Related Products

Bimba's pneumatic motion products work with a variety of supporting and supplementary products, including flow controls, boosters, reservoirs, and much more.

Contents

Materials of Construction (FQPS Models)

Adjusting Knob and Thread:	Brass (RoHS approved)
Body:	Thermoplastic Polymer
Tubing:	Nylon and polyurethane tubing
Maximum Operating Pressure:	150 PSI air only
Operating Temperature Range:	30° F to 140° F (0° C to 60° C)

Materials of Construction (FCP Models)

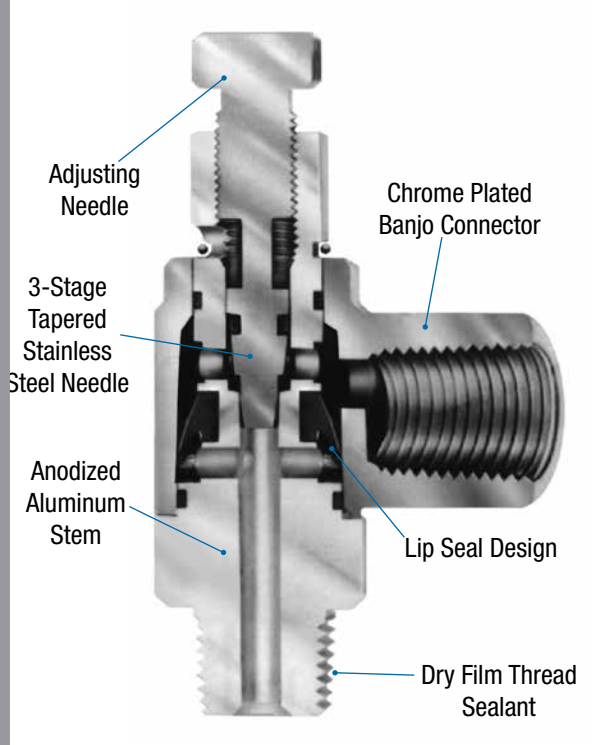
Banjo Connector:	Chrome plated, zinc die cast
Banjo Retaining Ring:	Zinc plated steel
Stem:	High strength anodized aluminum alloy
Adjusting Needle:	Stainless steel
"O" Rings and Lip Seal:	Buna N
Maximum Operating Pressure:	150 PSI air only
Operating Temperature Range:	-20° to 200° F (-25° C to 95° C)

Materials of Construction (FQP Models)

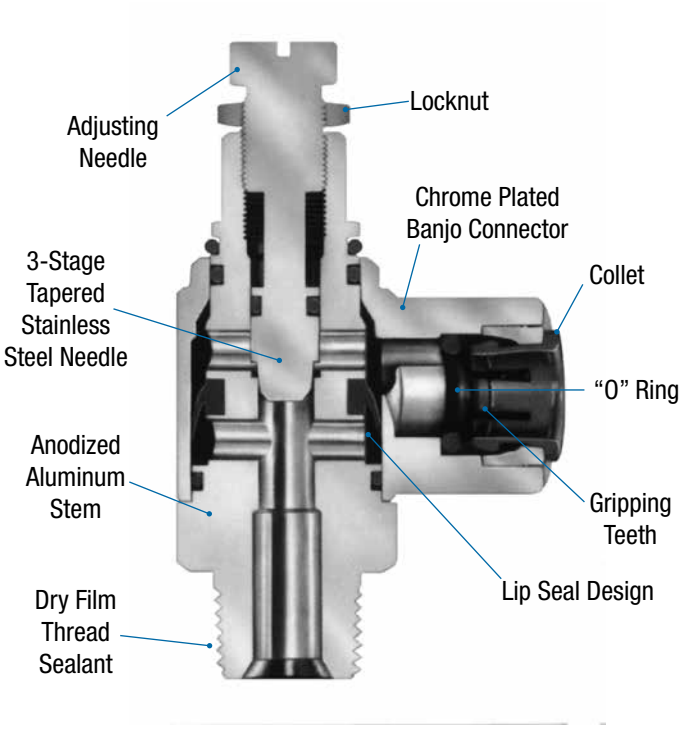
Banjo Connector:	Chrome plated, zinc die cast
Banjo Retaining Ring:	Zinc plated steel
Stem:	High strength anodized aluminum alloy
Adjusting Needle:	Stainless steel
O-Rings and Lip Seal:	Buna N
Collet:	Acetal copolymer
Gripping Teeth:	Stainless steel
Collet Retainer (if applicable):	Brass
Locknut:	416 Stainless steel
Tube Types:	All plastic tubing, including nylon and polyethylene
Maximum Operating Pressure:	150 PSI air only
Operating Temperature Range:	14° to 167° F (-25°C to 75°C)

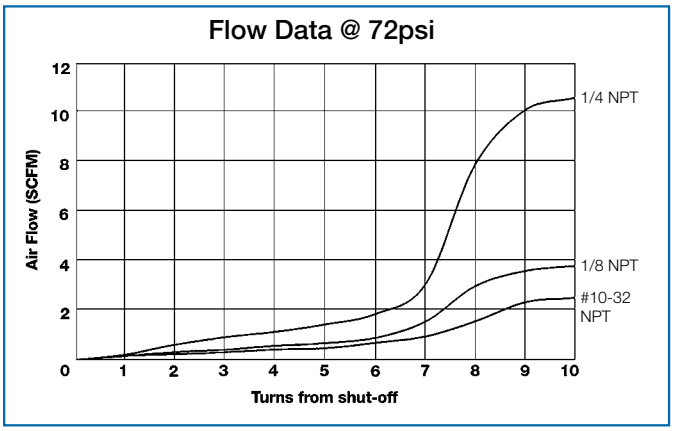
How to Specify

FCP

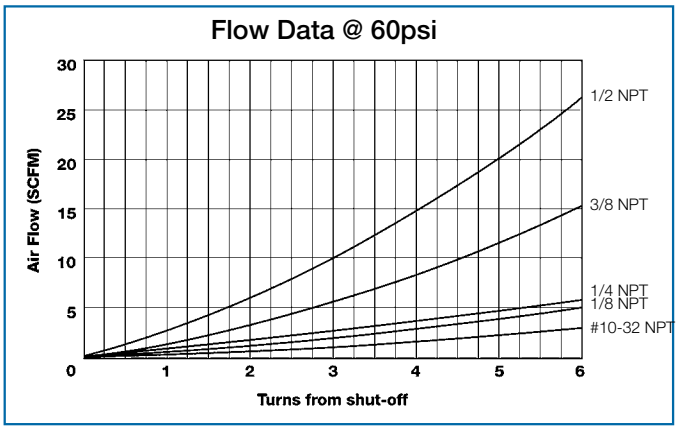


FQP





FQPS Series



FQP & FCP Series

C_v Factors for Bimba Flow Controls

The following estimated C_v factors apply to Bimba Flow Controls in both the FCP and FQP Series.

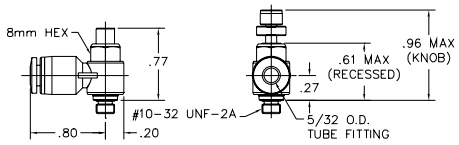
Models	Free Flow	Controlled Flow
FCP1, FCP1K, FCP1L, FQP1, FQP1K	0.12	0.09
FCP2, FCP2K, FCP2L, FQP21L, FQP2, FQP2K, FQP21K	0.24	0.21
FCP4, FCP4K, FCP4L, FQP4, FQP4K, FQP44, FQP44K	0.50	0.44
FCP6, FCP6K, FCP6L, FQP6, FQP6K	0.91	0.73
FCP8, FCP8K, FCP8L, FQP8, FQP8K	1.33	1.19

Bimba Miniature Quik-Flo® Flow Controls – FQPS Series

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

FQPS1

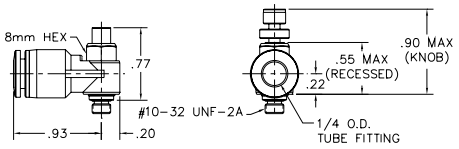
FQPS1K



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

FQPS12

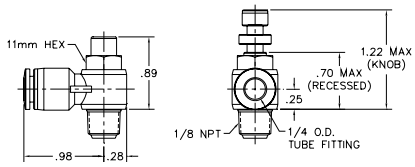
FQPS12K



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

FQPS2

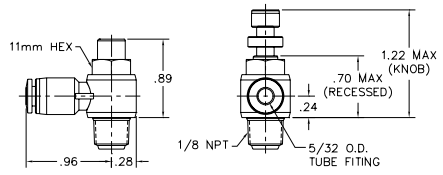
FQPS2K



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

FQPS21

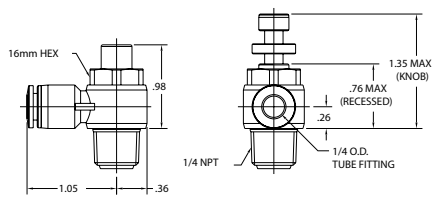
FQPS21K



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

FQPS44

FQPS44K



How to Specify

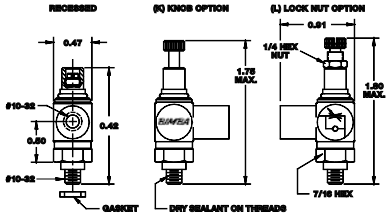
Bimba Flow Controls – FCP Series

For 10-32 port:

FCP1

FCP1K

FCP1L

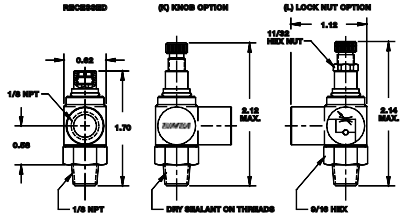


For 1/8 port:

FCP2

FCP2K

FCP2L

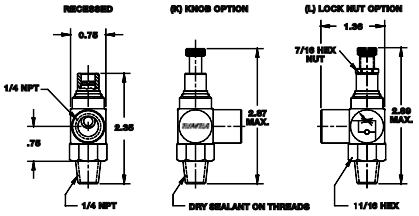


For 1/4 port:

FCP4

FCP4K

FCP4L

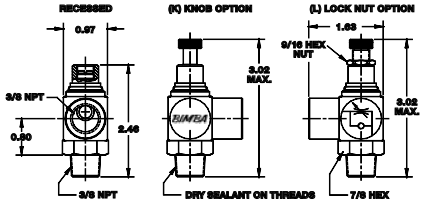


For 3/8 port:

FCP6

FCP6K

FCP6L

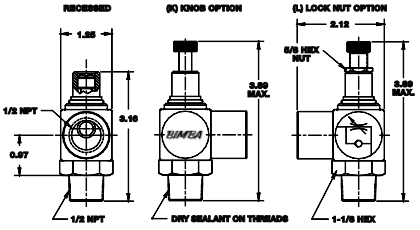


For 1/2 port:

FCP8

FCP8K

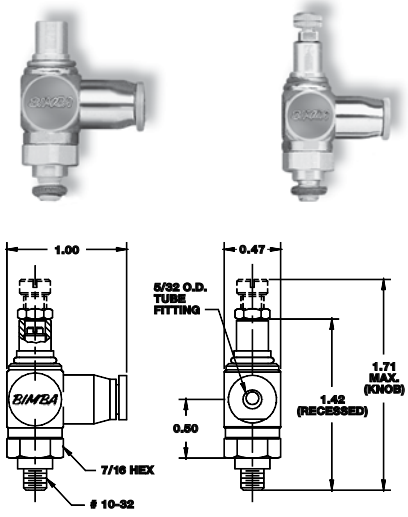
FCP8L



Bimba Quik-Flo® Flow Controls – FQP Series

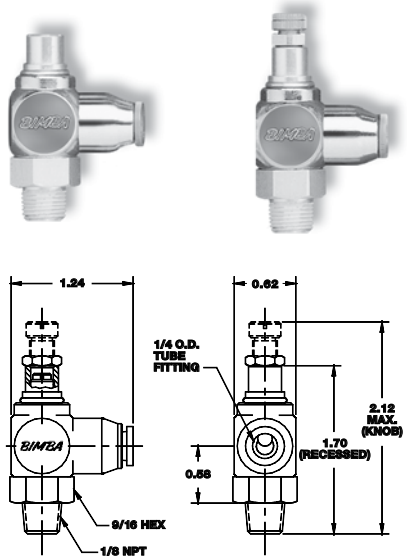
For 10-32 port, 5/32" OD tubing:

FQP1 FQWP1K



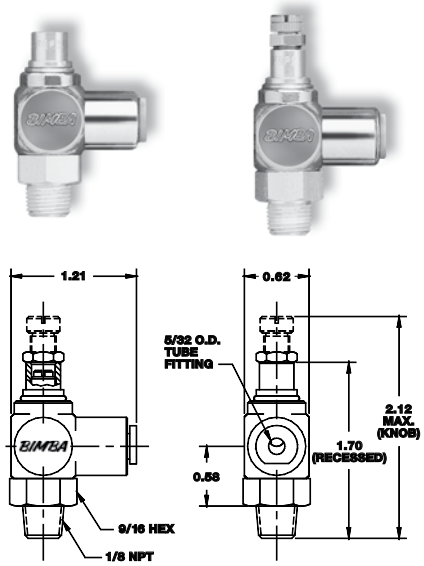
For 1/8 port, 1/4" OD tubing:

FQP2 FQP2K



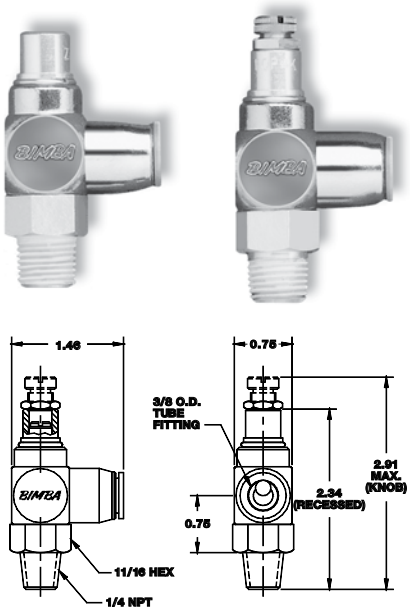
For 1/8 port, 5/32" OD tubing:

FQP21 FQP21K



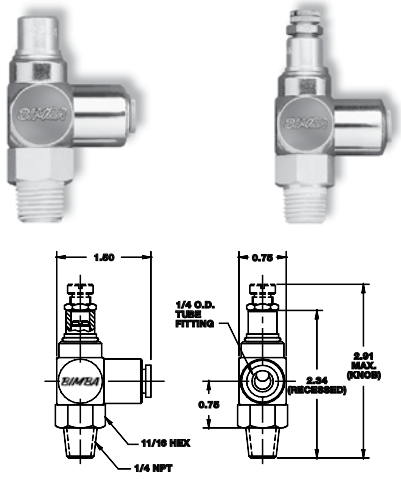
For 1/4 port, 3/8" OD tubing:

