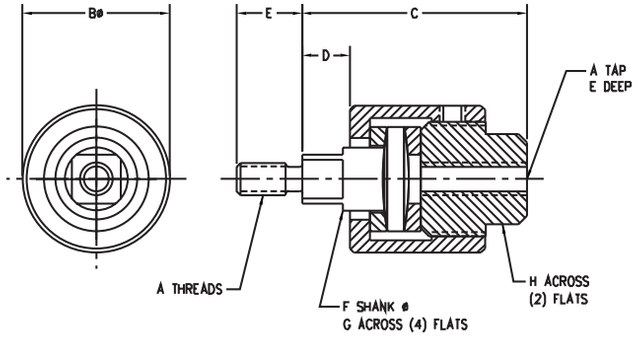
* Specify SS at the end of the part number for Stainless Steel.

Additional Jam Nuts

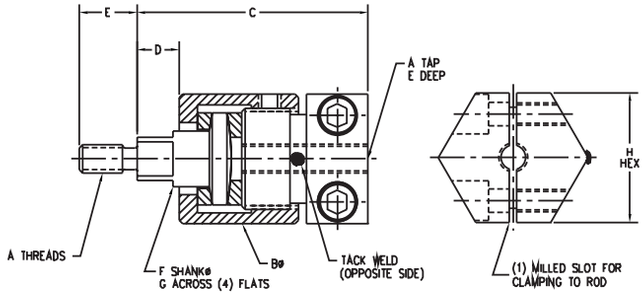
Size	Part Number	Price	Stainless Steel Part No.	Price
#5-40	D-3745		D-3745-SS	
#8-32	D-D0737		D-D0737-SS	
#10-32	D-5288		D-5288-SS	

Models 1/4"-28 through 1"-14

Standard Coupler
AC250-AC1000



ACH Coupler
ACH312-ACH1000



1/16" of lateral allowance
1° spherical movement

Part Number	A	B	C	C Hex	D	E	F	G	H	H Hex	Maximum Pull at Yield (lbs.)	List Prices Standard		List Price Stainless Steel
												AC	ACH	*SS
AC250	1/4"-28	1-1/8"	1-3/4"	--	3/8"	1/2"	1/2"	3/8"	11/16"	--	6,000			
AC312	5/16"-24	1-1/8"	1-3/4"	2"	3/8"	1/2"	1/2"	3/8"	11/16"	1-1/8"	8,300			
AC375	3/8"-24	1-1/8"	1-3/4"	2"	3/8"	1/2"	1/2"	3/8"	11/16"	1-1/8"	8,300			
AC437	7/16"-20	1-1/4"	2"	2-5/32"	7/16"	3/4"	5/8"	1/2"	13/16"	1-1/8"	10,000			
AC500	1/2"-20	1-1/4"	2"	2-5/32"	7/16"	3/4"	5/8"	1/2"	13/16"	1-1/8"	14,000			
AC625	5/8"-18	1-1/4"	2"	2-5/32"	7/16"	3/4"	5/8"	1/2"	13/16"	1-1/4"	19,000			
AC750	3/4"-16	1-3/4"	2-5/16"	2-1/2"	7/16"	1-1/8"	31/32"	13/16"	1-1/8"	1-3/4"	34,000			
AC875	7/8"-14	1-3/4"	2-5/16"	2-1/2"	7/16"	1-1/8"	31/32"	13/16"	1-1/8"	1-3/4"	39,000			
AC1000	1"-14	2-1/2"	2-15/16"	2-15/16"	7/16"	1-5/8"	1-11/32"	1-5/32"	1-5/8"	2-1/2"	64,000			

Please specify AC, ACH coupler when ordering AC750 (Standard Coupler) ACH-750 (Hex Coupler)
Please specify – SS at the end of the part number for Stainless Steel.
Jam nut sold separately for 1/4"-28 through 1"-14 size
*SS valid for AC models only

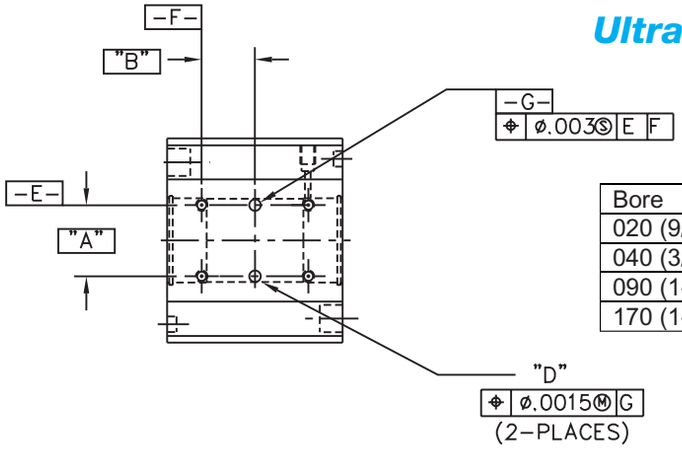
Jam Nuts

Size	Part Number Standard	Price	Stainless Steel Part No.	Price
1/4"-28	D-344		D-344-SS	
5/16"-24	D-746		D-746-SS	
3/8"-24	D-801		D-801-SS	
7/16"-20	D-154		D-154-SS	
1/2"-20	D-98		D-98-SS	
5/8"-18	D-9		D-9-SS	
3/4"-16	D-3556		D-3556-SS	
7/8"-14	D-2545		D-2545-SS	
1"-14	D-1331		D-1331-SS	

Transition Plate Data

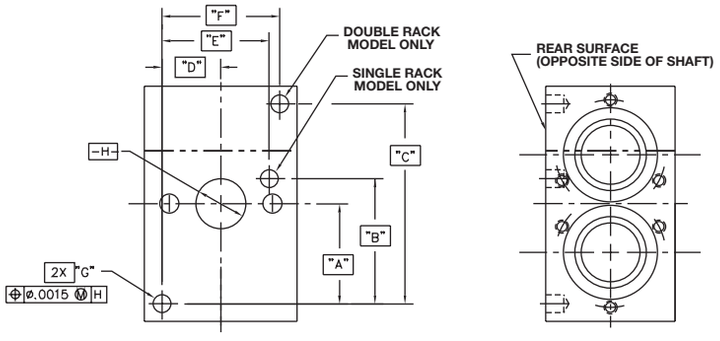
Dowel Pin Hole Locations

Ultran



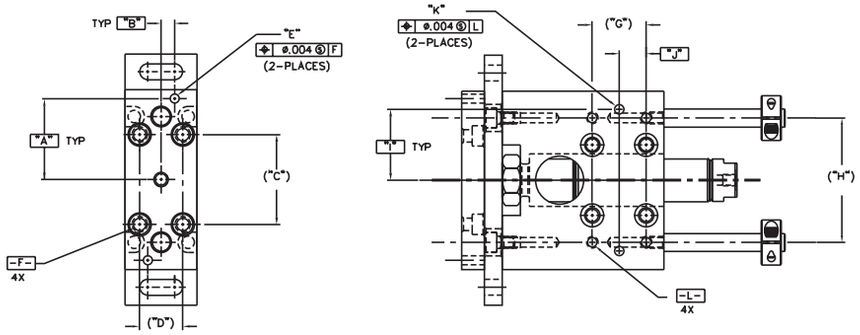
Bore	A	B	D
020 (9/16")	1.000	.750	.1270/.1280 x .240/.260 DP.
040 (3/4")	1.375	.876	.1895/.1905 x .410/.430 DP.
090 (1-1/16")	1.750	1.250	.2520/.2530 x .410/.430 DP.
170 (1-1/2")	2.500	1.750	.3145/.3155 x .560/.580 DP.

Pneu-Turn



Bore	A	B	C	D	E	F	G
020 (9/16")	.874	1.101	1.754	.500	.928	1.000	.1270/.1280 x .240/.260 DP.
040 (3/4")	1.061	1.330	2.125	.623	1.139	1.250	.1895/.1905 x .410/.430 DP.
090 (1-1/16")	1.311	1.730	2.625	.718	1.437	1.437	.2520/.2530 x .410/.430 DP.
170 (1-1/2")	1.811	2.281	3.625	.905	1.812	1.812	.3145/.3155 x .560/.580 DP.
310 (2")	2.187	3.000	4.375	.625	1.813	1.250	.3770/.3780 x .560/.580 DP.

Linear Thruster



Bore	A	B	C	D	E	G	H	I	J	K
020 (9/16")	1.125	.188	1.250	.600	.1270/.1280 THRU.	.750	1.750	.8750	.375	.1270/.1280 x .240/.260 DP.
040 (3/4")	1.313	.250	1.500	.750	.1895/.1905 THRU.	.938	2.125	1.1250	.469	.1895/.1905 x .290/.310 DP.
090 (1-1/16")	1.813	.375	2.000	1.000	.2520/.2530 THRU.	1.375	3.125	1.5625	.688	.2520/.2530 x .410/.430 DP.
170 (1-1/2")	2.375	.500	3.000	1.500	.3145/.3155 THRU.	1.750	4.000	2.0000	.875	.3145/.3155 x 560/.580 DP.
310 (2")	3.000	.625	4.000	2.000	.3770/.3780 THRU.	2.125	5.000	2.5000	1.063	.3770/.3780 x .810/.830 DP.
310 (2") TE	2.500	.625	3.000	2.000	.3770/.3780 THRU.	2.000	4.250	2.1250	1.000	.3770/.3780 x .810/.830 DP.
500 (2-1/2")	3.750	1.000	4.750	3.000	.3770/.3780 THRU.	2.630	6.250	3.1250	1.312	.3770/.3780 x 1.000/1.020 DP.
500 (2-1/2") TE	3.250	.750	3.750	2.250	.3770/.3780 THRU.	2.500	5.375	2.6875	1.250	.3770/.3780 x 1.000/1.020 DP.
700 (3")	4.750	1.000	6.000	3.000	.5020/.5030 THRU.	4.000	8.000	4.0000	2.000	.5020/.5030 x 1.250/1.270 DP.
700 (3") TE	4.000	1.000	4.500	2.750	.5020/.5030 THRU.	3.000	6.500	3.2500	1.500	.5020/.5030 x 1.250/1.270 DP.

