Schrader Bellows®

3MA/4MA Series

Non-Lube NFPA Air Cylinders

Catalog AU03-SB0929/NA

Parker

Parker Hannifin Corporation

A global Fortune 300 company with sales of $9 billion and more than 400,000 customers in 46 countries, Parker Hannifin is the world's leading supplier of motion control components and system solutions serving the industrial, mobile, and aerospace markets. Parker is the only manufacturer offering customers a choice of hydraulic, pneumatic, electromechanical, and computer motion control.

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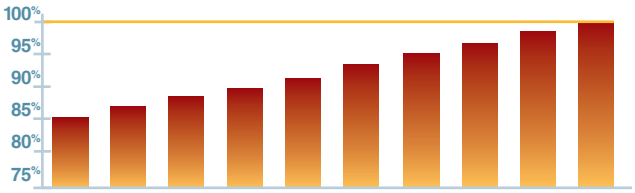
Parker's team of highly qualified application engineers, product development engineers, and system specialists can turn pneumatic products into an integrated system solution. And our Selectable Levels of Integration™ program provides the components, subsystems, and controlled motion systems to suit the level of integration you choose.



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Parker boasts the industry's largest global distribution network, with more than 8,600 distributors worldwide. With factories located strategically on five continents, we can maintain matchless on-time delivery rates.

Expect industry's fastest response and delivery by customer request date when you contact Parker or one of its distributors. Plus, Parker's army of pneumatic engineers works hand-in-hand with you and your local distributors during the design process to ensure the best products, services, and application performance.

Parker Pneumatic Distribution partners, our Pneumatic Technology Centers, offer the next level in premier customer service. Each location has on-hand inventory to keep your down time to a minimum, and in-house design capabilities to support your system and subsystem requirements.

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Parker's best-in-class technology training includes hands-on classes, web-based training, and comprehensive texts for employees, distributors, and customers. Parker also provides computer based training, PowerPoint presentations, exams, drafting and simulation software, and trainer stands.

www.schaderbellows.com

Industry's most comprehensive web site is your single source for:

- Product information
- Downloadable catalogs
- 3-D design files
- Training materials
- Product configuration software
- RFQs

24/7 Emergency Breakdown Referrals

The Parker product information center is available any time of the day or night at 800-C-Parker (US) or 011 (44) (1442) 458000 (Europe). Our operators will connect you with on-call representatives who will identify replacement parts or services for all motion technologies. Talk to a real person!

Parker

Schrader Bellows®

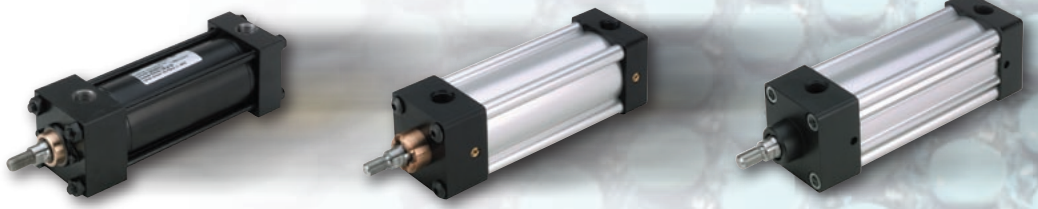
The Next Generation NFPA Cylinder

Schrader Bellows, the pioneer in the design and development of the aluminum NFPA cylinder, continues its innovation leadership with the release of the new **3MA Series**.

Schrader Bellows has always been at the forefront of cylinder design and application. Over **30 years ago**, we perceived the need for a lightweight, low-cost air cylinder with great performance. This led to the invention of the **Econo-Ram Series**, which included breakthroughs such as **aluminum tubing**, **check seal cushions** and **tie rod mounted sensors**, among other improvements.

Forecasting demand for even further weight reduction, improved performance and sleek aesthetics, we evolved the Econo-Ram Series into the **Econo-Ram II Series**. This robust design has been the backbone of the aluminum cylinder market for the past 13 years. Econo-Ram II Series innovations included new use of **aluminum for endcaps and pistons**, **an externally-removable bronze gland** and a **unique extruded profile cylinder body**. The result is a **lighter weight**, **lower cost**, **higher performance package** that pleased the eye.

Doing business with Schrader Bellows means that you always have the latest in technology to meet rapidly changing market and application demands. The 3MA Series represents the next generation solution for NFPA cylinder applications.



Econo-Ram **1976** → *Econo-Ram II* **1994** → *3MA* **2007**

REDEFINING MOTION in Cylinder Design

New Value for a Common Platform

Superior Performance
Resulting from efficient design, reduced weight, low friction and advanced sealing technology

Flexible Mount
Standard mount accommodates NFPA mounts as accessories

Sensor-Ready
Magnetic piston ring is standard. Sensors "drop-in" to grooves in cylinder body for easy, inexpensive assembly and protection

Safety
Rod lock version available

Environmentally Friendly
Reduced noise from RoHS-compliant materials

2-D and 3-D CAD Files
Immediately available at http://www.schraderbellows.com

Low Friction at Zero Leakage

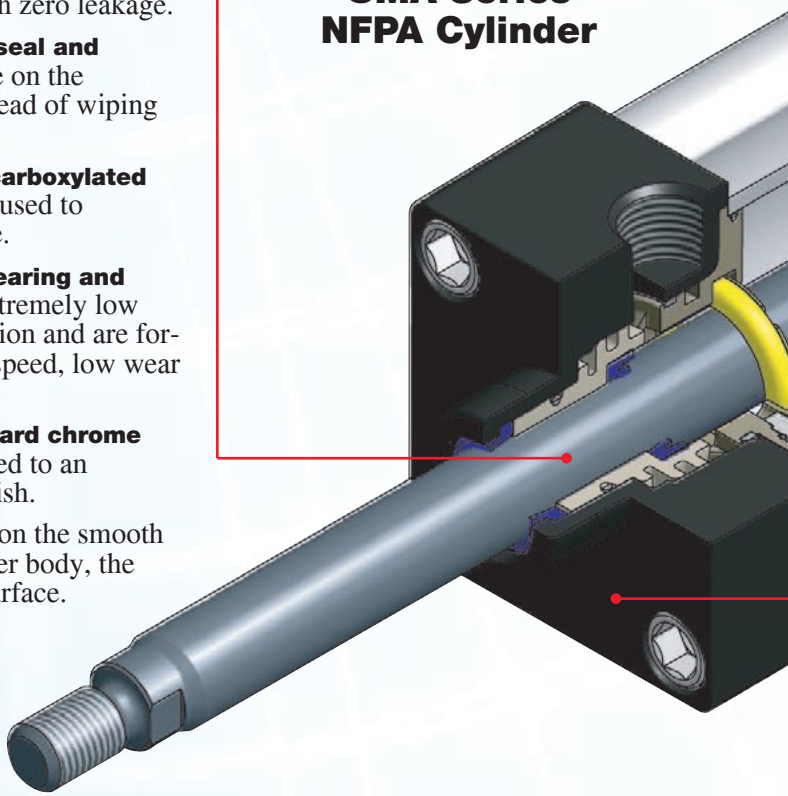
All moving components are designed for low friction. Low friction results in less wear, and we accomplish this with zero leakage.

- **Rounded-lip rod seal and piston seals** glide on the lubricant film instead of wiping it away.
- **Self-lubricating carboxylated nitrile** material is used to maximize seal life.
- **Composite rod bearing and piston** have an extremely low coefficient of friction and are formulated for high speed, low wear applications.
- **Rod material is hard chrome plated** and polished to an extremely fine finish.
- **Nitrile end seals** on the smooth bore of the cylinder body, the optimal sealing surface.

Reduced Weight Design

- **Use of lighter composites** as a qualified substitute for heavier metals, combined with die cast endcap design, have reduced the average weight of our cylinder by 15%.

3MA Series NFPA Cylinder

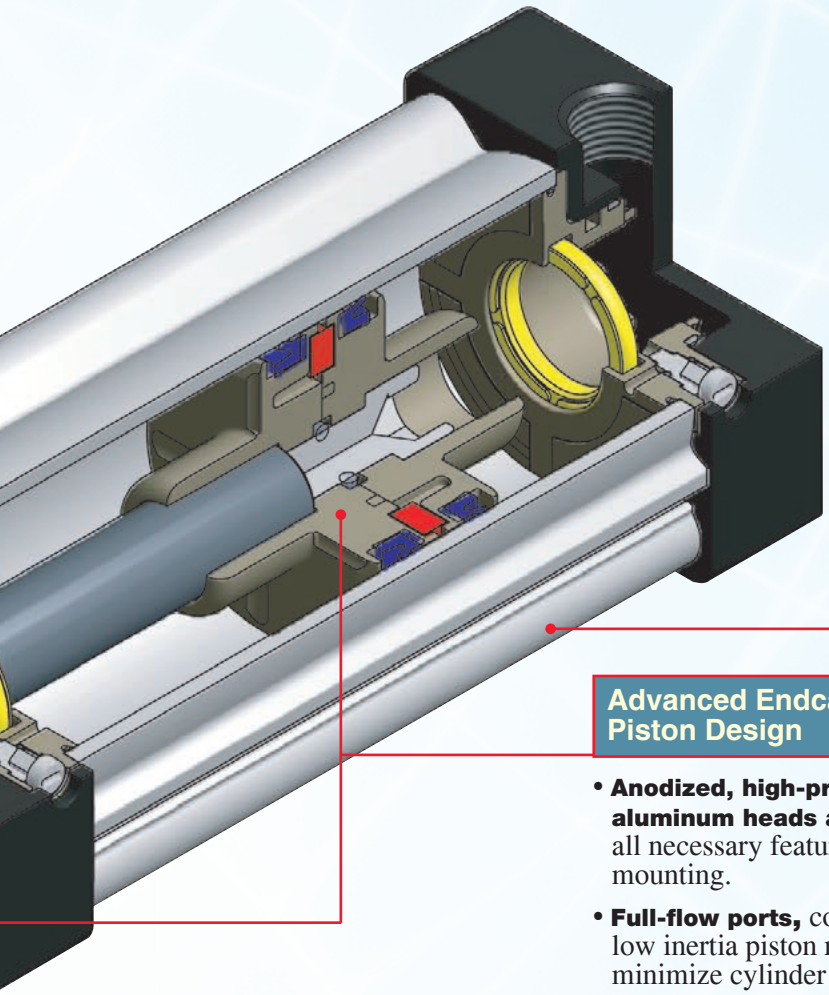


Flexible Mount

- **Heads and caps** are designed with a flexible mounting platform that allows almost every NFPA mount to be fastened as an accessory.
- **Cylinder with mountings** attached at the factory are available, or you may choose to install mountings from separate kits - it's your choice.
- **Rod lock feature** utilizes the 3MA standard head for assembly.

