

We make things MOVE®

PA Series
NFPA Pneumatic Actuators

Bimba is part of IMI Precision Engineering



We Make Things Move®

A forward-thinking innovator, Bimba provides industry-leading pneumatic, hydraulic and electric motion solutions that are easy-to-use, reliable and ready for your engineering challenges.

Doing whatever it takes to help you get the job done is what the Bimba companies do best. With an extensive line of industry-leading air cylinders, rotary actuators, linear thrusters, rodless cylinders, NFPA, hydraulics, flow controls, position-sensing cylinders, valves, switches and air preparation equipment, the people of Bimba are ready to tackle your toughest applications.

Bimba is part of IMI Precision Engineering, a world leader in motion and fluid control technologies. Wherever precision, speed and engineering reliability are essential, we deliver exceptional solutions which improve the productivity and efficiency of customers' equipment.

Our range of high-performance products, such as actuators, valves, valve islands, pressure monitoring controls and air preparation products together with trusted products brands including IMI Norgren, IMI Buschjost, IMI FAS, IMI Herion and IMI Maxseal underpin our position as a leading global supplier.

Part of IMI plc, we have a sales and service network in 75 countries, as well as manufacturing capability in the USA, Germany, China, UK, Switzerland.

Contents

02 Introduction

03 Product Features

04 How it Works

05 How it's Used

06 How to Specify

16 How to Accessorize

26 How to Order

27 How to Customize

PA Series

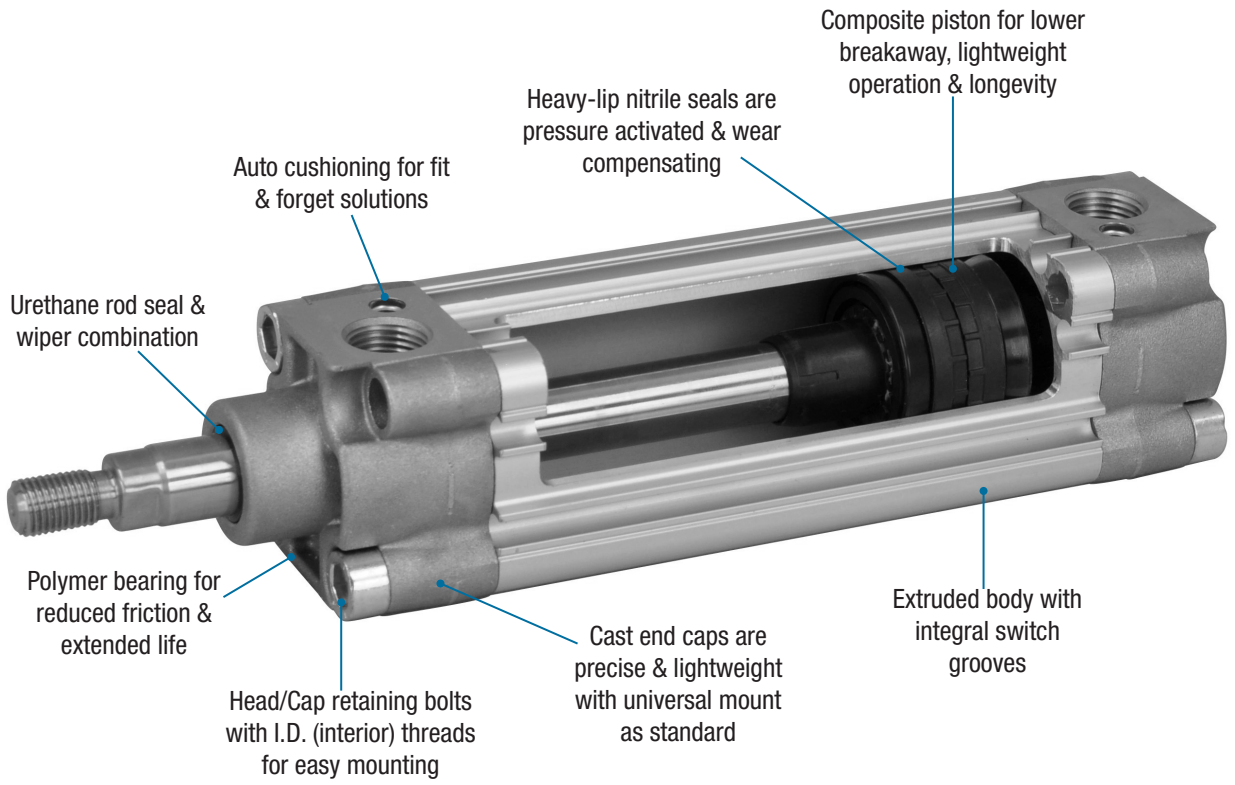
Bimba's PA Series actuator adds a NFPA extruded aluminum bodied alternative to Bimba's extensive NFPA tie rod actuator lineup. Built to meet the same demanding requirements as tie rod actuators, the PA has added features like die-cast aluminum end caps contoured to the profile tube for easy cleaning and maintenance.

The PA Series provides a versatile, cost effective solution to a variety of industries and applications. Its lightweight construction and modern design are only matched by flexible mounting configurations and a number of standard features.



Product Features

Bimba PA Series actuators offer lightweight and modern designs while remaining durable and competitively priced.



PA Series pneumatic actuators are ideal for everyday pneumatic linear motion applications where versatility and modularity are valued.

The model above is PA-MS4-1.50x4-HC-BP-MPR; 1.50” bore x 4” stroke with Ecology piston seals, MS4 and universal mount. Adjustable auto cushions and magnetic piston are standard features. The actuator is equipped to mount directly to your machine, or will accept any of the 12 NFPA mountings offered with this series.

Features and Benefits

- Available in 5 bore sizes
- Reduces complexity by offering 12 mounting configurations
- Lightweight construction
- Modern appearance with smooth end caps contoured to profile tube for easy cleaning
- Competitively priced within the marketplace
- Outfitted with an Auto Cushioning System for “Fit & Forget” solutions
- Magnetic piston included as standard with switch grooves on three sides for greater flexibility
- Optional Ecology Piston Seal to reduce impact, vibration and noise levels while increasing productivity

Bimba's PA Series NFPA actuators are designed for reliable, smooth performance. They come equipped with auto cushioning and magnetic piston as standard features. The Auto Cushioning System allows the actuator to automatically adapt to changing loads and conditions. The cushion screw is pre-set at the factory and field adjustment is not required for the majority of applications.

Many common options are also available. From rod end modifications to alternate piston rod materials, PA Series actuators are designed to suit a wide range of applications.

Mounting options:
- MS4 - Bottom tapped holes (standard)
- MF1 - Front flange
- MF2 - Rear flange
- MP1 - Rear pivot clevis
- MP2 - Rear pivot clevis
- MP4 - Rear pivot eye
- MS1 - Front & rear end angle
- MS2 - Side lug
- MX1 - Extended tie rods (head & cap)
- MX2 - Extended tie rods (cap)
- MX3 - Extended tie rods (head)
- MX4 - 2 Extended tie rods (head & cap)

Performance options:
- Extended piston rod thread
- Ecology piston seals
- Back-to-Back configuration
- Extended piston rod
- Variety of rod end configurations
- Magnetic piston for Reed or Solid State switches
- Case hardened piston rod
- PA Series with rod lock

Materials of Construction

Barrel:	Anodized aluminum extrusion, hard coat anodized OD
End Caps:	Die cast aluminum
Piston Rod:	Hard chrome plated steel
Seals:	Urethane rod seal/wiper, Nitrile piston and tube end seals
Rod Bearing:	Polymer
Piston:	Polymer

Engineering Specifications

Medium: Compressed air, filtered, clean, dry, lubricated or non-lubricated
Operation: Double acting adjustable cushioning
Operating Pressure: 250 PSIG
Operating Temperature: 25°F to 175°F
Cylinder Diameters: 1.50", 2.00", 2.50", 3.25", 4.00"
Strokes: 0.125" - 100"
Ports: 3/8 NPT, 1/2 NPT
Lubrication: None required. PA Series actuators are rated for non-lube service. All internal components are lubricated at the time of assembly with a Lithium based grease.

How It's Used

Application Ideas

- > Pick & Place
- > Sorting
- > Gating
- > Loading
- > Lifting
- > Stacking
- > Insertion
- > Dispensing
- > Clamping
- > Parts Transfer



Target Applications

Bimba's PA Series actuators are designed, built and tested to provide long life, durability, high quality, and value. The PA Series is well positioned to meet the needs of OEMs, custom machine builders, and machine tool manufacturers. They offer flexible, modular solutions and provide machine builders with many different options and configurations.

The PA Series features and options allow design engineers to adapt the product to many different types of applications. Adjustable Auto Cushions offer a fit & forget solution and make field installation quick and easy. The standard magnetic piston allows for the addition of reed or solid state switches before or after the actuator is installed on the machinery.

Cushioning

PA Series actuators are equipped with Auto Cushioning System. This uniquely designed internal air cushion auto-adapts to changing loads and conditions. This means cushion needle adjustment is not required, simplifying installation and set-up.

The optional Ecology Piston Seal is a specially engineered piston seal designed to absorb energy and reduce vibration in high speed applications. When used in conjunction with the Auto Cushion, the Ecology Piston Seal enhances conventional cushioning technology to improve end of stroke deceleration.

Advantages

Feature	Advantage	Benefit
Auto Cushioning - Standard	Adjusts to changing loads and pressures	Promotes longer machine life Saves time adjusting in the field Shorter cycle times
	No need to adjust for majority of applications	Saves time & money tweaking cushions at installation
	Fit & Forget solution	Reduces setup time No specialist knowledge needed
Optional Ecology Seal	Reduces impact & vibration	Prevent damage to machinery Reduce downtime
	Faster time through cushion	Faster cycle time, increase productivity
	Reduce noise levels	More pleasant work environment (OSHA guidelines)
Profile tube & die case end caps	Tube contoured to end caps	Modernized aesthetics
	Switch grooves on 3 sides	Increased versatility for mounting switches
	10-15% weight reduction	Reduce machine weight and shipping costs
Sleeve nut construction and bolt-on mountings	Versatile mounting configuration	Reduce skews & inventory
Aggressive market price	Complete with major competitors	Win more business

Specifications and Sizing

Technical Data

Bore Size (in.)	1.50	2.00	2.50	3.25	4.00
Rod Diameter (in.)	0.625	0.625	0.625	1.00	1.00
Port Size (NPT)	3/8	3/8	3/8	1/2	1/2
Piston Area - extend (in2)	1.77	3.14	4.91	8.30	12.57
Piston Area - retract (in2)	1.46	2.83	4.60	7.52	11.79

Theoretical Force Output (Extend) in Pounds

PSIG	1.50	2.00	2.50	3.25	4.00
40	71	126	196	332	503
60	106	189	295	498	754
80	142	251	393	665	1005
100	177	314	491	830	1257

Theoretical Force Output (Retract) in Pounds

PSIG	1.50	2.00	2.50	3.25	4.00
40	59	114	184	301	472
60	88	171	277	451	707
80	117	226	368	602	942
100	146	283	460	752	1179

How To Specify

Design and Sizing Guidelines

Basics to consider

When choosing a pneumatic actuator, always consider the force required, the pressure available, the speed of movement, and air consumption. The PA Series offers auto adjustable cushioning and magnetic pistons. Actuators are pre-lubricated at the factory and operate under normal conditions without additional lubrication. However, using a lubricator will extend the life of these products.