FQP4 FQP4K



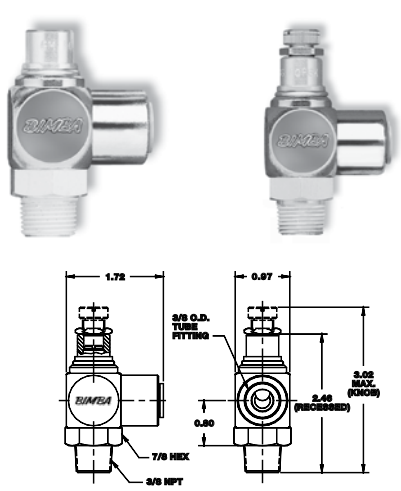
For 1/4 port, 1/4" OD tubing:

FQP44 FQP44K



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

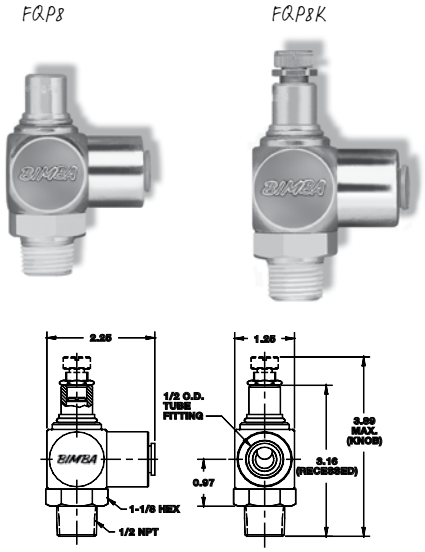
FQP6 FQP6K



How to Specify

Bimba Quik-Flo® Flow Controls – FQP Series

For 1/2 port, 1/2" OD tubing:



Bimba Needle Valves

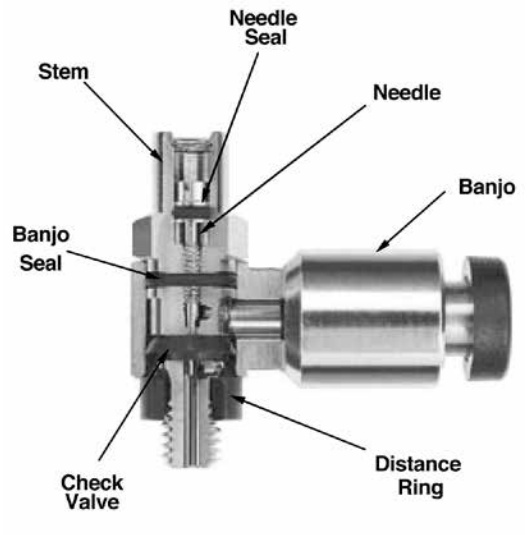
Bimba offers a range of Quik-Flo® Needle Valves, allowing for controlled flow of both the air intake and exhaust through the same valve. A needle valve can control a double acting cylinder's extension and retraction by controlling the volume of air entering the cylinder and the volume of air leaving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

For additional dimensional information, reference Quik-Flo® Flow Controls on pages 559-561. For example, reference FQP1 for QNV1 dimensions.

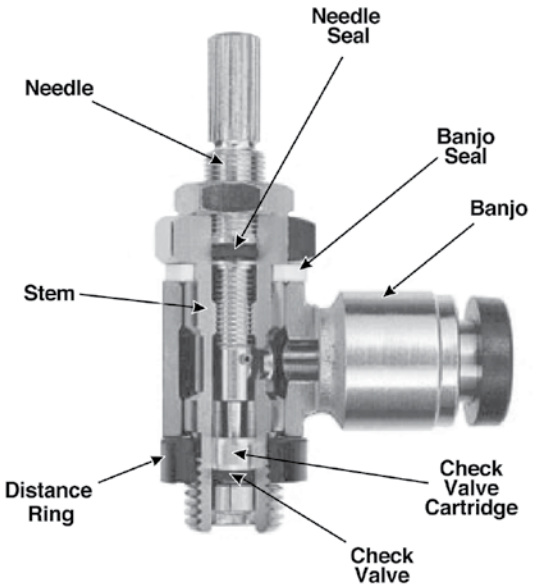
Model	Price	Tube Size	Port Size	C_v
QNV1	$13.52	5/32"	#10-32	.09
QNV1K	15.65	5/32"	#10-32	.09
QNV2	16.12	1/4"	1/8" NPT	.21
QNV2K	18.56	1/4"	1/8" NPT	.21
QNV44	20.59	1/4"	1/4" NPT	.44
QNV44K	23.50	1/4"	1/4" NPT	.44
QNV6	25.53	3/8"	3/8" NPT	.73
QNV6K	29.02	3/8"	3/8" NPT	.73

Metric Flow Control Specifications (FCPM Models)

Fluid:	Air
Maximum Operating Pressure:	10 bar (145 PSI)
Minimum Operating Pressure:	0.1 bar (1.5 PSI)
Temperature Range:	-10° C to +80°C (-14° F to +176° F)



Material Specifications for M5	
Banjo	Nickel Plated Brass
Stem	Nickel Plated Brass
Needle	Nickel Plated Brass
Check Valve	NBR (Buna-N)
Needle Seal	NBR (Buna-N)
Banjo Seal	NBR (Buna-N)
Distance Ring	Reinforced Nylon

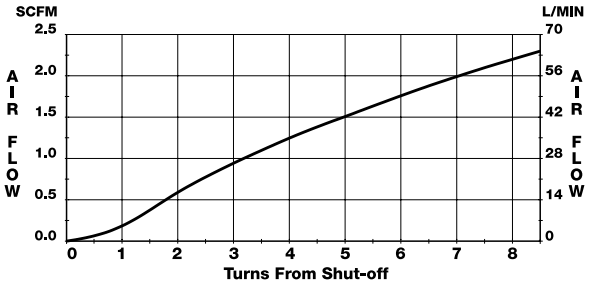


Material Specifications for G1/8" and G1/4"	
Banjo	Nickel Plated Brass
Stem	Nickel Plated Brass
Needle	Nickel Plated Brass
Check Valve	NBR (Buna-N)
Check Valve Cartridge	Brass
Needle Seal	NBR (Buna-N)
Banjo Seal	Reinforced Nylon
Distance Ring	Reinforced Nylon

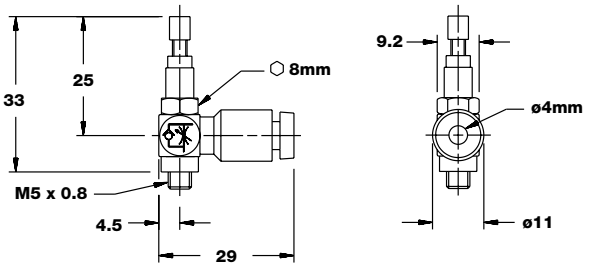
Metric Flow Control Specifications (FCPM Models)

M5 Port Mounted Flow Control Valves

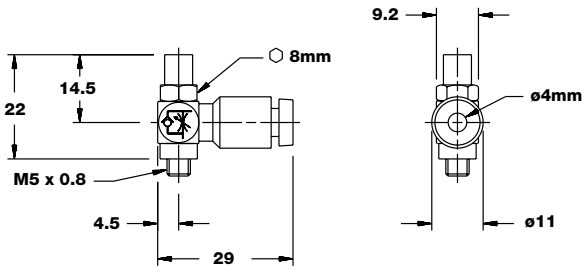
M5 Controlled Flow Chart (at 5 Bar)
Maximum Free Flow Capacity 91–122 l/min



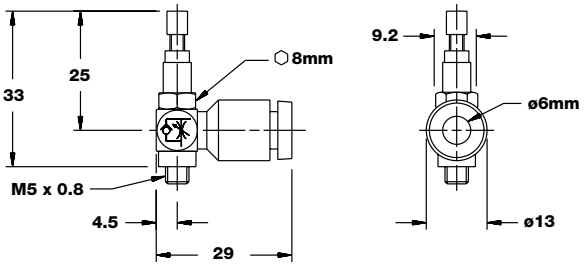
For M5 port, FCPM-1-Q4-L
4mm OD tubing
2mm ID tubing



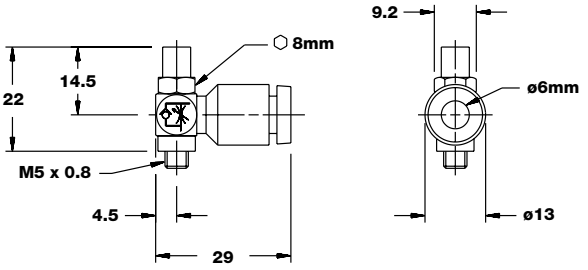
For M5 port, FCPM-1-Q4-R
4mm OD tubing
2mm ID tubing



For M5 port, FCPM-1-Q6-L
6mm OD tubing
4mm ID tubing

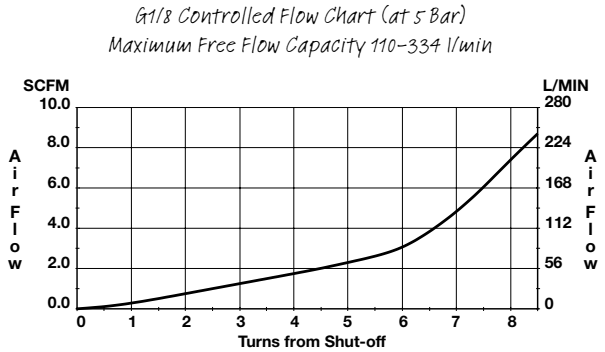


For M5 port, FCPM-1-Q6-R
6mm OD tubing
4mm ID tubing

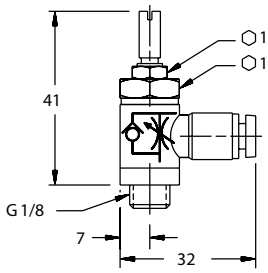


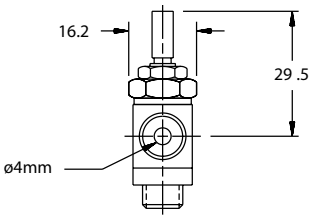
Metric Flow Control Specifications (FCPM Models)

G1/8 Port Mounted Flow Control Valves

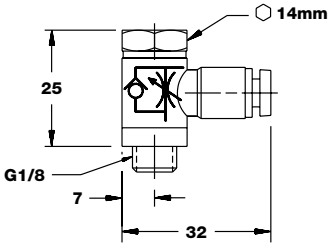


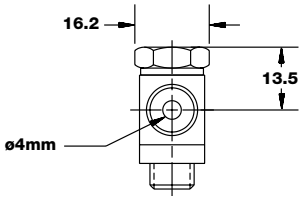
For G-1/8 port, FCPM-2-Q4-L
4mm OD tubing
2mm ID tubing



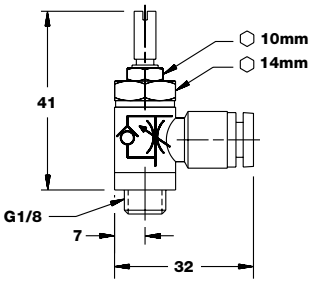


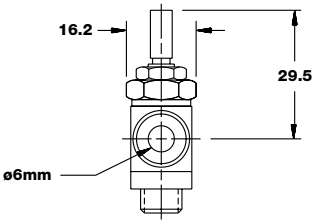
For G-1/8 port, FCPM-2-Q4-R
4mm OD tubing
2mm ID tubing



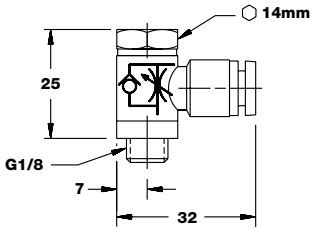


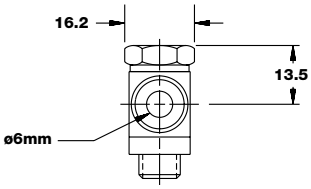
For G-1/8 port, FCPM-2-Q6-L
6mm OD tubing
4mm ID tubing





For G-1/8 port, FCPM-2-Q6-R
6mm OD tubing
4mm ID tubing

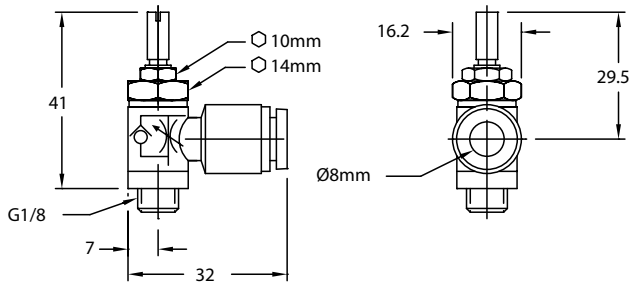




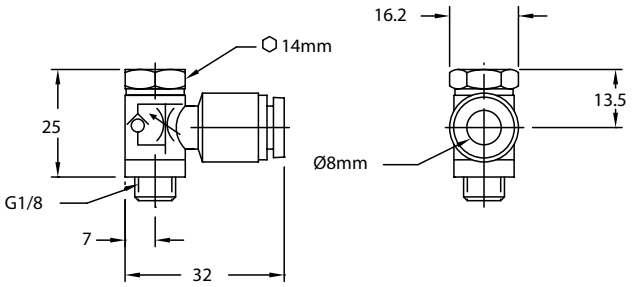
Metric Flow Control Specifications (FCPM Models)

G1/8 Port Mounted Flow Control Valves

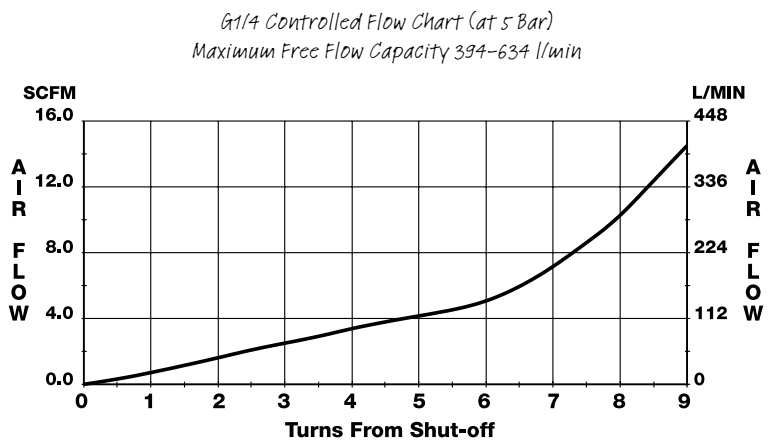
For G-1/8 port, FCPM-2-Q8-L
8mm OD tubing
6mm ID tubing



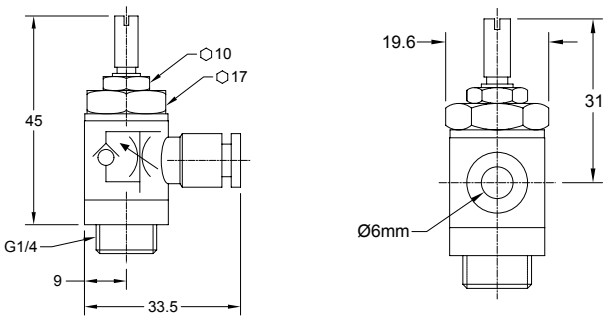
For G-1/8 port, FCPM-2-Q8-R
8mm OD tubing
6mm ID tubing