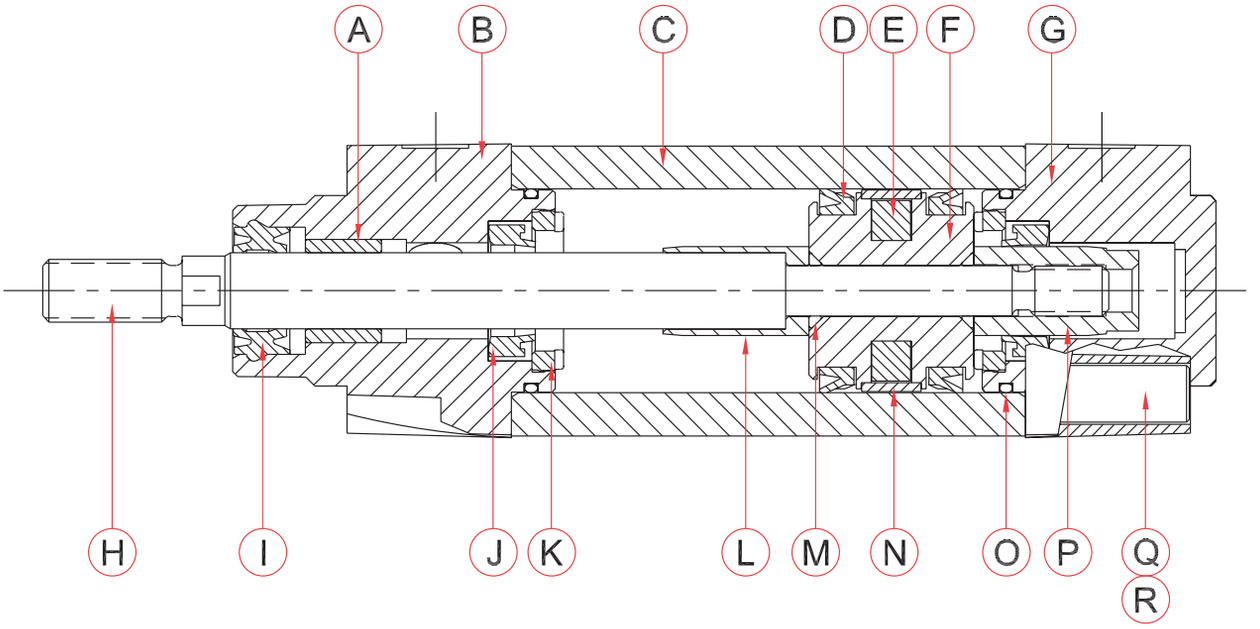
Notes

Notes

Notes

ISO 6431/6432 Cylinders

Bimba ISO 6431, VDMA 24562 Air Cylinders



Item	Component	Material
A	Rod Bearing	Sintered Bronze
B	Rod Guide	Aluminum Alloy
C	Body	Anodized Aluminum Alloy
D	Piston Seal (2)	Polyurethane
E	Magnet	Plastoferrite
F	Piston	Aluminum Alloy
G	Rear Head	Aluminum Alloy
H	Piston Rod	Stainless Steel
I	Rod Seal/Wiper	Polyurethane
J	Cushion Seal (2)	Buna-N
K	Cushion Seal Retainer (2)	Nylon 66
L	Cushion Sleeve	Aluminum Alloy
M	Piston O-Ring (2)	Buna-N
N	Piston Bearing Ring	Nylon 66
O	Body Seal (2)	Buna-N
P	Piston Nut/Cushion	Aluminum Alloy
Q	Tie Rod Nut (8)	Zinc Plated Steel
R	Tie Rod (4)	Stainless Steel
Not Shown	Cushion Adjustable Screw (2) Cushion Adjustable Seal (2)	Plated Brass Buna-N

How to Order

The Model Number for all Bimba ISO 6431 cylinders consists of four alphanumeric clusters. These designate type, bore size and stroke length, and options.

A variety of *Mounting Kits* are available for use with each basic cylinder. Please select the required mounting type from the specifications shown in the appropriate Bore Size Section.

Please refer to the charts below for an example of Model Number **AB-32-100-CB**. This is an ISO 6431 Type Cylinder, with 32mm Bore Size, 100mm Stroke Size. **Cushions and Magnetic Piston are standard.**

AB - 32 - 100 - CB

Type
AB (cast end cap design)

Bore Size
32mm
40mm
50mm
63mm
80mm
100mm

Stroke
Enter stroke in mm

Options		
CB	-	Cushions Both Heads
CF	-	Cushion Front Head Only
CR	-	Cushion Rear Head Only
D	-	Double Ended
EE	-	Extra Rod Extention
HR	-	High Temperature Seals (-20°C to +200°C)

General Specifications

Specifications	Cylinder Bore
Operating Pressure Range	0.5 bar to 10 bar
Operating Temperature Range	0°C to +80°C
Stroke Lengths	1mm to 2800mm

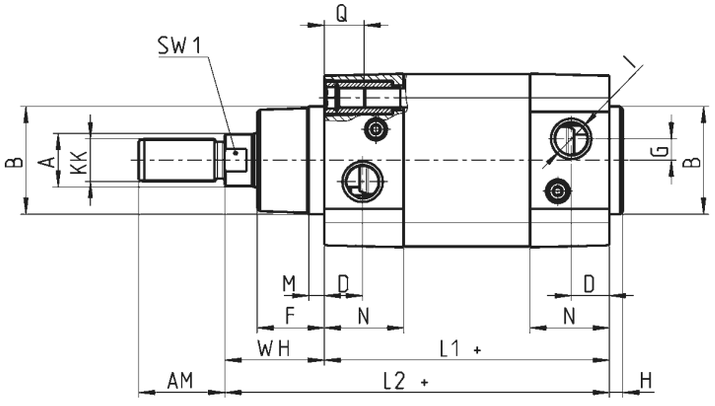
Note: Position Feedback available as a special option.

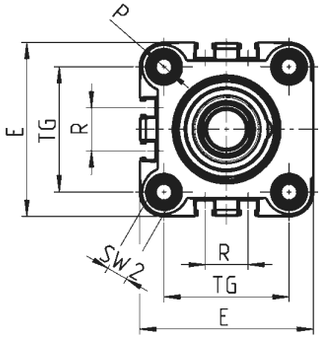
ISO 6431 VDMA Price List

Basic Model	32mm	40mm	50mm	63mm	80mm	100mm
AB-00-□-						
add per mm stroke						

Options						
D - Double Rod Option						
add per mm stroke						
HR - High Temperature						
EE - per mm						

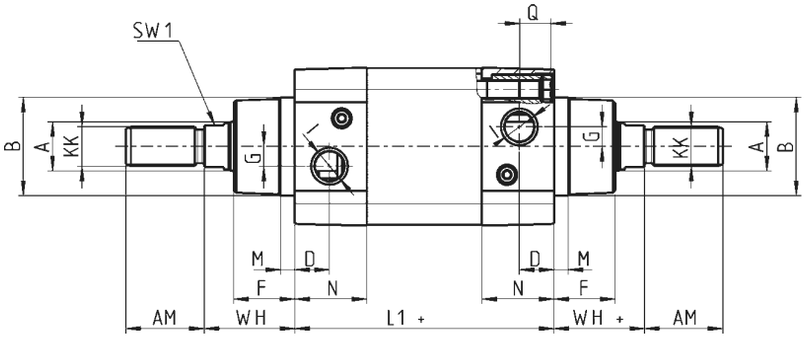
Basic Cylinder (mm)

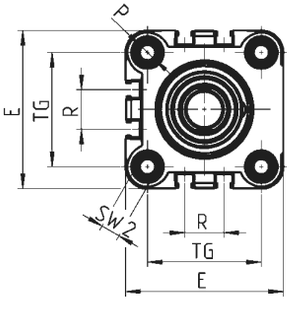




Bore	A	KK	B^{d}	D	F	AM	H	I	WH	L1	L2	M	N	Q	P	G	TG	R	E	SW1	SW2	Cushion Stroke	Weight (Kg)	Weight per mm
32	12	M10x1,25	30	14	18	22	4	G1/8	26	94	120	5	26	16	M6	5	32,5	13	46	10	6	19	.60	.003
40	16	M12x1,25	35	15	21	24	4	G1/4	30	105	135	5	29	16	M6	5	38	13,5	55	13	6	22	.89	.005
50	20	M16x1,5	40	15	25	32	4	G1/4	37	106	143	6	29,5	16	M8	8	46,5	16	64.5	17	8	22	1.44	.006
63	20	M16x1,5	45	21	26	32	4	G3/8	37	121	158	6	36,5	16	M8	8	56,5	28	75	17	8	22	2.08	.008
80	25	M20x1,5	45	21	30	40	4	G3/8	46	128	174	7	36	19	M10	8	72	30	93	22	10	25	3.43	.01
100	25	M20x1,5	55	23	35	40	4	G1/2	51	138	189	7	38,5	19,5	M10	8	89	40	110	22	10	25	4.85	.01

Double Rod End (mm)

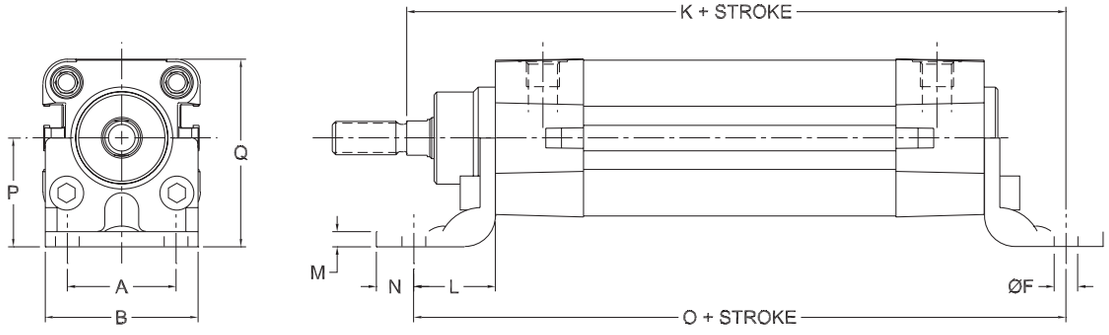




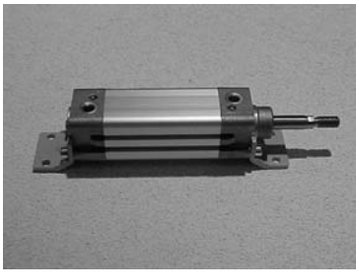
Bore	A	KK	B^{d}	D	F	AM	I	WH	L1	M	N	P	Q	G	TG	R	E	SW1	SW2	Cushion Stroke	Weight (Kg)	Weight per mm
32	12	M10x1,25	30	14	18	22	G1/8	26	94	5	26	M6	16	5	32,5	13	46	10	6	19	.69	.003
40	16	M12x1,25	35	15	21	24	G1/4	30	105	5	29	M6	16	5	38	13,5	55	13	6	22	1.06	.006
50	20	M16x1,5	40	15	25	32	G1/4	37	106	6	29,5	M8	16	8	46,5	16	64,5	17	8	22	1.76	.008
63	20	M16x1,5	45	21	26	32	G3/8	37	121	6	36,5	M8	16	8	56,5	28	75	17	8	22	2.40	.01
80	25	M20x1,5	45	21	30	40	G3/8	46	128	7	36	M10	19	8	72	30	93	22	10	25	4.06	.01
100	25	M20x1,5	55	23	35	40	G1/2	51	138	7	38,5	M10	19,5	8	89	40	110	22	10	25	5.55	.01

Foot Bracket (mm)

MS1 - □

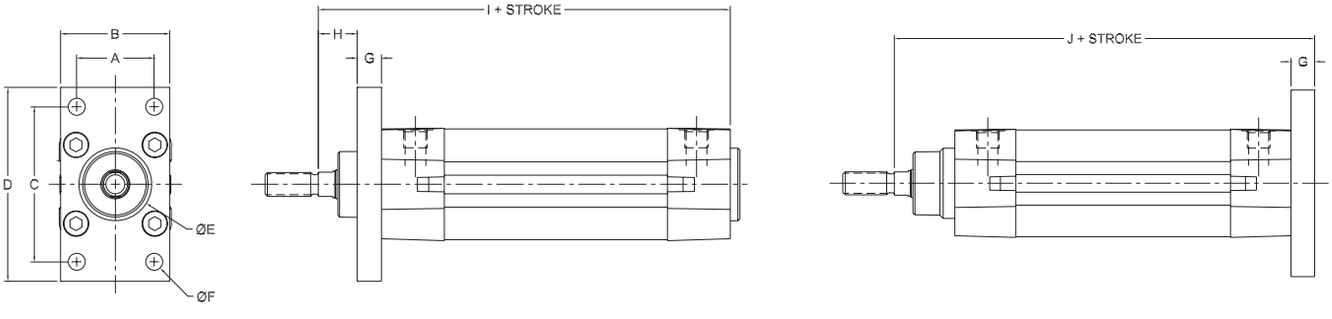


Model	K	L	M	N	O	P	Q	Weight (Kg)
MS1-32	144	24	4.5	11	142	32	55	.156
MS1-40	163	28	4.5	8	161	36	64	.186
MS1-50	175	32	5.5	15	170	45	77	.388
MS1-63	190	32	5.5	13	185	50	88	.438
MS1-80	215	41	6.5	14	210	63	110	.846
MS1-100	230	41	6.5	15	220	128	126	1.085



