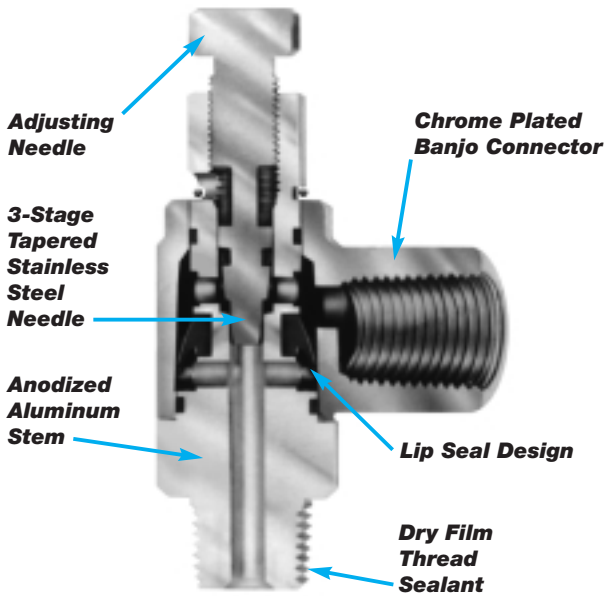
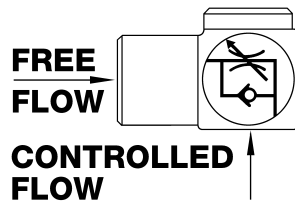
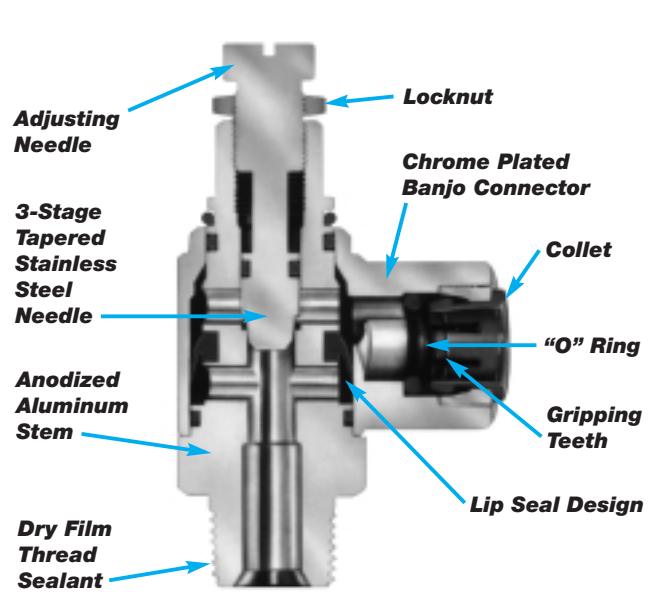


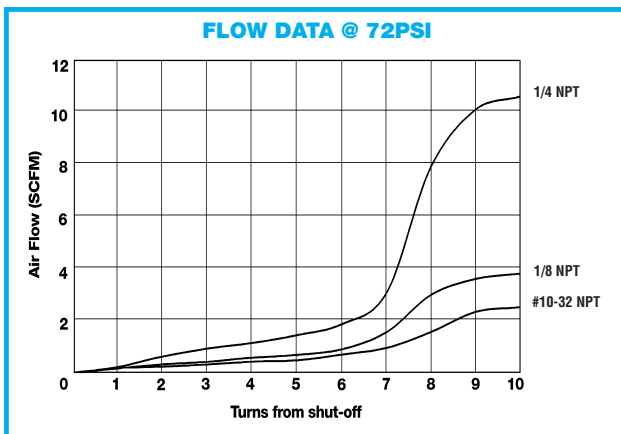
## FCP



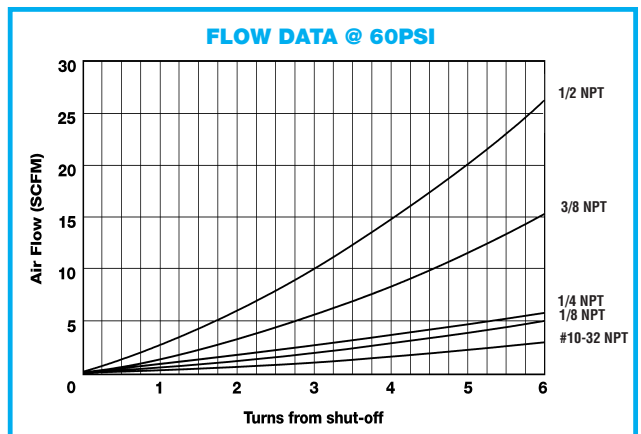
## FQP



## FQPS Series



## FQP & FCP Series



Flow Controls

Linear Thrusters

Pneu-Turn Rotary Actuators

Ultram Cylinders

Shock Absorbers

Pneu Moment (Pneumatic Actuators)

Transition Plates

Multi-Axis Configurations

Position Sensing Switches

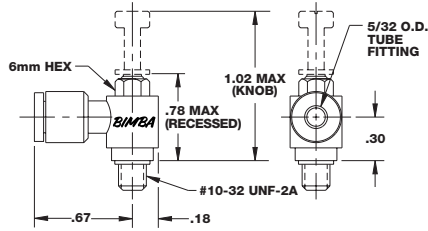
Application Checklist

# Bimba Miniature Quik-Flo® Flow Controls- FQPS Series

For 10-32 port,  
5/32" OD tubing

**FQPS1**  
\$10.60

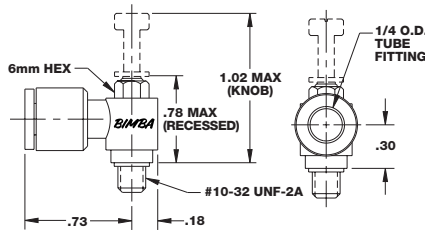
**FQPS1K**  
\$10.60



For 10-32 port,  
1/4" OD tubing

**FQPS12**  
\$11.60

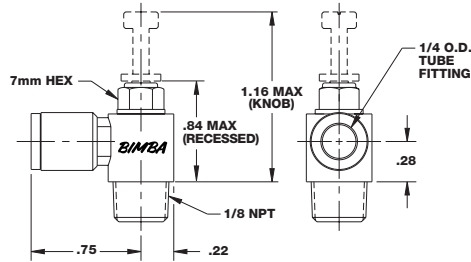
**FQPS12K**  
\$11.60



For 1/8 port,  
1/4" OD tubing

**FQPS2**  
\$12.40

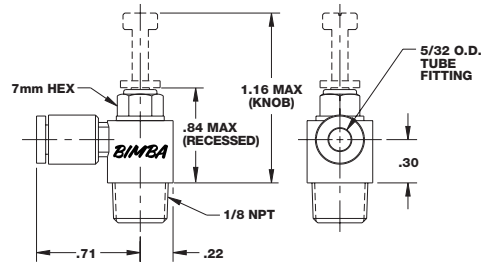
**FQPS2K**  
\$12.40



For 1/8 port,  
5/32" OD tubing

**FQPS21**  
\$11.35

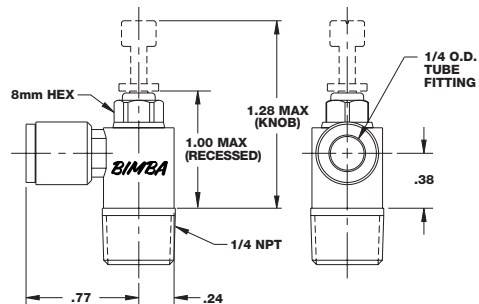
**FQPS21K**  
\$11.35



For 1/4 port,  
1/4" OD tubing

**FQPS44**  
\$16.00

**FQPS44K**  
\$16.00



## Materials:

Adjusting knob and thread:  
Nickel-plated brass

Body:  
Glass-filled nylon

Tubing:  
Nylon, polyurethane and polyethylene tubing

**Maximum Operating Pressure:**  
135 PSI Air Only

**Operating Temperature Range:**  
30 degrees to 160 degrees F  
(0°C to 70°C)

(Units shown in inch for all drawings)

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

# Bimba Flow Control- FCP Series

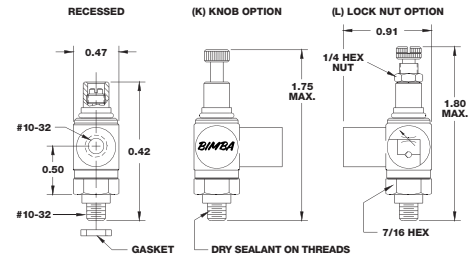
**FCP1**  
\$9.55

**FCP1K**  
\$10.50

**FCP1L**  
\$10.80



*For 10-32 port*



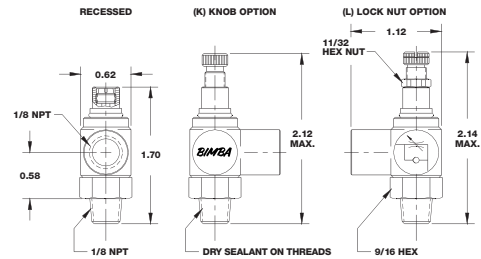
**FCP2**  
\$11.25

**FCP2K**  
\$12.35

**FCP2L**  
\$12.60



*For 1/8 port*



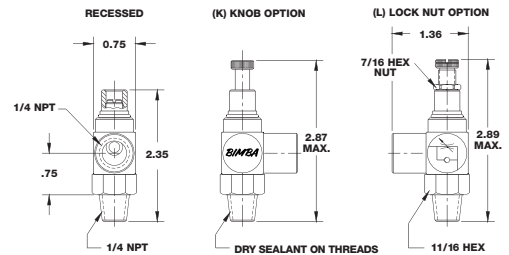
**FCP4**  
\$14.40

**FCP4K**  
\$16.10

**FCP4L**  
\$16.35



*For 1/4 port*



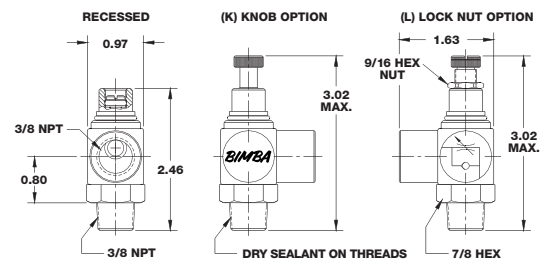
**FCP6**  
\$17.95

**FCP6K**  
\$19.70

**FCP6L**  
\$19.90



*For 3/8 port*



(Units shown in inch for all drawings)

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

**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)

Flow Controls

Linear Thrusters

Pneu-Turn Rotary Actuators

Ultram Cylinders

Shock Absorbers

Pneu Moment (Pneumatic Actuators)

Transition Plates

Multi-Axis Configurations

Position Sensing Switches

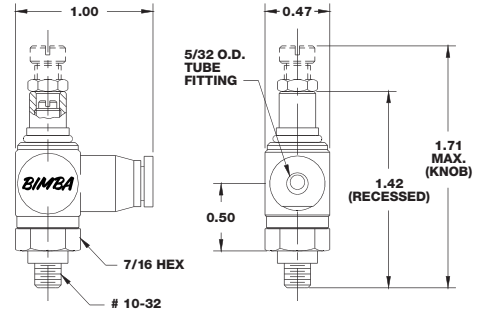
Application Checklist

# Bimba Quik-Flo® Flow Controls: FQP Series

For 10-32 port,  
5/32" OD tubing

**FQP1**  
\$10.45

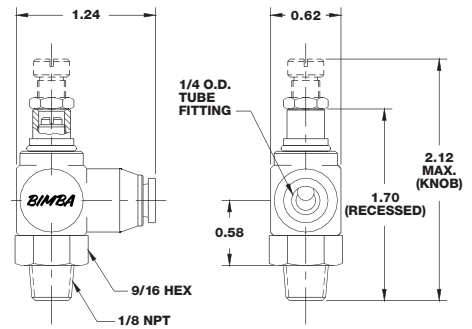
**FQP1K**  
\$12.00



For 1/8 port,  
1/4" OD tubing

**FQP2**  
\$12.40

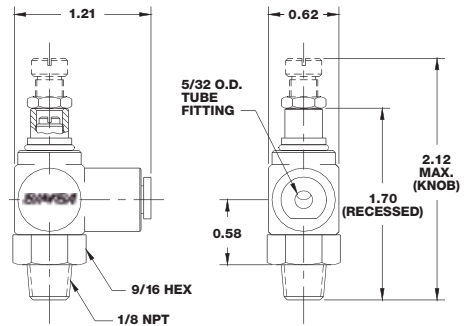
**FQP2K**  
\$14.25



For 1/8 port,  
5/32" OD tubing

**FQP21**  
\$12.40

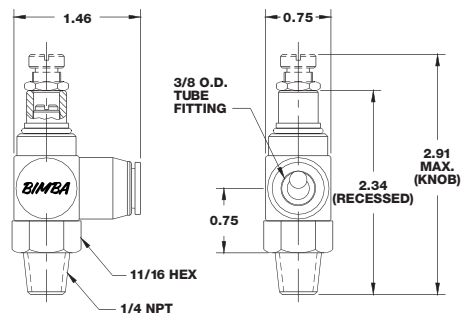
**FQP21K**  
\$14.25



For 1/4 port,  
3/8" OD tubing

**FQP4**  
\$15.90

**FQP4K**  
\$18.20



(Units shown in inch for all drawings)

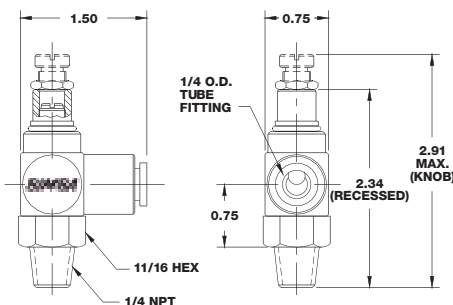
All prices are F.O.B. Monee, Illinois and are subject to change without notice.

# Bimba Quik-Flo® Flow Controls: FQP Series

**FQP44**  
\$15.90

**FQP44K**  
\$18.20

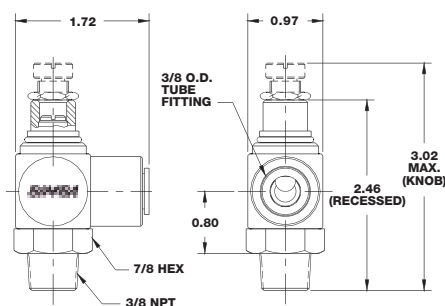
For 1/4 port,  
1/4" OD tubing



**FQP6**  
\$19.70

**FQP6K**  
\$22.40

For 3/8 port,  
3/8" OD tubing



(Units shown in inch for all drawings)

**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:**  
Chrome-plated brass

**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

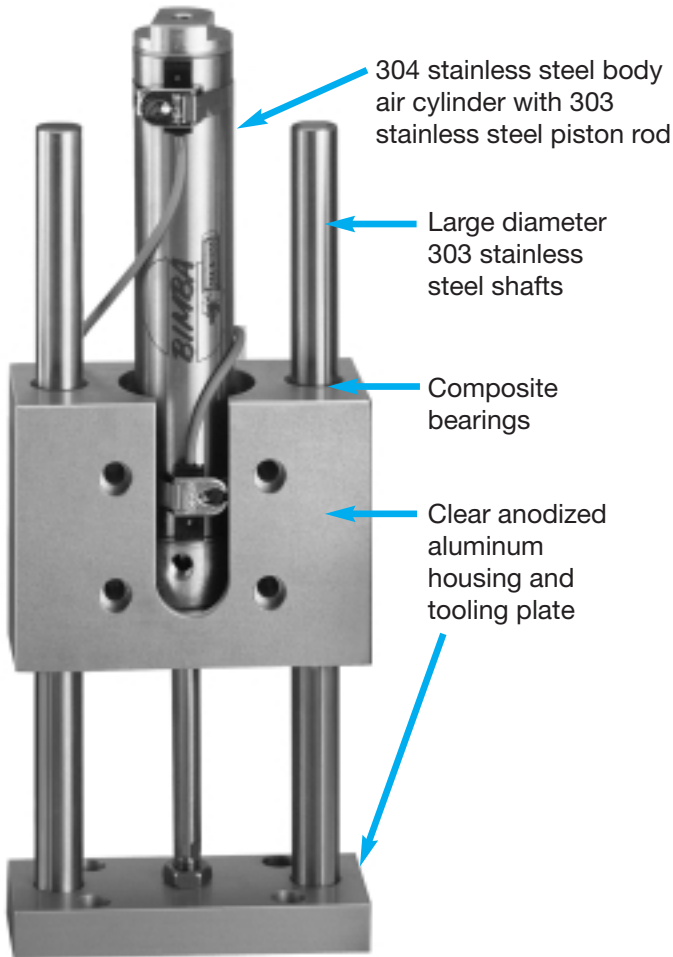
Bimba offers a range of Quik-Flo® Needle Valves, allowing for controlled flow of both the air intake and exhaust through the same valve. A needle valve can control a double acting cylinder's extension and retraction by controlling the volume of air entering the cylinder and the volume of air leaving the cylinder.

For additional dimensional information, reference Quik-Flo® Flow Controls on pages 6 and 7. For example, reference FQP1 for QNV1 dimensions.