G1/4 Port Mounted Flow Control Valves



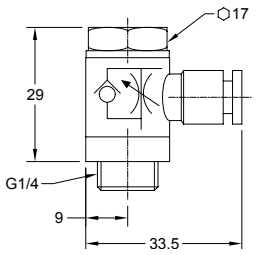
For G1/4 port, FCPM-4-Q6-L
6mm OD tubing
4mm ID tubing

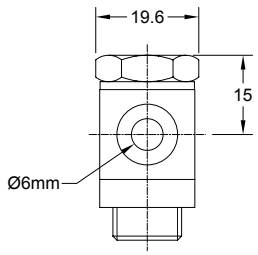


Metric Flow Control Specifications (FCPM Models)

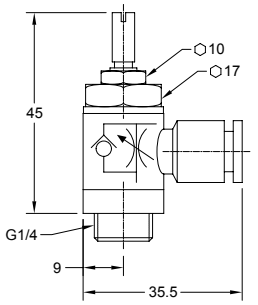
G1/4 Port Mounted Flow Control Valves

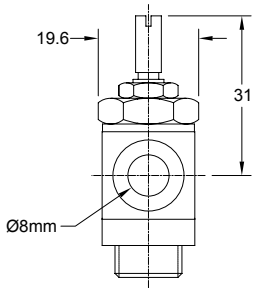
For G1/4 port, FCPM-4-Q6-R
6mm OD tubing
4mm ID tubing



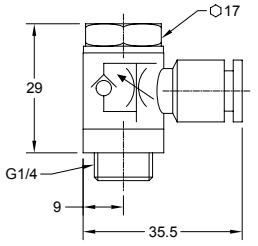


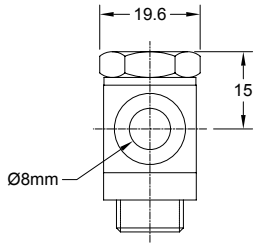
For G1/4 port, FCPM-4-Q8-L
8mm OD tubing
6mm ID tubing





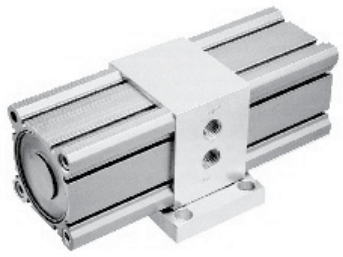
For G1/4 port, FCPM-4-Q8-R
8mm OD tubing
6mm ID tubing





Product Features

Basic 2:1 Air Booster



Bimba Basic 2:1 Air Boosters are designed to amplify inadequate air pressure applications. The unit is a self-contained design of integral valve components that reciprocate pistons to double the output pressure. Increasing the output air pressure will increase the output force of a pneumatic cylinder where space constraints exist.

High Flow 2:1 Air Booster

The Bimba High Flow 2:1 Air Booster doubles the air pressure at a greater flow rate than our basic booster model. The unit is a self-contained system of integral valve components that reciprocate pistons to increase the output pressure. This is a compact solution to deliver the output force required of a pneumatic cylinder under limited space conditions.

Air Reservoir

Bimba reservoirs are available in four different configurations. Traditional reservoirs are available with three different end cap materials, and an extruded aluminum body version is offered with the option of adding multiple ports for manifold applications.

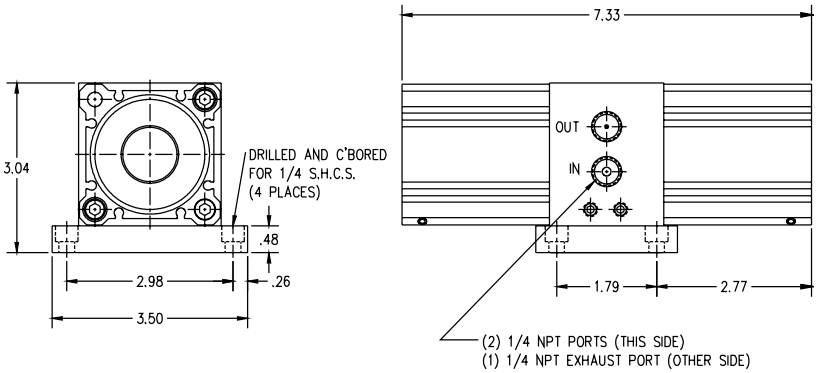
Aluminum End Caps
A Series

Plastic End Caps
P Series

Stainless Steel End Caps
S Series

Extruded Body with
Optional Ports
E Series

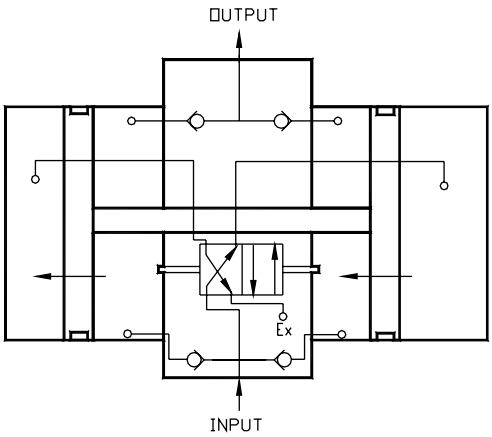
Basic 2:1 Air Booster Specifications

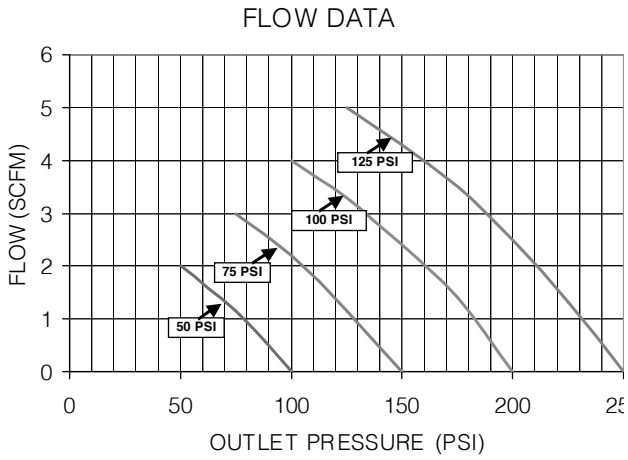


Engineering Specifications

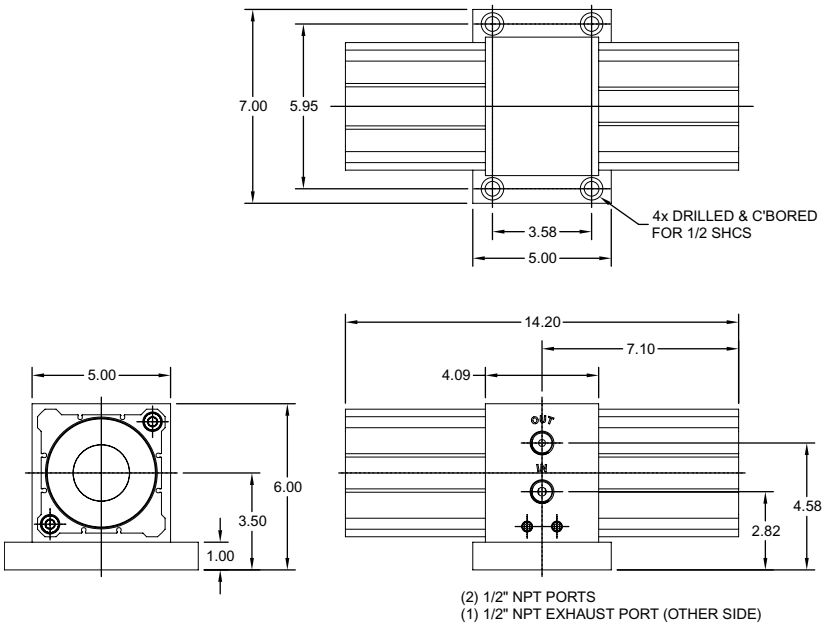
Maximum Input Pressure:	125 PSI
Operating Temperature:	15° to 160° F
Lubrication:	HT-99 oil
Bodies and Center Section:	Aluminum; Hard Coat with PTFE
Mounting Plate:	Anodized Aluminum
Estimated Charge Time:	28 seconds per 1 gallon reservoir

NOTE: Bimba Air Boosters are designed for intermittent duty usage such as maintaining pressure in an air reservoir. Continuous cycling decreases seal life.





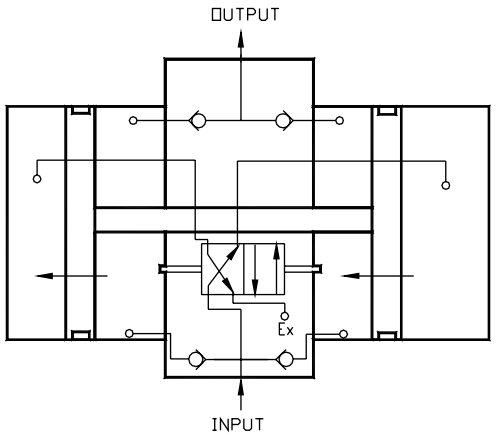
High Flow 2:1 Air Booster Specifications

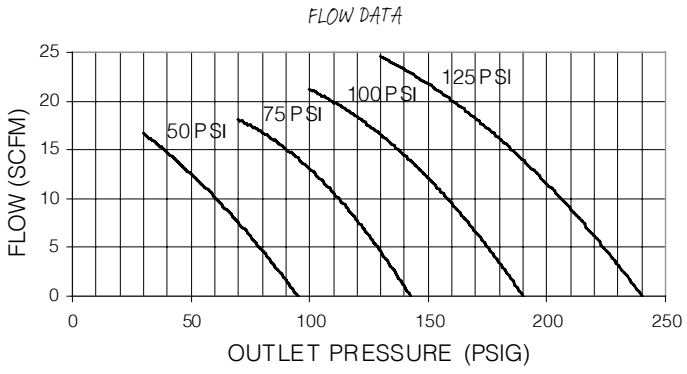


Engineering Specifications

Maximum Input Pressure:	125 PSI
Operating Temperature:	15° to 160° F
Lubrication:	HT-99 oil
Bodies and Center Section:	Aluminum; Hard Coat with PTFE
Mounting Plate:	Anodized Aluminum

NOTE: Bimba Air Boosters are designed for intermittent duty usage such as maintaining pressure in an air reservoir. Continuous cycling decreases seal life.

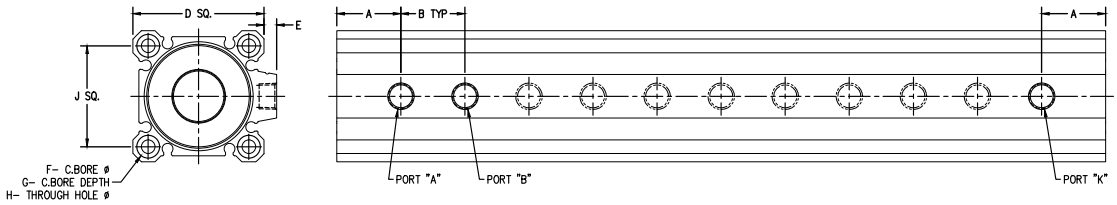




Air Reservoirs

Dimensions

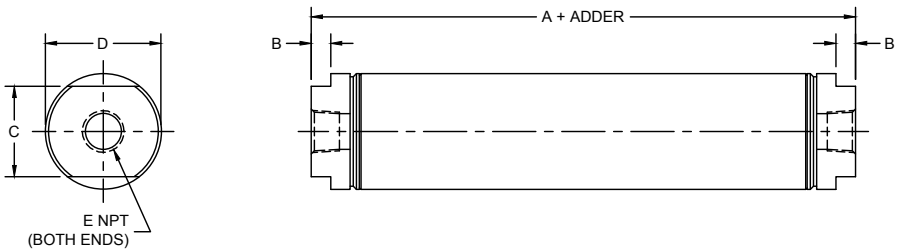
Series E



Bore	A	B	D	E	F
20mm (3/4")	25.4mm (1")	25.4mm (1")	36.3mm (1.43")	0mm (0")	9mm (0.35")
25mm (1-1/16")	25.4mm (1")	25.4mm (1")	40.4mm (1.59")	0mm (0")	9mm (0.35")
40mm (1-1/2")	25.4mm (1")	25.4mm (1")	52.3mm (2.06")	5.08mm (0.20")	9mm (0.35")
63mm (2-1/2")	25.4mm (1")	25.4mm (1")	77.5mm (3.05")	7.11mm (0.28")	14.1mm (0.56")
100mm (4")	25.4mm (1")	25.4mm (1")	117.6mm (4.63")	6.60mm (0.26")	17.5mm (0.69")

Bore	G	H	J	Port
20mm (3/4")	7.0mm (0.28")	5.5mm (0.22")	25.5mm (1.00")	M5 X 0.8 (#10-32)
25mm (1-1/16")	7.0mm (0.28")	5.5mm (0.22")	28.0mm (1.10")	M5 X 0.8 (#10-32)
40mm (1-1/2")	7.0mm (0.28")	5.5mm (0.22")	40.0mm (1.57")	G - 1/8 (NPT 1/8)
63mm (2-1/2")	10.5mm (0.41")	8.8mm (0.35")	60.0mm (2.36")	G - 1/4 (NPT 1/4)
100mm (4")	13.5mm (0.53")	11.0mm (0.43")	94.0mm (3.70")	G - 3/8" (NPT 3/8)

Series A, P, S



Bore	A	B	C	D	E (ports)
3/4"	1.94"	0.18"	0.63"	0.81"	1/8 NPT
1-1/16"	2.38"	0.19"	0.88"	1.13"	1/8 NPT
1-1/4"	1.38"	0.25"	0.88"	1.33"	1/8 NPT
1-1/2"	2.25"	0.31"	0.88"	1.56"	1/8 NPT
2"	2.88"	0.31"	1.25"	2.08"	1/4 NPT
2-1/2"	2.88"	0.31"	1.75"	2.61"	1/4 NPT
3"	3.19"	0.31"	2"	3.13"	3/8 NPT