Schrader Bellows®

REDEFINING MOTION in Cylinder Design



Sensor-Ready

- **Unique, extruded-profile cylinder body** offers integrated sensor grooves to minimize sensor installation time, maximize sensor protection and eliminate the need for brackets.
- **All Global and Mini-Global sensors** are accepted by six grooves on three sides that run the entire length of the cylinder body.
- **Magnetic piston ring** included as standard; the cylinder is already prepared for your position sensing needs.

Composite Materials

Key components leverage our experience with composites for industrial applications.

- **Tough and impact resistant**, bearing-grade materials are used in manufacturing all composite parts.
- **Extensive testing** confirms the composite as a qualified alternative to aluminum and bronze for high service life in rigorous installations.
- **Quicker cylinder response times** and potentially lower freight costs are possible through the use of composite materials which significantly reduce inertia of moving parts and total cylinder weight.
- **Additional advantages** include cushions as a standard feature, noise reduction without the need for bumpers, and lower friction than other materials.

Advanced Endcap and Piston Design

- **Anodized, high-pressure die-cast aluminum heads and caps** include all necessary features for flexible mounting.
- **Full-flow ports,** combined with the low inertia piston rod assembly, minimize cylinder response time.
- **Composite inserts** allow us to offer adjustable cushions at no additional cost.
- **Individual flow geometry** for each bore size results in effective cushioning that is easy to adjust and set.
- **Floating check-seal design** combines the sealing capability of a lipseal with check valve action for quick stroke reversal.
- **Cushioning performance** is outstanding due to symmetrical piston geometry and long-lasting urethane seals.

Proven Exterior Toughness

- **Anodized aluminum alloy** endcaps and cylinder body for high strength, corrosion resistance and low friction.
- **Zinc plated steel endcap fasteners** for tough environments.
- **Case hardened, hard chrome plated** and polished carbon steel piston rod for damage resistance, long rod seal life and low friction.
- **Outboard "Molythane" urethane rod wiper** to remove external debris and adherents from the piston rod during the entire stroke.

REDEFINING MOTION in Cylinder Design

Environment, Health and Safety

The 3MA is designed with goals beyond performance. Driving these efforts are requirements, regulations and other activities that attempt to make the world a better, safer place in which to live and work. Here are some of the results:

- **CE Approved and UL Listed Sensors –** all of our Global and Mini-Global Sensors are CE approved and UL listed.
- **Reduced Noise Pollution –** the innovative composite piston and endcap inserts reduce noise by 12 dB from the typical aluminum cylinder design. For further noise reduction by as much as 20 dB, specify bumper piston seals.
- **Rod Locks –** when precise load holding and emergency-stop situations arise, the 3MAJ (3MA with Rod Lock) is the perfect addition for your safety solution. In addition, our rod locks are IP67 rated, exceed NEMA 4X and classified as EN 954 Category 1 for robust applications.
- **Recycle –** all 3MA solid material content is 100% recyclable. Aluminum (endcaps, cylinder body) and steel (piston rod, fasteners) are the two most recycled primary metals in the world. The composite parts are classified as 7, which means they can also be recycled. Finally, the nitrile and urethane seals can be recycled via common commercial means.
- **RoHS Compliant –** you can feel safe using the 3MA cylinder worldwide. All 3MA materials are 100% RoHS (Restriction of Hazardous Substances) compliant.
- **ATEX, NAMUR, CSA, Weld Immune Applications –** we offer sensors and power supplies that function in applications requiring ATEX Ex, NAMUR (intrinsically-safe), CSA or weld field immune specification. Most of these sensors also carry CE approval and UL listing.

4MA - Designed for Modification

Although the 3MA is perfectly suited for many applications, there is an occasional need for something different. To accommodate these demands, we designed the highly-versatile 4MA Series cylinder. The 4MA will provide the same fit as the 3MA, but its construction offers more flexibility for modification.

General 4MA features include:

- Available in 1½" – 8" bore sizes
- Machined head and cap from extruded aluminum bar stock, black anodized for corrosion resistance
- Externally removable bronze alloy gland/bearing for easy maintenance
- Same piston rod assembly options and cylinder body as the 3MA
- Oversize rods
- RoHS compliant

The 4MA offers these additional options:

- Combination with the following as standard offerings:
  - HB slide packages to become guided cylinders (HBC/HBT/HBR/HBB)
  - "B" Series air valves as an air cylinder/valve combination unit (ACVB Option)
  - Bolt-On Linear Transducer for continuous piston rod position sensing (LPSO Option)
  - Rod lock (4MAJ Series)
- Custom designs for endcaps, pistons, piston rods, mounts, etc.
- Porting options
- Gland options, including the HI LOAD design for side load conditions and metallic rod wiper design
- High temperature (to +250ºF) and low temperature (to -50ºF) construction
- Hydraulic service to 400 PSIG (4ML)
- And many, many more. Please see page 14 for a detailed list.

For complete information of the 4MA Series, including how to order, please see pages 9 to 43.

REDEFINING MOTION in Cylinder Technology

Advanced Manufacturing

Cylinders, by nature, are customized products. Whether it is something basic, such as stroke length, or something more complex, such as a special head, raw material and basic parts must be procured and manufactured into components for configured cylinders.

Organizing cylinder production and assembly requires some degree of planning. To do so, without sacrificing customer service, requires a sharp focus on advanced manufacturing processes.

Lean Manufacturing Principles

Schrader Bellows has utilized Lean Manufacturing techniques for many years, even before it was called by name. Cellular Manufacturing, Value Stream Mapping, Kaizen events, Kanban, One-Piece Flow and other influences are pervasive in our manufacturing processes. We now follow Lean Implementation to focus all aspects of our operation on the same goals for customer service.

Made in U.S.A. and Canada

3MA Series cylinders are manufactured in Akron, Ohio; Portland, Oregon; and Milton, Ontario. Location is a significant part of our customer service model. We believe that customers value a domestic presence, in different time zones, for many reasons. A few include:

- **Quick Delivery –** standard lead time is a few days, with the capability of shipping some cylinder configurations within 24 hours. We deliver to your request.
- **Made-To-Order –** we are able to quickly manufacture customized products without the need to carry fixed finished goods inventory. This minimizes time-to-customer and cost-to-customer concerns.
- **Late-Day Orders –** a West Coast presence creates an order time advantage of three hours, which may be instrumental in keeping you on schedule.
- **Non-Standard Designs –** since 50% of applications require cylinders that are not catalog-standard, we organized our entire culture for flexibility. Our manufacturing processes are prepared to accommodate non-standard designs with minimal lead-time adjustments.
- **Early Morning Service –** an Eastern US presence establishes timely customer service for the entire country.
- **Risk Management –** the absence of international risks when dealing with suppliers from other continents can help you sleep at night. Our goal is to offer you the best product, on time, with your financial concerns in mind.

⚠ Warning

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from The Company, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application, including consequences of any failure and review the information concerning the product or system in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

The product described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by The Company and its subsidiaries at any time without notice.

Offer of Sale

The items described in this document are hereby offered for sale by The Company, its subsidiaries or its authorized distributors. This offer and its acceptance are governed by provisions stated on a separate page of the document entitled 'Offer of Sale'.

Table of Contents

A NEW LOOK…How To Use This Catalog

In order to make a catalog as user-friendly as possible, we have changed the traditional drawing & dimension presentation style and established a common page sequence. For example, all basic cylinder information is on one page, rod end information is on another and mount-specific information is on following pages.

Please note this pattern is generally followed for every cylinder section:

Page 1 = Cylinder picture/cutaway with noted features

2 = How To Order (Model Code)

3 = Available Mounting Styles table for the respective cylinder with mount-specific sketches

4 = General Specifications

5 = Material Specifications with material options

6 = How to Select a Cylinder (per respective cylinder)

7 = Single Rod Basic Cylinder Drawing with detailed dimensions

8 = Rod End Drawings with dimensions

9 = Double Rod End Cylinder Drawing with dimensions

10+ = Mount-Specific Drawings with only key mount dimensions

For more detailed cylinder dimensions, please refer to Single Rod Basic Cylinder Drawing page.

Cylinder accessories, sensors, service kits, unique options and application engineering information can be found in later sections of this catalog. This type of information is shared across the 3MA, 4MA, 3MAJ and 4MAJ series, and it is intentionally consolidated at the back of this catalog for easy reference.

Dimension Note: all dimensions without tolerances in this catalog are classified as reference dimensions and should be treated as such.

Private Labeling

For those discerning customers wanting a personal touch, we can “private label” cylinders at no charge. The information must be in text format (no logos) and the label must include our serial number and cylinder pressure rating. Just place an “S” for special in the Special Modification field and provide the private label information in the item notes. We take care of the rest!

If labels with logos are desired, please contact the Actuator Division for assistance.

Rod Bearing and Piston
Manufactured from tough, impact-resistant, bearing-grade materials, the composite rod bearing and piston provide excellent wear resistance. Other advantages include noise reduction without the need for bumpers and lower friction than other materials. Aluminum piston with wear band is available for bumper piston seals and other options.

Piston Seals
Carboxylated nitrile rounded-lip piston seals combine low friction with leak-free service and long service life. Optional bumper piston seals provide additional noise reduction and smooth end-of-stroke deceleration.

Piston Assembly
High strength steel fastener (composite piston) or piston rod thread (aluminum piston) connects the piston to the rod and is secured in place with anaerobic adhesive.

Ports
NPTF ports are standard.

Endcap Fasteners
Zinc plated steel endcap fasteners for tough environments. Stainless steel is available as an option.

Rod Seal
Carboxylated nitrile rounded-lip rod seal combines low friction with leak-free service and long service life.

Magnetic Piston Ring
Included as a standard feature for use with a variety of sensors.

Cylinder Body
Extruded aluminum profile cylinder body offers integrated sensor grooves to minimize sensor installation time, maximize sensor protection and eliminate the need for brackets. Grooves readily accept both Global and Mini-Global Sensors. Anodized and bright-dipped for corrosion resistance, maximum seal life and lower friction.

Adjustable Cushions
Included as a free standard feature.

Heads and Caps
High-pressure die cast aluminum heads and caps are designed with the most flexible mounting platform. TEF mount is standard. Anodized for corrosion resistance.

Rod Wiper
Outboard urethane rod wiper protects the cylinder by removing external debris and adherents from the piston rod during the entire stroke.

Piston Rod
Standard case-hardened (50-64 Rc), hard chrome plated and polished carbon steel piston rod for reliable performance, long rod seal life and low friction. Grades of stainless steel are available as options.

For a complete list of 3MA options, please see pages 4 and 14.

How to Order 3MA Series Cylinders for 1½" to 5" Bore

3MA cylinders can be specified by model number by using the table below.