The adequate sizing of a pneumatic actuator depends on the force required and the applied pressure. Refer to previous page for theoretical force output details.

Load and buckling

Applications requiring the movement of heavy loads should be supported and guided to prevent excessive side load. In this case, it is recommended to use an external guide system or incorporate a stop tube into the actuator design. When a long stroke length is required, care must be taken to ensure the rod length is within the limits for prevention of rod buckling.

To determine the limits of the actuator in your application, follow these steps:

1. Select the “Extend Force” from the “Maximum Effective Length” chart.
2. Select the stroke factor from the “Actuator Mounting Diagram” chart.
3. To obtain the effective length “L”, multiply the actuator stroke by the appropriate stroke factor obtained in Step 2.

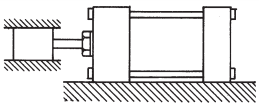
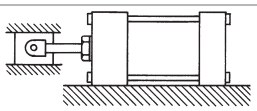
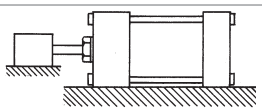
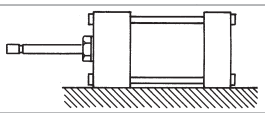
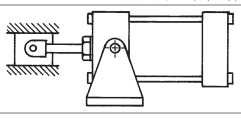
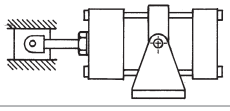
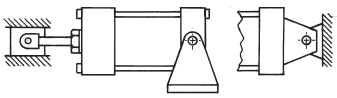
If the calculated effective “L” length exceeds L values in the “Maximum Effective Length” chart for the given extend force and rod diameter, the actuator may require a larger rod diameter and/or a stop tube or external guides. In this case, please contact Engineering for further design consultation.

Maximum Effective Length “L”

Extended Force (lb.)	5/8”	1”
50	95	—
100	65	170
150	50	135
200	43	115
300	34	93
500	25	70
750	20	56
1000	17	48
1500	13	38
2000	11	33

Note: In some cases, it may be necessary to use a larger bore cylinder than is required for the force in order to obtain an adequate rod diameter.

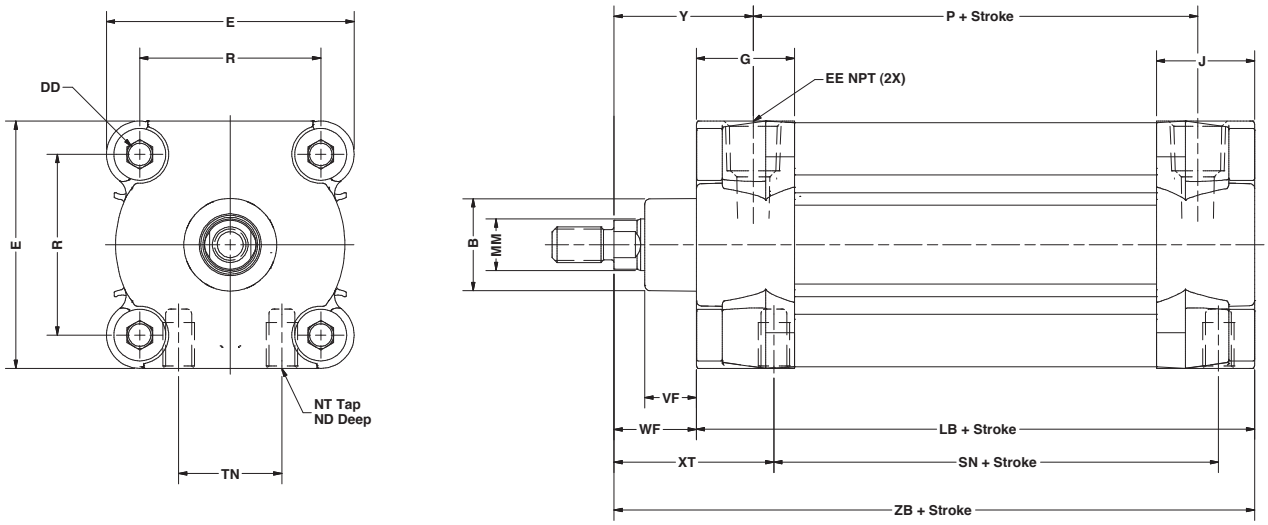
Actuator Mounting Diagram Chart

Actuator Mounting	Rod End Connection	Mounting Style	Stroke Factor
Side Tapped, Head or Cap Flange, Tie Rod, Center or Side Lug	Fixed and Rigidly Guided		.50
Side Tapped, Head or Cap Flange, Tie Rod, Center or Side Lug	Pivoted and Rigidly Guided		.70
Side Tapped, Head or Cap Flange, Tie Rod, Center or Side Lug	Supported but not Rigidly Guided		2.00
Side Tapped, Head or Cap Flange, Tie Rod, Center or Side Lug	None		5.00
Head Trunnion	Pivoted and Rigidly Guided		1.00
Center Trunnion	Pivoted and Rigidly Guided		1.50
Cap Trunnion or Clevis	Pivoted and Rigidly Guided		2.00

Specifications and Sizing

Basic Dimensions

Standard Mount - NFPA MS4 & Sleeve Nut Construction



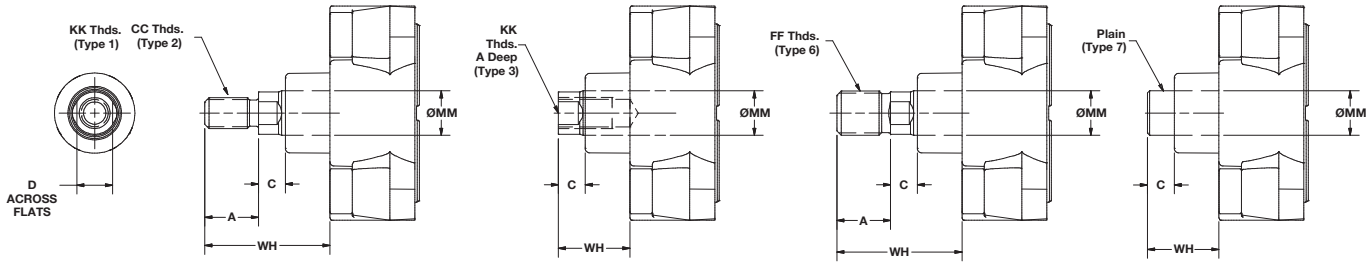
Bore	MM Ø	B Ø	DD	E	EE	G	J	LB	NT	ND
1.50	0.625	1.124	1/4-28	2.000	3/8 NPT	1.188	1.188	3.625	1/4-20	0.375
2.00	0.625	1.124	5/16-24	2.500	3/8 NPT	1.188	1.188	3.625	5/16-18	0.375
2.50	0.625	1.124	5/16-24	3.000	3/8 NPT	1.228	1.147	3.750	3/8-16	0.500
3.25	1.00	1.499	3/8-24	3.750	1/2 NPT	1.438	1.438	4.250	1/2-13	0.750
4.00	1.00	1.499	3/8-24	4.500	1/2 NPT	1.438	1.438	4.250	1/2-13	0.750

Bore	P	R	SN	TN	VF	WF	XT	Y	ZB
1.50	2.391	1.428	2.250	0.625	0.625	1.000	1.938	1.618	4.625
2.00	2.250	1.838	2.375	0.875	0.625	1.000	1.938	1.688	4.625
2.50	2.375	2.192	2.375	1.250	0.625	1.000	1.938	1.688	4.750
3.25	2.576	2.758	2.625	1.500	0.875	1.375	2.438	2.213	5.625
4.00	2.576	3.324	2.625	2.063	0.875	1.375	2.438	2.213	5.625

Specifications and Sizing

Basic Dimensions

Rod Ends

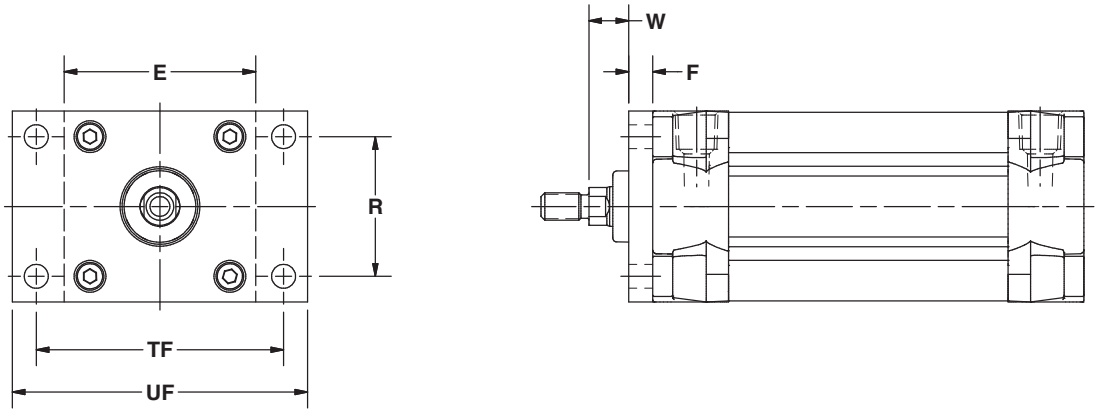


Bore	MM Ø	Thread Type		Rod Thread	A	C	D (Flats)	WH
1.50 2.00 2.50	0.625	KK1	KK	7/16-20	0.75	0.375	0.50	1.75
		KK2	CC	1/2-20	0.75	0.375	0.50	1.75
		KK3	KK	7/16-20	0.75	0.375	0.50	1.00
		KK4	FF	5/8-18	0.75	0.375	0.50	1.75
		KK5	Plain	—	—	0.375	—	1.00
3.25 4.00	1.00	KK1	KK	3/4-16	1.125	0.50	0.813	2.50
		KK2	CC	7/8-14	1.125	0.50	0.813	2.50
		KK3	KK	3/4-16	1.125	0.50	0.813	1.375
		KK4	FF	1-14	1.125	0.50	0.813	2.50
		KK5	Plain	—	—	0.50	—	1.375