Air Reservoirs

Weights and Volumes
All Series

Bore	Model	Base Weight (lbs)	Weight Adder per inch of length (lbs)	Base Volume (cu. in)	Volume Adder (cu. in)
3/4"	D-1022-A	0.06	0.02	0.43	0.45
	D-1022-S	0.13		0.43	0.45
	D-1022-P	0.04		0.47	0.45
	D-1022-E	0.19	0.10	0.78	0.47
1-1/16"	D-1500-A	0.14	0.03	1.06	0.89
	D-1500-S	0.33		1.06	0.89
	D-1500-P	0.08		1.21	0.89
	D-1500-E	0.23	0.12	1.18	0.74
1-1/4"	D-27715-A	0.13	0.03	0.39	1.23
	D-27715-S	0.36		0.39	1.23
1-1/2"	D-5096-A	0.23	0.04	1.95	1.77
	D-5096-S	0.57		1.95	1.77
	D-5096-P	0.14		1.97	1.77
	D-5096-E	0.31	0.15	3.05	1.90
2"	D-2485-A	0.49	0.06	4.74	3.15
	D-2485-S	1.33		4.31	3.15
	D-2485-P	0.31		4.74	3.15
2-1/2"	D-11846-A	0.77	0.08	7.14	4.92
	D-11846-S	1.76		7.99	4.92
	D-11846-E	0.64	0.32	6.84	4.71
3"	D-17469-A	1.40	0.14	10.07	7.09
	D-17469-S	3.65		10.07	7.09
4"	D-116067-E	1.44	0.72	15.43	11.95

Materials and Specifications

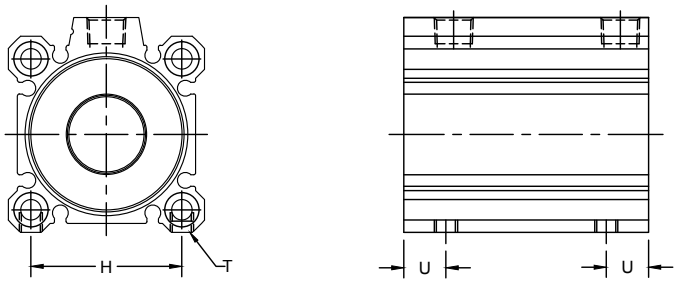
Series	End Cap Material	Body Material	Maximum Pressure	Maximum Temperature
A	6000 Series Aluminum	304 Stainless Steel	250 PSI	400º F
S	303 Stainless Steel	304 Stainless Steel	250 PSI	400º F
P	Delrin®	304 Stainless Steel	100 PSI	32º F to 160º F
E	Aluminum	Anodized Aluminum	200 PSI	250º F

Mounting Options (Air Reservoirs)

Series E

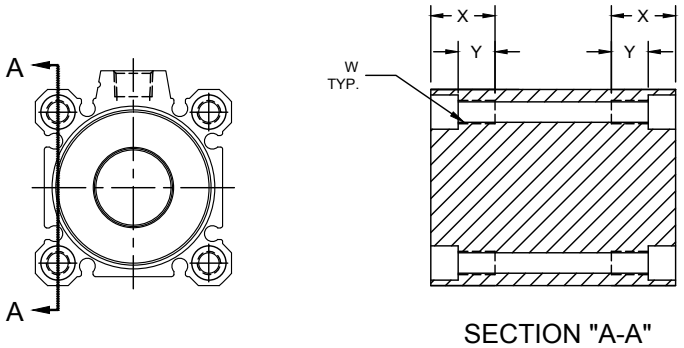
Threaded Bottom Mount (-1)

Bore	H	T	U
20mm (3/4")	25.5mm (1.00")	M6 x 1.0 6H (1/4-20 UNC-2B)	11.2mm (0.44")
25mm (1")	28.0mm (1.10")	M6 x 1.0 6H (1/4-20 UNC-2B)	11.2mm (0.44")
40mm (1-1/2")	40.0mm (1.57")	M6 x 1.0 6H (1/4-20 UNC-2B)	11.2mm (0.44")
63mm (2-1/2")	60.0mm (2.36")	M10 x 1.5 6H (7/16-14 UNC-2B)	16.8mm (0.66")
100mm (4")	94.0mm (3.70")	M12 x 1.75 6H (1/2-13 UNC-2B)	20.8mm (0.82")



Threaded Front/Rear Mount (-3)

Bore	W	X	Y
20mm (3/4")	M6 x 1.0 6H (1/4-20 UNC-2B)	17.0mm (0.67")	10.0mm (0.39")
25mm (1")	M6 x 1.0 6H (1/4-20 UNC-2B)	17.0mm (0.67")	10.0mm (0.39")
40mm (1-1/2")	M6 x 1.0 6H (1/4-20 UNC-2B)	17.0mm (0.67")	10.0mm (0.39")
63mm (2-1/2")	M10 x 1.5 6H (7/16-14 UNC-2B)	28.5mm (1.12")	18.0mm (0.71")
100mm (4")	M12 x 1.75 6H (1/2-13 UNC-2B)	35.6mm (1.40")	22.0mm (0.87")



SECTION "A-A"

How to Order

Basic 2:1 Air Booster

Bimba Basic 2:1 Air Boosters can be ordered using a standard part number. They are non-configurable; please contact the factory for customization options.

CSS-00118-A

High Flow 2:1 Air Booster

Bimba High Flow 2:1 Air Boosters can be ordered using a standard part number. They are non-configurable; please contact the factory for customization options.

CSS-00416-A

Air Reservoirs

Bimba Air Reservoirs can be configured using basic alphanumeric clusters. To create a basic part number, choose bore size, series, length, port locations, mounting options, and port/mounting threads.

D - 1500 - A - 4 - _ _ _ _ * - _ _ *

Bore Size	
1022	3/4"
1500	1-1/16"
27715	1-1/4"
5096	1-1/2"
2485	2"
11846	2-1/2"
17469	3"
116067	4"

Series	
A	Aluminum end caps (3/4"-3" bores only)
E	Extruded aluminum manifold designs (3/4", 1-1/16", 1-1/2", 2-1/2", and 4" bore only)
P	Plastic end caps (3/4", 1-1/16", 1-1/2", and 2" bore only)
S	Stainless steel end caps (3/4"-3" bore only)

Length	
Series A, P, S	1"-50" (.01" increments)
Series E	1"-11" (1" increments)

Port Locations**
The number of ports cannot exceed the model's length.

* Ports located on manifold style E: The total number of ports is signified by the number of letters shown (ex.: A C D = three ports). The location of ports is signified by the letter (see drawing). Location A = A, Location B = B, etc.
** Required for Extruded Body "E" series only.

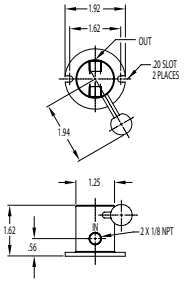
Mounting Options and Port/Mounting Threads**	
1	Threaded bottom mounting and metric port and mounting threads
1E	Threaded bottom mounting and imperial port and mounting threads
3	Threaded front/rear mounting and metric port and mounting threads
3E	Threaded front/rear mounting and imperial port and mounting thread
5	Basic counterbored mounting holes and metric port threads
5E	Basic counterbored mounting holes and imperial threads (previous "standard" design)

3 and 4 Way Disc Air Valves

Model 3MV8

3 Way Disc Air Valve – Operates single acting cylinders. Full 1/8" orifice - 1/8" NPT inlet and outlet ports. To operate, a precision lapped disc is rotated through 60° by means of a ball handle which will hold set position. To repair, remove handle and retaining ring.

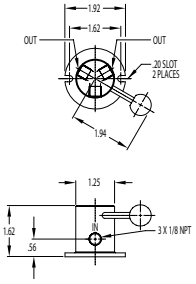
Weight: .22



Model 4MV8

4 Way Disc Air Valve – Operates double acting cylinders. Ball handle will rotate through 120° and will hold set position – 1/8" NPT ports are located 120° apart – orifice 1/8" diameter. To repair, remove handle and retaining ring.

Weight: .22



Shock Absorbers

Shock Absorbers
Shock Absorbers can be used to decelerate loads or to absorb excess Kinetic Energy.

Calculating Kinetic Energy
When a load is being moved by the High Load Ultran, kinetic energy is generated. This energy must be absorbed either by the High Load Ultran or by some external device. If the energy is to be absorbed by the High Load Ultran, then the energy must not exceed 3.5 foot-pounds (42 inch-pounds).

Kinetic energy is defined by the formula $1/2mV^2$, where m is the mass of the load being moved and V is the speed at which the load is moving upon impact.

m is defined as W/g, where W is the known weight of the load including the weight of the carriage, and g is acceleration due to gravity. V is defined in feet per second.

Considering Total Energy
In addition to the energy generated by the moving load, other external (propelling) forces must be considered to ensure the proper use of the shock absorber. See page 577 for maximum force information. Propelling forces are those forces generated by cylinder air pressure, springs, gravity, etc. Once the energy generated by these forces is determined, it must be added to the kinetic energy generated by the moving load to determine total energy (ET) to be absorbed by the shock (see example below).

Selecting Shock Absorber Setting
The shock absorber offered for the High Load Ultran Slide is adjustable. This means that the shock absorber is capable of decelerating loads over a range of velocities. Use Graph 5 to determine the appropriate setting for your application. Some adjustment to this setting may be required to achieve the desired deceleration rate. Page 577 shows the shock absorber ratings.

Example (Total Energy):

Operating a UHL-17 at 60 psi in a horizontal application, carrying a 100-pound load at 10 inches per second end-of-stroke velocity, the total energy, ET, is determined as follows.

1. Determine kinetic energy generated by the moving load using the formula, KE = 1/2 mV2.
   m = (W + weight of carriage)/g = (7.5 + 100)/32.179 = 3.34 lbm
   V = 10 in/sec = 0.833 feet per second
   KE = 1/2 * 3.34 * 0.8332 = 1.16 foot-pounds or 13.92 inch-pounds (1.16 x 12 inches)
2. Determine the propelling forces and their respective energy.
   Force (F) = piston area * air pressure = 1.76 * 60 = 106 pounds
   Energy (E) = F * stroke of shock = 106 * 0.5 = 53 inch-pounds
3. Total Energy (ET) = 53 + 13.92 = 66.92 inch-pounds

NOTE: If the total energy (ET) of your application exceeds the allowable maximum of 100 inch-pounds for the adjustable shock absorber, the standard HS-17 shock absorber may be used. Refer to page 578 for specifications.

Bore	Carriage Weight
1-1/4" (12)	3.9 lbs.
1-1/2" (17)	7.5 lbs.

Table 2

Shock Absorber (Ultran Slide and Ultran Rodless Cylinders)

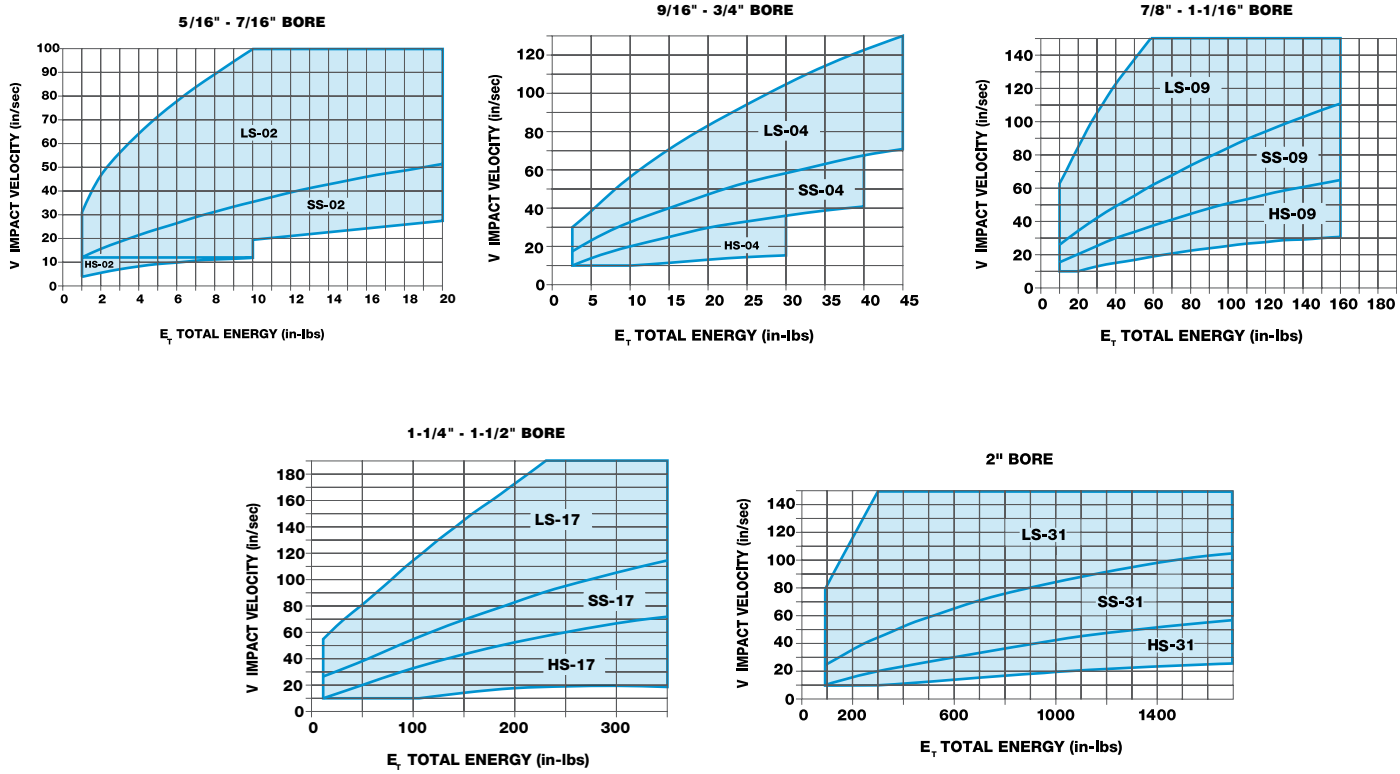
Ultran Slide

Bore	007	01	02	04	06	09	12	17	31
SF	0.250	0.250	0.410	0.410	0.630	0.630	0.880	0.880	1.560
UF1	0.077	0.150	0.249	0.442	0.601	0.887	1.227	1.767	3.142
UF2	0.285	0.385	0.805	1.565	2.195	3.140	4.750	7.530	24.380
ET	20	20	45	45	190	190	400	400	1,700
ET-C	36,000	36,000	125,000	125,000	300,000	300,000	475,000	475,000	670,000

Ultran Standard

Bore	007	01	02	04	06	09	12	17	31
SF	N/A	N/A	0.250	0.410	0.630	0.630	0.880	0.880	1.560
UF1	N/A	N/A	0.249	0.442	0.601	0.887	1.227	1.767	3.142
UF2	N/A	N/A	0.485	1.060	1.585	2.285	3.500	5.845	16.965
E_T	N/A	N/A	20	45	190	190	400	400	1,700
E_T-C	N/A	N/A	36,000	125,000	300,000	300,000	475,000	475,000	670,000

Velocity vs. Load for Shock Absorbers



*Ultran Maximum Velocity: 20 inches per second or cycle rate not to exceed 15 per minute

How to Specify

Shock Absorber (Ultran Slide and Ultran Rodless Cylinders)

For each model, dimensions and engineering specifications are the same for Light, Standard, and Heavy Duty Shock Absorbers. (LS, SS and HS model numbers).