2.00	C		J	3MA		U			1	4		A	C	6.000

Bore Size
1.50
2.00
2.50
3.25
4.00
5.00

Cushion Head End
C	Standard (cushioned head end)
Blank	Non-cushioned head end

Double Rod Cylinder
Specify "K" only if double rod cylinder is required.

Mounting Style
Specify mounting style code (see table on following page).

Series
3MA

Piston Type
Blank	Standard (lipseals and magnetic ring)
1	Lipseals, no magnetic ring
2	Lipseals, no magnetic ring (aluminum piston)
3	Lipseals and magnetic ring (aluminum piston)
4	Bumper seals, no magnetic ring
6	Bumper seals and magnetic ring
B	Lipseals, 1/4" thick bumpers both ends[1]
H	Lipseals, 1/4" thick bumper head end[1]
C	Lipseals, 1/4" thick bumper cap end[1]
D	Lipseals and magnetic ring, 1/4" thick bumpers both ends[1]
F	Lipseals and magnetic ring, 1/4" thick bumper head end[1]
R	Lipseals and magnetic ring, 1/4" thick bumper cap end[1]

Ports
Standard (NPTF)

Seals
Blank	Standard (nitrile seals)
E	Fluorocarbon rod wiper and rod seal only[2]

Special Modification
Specify "S" only for special modification other than rod end, and then describe modification in item notes.

Piston Rod Number
Standard (rod code number 1)[3]

Piston Rod Thread Style
4	Small male
8	Intermediate male
9	Short female
55	For use with Split Coupler[4]
3	Special (and specify all dimensions required)

Rod Material Code
Blank	Standard
Y	17-4 PH stainless steel
J	303 stainless steel
S	316 stainless steel

Piston Rod Thread Type
A	Standard (UNF Unified Thread)
W	BSF British Fine
M	Metric (see page 104)

Cushion Cap End
C	Standard (cushioned cap end)
Blank	Non-cushioned cap end

Stroke Length
Specify stroke length required in inches.

[1] Addition of ¼" bumper results in a ¼" stroke loss per bumper, per end. For example, a 6" stroke cylinder with ¼" bumpers at both ends (option B) has an effective stroke of 5½".

[2] Used for external chemical compatibility applications, not high temperature.

[3] Review Piston Rod Selection Chart on page 134 to determine proper piston rod diameter. (Note: 3MA has only one rod diameter per bore size, so proper piston rod diameter from chart result may lead to bore size change). For oversize rod within the same bore size, please see 4MA section.

[4] For additional information regarding this style, refer to page 103. If non-standard Rod Material Code is required with this option, please place an "S" for special in Special Modification field and specify rod material in the item notes.

How to order 3MA Series cylinders with sensors:

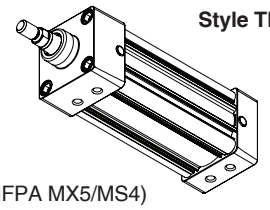
Sensors must be ordered separately and are not mounted to the cylinder prior to shipment.

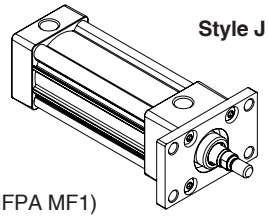
1. Cylinder model number must have a Piston Type with a magnetic ring ((blank), 3, 6, D, F or R).
2. Please refer to pages 111-118 for sensor part numbers and specifications. Global, Mini-Global, NAMUR and Weld Immune Sensors will fit the 3MA Series.
3. Style DD mounts and tie rod versions with Global Sensors will require tie rod bracket P8S-TMA0X. Please refer to page 115 for more information.

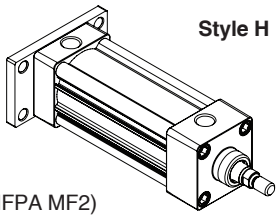
3MA Series Mounting Styles for 1½" to 5" Bore

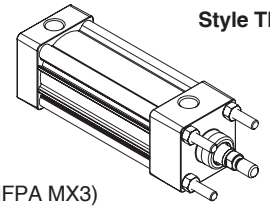
Mounting Code	NFPA Mounting	Description	Available Bore Sizes
			3MA
TEF	MX5/MS4	Sleeve Nut with Side Tap (standard mount)	1-1/2 - 5
T	MX0	No Mount (same construction as TEF)	1-1/2 - 5
TE	MX5	Sleeve Nut (same construction as TEF)	1-1/2 - 5
F	MS4	Side Tap (same construction as TEF)	1-1/2 - 5
J	MF1	Head Rectangular Flange	1-1/2 - 5
H	MF2	Cap Rectangular Flange	1-1/2 - 5
TB	MX3	Tie Rods Extended Head End	1-1/2 - 5
TC	MX2	Tie Rods Extended Cap End	1-1/2 - 5
TD	MX1	Tie Rods Extended Both Ends	1-1/2 - 5
C	MS2	Side Lug	1-1/2 - 5
CB	MS1	Side End Angle	1-1/2 - 5
G	MS7	Side End Lug	1-1/2 - 4
NB	N/A	Base Bar	1-1/2 - 4
BB	MP1	Cap Fixed Clevis	1-1/2 - 4
BC	MP2	Cap Detachable Clevis	1-1/2 - 5
BE	MP4	Cap Detachable Eye	1-1/2 - 4
DD	MT4	Intermediate Trunnion	1-1/2 - 5
KTEF*	MDX5/MDS4	Double Rod End, TEF Mount	1-1/2 - 5

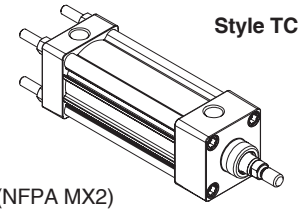
*Double rod end cylinders can be ordered with head mountings, i.e. KJ (see page 19).

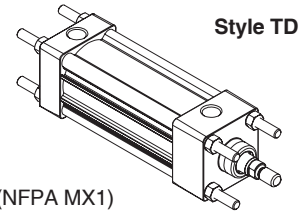
Standard Mount
Style TEF

(NFPA MX5/MS4)

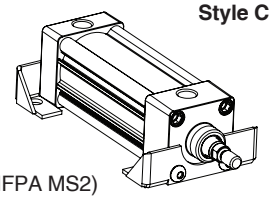
Head Rectangular Flange
Style J

(NFPA MF1)

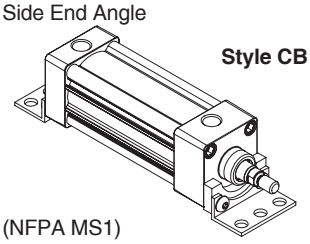
Cap Rectangular Flange
Style H

(NFPA MF2)

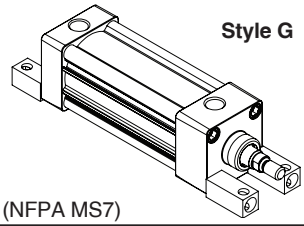
Tie Rods Ext. Head End
Style TB

(NFPA MX3)

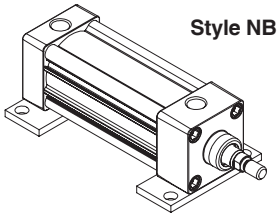
Tie Rods Ext. Cap End
Style TC

(NFPA MX2)

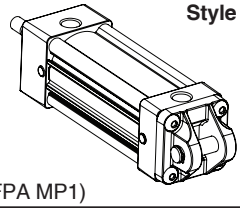
Tie Rods Ext. Both Ends
Style TD

(NFPA MX1)

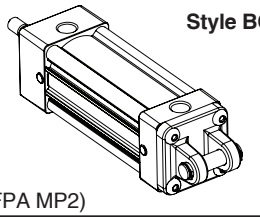
Side Lug
Style C

(NFPA MS2)

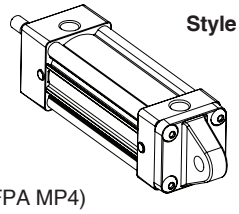
Side End Angle
Style CB

(NFPA MS1)

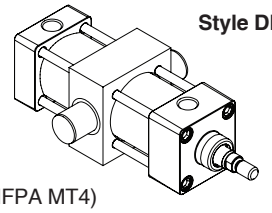
Side End Lug
Style G

(NFPA MS7)

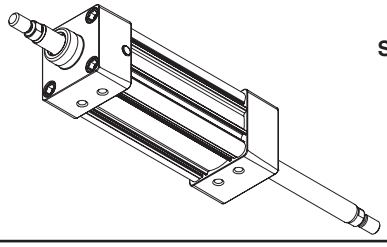
Base Bar Mount
Style NB

(NFPA MP1)

Cap Fixed Clevis
Style BB

(NFPA MP1)

Cap Detachable Clevis
Style BC

(NFPA MP2)

Cap Detachable Eye
Style BE

(NFPA MP4)

Intermediate Trunnion
Style DD

(NFPA MT4)

Double Rod End
Style KTEF

(NFPA MDX0)

General Specifications

- NFPA interchangeable
- Bore sizes – 1-1/2", 2", 2-1/2", 3-1/4", 4" and 5"
- Strokes – available in any practical stroke length
- Rod diameters – 5/8" and 1"
- Rod end styles – 4 standard, specials available
- Single rod end or double rod ends
- Cushions – standard and adjustable at both ends, optional non-cushioned
- Operating pressure – 250 PSIG (17 Bar) maximum air service
- Media – dry, filtered air
- Temperature range – -10°F to +165°F (-23°C to +74°C)
- Mounting styles – 18 standard styles
- One porting style – NPTF
- RoHS compliant

For material options, including seals and piston rods, please see Material Specifications on next page.

Cylinder Weights – 3MA Cylinders

Bore (inch)	Rod (inch)	No Mount Single Rod 3MA	
		Base Wt. (lbs.)	Per Inch (lbs.)
1 1/2	5/8	1.57	0.20
2	5/8	2.13	0.21
2 1/2	5/8	2.87	0.23
3 1/4	1	5.73	0.42
4	1	7.51	0.49
5	1	10.99	0.61

Mounting Weight Adders

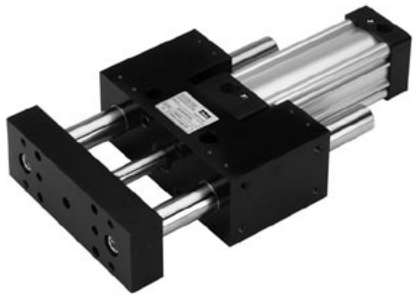
Bore (inch)	Weight (lbs) by Mounting Style						
	J, H	BB	CB, G	DD	BE	C	BC
1 1/2	0.51	0.15	0.36	1.70	0.23	0.15	0.20
2	0.76	0.26	065	2.38	0.32	0.15	0.29
2 1/2	1.13	0.38	1.05	3.00	0.42	0.15	0.41
3 1/4	2.76	0.98	1.38	5.35	1.26	0.35	1.06
4	4.05	1.35	2.20	6.75	1.62	0.35	1.49
5	6.46	N/A	4.29	8.77	N/A	0.57	2.41

Standard Cushion Position

Mounting Code	Position
All 3MA mounts	2

Standard Port Sizes

Bore	NPTF
1 1/2	3/8
2	3/8
2 1/2	3/8
3 1/4	1/2
4	1/2
5	1/2



For a guided version of the 3MA Series, please see the HB Series in Schrader Bellows Pneumatic Actuator Products Catalog AU03-SB0900P-2/NA.