Specifications and Sizing

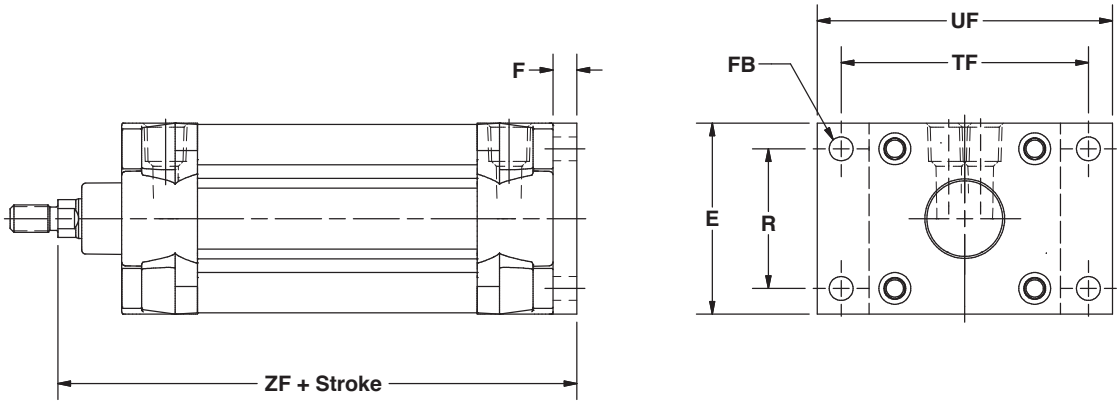
Model Dimensions

NFPA MF1 Mount (Front Flange)



Bore	E	F	FB	R	TF	UF	W
1.50	2.000	0.375	0.312	1.428	2.750	3.375	0.625
2.00	2.500	0.375	0.375	1.838	3.375	4.125	0.625
2.50	3.000	0.375	0.375	2.192	3.875	4.625	0.625
3.25	3.750	0.625	0.438	2.758	4.688	5.500	0.750
4.00	4.500	0.625	0.438	3.324	5.438	6.250	0.750

NFPA MF2 Mount (Rear Flange)

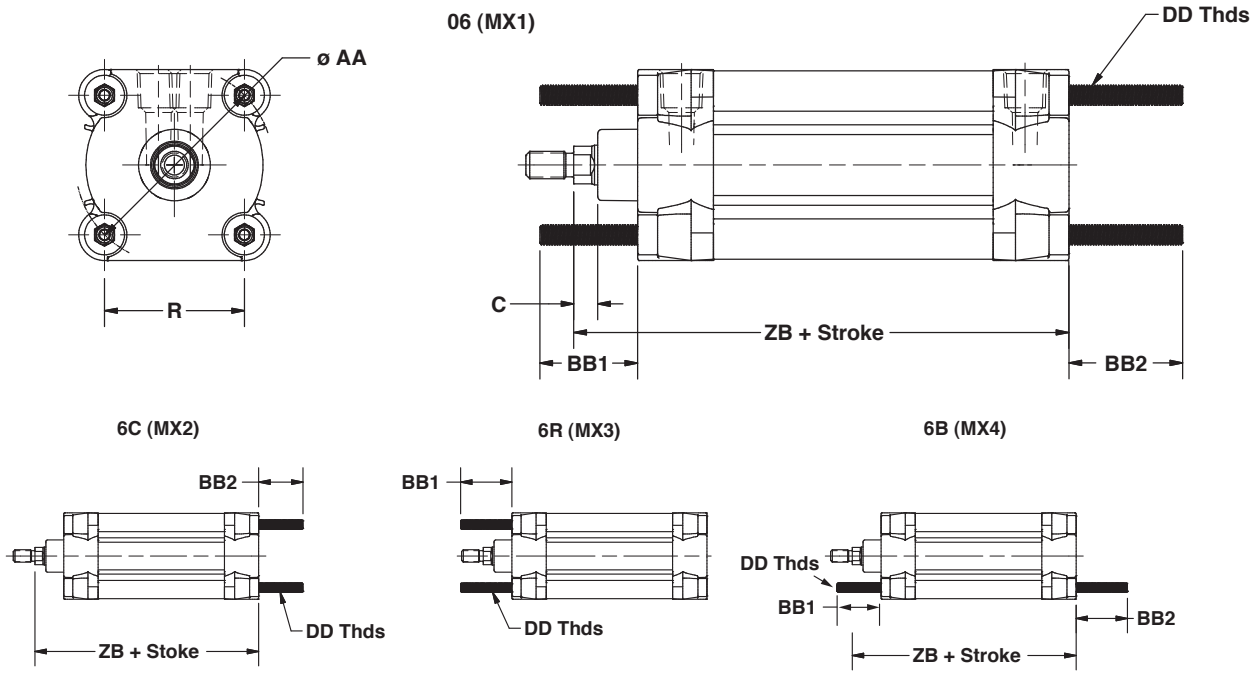


Bore	E	F	FB	R	TF	UF	ZF
1.50	2.000	0.375	0.312	1.428	2.750	3.375	5.000
2.00	2.500	0.375	0.375	1.838	3.375	4.125	5.000
2.50	3.000	0.375	0.375	2.192	3.875	4.625	5.125
3.25	3.750	0.625	0.438	2.758	4.688	5.500	6.250
4.00	4.500	0.625	0.438	3.324	5.438	6.250	6.250

Specifications and Sizing

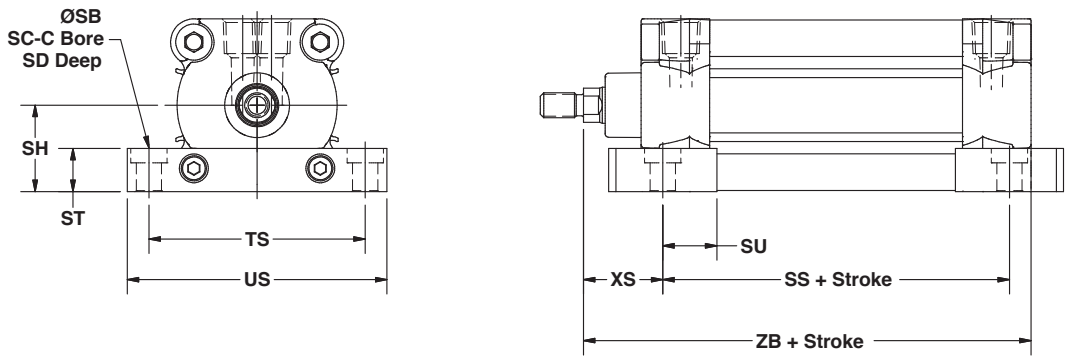
Model Dimensions

NFPA MX1, MX2, MX3 & MX4 Mounts (Extended Tie Rods)



Bore	AA	BB1	BB2	C	DD	R	VF	ZB
1.50	2.020	1.375	1.000	0.375	1/4-28	1.428	0.625	4.625
2.00	2.600	1.500	1.125	0.375	5/16-24	1.838	0.625	4.625
2.50	3.100	1.500	1.125	0.375	5/16-24	2.192	0.625	4.750
3.25	3.900	2.000	1.375	0.500	3/8-24	2.758	0.875	5.625
4.00	4.700	2.000	1.375	0.500	3/8-24	3.324	0.875	5.625

NFPA MS2 Mount (Side Lug)

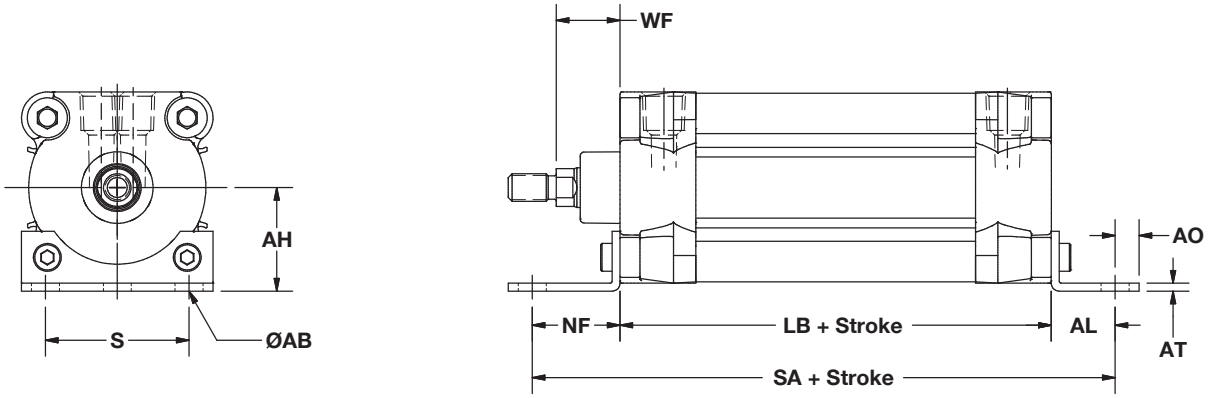


Bore	SB	SC	SD	SH	SW	SS	ST	SU	TS	US	XS	ZB
1.50	0.438	0.625	0.125	1.000	0.375	2.875	0.625	0.938	2.750	3.500	1.375	4.625
2.00	0.438	0.625	0.125	1.250	0.375	2.875	0.625	0.938	3.250	4.000	1.375	4.625
2.50	0.438	0.625	0.250	1.500	0.375	3.000	0.750	0.938	3.750	4.500	1.375	4.750
3.25	0.563	0.813	0.250	1.875	0.500	3.250	1.000	1.250	4.750	5.750	1.875	5.625
4.00	0.563	0.813	0.250	2.250	0.500	3.250	1.000	1.250	5.500	6.500	1.875	5.625

Specifications and Sizing

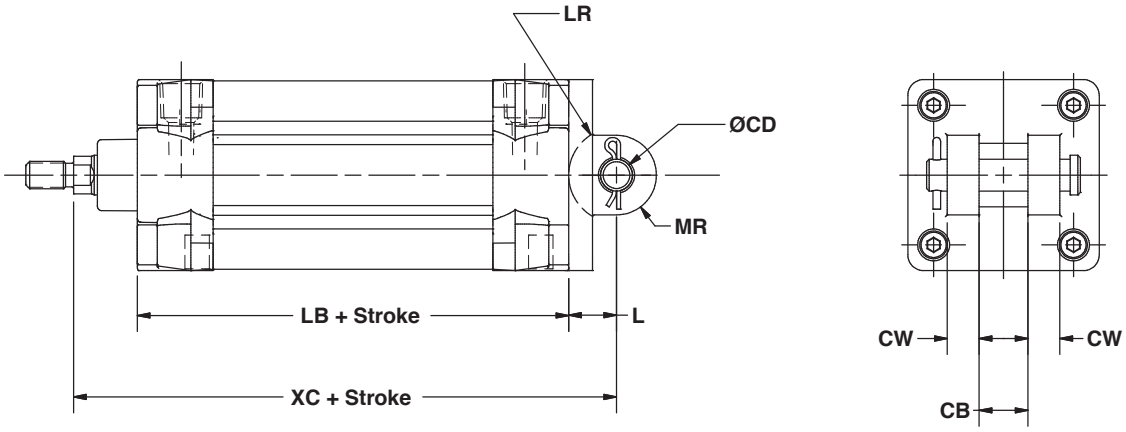
Model Dimensions

NFPA MS1 Mount (Front & Rear End Angle)



Bore	AB	AH	AL	AO	AT	LB	NF	S	SA	WF
1.50	0.438	1.188	1.000	0.375	0.125	3.625	1.375	1.250	6.000	1.000
2.00	0.438	1.438	1.000	0.375	0.125	3.625	1.375	1.750	6.000	1.000
2.50	0.438	1.625	1.000	0.375	0.125	3.750	1.375	2.250	6.125	1.000
3.25	0.563	1.938	1.250	0.500	0.125	4.250	1.875	2.750	7.375	1.375
4.00	0.563	2.250	1.250	0.500	0.125	4.250	1.875	3.500	7.375	1.375