Shock Absorber Selection Guide

Bore	Ultran	Ultran Slide
5/16" (007)	N/A	☐ S-02
7/16" (01)		
9/16" (02)	☐ S-02	☐ S-04
3/4" (04)	☐ S-04	
7/8" (06)	☐ S-09	☐ S-09
1-1/16" (09)		
1-1/4" (12)	☐ S-17	☐ S-17
1-1/2" (17)		
2" (31)	☐ S-31	☐ S-31

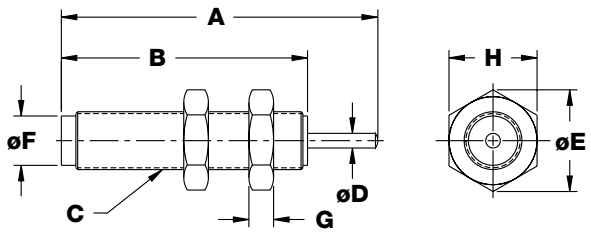
NOTE: Do not let shock absorbers bottom out. The shock should not be used as a stroke adjuster. A stop collar is needed for the shock if stroke adjustment is required.

Dimensions (in)

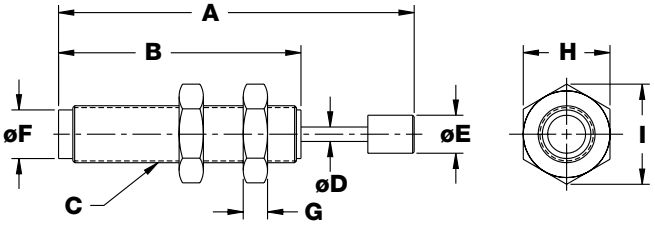
Model	A	B	C	D	E	F	G	H	I
☐ S-02	1.39	1.13	3/8-32 UNEF	0.12	N/A	0.32	0.09	0.50	0.58
☐ S-04	2.74	1.96	7/16-28 UNEF	0.12	0.40	0.39	0.16	0.56	0.65
☐ S-09	4.25	3.20	1/2-20 UNF	0.16	0.44	0.43	0.12	0.63	0.72
☐ S-17	5.13	3.76	3/4-16 UNF	0.19	0.50	0.64	0.18	0.94	1.08
☐ S-31	7.93	5.21	1-12 UNF	0.31	0.88	N/A	0.18	1.13	1.30

Model (LS, SS, HS)

☐ S-02



☐ S-04, ☐ S-09, ☐ S-17, ☐ S-31



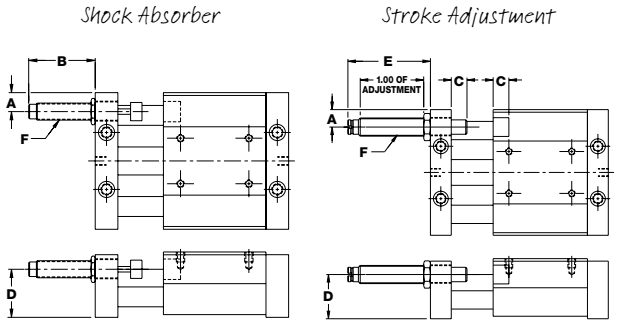
Engineering Specifications

Model	Shock Absorber Bore	(S) Stroke (in)	Thread Type	(E_T) Max. in-lbs Per Cycle	(E_T-C) Max. in-lbs Per Hour	(F_P) Max. Shock Force (lbs)	Nominal Coil Spring Force		(F_D) Max. Propelling Force (lbs)	Model Weight (oz)
							Extension (lbs)	Compression (lbs)		
☐ S-02	0.28	0.25	3/8-32 UNEF	20	36,000	160	0.65	1.13	20	0.4
☐ S-04	0.25	0.41	7/16-28 UNEF	45	125,000	225	0.7	1.6	50	2
☐ S-09	0.28	0.63	1/2-20 UNF	190	300,000	500	1	3.6	120	3
☐ S-17	0.44	0.88	3/4-16 UNF	400	475,000	700	2	6.8	200	7
☐ S-31	0.56	1.56	1-12 UNF	1,700	670,000	1,700	4	11	500	16

Shock Absorber (Ultran Slide and Ultran Rodless Cylinders)

Shock Absorber/Stroke Adjustment (in)

Bore	A	B	C	D	E	F
5/16" (007)	0.215	0.750	0.000	0.785	1.093	3/8-32 UNEF
7/16" (01)	0.218	0.750	0.000	0.780	1.093	3/8-32 UNEF
9/16" (02)	0.406	1.460	0.375	1.094	1.594	7/16-28 UNEF
3/4" (04)	0.406	1.335	0.375	1.438	1.469	7/16-28 UNEF
7/8" (06)	0.500	2.490	0.375	1.562	1.438	1/2-20 UNF
1-1/16" (09)	0.594	2.490	0.375	1.875	1.438	1/2-20 UNF
1-1/4" (12)	0.656	2.890	0.500	2.062	1.500	3/4-16 UNF
1-1/2" (17)	1.000	2.890	0.562	2.219	1.438	3/4-16 UNF
2" (31)	1.125	3.500	0.562	3.312	1.563	1-12 UNF



NOTE: Do not let the shock absorbers bottom out. The shock should not be used as a stroke adjuster. A stop collar is needed for the shock if stroke adjustment is required.

How to Size a Shock Absorber

Selecting the proper shock absorber model is accomplished using the shock absorber graph given for each Ultran bore. The intersection of the total energy per stroke "E_T", and velocity at shock absorber contact "V", indicates the proper shock absorber model. E_T is calculated by the equation given below using values determined for:

P = Air pressure (PSI)
V = Velocity at impact (in/sec)
W_U = Load attached to the Ultran mounting plate (lbs.)
C = Cycles per hour
SF = Shock factor
UF1 = Ultran factor #1
UF2 = Ultran factor #2

E_T (Total energy) equals the sum of E_K (Kinetic energy) and E_W (Work energy)

NOTE: the Work energy calculation varies with mounting position, E_{WH} Horizontal, or E_{WV} Vertical.

$E_K = ((W_U + UF2) / 772) \times V^2$ (Kinetic energy, in-lbs)

$E_{WH} = UF1 \times SF \times P$ (Work energy, in-lbs) **HORIZONTAL**

$E_{WV} = ((UF1 \times P) + W_U + UF2) \times SF$ (Work energy, in-lbs) **VERTICAL**

Example: determine the proper shock absorber for a model Ultran Slide mounted vertically with an attached load of 15 lbs, operating air pressure of 80 PSI, and a velocity of 20 in/sec, at a cycle rate of 3,600 per hour.

P = 80 PSI
V = 20 in/sec
S = 6 in
W_U = 15 lbs
C = 3,600 cycles/hr

From the charts for a 3/4" bore Ultran Slide

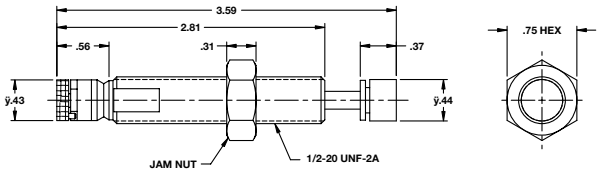
SF = 0.410
UF1 = 0.442
UF2 = 1.565
E_K = (15 lbs + 1.565) / 772) x $(20 \text{ in/sec})^2$ → E_K = 8.56 in-lbs
E_{WV} = ((0.442 x 80 PSI) + 15 lbs + 1.565 x 0.410 → E_{WV} = 21.29 in-lbs
E_T = $E_K + E_{WV}$ = 29.85 in-lbs → $E_TC = E_T \times C$ = 107,457 in-lbs/hr

Checking specifications chart, both E_T and E_TC are less than maximum. Per the sizing graph for a model UGS-04 with 21.29 in-lbs total energy at 20 in/sec velocity, use a heavy duty model HS-04 shock absorbers.

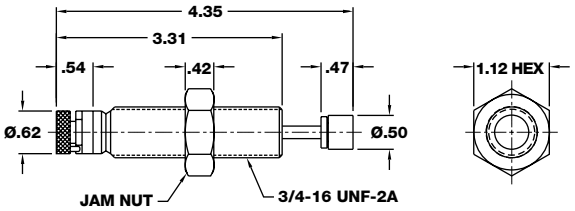
How to Specify

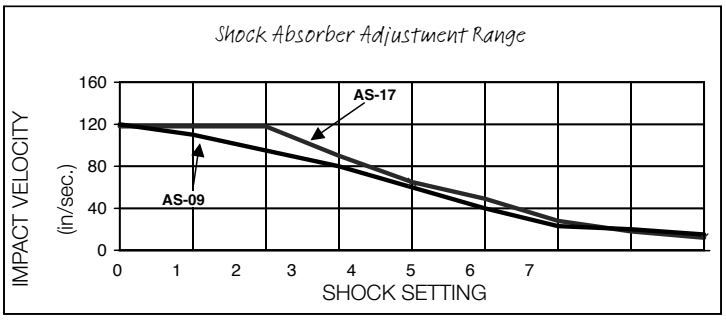
Shock Absorber (High Load Ultran)

Dimensions (in)
1-1/16" bore



Dimensions (in)
1-1/2" bore





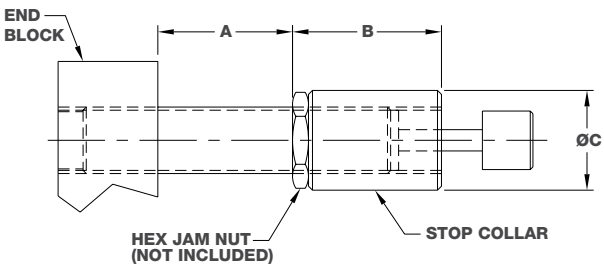
GRAPH 5

Table 3. Shock Absorber Ratings

Model	Shock Absorber Bore	(S) Stroke	Thread Type	(E_T) Max. In-Lb Per Cycle	(E_T-C) Max. In-Lb Per Cycle	(F_P) Max. Shock Force	Normal Coil Spring Force		(F_D) Max. Propelling Force	Weight
							Extension	Compression		
AS-09	.25	.38	1/2"-20 UNF	50	178,000	200	.8	1.7	8	2
AS-17	.28	.5	3/4"-16 UNF	100	284,000	300	1.5	2.0	150	5

Stop Collar (Ultran Models)

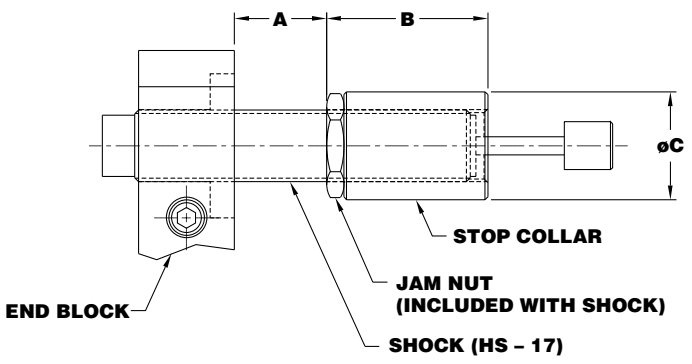
Ultran Slide & Ultran Rodless Cylinders



Model	A	B	øC
USC-04	1.0	.91	.63
USC-09	1.5	1.12	.69
USC-17	2.0	1.68	1.12
USC-31	3.0	1.93	1.50

NOTE: The Ultran Stroke Length needs increased by the B dimension in order to maintain intended stroke length. The overall length increases by the same amount. The A dimension indicates maximum amount of stroke adjustment attainable. The Hex Jam Nut is included with the shock absorber.

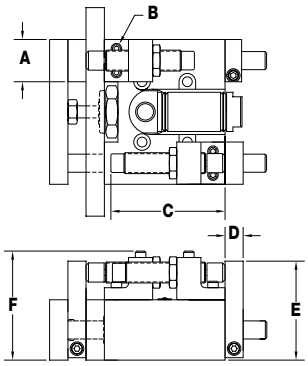
High Load Ultran



Model	A	B	øC
USC-09	.96	1.12	ø1.69
USC-17	.96	1.68	ø1.12

NOTE: The High Load Ultran Slide needs increased by the B dimension in order to maintain intended stroke length. The overall length increases by the same amount. The A dimension indicates maximum amount of stroke adjustment attainable.

Shock Absorber (Linear Thruster Cylinders)



Dimensions

Bore	A	B	C	D	E	F
9/16" (02)	0.75	#6-32	1.14	0.25	1.65	1.88
3/4" (04)	0.88	#6-32	2.37	0.38	2.05	2.13
1-1/16" (09)	1	#8-32	3.68	0.38	2.87	3
1-1/2" (17)	1.25	#10-32	4.47	0.5	3.75	4
2" (31)	1.5	1/4-20	4.75	0.75	4.50 (TE) 5.50 (T)	4.75 (TE) 5.75 (T)

How to Size a Shock Absorber

Selecting the proper shock absorber model is accomplished using the shock absorber graph given for each Thruster bore. The intersection of the total energy per stroke "E_T", and velocity at shock absorber contact "V", indicates the proper shock absorber model. E_T is calculated by the equation given below using values determined for:

E_T (Total energy) equals the sum of E_K (Kinetic energy) and E_W (Work energy).

NOTE: the Work energy calculation varies with mounting position, E_{WH} Horizontal, or E_{WV} Vertical.

$E_K = ((W_U + (TF2 + (TF3 \times S))) / 772) \times V^2$ (Kinetic energy, in-lbs)

$E_{WH} = TF1 \times SF \times P$ (Work energy, in-lbs)

HORIZONTAL

$E_{WV} = ((TF1 \times P) + W_U + (TF2 + (TF3 \times S))) \times SF$ (Work energy, in-lbs)

VERTICAL

$E_T = E_K + E_W$ (Total energy per stroke, in-lbs)

$E_TC = E_T \times C$ (Total energy per hour, in-lbs/hr)

P	=	Air pressure (PSI)
V	=	Velocity at impact (in/sec)
S	=	Stroke of the Thruster (in)
W_U	=	Load attached to the Thruster mounting plate (lbs)
C	=	Cycles per hour
SF	=	Shock factor
TF1	=	Thruster factor #1
TF2	=	Thruster factor #2
TF3	=	Thruster factor #3

E_T and E_TC must not exceed maximum listed in specifications.

Example: determine the proper shock absorber for a model T-046 Thruster mounted vertically with an attached load of 15 lbs, operating air pressure of 80 PSI, and a velocity of 20 in/sec, at a cycle rate of 3,600 per hour.

P	=	80 PSI
V	=	20 in/sec
S	=	6 in
W_U	=	15 lbs
C	=	3,600 cycles/hr

From the charts for a 3/4" bore "T" series Thruster:

SF	=	0.410
TF1	=	0.442
TF2	=	0.632
TF3	=	0.063
E_K	=	((15 lbs + (0.632 + (0.063 x 6 in))) / 772) x (20 in/sec)^2 E_K = 8.30 in-lbs
E_{WV}	=	((0.442 x 80 PSI) + 15 lbs + (0.632 + (0.063 x 6 in))) x 0.410 E_{WV} = 21.06 in-lbs
E_T	=	$E_K + E_{WV}$ = 29.36 in-lbs $E_TC = E_T \times C$ = 105,685 in-lbs/hr

Checking specifications chart, both E_T and E_TC are less than maximum. Per sizing graph for a model T-04 with 29.36 in-lbs total energy at 20 in/sec velocity, use a heavy duty model HS-04 shock absorbers.