Front and Rear Flange (mm)

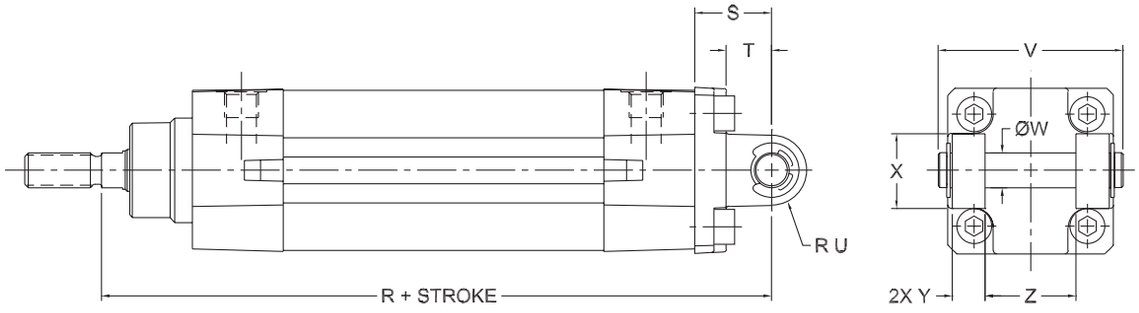
MF - □



Model	A	B	C	D	E	F	G	H	I	J	Weight (Kg)
MF-32	32	45	64	80	Ø30	Ø7	10	16	120	130	.218
MF-40	36	52	72	90	Ø35	Ø9	10	20	135	145	.270
MF-50	45	65	90	110	Ø40	Ø9	12	25	143	155	.522
MF-63	50	75	100	120	Ø45	Ø9	12	25	158	170	.667
MF-80	63	95	126	150	Ø45	Ø12	16	30	174	190	1.505
MF-100	75	115	150	170	Ø55	Ø14	16	35	189	205	2.500

Clevis Mount (mm)

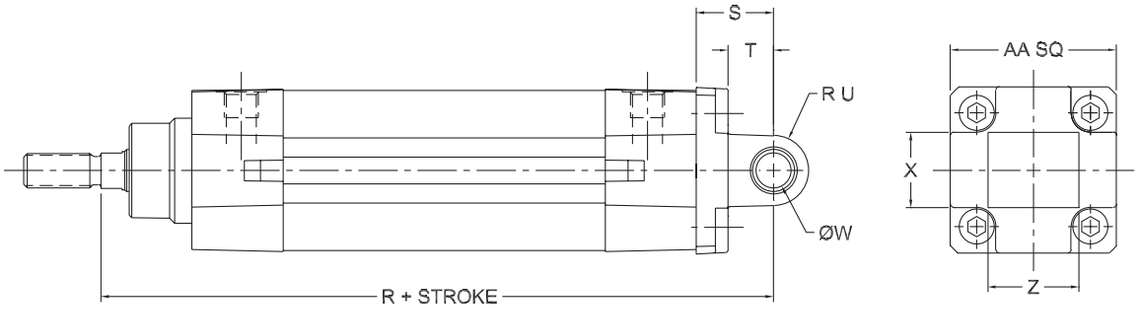
MP2 - □



Model	R	S	T	U	V	W	X	Y	Z	Weight (Kg)
MP2-32	142	22	12	R10	53	Ø10	22	9.5	26	.111
MP2-40	160	25	15	R12	60	Ø12	26	12	28	.157
MP2-50	170	27	15	R12	68	Ø12	28	14	32	.234
MP2-63	190	32	20	R16	79	Ø16	39	15	40	.376
MP2-80	210	36	21	R16	99	Ø16	46	20	50	.639
MP2-100	230	41	26	R20	121	Ø20	55	25	60	1.008

Pivot Mount (mm)

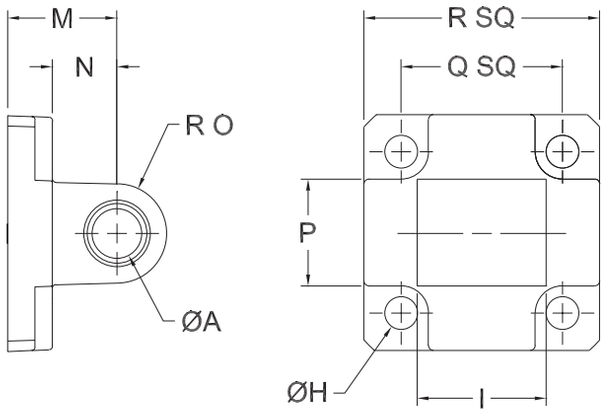
MP4 - □



Model	R	S	T	U	W	X	Z	AA	Weight (Kg)
MP4-32	142	22	12	R10	Ø10	22	26	48	.081
MP4-40	160	25	15	R12	Ø12	26	28	54	.108
MP4-50	170	27	15	R12	Ø12	28	32	66	.174
MP4-63	190	32	20	R16	Ø16	39	40	76	.257
MP4-80	210	36	21	R16	Ø16	46	50	95	.483
MP4-100	230	41	26	R20	Ø20	55	60	114	.690

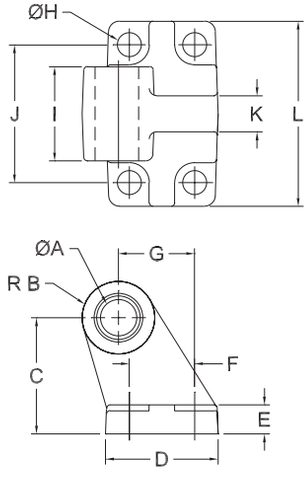
Accessories (mm)

Pivot Bracket - Type 2



Model	A	H	I	M	N	O	P	Q	R	Weight (Kg)
PB2-32	Ø10	Ø6.6	26	22	12	R10	22	32.5	48	.059
PB2-40	Ø12	Ø6.6	28	25	15	R12	26	38	54	.083
PB2-50	Ø12	Ø9	32	27	15	R12	28	46.5	65	.123
PB2-63	Ø16	Ø9	40	32	20	R16	28	56.5	76	.206
PB2-80	Ø16	Ø11	50	36	21	R16	46	72	95	.393
PB2-100	Ø20	Ø11	60	41	26	R16	55	89	114	.601

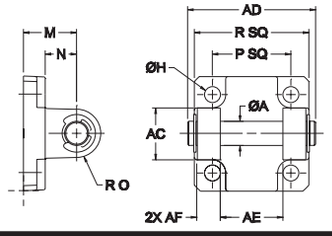
Pivot Bracket - Type 1



Model	A	B	C	D	E	F	G	H	I	J	K	L	Weight (Kg)
PB1-32	Ø10	R10	32	31	8	18	21	Ø6.6	26	38	10	51	.058
PB1-40	Ø12	R11	36	35	10	22	24	Ø6.6	28	41	12	54	.083
PB1-50	Ø12	R13	45	45	12	30	33	Ø9	32	50	15	65	.153
PB1-63	Ø16	R15	50	50	12	35	37	Ø9	40	52	16	67	.203
PB1-80	Ø16	R15	63	60	14	40	47	Ø11	50	66	18	86	.331
PB1-100	Ø20	R15	71	70	15	50	55	Ø11	60	76	20	96	.512

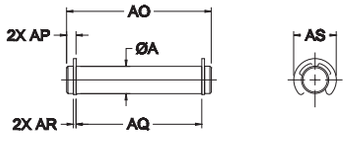
Accessories

Clevis Bracket



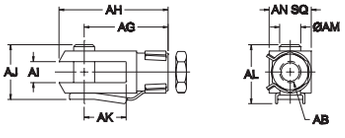
Model	A	H	M	N	O	P	R	AC	AD	AE	AF	Weight (Kg)
CB-32	Ø10	Ø6.6	22	12	R10	22	48	22	53	26	9.5	.086
CB-40	Ø12	Ø6.6	25	15	R12	26	54	26	60	28	12	.130
CB-50	Ø12	Ø9	27	15	R12	28	65	28	68	32	14	.183
CB-63	Ø16	Ø9	32	20	R16	28	76	28	79	40	15	.322
CB-80	Ø16	Ø11	36	21	R16	46	95	46	99	50	20	.543
CB-100	Ø20	Ø11	41	26	R16	55	114	55	121	50	25	.909

Pivot Pin



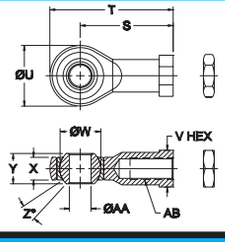
Model	A	AO	AP	AQ	AR	AS	Weight (Kg)
PP-32	Ø10	53	3.5	46	1	16	.035
PP-40	Ø12	60	3.3	53	1.1	19	.055
PP-50	Ø12	68	3.5	61	1.1	19	.060
PP-63	Ø16	79	4	71	1.3	23	.127
PP-80	Ø16	99	4	91	1.3	23	.160
PP-100	Ø20	121	5	111	1.5	29	.300

Rod Clevis



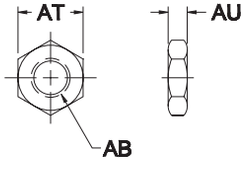
Bore	Model	AB	AG	AH	AI	AJ	AK	AL	AM	AN	Weight (Kg)
32	RC-M10x1.25	M10x1.25	40	52	10	26	20	28	10	20	.097
40	RC-M12x1.25	M12x1.25	48	62	12	32	24	34	12	24	.157
50, 63	RC-M16x1.5	M16x1.5	64	83	16	40	32	42	16	32	.356
80, 100	RC-M20x1.5	M20x1.5	80	105	20	48	40	50	20	40	.714

Spherical Rod Eye



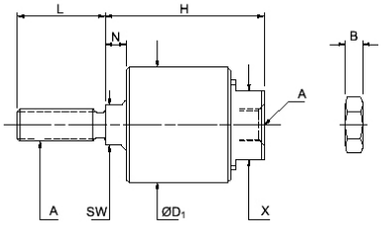
Bore	Model	S	T	U	V	W	X	Y	Z	AA	AB	Weight (Kg)
32	SRE-M10x1.25	43	57	Ø28	17	Ø19	10.5	14	13°	Ø10	M10x1.25	.080
40	SRE-M12x1.25	50	66	Ø32	19	Ø22	12	16	13°	Ø12	M12x1.25	.124
50, 63	SRE-M16x1.5	64	85	Ø42	23	Ø28.5	15	21	15°	Ø16	M16x1.5	.248
80, 100	SRE-M20x1.5	77	102	Ø50	30	Ø35	18	25	14°	Ø20	M20x1.5	.438