Model	Price	Tube Size	Port Size	Cv
QNV1	\$10.30	5/32"	#10-32	.09
QNV1K	11.90	5/32"	#10-32	.09
QNV2	12.30	1/4"	1/8" NPT	.21
QNV2K	14.15	1/4"	1/8" NPT	.21
QNV44	15.70	1/4"	1/4" NPT	.44
QNV44K	18.00	1/4"	1/4" NPT	.44
QNV6	19.50	3/8"	3/8" NPT	.73
QNV6K	22.15	3/8"	3/8" NPT	.73

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

# Bimba Linear Thruster

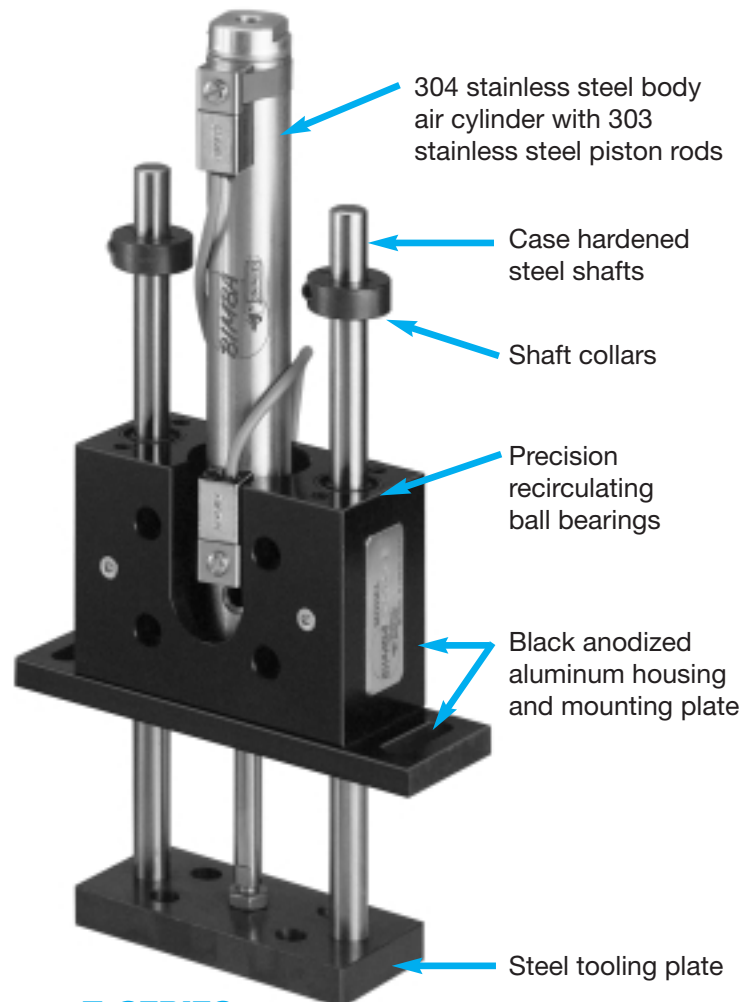


## TE SERIES

- 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

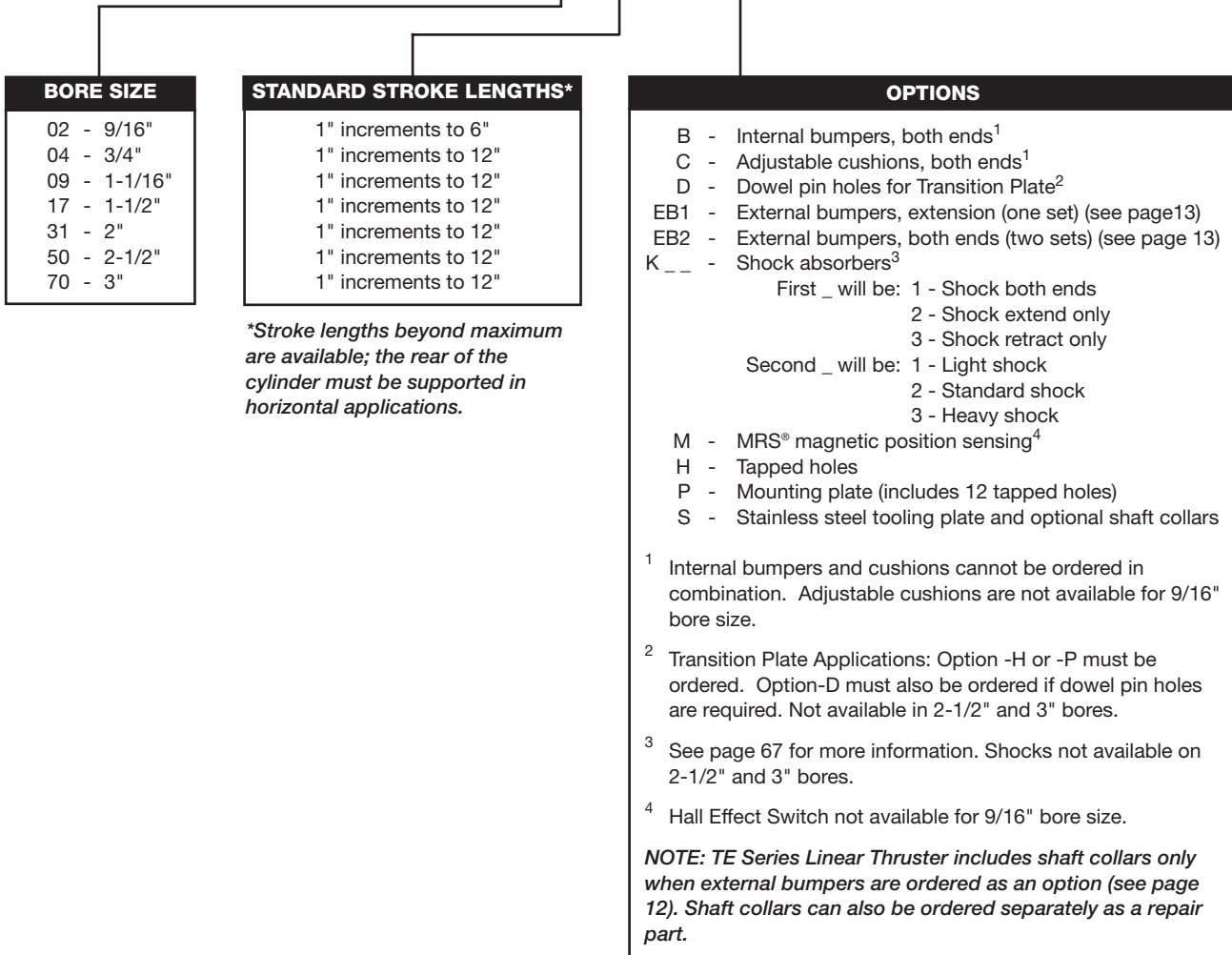
- Less friction
- High precision
- Easily accessible lubrication ports
- Mounting plate and shaft collars standard

## 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



### Approximate Power Factors

9/16" = 0.2	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.
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	

Flow Controls

Linear Thrusters

Pneu-Turn Rotary Actuators

Ultram Cylinders

Shock Absorbers

Pneu Moment (Pneumatic Actuators)

Transition Plates

Multi-Axis Configurations

Position Sensing Switches

Application Checklist

## 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	\$147.25	\$159.45	\$192.40	\$273.25	\$404.60	\$659.10	\$1079.55
Adder per 1" of Stroke	2.75	3.20	3.65	5.10	6.80	6.00	6.45

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	\$3.60	\$3.60	\$3.60	\$4.40	\$5.65	\$5.40	\$7.00
C-Adjustable Cushions, Both Ends	N/A	11.80	13.15	15.35	25.20	30.00	34.00
D-Dowel Pin Holes— Standard Tooling Plate	5.05	6.50	9.50	12.75	13.00	18.80	26.40
D-Dowel Pin Holes—Stainless Steel Tooling Plate	8.05	9.50	16.00	20.75	22.45	N/A	N/A
EB1-External Bumpers, Extension (1 set)	28.45	30.05	33.00	35.95	41.75	72.60	115.45
EB1-with S-Option	40.65	42.90	47.15	51.40	59.65	N/A	N/A
EB2-External Bumpers, Both Ends (2 sets)	50.95	52.50	57.00	61.45	71.40	135.25	215.95
EB2-with S-Option	72.75	74.95	81.50	87.80	101.95	N/A	N/A
H-12 Tapped Holes	5.80	5.80	5.80	7.05	8.05	25.95	37.15
K-Shock Absorbers, Per End	82.65	104.65	116.95	140.55	188.10	N/A	N/A
M-MRS Magnetic Position Sensing	8.40	8.40	10.50	12.60	14.70	14.00	25.00
P-Mounting Plate*	20.00	22.50	27.50	37.55	50.05	82.40	116.20
S-Stainless Steel Tooling Plate	32.75	36.50	49.25	56.45	105.00	310.70	370.20

\*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:

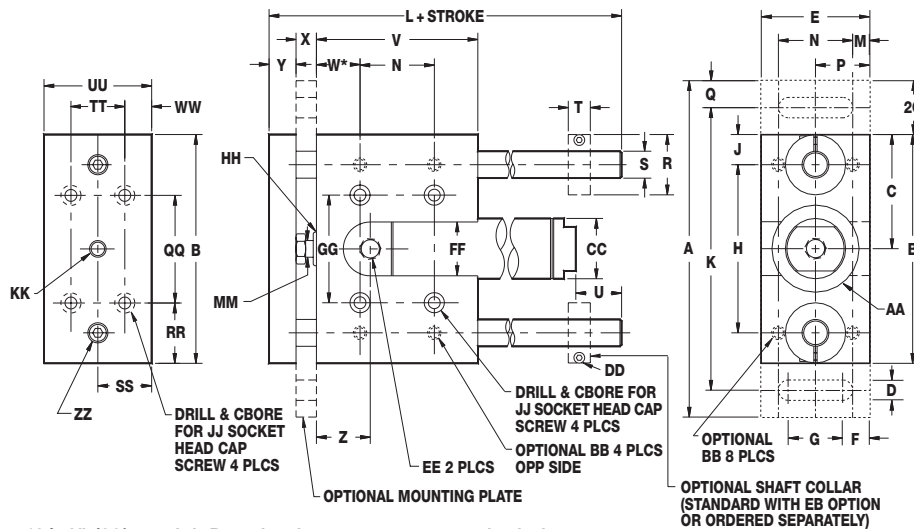
Air cylinders are pre-lubricated and sealed at the factory for extensive maintenance-free life. Cylinder life can be lengthened by providing additional lubricant with an air line mist lubricator or direct introduction of oil to the cylinder every 500 hours of operation. Recommended oils are medium to heavy inhibited hydraulic and general purpose oil.

All prices are F.O.B. Waco, Texas, and are subject to change without notice.



# Bimba Linear Thruster- TE Series (Composite Bearings)

## 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
2 1/2" (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.

Flow Controls  
Linear Thrusters  
Pneu-Turn Rotary Actuators  
Ultra-nan Cylinders  
Shock Absorbers  
Pneu Moment (Pneumatic Actuators)  
Transition Plates  
Multi-Axis Configurations  
Position Sensing Switches  
Application Checklist

## 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.

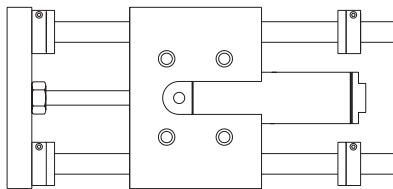
Part #	Description	Quantity
BTE-□	Shaft Bearing	4
BSTE-□	-X.XX Basic Shaft	2
EBTE-□	External Bumper	2 or 4
LT-Bore Stroke-D	Cylinder	1
LT-Bore Stroke-DB	Cylinder	1
LT-Bore Stroke-DM*	Cylinder	1
LT-Bore Stroke-DBM*	Cylinder	1
LTC-Bore Stroke-D	Cylinder	1
LTC-Bore Stroke-DM	Cylinder	1
SCTE-□	Shaft Collars	2 or 4
TNTE-□	Cylinder Lock Nut	1

\*For 1-1/16" bore use LTE prefix.

## External Bumpers

### Use and Dimensional Changes

Guide Shaft Extension 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,

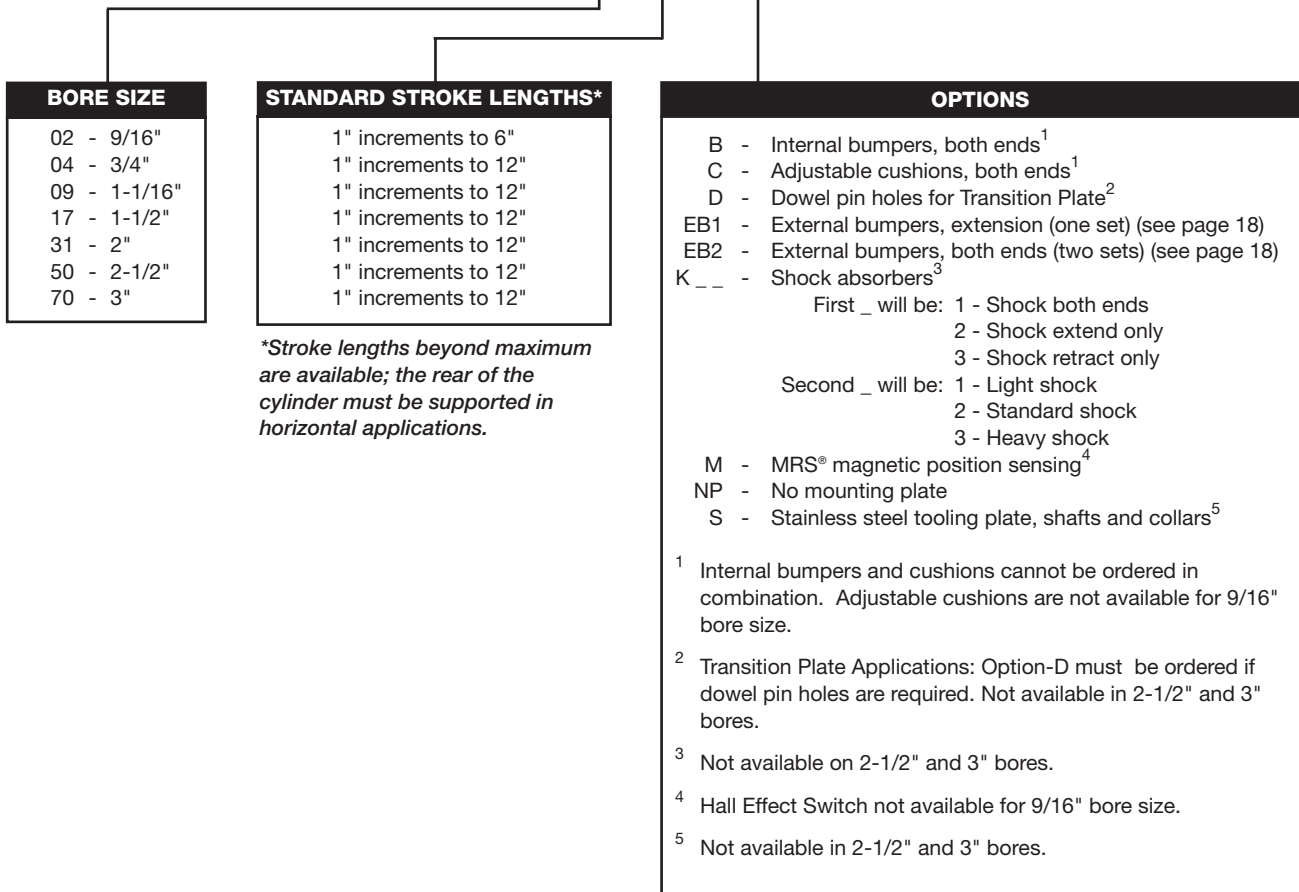
with -EB1 option, there will be a total of two collars; with -EB2 option, there will be four shaft collars. **Guide shafts are lengthened so stroke on extension isn't affected; however, bumpers reduce the retraction stroke (see charts above).** Higher loads and velocities may dictate the use of external means of deceleration such as shock absorbers.

## 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



### Approximate Power Factors

9/16"	= 0.2	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.
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	

## 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	\$259.80	\$289.75	\$303.40	\$427.90	\$594.15	\$1170.45	\$2218.20
Adder per 1" of Stroke	3.25	3.25	3.45	4.90	5.45	6.00	7.00

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	\$3.60	\$3.60	\$3.60	\$4.40	\$5.65	\$5.40	\$7.00
C-Adjustable Cushions, Both Ends	N/A	11.80	13.15	15.35	25.20	30.00	34.00
D-Dowel Pin Holes— Standard Tooling Plate	5.05	6.50	9.50	12.75	13.00	18.80	26.40
D-Dowel Pin Holes—Stainless Steel Tooling Plate	8.05	9.50	16.00	20.75	22.45	N/A	N/A
EB1-External Bumpers, Extension (1 set)	22.45	22.45	24.00	25.45	29.65	62.40	106.70
EB1-with S-Option	31.80	31.80	35.00	41.35	50.95	N/A	N/A
EB2-External Bumpers, Both Ends (2 sets)	44.95	44.95	48.00	50.95	59.35	114.75	202.35
EB2-with S-Option	63.65	63.65	70.05	82.75	101.85	97.00	97.00
K-Shock Absorbers, Per End	82.65	104.65	116.95	140.55	188.10	N/A	N/A
M-MRS Magnetic Position Sensing	8.40	8.40	10.50	12.60	14.70	14.00	25.00
NP-No Mounting Plate (Deduct from Price)	(6.90)	(10.50)	(16.75)	(21.60)	(35.00)	(60.15)	(116.85)
S-Stainless Steel Tooling Plate, Shafts and Collars (Base Price)	74.75	100.95	117.95	166.75	257.45	N/A	N/A
Adder Per Inch of Stroke	5.45	5.56	6.10	7.30	8.10	N/A	N/A

## 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:

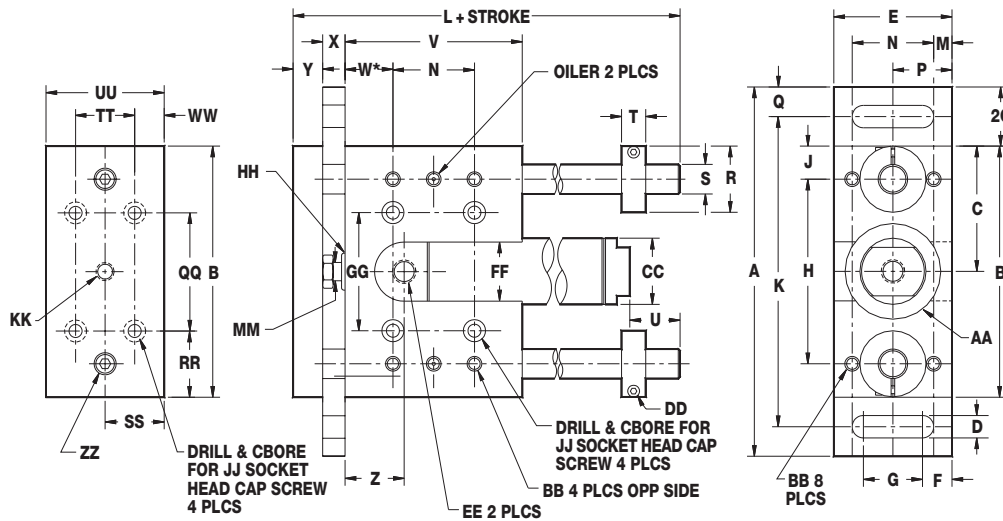
Air cylinders are pre-lubricated and sealed at the factory for extensive maintenance-free life. Cylinder life can be lengthened by providing additional lubricant with an air line mist lubricator or direct introduction of oil to the cylinder every 500 hours of operation. Recommended oils are medium to 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.