Shock Absorber (Linear Thruster Cylinders)

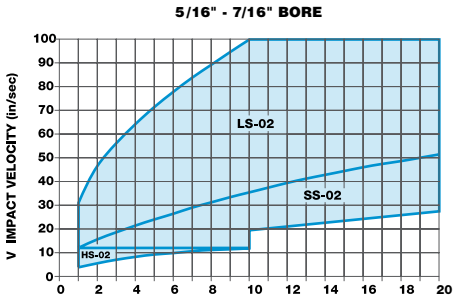
T Series Thruster Calculation Constants

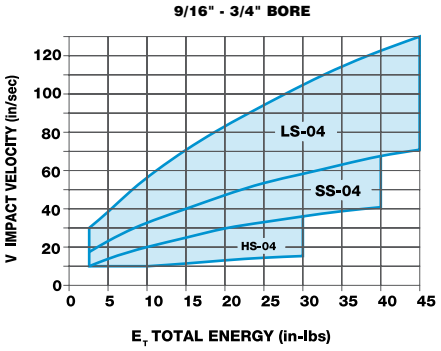
Model T					
Factor	**9/16"**	**3/4"**	**1-1/16"**	**1-1/2"**	**2"**
SF	0.250	0.410	0.630	0.880	1.000
TF1	0.249	0.442	0.887	1.767	3.142
TF2	0.310	0.632	1.675	3.874	7.444
TF3	0.028	0.063	0.111	0.174	0.250
(ET) max. in-lbs per cycle	20	45	190	400	650
(ET-C) max. in-lbs per hour	36,000	125,000	300,000	475,000	622,000

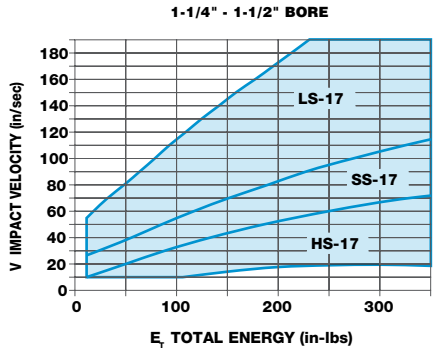
TE Series Thruster Calculation Constants

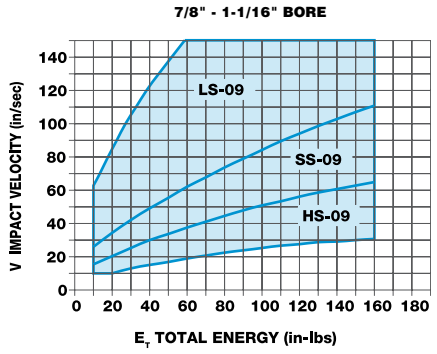
Model TE					
Factor	**9/16"**	**3/4"**	**1-1/16"**	**1-1/2"**	**2"**
SF	0.250	0.410	0.630	0.880	1.000
TF1	0.249	0.442	0.887	1.767	3.142
TF2	0.434	0.905	2.075	4.033	6.754
TF3	0.063	0.111	0.174	0.250	0.340
(ET) max. in-lbs per cycle	20	45	190	400	650
(ET-C) max. in-lbs per hour	36,000	125,000	300,000	475,000	622,000

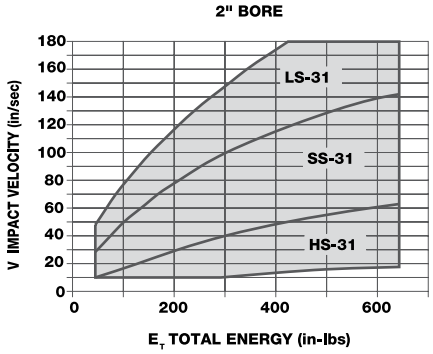
Velocity vs. Load for Shock Absorbers





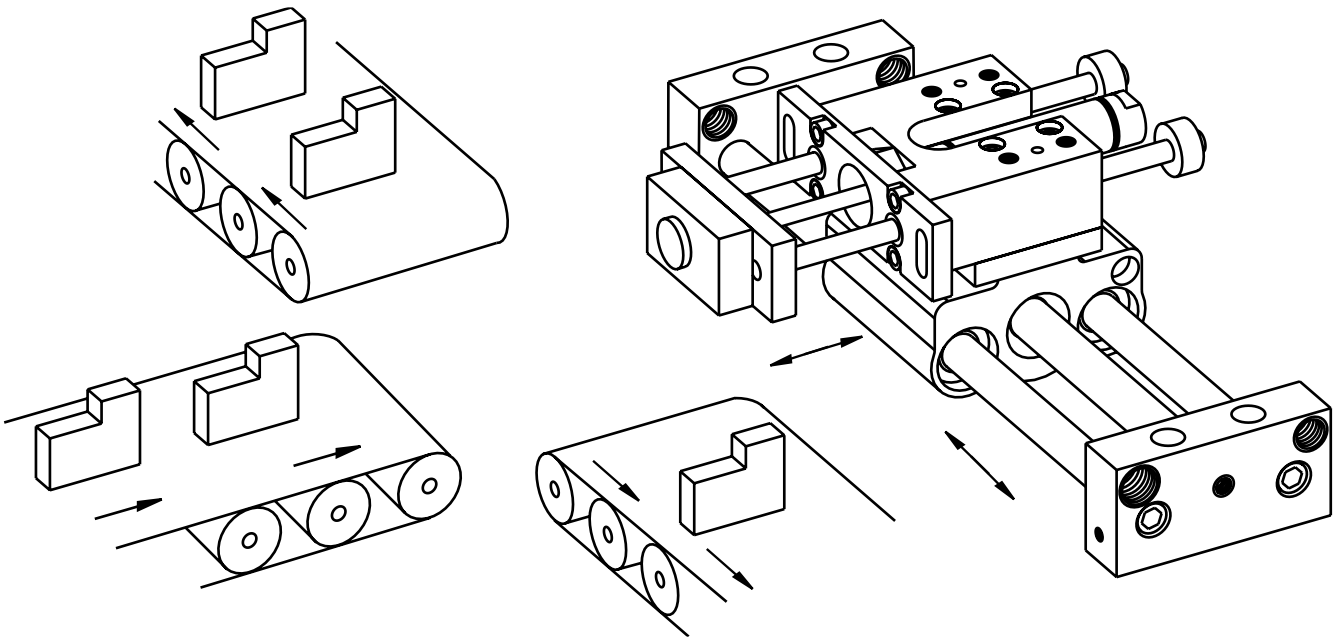






Transition Plates

Aluminum plates that couple Bimba actuators–Ultran® rodless cylinders, Pneu-Turn® rotary actuators, and Linear Thrusters–into a variety of multi-axis configurations.



The customer's attachment reads a bar code on the product to determine the required paint scheme. The Ultran Slide Rodless Cylinder and Linear Thruster picks the item off the incoming conveyor and places it on the appropriate out-going one.

How to Choose a Transition Plate

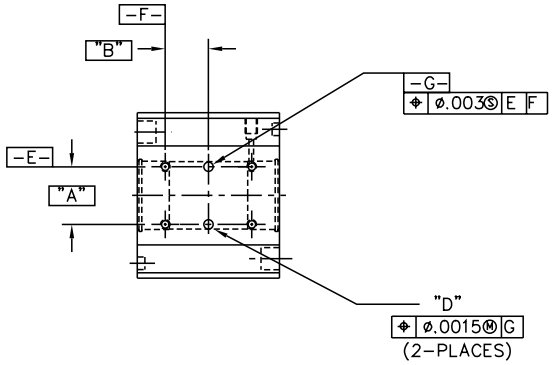
Page 596 shows how to build the Transition Plate model numbers. Choose the configuration (base product and coupled product) that best suits your application and turn to that section. It will describe the valid bore size combinations and provide basic dimensions, weights and prices for those Transition 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 the engineering specifications for the individual actuators for more information.

Transition Plates

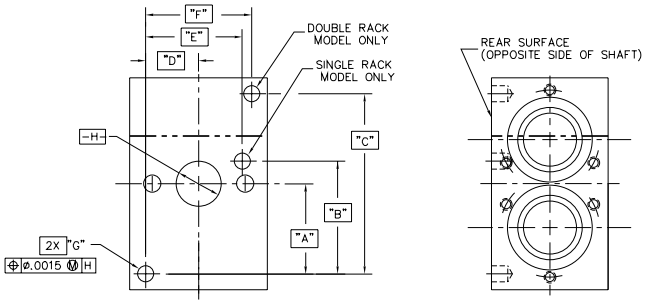
Dowel Pin Hole Locations

Ultran



Bore	A	B	D
020 (9/16")	1.000	.750	.1270/.1280 x .240/.260 DP.
040 (3/4")	1.375	.876	.1895/.1905 x .410/.430 DP.
090 (1-1/16")	1.750	1.250	.2520/.2530 x .410/.430 DP.
170 (1-1/2")	2.500	1.750	.3145/.3155 x .560/.580 DP.

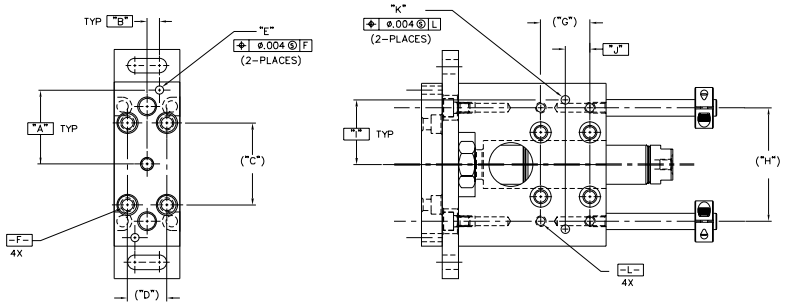
Pneu-Turn



Bore	A	B	C	D
020 (9/16")	.874	1.101	1.754	.500
040 (3/4")	1.061	1.330	2.125	.623
090 (1-1/16")	1.311	1.730	2.625	.718
170 (1-1/2")	1.811	2.281	3.625	.905
310 (2")	2.187	3.000	4.375	.625

Bore	E	F	G
020 (9/16")	.928	1.000	.1270/.1280 x .240/.260 DP.
040 (3/4")	1.139	1.250	.1895/.1905 x .410/.430 DP.
090 (1-1/16")	1.437	1.437	.2520/.2530 x .410/.430 DP.
170 (1-1/2")	1.812	1.812	.3145/.3155 x .560/.580 DP.
310 (2")	1.813	1.250	.3770/.3780 x .560/.580 DP.

Linear Thruster



Bore	A	B	C	D	E	G	H	I	J	K
020 (9/16")	1.125	.188	1.250	.600	.1270/.1280 THRU.	.750	1.750	.8750	.375	.1270/.1280 x .240/.260 DP.
040 (3/4")	1.313	.250	1.500	.750	.1895/.1905 THRU.	.938	2.125	1.1250	.469	.1895/.1905 x .290/.310 DP.
090 (1-1/16")	1.813	.375	2.000	1.000	.2520/.2530 THRU.	1.375	3.125	1.5625	.688	.2520/.2530 x .410/.430 DP.
170 (1-1/2")	2.375	.500	3.000	1.500	.3145/.3155 THRU.	1.750	4.000	2.0000	.875	.3145/.3155 x .560/.580 DP.
310 (2")	3.000	.625	4.000	2.000	.3770/.3780 THRU.	2.125	5.000	2.5000	1.063	.3770/.3780 x .810/.830 DP.
310 (2") TE	2.500	.625	3.000	2.000	.3770/.3780 THRU.	2.000	4.250	2.1250	1.000	.3770/.3780 x .810/.830 DP.
500 (2-1/2")	3.750	1.000	4.750	3.000	.3770/.3780 THRU.	2.630	6.250	3.1250	1.312	.3770/.3780 x .1.000/1.020 DP.
500 (2-1/2") TE	3.250	.750	3.750	2.250	.3770/.3780 THRU.	2.500	5.375	2.6875	1.250	.3770/.3780 x .1.000/1.020 DP.
700 (3")	4.750	1.000	6.000	3.000	.5020/.5030 THRU.	4.000	8.000	4.0000	2.000	.5020/.5030 x .1.250/1.270 DP.
700 (3") TE	4.000	1.000	4.500	2.750	.5020/.5030 THRU.	3.000	6.500	3.2500	1.500	.5020/.5030 x .1.250/1.270 DP.

Transition Plates

Linear Thruster (Base Product) to Pneu-Turn Rotary Actuator (Coupled Product) Shaft Parallel*

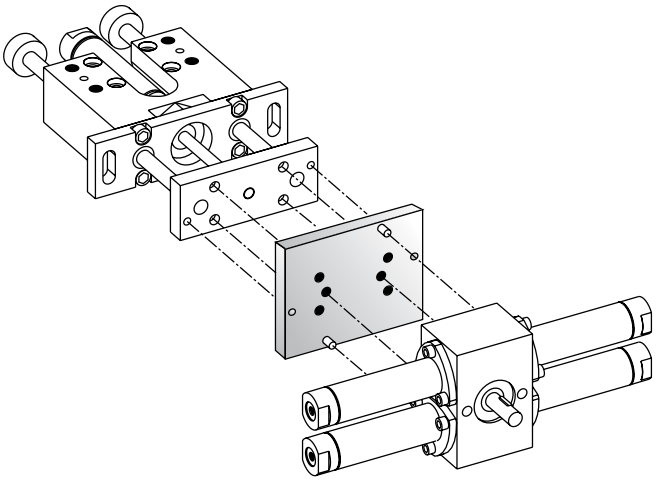
Pneu-Turn Rotary Actuator			Linear Thruster				
			9/16" (02)	3/4" (04)	1-1/16" (09)	1-1/2" (17)	2" (31)
	9/16"	Single rack (006)	TPT02-PT006A TPT02-PT014A	TPT04-PT006A TPT04-PT014A			
		Double rack (014)					
	3/4"	Single rack (017)		TPT04-PT017A TPT04-PT033A	TPT09-PT017A TPT09-PT033A		
		Double rack (033)					
	1-1/16"	Single rack (037)			TPT09-PT037A TPT09-PT074A	TPT17-PT037A TPT17-PT074A	
		Double rack (074)					
	1-1/2"	Single rack (098)				TPT17-PT098A	TPT31-PT098A TPTE31-PT098A
		Double rack (196)				TPT17-PT196A	TPT31-PT196A TPTE31-PT196A
	2"	Single rack (247)					TPT31-PT247A TPTE31-PT247A
		Double rack (494)					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)
	Length (in)	Width (in)	Thickness (in)	
TPT02-PT006A TPT02-PT014A	2.50	2.00	0.28	0.14
TPT04-PT006A TPT04-PT014A	3.00	2.00	0.28	0.17
TPT04-PT017A TPT04-PT033A	3.00	2.50	0.36	0.26
TPT09-PT017A TPT09-PT033A	4.00	2.50	0.36	0.35
TPT09-PT037A TPT09-PT074A	4.00	3.12	0.47	0.58
TPT17-PT037A TPT17-PT074A	5.38	3.00	0.47	0.74
TPT17-PT098A TPT17-PT196A	5.38	4.25	0.72	1.61
TPT31-PT098A TPT31-PT196A	6.75	4.25	0.72	2.02
TPT31-PT247A TPT31-PT494A	6.75	5.00	0.72	2.38
TPTE31-PT098A TPTE31-PT196A	5.75	4.25	0.72	1.72
TPTE31-PT247A TPTE31-PT494A	5.75	5.00	0.72	2.03

Transition Plates

Linear Thruster (Base Product) to Pneu-Turn Rotary Actuator (Coupled Product) Shaft Parallel*



Dowel Pins

In addition to ordering a Transition Plate with dowel pin option, dowel pin options must be selected for your Linear Thruster (-D option); and the ball bearing (-R) and hardened shaft (-F) options must be selected for your Pneu-Turn Rotary Actuator (the ball bearing option includes dowel pin holes). For example, your order would include:

> T-096-DM
> PT-033180-FMR
> TPT09-PT017AD

This provides: a 1-1/16" bore, 6" stroke Linear Thruster with dowel pin holes and a magnetic piston; a single rack 3/4" bore, 180˚ Pneu-Turn with hardened shafts, magnetic piston, and ball bearing (with dowel pin holes); and the appropriate Transition Plate with dowel pins. Refer to individual actuator sections for dowel pin option pricing.