NFPA MP1 Mount (Rear Pivot Clevis)

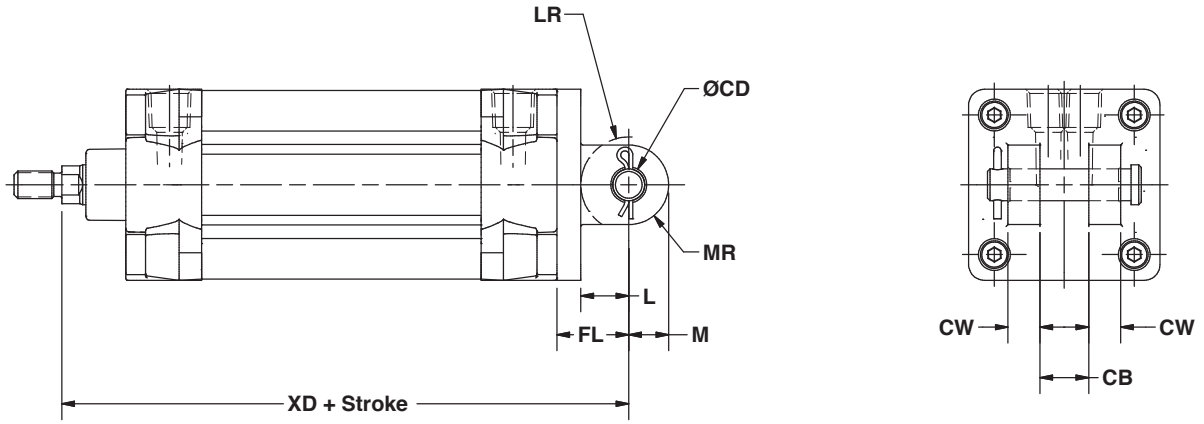


Bore	CB	CD	CW	L	LB	LR	MR	XC
1.50	0.750	0.500	0.500	0.750	3.625	0.625	0.625	5.375
2.00	0.750	0.500	0.500	0.750	3.625	0.625	0.625	5.375
2.50	0.750	0.500	0.500	0.750	3.750	0.625	0.625	5.500
3.25	1.250	0.750	0.625	1.250	4.250	0.875	0.875	6.875
4.00	1.250	0.750	0.625	1.250	4.250	0.875	0.875	6.875

Specifications and Sizing

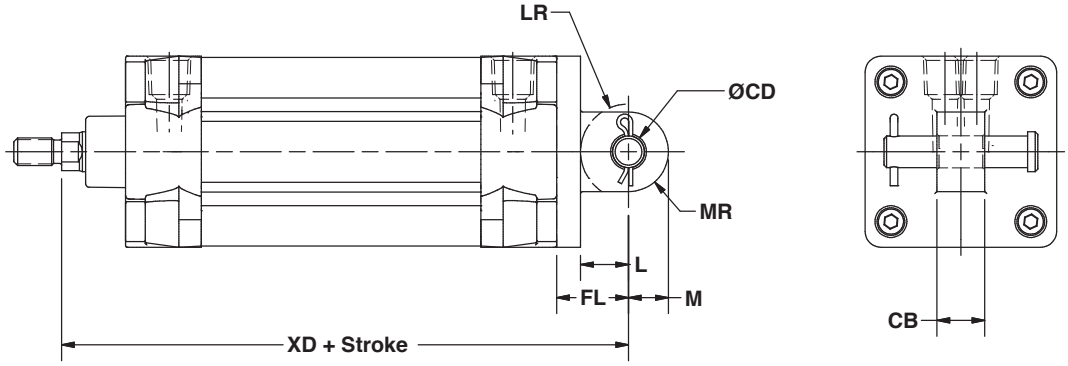
Model Dimensions

NFPA MP2 Mount (Rear Pivot Clevis)



Bore	CB	CD	CW	FL	L	LR	M	MR	XD
1.50	0.750	0.500	0.500	1.125	0.750	0.750	0.625	0.625	5.750
2.00	0.750	0.500	0.500	1.125	0.750	0.750	0.625	0.625	5.750
2.50	0.750	0.500	0.500	1.125	0.750	0.750	0.625	0.625	5.875
3.25	1.250	0.750	0.625	1.875	1.250	1.250	0.875	0.875	7.500
4.00	1.250	0.750	0.625	1.875	1.250	1.250	0.875	0.875	7.500

NFPA MP4 Mount (Rear Pivot Eye)

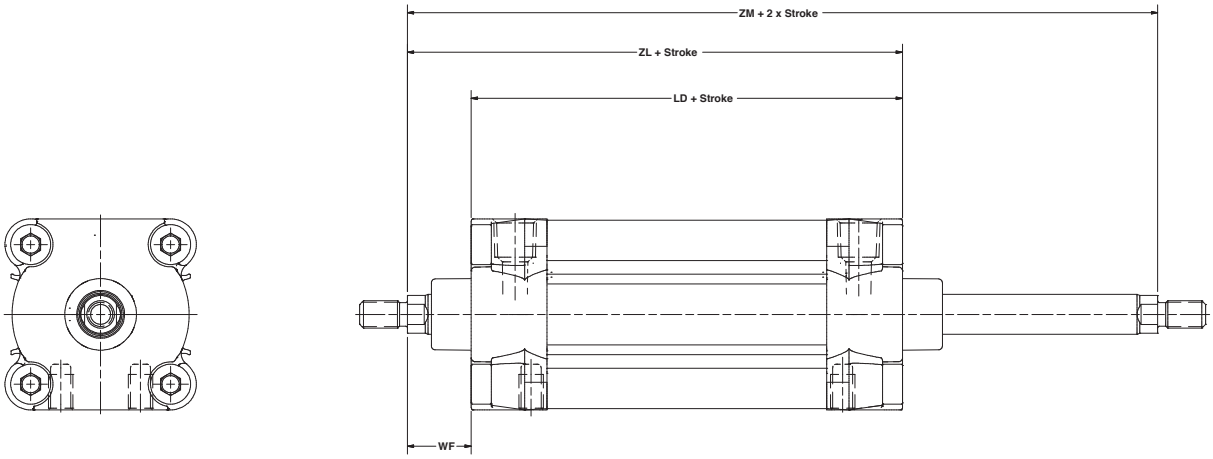


Bore	CB	CD	FL	L	LR	M	MR	XD
1.50	0.750	0.500	1.125	0.750	0.750	0.625	0.625	5.750
2.00	0.750	0.500	1.125	0.750	0.750	0.625	0.625	5.750
2.50	0.750	0.500	1.125	0.750	0.750	0.625	0.625	5.875
3.25	1.250	0.750	1.875	1.250	1.250	0.875	0.875	7.500
4.00	1.250	0.750	1.875	1.250	1.250	0.875	0.875	7.500

Specifications and Sizing: Optional Configurations

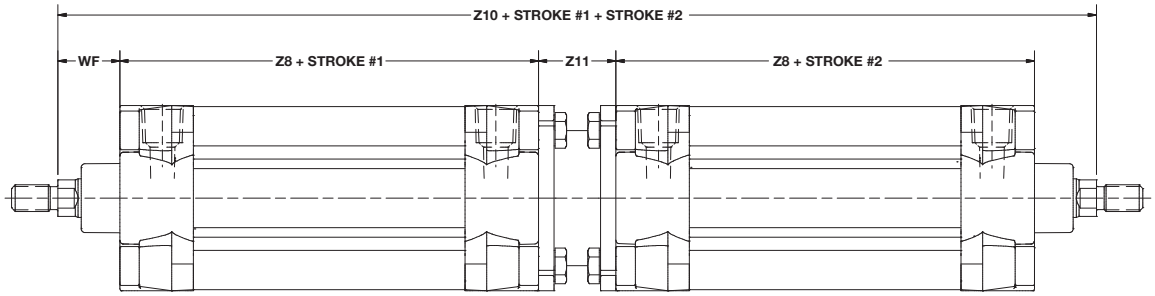
Model Dimensions

Double Rod End (D)



Bore	LD	WF	ZL	ZM
1.50	4.125	1.000	5.375	6.125
2.00	4.125	1.000	5.438	6.125
2.50	4.250	1.000	5.563	6.250
3.25	4.750	1.375	6.500	7.500
4.00	4.750	1.375	6.500	7.500

Back-to-Back (BTB)

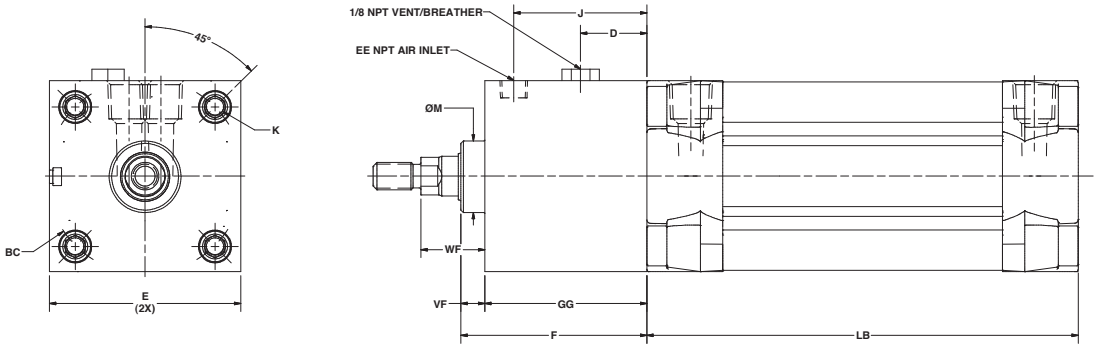


Bore	Z8	Z10	Z11	WF	Adapter Kit Part Number
1.50	3.625	10.375	1.125	1.000	PA-BTB-15-KIT
2.00	3.625	10.500	1.250	1.000	PA-BTB-20-KIT
2.50	3.750	10.750	1.250	1.000	PA-BTB-25-KIT
3.25	4.250	12.750	1.500	1.375	PA-BTB-32-KIT
4.00	4.250	12.750	1.500	1.375	PA-BTB-40-KIT

Specifications and Sizing: Optional Configurations

Model Dimensions

Actuator with Rod Lock (RLE)



Bore	BC	D	E	EE	F	GG	J	K	LB	M	VF	WF	Holding Force* (lbs.)
1.50	2.022	1.010	2.000	1/8	2.772	2.397	1.910	1/4-28	3.625	1.124	0.375	1.000	180
2.00	2.602	1.000	2.500	1/8	2.797	2.422	1.980	5/16-24	3.625	1.124	0.375	1.000	314
2.50	3.097	1.040	3.000	1/8	2.915	2.540	2.090	5/16-24	3.750	1.124	0.375	1.000	491
3.25	3.903	1.370	3.750	1/8	4.476	3.976	2.760	3/8-24	4.250	1.499	0.500	1.375	830
4.00	4.695	1.690	4.500	1/4	4.476	3.976	2.830	3/8-24	4.250	1.499	0.500	1.375	1257

*CAUTION: Rated holding force corresponds to static load conditions. If the rated value is exceeded, slipping may occur.