*All prices are F.O.B. Waco, Texas, and are subject to change without notice.*

# Bimba Linear Thruster- T Series (Ball Bearings)

## 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.

# Bimba Linear Thruster- T Series (Ball Bearings)

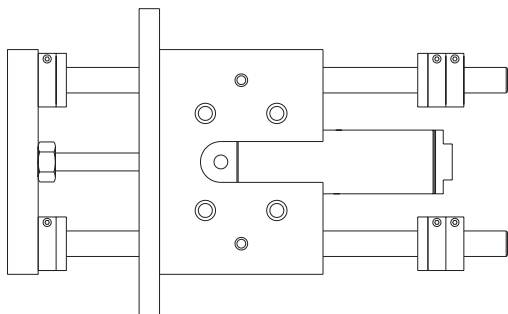
## External Bumpers

### 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 Extension with Bumpers (in.)		Retraction Stroke Reduction with Bumpers (in.)		
Bore Size	Length Adder	Bore Size	With Mounting Plate	Without Mounting Plate
9/16"	0.5	9/16"	0.56	.31
3/4"	0.5	3/4"	0.62	.24
1-1/16"	0.63	1-1/16"	0.70	N/A
1-1/2"	0.75	1-1/2"	0.73	.25
2"	0.875	2"	0.81	N/A
2-1/2"	1.38	2-1/2"	1.06	0.31
3"	1.50	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

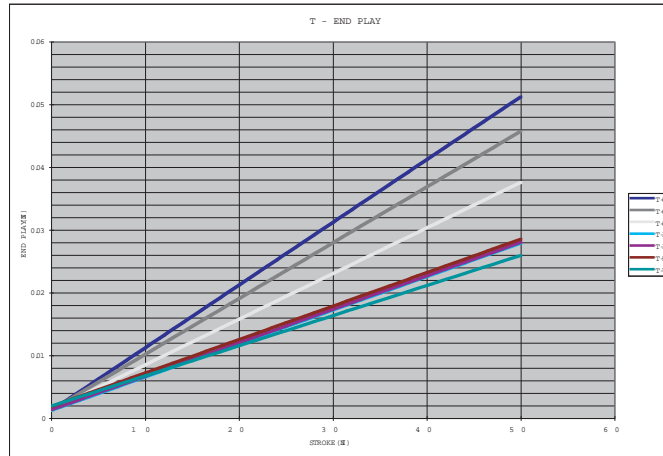
(T and TE Series)

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



# Bimba Linear Thruster- T Series (Ball Bearings)

## T - Tooling Plate End Play (in.)



Page 1

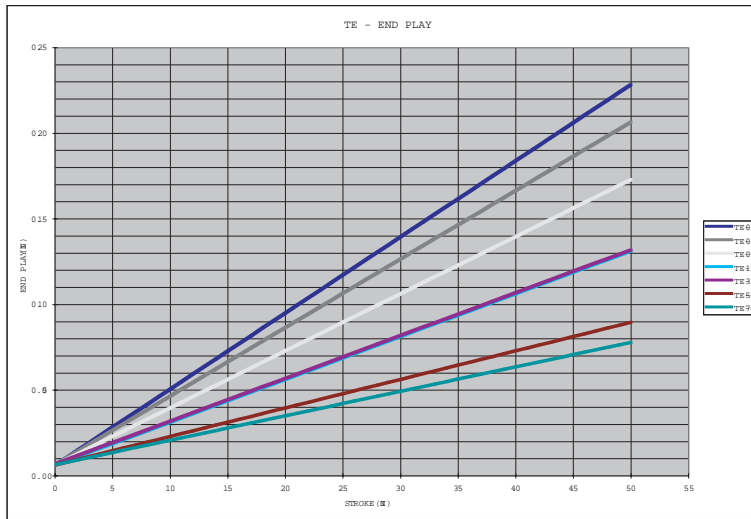
	T-02	T-04	T-09	T-17	T-31	T-50	T-70
0	0.001	0.001	0.001	0.001	0.001	0.002	0.002
1	0.002	0.002	0.002	0.002	0.002	0.002	0.002
2	0.003	0.003	0.003	0.002	0.002	0.003	0.003
3	0.004	0.004	0.003	0.003	0.003	0.004	0.003
4	0.005	0.005	0.004	0.003	0.004	0.004	0.004
5	0.006	0.006	0.005	0.004	0.004	0.005	0.004
6	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 Linear Thruster- TE Series (Ball Bearings)

## 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

# Bimba Multiple Position Linear Thruster



Bimba's multiple position Linear Thrusters incorporate a double-acting, single rod end cylinder that provides three positions with just one cylinder.

Flow Controls

Linear Thrusters

Pneu-Turn Rotary Actuators

Ultram Cylinders

Shock Absorbers

Pneu Moment (Pneumatic Actuators)

Transition Plates

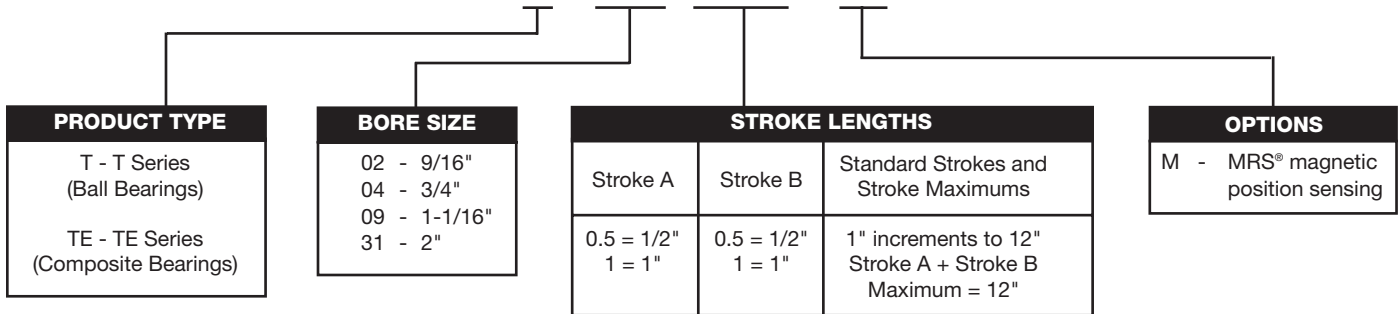
Multi-Axis Configurations

Position Sensing Switches

Application Checklist

## How to Order

### T-09 1/2 - M



## List Prices

Additional pricing can be found on pages 10 and 14

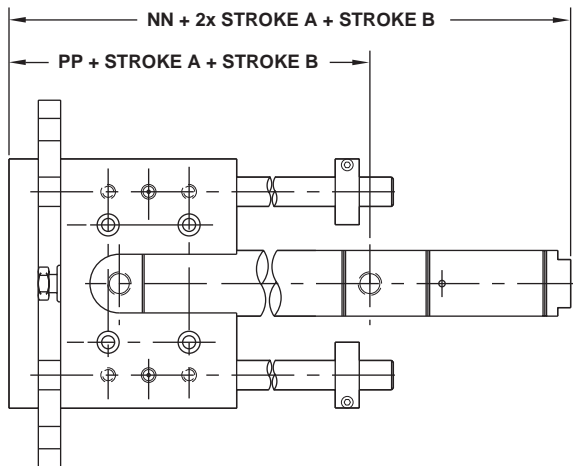
Bore	Add to Base	Stroke adder**	
		Total combined stroke adder per inch	
		T	TE
9/16" (02)	\$15.00	\$3.10	\$2.50
3/4" (04)	17.50	3.10	2.90
1-1/16" (09)	20.00	3.30	3.30
1-1/2" (17)	22.50	4.65	4.65
2" (31)	25.00	5.20	6.20

\*\*Total combined stroke = (2 x Stroke A) + Stroke B  
Note: Cushions are not available in three-position cylinder

All prices are F.O.B. Waco, Texas, and are subject to change without notice.

## 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 11 and 15.

## 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:

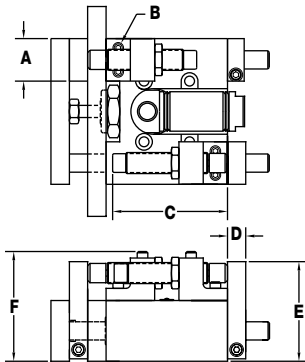
Air cylinders are pre-lubricated and sealed at the factory for extensive maintenance-free life. Cylinder life can be lengthened by providing additional lubricant with an air line mist lubricator or direct introduction of oil to the cylinder every 500 hours of operation. Recommended oil is medium to heavy 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.

## 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<sub>T</sub>", and velocity at shock absorber contact "V", indicates the proper shock absorber model. E<sub>T</sub> 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<sub>U</sub> = 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<sub>T</sub> (Total energy) equals the sum of E<sub>K</sub> (Kinetic energy) and E<sub>w</sub> (Work energy)  
 Note the Work energy calculation varies with mounting position, E<sub>WH</sub> Horizontal, or E<sub>WV</sub> Vertical.

E<sub>K</sub> = ((W<sub>U</sub> + (TF2 + (TF3 x S))) / 772) x V<sup>2</sup> .....(Kinetic energy, in-lbs)

E<sub>WH</sub> = TF1 x SF x P.....(Work energy, in-lbs) **HORIZONTAL**

E<sub>WV</sub> = ((TF1 x P) + W<sub>U</sub> + (TF2 + (TF3 x S))) x SF .....(Work energy, in-lbs) **VERTICAL**

E<sub>T</sub> = E<sub>K</sub> + E<sub>w</sub>.....(Total energy per stroke, in-lbs)

E<sub>T</sub>C = E<sub>T</sub> x C .....(Total energy per hour, in-lbs/hr)

E<sub>T</sub> and E<sub>T</sub>C .....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<sub>U</sub> = 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<sub>K</sub> = ((15 lbs + (0.632 + (0.063 x 6 in))) / 772) x (20 in/sec)<sup>2</sup> .....E<sub>K</sub> = 8.30 in-lbs
- E<sub>wv</sub> = ((0.442 x 80 PSI) + 15 lbs + (0.632 + (0.063 x 6 in))) x 0.410 .....E<sub>wv</sub> = 21.06 in-lbs
- E<sub>T</sub> = E<sub>K</sub> + E<sub>wv</sub> = 29.36 in-lbs ..... E<sub>T</sub>C = E<sub>T</sub> x C = 105,685 in-lbs/hr

Checking specifications chart: both E<sub>T</sub> and E<sub>T</sub>C 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.

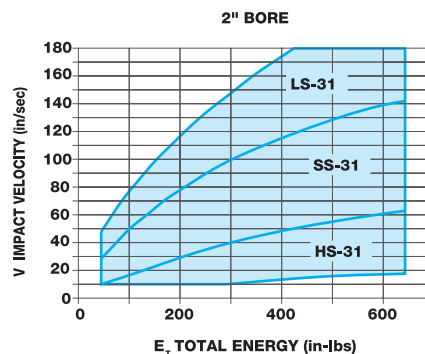
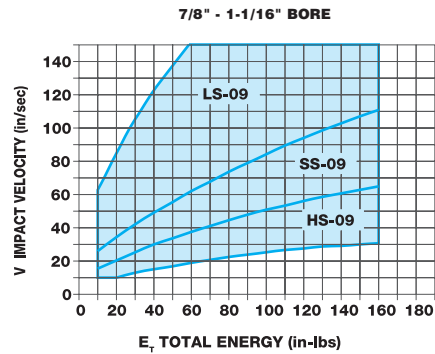
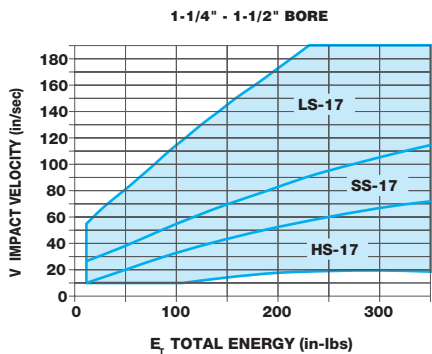
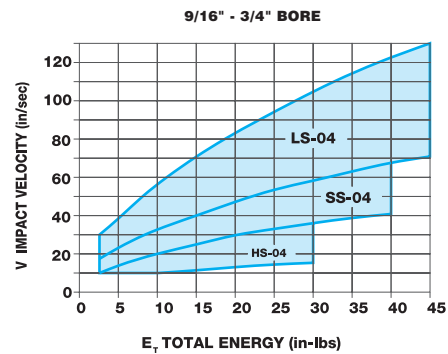
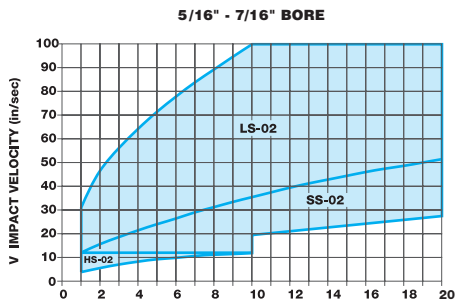
## T Series Thruster Calculation Constants

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 <sub>T</sub> ) Max. in.-lbs. per cycle	20	45	190	400	650
(E <sub>T</sub> - 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 <sub>T</sub> ) Max. in.-lbs. per cycle	20	45	190	400	650
(E <sub>T</sub> - C) max. in.-lbs. per hour	36,000	125,000	300,000	475,000	622,000

## Velocity vs. Load for Shock Absorbers



Flow Controls

Linear Thrusters

Pneu-Turn Rotary Actuators

Ultraan Cylinders

Shock Absorbers

Pneu Moment (Pneumatic Actuators)

Transition Plates

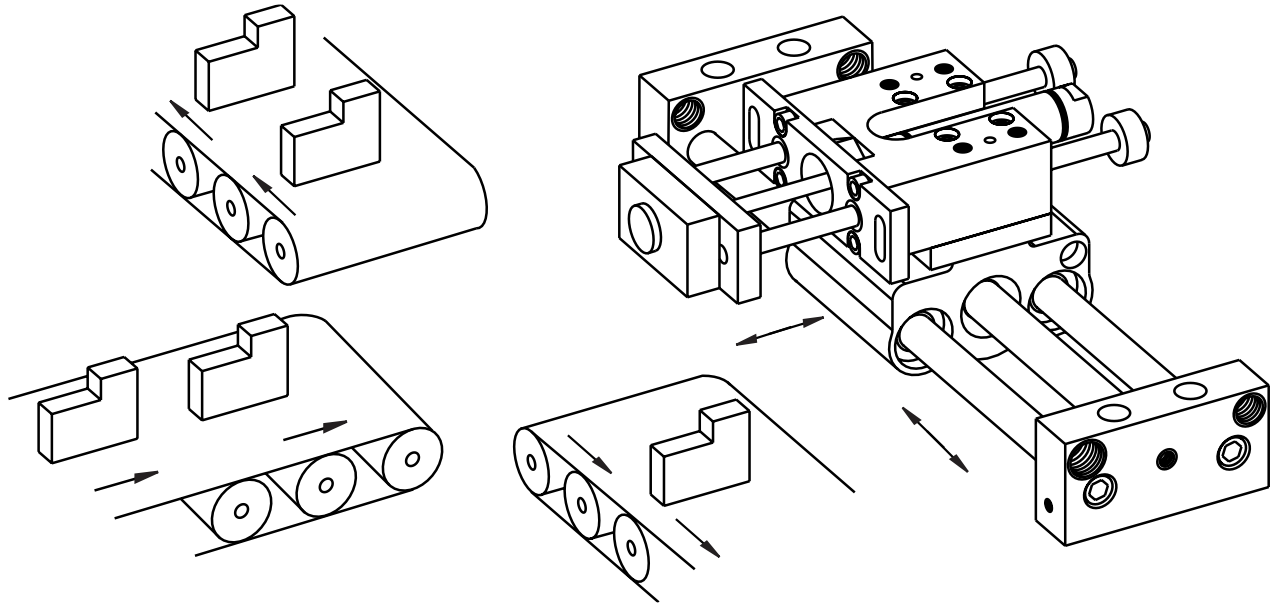
Multi-Axis Configurations

Position Sensing Switches

Application Checklist

# Bimba Transition Plates

**Aluminum plates that couple Bimba actuators –  
Ultran<sup>®</sup> rodless cylinders, Pneu-Turn<sup>®</sup> 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 93 shows how to build the Transition Plate model numbers.