Transition Plates

Pneu-Turn Rotary Actuator (Base Product) to Linear Thruster (Coupled Product) Shaft 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	TPPT31-T17P
	1-1/2" (17)				TPPT17-T17P	TPPT31-T31P
	2" (31)					TPPT31-TE31P

NOTE: Two plates are needed for this configuration. Both plates will be included if part number TPP☐ - 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.

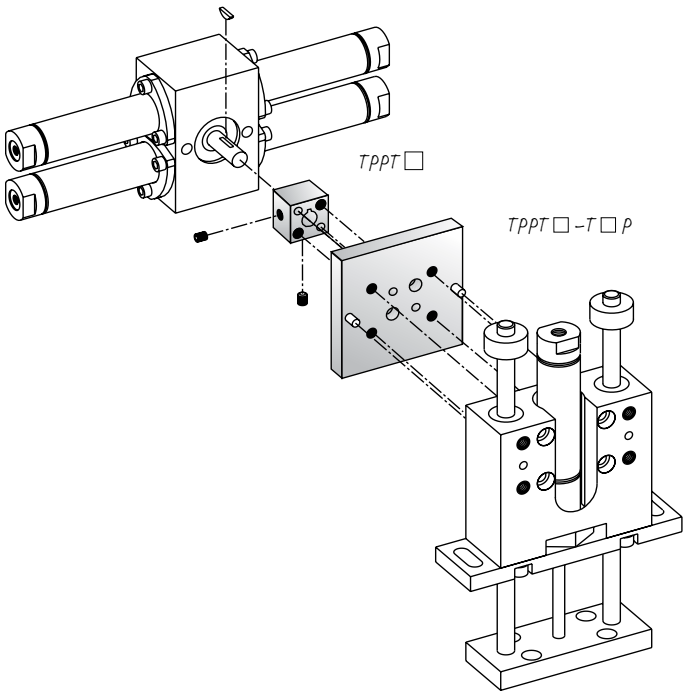
Screws and dowel pins (if ordered) are included with the Transition Plate.

Model Number	Dimensions			Weight (includes screws) (lbs)
	Length (in)	Width (in)	Thickness (in)	
TPPT02-T02P	2.00	2.00	0.28	0.15
(includes TPPT02)	0.62	0.62	0.50	0.04
TPPT04-T04P	2.50	2.25	0.36	0.28
(includes TPPT04)	0.75	0.75	0.75	0.08
TPPT09-T04P	3.50	3.00	0.47	0.67
(includes TPPT09)	1.00	1.00	0.94	0.19
TPPT09-T09P	3.50	3.00	0.47	0.67
(includes TPPT09)	1.00	1.00	0.94	0.19
TPPT17-T09P	4.50	4.25	0.72	1.82
(includes TPPT17)	1.50	1.50	0.94	0.47
TPPT17-T17P	4.50	4.25	0.72	1.84
(includes TPPT17)	1.50	1.50	0.94	0.47
TPPT31-T17P	4.50	4.25	0.72	1.84
(includes TPPT31)	1.50	1.50	1.12	0.47
TPPT31-T31P	6.00	3.00	0.72	1.76
(includes TPPT31)	1.50	1.50	1.12	0.47
TPPT31-TE31P	5.25	3.00	0.72	1.60
(includes TPPT31)	1.50	1.50	1.12	0.47

NOTE: The key on the Pneu-Turn shaft is mounted in the 12 o'clock position, therefore, rotation of the Linear Thruster will be equal in the clockwise and counterclockwise directions. Please order sufficient angle of rotation, angle adjustment option or a Pneu-Turn rotary actuator with the key mounted in a special position as required for your application.

Transition Plates

Pneu-Turn Rotary Actuator (Base Product) to Linear Thruster (Coupled Product) Shaft Perpendicular*



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

Dowel Pins

In addition to ordering a Transition Plate with dowel pin option, the ball bearing (-R) and hardened shaft (-F) options must be selected for your Pneu-Turn Rotary Actuator (the -R option includes dowel pin holes), and the dowel pin option (-D) must be selected for your Linear Thruster. For example, your order would include:

> PT-247180-FMR
> T-096-DM
> TPPT31-T17PD

This provides: a single rack 2" bore, 180˚ Pneu-Turn with hardened shafts magnetic piston, and ball bearing (with dowel pin holes); a 1-1/2" bore, 6" stroke Linear Thruster with dowel pin holes and magnetic piston; and the appropriate Transition Plate with dowel pins. Refer to individual actuator sections for dowel pin option pricing.

Toleranced Clearance Hole Sizes	
TPPT02	.1270/.1280
TPPT04	.1895/.1905
TPPT09	.2520/.2530
TPPT17	.3145/.3155
TPPT31	.3145/.3155

NOTE: Dowel pins to attach part TPPT☐ are not provided, although clearance holes are available for dowel pins.

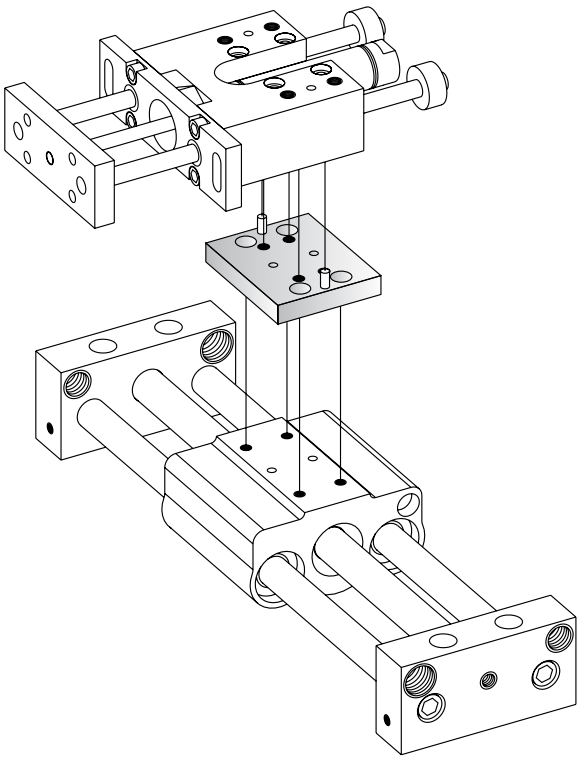
Transition Plates

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)
	Length (in)	Width (in)	Thickness (in)	
TPU02-T02P	2.00	2.00	0.28	0.11
TPU04-T04P	2.50	2.25	0.36	0.20
TPU09-T04P	3.50	3.00	0.47	0.48
TPU09-T09P	3.50	3.00	0.47	0.48
TPU17-T09P	4.50	4.25	0.72	1.35
TPU17-T17P	4.50	4.25	0.72	1.35



Dowel Pins

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

> UGS-0915-ADT
> T-096-DM
> TPU09-T09PD

This provides: 1-1/16" bore, 15" stroke Ultran Slide with gold coupling strength, stroke adjustment on both ends, dowel pin holes and switch track; a 1-1/16" bore, 6" stroke, Linear Thruster with dowel pin holes and a magnetic piston; and the appropriate Transition Plate with dowel pins. Refer to individual actuator sections for dowel pin option pricing.

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

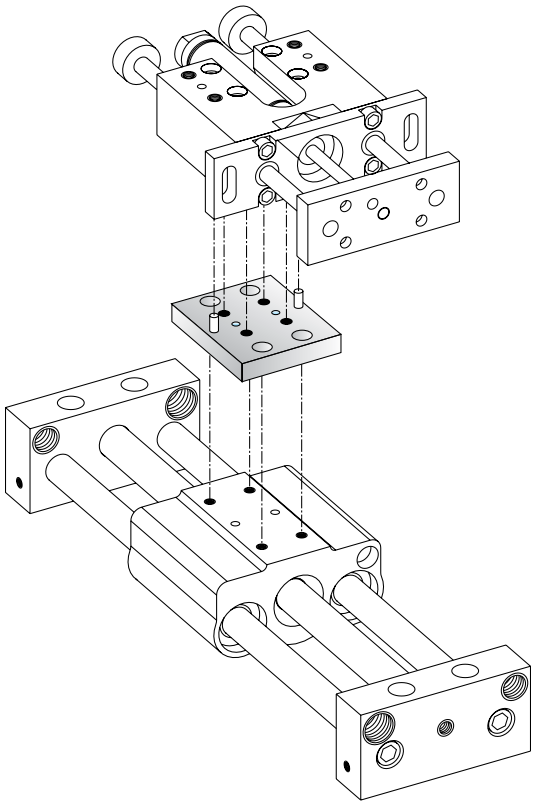
Transition Plates

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)
	Length (in)	Width (in)	Thickness (in)	
TPU02-T02A	2.00	2.00	0.28	0.11
TPU04-T04A	2.50	2.25	0.36	0.20
TPU09-T04A	3.50	3.00	0.47	0.48
TPU09-T09A	3.50	3.00	0.47	0.48
TPU17-T09A	4.50	4.25	0.72	1.35
TPU17-T17A	4.50	4.25	0.72	1.35



Dowel Pins

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

> UGS-0915-ADT
> T-096-DM
> TPU09-T09AD

This provides: 1-1/16" bore, 15" stroke Ultran Slide with gold coupling strength, stroke adjustment on both ends, dowel pin holes and switch track; a 1-1/16" bore, 6" stroke, Linear Thruster with dowel pin holes and a magnetic piston; and the appropriate Transition Plate with dowel pins. Refer to individual actuator sections for dowel pin option pricing.

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

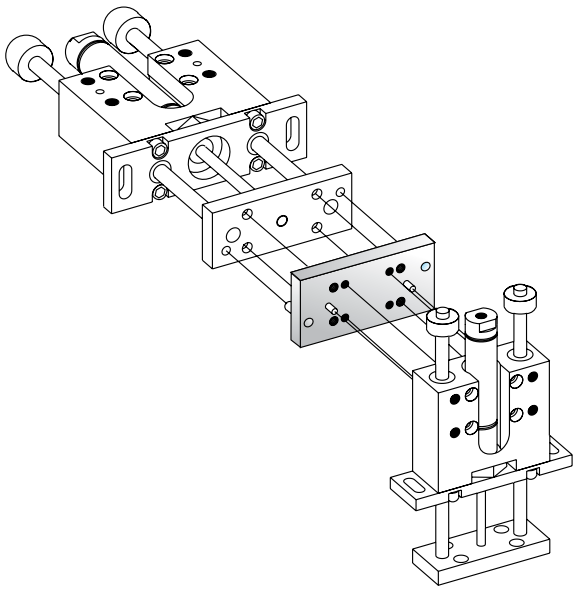
Transition Plates

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)
	Length (in)	Width (in)	Thickness (in)	
TPT02-T02P	2.50	1.50	0.28	0.10
TPT04-T02P	3.00	1.50	0.36	0.16
TPT04-T04P	3.00	1.50	0.36	0.16
TPT09-T04P	4.25	2.00	0.47	0.39
TPT09-T09P	4.25	2.00	0.47	0.39
TPT17-T09P	5.50	3.00	0.72	1.16
TPT17-T17P	5.50	3.00	0.72	1.16
TPT31-T17P	7.00	3.00	0.97	2.00
TPT31-T31P	7.00	4.50	0.97	2.99
TPTE31-T17P	6.00	3.00	0.97	1.71
TPTE31-TE31P	6.00	4.50	0.97	2.57



Dowel Pins

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

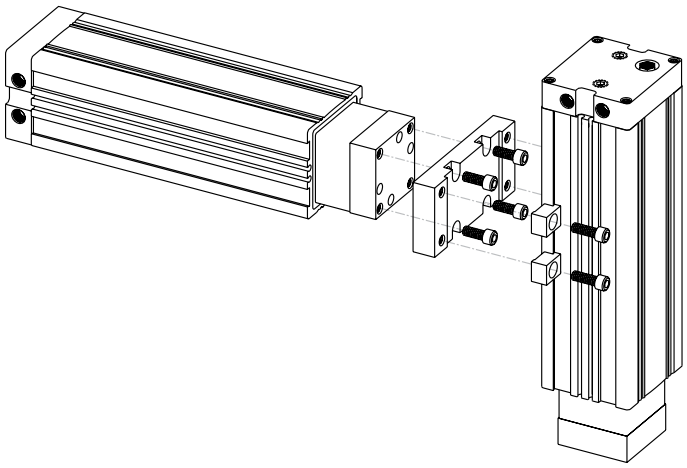
> T-096-DM
> T-042-DM
> TPT09-T04PD

This provides: a 1-1/16" bore, 6" stroke Linear Thruster with dowel pin holes and a magnetic piston; a 3/4" bore, 2" stroke Linear Thruster with dowel pin holes and magnetic piston; and the appropriate Transition Plate with dowel pins. Refer to individual actuator sections for dowel pin option pricing.

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

Transition Plates

PneuMoment to PneuMoment



Mounting Kits

Model Number	Type
TPPM09-PM09	Imperial
TPPMM09-PMM09	Metric

Kits Include: the plate, four clamps and four S.H.C.S.