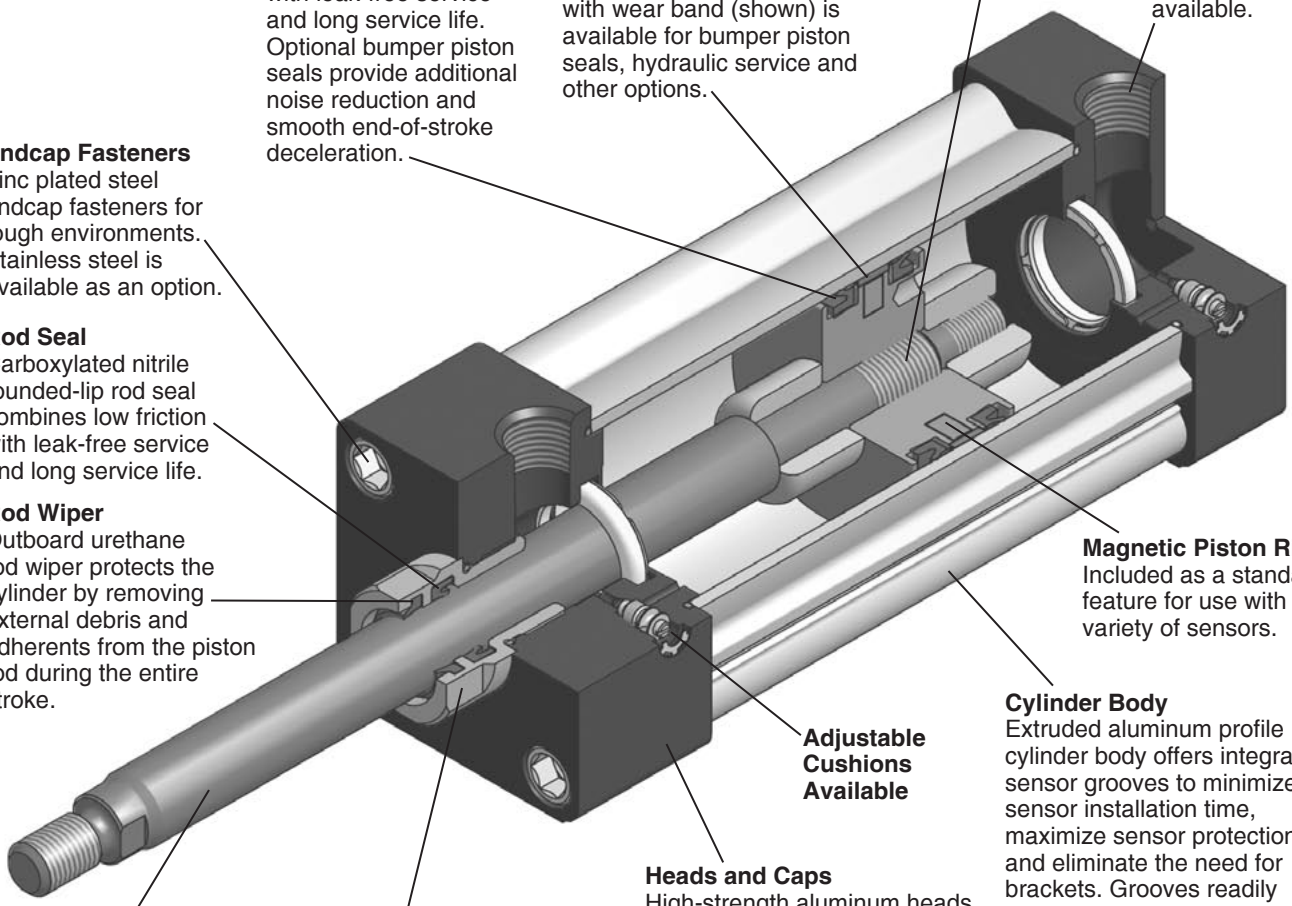
Material Specifications – Standard Temperatures and Applications

Head and cap	Black anodized aluminum alloy
Head and cap screws	Zinc plated steel alloy
Cylinder body	Clear anodized aluminum alloy
Piston rod	Case-hardened, chrome plated carbon steel
Rod seal	Carboxylated nitrile (Nitroxile)
Rod wiper	Molythane
Rod bearing	Composite
Needle valve inserts	Composite
Piston	Composite (standard)
	Aluminum alloy (optional)
Piston seals	Carboxylated nitrile (Nitroxile)
Piston bearing	Composite (for standard piston)
	MolyGard™ (for aluminum piston)
Magnetic ring	Plastic-bound magnetic material
Piston fastener	Zinc plated steel alloy (for composite piston)
	Piston rod for aluminum piston
O-rings	Nitrile
End seals	Nitrile
Cushion seals	Urethane
Cushion needle valves	Composite
Tie-rods/studs (some mounts)	Blackened carbon steel
Tie-rod nuts (some mounts)	Steel alloy, SAE J995 Grade 8

Other Standard Options – Material and Part Changes

Cylinder seal options	Fluorocarbon rod wiper and rod seal for chemical compatibility
	Other seal options available, please consult factory
Bumper piston seal options	Carboxylated nitrile (Nitroxile) for standard temperatures
Piston rod material options	Case-hardened, chrome plated carbon steel (standard)
	17-4 PH stainless steel, chrome plated
	303 stainless steel, chrome plated
	316 stainless steel, chrome plated
	(for stainless steel without chrome plating, please consult factory)
1/4" thick bumpers option	Urethane

NOTES



Piston
Manufactured from tough, impact-resistant, bearing-grade materials, the composite piston provides excellent wear resistance. Other advantages include noise reduction without the need for bumpers and lower friction than other materials. Aluminum piston with wear band (shown) is available for bumper piston seals, hydraulic service and other options.

Piston Assembly
High strength steel fastener or piston rod thread connects the piston to the rod and is secured in place with anaerobic adhesive.

Ports
NPTF ports are standard. Other port styles available.

Piston Seals
Carboxylated nitrile rounded-lip piston seals combine low friction with leak-free service and long service life. Optional bumper piston seals provide additional noise reduction and smooth end-of-stroke deceleration.

Endcap Fasteners
Zinc plated steel endcap fasteners for tough environments. Stainless steel is available as an option.

Rod Seal
Carboxylated nitrile rounded-lip rod seal combines low friction with leak-free service and long service life.

Rod Wiper
Outboard urethane rod wiper protects the cylinder by removing external debris and adherents from the piston rod during the entire stroke.

Magnetic Piston Ring
Included as a standard feature for use with a variety of sensors.

Cylinder Body
Extruded aluminum profile cylinder body offers integrated sensor grooves to minimize sensor installation time, maximize sensor protection and eliminate the need for brackets. Grooves readily accept both Global and Mini-Global Sensors. Anodized and bright-dipped for corrosion resistance, maximum seal life and lower friction.

Adjustable Cushions Available

Heads and Caps
High-strength aluminum heads and caps are designed with the most flexible mounting platform. TEF mount is standard. Using our proprietary extrusion, we can offer customization of the endcaps for unique designs, including extra ports, duplex, tandem and many special mountings. Anodized for corrosion resistance.

Piston Rod
Standard case-hardened (50-64 Rc), hard chrome plated and polished carbon steel piston rod for reliable performance, long rod seal life and low friction. Grades of stainless steel are available as options.

Rod Gland/Bearing
Threaded bronze rod gland is externally removable, without cylinder disassembly, for easy maintenance. Machined flats permit the use of common tools for removal and installation. Options include HI LOAD design for side load conditions and metallic wiper design for extremely tough rod contaminant/adherent applications.

For a complete list of 4MA options, please see pages 10 and 14.

How to Order 4MA Series Cylinders for 1½" to 5" Bore

4MA cylinders can be specified by model number by using the table below.

2.00			J	4MA		U			1	4		A		6.000

Bore Size
- 1.50[1]
- 2.00
- 2.50
- 3.25
- 4.00
- 5.00

Double Rod Cylinder
Specify "K" only if double rod cylinder is required.

Series
- **4MA** Air service
- **4ML** Hydraulic service[2]

Ports
- **U** NPTF
- **R** BSPP
- **B** BSPT
- **T** SAE

Piston Rod Number
Specify rod code number for required diameter.[8, 2]

Stroke Length
Specify stroke length required in inches.[11]

Mounting Style
Specify mounting style code (see table on following page).

Seals
- **Blank** Standard (nitrile seals)
- **V** Fluorocarbon seals[4]
- **E** Fluorocarbon rod wiper and rod seal only[5]
- **4** Low temperature seals[4]
- **M** Metallic rod wiper, nitrile seals[6]

Cushion Cap End
- **Blank** Non-cushioned cap end
- **C** Cushioned cap end (not available for 4ML)

Cushion Head End
- **Blank** Non-cushioned head end
- **C** Cushioned head end (not available for 4ML)

Piston Rod Thread Type
- **A** Standard (UNF Unified Thread)
- **W** BSF British Fine
- **M** Metric (see page 104)

Piston Type[2]
- **Blank** Standard (lipseals and magnetic ring)
- **1** Lipseals, no magnetic ring
- **2** Lipseals, no magnetic ring (aluminum piston)
- **3** Lipseals and magnetic ring (aluminum piston) (standard for 4ML)
- **4** Bumper seals, no magnetic ring
- **6** Bumper seals and magnetic ring
- **B** Lipseals, 1/4" thick bumpers both ends[3]
- **H** Lipseals, 1/4" thick bumper head end[3]
- **C** Lipseals, 1/4" thick bumper cap end[3]
- **D** Lipseals and magnetic ring, 1/4" thick bumpers both ends[3]
- **F** Lipseals and magnetic ring, 1/4" thick bumper head end[3]
- **R** Lipseals and magnetic ring, 1/4" thick bumper cap end[3]

Special Modification
Specify "S" only for special modification other than rod end, and then describe modification in item notes. (Includes 4MA with Linear Position Sensor Option)[7]

Rod Material and Gland Code
- **Blank** Standard rod and gland
- **H** Standard rod and HI LOAD gland
- **Y** 17-4 PH stainless steel rod and standard gland
- **Z** 17-4 PH stainless steel rod and HI LOAD gland
- **J** 303 stainless steel rod and standard gland[10]
- **K** 303 stainless steel rod and HI LOAD gland[10]
- **S** 316 stainless steel rod and standard gland[10]
- **T** 316 stainless steel rod and HI LOAD gland[10]

Piston Rod Thread Style
- **4** Small male
- **8** Intermediate male
- **9** Short female
- **55** For use with Split Coupler[9]
- **3** Special (and specify all dimensions required)

1 Not available with Linear Position Sensor Option (LPSO).

2 Piston Types (blank), 1, 4 and 6 not available for 4ML. Piston Types (blank) and 1 not available for oversize rod numbers 2 and 3. Seals option V only available with Piston Types 2 and 4. Seals option 4 only available with Piston Types 2 and 3.