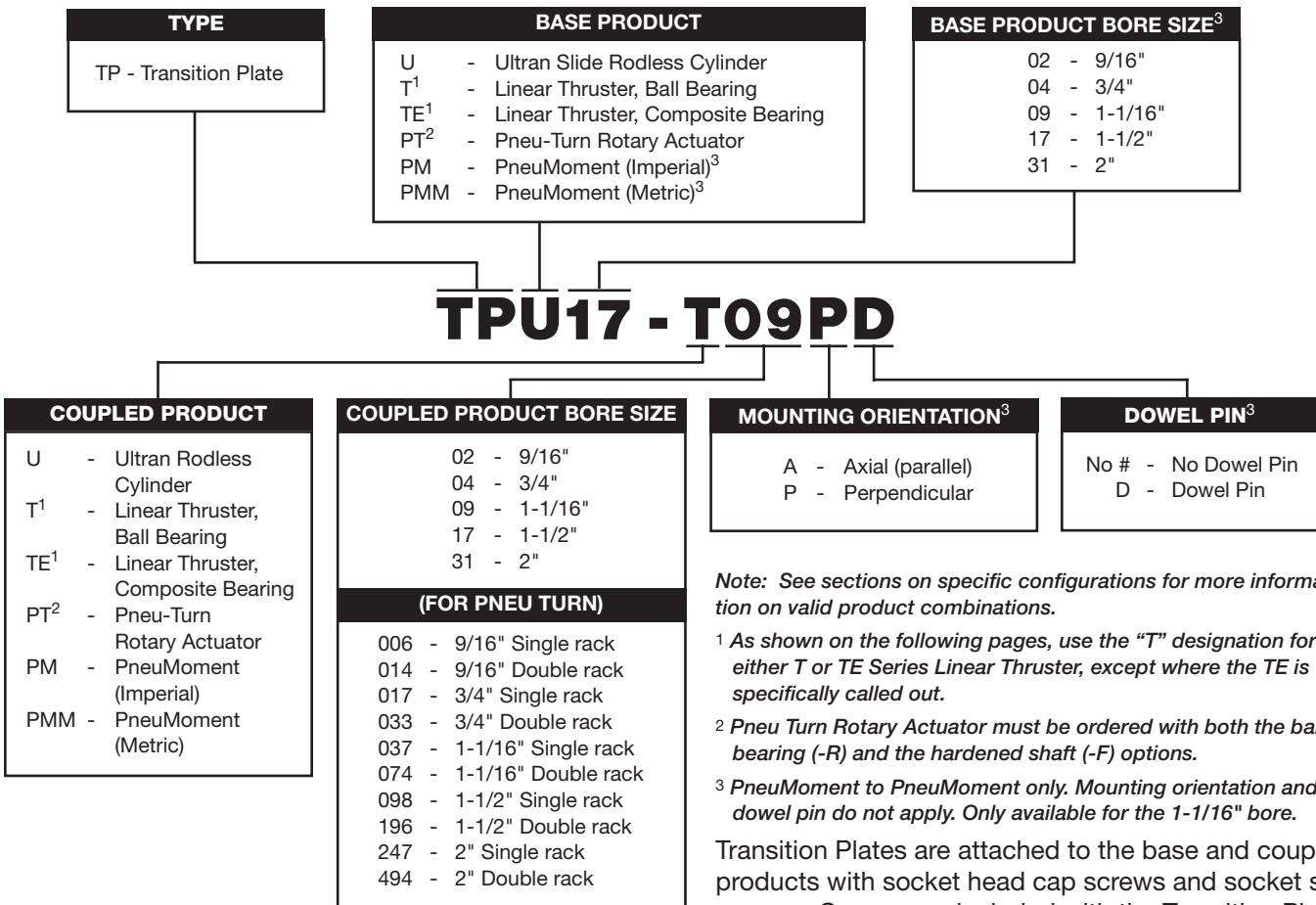
Choose the configuration (base product and coupled product) that best suits your application and turn to that section. It will describe the valid bore size combinations and provide basic dimensions, weights and prices for those Transition Plates. It will also show alignment of the products to help you 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 105 and the engineering specifications for the individual actuators for more information. Or, complete the Application Checklist on page 130 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 Ultram rodless cylinder that will be coupled to a 1-1/16" bore Linear Thruster (ball bearing), in a perpendicular orientation, with dowel pins.



*Note: See sections on specific configurations for more information on valid product combinations.*

<sup>1</sup> 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.

<sup>2</sup> Pneu Turn Rotary Actuator must be ordered with both the ball bearing (-R) and the hardened shaft (-F) options.

<sup>3</sup> 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.

Flow Controls

Linear Thrusters

Pneu-Turn Rotary Actuators

Ultram Cylinders

Shock Absorbers

Pneu Moment (Pneumatic Actuators)

Transition Plates

Multi-Axis Configurations

Position Sensing Switches

Application Checklist



## Linear Thruster (Base Product) to Pneu-Turn Rotary Actuator (Coupled Product)

SHAFT PARALLEL\*

	Linear Thruster					
		9/16" (02)	3/4" (04)	1-1/16" (09)	1-1/2" (17)	2" (31)
<b>Pneu-Turn Rotary Actuator</b>	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

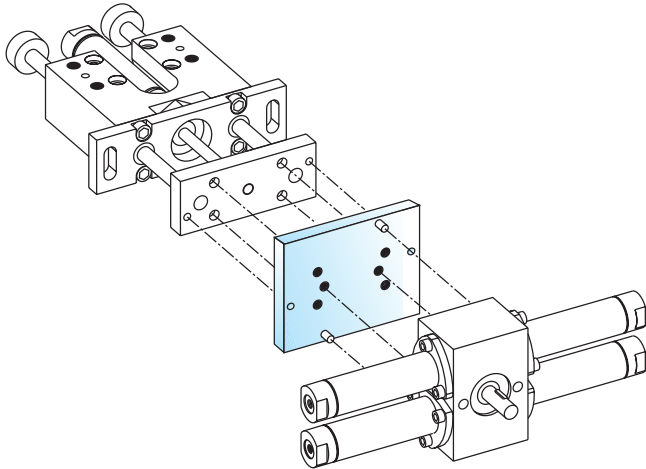
Note: Use model numbers shown for both T and TE Series Linear Thrusters through 1-1/2" bore; 2" bore requires specific call-out of TE as shown. Screws and dowel pins (if ordered) are included with the Transition Plate.

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	\$23.60	\$29.30
TPT04-PT006A TPT04-PT014A	3.00	2.00	0.28	0.17	27.80	34.10
TPT04-PT017A TPT04-PT033A	3.00	2.50	0.36	0.26	27.80	34.10
TPT09-PT017A TPT09-PT033A	4.00	2.50	0.36	0.35	31.10	39.30
TPT09-PT037A TPT09-PT074A	4.00	3.12	0.47	0.58	31.10	39.30
TPT17-PT037A TPT17-PT074A	5.38	3.00	0.47	0.74	39.70	48.00
TPT17-PT098A TPT17-PT196A	5.38	4.25	0.72	1.61	39.70	48.00
TPT31-PT098A TPT31-PT196A	6.75	4.25	0.72	2.02	50.30	60.00
TPT31-PT247A TPT31-PT494A	6.75	5.00	0.72	2.38	50.30	60.00
TPTE31-PT098A TPTE31-PT196A	5.75	4.25	0.72	1.72	50.30	60.00
TPTE31-PT247A TPTE31-PT494A	5.75	5.00	0.72	2.03	50.30	60.00

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

## 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. See page 101 for prices for dowel pin options for actuators.

Flow  
Controls

Linear  
Thrusters

Pneu-Turn  
Rotary Actuators

Ultra  
Cylinders

Shock  
Absorbers

Pneu Moment  
(Pneumatic Actuators)

Transition  
Plates

Multi-Axis  
Configurations

Position Sensing  
Switches

Application  
Checklist

## 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.

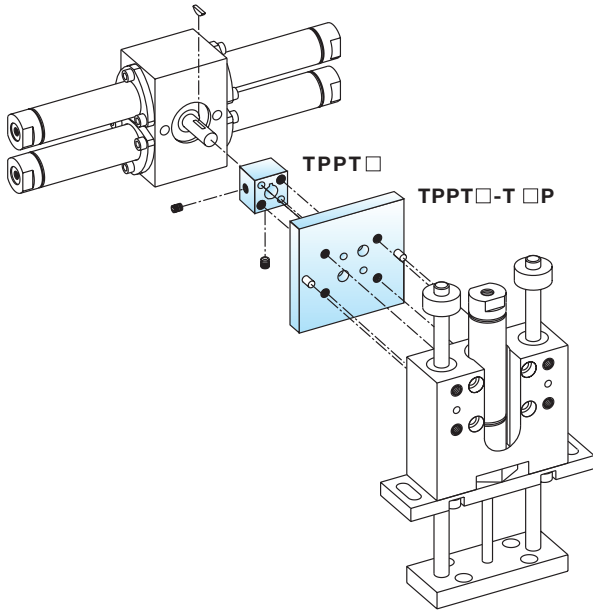
Model Number	Dimensions			Weight (includes screws) (lbs)	List Price	List Price with Dowel Pins (-D Option)
	Length (in)	Width (in)	Thickness (in)			
TPPT02-T02P	2.00	2.00	0.28	0.15	\$51.40	\$56.20
(includes TPPT02)	0.62	0.62	0.50	0.04	30.40	
TPPT04-T04P	2.50	2.25	0.36	0.28	65.10	71.40
(includes TPPT04)	0.75	0.75	0.75	0.08	45.50	
TPPT09-T04P	3.50	3.00	0.47	0.67	89.80	97.20
(includes TPPT09)	1.00	1.00	0.94	0.19	59.30	
TPPT09-T09P	3.50	3.00	0.47	0.67	89.80	97.20
(includes TPPT09)	1.00	1.00	0.94	0.19	59.30	
TPPT17-T09P	4.50	4.25	0.72	1.82	98.60	107.00
(includes TPPT17)	1.50	1.50	0.94	0.47	65.70	
TPPT17-T17P	4.50	4.25	0.72	1.84	98.60	107.00
(includes TPPT17)	1.50	1.50	0.94	0.47	65.70	
TPPT31-T17P	4.50	4.25	0.72	1.84	103.90	114.40
(includes TPPT31)	1.50	1.50	1.12	0.47	68.60	
TPPT31-T31P	6.00	3.00	0.72	1.76	103.30	114.40
(includes TPPT31)	1.50	1.50	1.12	0.47	68.60	
TPPT31-TE31P	5.25	3.00	0.72	1.60	103.90	114.40
(includes TPPT31)	1.50	1.50	1.12	0.47	68.60	

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.

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

## 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. See page 103 for prices for dowel pin options for actuators.

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.*

Flow Controls

Linear Thrusters

Pneu-Turn Rotary Actuators

Ultram Cylinders

Shock Absorbers

Pneu Moment (Pneumatic Actuators)

Transition Plates

Multi-Axis Configurations

Position Sensing Switches

Application Checklist

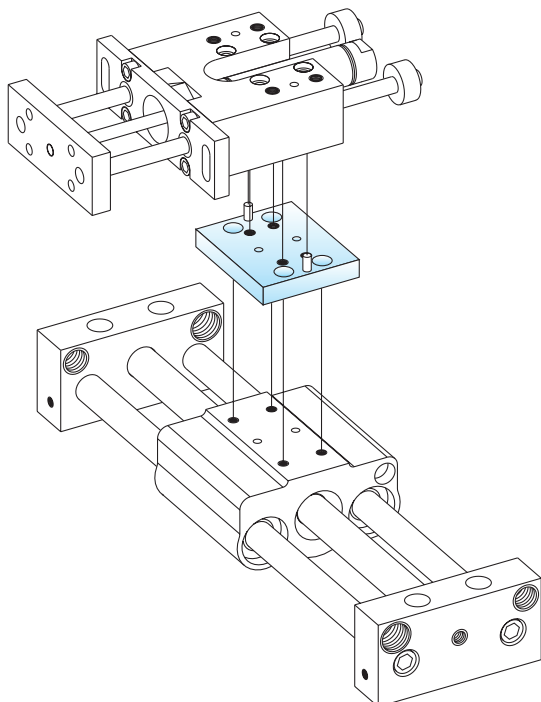
## Ultran Rodless Cylinder (Base Product) to Linear Thruster (Coupled Product)

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	\$22.60	\$28.30
TPU04-T04P	2.50	2.25	0.36	0.20	24.70	31.10
TPU09-T04P	3.50	3.00	0.47	0.48	28.70	35.70
TPU09-T09P	3.50	3.00	0.47	0.48	28.70	35.70
TPU17-T09P	4.50	4.25	0.72	1.35	34.00	42.30
TPU17-T17P	4.50	4.25	0.72	1.35	34.00	42.30



### 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. See page 103 for prices for dowel pin options on actuators.

\*Shown is 9/16" (02) bore Linear Thruster. Bolt pattern for this size only is offset 1/2" from center axis of housing.

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

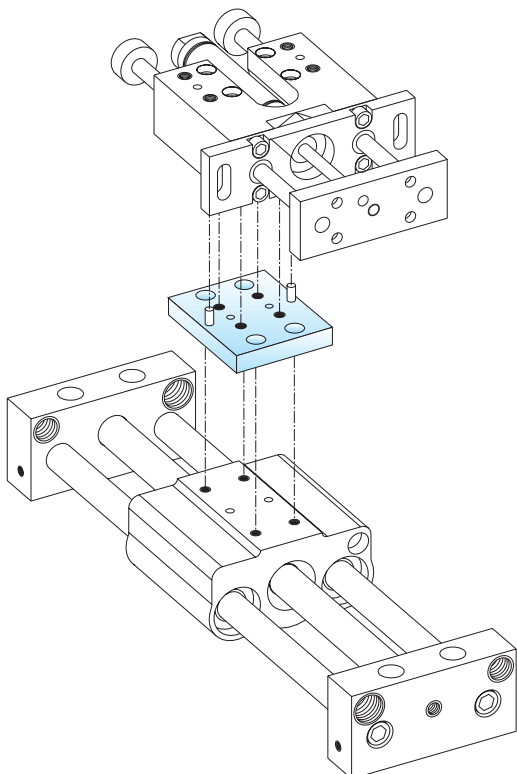
## Ultran Rodless Cylinder (Base Product) to Linear Thruster (Coupled Product)

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	\$22.60	\$28.30
TPU04-T04A	2.50	2.25	0.36	0.20	24.70	31.10
TPU09-T04A	3.50	3.00	0.47	0.48	28.70	35.70
TPU09-T09A	3.50	3.00	0.47	0.48	28.70	35.70
TPU17-T09A	4.50	4.25	0.72	1.35	34.00	42.30
TPU17-T17A	4.50	4.25	0.72	1.35	34.00	42.30



### 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. See page 103 for prices for dowel pin options for actuators.

\*Shown is 9/16" (02) bore Linear Thruster. Bolt pattern for this size only is offset 1/2" from center axis of housing.

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

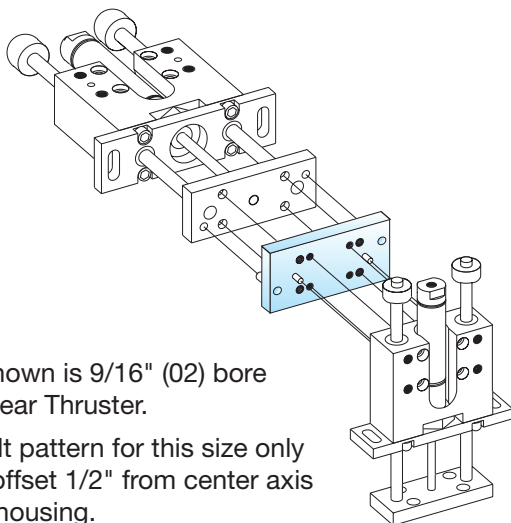
## Linear Thruster (Base Product) to Linear Thruster (Coupled Product)

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	\$21.60	\$27.30
TPT04-T02P	3.00	1.50	0.36	0.16	26.60	32.90
TPT04-T04P	3.00	1.50	0.36	0.16	26.60	32.90
TPT09-T04P	4.25	2.00	0.47	0.39	31.40	38.60
TPT09-T09P	4.25	2.00	0.47	0.39	31.40	38.60
TPT17-T09P	5.50	3.00	0.72	1.16	37.10	45.40
TPT17-T17P	5.50	3.00	0.72	1.16	37.10	45.40
TPT31-T17P	7.00	3.00	0.97	2.00	47.70	57.30
TPT31-T31P	7.00	4.50	0.97	2.99	47.70	57.30
TPTE31-T17P	6.00	3.00	0.97	1.71	47.70	57.30
TPTE31-TE31P	6.00	4.50	0.97	2.57	47.70	57.30



\*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

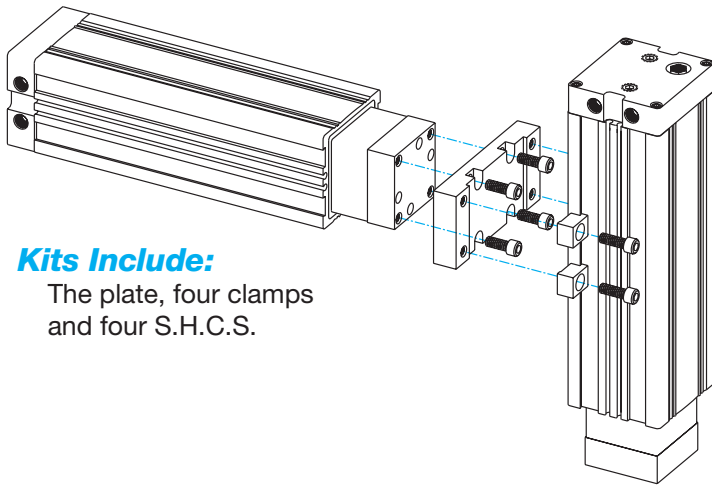
In addition to ordering a Transition Plate with dowel pin option, dowel pin options must be selected for your Linear Thrusters (-D option). For example, your order would include:

**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. See page 103 for prices for dowel pin options for actuators.

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

## PneuMoment to PneuMoment



### Kits Include:

The plate, four clamps and four S.H.C.S.

## Mounting Kits

Model Number	List Price	
TPPM09-PM09	Imperial	\$58.00
TPPMM09-PMM09	Metric	58.00

## 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"	\$8.70
3/4"	9.45
1-1/16"	10.05
1-1/2"	10.55
2"	11.40

Ultran Slide Dowel Pin Holes (-D Option)	
9/16"	\$8.40
3/4"	9.75
1-1/16"	11.30
1-1/2"	13.40

Linear Thruster Dowel Pin Holes (-D Option) T or TE Series		
	Standard Tooling Plate	Stainless Steel Tooling Plate Option
9/16"	\$4.80	\$7.65
3/4"	6.20	9.05
1-1/16"	9.05	15.25
1-1/2"	12.15	19.75
2"	12.40	21.40

Will include dowel pin holes.