Rod Lock Technical Specifications

Rod lock release pressure:
60-120 PSI
Caution: Rod lock will not hold a load when mounted to actuators with operating pressures in excess of 100 PSI. Refer to holding force in dimensional chart.

Temperature range:
33°F to 150°F

Rod lock operation:
Operates in both directions
Note: If personal safety is required, an unrelated, redundant safety system should be used.

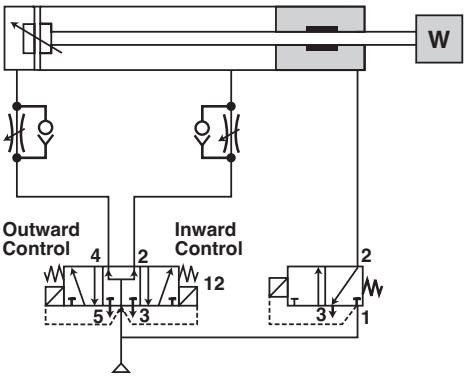
Rod locks require clean, dry, pressure regulated air—lubrication is not required.

The rod must be kept clean and dry to maintain optimum holding forces.

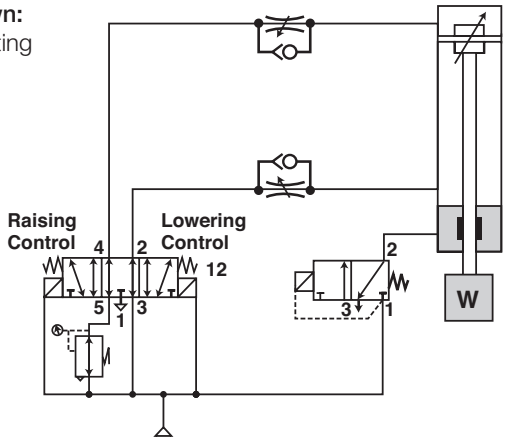
Rod rotation is not allowed when rod lock is engaged (not intended for torsional braking).

Rod Lock Schematics

System shown:
Actuator control using a 5/3 valve with the center open on the central port.

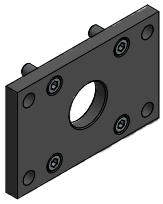


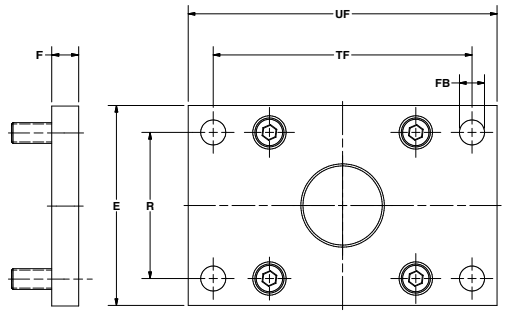
System shown:
Vertical mounting with the load beneath the actuator.



NFPA Mounting Kits

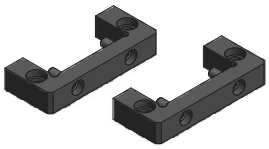
MF1 & MF2

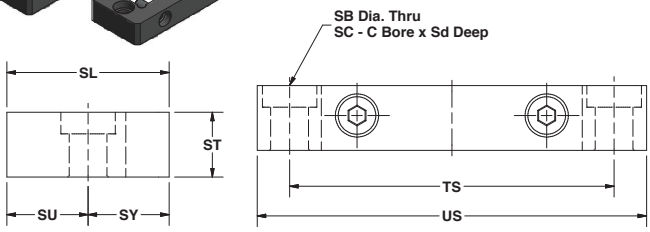




Bore	E	F (Thickness)	FB	R	TF	UF	Part Number
1.50	2.000	0.375	0.313	1.428	2.750	3.375	PA-MF1-15-KIT
2.00	2.500	0.375	0.375	1.842	3.375	4.125	PA-MF1-20-KIT
2.50	3.000	0.375	0.375	2.192	3.875	4.625	PA-MF1-25-KIT
3.25	3.750	0.625	0.438	2.758	4.688	5.500	PA-MF1-32-KIT
4.00	4.500	0.625	0.438	3.323	5.438	6.250	PA-MF1-40-KIT

MS2

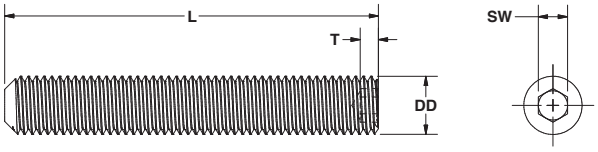




Bore	SB	SC	SD	SY	ST	SU	TS	US	Part Number
1.50	0.438	0.625	0.125	0.938	0.625	0.938	2.750	3.500	PA-MS2-15-KIT
2.00	0.438	0.625	0.125	0.938	0.625	0.938	3.250	4.000	PA-MS2-20-KIT
2.50	0.438	0.625	0.250	0.938	0.750	0.938	3.750	4.500	PA-MS2-25-KIT
3.25	0.563	0.813	0.250	1.250	1.000	1.250	4.750	5.750	PA-MS2-32-KIT
4.00	0.563	0.813	0.250	1.250	1.000	1.250	5.500	6.500	PA-MS2-40-KIT

MX1, MX2, MX3 & MX4

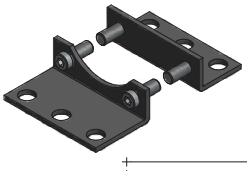


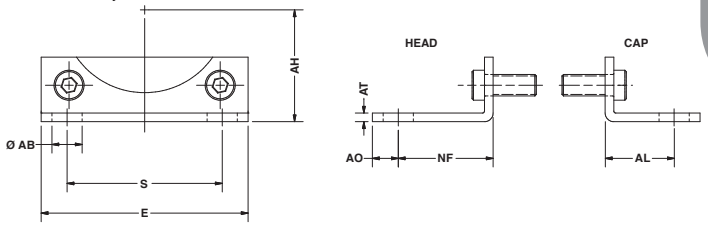


Bore	End	DD	L	SW	T	Part Number	
						Single Rod End	Double Rod End
1.50	HEAD	1/4-28	2.000	0.125	0.125	PA-MX1-15-KIT	PA-MX1D-15-KIT
	CAP	1/4-28	1.500	0.125	0.125		
2.00	HEAD	5/16-24	2.000	0.156	0.156	PA-MX1-20-KIT	PA-MX1D-20-KIT
	CAP	5/16-24	1.750	0.156	0.156		
2.50	HEAD	5/16-24	2.000	0.156	0.156	PA-MX1-20-KIT	PA-MX1D-20-KIT
	CAP	5/16-24	1.750	0.156	0.156		
3.25	HEAD	3/8-24	2.625	0.188	0.188	PA-MX1-32-KIT	PA-MX1D-32-KIT
	CAP	3/8-24	2.000	N/A	N/A		
4.00	HEAD	3/8-24	2.625	0.188	0.188	PA-MX1-40-KIT	PA-MX1D-40-KIT
	CAP	3/8-24	2.000	N/A	N/A		

Note: Single rod end kits include 4 head bolts and 4 cap bolts.
Double rod end kits include 8 head bolts.

MS1



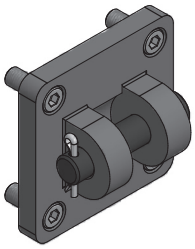


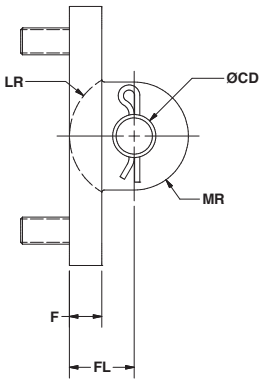
Bore	Ø AB	AH	AO	AL	AT	NF	E	S	Part Number	
									MS1 Single Rod	MS1 Double Rod
1.50	0.438	1.188	0.375	1.00	0.125	1.375	2.000	1.250	PA-MS1-15-KIT	PA-MS1D-15-KIT
2.00	0.438	1.438	0.375	1.00	0.125	1.375	2.500	1.750	PA-MS1-20-KIT	PA-MS1D-20-KIT
2.50	0.438	1.625	0.375	1.00	0.125	1.375	3.000	2.250	PA-MS1-25-KIT	PA-MS1D-25-KIT
3.25	0.563	1.938	0.500	1.25	0.125	1.875	3.750	2.750	PA-MS1-32-KIT	PA-MS1D-32-KIT
4.00	0.563	2.250	0.500	1.25	0.125	1.875	4.500	3.500	PA-MS1-40-KIT	PA-MS1D-40-KIT

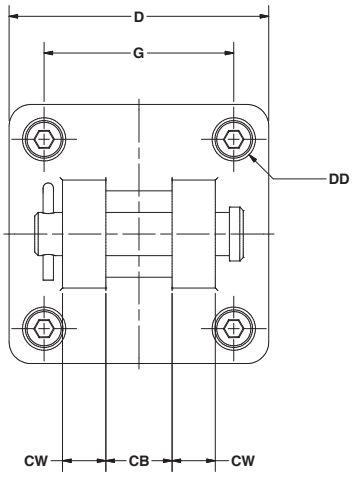
Note: Single rod end kits include 1 head and 1 cap bracket.
Double rod end kits include 2 head brackets.