3 Addition of ¼" bumper results in a ¼" stroke loss per bumper, per end. For example, a 6" stroke cylinder with ¼" bumpers at both ends (option B) has an effective stroke of 5½".

4 Reed and solid-state sensors only available with standard seals or options E and M. See footnote 2.

5 Used for external chemical compatibility applications, not high temperature.

6 If fluorocarbon seals are required with this option, please place an "S" for special in the Special Modification field and specify the "fluorocarbon seals and metallic rod wiper" in the item notes.

7 For Linear Position Sensor Option (LPSO), please include the following information for the Special Modification item notes:
a. Sensor part number (see pages 98-102)
b. Sensor position
c. Port position (if other than position 1)
d. Length of stop tubing, gross stroke and net stroke (if required)
Also, Piston Type option (blank), 3, 6, D, F or R is required.

8 Review Piston Rod Selection Chart on page 134 to determine proper piston rod diameter.

9 For additional information regarding this style, refer to page 103. If non-standard Rod Material and Gland Code is required with this option, please place an "S" for special in Special Modification field and specify Rod Material and Gland Code in the item notes.

10 Not available for 4ML.

11 If a stop tube is required, specify gross stroke (net stroke + stop tube) in the model number, then place an "S" for special in the Special Modification field and specify the stop tube length in the item notes. Not available with Piston Types (blank) and 1.

How to order 4MA/4ML Series cylinders with sensors:

Sensors must be ordered separately and are not mounted to the cylinder prior to shipment.

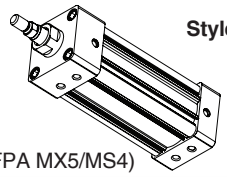
1. Cylinder model number must have a Piston Type with a magnetic ring ((blank), 3, 6, D, F or R).
2. Please refer to pages 111-118 for sensor part numbers and specifications. Global, Mini-Global, NAMUR and Weld Immune Sensors will fit the 4MA/4ML Series.
3. Style DD mounts and tie rod versions with Global Sensors will require tie rod bracket P8S-TMA0X. Please refer to page 115 for more information.

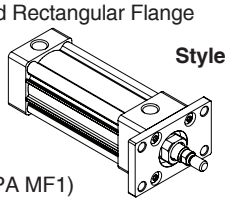
Parker Hannifin Corporation
Actuator Division
Wadsworth, Ohio USA

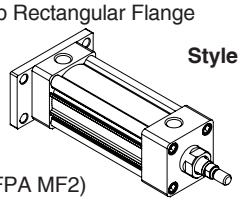
4MA Series Mounting Styles for 1½" to 5" Bore

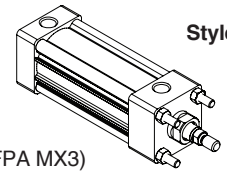
Mounting Code	NFPA Mounting Style	Description	Available Bore Sizes		
			4MA/4ML	4MA/4ML-LPSO w/o Stop Tube	4MA/4ML-LPSO w/Stop Tube
TEF	MX5/MS4	Sleeve Nut with Side Tap (standard mount)	1-1/2 - 5	2 - 5	2 - 5
T	MX0	No Mount (same construction as TEF)	1-1/2 - 5	2 - 5	2 - 5
TE	MX5	Sleeve Nut (same construction as TEF)	1-1/2 - 5	2 - 5	2 - 5
F	MS4	Side Tap (same construction as TEF)	1-1/2 - 5	2 - 5	2 - 5
J	MF1	Head Rectangular Flange	1-1/2 - 5	2 - 5**	2 - 5
H	MF2	Cap Rectangular Flange	1-1/2 - 5	2 - 5**	2 - 5**
TB	MX3	Tie Rods Extended Head End	1-1/2 - 5	-	2 - 5
TC	MX2	Tie Rods Extended Cap End	1-1/2 - 5	-	-
TD	MX1	Tie Rods Extended Both Ends	1-1/2 - 5	-	-
C	MS2	Side Lug	1-1/2 - 5	2 - 5	2 - 5
CB	MS1	Side End Angle	1-1/2 - 5	2 - 5	2 - 5
G	MS7	Side End Lug	1-1/2 - 4	2 - 4	2 - 4
NB	N/A	Base Bar	1-1/2 - 4	2 - 4	2 - 4
BB	MP1	Cap Fixed Clevis	1-1/2 - 5	2 - 5**	2 - 5**
BC	MP2	Cap Detachable Clevis	1-1/2 - 5	2 - 5**	2 - 5**
BE	MP4	Cap Detachable Eye	1-1/2 - 5	2 - 5**	2 - 5**
D	MT1	Head Trunnion	1-1/2 - 5	2 - 5	2 - 5
DB	MT2	Cap Trunnion	1-1/2 - 5	2 - 5**	2 - 5**
DD	MT4	Intermediate Trunnion	1-1/2 - 5	-	-
KTEF***	MDX5/MDS4	Double Rod End, TEF Mount	1-1/2 - 5	2 - 5	2 - 5

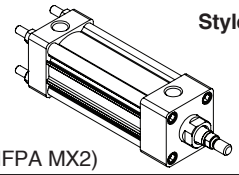
*Standard mount for 1-1/2" bore with 1" rod is TE mount; TEF and F mount not available.
**May interfere with mounting. Please provide clearance for Linear Position Sensor overhang (see page 99).

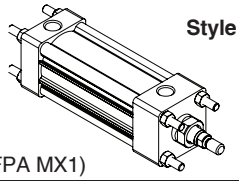
Standard Mount
Style TEF

(NFPA MX5/MS4)

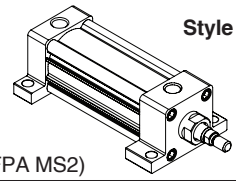
Head Rectangular Flange
Style J

(NFPA MF1)

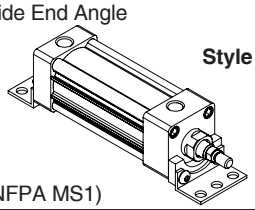
Cap Rectangular Flange
Style H

(NFPA MF2)

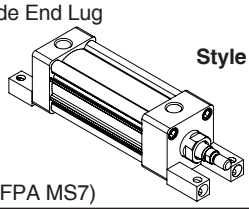
Tie Rods Ext. Head End
Style TB

(NFPA MX3)

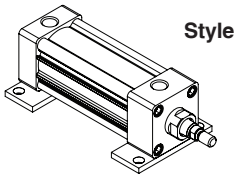
Tie Rods Ext. Cap End
Style TC

(NFPA MX2)

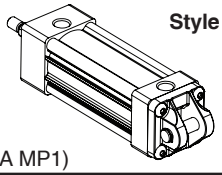
Tie Rods Ext. Both Ends
Style TD

(NFPA MX1)

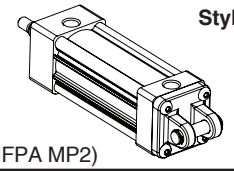
Side Lug
Style C

(NFPA MS2)

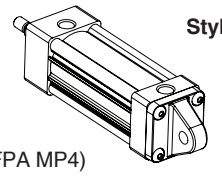
Side End Angle
Style CB

(NFPA MS1)

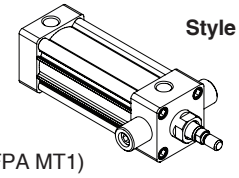
Side End Lug
Style G

(NFPA MS7)

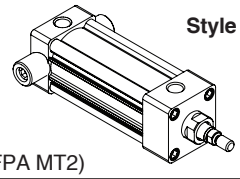
Base Bar Mount
Style NB

(NFPA MP1)

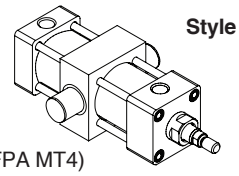
Cap Fixed Clevis
Style BB

(NFPA MP1)

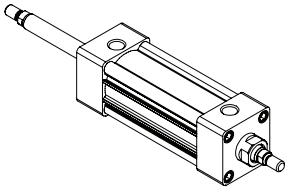
Cap Detachable Clevis
Style BC

(NFPA MP2)

Cap Detachable Eye
Style BE

(NFPA MP4)

Head Trunnion
Style D

(NFPA MT1)

Cap Trunnion
Style DB

(NFPA MT2)

Intermediate Trunnion
Style DD

(NFPA MT4)

Double Rod End
Style KTEF

(NFPA MDX0)

***Double rod end cylinders can be ordered with head mountings, i.e. KJ (see page 19).

General Specifications

- NFPA interchangeable
- Bore sizes – 1-1/2", 2", 2-1/2", 3-1/4", 4" and 5"
- Strokes – available in any practical stroke length
- Rod diameters – 5/8", 1" and 1-3/8"
- Rod end styles – 4 standard, specials available
- Single rod end or double rod ends
- Cushions – optional and adjustable at either end or both ends (n/a for 4ML Hydraulic Version)
- Operating pressure – 4MA = 250 PSIG (17 Bar) maximum air service
  4ML = 400 PSIG (27 Bar) maximum hydraulic service
- Media 4MA = dry, filtered air
  4ML = filtered hydraulic oil
- Temperature range –
  -10°F to +165°F (-23°C to +74°C) with standard seals
  -10°F to +250°F (-23°C to +121°C) with fluorocarbon seals option
  -50°F to +150°F (-46°C to +66°C) with low temperature seals option
- Mounting styles – 20 standard styles
- RoHS compliant

For material options, including seals, piston rods and glands, please see Material Specifications on next page.