\*Must also be ordered with Ball Bearing -R Option

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



## Sizing a Multi-Axis Configuration

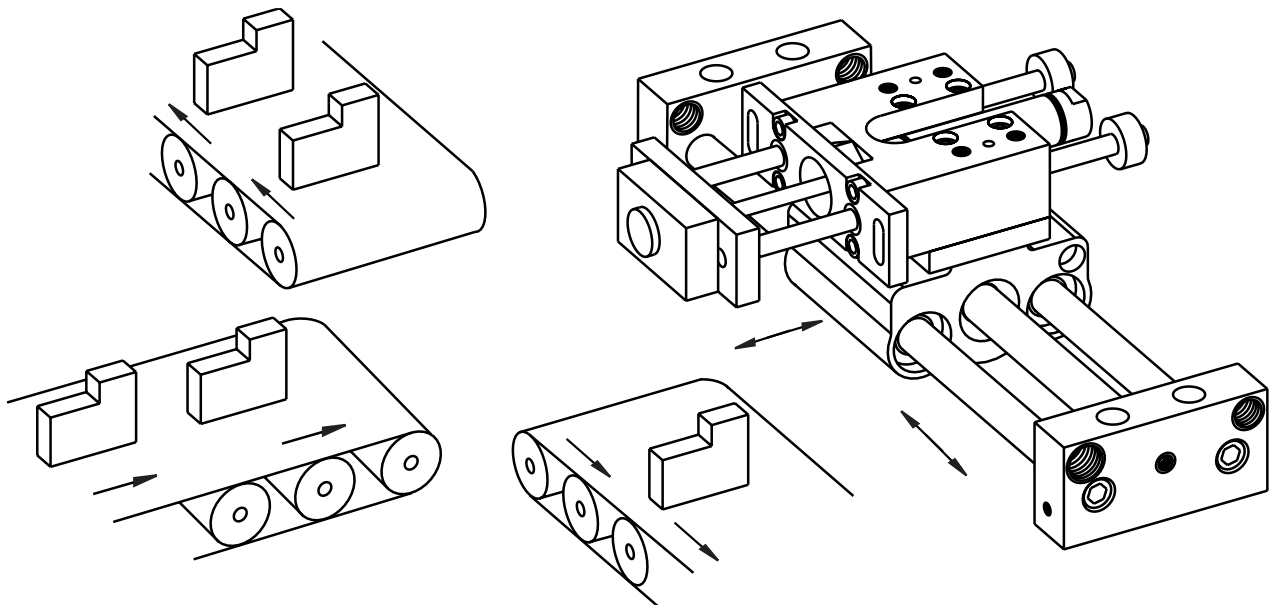
### General Comments:

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 99 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 99). 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 45 and then comparing the result to the 20 lb. limit.

Flow  
Controls

Linear  
Thrusters

Pneu-Turn  
Rotary Actuators

Ultran  
Cylinders

Shock  
Absorbers

Pneu Moment  
(Pneumatic Actuators)

Transition  
Plates

Multi-Axis  
Configurations

Position Sensing  
Switches

Application  
Checklist

## Sizing a Multi-Axis Configuration

*(Calculations for page 98 example)*

$$\text{Side Load} = \sum \text{Actual Load} * [2 * [(Y_1/Z) + 1]]$$

Actual Loads: product - 5 lbs.  
 gripper - 1 lb.  
 Linear Thruster tooling plate - .40 lb.

$$\begin{aligned} \text{Side Load} &= 5 \text{ lbs.} * [2 * [(8.25 \text{ in.}/2.518 \text{ in.}) + 1]] + \\ &1 \text{ lb.} * [2 * [(4.50 \text{ in.}/2.518 \text{ in.}) + 1]] + \\ &.40 \text{ lb.} * [2 * [(3.56 \text{ in.}/2.518 \text{ in.}) + 1]] \end{aligned}$$

$$\text{Side Load } 3/4" \text{ bore} = 50.25 \text{ lbs.}$$

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.

$$\text{Side Load } 1-1/16 \text{ bore} = 42.48 \text{ lbs.}$$

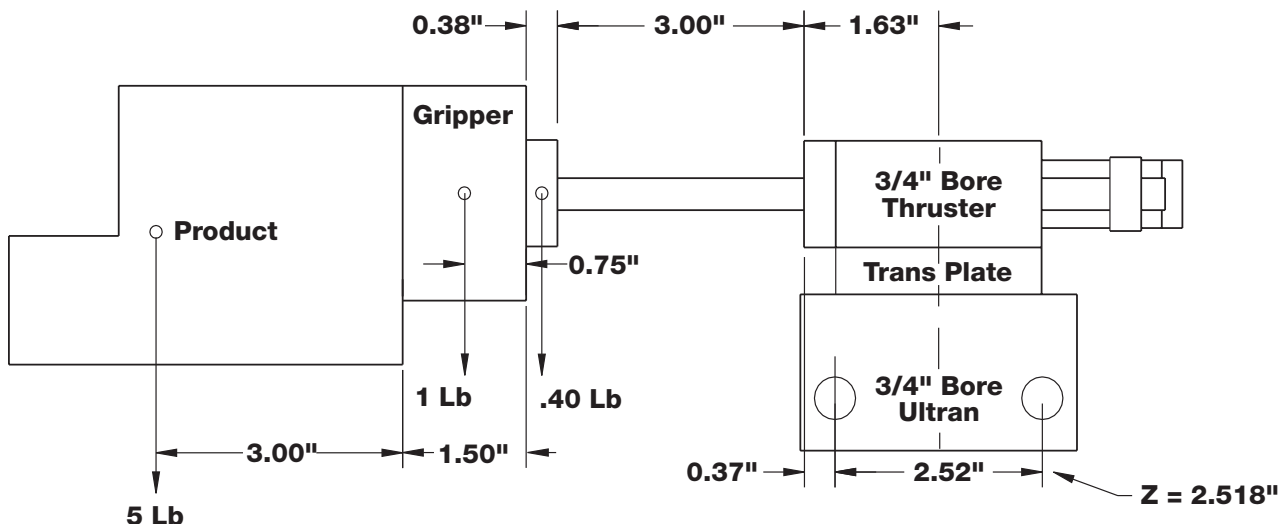
This side load is within the capability of an 1-1/16 inch bore Ultran Slide and this unit will be chosen as the base unit.

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



## Switches



Bimba offers Hall Effect, Magnetic Reed and Magnetic Reed/Triac-type switches to meet a wide variety of customer needs. Bimba actuators and switches provide a reliable, cost-effective interface between the pneumatically-powered functions of applications and the electrical controls. They eliminate costly, time-consuming design and fabrication of independent electrical limit switch arrangements, and provide an aesthetically pleasing installation.

The switches perform the same function as conventional limit switches. They can be used as position indicators, cycle counters, or to confirm operation. They may also be used as safety devices by allowing for operation of secondary devices only when the actuator is properly positioned.

The Switch Application Selection Guide provides information on which type of switch is suitable for a particular application.

All Bimba switches are designed to sense the magnet that is used in Bimba actuators that are ordered with the -M option. All are normally open switches that close when sensing the magnet. Switch models differ by actuator product lines. We also offer a variety of lead lengths and optional quick connect models. Refer to the Switch Selection Chart on page 109 to determine which switch models are available for your actuator. Then check for information on those models for more information on options, prices, specifications, circuit diagrams, etc.

## Bimba Magnetic Reed Switch

This is a two-wire device with wires directly connected to a reed switch. Specifications are valid for purely resistive loads only. Choosing a switch is governed by our published load current derating curves. These are derived from the switch contact rating, expressed in wattage. Bimba offers magnetic reed switches that can handle the current requirements of a wide variety of applications. In addition, models are available for track- or band-mounting, and many include an LED indicator light to show when switching occurs.

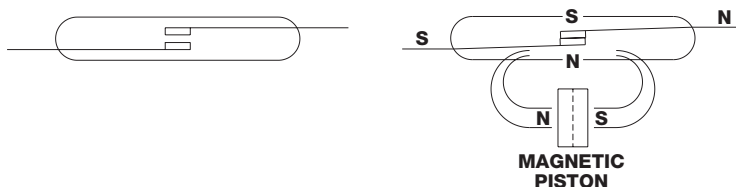
A third wire is added for switches with LED indicator lights to power the LED.

### Magnetic Reed/Triac-type Switch

This is a two-wire device recommended for high current AC loads. The reed switch senses the magnet and triggers the solid state triac that performs the actual current switching. The switch can handle up to 25A one-cycle surge to accommodate inductive kickback (current surge when an electrical device such as a solenoid coil is turned off) and inrush (current surge when a device is first turned on). Its operation is unreliable below 100mA load current. Maximum current is subject to ambient temperature. Models are available for track or band mounting.

#### How it works:

Reed switches contain hermetically-sealed reeds, or contacts. When the magnet on the piston moves close to the switch, the reeds become magnetized and the normally open contacts will close or pull in. The resulting signal can be used to signal or control other operations in the system. When the magnet moves away from the piston, the contacts will open or drop out.



Flow Controls

Linear Thrusters

Pneu-Turn Rotary Actuators

Ultraan Cylinders

Shock Absorbers

Pneu Moment (Pneumatic Actuators)

Transition Plates

Multi-Axis Configurations

Position Sensing Switches

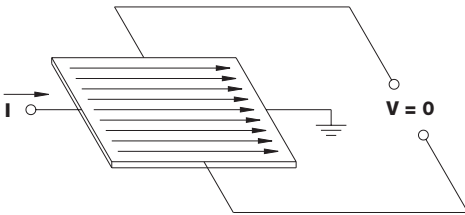
Application Checklist

## Bimba Solid State Switch

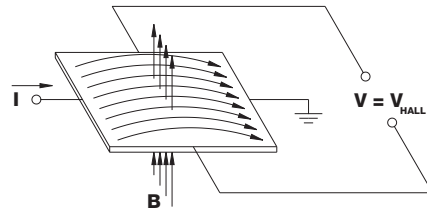
This is a three-wire, solid state device recommended for low current DC loads such as interfacing with a programmable controller. It provides compact, reliable sensing for virtually infinite life. An LED indicator light illuminates when switching occurs. Models are available in current sinking (NPN) 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 magnetoresistive 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.**

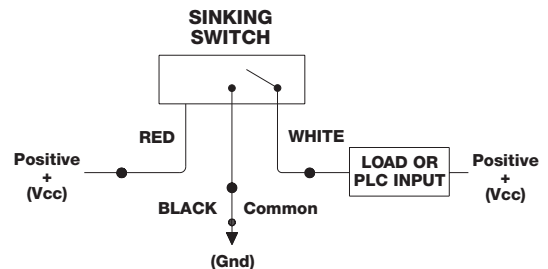
**Sinking switches** are applied to the **negative** side of a load. When the switch is activated, the negative (ground) is connected, completing the circuit.

**Sourcing switches** are applied to the **positive** side of a load. When the switch is activated, power is connected, completing the circuit.

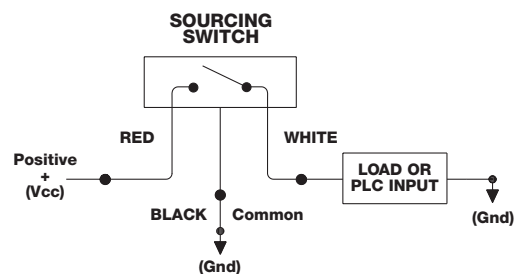
**The model needed will be determined by a number of factors, including:**

- 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)



## 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 2 lengths or quick connect with two cable length options.

## Benefits of the Hall Effect 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 2 lengths) or quick connect (with two cable length options)
- Faster signal speeds

## Switch Application Selection Guide

	Programmable Controllers	Relays	Solenoids	Indicator Lights		Motors	Time Counters
				Bulbs	Solid State		
Reed Switch	Yes	<5VA*	<5VA*	<5VA*	Yes	<5VA*	<5VA*
Triac Reed Switch**	No	Yes	Yes	Yes	No	Yes	Yes
Hall Effect Switch	Yes	<300mA	No	<300mA	Yes	No	<300mA
GMR Switch	Yes	<50mA	No	<50mA	Yes	No	<50mA

\* Use resistor-capacitor protection

\*\* Minimum current = 100mA

## Switch Selection Chart

Switch Type <sup>2</sup>		Pneu-Turn <sup>®1</sup>	Linear Thruster	Ultran <sup>®1</sup>	Ultran Slide <sup>1</sup>	High Load Ultran	Pneu-Moment <sup>™</sup>
Reed Switch	MRS-.087				x	x	
	MRS-.087-B	x	x				
	MRS-.087-BL	x	x				
	MRS-.087-PBL	x	x				
	MRS-1.5-B	x	x				
	RSU-1, RSUM-1			x	x	x	
Hall Effect Switch	HSK	x	x <sup>3</sup>				
	HSC	x	x <sup>3</sup>				
	HK				x	x	
	HC				x	x	
GMR Switch	MSC	x <sup>4</sup>			x	x	x
	MSK	x <sup>4</sup>			x	x	x
	MR	x <sup>4</sup>			x	x	x

<sup>1</sup> Includes metric actuators

<sup>2</sup> Includes Q and QC options where applicable for Quick Connect models

<sup>3</sup> Not available in 9/16" bore

<sup>4</sup> Soon to be introduced with a mini switch track

Flow Controls

Linear Thrusters

Pneu-Turn Rotary Actuators

Ultran Cylinders

Shock Absorbers

Pneu Moment (Pneumatic Actuators)

Transition Plates

Multi-Axis Configurations

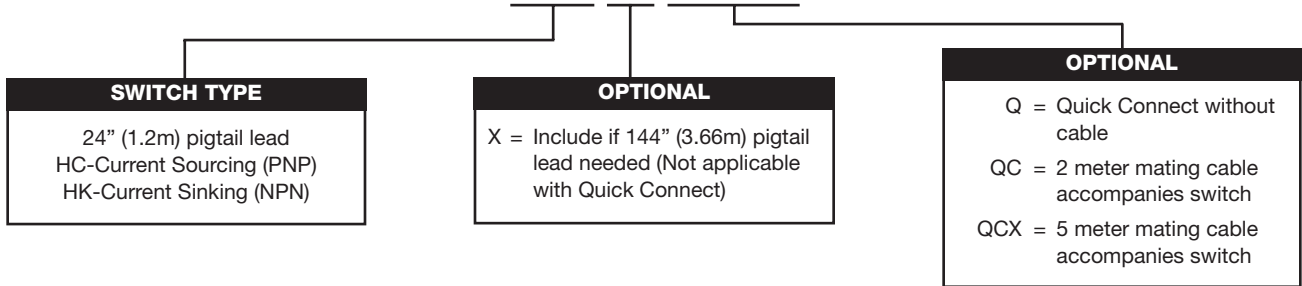
Position Sensing Switches

Application Checklist

## How to Order/List Prices

For Ultran Slide and High Load Ultran

### HC QCX

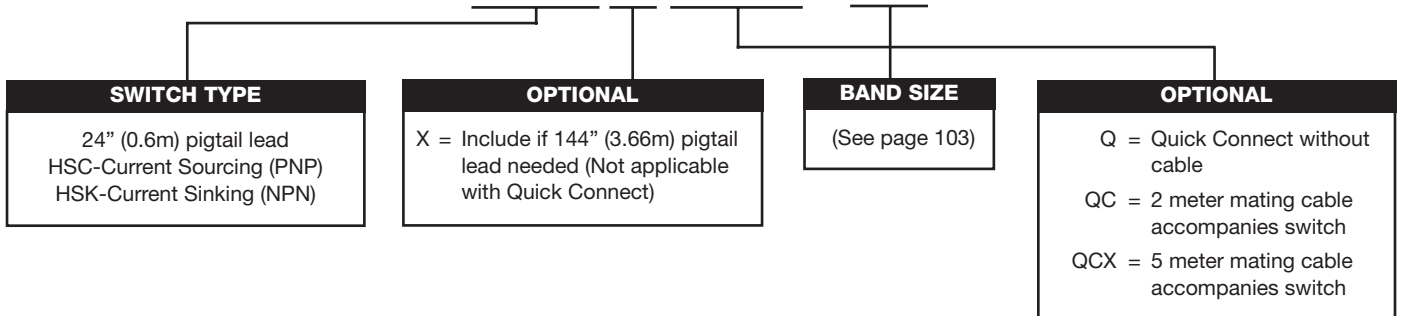


Base Model	Where Used	Base Model 24" (1.2m) pigtail lead	OPTIONS			
			X 144" (3.66m) pigtail lead	Quick Connect		
				Q (no cable)	QC (2m cable)	QCX (5m cable)
HC HK	Ultran Slide	\$33.30	\$46.85	\$48.20	\$69.20	\$79.70

\*Note: 0.38 minimum stroke required for Flat-1 cylinders.

## Band Style Solid State Switches Used for Pneu-Turn\*

### HSK QCX - 04



Base Model	Base Model 24" (0.6m) pigtail lead*	OPTIONS			
		X 144" (3.66m) pigtail lead	Quick Connect		
			Q (no cable)	QC (2m cable)	QCX (5m cable)
HSC - HSK -	\$28.55	\$35.95	\$50.15	\$71.15	\$81.65

\* Bands are included in the price. See page 112 to specify band size.

### To Order Cable Connectors Separately

Base Model	Description	List Price
C4	2m - straight	\$21.00
C4X	5m - straight	31.50

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

## Specifying Band Size

Many of the Bimba Solid State switches are band-mounted to the actuator. For all band-style switches, a pre-sized band is ordered by adding a bore size designation as the last two or three digits of the basic switch model number. For example, the current sourcing Solid State Switch model for a 1-1/16" bore MRS cylinder would be HSC-09.