Rod Nut



Bore	Model	AB	AT	AU	Weight (Kg)
32	RN-4	M10x1.25	17	5	.006
40	MN-1	M12x1.25	19	7	.010
50, 63	MN-2	M16x1.5	24	8	.017
80, 100	MN-5	M20x1.5	30	9	.030

Rod Coupler



Bore	Model	A	B	D_1	H	L	N	SW	X
25, 32	AC-M10x1.25	M10x1.25	5	29	40	24	5.3	10	17
40	AC-M12x1.25	M12x1.25	7	32	47	24	8.2	13	20
50, 63	AC-M16x1.5	M16x1.5	8	32	48	32	10	13.5	20
80, 100	AC-M20x1.5	M20x1.5	9	45	57	40	10	21	28

Accessories

Prices

Mounting Kits and Accessories	32mm	40mm	50mm	63mm	80mm	100mm
MS1 Bore (Foot Bracket Kit)						
MF Bore (Flange Kit)						
MP2 Bore (Pivot Female Kit)						
MP4 Bore (Pivot Male Kit)						
PB1 Bore (Pivot Bracket)						
PB2 Bore (Pivot Bracket)						
CB Bore (Clevis Bracket)						

Rod Accessories

Rod Clevis	List
RC-M10x1.25	
RC-M12x1.25	
RC-M16x1.5	
RC-M20x1.5	

Spherical Rod Eyes	List
SRE-M10x1.25	
SRE-M12x1.25	
SRE-M16x1.5	
SRE-M20x1.5	

Rod Nuts	List
RN-4	
MN-1	
MN-2	
MN-5	

Rod Alignment Couplers	
AC-M10x1.25	
AC-M12x1.25	
AC-M16x1.5	
AC-M20x1.5	

Pivot Pins	List
PP-32	
PP-40	
PP-50	
PP-63	
PP-80	
PP-100	

Switches	List
MRS-AB	
MRS-ABQ	
HS-AB	
HS-ABQ	

BIMBA *meets YOUR NEEDS .....*

- **Reliable Service, World-Wide**
  - From a world-wide leader producing millions of actuators each year
- **Environmental**
  - Pre-lubricated for longer, maintenance free operation (1)
- **Noise Reduction**
  - Shock absorbing bumpers (2)
- **Performance And Quality Processes Throughout**
  - Roll formed threads (3)
  - High strength pistons permanently rivetted and sealed (4)
  - Roller burnished stainless steel rods
- **Productivity**
  - Advanced bearing and seal materials for higher speed applications (5)
- **Safety**
  - Double rolled construction (6)
  - Permanent mechanical retention; needles cannot blow out under pressure (7)
- **Reduced Envelope**
  - Space savings available resulting from smaller external dimensions
- **A Material For Any Application**
  - Heads available in Aluminium, Stainless Steel and Delrin®
- **Unique Customer Solutions**
  - Rapid design and delivery time for custom modifications

How to Order

The Model Number for all Bimba ISO 6432 Cylinders consists of five Alpha-Numeric clusters. The first designates the *Type*, the second the *Bore Size*, the third the *Stroke Length*, the fourth the *Mounting* style, and the fifth the *Options*.

Please refer to the chart below for an explanation of the following model number:

EM-25-100-N-CNT: This is an ISO 6432 Type Cylinder with a magnet, with 25mm Bore Size, 100mm Stroke Size, Nose Mounted, and with Cushions in Both Heads and No Thread Rod.

EM-25-100-N-CNT

TYPE

E(M)	=	(MRS) Double Acting
ED(M)	=	(MRS) Double Acting Double End Rod
ES(M)	=	(MRS) Single Acting - 0-50mm Stroke
ESZ(M)	=	(MRS) Single Acting - HD Spring*
ER(M)	=	(MRS) Reverse Single Acting - HD Spring*
NRE(M)	=	(MRS) Non-Rotating Rod

MOUNTINGS

N	=	Nose Mount Axial Port
Q	=	Nose Mount Radial Port
U	=	Universal Mount

BORE SIZE

8mm
10mm
12mm
16mm
20mm
25mm

STROKE

Enter Stroke in mm

Standard stroke lengths in 1mm increments

E	=	1-300mm
ES	=	1-50mm
ESZ	=	1-300mm
ED	=	1-300mm
ER	=	1-100mm
NRE	=	1-300mm

OPTIONS

C	=	Cushions Both Heads
CF	=	Cushion Front Only
CR	=	Cushion Rear Only
Y	=	Stainless Steel End Caps (16, 20 & 25mm bore)
HR	=	High Temperature Seals (-20°C to +200°C)
NT	=	No Thread Rods
S	=	Piston Wearstrip (16, 20 & 25mm bore)
T2	=	Low Profile (All MRS) 90° CW from ports**
T4	=	Low Profile (All MRS) 90° CCW from ports**
EE	=	Extra Rod Extension (Both ends on ED)

* - HD (Heavy Duty) springs available in stroke lengths over 50mm

** - when viewed from the rear

Y option available with radial ports only

List Prices

E- Bore - Stroke - Mount - Options

	8mm	10mm	12mm	16mm	20mm	25mm
Nose Mount Base (-N)						
Universal Base (-U)						
Stroke						
EEX.XX (per mm)						
HR (High Temperature Seals)						
Cushions Per End						
S (Wear Strip)						
Y (SS End Caps)						
M (Magnet Prefix)						
NR (Non-rotating)						
Stroke Adder for NR						
EEX.XX (per mm) for NR						
T (Switch Track)						

Standard strokes are 1mm increments to 300mm. Non-standard and longer strokes, add Schedule 27.

No charge options: Q, Side Ported Rear Head (use Nose Mount base price); NT, Nontreaded Rod.

ES - Bore - Stroke - Mount - Options

	8mm	10mm	12mm	16mm	20mm	25mm
Nose Mount Base (-N)						
Universal Mount Base (-U)						
Stroke						
HR (High Temperature Seals)						
EEX.XX (per mm)						
M (Magnet Prefix)						
Z (Heavy Spring and long Strokes; Prefix)						
T (Switch Track)						

Standard strokes are 1mm increments to 50mm. For longer strokes, order as ESZ model.

No charge options: Q (use Nose Mount base price); NT

*Z option required for strokes longer than 50mm. ESZ strokes are standard in 1mm increments from 1 to 150mm. Non-standard strokes, add Schedule 27.

ED - Bore - Stroke - Options

	8mm	10mm	12mm	16mm	20mm	25mm
Base						
Stroke						
HR (High Temperature Seals)						
Cushions per end						
S (Wear Strip)						
Y (SS End Caps)						
EEX.XX (per mm)						
M (Magnet Prefix)						
T (Switch Track)						

Standard strokes are 1mm increments to 300mm. Non-standard and longer strokes, add Schedule 27.

No charge options: NT

List Prices

ER - Bore - Stroke - Mount - Options

	8mm	10mm	12mm	16mm	20mm	25mm
Nose Mount Base (-N)						
Universal Mount Base (-U)						
Stroke						
HR (High Temperature Seals)						
EEX.XX (per mm)						
M (Magnet Prefix)						
T (Switch Track)						

Standard strokes are 1mm increments to 100mm. Non-standard and longer strokes, add Schedule 27.

No charge options: NT

Type PCE - Bore - Stroke - Mount - Options

	16mm	20mm	25mm
Nose Mount Base (-N)			
Universal Mount Base (-U)			
Stroke			
Cushions per end			
S (Wear Strip)			
EEX.XX (per mm)			
M (Magnet Prefix)			
T (Switch Track)			

Standard strokes are 1mm increments to 500mm. Non-standard and longer strokes, add Schedule 27.

No charge options: NT

PCED - Bore - Stroke - Mount - Options

	16mm	20mm	25mm
Nose Mount Base (-N)			
Stroke			
Cushions per end			
S (Wear Strip)			
EEX.XX (per mm)			
M (Magnet Prefix)			
T (Switch Track)			

Standard strokes are 1mm increments to 300mm. Non-standard and longer strokes, add Schedule 27.

No charge options: NT

ISO 6432 Position Sensing Switches

Model Number	Price[1]	Model Number	Price[1]
MRS-.027-B-☐		MRS-.027-BL-☐	
MRS-.027-XB-☐		MRS-.027-XBL-☐	
MRS-.027-BQ-☐		MRS-.027-BLQ-☐	
MRS-.027-BQC-☐		MRS-.027-BLQC-☐	
MRS-.027-BQCX-☐		MRS-.027-BLQCX-☐	

[1]Price includes band

Accessories

Foot Bracket

Bore	Model Number	Price
8, 10	FB-1	
12, 16	FB-2	
20, 25	FB-3	

Flange Mount

Bore	Model Number	Price
8, 10	MF-1	
12, 16	MF-2	
20, 25	MF-3	

Clevis Foot

Bore	Model Number	Price
8, 10	CFB-1	
12, 16	CFB-2	
20, 25	CFB-3	

Rod Clevis

Bore	Model Number	Price
8, 10	RC-M4X0.7	
12, 16	RC-M6X1.0	
20	RC-M8X1.25	
25	RC-M10X1.25	

Mounting Nut

Bore	Model Number	Price
8, 10	MN-1	
12, 16	MN-2	
20, 25	MN-3	

Rod Nut

Bore	Model Number	Price
8, 10	RN-1	
12, 16	RN-2	
20	RN-3	
25	RN-4	

Metric Quik-Flo® Flow Controls

Spherical Rod Eyes

Bore	Model Number	Price
8, 10	SRE-M4X0.7	
12, 16	SRE-M6X1.0	
20	SRE-M8X1.25	
25	SRE-M10X1.25	

Recessed Needle

Model Number	Price
FCPM-1-Q4-L	
FCPM-1-Q6-L	
FCPM-2-Q4-L	
FCPM-2-Q6-L	
FCPM-2-Q8-L	
FCPM-4-Q6-L	
FCPM-4-Q8-L	

Knurled Knob

Model Number	Price
FCPM-1-Q4-R	
FCPM-1-Q6-R	
FCPM-2-Q4-R	
FCPM-2-Q6-R	
FCPM-2-Q8-R	
FCPM-4-Q6-R	
FCPM-4-Q8-R	

PCE Accessories (All Stainless Construction)

Foot Bracket

Bore	Model Number	Price
16	FB-2-SS	
20, 25	FB-3-SS	

Clevis Foot (Pivot Bracket)

Bore	Model Number	Price
16	CFB-2-SS	
20, 25	CFB-3-SS	

Rod Clevis

Bore	Model Number	Price
16	RC-2-SS	
20	RC-3-SS	
25	RC-4-SS	

Mounting Nut

Bore	Model Number	Price
16	MN-2-SS	
20, 25	MN-3-SS	

Rod Nut

Bore	Model Number	Price
16	RN-2-SS	
20	RN-3-SS	
25	RN-4-SS	

Compatibility Chart

Due to design or incompatibility restrictions, the following options may ***NOT*** be ordered in combination. For example stainless steel end cap may not be ordered with cushions.
Options NT and EE are available independently, with each other or with all viable option combinations.