Cylinder Weights – 4MA/4ML Cylinders

Bore (inch)	Rod (inch)	No Mount Single Rod 4MA/4ML		No Mount Double Rod	
		Base Wt. (lbs.)	Per Inch (lbs.)	Base Wt. (lbs.)	Per Inch (lbs.)
1 1/2	0.625	1.73	0.20	2.16	0.28
2	0.625	2.40	0.21	3.05	0.30
	1.00	2.99	0.35	4.34	0.58
2 1/2	0.625	3.25	0.23	3.96	0.31
	1.00	4.06	0.37	5.74	0.60
3 1/4	1.00	6.45	0.42	7.65	0.64
	1.375	7.93	0.62	11.46	1.05
4	1.00	8.80	0.49	10.32	0.71
	1.375	10.29	0.69	14.37	1.12
5	1.00	13.20	0.61	15.84	0.84
	1.375	14.72	0.81	18.89	1.24

Standard Cushion Position

Mounting Code	Position
All except D, DB, DD	2
D, DB, DD	3

Standard Port Sizes

Bore	NPTF	BSPT	BSPP	SAE
1 1/2	3/8	Rc 3/8	G 3/8	6
2	3/8	Rc 3/8	G 3/8	6
2 1/2	3/8	Rc 3/8	G 3/8	6
3 1/4	1/2	Rc 1/2	G 1/2	10
4	1/2	Rc 1/2	G 1/2	10
5	1/2	Rc 1/2	G 1/2	10

Mounting Weight Adders

Bore (inch)	Weight (lbs) by Mounting Style							
	J, H	D, DB	BB	CB, G	DD	BE	C	BC
1 1/2	0.51	0.50	0.15	0.36	1.70	0.23	0.15	0.20
2	0.76	0.50	0.26	065	2.38	0.32	0.15	0.29
2 1/2	1.13	0.50	0.38	1.05	3.00	0.42	0.15	0.41
3 1/4	2.76	0.50	0.98	1.38	5.35	1.26	0.35	1.06
4	4.05	0.50	1.35	2.20	6.75	1.62	0.35	1.49
5	6.46	0.50	1.20	4.29	8.77	1.26	0.57	2.41

For a guided version of the 4MA or 4ML Series, please see the HB Series in Schrader Bellows Pneumatic Actuator Products Catalog AU03-SB0900P-2/NA.

Material Specifications – Standard Temperatures and Applications

Head and cap	Black anodized aluminum alloy
Head and cap screws	Zinc plated steel alloy
Cylinder body	Clear anodized aluminum alloy
Piston rod	Case-hardened, chrome plated carbon steel
Rod seal	Carboxylated nitrile (Nitroxile)
Rod wiper	Molythane
Rod bearing (gland)	Bronze alloy
Piston	Composite (standard)
	Aluminum alloy (optional)
Piston seals	Carboxylated nitrile (Nitroxile)
Piston bearing	Composite (for standard piston)
	MolyGard™ (for aluminum piston)
Magnetic ring	Plastic-bound magnetic material
Piston fastener	Zinc plated steel alloy (for composite piston)
	Piston rod for aluminum piston
O-rings	Nitrile
End seals	Nitrile
Cushion seals	Urethane
Cushion needle valves	Stainless steel
Tie-rods/studs (some mounts)	Blackened carbon steel
Tie-rod nuts (some mounts)	Steel alloy, SAE J995 Grade 8

4MA Options – Material and Part Changes

High temperatures (-10°F to +250°F)	All seals and wiper are fluorocarbon
	Aluminum piston only (without magnetic ring)
Low temperatures (-50°F to +150°F)	Rod seal, piston seals, o-rings and end seals are low temperature-rated nitrile
	Aluminum piston only

4ML Hydraulic Version – Material and Part Changes

Hydraulic service (general)	Aluminum piston only (all temperatures)
	Cushions and bumper piston seals not available
Hydraulic service (std temp)	Polyurethane TS-2000 rod seal and nitrile piston seals (for hydraulic use)
Hydraulic service (high temp)	Fluorocarbon TS-2000 rod seal; wiper and all seals are fluorocarbon (for hydraulic use)

Other Standard Options – Material and Part Changes

Cylinder seal options	Fluorocarbon for high temperatures or chemical compatibility
	Other seal options available, please consult factory
Bumper piston seal options (4MA only, n/a for 4ML)	Carboxylated nitrile (Nitroxile) for standard temperatures
	Fluorocarbon for high temperatures or chemical compatibility
1/4" thick bumpers option	Urethane
Piston rod material options	Case-hardened, chrome plated carbon steel (standard)
	17-4 PH stainless steel, chrome plated
	303 stainless steel, chrome plated (n/a for 4ML)
	316 stainless steel, chrome plated (n/a for 4ML)
	(for stainless steel without chrome plating, please consult factory)
HI LOAD gland option	Composite bearing pressed into bronze alloy gland
Metallic rod scraper option	Dual high strength bronze wipers with PTFE (5/8" rod only) or fluorocarbon energizer

How to Select a 3MA or 4MA Cylinder

Schrader Bellows cylinders are available based on air or hydraulic operating pressure. The many styles, sizes and optional features available assure that your application requirements are precisely met. To select a cylinder, follow these simple steps:

Step 1 - **Determine the correct cylinder bore size** necessary to achieve required force using the available operating pressure.

Step 2 - **Determine the series cylinder to use**, based on operating pressure.

Step 3 - **Turn to the appropriate cylinder selection section.** Select the mounting style that fits your installation needs. Determine the bore and rod sizes available for the model you select. Then complete model selection.

- Choose a rod end style and the desired rod end accessories.
- Size the cylinder to meet your application requirements.

Step 4 - **Consider the following conditions** which may require further modifications to the cylinder you have selected.

Application Condition	Check the Following
Quick Starts or Stops	Confirm that determined thrust is sufficient to accelerate or decelerate cylinder and load within prescribed distance. Optional cushions should be used to reduce shock during deceleration, check that peak pressures will be within tolerable limits.
Long Push Stroke	Check whether stop tube (4MA with aluminum piston only) is required to prevent excessive bearing loads and wear.
High-column Loading Long Push Stroke	Determine if standard size piston rod is strong enough to accommodate intended load. See Application Engineering section for recommendations.
Long Horizontal Stroke	Determine if standard size piston rod is strong enough to accommodate intended load.
High Operating Temperatures	For temperatures between 165°F and 250°F use 4MA or 4ML cylinder with high temperature seals.

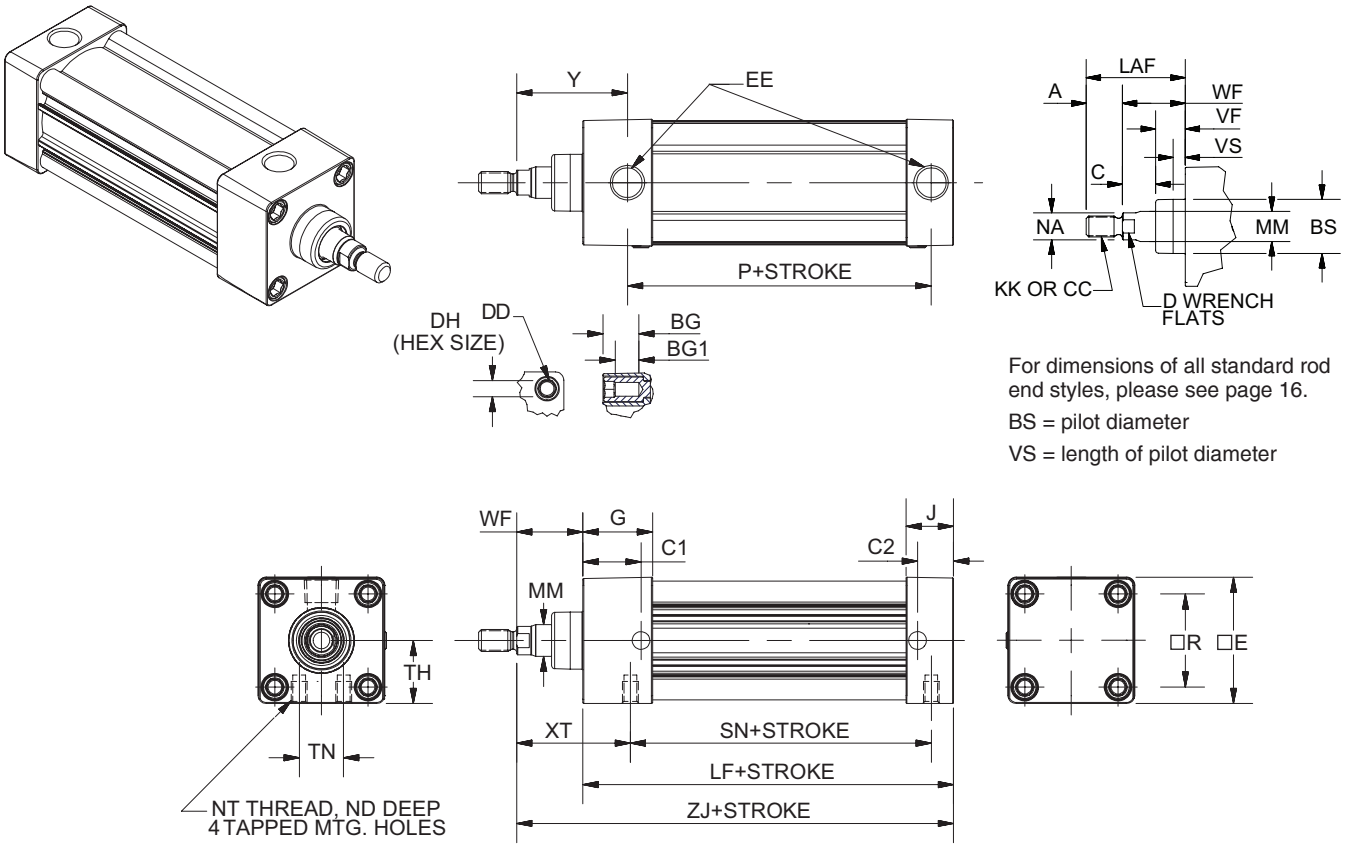
General Options and Modifications

3MA
- Non-Cushioned (adjustable cushions standard)
- Non-Magnetic piston (magnetic ring standard)
- Piston Bumper Seals
- Piston Bumpers (¼" thick)
- Port Relocation (cushions will follow)
- Double Rod End
- Rod End Modifications
- Rod Materials (grades of stainless steel)
- Fluorocarbon Rod Wiper and Rod Seal only
- Mixed Mountings
- Round Tube and Tie Rod Construction
- Stainless Steel Fasteners/Tie Rods
- Hydro-Check unit for smooth hydraulic control
- Air Cylinder/Valve Combination (ACVB)
- Adjustable Point Sensors (order separately)
- Rod lock version (see 3MAJ)

4MA
- Adjustable Cushions
- Non-Magnetic Piston (magnetic ring standard)
- Piston Bumper Seals
- Piston Bumpers (¼" thick)
- Port and Adjustable Cushion Relocation
- Port Thread Styles
- Multiple Ports

4MA (continued)
- Special Heads, Caps, Pistons and Mounts
- Double Rod End
- Oversize Rod Diameters
- Rod End Modifications
- Rod Materials (grades of stainless steel)
- Fluorocarbon Rod Wiper and Rod Seal only
- Fluorocarbon Seals (all cylinder seals)
- Metallic Rod Wiper
- HI LOAD Gland Assembly
- Stop Tube
- Mixed Mountings
- Round Tube and Tie Rod Construction
- Stainless Steel Fasteners/Tie Rods
- Shock Absorber on Cap End
- NuCushion Bumpers
- LECTROFLUOR® Coating
- Hydro-Check unit for smooth hydraulic control
- Air Cylinder/Valve Combination (ACVB)
- Adjustable Point Sensors (order separately)
- Continuous Linear Position Sensing (LPSO)
- High Temperature Service (to +250°F)
- Low Temperature Service (to -50°F)
- Hydraulic Service (4ML) (400 PSIG)
- Rod lock version (see 4MAJ)

3MA Single Rod Dimensioned Drawings for 1 1/2" to 5" Bore Size (Styles TEF, T, TE and F)



For dimensions of all standard rod end styles, please see page 16.