### Pneu-Turn Rotary Actuators:

Bore Size	9/16" (14mm)	3/4" (19mm)	7/8"	1-1/16" (27mm)	1-1/4"	1-1/2" (38mm)	1-3/4"	2" (50mm)	2-1/2"	3"
Bore Model Number	02	04	06	09	12	17	24	31	50	70

## Electrical Specifications

### Solid State Switches (3 wire switches)

Input Voltage:	4.5 to 30 VDC
Load Current:	150 mA, maximum
Sensor Element:	Solid-State
Off-State Leakage:	10 microamperes, maximum
Reverse Battery:	40 VDC, minimum
Transient Protection:	500 Watts of peak power, minimum
Overvoltage Protection:	37 VDC maximum with up to 12 amperes
Sensor Operation Indicator:	Red LED for Sinking, Yellow LED for Sourcing
Turn-on Time:	1 microsecond
Turn-off Time:	1 microsecond
“On” Voltage Drop:	0.4 VDC, maximum, for a Sinking Circuit 1.5 VDC, maximum, for a Sourcing Circuit
Operational Temperature Range:	-20° F to +185° F 25° C to 85° C
Insulation Resistance:	100 megohms, lead to case with a 500 volt AC and or DC source
Flammability Rating:	UL 94 VO
Packaging:	IEC 529-1989, Category IP 67 Tests
Vibration:	Mil-Std-810E, Method 514.1, Category 10
Welding Field Immunity:	Immune to welding fields to 4000 amperes minimum, at a minimum distance of 0.25"
CE Mark:	CE Compliance per engineering evaluation to certified circuits
Cable:	3 conductor, 24 to 26 AWG, Gray polyurethane outer jacket
Repeatability:	+/- .005"

Flow Controls

Linear Thrusters

Pneu-Turn Rotary Actuators

Ultram Cylinders

Shock Absorbers

Pneu Moment (Pneumatic Actuators)

Transition Plates

Multi-Axis Configurations

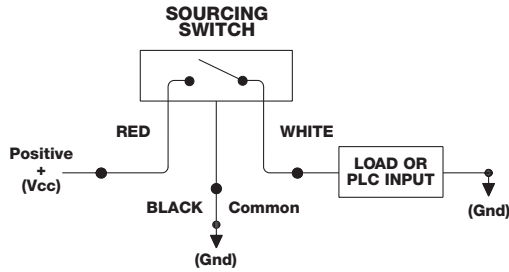
Position Sensing Switches

Application Checklist



## Electrical Circuit Diagrams

**Typical Solid State Sourcing Configuration for HSC Models (PNP)**

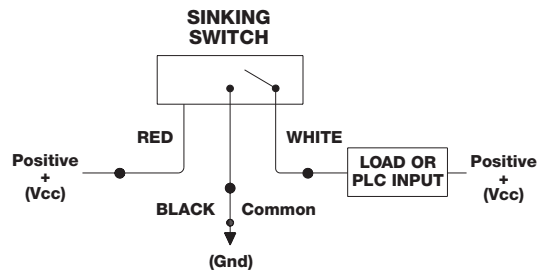


**HSC, HC**

Basic Circuit Layout for Programmable Logic Controllers (PLC) and Normally Off Relays and Solenoids

CAUTION: Shorting white wire to ground will damage switch

**Typical Solid State Sinking Configuration for HSK Models (NPN)**

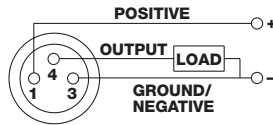


**HSK, HK**

Basic Circuit Layout for Programmable Logic Controllers (PLC) and Normally Off Relays and Solenoids

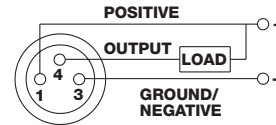
CAUTION: Shorting white wire to supply voltage will damage switch

**8mm Male Connector Sourcing Solid State Switch**



**HSCQ, HCQ**

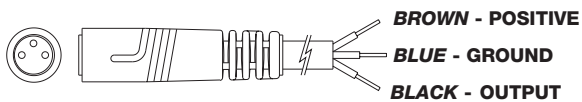
**8mm Male Connector Sinking Solid State Switch**



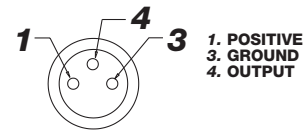
**HSKQ, HKQ**

## Pin and Wire Assignments for Quick Connect

**8mm Female Connector**

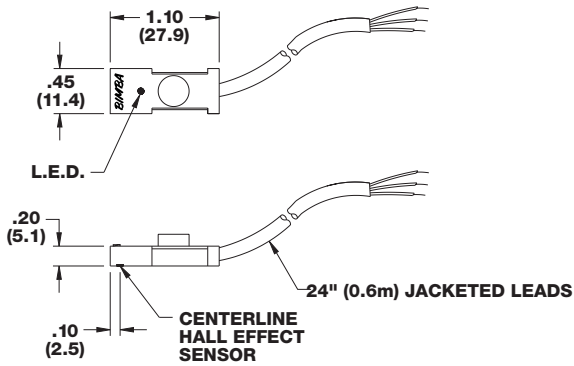


**Face View of Male Connector**

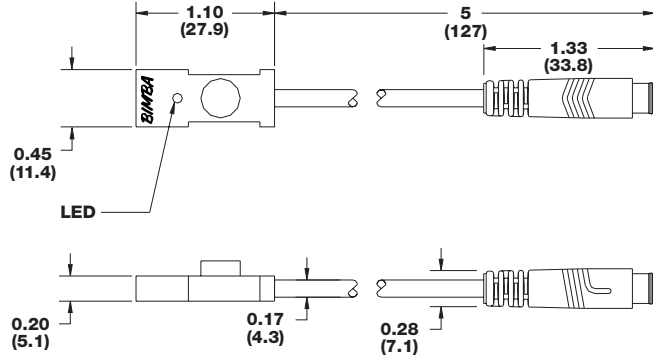


## Dimensions

### HSC, HSK Solid State Switches (inches shown, mm in parentheses)

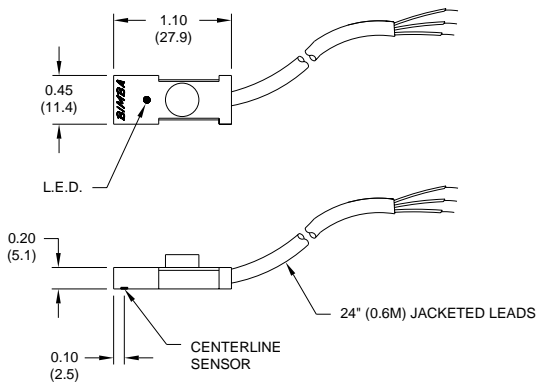


**HSC, HSK**

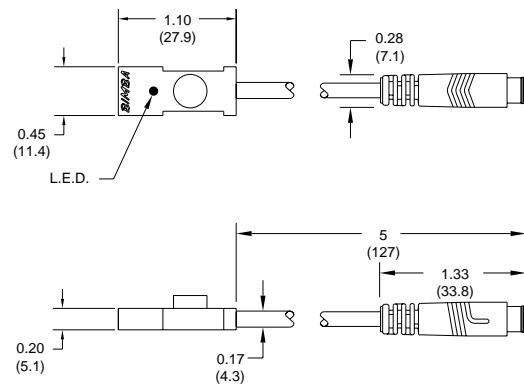


**HSCQ, HSKQ**

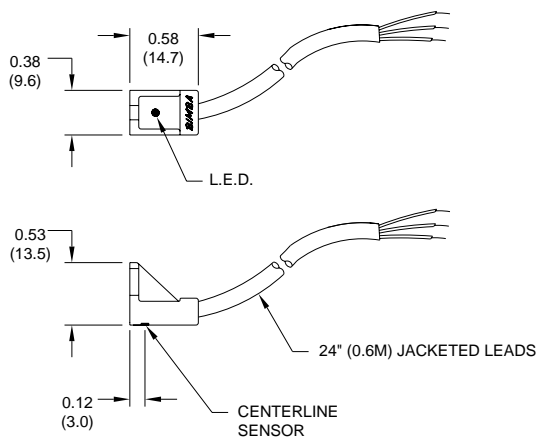
### HC, HK Solid State Switches



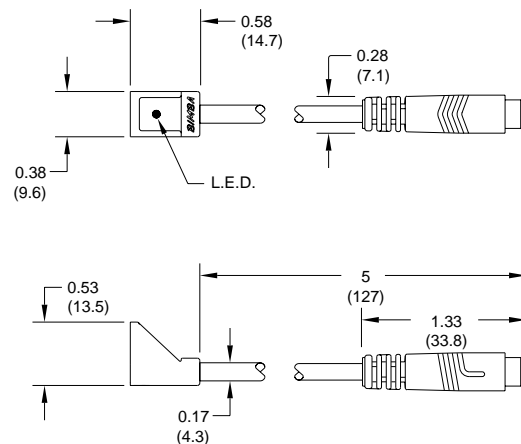
**HSC, HSK**



**HSCQ, HSKQ**



**HC, HK**



**HCQ, HKQ**

Flow Controls

Linear Thrusters

Pneu-Turn Rotary Actuators

Ultram Cylinders

Shock Absorbers

Pneu Moment (Pneumatic Actuators)

Transition Plates

Multi-Axis Configurations

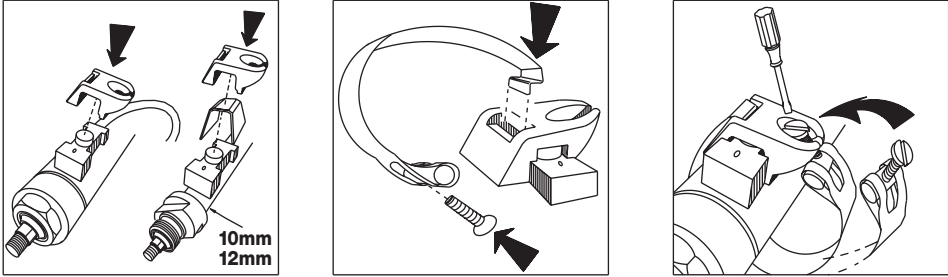
Position Sensing Switches

Application Checklist

## Mounting

### HSC, HSCQ, HSK, HSKQ Pneu-Turn Rotary Actuators

The switch can be mounted anywhere along the length and circumference of the actuator body. Mounting hardware includes the switch, a presized stainless steel band, a chrome-plated zinc die cast housing and a ball head screw. For 10mm and 12mm ISO 6432 cylinders, a clip is also included.



*Note: Mount with LED face up.*

## Hysteresis and Operating Windows

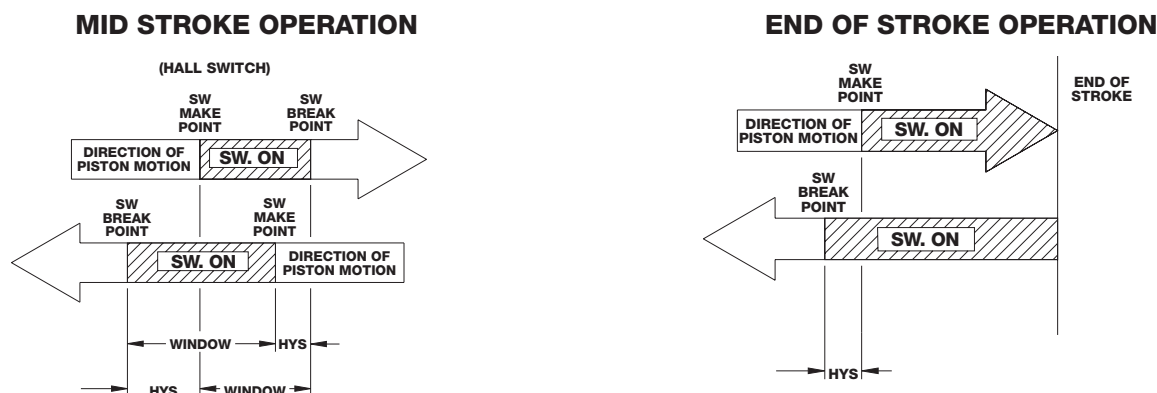
### Hysteresis

Bimba Hall Effect 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 Hall Effect 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 Hall Effect Switch.



### HSK, HK, HSC and HC Ultran Slide Rodless Cylinders (inches shown, mm in parentheses)

Cylinder		Operating Window		Hysteresis		Repeatability
Type	Bore	W1	W2	H1	H2	
Ultran Rodless Cylinders*	0.25 to 0.5 (6.4 to 12.70), depending on individual assembly					± 0.015 (.4)

\*Any ferrous materials within an inch of the Ultran carriage may reduce the magnetic flux and affect switch operation.

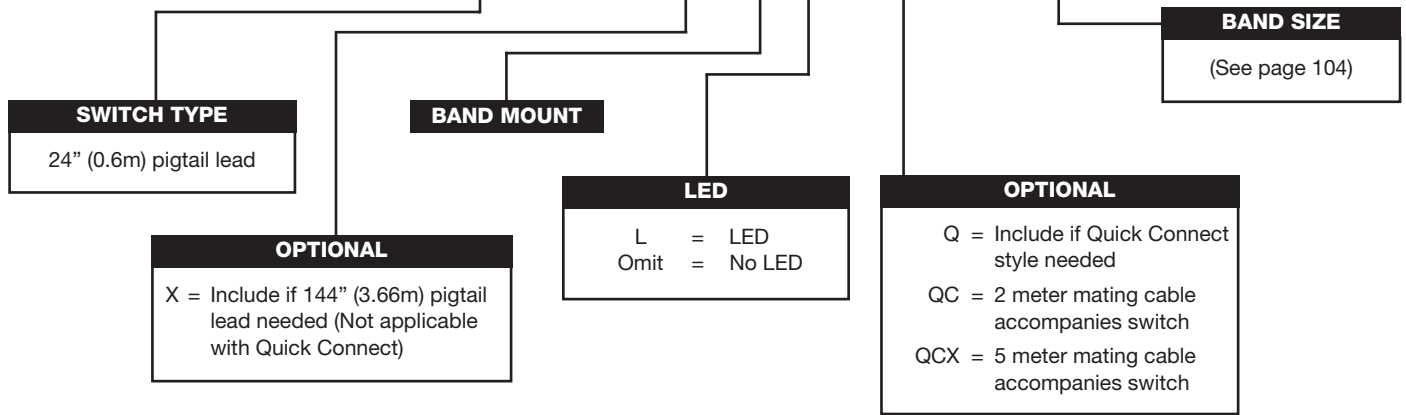
### HSK and HSC for Pneu-Turn Rotary Actuators

Pneu-Turn Model	Operating Windows				Hysteresis				Repeatability
	Switch Mounted on Side 1		Switch Mounted on Side 2		Switch Mounted on Side 1		Switch Mounted on Side 2		
	CW	CCW	CW	CCW	CW	CCW	CW	CCW	
9/16" (14mm)	84°	46°	46°	84°	47°	7°	7°	47°	3°
3/4" (19mm)	61°	34°	34°	61°	34°	5°	5°	34°	2°
1-1/16" (27mm)	55°	30°	30°	55°	31°	5°	5°	31°	2°
1-1/2" (38mm)	41°	23°	23°	41°	23°	4°	4°	23°	2°
2" (50mm)	29°	16°	16°	29°	16°	3°	3°	16°	1°

## How to Order/List Prices

Ultran Rodless Cylinders, and Pneu-Turn Rotary Actuators

### MRS-.087-P BLQCX-04



NOTE: Before ordering, reference switch selection chart on page 102 for compatibility.

Base Model	Base Model (24" (0.6m) pigtail lead)	OPTIONS			
		X 144" (3.66m) pigtail lead	Quick Connect		
			Q (no cable)	QC (2m cable)	QCX (5m cable)
MRS-.087 <sup>1</sup>	12.25	N/A	N/A	N/A	N/A
MRS-.087-B- <sup>2</sup>	17.85	23.55	33.70	54.70	65.20
MRS-.087-BL- <sup>2</sup>	21.50	28.35	40.20	61.20	71.70
MRS-.087-PBL- <sup>2</sup>	21.50	28.35	40.20	61.20	71.70
MRS-1.5-B- <sup>2</sup>	25.10	30.60	N/A	N/A	N/A
RSU-1 <sup>3</sup>	10.87	N/A	31.50	51.50	61.50
RSUM-1 <sup>3</sup>	11.60	N/A	N/A	N/A	N/A

<sup>1</sup> Track mount switches.

<sup>2</sup> Bands are included in the price. See page 110 to specify band size

<sup>3</sup> Pigtail leads 12" for RSU-1 and RSUM-1. These switches are for Ultran Rodless Cylinders.

### To Order Cable Connectors Separately

Base Model	Description	List Price
C4	2 meter - straight	\$20.00
C4X	5 meter - straight	30.00

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

## Specifying Band Size

Many of the Bimba Magnetic Reed switches are band-mounted to the actuator. For all band-style switches, a pre-sized band is ordered by adding a bore size designation as the last two digits of the basic switch model number.

For example, the Magnetic Reed Switch model MRS-.087-B for a 2" bore Linear Thruster would be MRS-.087-B-31. Magnetic Reed Switch model MRS-.087-PBL for a 2-1/2" bore Double-Wall cylinder would be MRS-.087-PBL-DW3. A triac-type reed switch for a 16mm bore ISO 6432 cylinder would be MRS-1.5-B-M16.