BORE	OPTION				
	NRE	C	Y	M	S
8	N/A	N/A	N/A	N/A	N/A
10	N/A	N/A	N/A	N/A	N/A
12	N/A	N/A	N/A	N/A	N/A
16	C, Y	NRE, Y	NRE, C	S	M
20	C, Y	NRE, Y	NRE, C	S	M
25	C, Y	NRE, Y	NRE, C	S	M

Conversion Tables

	Metric Unit Of Measure	Metric To Imperial Conversion	Imperial Unit Of Measure	Imperial To Metric Conversion
Force	Newtons (N)	*x* 0.2248	Pounds (Lbs)	*x* 4.448
Pressure	Bar (b)	*x* 14.5	Pounds Per Square Inch (PSI)	*x* 0.069
Measurement	Millimetres	*x* 0.03937	Inches	*x* 25.4
Temperature	Centigrade	$\frac{9\,x^{\circ}C}{5} + 32$	Fahrenheit	$\frac{5\ x(^{\circ}F - 32)}{9}$

General Specifications

	BORE					
	8	10	12	16	20	25
Cushion Length (mm) Each End	N/A			18	21	21
Operating Pressure Range **Maximum** **Minimum - Double Acting**	10 bar 0.5 bar					
Operating Temperature Range **Standard Seals** **High Temperature Seals**	-10°C to +80°C -20°C to +200°C					
Operating Media	Filtered Compressed Air/Lubricated or Non-Lubricated					
Standard Stroke Lengths	See Table on page 2.2					
Maximum Stroke Length*	1000mm					
Stroke Tolerance	+1.0mm/-0mm					
Piston Speed	5mm/s to 1000mm/s (Higher speed available on request)					
Life Expectancy	3000km					

* Varies according to bore size, please consult your local BIMBA distributor.

Weights

	BORE					
	8	10	12	16	20	25
Option N	20	22	41	53	102	149
Option U	23	25	46	59	118	167
Type ED	28	30	61	74	152	218
adder per 10mm stroke	2	2	4	5	8	11

Weights (approximate) are for zero stroke, in grams.

Rod Buckling Formula

The maximum recommended cylinder stroke is dependent upon:

1. Mounting type
2. Rod diameter
3. Rod end connection

Using the following formula it is possible to determine the buckling load for a given stroke length of cylinder

$$BL = \frac{\pi^2 EJ}{(l \times M)^2 S}$$

BL = Permissible Buckling Load (N)
E = Young's Modulus of Elasticity (N/mm^2)
J = Moment of Inertia (mm^4)
l = Buckling Length = Stroke (mm)
M = Stroke Multiplier (see table below)
S = Safety Factor (recommended minimum 5)

HOW TO CALCULATE ROD BUCKLING FORCES

EXAMPLE:

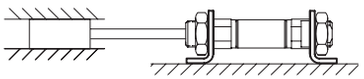
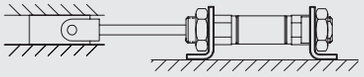
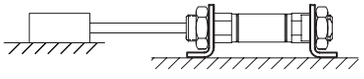
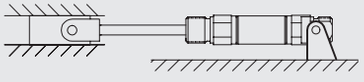
Q. What is the buckling load for a 25mm bore cylinder with a pivoted and guided load attached, stroke 200mm?

A. Using the formula: $BL = \frac{\pi^2 EJ}{(l \times M)^2 S}$

$E = 190.05 \times 10^3 \text{N/mm}^2$
$l = 200\text{mm}$ (stroke)
$M = 2$ (for pivoted and guided load)
$S = 5$ (safety factor)
$D = 10\text{mm}$ (piston rod diameter for cylinder)

$$J = \frac{\pi D^4}{64} = \frac{\pi 10^4}{64} = 490.87\text{mm}^4$$

$$BL = \frac{\pi^2 \times 190.05 \times 10^3 \times 490.9}{(2 \times 200)^2 \times 5} = 1150.9\text{N} = 1.15\text{kN}$$

ROD END CONNECTION	CYLINDER MOUNTING	TYPE	STROKE MULTIPLIER
FIXED & GUIDED		A	0.5
PIVOTED & GUIDED		B	0.7
FIXED & SUPPORTED		C	2
PIVOTED & GUIDED		C	2

Output Forces

Cylinder output forces can be determined in one of two ways:

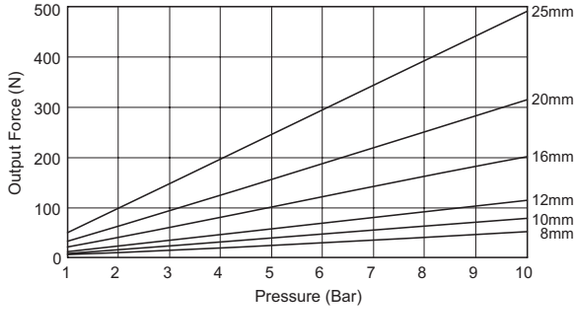
1. Calculation

Cylinder Output Force (N) = ***Power Factor*** x ***Pressure (bar)***

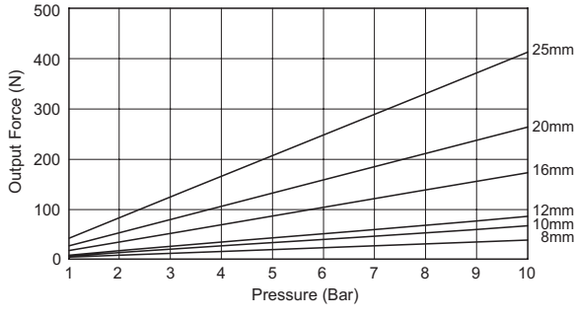
BORE	*POWER FACTOR*	
	EXTENSION	RETRACTION
8	5.3	4.0
10	7.9	6.6
12	11.3	8.5
16	20.1	17.3
20	31.4	26.1
25	49.1	41.2

2. Graph

Extend



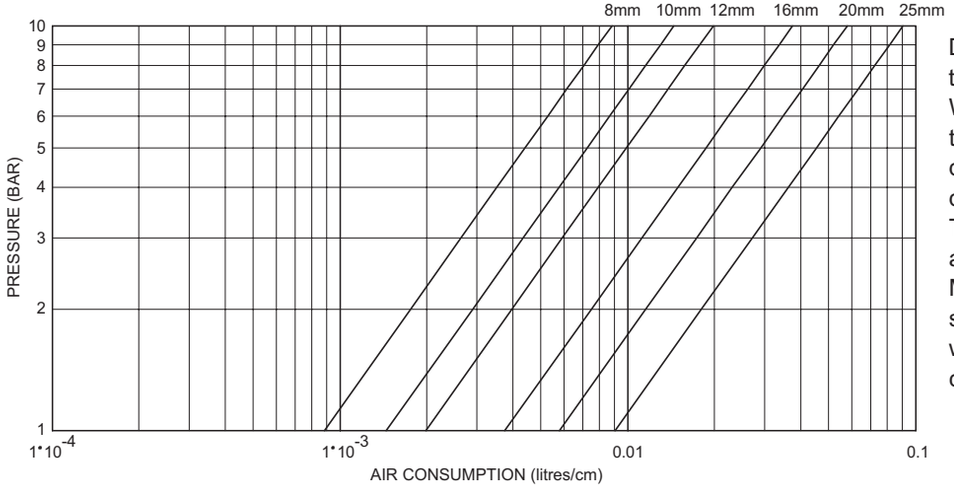
Retract



Air Consumption Chart

The Air Consumption Chart is based on the following formula for a complete cylinder cycle (cylinder extends and retracts):

$$Q = \left[\frac{\pi D^2}{4} + \left(\frac{\pi(D^2 - d^2)}{4}\right)\right] hp10^{-6}$$



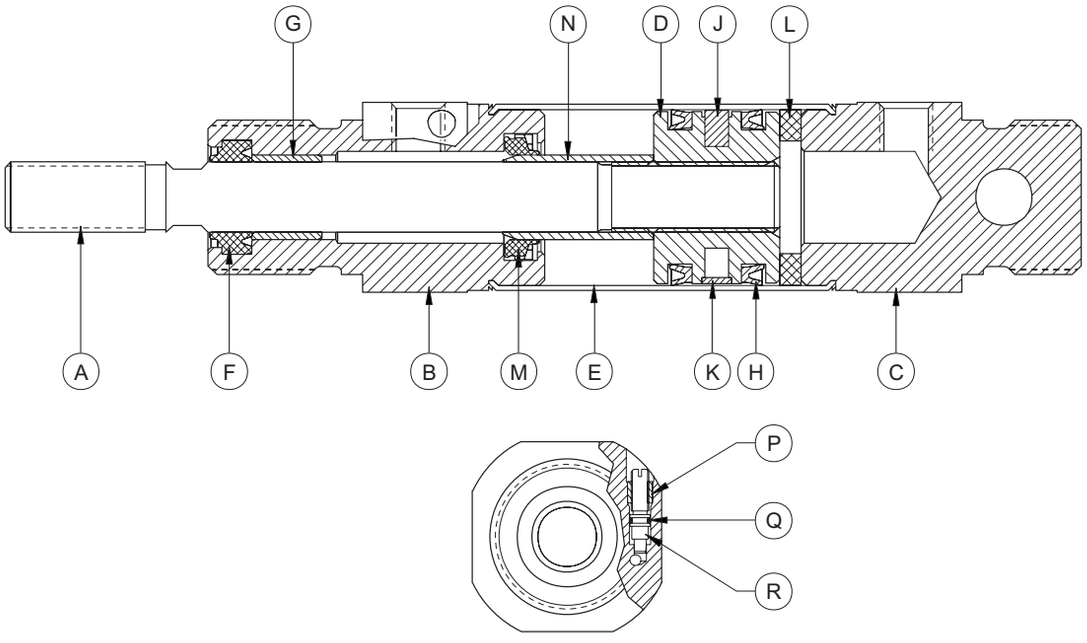
Draw a line across for the pressure used. Where this intersects the required bore size, draw a vertical line down.
This will give you the air consumption. Multiply this by the stroke in cm, and this will give the air consumption per cycle.