NFPA Mounting Kits

MP1

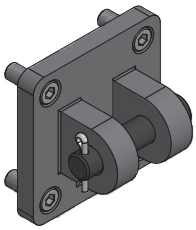


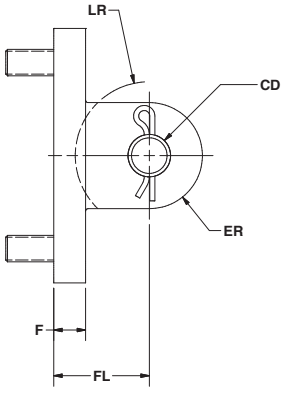


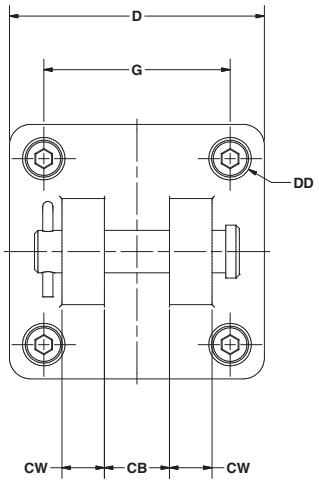


Bore	CB	CD	CW	D	DD	F	FL	G	LR	MR	Part Number
1.50	0.750	0.500	0.500	2.000	1/4-28	0.375	0.750	1.428	0.625	0.625	PA-MP1-15-KIT
2.00	0.750	0.500	0.500	2.500	5/16-24	0.375	0.750	1.838	0.625	0.625	PA-MP1-20-KIT
2.50	0.750	0.500	0.500	3.000	5/16-24	0.375	0.750	2.192	0.625	0.625	PA-MP1-25-KIT
3.25	1.250	0.750	0.625	3.750	3/8-24	0.500	1.250	2.758	0.875	0.875	PA-MP1-32-KIT
4.00	1.250	0.750	0.625	4.500	3/8-24	0.500	1.250	3.324	0.875	0.875	PA-MP1-40-KIT

MP2



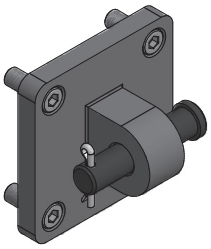


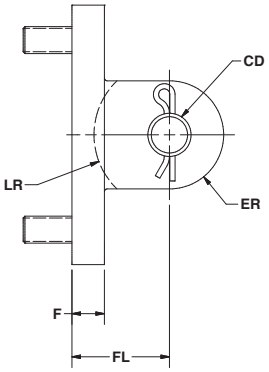


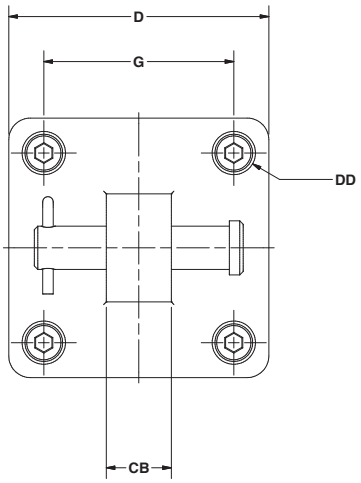
Bore	CB	CD	DD	ER	G	F	FL	LR	M	MR	Part Number
1.50	0.750	0.500	1/4-28	0.625	1.428	0.375	1.125	0.750	0.625	0.625	PA-MP2-15-KIT
2.00	0.750	0.500	5/16-24	0.625	1.838	0.375	1.125	0.750	0.625	0.625	PA-MP2-20-KIT
2.50	0.750	0.500	5/16-24	0.625	2.192	0.375	1.125	0.750	0.625	0.625	PA-MP2-25-KIT
3.25	1.250	0.750	3/8-24	0.875	2.758	0.500	1.875	1.250	0.875	0.875	PA-MP2-32-KIT
4.00	1.250	0.750	3/8-24	0.875	3.324	0.500	1.875	1.250	0.875	0.875	PA-MP2-40-KIT

NFPA Mounting Kits

MP4





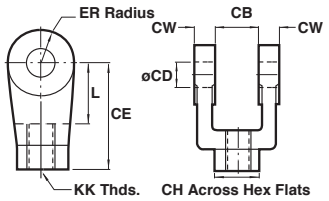


Bore	CB	CD	DD	ER	G	F	FL	LR	M	MR	Part Number
1.50	0.750	0.500	1/4-28	0.625	1.428	0.375	1.125	0.750	0.625	0.625	PA-MP4-15-KIT
2.00	0.750	0.500	5/16-24	0.625	1.838	0.375	1.125	0.750	0.625	0.625	PA-MP4-20-KIT
2.50	0.750	0.500	5/16-24	0.625	2.192	0.375	1.125	0.750	0.625	0.625	PA-MP4-25-KIT
3.25	1.250	0.750	3/8-24	0.875	2.758	0.500	1.875	1.250	0.875	0.875	PA-MP4-32-KIT
4.00	1.250	0.750	3/8-24	0.875	3.324	0.500	1.875	1.250	0.875	0.875	PA-MP4-40-KIT

NFPA Mounting Accessories

Rod Clevis

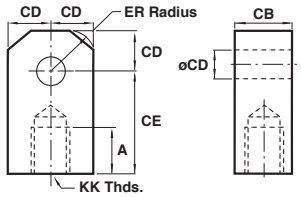
Note: Includes standard pin assembly.



Bore	Rod Ø	KK	CB	CD	CE	CH	CW	ER	L	Part Number
1.50 2.00 2.50	0.625	7/16-20	0.75	0.50	1.50	1.00	0.50	0.50	0.75	RC437-PA
3.25 4.00	1.00	3/4-16	1.25	0.75	2.375	1.25	0.625	0.75	1.25	RC750-PA

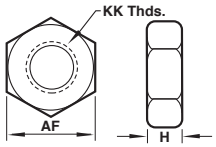
Rod Eye

Note: Includes standard pin assembly.



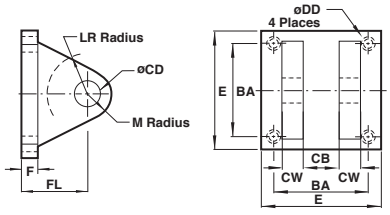
Bore	Rod Ø	KK	A	CB	CD	CE	ER	Part Number
1.50 2.00 2.50	0.625	7/16-20	0.75	0.75	0.50	1.50	0.563	RE437-PA
3.25 4.00	1.00	3/4-16	1.125	1.25	0.75	2.063	0.938	RE750-PA

Rod Jam Nut



Bore	KK	AF	H	Part Number
1.50 2.00 2.50	7/16-20	0.688	0.25	JN437-20-PA
3.25 4.00	3/4-16	1.125	0.422	JN750-16-PA

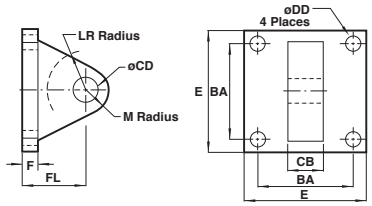
Clevis Bracket



Bore	BA	CB	CD	CW	DD	E	F	FL	LR	M	Part Number
1.50 2.00 2.50	1.625	0.75	0.50	0.50	3/8-24	2.50	0.375	1.125	0.75	0.5	CB500-PA
3.25 4.00	2.563	1.25	0.75	0.625	1/2-20	3.50	0.625	1.875	1.25	0.813	CB750-PA

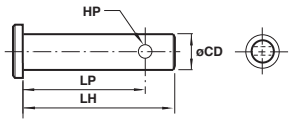
NFPA Mounting Accessories

Eye Bracket



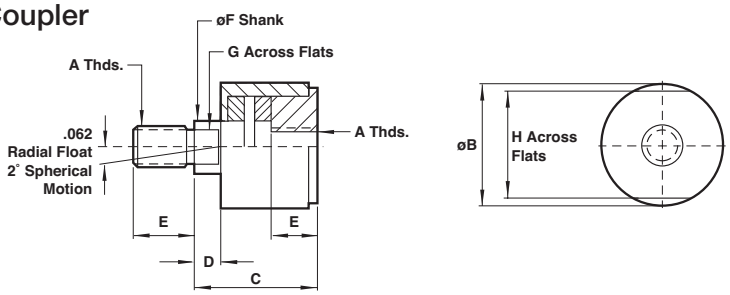
Bore	BA	CB	CD	DD	E	F	FL	LR	M	Part Number
1.50 2.00 2.50	1.625	0.75	0.50	0.406	2.50	0.375	1.125	0.75	0.50	EB500-PA
3.25 4.00	2.563	1.25	0.75	0.531	3.50	0.625	1.875	1.25	0.75	EB750-PA

Standard Pin Assembly



Bore	CD	HP	LH	LP	Part Number
1.50 2.00 2.50	0.5	0.126	2.25	2.093	CP500-PA
3.25 4.00	0.75	0.126	3.00	2.843	CP750-PA

Alignment Coupler



Bore	A	B	C	D	E	F	G	H	Max Pull (lbs.)	Part Number
1.50 2.00 2.50	7/16-20	1.25	2.00	0.50	0.75	0.625	0.50	1.125	10,000	AC437-PA
3.25 4.00	3/4-16	1.75	2.312	0.50	1.125	0.969	0.812	1.50	34,000	AC750-PA

Seal Kits

Single Rod End

PA Series	Ecology Seal
PASK625-150-HC	PASK625-150-HC-BP
PASK625-200-HC	PASK625-200-HC-BP
PASK625-250-HC	PASK625-250-HC-BP
PASK100-325-HC	PASK100-325-HC-BP
PASK100-400-HC	PASK100-400-HC-BP

Note: Includes rod bearing, piston seals, cushion seals, tube seals and rod seal/wiper.

Double Rod End

PA Series	Ecology Seal
PASKD625-150-HC	PASKD625-150-HC-BP
PASKD625-200-HC	PASKD625-200-HC-BP
PASKD625-250-HC	PASKD625-250-HC-BP
PASKD100-325-HC	PASKD100-325-HC-BP
PASKD100-400-HC	PASKD100-400-HC-BP

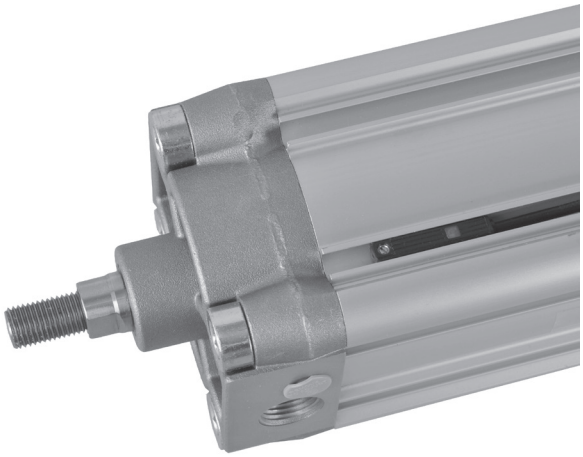
Note: Includes rod bearing, piston seals, cushion seals, tube seals and rod seal/wiper.