### Pneu-Turn Rotary Actuators:

Bore Size	9/16" (14mm)	3/4" (19mm)	7/8"	1-1/16" (27mm)	1-1/4"	1-1/2" (38mm)	1-3/4"	2" (50mm)	2-1/2"	3"
Bore Model Number	02	04	06	09	12	17	24	31	50	70

Flow Controls

Linear Thrusters

Pneu-Turn Rotary Actuators

Ultram Cylinders

Shock Absorbers

Pneu Moment (Pneumatic Actuators)

Transition Plates

Multi-Axis Configurations

Position Sensing Switches

Application Checklist

## Electrical Specifications

### Magnetic Reed Switches

#### **MRS-.087** **MRS-.087-B** (2 wire switch)

Contacts.....SPST Form A (Normally Open)  
Contact Rating .....10 Watts max.  
Switch Voltage .....200 Volts max. AC/DC  
Maximum Current 500 mA max. (Resistive)  
Initial Contact Resistance 0.10 ohms max.  
Actuating Time Average.....1.0 millisecond

#### **MRS-.087-BL** **MRS-.087-BLQ** (3 wire switch)

Contacts.....SPST Form A (Normally Open)  
Contact Rating .....9 Watts max.  
Switch Voltage .....6 to 24 Volts  
Maximum Current 500 mA max. (Resistive)  
Initial Contact Resistance 0.10 ohms max.  
Actuating Time Average.....1.0 millisecond  
LED Indicator

#### **MRS-.087-BQ** (2 wire switch)

Contacts.....SPST Form A (Normally Open)  
Contact Rating .....10 Watts max.  
Switch Voltage .....120 Volts AC or DC  
Maximum Current:.....500 mA (Resistive)  
Actuating Time Average.....1.0 millisecond

#### **MRS-.087-PBL** **MRS-.087-PBLQ** (2 wire switch)

Contacts.....SPST Form A (Normally Open)  
Contact Rating .....2.5 Watts max.  
Switch Voltage .....3 to 120 Volts AC or DC  
Minimum Current .....10mA AC or DC  
Maximum Current.....20 mA AC or DC  
Initial Contact Resistance 0.10 ohms max.  
Actuating Time Average.....1.0 millisecond  
LED Indicator

#### **MRS-1.5 (1-1/16" to 2-1/2")** **MRS-1.5-S (9/16" to 3/4" bore)** **MRS-.1.5-B** (2 wire switch)

Contacts.....SPST Form A (Normally Open)  
Voltage Rating .....12 to 230 Volts (AC only)  
Minimum Current .....0.1 amps  
Maximum Current ..1.5 amps @ 50°F(10°C)  
0.5 amps @ 200°F(93°C)  
Actuating Time Average.....2.0 milliseconds

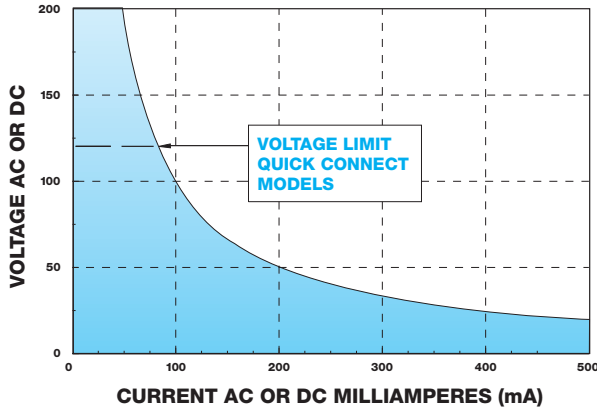
#### **RSU-1** **RSUM-1** (2 wire switch)

Contacts.....SPST Form A (Normally Open)  
Contact Rating .....10 Watts max.  
Switching Voltage ...200 Volts Max. AC/DC  
Breakdown Voltage .....250 Volts min.  
Switching Current .....500 mA max.  
Initial Contact Resistance ...0.2 ohms max.  
Actuating Time Average.....1.0 millisecond

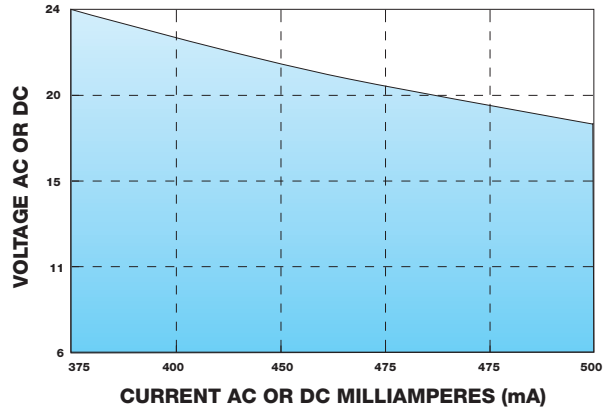
*NOTE: See page 116 for Repeatability and Hysteresis*

## Load Current Derating Curves

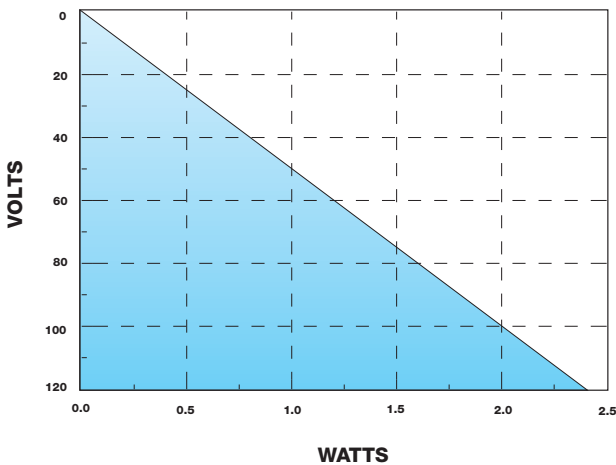
**MRS-.087 MRS-.087-B MRS-.087-BQ  
RSU-1 RSUM-1**



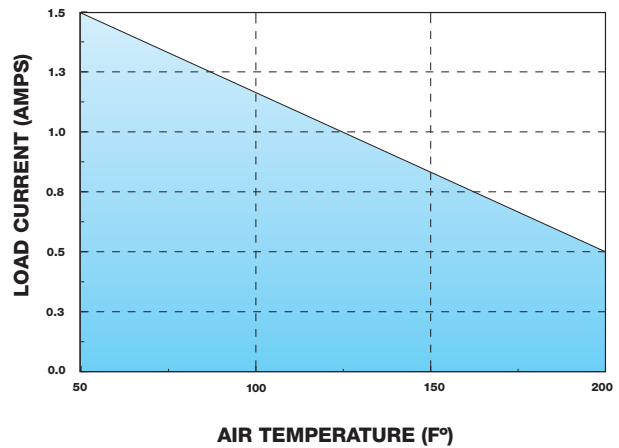
**MRS-.087-BL MRS-.087-BLQ**



**MRS-.087-PBL MRS-.087-PBLQ**  
VOLTS vs WATTS @ MAX. CURRENT (20mA)



**MRS-1.5 MRS-1.5-B MRS-1.5-S**



Flow Controls

Linear Thrusters

Pneu-Turn Rotary Actuators

Ultram Cylinders

Shock Absorbers

Pneu Moment (Pneumatic Actuators)

Transition Plates

Multi-Axis Configurations

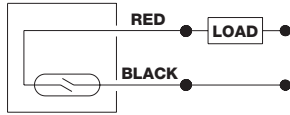
Position Sensing Switches

Application Checklist

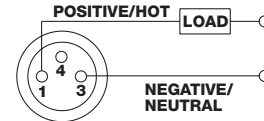


## Electrical Circuit Diagrams

**MRS-.087**  
**MRS-.087-B**  
**RSU-1**  
**RSUM-1**

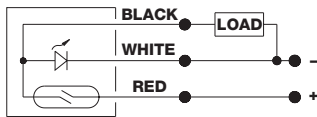


**MRS-.087-BQ**  
**MRS-.087-PBLQ**

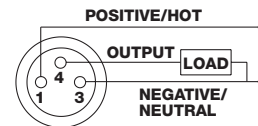


8mm Male Connector

**MRS-.087-BL**

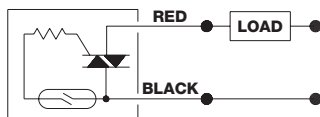


**MRS-.087-BLQ**

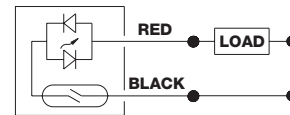


8mm Male Connector

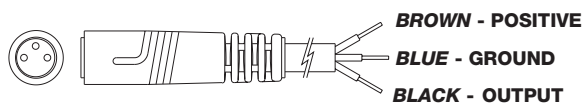
**MRS-1.5**  
**MRS-1.5-S**  
**MRS-1.5-B**



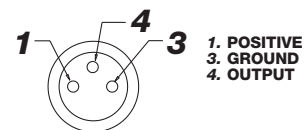
**MRS-.087-PBL**



### Pin and Wire Assignments for Quick Connect



8mm Female Connector

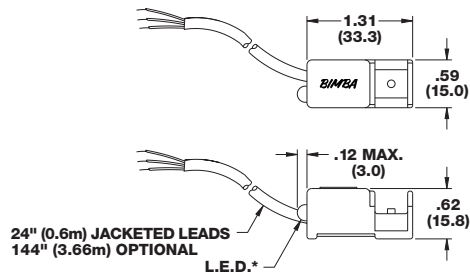


Face View of Male Connector

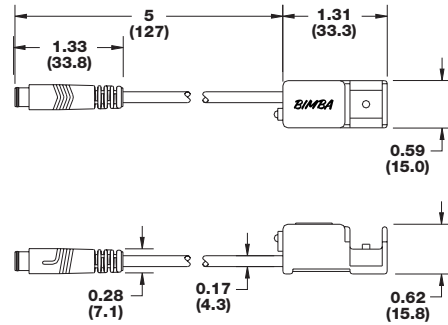
## Dimensions

(inches shown, mm in parentheses)

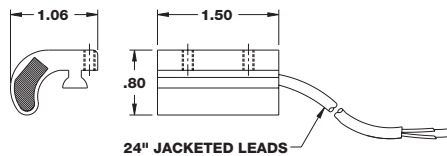
**MRS-.087-B**  
**MRS-.087-BL**  
**MRS-.087-PBL**  
**MRS-1.5-B**



**MRS-.087-BQ**  
**MRS-.087-BLQ**  
**MRS-.087-PBLQ**

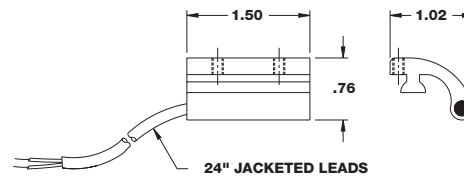


**MRS-1.5**



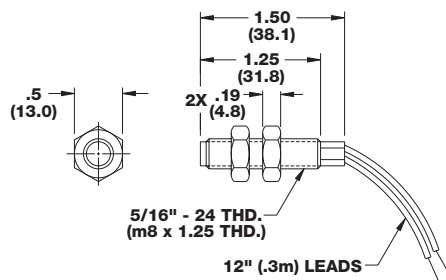
To order longer leads, specify D-7001-A-lead length in inches.  
 Consult BIMBA distributor or factory for prices.

**MRS-.087**

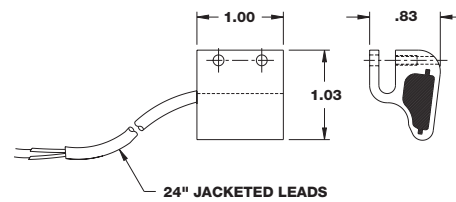


To order longer leads, specify D-7000-A-lead length in inches.  
 Consult BIMBA distributor or factory for prices.

**RSU-1, RSUM-1**



**MRS-1.5-S**



To order longer leads, specify D-16312-A-lead length in inches.  
 Consult BIMBA distributor or factory for prices.

Flow  
Controls

Linear  
Thrusters

Pneu-Turn  
Rotary Actuators

Ultram  
Cylinders

Shock  
Absorbers

Pneu Moment  
(Pneumatic Actuators)

Transition  
Plates

Multi-Axis  
Configurations

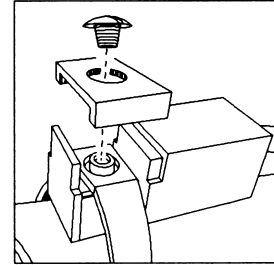
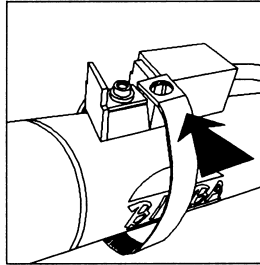
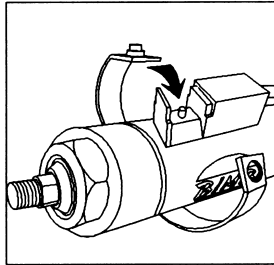
Position Sensing  
Switches

Application  
Checklist

## Mounting

### Band-style Pneu-Turn Rotary Actuators

The switch can be mounted anywhere along the length and circumference of the actuator body. Mounting hardware includes the switch, a band, a U-shaped bracket and a screw (included).



### Track-style

#### For Ultram Slide Rodless Cylinders

Actuator models ordered for position sensing include a special switch track. The switch slides into the track and is tightened with a screw (included). For track-mounted switches on MRS cylinders with -Z option, the following dimensions apply:

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

#### For Ultram Rodless Cylinder RSU-1, RSUM-1

The switch clamps directly into the switch bracket, shock absorber/switch bracket, mounting plate or end plate of the Ultram rodless cylinder with two mounting nuts (included).

*Note: Switches not available for 5/16" and 7/16" bores for Ultram Rodless Cylinders and Original Line Cylinders.*

## Hysteresis and Operating Windows

### Hysteresis

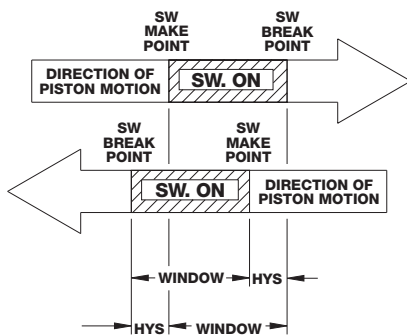
Bimba Magnetic Reed switches are subject to hysteresis. Hysteresis is the difference in magnetic field strength needed to initiate switch operation versus the field strength needed to sustain switch operation. The effect is that the switch break point will be different from the switch make point in the piston travel.

### Operating Window

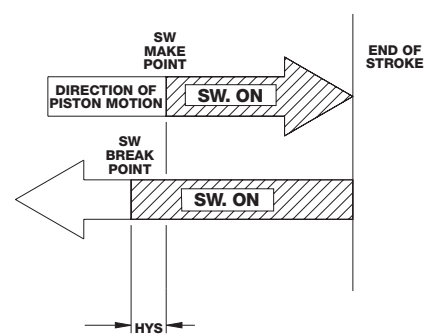
The operating window is the distance the piston travels while the switch is in the "ON" state, and includes the hysteresis action. For the Magnetic Reed Switch, hysteresis is equal on both sides of the operating window.

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 charts below show the operating windows for the Magnetic Reed Switches.

#### MID STROKE OPERATION



#### END OF STROKE OPERATION

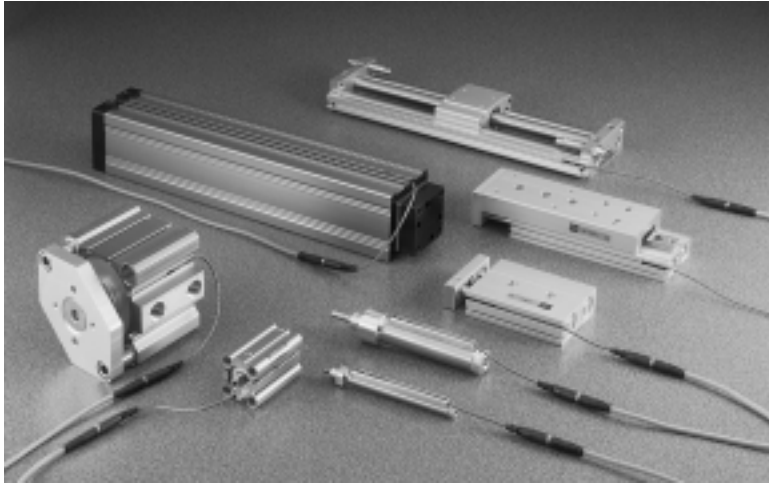


### Ultran Rodless Cylinders, and Pneu-Turn Rotary Actuators (inches shown, mm in parentheses)

Cylinder			Operating Window	Hysteresis Maximum	Repeatability
Type	Bore Designator	Bore			
Original Line	02, 04, 09	9/16", 3/4", 1-1/16"	0.350	0.040	± .015"
	12, 17, 24, 31, 50	1-1/4", 1-1/2", 1-3/4", 2", 2-1/2"	0.440	0.040	± .015"
Double-Wall	17, 31	1-1/2", 2"	0.680	0.090	± .015"
	50, 83, 125	2-1/2", 3-1/4", 4"	0.780	0.070	± .015"
Pneu-Turn		9/16" (14mm)	62°	9°	± 3°
		3/4" (19mm)	51°	7°	± 2°
		1-1/16" (27mm)	54°	9°	± 2°
		1-1/2" (38mm)	40°	6°	± 2°
		2" (50mm)	30°	5°	± 1°
Ultran		All types and bores	0.320 (8.1mm)	0.040 (1.0mm)	± .015" (.4mm)

## Bimba Low Profile Switch

Bimba's new low profile switches offer the latest giant magnetoresistive technology, and offers more features and functionality in the smallest package of any actuator position sensing switch. The switch fits in a track located on the cylinder's body and leaves it flush with the cylinder body. It has fast response, symmetrical hysteresis, and infinite life.



Bimba offers 4 different low profile switches:

- Magnetic Reed Switch
- GMR Auto-configure
- GMR source (PNP) output
- GMR Sink (NPN) output

### Features/Advantages

- Extremely small – the Bimba GMR Switches are the lowest profile switch currently available.
- The Auto-Configure GMR Switch automatically determines whether the switch has been connected to a current sinking or sourcing load.
- Solid state reliability – no moving parts means longer life, no contact bounce.
- Fast response rate – 1 microsecond maximum.

- Low, symmetrical hysteresis eases set-up and provides more accurate sensing.
- Built-in fault protection including reverse polarity, overvoltage and transient protection.
- LED verifies switching and eases set-up.
- Several switches can be mounted on one actuator.
- Pigtail leads in two lengths, with Quick Connect option for easy set-up.
- For use with Bimba EF1, Twin Bore, and Original Line cylinders, and PneuMoment® actuators.

## How it Works

The Bimba GMR Switch is based on giant magnetoresistive (GMR) technology, which was first developed in 1988. It includes 4 GMR resistors (2active, 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.

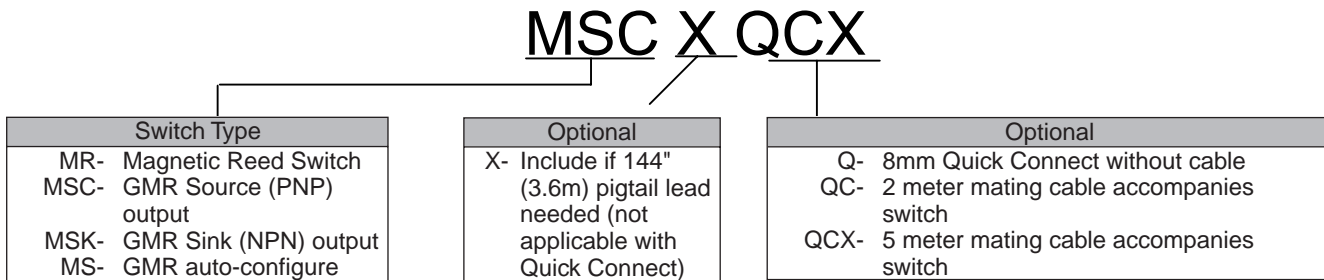
## Switch Application Selection Guide

Switch Application Guideline							
Switch	Programmable Controllers	Solid State Relays Only	Solenoids	Indicator Lights		Motors	Time Counters
				Bulb	LED		
Magnetic Reed	Yes	<5VA*	<5VA*	<5VA*	Yes	<5VA*	<5VA*
GMR Auto-configure Switch	Yes	Yes	No	No	Yes	No	Yes
GMR Source or Sink Output	Yes	<50mA	No	<50mA	Yes	No	<50mA

\*Use resistor-capacitor protection

## How to Order

The Model Number for all extruded track mount switches consists of three alphanumeric clusters. These designate switch type and lead length. Please refer to the chart below for an example of Model Number MSCQCX. This is a Solid State switch with PNP output including a Quick Connect cable attachment and a 5meter mating cable.