Q = Air volume per cm of stroke (L)
D = Piston or piston rod diameter (mm)
h = Stroke (mm)
p = Operating pressure (bar)
d = Piston rod diameter (mm)

EXAMPLE:

Cylinder Stroke	= 2.5cm
Cylinder Bore	= ø25mm
Operating Pressure	= 7 Bar
Air Consumption	= 0.158 Litres

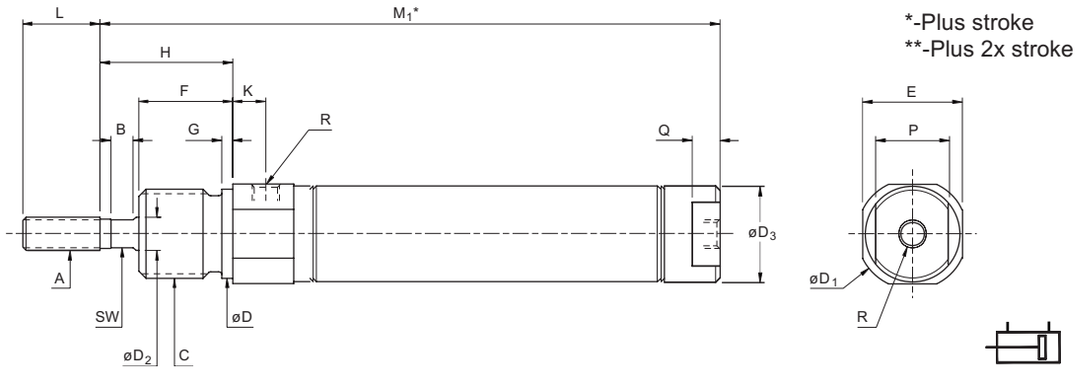
Materials



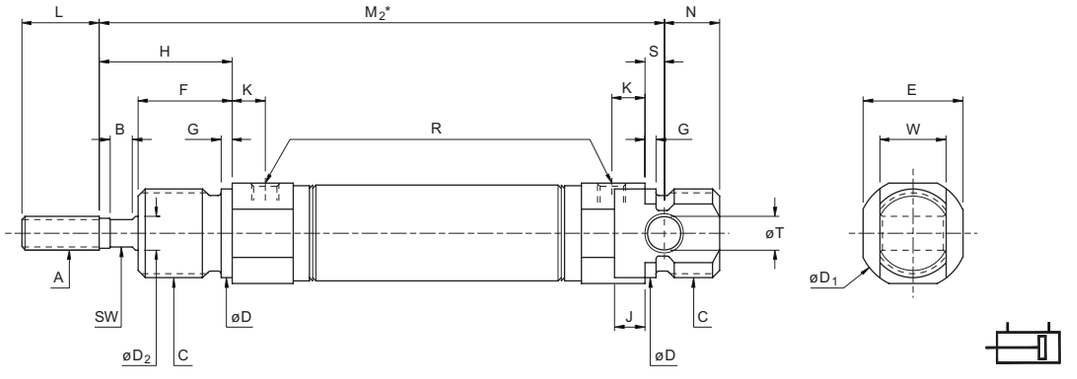
ITEM	COMPONENT	MATERIAL
A	Piston Rod	Stainless Steel (type 303 s31)
B	Rod Guide	Aluminium Alloy (anodised) Delrin® Plastic - (type PCE) Stainless Steel - (option Y)
C	Rear Head	Aluminium Alloy (anodised) Delrin® Plastic - (type PCE) Stainless Steel - (option Y)
D	Piston	Aluminium Alloy Brass - (type ED)
E	Body	Stainless Steel (type 304)
F	Rod Seal/Rod Wiper	Nitrile (NBR) or Fluoro-rubber (FPM) - (option HR)
G	Rod Bearing	Self Lubricating Thermoplastic Alloy
H	Piston Seal	Nitrile (NBR) or Fluoro-rubber (FPM) - (option HR)
J	Magnet	Neodymium Iron Boron Nitrile
K	Piston Bearing Ring	Carbon Filled PTFE
L	Bumper	Fluoro-rubber (FPM)
M	Cushion Seal	Nitrile (NBR) - Standard or Fluoro-rubber (FPM) - (option HR)
N	Cushion Sleeve	Aluminium Alloy
P	Cushion Screw Retainer	Aluminium Alloy (anodised) Stainless Steel - (type PCE)
Q	Cushion o-ring	Fluoro-rubber (FPM)
R	Cushion Screw	Stainless Steel (type 303 s31)

Double Acting

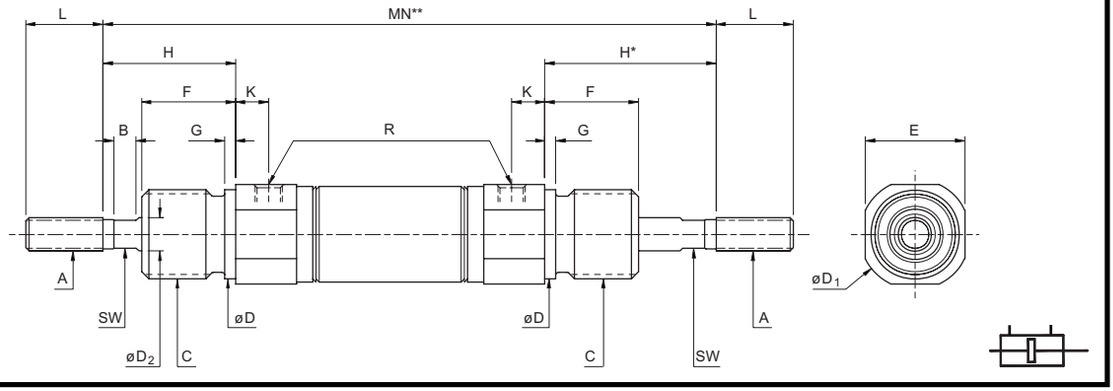
NOSE MOUNT - N option



UNIVERSAL MOUNT - U option



DOUBLE ENDED

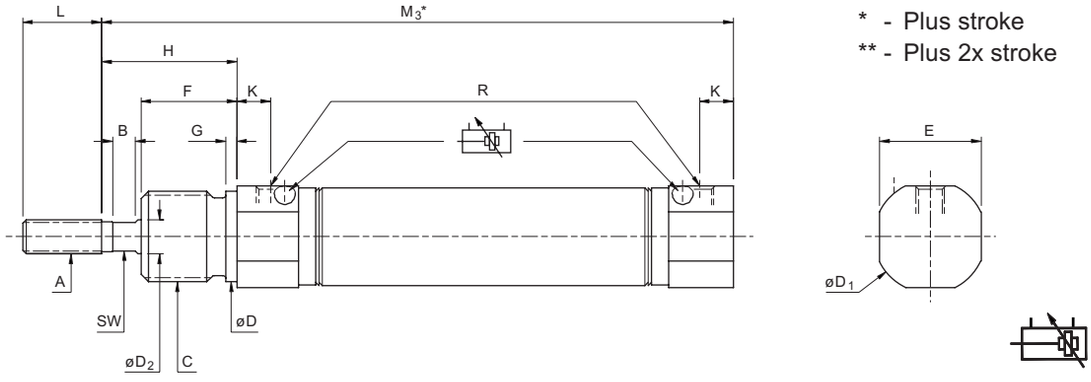


Bore	A^{6g}	B	C^{6g}	D	D_1	D_2^{h8}	D_3	E	F	G	H	J	K	L	P	Q	N	R	S	T^{H9}	W^{d13}	SW	M_1	M_2	MN
8	M4x0.7	-	M12x1.25	12	17	4	9	15	12	2	16	3	6	12	8	4	9	M5x0.8	3	4	8	-	56.5	64	77
10	M4x0.7	-	M12x1.25	12	17	4	11	15	12	2	16	3	6	12	10	5	9	M5x0.8	3	4	8	-	58	64	77
12	M6x1.0	4	M16x1.5	16	20	6	13	18	17	2	24	5.4	6	14	10	5	8	M5x0.8	3.6	6	12	5	68.7	77	97
16	M6x1.0	4	M16x1.5	16	20	6	17	18	17	2	24	5.5	6	14	13	5	10	M5x0.8	3.5	6	12	5	74	84	104
20	M8x1.25	4	M22x1.5	22	28	8	21	24	19	3	25	8	8	19	19	7	11	G1/8	4	8	16	6	84.5	96	117
25	M10x1.25	4	M22x1.5	22	30	10	26	27	22	3	30	6	8	20	22	8	11	G1/8	6	8	16	8	92	106	130

Q option	Bore	Adder	Bore	Adder
Radially ported rear head available on non-cushioned cylinders. The M_1 dimension increases by the amount shown alongside	8	4.5	16	6.5
	10	3	20	7.5
	12	4.7	25	8

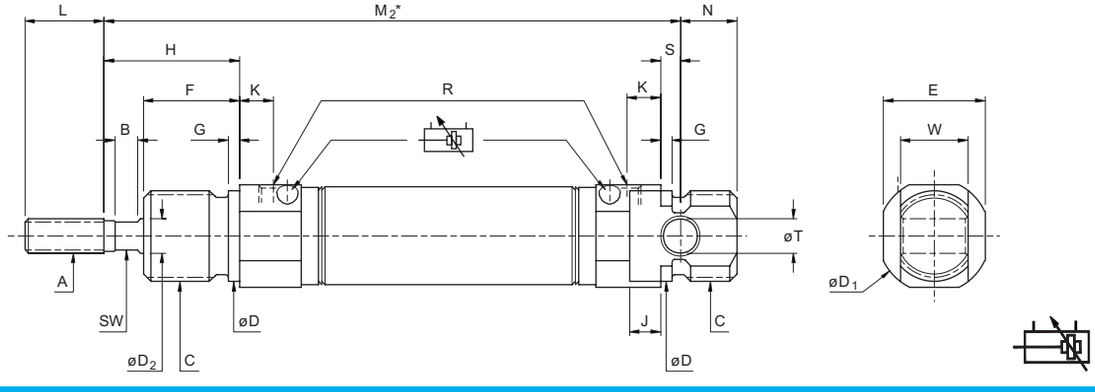
Double Acting - With Adjustable Cushioning

NOSE MOUNT - N option

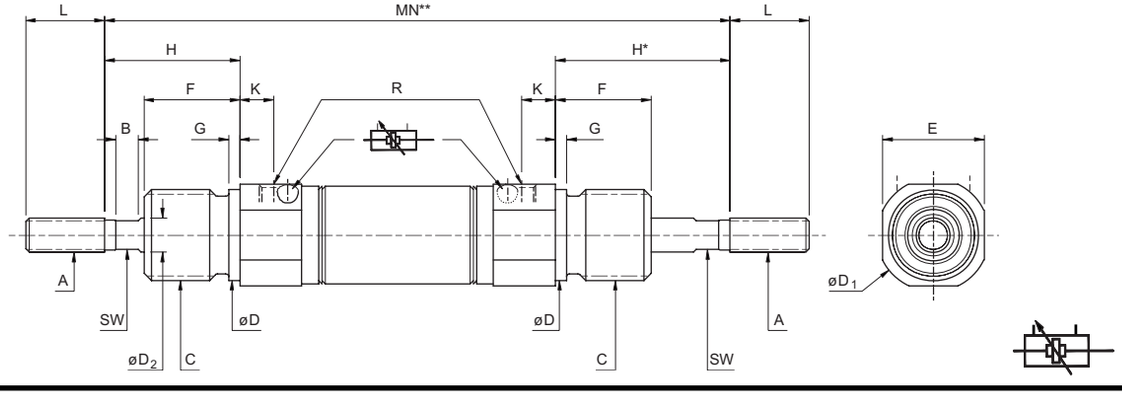


* - Plus stroke
** - Plus 2x stroke

UNIVERSAL MOUNT - U option



DOUBLE ENDED

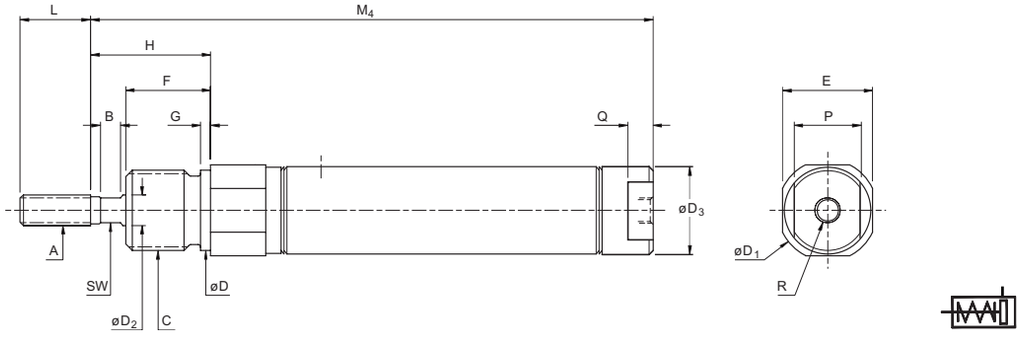


Bore	A^{6g}	B	C^{6g}	D	D_1	D_2^{h8}	E	F	G	H	J	K	L	N	R	S	T^{H9}	W^{d13}	SW	M_2	M_3	MN
16	M6x1.0	4	M16x1.5	16	20	6	18	17	2	24	5.5	6	14	10	M5x0.8	3.5	6	12	5	84	80.5	104
20	M8x1.25	4	M22x1.5	22	28	8	24	19	3	25	8	8	19	11	G1/8	4	8	16	6	96	92	117
25	M10x1.25	4	M22x1.5	22	30	10	27	22	3	30	6	8	20	11	G1/8	6	8	16	8	106	100	130