BS = pilot diameter

VS = length of pilot diameter

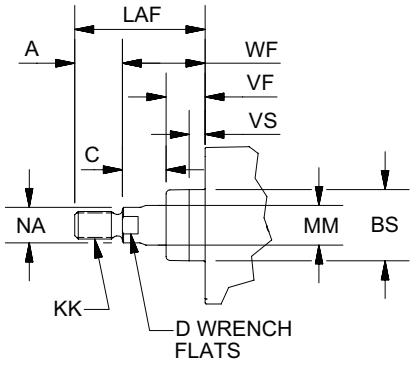
3MA Cylinder Dimensions – Styles TEF, T, TE and F

Bore Size	Rod No.	Rod Dia. MM	Thread Style 8 CC	Thread Style 4 & 9 KK	A	AA	BG	BG1	+.000 -.004 BS	C	C1	C2	D	DD	DH	E	EE (NPTF)	G
1 1/2	1	5/8	1/2-20	7/16-20	0.750	2.020	0.562	0.374	1.124	0.385	1.000	0.500	1/2	1/4-28	1/4	2.000	3/8	1.438
2	1	5/8	1/2-20	7/16-20	0.750	2.600	0.562	0.362	1.124	0.385	1.148	0.711	1/2	5/16-24	5/16	2.500	3/8	1.375
2 1/2	1	5/8	1/2-20	7/16-20	0.750	3.100	0.562	0.362	1.124	0.385	1.117	0.711	1/2	5/16-24	5/16	3.000	3/8	1.344
3 1/4	1	1	7/8-14	3/4-16	1.125	3.900	0.700	0.500	1.499	0.510	1.350	0.881	7/8	3/8-24	3/8	3.750	1/2	1.594
4	1	1	7/8-14	3/4-16	1.125	4.700	0.700	0.500	1.499	0.510	1.350	0.881	7/8	3/8-24	3/8	4.500	1/2	1.594
5	1	1	7/8-14	3/4-16	1.125	5.800	0.781	0.531	1.499	0.510	1.350	0.975	7/8	1/2-20	1/2	5.500	1/2	1.594

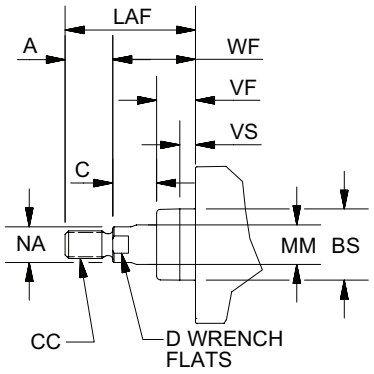
Bore Size	Rod No.	Rod Dia. MM	J	LAF	NA	ND	NT	R	+.005 -.005 TH	TN	VF	VS	WF	XT	Y	Add Stroke LF	Add Stroke P	Add Stroke SN	Add Stroke ZJ
1 1/2	1	5/8	0.938	1.750	0.563	0.375	1/4-20	1.430	0.993	0.625	0.615	-	1.000	1.938	1.875	3.625	2.313	2.250	4.625
2	1	5/8	0.938	1.750	0.563	0.438	5/16-18	1.840	1.243	0.875	0.615	0.250	1.000	1.938	1.875	3.625	2.313	2.250	4.625
2 1/2	1	5/8	0.938	1.750	0.563	0.625	3/8-16	2.190	1.493	1.250	0.615	0.250	1.000	1.938	1.938	3.750	2.375	2.375	4.750
3 1/4	1	1	1.125	2.500	0.938	0.750	1/2-13	2.760	1.868	1.500	0.865	0.250	1.375	2.438	2.438	4.250	2.625	2.625	5.625
4	1	1	1.125	2.500	0.938	0.750	1/2-13	3.320	2.243	2.063	0.865	0.250	1.375	2.438	2.438	4.250	2.625	2.625	5.625
5	1	1	1.219	2.500	0.938	0.938	5/8-11	4.100	2.743	2.688	0.865	0.250	1.375	2.438	2.438	4.500	2.875	2.875	5.875

3MA Rod End Dimensions – 1 1/2" to 5" Bore Size

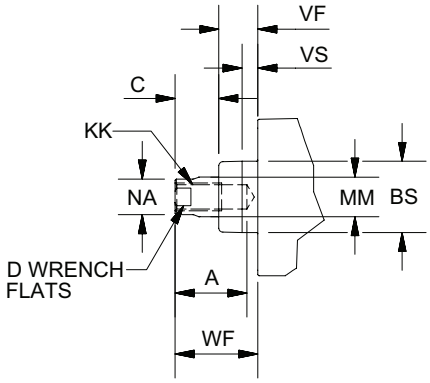
Thread Style 4
(NFPA Style SM)
Small Male



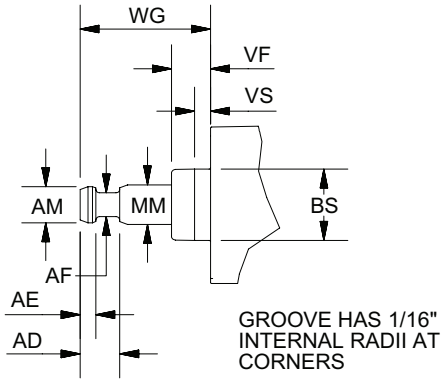
Thread Style 8
(NFPA Style IM)
Intermediate Male



Thread Style 9
(NFPA Style SF)
Short Female



Thread Style 55
For use with Split Coupler
(see page 103 for more information)



Applies to all rod ends:
BS = pilot diameter
VS = length of pilot diameter

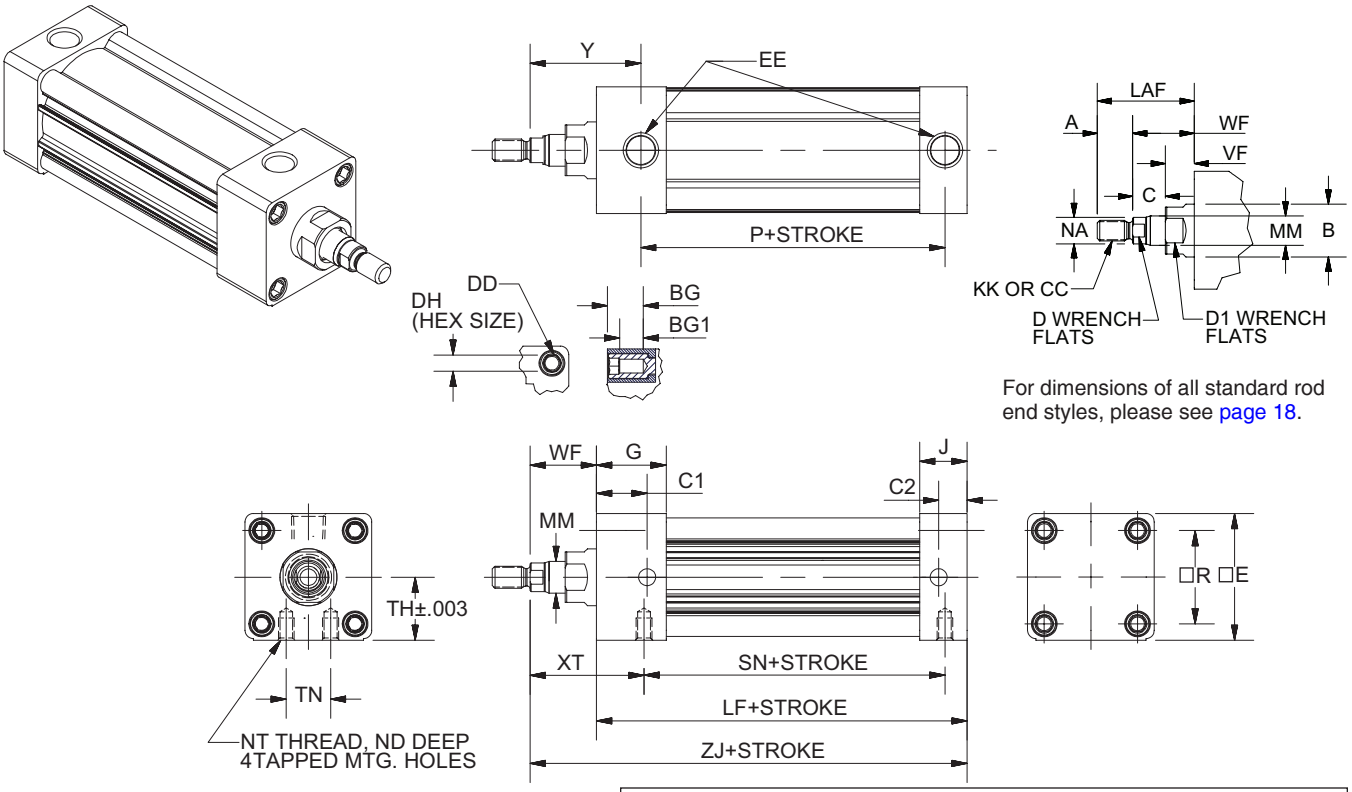
Rod End Dimensions

Bore Size	Rod No.	Rod Dia. MM	Thread Style 8 CC	Thread Style 4 & 9 KK	A	AD	AE	AF	AM	+.000 -.004 BS	C	D	LAF	NA	VF	VS	WF	WG
1 1/2	1	5/8	1/2-20	7/16-20	0.750	0.625	0.250	0.375	0.570	1.124	0.385	1/2	1.750	0.563	0.615	-	1.000	1.750
2	1	5/8	1/2-20	7/16-20	0.750	0.625	0.250	0.375	0.570	1.124	0.385	1/2	1.750	0.563	0.615	0.250	1.000	1.750
2 1/2	1	5/8	1/2-20	7/16-20	0.750	0.625	0.250	0.375	0.570	1.124	0.385	1/2	1.750	0.563	0.615	0.250	1.000	1.750
3 1/4	1	1	7/8-14	3/4-16	1.125	0.938	0.375	0.688	0.950	1.499	0.510	7/8	2.500	0.938	0.865	0.250	1.375	2.375
4	1	1	7/8-14	3/4-16	1.125	0.938	0.375	0.688	0.950	1.499	0.510	7/8	2.500	0.938	0.865	0.250	1.375	2.375
5	1	1	7/8-14	3/4-16	1.125	0.938	0.375	0.688	0.950	1.499	0.510	7/8	2.500	0.938	0.865	0.250	1.375	2.375

Thread Style 3 - "Special Thread"

Special threads, rod extensions, rod eyes, blanks, etc. are also available.
To order, specify "Style 3" and give desired dimensions for KK or CC, A and W or WF.
If otherwise special, please supply dimensioned sketch.