Reed and Solid State Switches

- Reed and Solid State functionality
- LED indicator
- Flush with tube profile
- Flying lead or quick disconnect
- Auto select versions
- Acrylonitrile butadiene styrene (ABS) housing

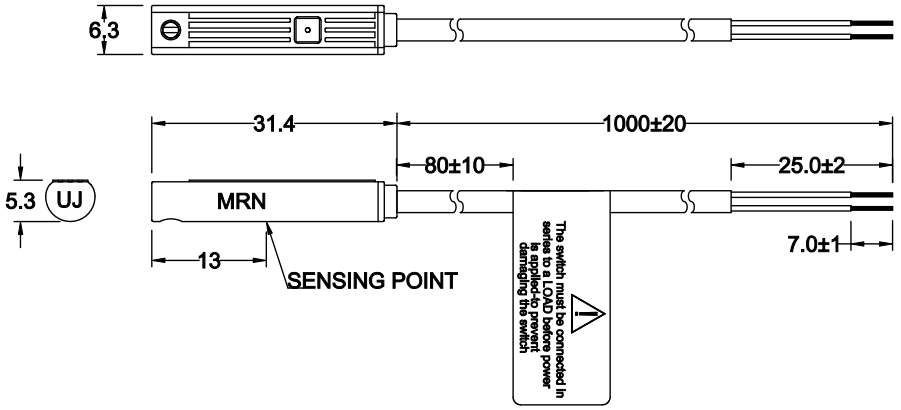


Switch P/N	Type	Voltage	Current Maximum (mA)	Function	Operating Temperature (°F)	LED	Protection Class	Plug	Cable Length
MRN	Reed, 2-Wire Flying Lead	240V AC/DC	100	Normally Open	25 to 158°F	RED	IP69K		1000 mm
MRNQS	Reed, 2-Wire M8	240V AC/DC	100	Normally Open	25 to 158°F	RED	IP69K	M8, 3 pin	300 mm
MDN	Solid State, 2-Wire Flying Lead	10 - 28V DC	50	Normally Open	25 to 158°F	RED	IP69K		1000 mm
MDNQS	Solid State, 2-Wire M8	10 - 28V DC	50	Normally Open	25 to 158°F	RED	IP69K	M8, 3 pin	300 mm
MSN	Solid State auto select, 3-Wire Flyind Lead	5 - 30V DC	200	NPN or PNP	25 to 158°F	RED	IP69K		1000 mm
MSNQS	Solid State auto select, 3-Wire M8	5 - 30V DC	200	NPN or PNP	25 to 158°F	RED	IP69K	M8, 3 pin	300 mm

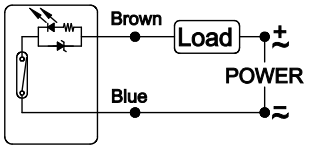


Reed Switches

MRN Reed, 2-Wire Flying Lead

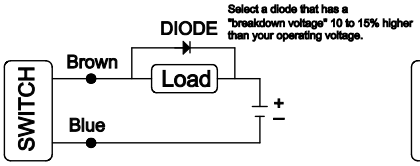


Circuit & Connect Diagram

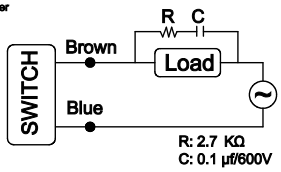


The brown wire series load to the positive (+)
and the blue to the negative (-) of power source.

External Protect Circuit

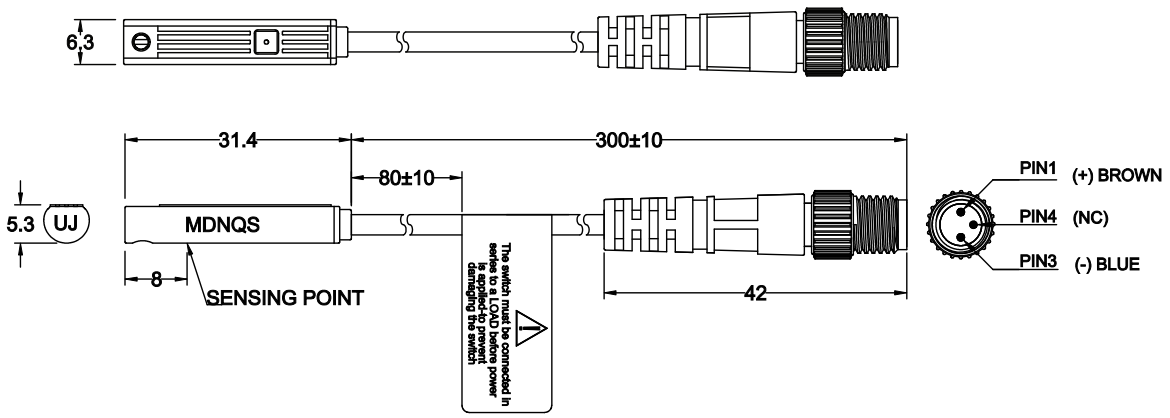


Applicably to
DC Conductive Load

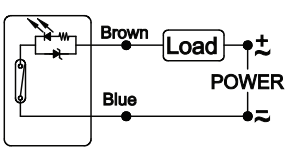


Applicably to
AC Conductive Load

MRNQS Reed, 2-Wire M8

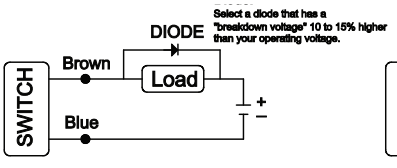


Circuit & Connect Diagram

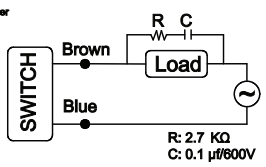


The brown wire series load to the positive (+)
and the blue to the negative (-) of power source.

External Protect Circuit



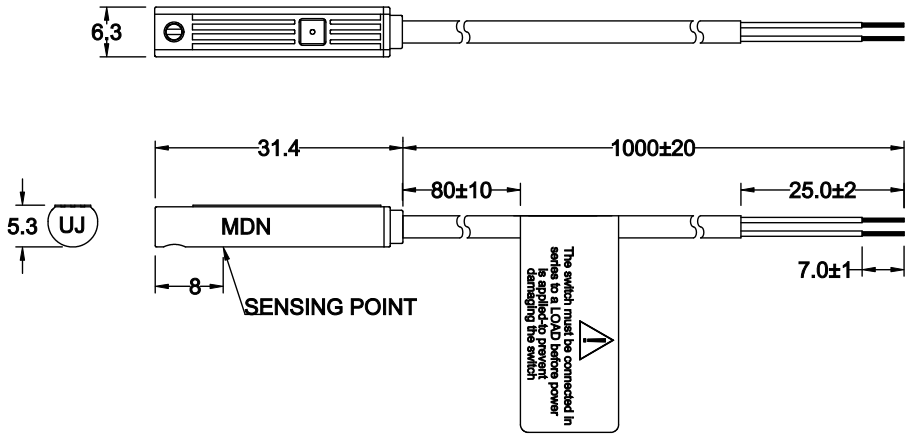
Applicably to
DC Conductive Load



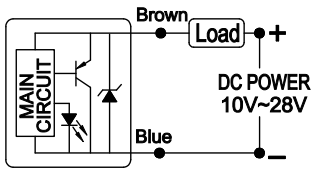
Applicably to
AC Conductive Load

Solid State Switches

MDN Solid State, 2-Wire Flying Lead

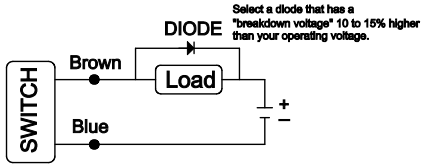


Circuit & Connect Diagram



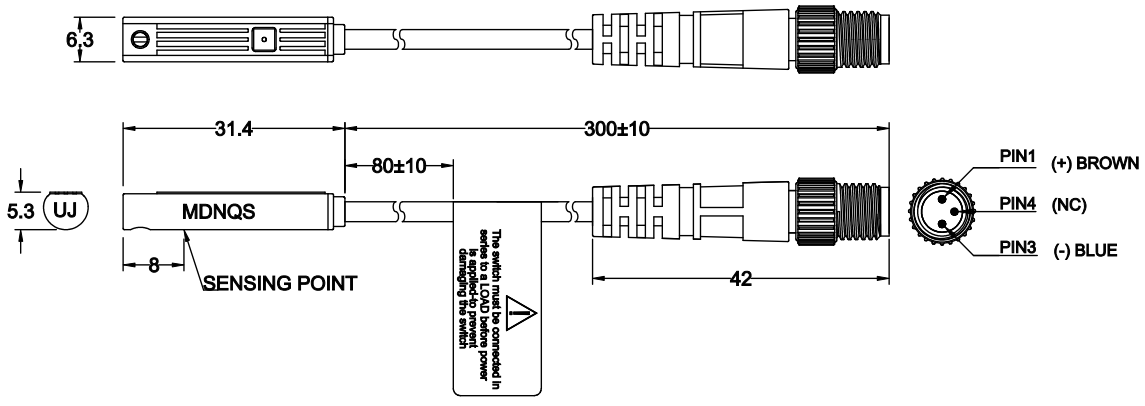
The brown wire series load to the positive (+)
and the blue to the negative (-) of power source.

External Protect Circuit

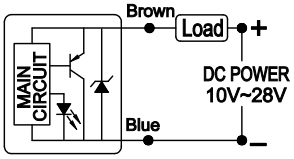


Applicably to
DC Conductive Load

MDNQS Solid State, 2-Wire M8

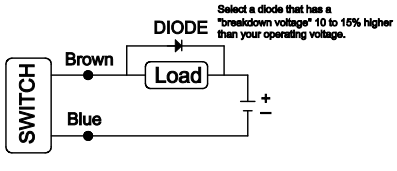


Circuit & Connect Diagram



The brown wire series load to the positive (+)
and the blue to the negative (-) of power source.

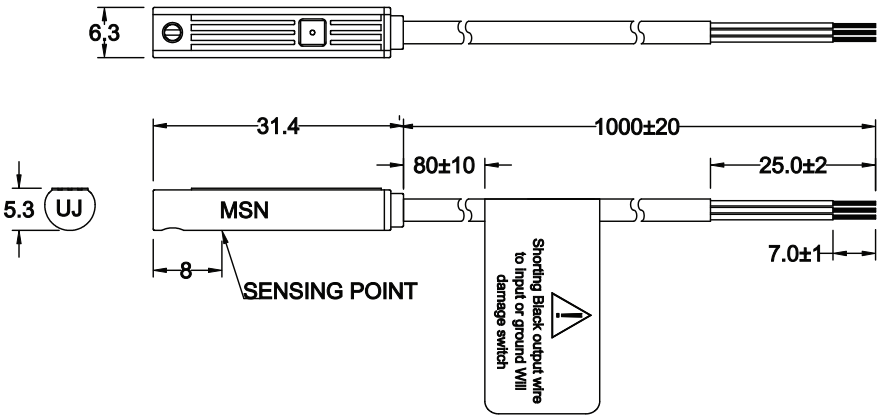
External Protect Circuit



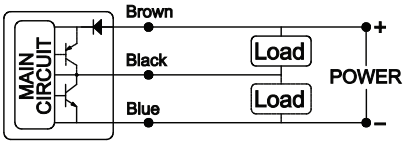
Applicably to
DC Conductive Load

Solid State Switches

MSN Solid State Auto Select, 3-Wire Flying Lead

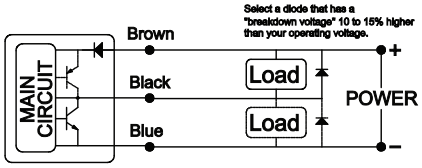


Circuit & Connect Diagram



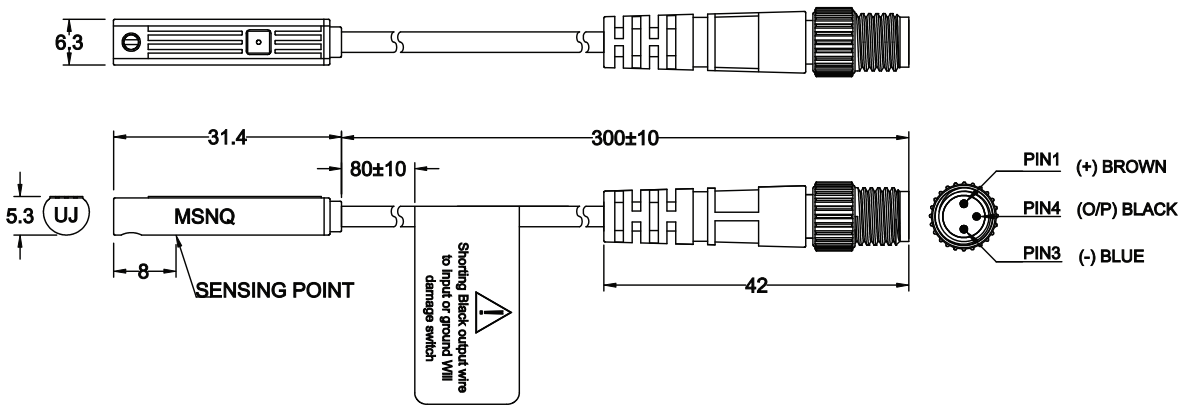
The brown wire to the positive (+) and the blue to the negative (-) from DC power.
The black wire have to connect to the load.