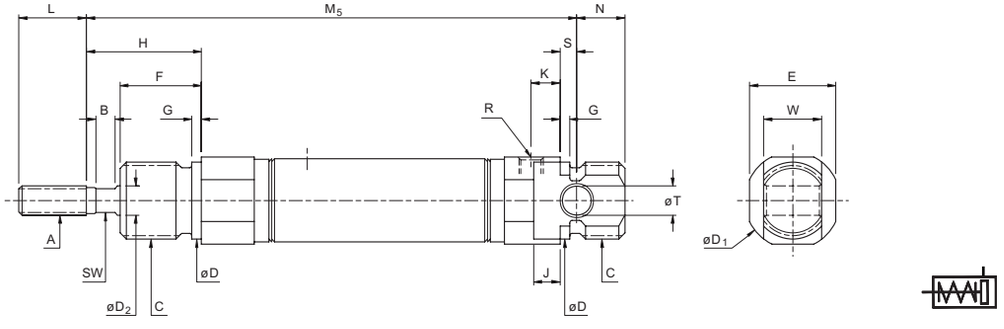
Single Acting – Spring To Retract (ESZ)

The ESZ & ER series offer a heavier spring force than the ES, and the flexibility of strokes exceeding 50mm.

NOSE MOUNT - N option

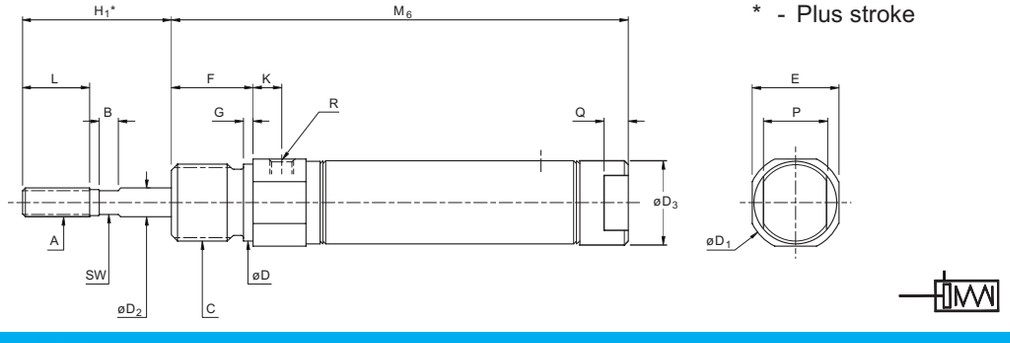


UNIVERSAL MOUNT - U option

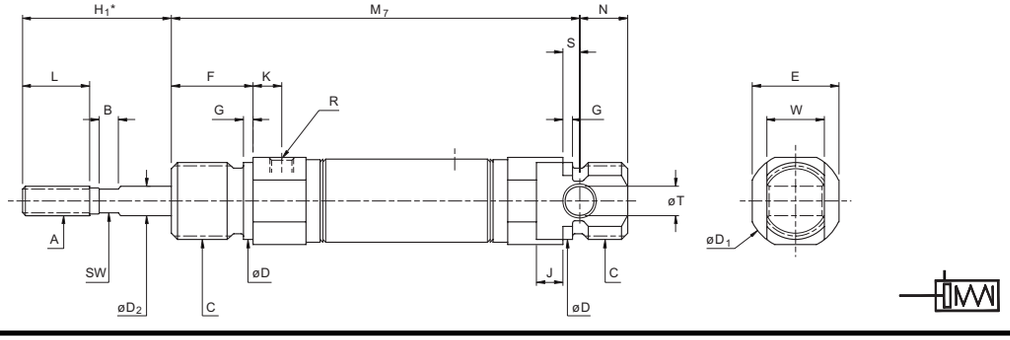


Single Acting – Spring To Extend (ER)

NOSE MOUNT - N option



UNIVERSAL MOUNT - U option



See following page for dimensional tables

Bore	A^{6g}	B	C^{6g}	D	D_1	D_2^{h8}	D_3	E	F	G	H	H_1	J	K	L	N	P	Q	R	S	T^{H9}	W^{d13}	SW
8	M4x0.7	-	M12x1.25	12	17	4	9	15	12	2	16	16	3	6	12	9	8	4	M5x0.8	3	4	8	-
10	M4x0.7	-	M12x1.25	12	17	4	11	15	12	2	16	16	3	6	12	9	10	5	M5x0.8	3	4	8	-
12	M6x1.0	4	M16x1.5	16	20	6	13	18	17	2	24	21	5.4	6	14	8	10	5	M5x0.8	3.6	6	12	5
16	M6x1.0	4	M16x1.5	16	20	6	17	18	17	2	24	21	5.5	6	14	10	13	5	M5x0.8	3.5	6	12	5
20	M8x1.25	4	M22x1.5	22	28	8	21	24	19	3	25	27	8	8	19	11	19	7	G1/8	4	8	16	6
25	M10x1.25	4	M22x1.5	22	30	10	26	27	22	3	30	28	6	8	20	11	22	8	G1/8	6	8	16	8

Calculating Cylinder Lengths

In order to provide greater customer flexibility, Bimba ESZ and ER cylinders can be fitted with multiple springs. To calculate the length ("**M**" dimension), use the following formula based on the table below:

Example 1: **ESZ-25-78-U**

ESZ-25-_-U Base length ($\mathbf{M_5}$) = 103mm
Multiplier = Stroke ÷ Increment = 78 ÷ 25 = 3.12
Multiplier = 3 (always round down)
Multiplier x Adder = 3 x 47 = 141mm
Add Base Length = 141 + 103 = 244

Add whole stroke increment:
Stroke – (Multiplier x 25) = 78 - 75 = 3

ESZ-25-78-U = 244 + 3 = 247

Example 2: **ER-12-86-N**

ER-12-86-N Base length ($\mathbf{M_6}$) = 60.2mm
Multiplier = Stroke ÷ Increment = 86 ÷ 12.5 = 6.88
Multiplier = 6 (always round up)
Multiplier x Adder = 6 x 29 = 174mm
Add Base Length = 174 + 60.2 = 234.2

Add whole stroke increment:
Stroke – (Multiplier x 12.5) = 86 - 75 = 11

ER-12-86-N = 234.2 - 11 = 223.2

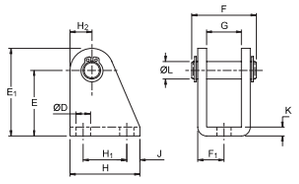
	ESZ - Single Acting, Rod To Retract				*ER - Single Acting, Rod To Extend*			
	M_4 (N)	M_5 (U)	Adder	Increment	M_6 (N)	M_7 (U)	Adder	Increment
8	63.8	71.3	20.8	12.5	51.5	59	20.8	12.5
10	57	63	24		53	59	29	
12	67.2	75.5	26.5		60.2	68.5	29	
16	72	82	48.5	25	65	75	49	25
20	81.5	93	46.5		75.5	87	49	
25	89	103	47		81	95	41.7	

Spring Forces

Bore	*ES (available up to 50mm stroke)*				*ESZ & ER*	
	Preload At Strokes (N)			Final Load (N)	Preload At 10mm Stroke (N)	Final Load (N)
	10mm	25mm	50mm			
8	5.1	4.2	2.6	5.7	1.8	8
10	5.1	4.2	2.6	5.7	3.1	8
12	5.8	4.4	3.1	6.2	4.9	16
16	5.8	4.4	3.1	6.2	8.9	22.7
20	20	16.5	11.1	22	12	31.7
25	28	23.1	15.6	31.1	12	39.2

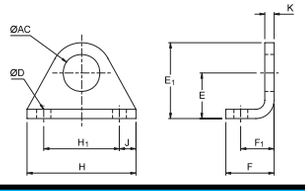
Accessories - Carbon Steel

CLEVIS FOOT



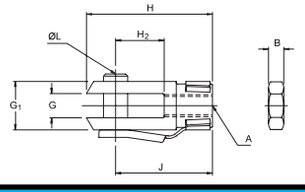
Bore	Type	D	E	E_1	F	F_1	G	H	H_1	H_2	J	K	L
8, 10	CFB-1	4.5	24	29	17	6.5	8.1	20	12.5	5	4	2.5	4
12, 16	CFB-2	5.5	27	34	23	9	12.1	25	15	7	5	3	6
20, 25	CFB-3	6.6	30	40	29.5	12	16.1	32	20	10	6	4	8

FOOT MOUNTING



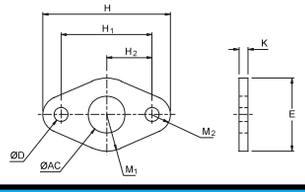
Bore	Type	AC	D	E	E_1	F	F_1	H	H_1	J	K
8, 10	FB-1	12.1	4.6	15	25	16	11	36	25	5.5	3
12, 16	FB-2	16.1	5.6	20	33	20	14	45	32	6.5	4
20, 25	FB-3	22.1	6.6	25	40	24	17	56	40	8	4.5

ROD CLEVIS



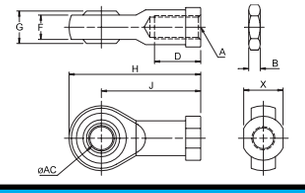
Bore	Type	A	B	G	G_1	H	H_2	J	L
8, 10	RC-M4x0.7	M4x0.7	3.2	4	8	21	8	16	84
12, 16	RC-M6x1.0	M6x1.0	5	6	12	31	12	24	6
20	RC-M8x1.25	M8x1.25	4	8	16	42	16	32	8
25	RC-M10x1.25	M10x1.25	5	10	20	52	24	40	10

FLANGE MOUNTING



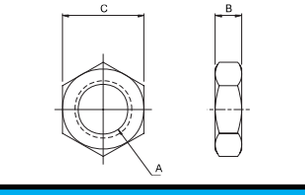
Bore	Type	AC	D	E	H	H_1	H_2	K	M_1	M_2
8, 10	MF-1	12.1	4.6	24	42	30	15	3	12	6
12, 16	MF-2	16.1	5.6	28	54	40	20	4	14	7
20, 25	MF-3	22.1	6.6	38	66	50	25	4.5	19	8

SPHERICAL ROD EYE



Bore	Type	A	AC	B	D	F	G	H	J	X
8, 10	SRE-M4x0.7	M4x0.7	5	3.2	10	6	8	36	27	9
12, 16	SRE-M6x1.0	M6x1.0	6	5	12	6.75	9	40	30	11
20	SRE-M8x1.25	M8x1.25	8	4	16	9	12	48	36	14
25	SRE-M10x1.25	M10x1.25	10	5	20	10.5	14	57	43	17

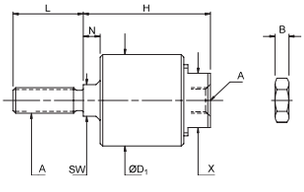
ROD/MOUNTING NUT



Bore	Type	A	B	C
8, 10	RN-1	M4x0.7	3.2	7
12, 16	RN-2	M6x1.0	5	10
20	RN-3	M8x1.25	4	13
25	RN-4	M10x1.25	5	17

Type	A	B	C
MN-1	M12x1.25	7	19
MN-2	M16x1.5	8	24
MN-3	M22x1.5	10	32

ROD COUPLER



Bore	Type	A	B	D_1	H	L	N	SW	X
8, 10	AC-M4x0.7	M4x0.7	3.2	14	24	14	6.5	-	11.3
12, 16	AC-M6x1.0	M6x1.0	5	17	24	16	5	5	10
20	AC-M8x1.25	M8x1.25	4	29	40	22	5.3	10	17
25, 32	AC-M10x1.25	M10x1.25	5	29	40	24	5.3	10	17
40	AC-M12x1.25	M12x1.25	7	32	47	24	8.2	13	20
50, 63	AC-M16x1.5	M16x1.5	8	32	48	32	10	13.5	20
80, 100	AC-M20x1.5	M20x1.5	9	45	57	40	10	21	28

How to Order

The Model Number for all Bimba PCE Cylinders consists of five Alpha-Numeric clusters. The first designates the *Type*, the second the *Bore Size*, the third the *Stroke Length*, the fourth the *Mounting* style, and the fifth the *Options*

Please refer to the charts below for an explanation of the following model number:

PCEM-25-100-N-CNT: This is a PCE Type Cylinder with a magnet, with 25mm Bore Size, 100mm Stroke Size, Nose Mounted, and with Cushions in Both Heads and no Rod Threads.