## List Prices

Base Model	Base Model with Options			
MR (Magnetic Reed)	MRX (3.6m leads)	MRQ (Quick Connect)	MRQC (2m mating cable)	MRQCX (5m mating cable)
\$17.50	\$28.50	\$33.50	\$53.50	\$63.50
MSC (GMR Source output)	MSCX (3.6 leads)	MSCQ (Quick Connect)	MSCQC (2m mating cable)	MSQCX (5m mating cable)
\$28.80	\$39.80	\$44.80	\$64.80	\$74.80
MSK (GMR Sink output)	MSKX (3.6m leads)	MSKQ (Quick Connect)	MSKQC (2m mating cable)	MSKQCX (5m mating cable)
\$28.80	\$39.80	\$44.80	\$64.80	\$74.80
MS (Auto-configure)	MSX (3.6m leads)	MSXQ (Quick Connect)	MSQC (2m mating cable)	MSQCX (5m mating cable)
\$35.75	\$45.00	\$48.35	\$68.35	\$78.35

### To Order Cable Connectors Separately

Base Model	Description	List Price
C4	2 meter – straight	\$20.00
C4X	5 meter – straight	30.00

## Mounting

### To Install:

Slide the switch into the cylinder's switch track. Extend and retract the cylinder while positioning the switch until the switch's operating window is correct. Secure the switch in the cylinder track by turning the set screw with a hex driver. Cycle the cylinder (both extending and retracting) a number of times to confirm correct operation and adjust as required.

**Note: Maximum torque on set screw is .170 N-m (1.5 in.-lbs.). Do not overtighten.**

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

# Bimba Low Profile Switches

including a Quick Connect cable attachment and a 5meter mating cable.

## MSC X QCX

Switch Type		Optional	Optional
MR-	Magnetic Reed Switch	X - Include if 144" (3.6m) pigtail lead needed (not applicable with Quick Connect)	Q - 8mm Quick Connect without cable QC - 2 meter mating cable accompanies switch QCX - 5 meter mating cable accompanies switch
MSC-	GMR Source (PNP) output		
MSK-	GMR Sink (NPN) output		
MS-	GMR auto-configure		

## List Prices

Base Model	Base Model with Options			
MR (Magnetic Reed)	MRX (3.6m leads)	MRQ (Quick Connect)	MRQC (2m mating cable)	MRQCX (5m mating cable)
\$17.50	\$28.50	\$33.50	\$53.50	\$63.50
MSC (GMR Source output)	MSCX (3.6m leads)	MSCQ (Quick Connect)	MSCQC (2m mating cable)	MSQCX (5m mating cable)
\$28.80	\$39.80	\$44.80	\$64.80	\$74.80
MSK (GMR Sink output)	MSKX (3.6m leads)	MSKQ (Quick Connect)	MSKQC (2m mating cable)	MSKQCX (5m mating cable)
\$28.80	\$39.80	\$44.80	\$64.80	\$74.80
MS (Auto-configure)	MSX (3.6m leads)	MSXQ (Quick Connect)	MSQC (2m mating cable)	MSQCX (5m mating cable)
\$35.75	\$45.00	\$48.35	\$68.35	\$78.35

## To Order Cable Connectors Separately

Base Model	Description	List Price
C4	2 meter – straight	\$20.00
C4X	5 meter – straight	30.00

## Mounting

### To Install:

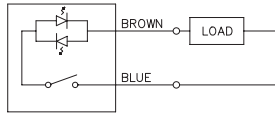
Slide the switch into the cylinder's switch track. Extend and retract the cylinder while positioning the switch until the switch's oper: window is correct. Secure the switch in the cylinder track by turning the set screw with a hex driver. Cycle the cylinder (both exte and retracting) a number of times to confirm correct operation and adjust as required.

**Note: Maximum torque on set screw is .170 N-m (1.5 in.-lbs.). Do not overtighten.**

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

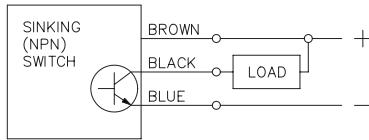
## Electrical Circuit Diagrams

### MR, MRX, MRQ (Reed Switch)

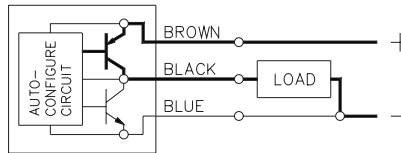
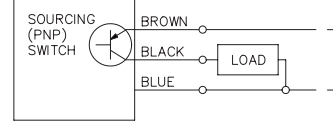


**Note:** On Quick Connect reed switch models, connect only the Blue and Brown wires on the mating cable and cut back the Black wire. **Do Not** connect switch to a mating cable that has been previously wired for a 3 wire solid state switch, as it will short the MRQ switch.

### MSK, MSKX, MSKQ (Sinking, Solid State)



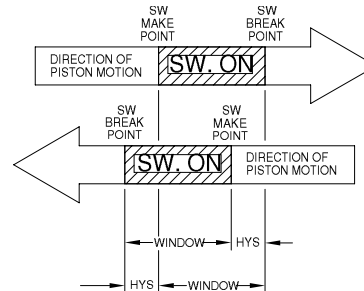
### MSC, MSCX, MSCQ (Sourcing, Solid State)



Color Codes	
Brown	(+) Positive
Black	Output
Blue	(-) Negative

## Hysteresis and Operating Window

Original Line Cylinder Window Switch Comparisons for Mini GMR and Mini Reed Switches					
Bore	Window		Maximum Hysteresis	Repeatability	
	Mini GMR	Mini Reed			
007	5/16"	.250"	.350"	.040"	±.010"
01	7/16"	.275"	.375"	.040"	±.010"
02	9/16"	.350"	.450"	.040"	±.010"
04	3/4"	.375"	.475"	.045"	±.010"
06	7/8"	.375"	.500"	.045"	±.010"
09	1-1/16"	.425"	.550"	.045"	±.010"
12	1-1/4"	.450"	.575"	.050"	±.010"
17	1-1/2"	.450"	.575"	.050"	±.010"
24	1-3/4"	.450"	.575"	.050"	±.010"
31	2"	.450"	.575"	.050"	±.010"
50	2-1/2"	.450"	.575"	.050"	±.010"
70	3"	.500"	.650"	.050"	±.010"



Pneu-Turn Cylinder Window for Mini GMR and Mini Reed Switches						
Bore	Window		Maximum Hysteresis		Repeatability	
	MS/MSK/MSC	Mini Reed MR	MS/MSK/MSC	Mini Reed MR	MS/MSK/MSC	Mini Reed MR
9/16"	73	93	8	9	2	4
3/4"	57	75	7	8	1.5	3
1-1/16"	57	75	6	7	1.5	3
1-1/2"	47	60	5	6	1	2
2"	33	42	4	5	.75	1.5

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.

Bore/Rotation	9/16"	3/4"	1-1/16"	1-1/2"	2"
45°	\$4.01	\$4.02	\$4.02	\$4.02	\$4.08
90°	\$4.10	\$4.20	\$4.20	\$4.30	\$4.40
180°	\$4.02	\$4.08	\$4.08	\$4.04	\$4.05
270°	\$4.20	\$4.30	\$4.40	\$4.50	\$4.80
360°	\$4.08	\$4.05	\$4.05	\$4.07	\$5.00

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

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.



## 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?**

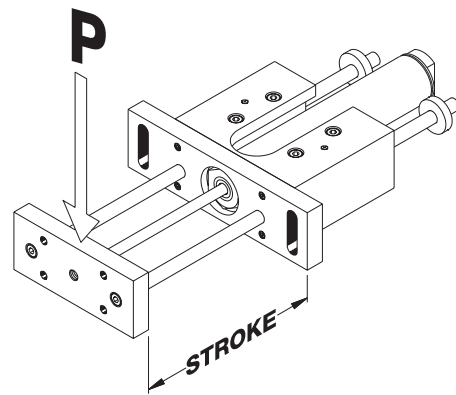
\_\_\_\_\_ (in.)

**4. How will the Linear Thruster be mounted?**

- Horizontally.  
 Vertically, tooling plate at top.  
 Vertically, tooling plate at bottom.

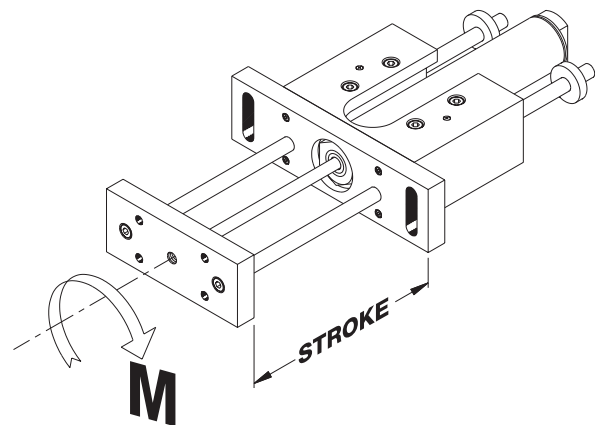
**5. What kind of force does the load place on the tooling plate?**

- Side load \_\_\_\_\_ (lbs)



**Maximum Side Load**

- Moment \_\_\_\_\_ (lbs)



**Maximum Moments**

## 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:** \_\_\_\_\_

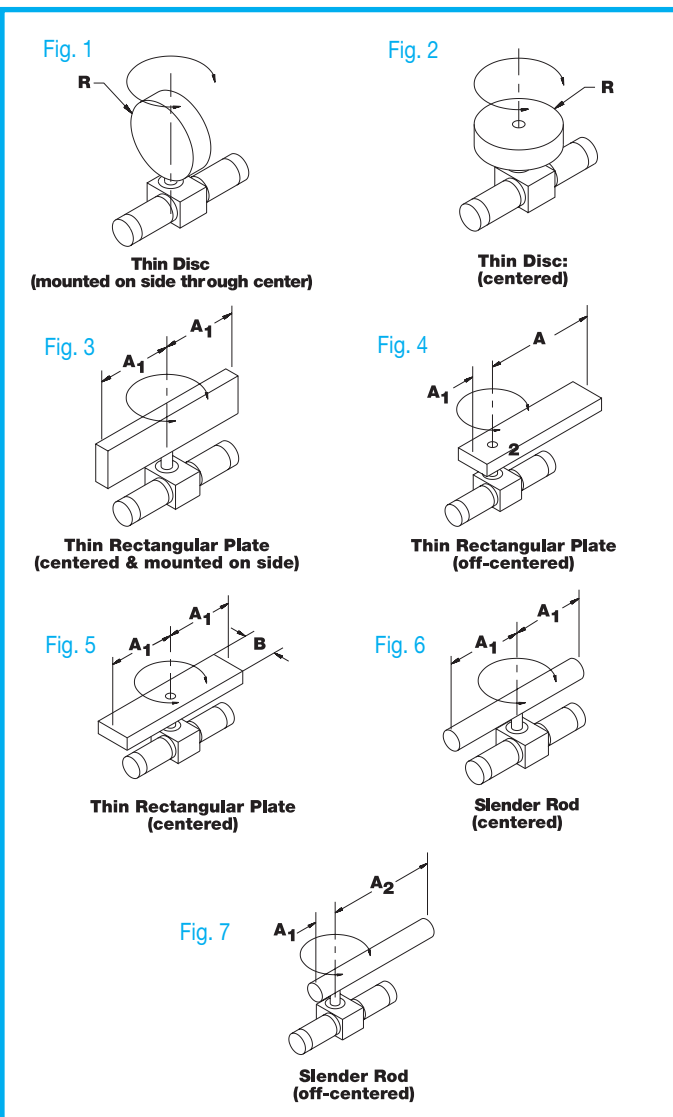
**Your Name:** \_\_\_\_\_

**Company:** \_\_\_\_\_

**Address:** \_\_\_\_\_

**Phone:** \_\_\_\_\_

**Fax:** \_\_\_\_\_



**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

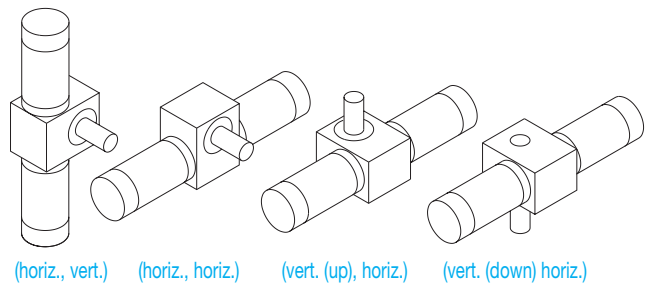
**Dimensions applicable to your lever arm:**  
 Radius \_\_\_\_\_ in. A1 \_\_\_\_\_ in.  
 A2 \_\_\_\_\_ in. B \_\_\_\_\_ in.

**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)**



**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 \_\_\_\_\_

Flow Controls

Linear Thrusters

Pneu-Turn Rotary Actuators

Ultraan Cylinders

Shock Absorbers

Pneu Moment (Pneumatic Actuators)

Transition Plates

Multi-Axis Configurations

Position Sensing Switches

Application Checklist

## Ultran and High Load Ultran 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:** \_\_\_\_\_

**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 center of the cylinder?**

a. Ultran \_\_\_\_\_ (in.)

b. Ultran Slide \_\_\_\_\_ (in.)

c. High Load Ultran \_\_\_\_\_ (in.)

(See page10 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:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## 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)

Flow Controls

Linear Thrusters

Pneu-Turn Rotary Actuators

Ultraan Cylinders

Shock Absorbers

Pneu Moment (Pneumatic Actuators)

Transition Plates

Multi-Axis Configurations

Position Sensing Switches

Application Checklist

## 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:	<input type="checkbox"/>	<input type="checkbox"/>
Coupled:	<input type="checkbox"/>	<input type="checkbox"/>
Coupled:	<input type="checkbox"/>	<input type="checkbox"/>
_____:	<input type="checkbox"/>	<input type="checkbox"/>

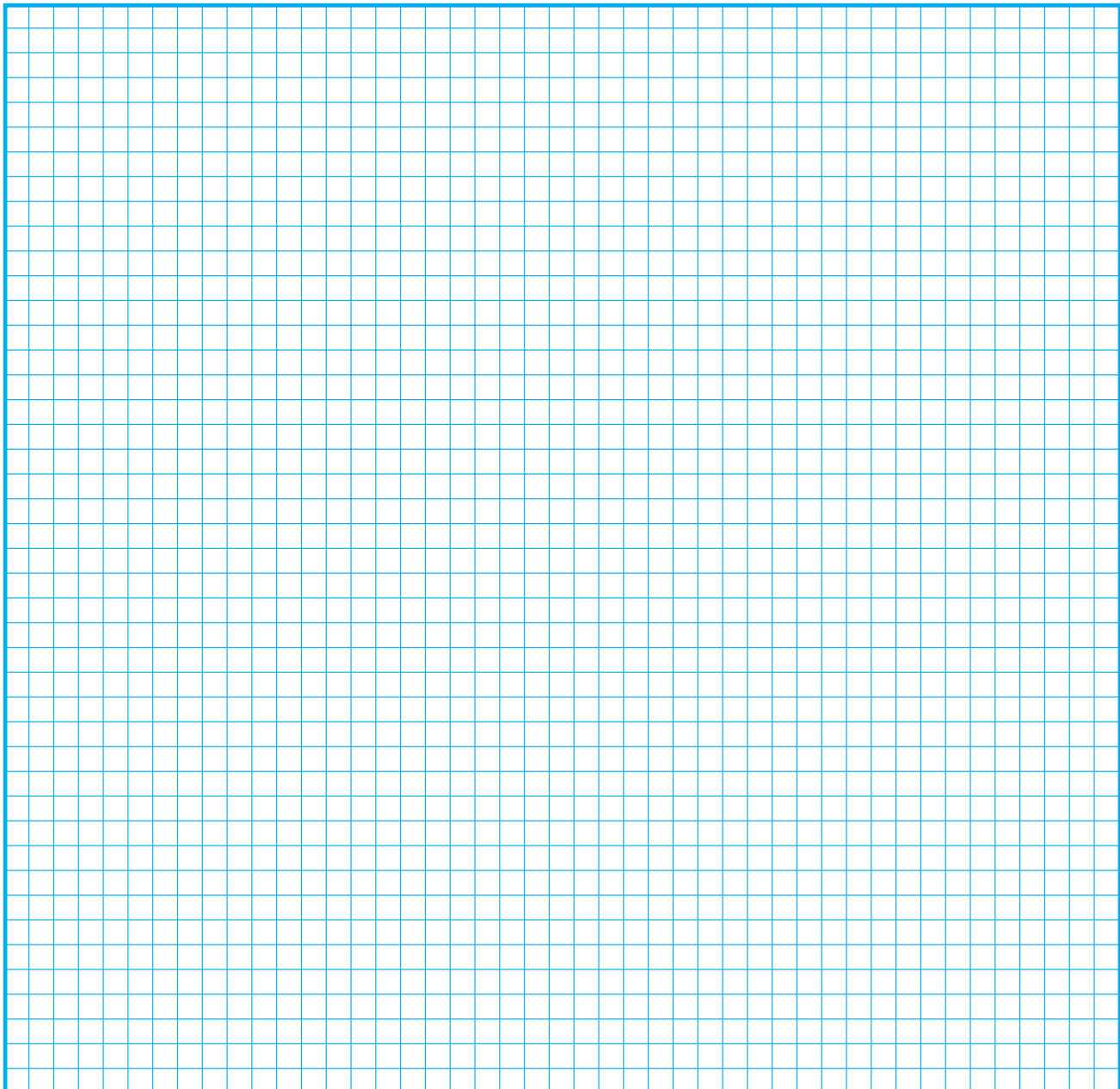
**8. Explain the sequence of movement you have in mind for the system.**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## 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.



Flow  
Controls

Linear  
Thrusters

Pneu-Turn  
Rotary Actuators

Ultram  
Cylinders

Shock  
Absorbers

Pneu Moment  
(Pneumatic Actuators)

Transition  
Plates

Multi-Axis  
Configurations

Position Sensing  
Switches

Application  
Checklist