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/lbs)		
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

Transition Plates

Sizing a Multi-Axis Configuration

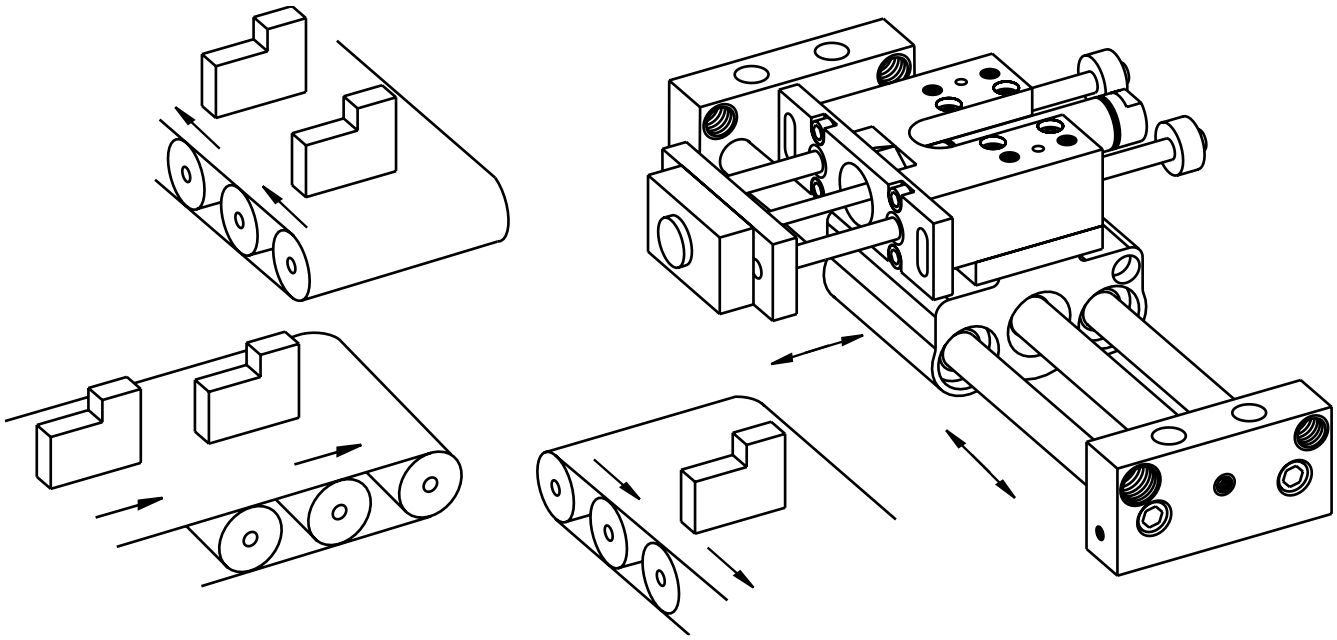
General Comments:

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:



Transition Plates

Sizing a Multi-Axis Configuration

An example of a motion system is shown on page 595 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 5lbs 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 3" from the grip surface and in the middle of the product width and height. The vacuum gripper weighs 1lb and has a center of gravity that is .75" 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 6" stroke is chosen to move the product. The combined weight of the product and gripper is 6lbs. Comparing the 6lb load to the maximum side load table for a standard Linear Thruster with a 6" stroke, a 3/4" bore unit has the capability of 11.09lbs. This should be sufficient to handle the 6lb 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" 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" 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 (0.20lb), Linear Thruster (2.82lbs), the gripper (1lb), and the product (5lbs) The total weight the Ultran Slide will move is 9.02lbs Comparing this to the maximum allowable radial loads for 16" stroke Ultran Slides, a 3/4" bore unit can carry approximately a 20lb load. The Linear Thruster is fully extended when it picks the product from the incoming conveyor, then retracts 3" 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 3". 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 Thrusters are found by rearranging and solving the equation found on page 595 and then comparing the result to the 20lb limit.

Transition Plates

Sizing a Multi-Axis Configuration

Side Load = ∑ Actual Load* [2* [(Y1/Z+ 1]]

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

Side Load = 5lbs *[2* [(8.25 in/2.518 in) + 1]] +
1lb * [2* [(4.50 in/2.518 in) + 1]] +
.40lb * [2* [(3.56 in/2.518 in) + 1]]

Side Load 3/4" bore = 50.25lbs

This side load is greater than the 20lb 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 55lbs. This Slide will be reviewed for the side load condition using the equation above.

Side Load1-1/16 bore = 42.48lbs

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:

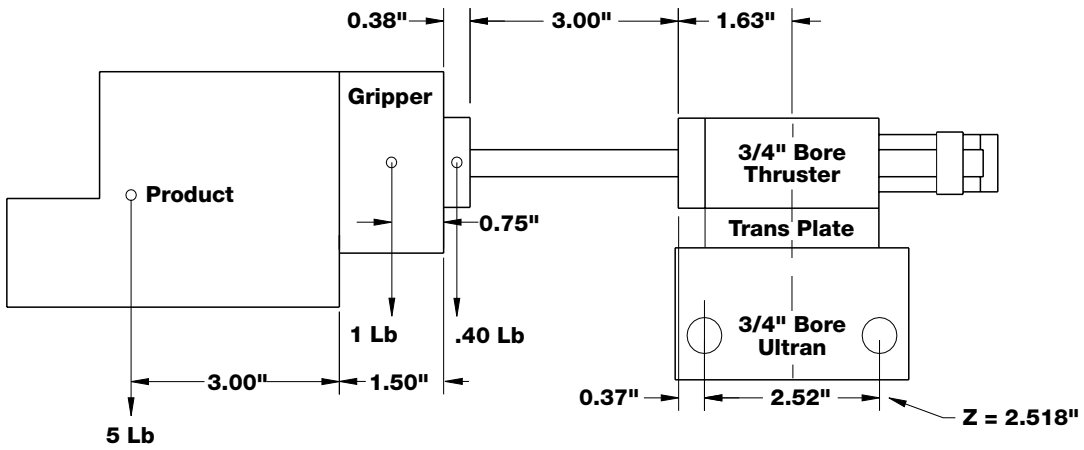
1. The need for a Hall Effect switch that will signal a controller when the Linear Thruster has retracted three inches. Also, external bumpers will be used to soften the impact at end-of-stroke.
2. Hall Effect Switches will be used for end-of-stroke and mid-stroke signalling on the Ultran Slide rodless 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



How to Order

Transition Plates

The model number of all Transition Plates consists of two alphanumeric clusters. The first cluster designates product type, base product and bore size of the base product. The second cluster designates coupled product and bore size of the coupled product, mounting orientation, and an optional character for dowel pins. Please refer to the charts below for an example of model number TPU17-T09PD. This is a transition plate for a 1-1/2" bore Ultran rodless cylinder that will be coupled to a 1-1/16" bore Linear Thruster (ball bearing), in a perpendicular orientation, with dowel pins.

Model	
TP	Transition Plate

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

Mounting Orientation[3]	
A	Axial (parallel)
P	Perpendicular

Dowel Pin[3]	
Blank	No dowel pin
D	Dowel pin

TP U 17 - T 09 P D

Base Product	
U	Ultran Slide Rodless Cylinder
T[1]	Linear Thruster, Ball Bearing
TE[1]	Linear Thruster, Composite Bearing
PT[2]	Pneu-Turn Rotary Actuator
PM	PneuMoment (imperial)[3]
PMM	PneuMoment (metric)[3]

Coupled Product	
U	Ultran Rodless Cylinder
T[1]	Linear Thruster, Ball Bearing
TE[1]	Linear Thruster, Composite Bearing
PT[2]	Pneu-Turn Rotary Actuator
PM	PneuMoment (imperial)
PMM	PneuMoment (metric)

Coupled Product Bore Size	
02	9/16"
04	3/4"
09	1-1/16"
17	1-1/2"
31	2"
For Pneu-Turn	
006	9/16" single rack
014	9/16" double rack
017	3/4" single rack
033	3/4" double rack
037	1-1/16" single rack
074	1-1/16" double rack
098	1-1/2" single rack
196	1-1/2" double rack
247	2" single rack
494	2" double rack

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

[1] As shown on the following pages, use the "T" designation for either T or TE Series Linear Thruster, except where the TE is specifically called out.
[2] Pneu-Turn Rotary Actuator must be ordered with both the ball bearing (-R) and the hardened shaft (-F) options.
[3] PneuMoment to PneuMoment only. Mounting orientation and dowel pin do not apply. Only available for the 1-1/16" bore.

Transition Plates are attached to the base and coupled products with socket head cap screws and socket set screws. Screws are included with the Transition Plate. Dowel pins can be ordered as an option for ease of assembly and/or improved shear loading.

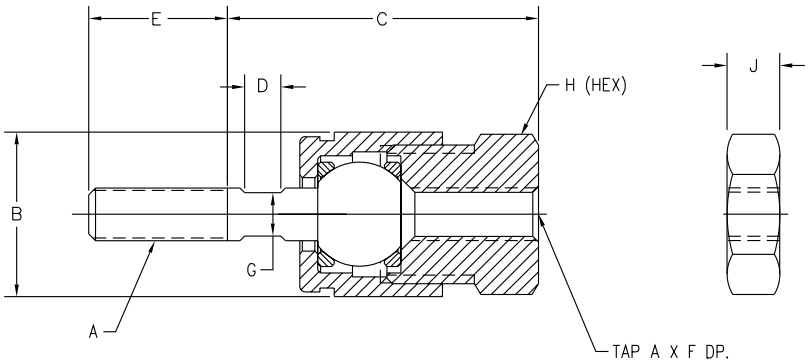
Alignment Couplers

Features and Advantages

- Bimba's miniature coupler design allows excellent freedom of movement on the three new, miniature sizes; #5-40 through #10-32 sizes.
- The miniature couplers allow up to 20° of spherical movement and 0.02" lateral allowance with only .002" of axial play, and are manufactured from high tensile, hardened and blackened steel components.
- Larger sizes are available, from 1/4"-28 to 1"-14, with 1° of spherical movement and 1/16" of lateral allowance.
- The alignment allowances can eliminate the need for expensive precision machining in rigidly mounted applications.
- Alignment couplers help reduce binding and simplify field alignment problems, enhancing cylinder performance and reducing seal and bearing wear.
- An innovative design to resist vibrational loosening is available on sizes 5/16"-24 and larger. In the ACH style coupler, a slot is milled through the tapped mounting threads. Two socket head cap screws are strategically placed to allow the coupler to be clamped to the rod, offering superior strength connection.

Dimensions

Models #5-40 through #10-32



Model*	A	B	C	D	E	F
AC5-40	#5-40	15/32"	31/32"	1/8"	3/8"	3/8"
AC8-32	#8-32	17/32"	31/32"	1/8"	3/8"	3/8"
AC10-32	#10-32	19/32"	1-1/8"	1/8"	1/2"	1/2"

Model*	G	H	J	Maximum Pull at Yield (lbs)	Alignment Allowance		Weight (oz)
					Lateral	Spherical	
AC5-40	1/8"	3/8"	1/8"	200	0.02	20°	0.3
AC8-32	1/8"	7/16"	1/8"	650	0.02	10°	0.5
AC10-32	5/32"	1/2"	1/8"	1200	0.02	10°	0.8

* Specify SS at the end of the part number for Stainless Steel.

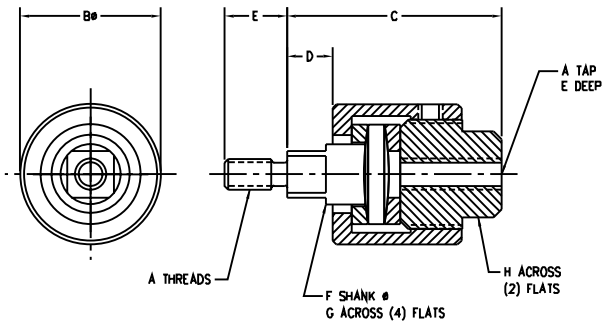
Additional Jam Nuts

Size	Part Number	Stainless Steel Part No.
#5-40	D-3745	D-3745-SS
#8-32	D-D0737	D-D0737-SS
#10-32	D-5288	D-5288-SS

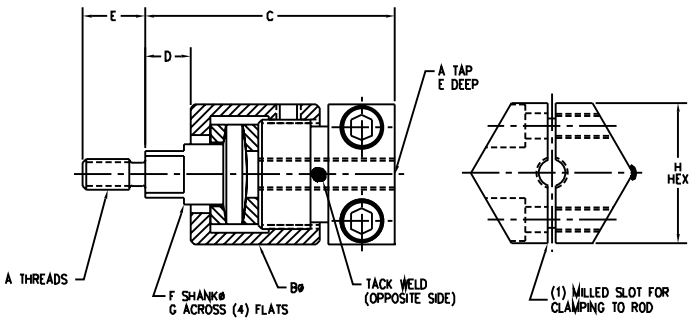
Alignment Couplers

Models 1/4"-28 through 1"-1/4

Standard Coupler
AC250-AC1000



ACH Coupler
ACH312-ACH1000



1/16" of lateral allowance
1° spherical movement

Part Number	A	B	C	C Hex	D	E	F	G	H	H Hex	Maximum Pull at Yield (lbs)
AC250	1/4"-28	1-1/8"	1-3/4"	--	3/8"	1/2"	1/2"	3/8"	11/16"	--	6,000
AC312	5/16"-24	1-1/8"	1-3/4"	2"	3/8"	1/2"	1/2"	3/8"	11/16"	1-1/4"	8,300
AC375	3/8"-24	1-1/8"	1-3/4"	2"	3/8"	1/2"	1/2"	3/8"	11/16"	1-1/4"	8.300
AC437	7/16"-20	1-1/4"	2"	2-5/32"	7/16"	3/4"	5/8"	1/2"	13/16"	1-1/4"	10,000
AC500	1/2"-20	1-1/4"	2"	2-5/32"	7/16"	3/4"	5/8"	1/2"	13/16"	1-1/4"	14,000
AC625	5/8"-18	1-1/4"	2"	2-5/32"	7/16"	3/4"	5/8"	1/2"	13/16"	1-1/4"	19,000
AC750	3/4"-16	1-3/4"	2-5/16"	2-1/2"	7/16"	1-1/8"	31/32"	13/16"	1-1/8"	1-3/4"	34,000
AC875	7/8"-14	1-3/4"	2-5/16"	2-1/2"	7/16"	1-1/8"	31/32"	13/16"	1-1/8"	1-3/4"	39,000
AC1000	1"-14	2-1/2"	2-15/16"	2-15/16"	7/16"	1-5/8"	1-11/32"	1-5/32"	1-5/8"	2-1/2"	64,000

Please specify AC, ACH coupler when ordering AC750 (Standard Coupler) ACH750 (Hex Coupler)
Please specify – SS at the end of the part number for Stainless Steel.
Jam nut sold separately for 1/4"-28 through 1"-14 size
*SS valid for AC models only

Jam Nuts

Size	Part Number Standard	Stainless Steel Part No.
1/4"-28	D-344	D-344-SS
5/16"-24	D-746	D-746-SS
3/8"-24	D-801	D-801-SS
7/16"-20	D-154	D-154-SS
1/2"-20	D-98	D-98-SS
5/8"-18	D-9	D-9-SS
3/4"-16	D-3556	D-3556-SS
7/8"-14	D-2545	D-2545-SS
1"-14	D-1331	D-1331-SS