TYPE	
PCE	= Double Acting
PCEM	= MRS Double Acting
PCED	= Double Acting Double End Rod
PCEDM	= MRS Double Acting Double End Rod

MOUNTINGS	
N	= Nose Mount Radial Port
U	= Universal Mount

PCEM-25-100-N-CNT

BORE SIZE
16mm
20mm
25mm

STROKE
Enter
Stroke
In mm

OPTIONS	
C	= Cushions Both Heads
CF	= Cushion Front Only
CR	= Cushion Rear Only
NT	= No Thread Rods
S	= Piston Wearstrip
T2	= Low Profile (All MRS) 90˚ CW from ports*
T4	= Low Profile (All MRS) 90˚ CCW from ports*
EE	= Extra Rod Extension (Both ends on ED)

NOTE: Elastomer bumpers are not standard for the PCE

* - when viewed from the rear

General Specifications

The Bimba PCE cylinder has stainless steel body, stainless steel rod and Delrin® end caps. It is ideal for applications or operating environments that require exposure to moisture, lubricants and specific solvents.

	BORE		
	16	20	25
Cushion Length (mm) Each End	18	21	21
Head Material	Delrin® Plastic type 150SA		
Operating Pressure Max. Min.	 7 bar 0.5 bar		
Operating Temperature Range	-10°C to +80°C		
Operating Media	Filtered Compressed Air/Lubricated or Non-Lubricated		
Standard Stroke Lengths	1mm to 300mm		
Maximum Stroke Length*	1000mm		
Stroke Tolerance	+1.0mm/-0mm		
Piston Speed	5mm/s to 1000mm/s		
Life Expectancy	3000km		

* Varies according to bore size, please consult your local BIMBA distributor.

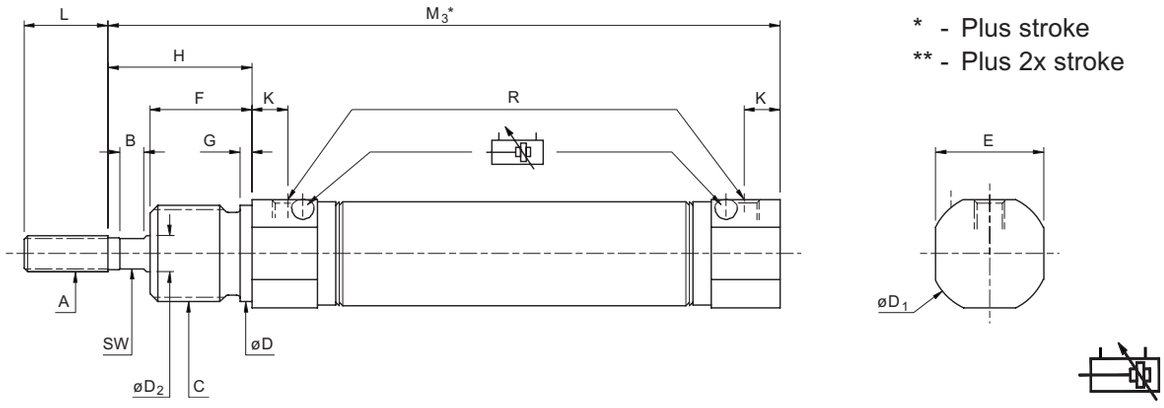
Weights

	Bore		
	16	20	25
Option N	40	77	117
Option U	43	85	126
Type ED	57	116	176
adder per 10mm stroke	5	8	11

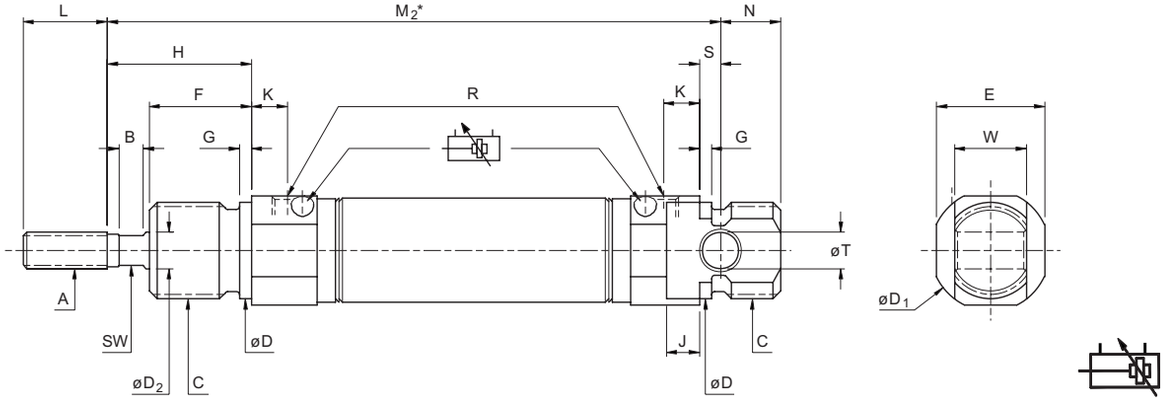
Weights (approximate) are for zero stroke, in grams.

Double Acting – With Adjustable Cushioning

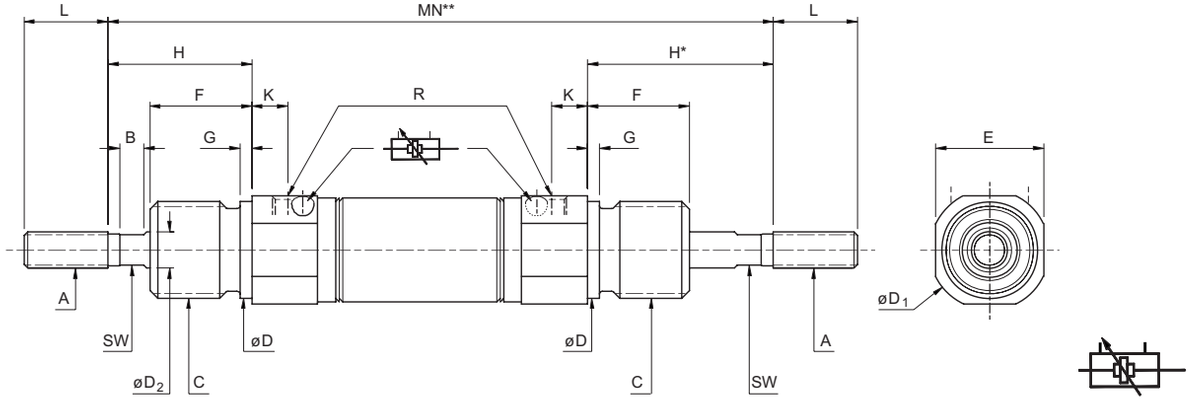
NOSE MOUNT - N option



UNIVERSAL MOUNT - U option



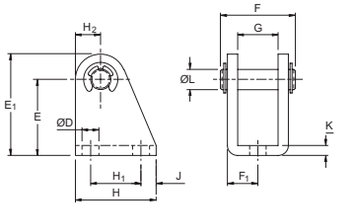
DOUBLE ENDED



Bore	A^{6g}	B	C^{6g}	D	D_1	D_2^{h8}	E	F	G	H	J	K	L	N	R	S	T^{H9}	W^{d13}	SW	M_2	M_3	MN
16	M6x1.0	4	M16x1.5	16	20	6	18	17	2	24	5.5	6	14	10	M5x0.8	3.5	6	12	5	84	80.5	104
20	M8x1.25	4	M22x1.5	22	28	8	24	19	3	25	8	8	19	11	G1/8	4	8	16	6	96	92	117
25	M10x1.25	4	M22x1.5	22	30	10	27	22	3	30	6	8	20	11	G1/8	6	8	16	8	106	100	130

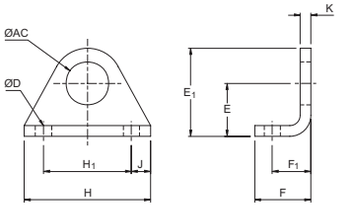
Accessories – Stainless Steel

PIVOT BRACKET



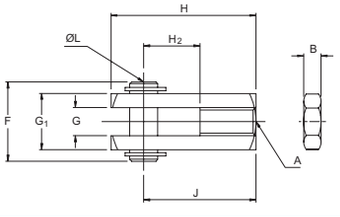
Bore	Type	D	E	E_1	F	F_1	G	H	H_1	H_2	J	K	L
16	CFB-2-SS	5.6	27	34	24	9	12.5	25	15	7	5	3	6
20, 25	CFB-3-SS	6.6	30	40	30.5	12	16.5	32	20	10	6	4	8

FOOT MOUNTING BRACKET



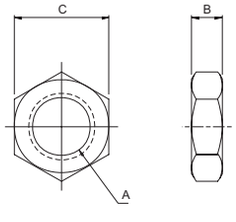
Bore	Type	AC	D	E	E_1	F	F_1	H	H_1	J	K
16	FB-2-SS	16.1	5.6	20	33	20	14	42	32	5	4
20, 25	FB-3-SS	22.1	6.6	25	40	25	17	54	40	7	5

ROD CLEVIS BRACKET



Bore	Type	A	B	F	G	G_1	H	H_2	J	L
16	RC-2-SS	M6x1.0	5	16	6	12	31	12	24	6
20	RC-3-SS	M8x1.25	4	20	8	16	42	16	32	8
25	RC-4-SS	M10x1.25	5	26	10	20	52	24	40	10

ROD NUT



Bore	Type	A	B	C
16	RN-2-SS	M6 x 1.0	5	10
20	RN-3-SS	M8 x 1.25	4	13
25	RN-4-SS	M10 x 1.25	5	17

MOUNTING NUT

Bore	Type	A	B	C
16	MN-2-SS	M16 x 1.5	8	24
20, 25	MN-3-SS	M22 x 1.5	10	32

Notes

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Notes