External Protect Circuit

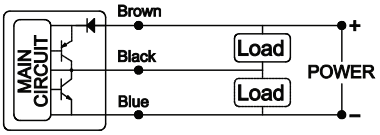


Applicably to Conductive Load
Attach an extenal diode between Brown(+) and Black(out) when NPN connection
Attach an extenal diode between Blue(-) and Black(out) when PNP connection

MSNQS Solid State Auto Select, 3-Wire M8

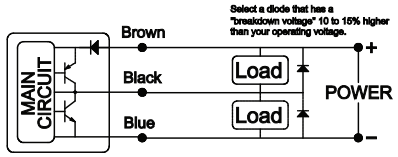


Circuit & Connect Diagram



The brown wire to the positive (+) and the blue to the negative (-) from DC power.
The black wire have to connect to the load.

External Protect Circuit



Applicably to Conductive Load
Attach an extenal diode between Brown(+) and Black(out) when NPN connection
Attach an extenal diode between Blue(-) and Black(out) when PNP connection

How to Order

The model number of all PA Series actuators consists of alphanumeric clusters designating model, mounting option, style, bore size, stroke length, rod end style, port location and size, as well as special options. The example below describes PA-MS4-2x12-HC-BP-KK1-MPR, a 2" bore x 12" stroke model with bottom tapped holes mounting (standard), head and cap cushions, along with optional bumper piston seals and magnetic piston for Reed or Solid State Switches.

Model
PA

NFPA Mounts			
MS4	Bottom Tapped Holes (Standard)	MS1	Front & Rear End Angle
MF1	Front Flange	MS2	Side Lug
MF2	Rear Flange	MX1	Extended Tie Rods (Head & Cap)
MP1	Rear Pivot Clevis	MX2	Extended Tie Rods (Cap)
MP2	Rear Pivot Clevis	MX3	Extended Tie Rods (Head)
MP4	Rear Pivot Eye	MX4	2 Extended Tie Rods (Head & Cap)

Cushions[1]	
H	Head Cushion (Position 1 is Standard)
C	Cap Cushion (Position 5 is Standard)

[1] When cushions aren't specified, seal is removed; spuds present. Non-cushioned cylinders are only available with Ecology piston seals. Note: It is recommended to use cushions for applications with operating speeds in excess of 20" per second.

PA - MS4 __ - 2.00 x 12 - HC - BP - KK1 - MPR

Style	
Blank	Single Rod End
D	Double Rod End

Bore Size	
1.50"	3.25"
2.00"	4.00"
2.50"	—

Stroke Length
0" to 100" (Made-to-Order)

Rod Lock Options				
Rod Lock	Rod Size		Bore	
RLE	063	0.625	150	1.50"
	100	1.00"	200	2.00"
			250	2.50"
Example: RLE-063250			325	3.25"
			400	4.00"

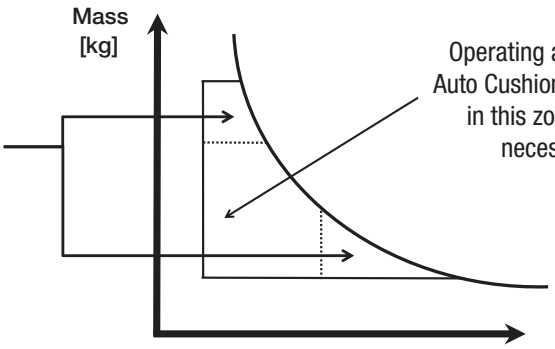
Options	
A=[2]	Extended Piston Rod Thread Example: A=2"
BP	Ecology Piston Seals
BTB[3]	Back-to-Back Configuration (Specify Stroke) Example: If Stroke 1=1" and Stroke 2=2", Then BTB=2 is Required
C=	Extended Piston Rod Example: If C=0.50", then 1" Rod Extension is C=1.50"
KK1	Small Male Rod Thread
KK2	Large Male Rod Thread
KK3	Female Rod Thread
KK3S	Studded Piston Rod KK3 with Stud, High Strength Threadlocker
KK3SB	Studded Piston Rod KK3 with Stud, Medium Strength Threadlocker
KK4	Full Diameter Male Rod Thread
KK5	Blank Rod End No Threads, A=0"
KKX	Special Thread (Specify)
MPR	Magnetic Piston for Reed or Solid State Switches
PRC[4]	Case Hardened Piston Rod
RLE	PA Series with Rod Lock Specify Model From Rod Lock Options Chart at Left
RLC=	Extended Piston Rod Example: If RLC=0.50", Then 1" Rod Extension is RLC=1.50"
SSR	Stainless Steel Piston Rod
XX	Special Variation (Specify)

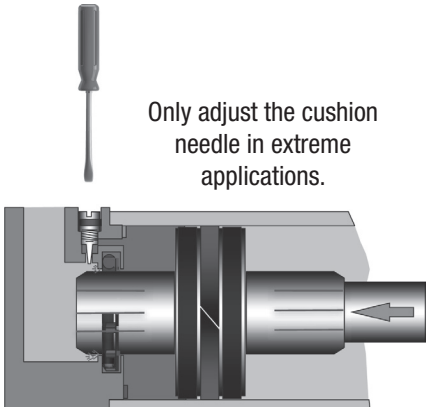
[2] Thread extension is increments of 0.125" up to 2.00".
[3] BTB option must reference 2nd stroke. Options will apply to both actuators. Mount will be assembled with respect to primary stroke.
[4] Must be used with RLE option.

Auto Cushioning System

The PA Series actuators are equipped with an Auto Cushioning System. This uniquely designed internal air cushion auto-adapts to changing loads and conditions. This means cushion needle adjustment is not required, simplifying installation and set-up. The auto cushioning results in longer machine life and offers a fit and forget solution.

The Auto Cushioning System provides a high performance pneumatic dampening function. The cushion screw is preset at the factory and will cushion for a wide range of general applications. Manual adjustment of the cushion screw is still possible for extreme applications.





Auto Cushioning Benefits

- Simplifies installation
- No specialist knowledge for setup
- No cushion setting required for many applications
- Actuator auto adjusts to changing loads and conditions
- Fit and forget

Energy Absorption Capacity of PA Series Actuators with Auto Cushioning

Usable Pounds Stoppable at the following piston speeds[1]

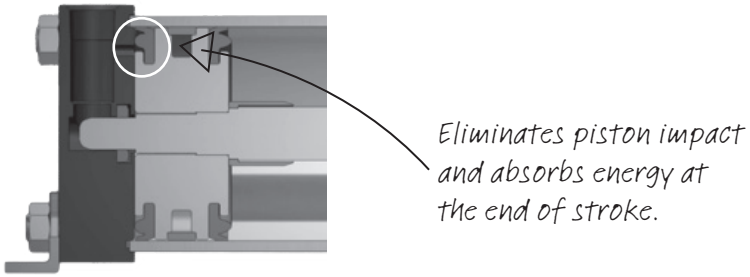
This chart features energy absorption capacity of the PA Series with auto cushioning.

In/Sec.	Bore				
	1.50	2.00	2.50	3.25	4.00
6	104	184	334	649	1007
12	26	46	84	162	252
18	12	20	37	72	112
24	7	12	21	41	63
30	4	7	13	26	40
36	3	5	9	18	28
42	2	4	7	13	21
48	2	3	6	12	18

[1] The weight of the actuator piston has been deducted from the figures shown above.

Ecology Piston Seals (BP)

The Ecology Piston Seal is an optional feature in PA Series NFPA actuators. The Ecology Seal is a specially engineered piston seal designed to absorb energy and reduce vibration in high speed applications. When used in conjunction with the auto-cushion, the Ecology piston seal enhances conventional cushioning technology to improve end of stroke deceleration.



Ecology Piston Seal Benefits

- Absorbs energy, eliminating impact forces, reducing vibration
- Reduces noise by 25%
- Reduces time through cushion to decrease cycle time, increasing productivity

Applications Recommended for Ecology Seals

- In high-speed applications when load deceleration is a concern
- When excess machine vibration due to pneumatic components is a concern
- When cushions are required but speed cannot be sacrificed
- To reduce the effects of pneumatic bounce
- To reduce noise levels

Energy Absorption Capacity of Ecology Seals with Adjustable Cushions

Usable Pounds Stoppable at the following piston speeds[1]

This chart features energy absorption capacity of the Ecology Seal with adjustable cushions.

In/Sec.	Bore				
	1.50	2.00	2.50	3.25	4.00
6	251	446	809	1570	2438
12	61	110	199	387	629
18	27	48	86	168	262
24	14	26	47	92	144
30	9	16	29	57	89
36	6	10.8	19	38	59
42	4.2	7.5	13	26	41
48	3.1	5.1	9.4	19	30

[1] The weight of the actuator piston has been deducted from the figures shown above.

Effect of Impact Dampening Seals on Total Stroke of Cylinders

PSI	Bore				
	1.50	2.00	2.50	3.25	4.00
0	.14	.15	.17	.19	.22
20	.10	.10	.12	.14	.16
40	.07	.07	.08	.09	.10
60	.04	.04	.05	.05	.06
80	.02	.02	.02	.02	.03
100	0	0	0	0	0

Note: These figures are for new actuators. The impact dampening seals will take some compression set during operation of the actuator and stroke loss will decrease. Also, the pressure for zero stroke loss will decrease to about 80 PSI. To determine the stroke loss for either head or cap end, divide the values shown by 2.

Noise Reduction
Sound Levels in Decibels

PSI Air Sound Pressure Level in Decibels		2.00" x 6.00" Actuator	
		Standard Seals	Ecology Seals
95	End	110	74
PSI	Side	110	81
50	End	113	74
PSI	Side	110	81

Notes

Notes

IMI Precision Engineering operates four global centres of technical excellence and a sales and service network in 75 countries, as well as manufacturing capability in the USA, Germany, China, UK, Switzerland, Czech Republic, Mexico and Brazil.

For information on all IMI Precision Engineering companies visit **www.imi-precision.com**

Supported by distributors worldwide.

Due to our policy of continuous development, Bimba reserve the right to change specifications without prior notice.

BIM-PAFL-0119

Selected Images used under license from Shutterstock.com

Bimba
25150 S. Governors Hwy
University Park, IL 60484

Tel: +1 708 534 8544
Fax: +1 708 235 2014

For further information, scan this QR code or visit **www.bimba.com**

Bimba is part of IMI Precision Engineering