4MA Single Rod Dimensioned Drawings for 1 1/2" to 5" Bore Size (Styles TEF, T, TE and F)



For dimensions of all standard rod end styles, please see page 18.

(1-1/2" bore with 1" rod is TE mount, F mount not available)

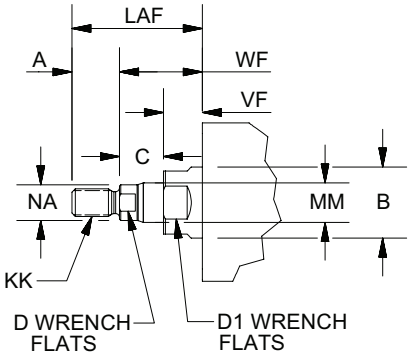
4MA Cylinder Dimensions – Styles TEF, T, TE and F

Bore Size	Rod No.	Rod Dia. MM	Thread Style 8 CC	Thread Style 4 & 9 KK	A	AA	+.000 -.002 B	BG	BG1	C	C1	C2	D	D1	DD	DH	E	EE (NPTF)	G
1 1/2	1	5/8	1/2-20	7/16-20	0.750	2.020	1.124	0.562	0.374	0.385	1.000	0.500	1/2	1	1/4-28	1/4	2.000	3/8	1.438
	2	1	7/8-14	3/4-16	1.125	2.020	1.499	0.562	0.374	0.510	1.000	0.500	7/8	1-3/8	1/4-28	1/4	2.000	3/8	1.438
2	1	5/8	1/2-20	7/16-20	0.750	2.600	1.124	0.562	0.362	0.385	1.000	0.562	1/2	1	5/16-24	5/16	2.500	3/8	1.375
	3	1	7/8-14	3/4-16	1.125	2.600	1.499	0.562	0.362	0.510	1.000	0.562	7/8	1-3/8	5/16-24	5/16	2.500	3/8	1.375
2 1/2	1	5/8	1/2-20	7/16-20	0.750	3.100	1.124	0.562	0.362	0.385	1.000	0.594	1/2	1	5/16-24	5/16	3.000	3/8	1.344
	3	1	7/8-14	3/4-16	1.125	3.100	1.499	0.562	0.362	0.510	1.000	0.594	7/8	1-3/8	5/16-24	5/16	3.000	3/8	1.344
3 1/4	1	1	7/8-14	3/4-16	1.125	3.900	1.499	0.700	0.500	0.510	1.188	0.719	7/8	1-3/8	3/8-24	3/8	3.750	1/2	1.594
	3	1 3/8	1-1/4-12	1-14	1.625	3.900	1.999	0.700	0.500	0.635	1.188	0.719	1-1/8	1-7/8	3/8-24	3/8	3.750	1/2	1.594
4	1	1	7/8-14	3/4-16	1.125	4.700	1.499	0.700	0.500	0.510	1.188	0.719	7/8	1-3/8	3/8-24	3/8	4.500	1/2	1.594
	3	1 3/8	1-1/4-12	1-14	1.625	4.700	1.999	0.700	0.500	0.635	1.188	0.719	1-1/8	1-7/8	3/8-24	3/8	4.500	1/2	1.594
5	1	1	7/8-14	3/4-16	1.125	5.800	1.499	0.781	0.531	0.510	1.188	0.813	7/8	1-3/8	1/2-20	1/2	5.500	1/2	1.594
	3	1 3/8	1-1/4-12	1-14	1.625	5.800	1.999	0.781	0.531	0.635	1.188	0.813	1-1/8	1-7/8	1/2-20	1/2	5.500	1/2	1.594

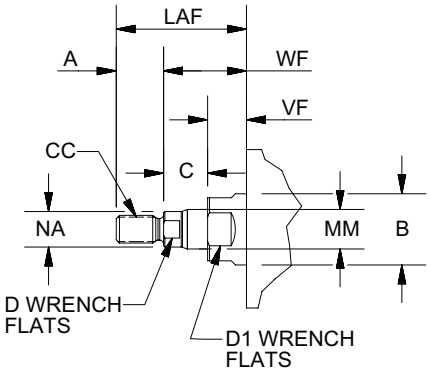
Bore Size	Rod No.	Rod Dia. MM	J	LAF	NA	ND	NT	R	+.003 -.003 TH	TN	VF	WF	XT	Y	Add Stroke LF	P	SN	ZJ
1 1/2	1	5/8	0.938	1.750	0.563	0.375	1/4-20	1.430	0.993	0.625	0.615	1.000	1.938	1.875	3.625	2.313	2.250	4.625
	2	1	0.938	2.500	0.938	-	-	1.430	0.993	-	0.865	1.375	-	2.250	3.625	2.313	-	5.000
2	1	5/8	0.937	1.750	0.563	0.438	5/16-18	1.840	1.243	0.875	0.615	1.000	1.938	1.875	3.625	2.313	2.250	4.625
	3	1	0.937	2.500	0.938	0.375	5/16-18	1.840	1.243	0.875	0.865	1.375	2.313	2.250	3.625	2.313	2.250	5.000
2 1/2	1	5/8	0.938	1.750	0.563	0.625	3/8-16	2.190	1.493	1.250	0.615	1.000	1.938	1.938	3.750	2.375	2.375	4.750
	3	1	0.938	2.500	0.938	0.625	3/8-16	2.190	1.493	1.250	0.865	1.375	2.313	2.313	3.750	2.375	2.375	5.125
3 1/4	1	1	1.125	2.500	0.938	0.750	1/2-13	2.760	1.868	1.500	0.865	1.375	2.438	2.438	4.250	2.625	2.625	5.625
	3	1 3/8	1.125	3.250	1.313	0.750	1/2-13	2.760	1.868	1.500	0.990	1.625	2.688	2.688	4.250	2.625	2.625	5.875
4	1	1	1.125	2.500	0.938	0.750	1/2-13	3.320	2.243	2.063	0.865	1.375	2.438	2.438	4.250	2.625	2.625	5.625
	3	1 3/8	1.125	3.250	1.313	0.750	1/2-13	3.320	2.243	2.063	0.990	1.625	2.688	2.688	4.250	2.625	2.625	5.875
5	1	1	1.219	2.500	0.938	0.938	5/8-11	4.100	2.743	2.688	0.865	1.375	2.438	2.438	4.500	2.875	2.875	5.875
	3	1 3/8	1.219	3.250	1.313	0.938	5/8-11	4.100	2.743	2.688	0.990	1.625	2.688	2.688	4.500	2.875	2.875	6.125

4MA Rod End Dimensions – 1 1/2" to 5" Bore Size

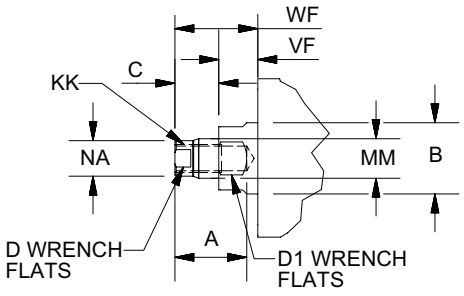
Thread Style 4
(NFPA Style SM)
Small Male



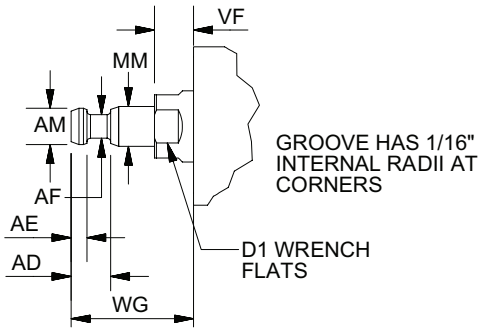
Thread Style 8
(NFPA Style IM)
Intermediate Male



Thread Style 9
(NFPA Style SF)
Short Female



Thread Style 55
For use with Split Coupler
(see page 103 for more information)



Rod End Dimensions

Bore Size	Rod No.	Rod Dia. MM	Thread Style 8 CC	Thread Style 4 & 9 KK	A	AD	AE	AF	AM	+.000 -.002 B	C	D	D1	LAF	NA	VF	WF	WG
1 1/2	1	5/8	1/2-20	7/16-20	0.750	0.625	0.250	0.375	0.570	1.124	0.385	1/2	1	1.750	0.563	0.615	1.000	1.750
	2	1	7/8-14	3/4-16	1.125	0.938	0.375	0.688	0.950	1.499	0.510	7/8	1-3/8	2.500	0.938	0.865	1.375	2.375
2	1	5/8	1/2-20	7/16-20	0.750	0.625	0.250	0.375	0.570	1.124	0.385	1/2	1	1.750	0.563	0.615	1.000	1.750
	3	1	7/8-14	3/4-16	1.125	0.938	0.375	0.688	0.950	1.499	0.510	7/8	1-3/8	2.500	0.938	0.865	1.375	2.375
2 1/2	1	5/8	1/2-20	7/16-20	0.750	0.625	0.250	0.375	0.570	1.124	0.385	1/2	1	1.750	0.563	0.615	1.000	1.750
	3	1	7/8-14	3/4-16	1.125	0.938	0.375	0.688	0.950	1.499	0.510	7/8	1-3/8	2.500	0.938	0.865	1.375	2.375
3 1/4	1	1	7/8-14	3/4-16	1.125	0.938	0.375	0.688	0.950	1.499	0.510	7/8	1-3/8	2.500	0.938	0.865	1.375	2.375
	3	1 3/8	1-1/4 - 12	1-14	1.625	1.063	0.375	0.875	1.320	1.999	0.635	1-1/8	1-7/8	3.250	1.313	0.990	1.625	2.750
4	1	1	7/8-14	3/4-16	1.125	0.938	0.375	0.688	0.950	1.499	0.510	7/8	1-3/8	2.500	0.938	0.865	1.375	2.375
	3	1 3/8	1-1/4 - 12	1-14	1.625	1.063	0.375	0.875	1.320	1.999	0.635	1-1/8	1-7/8	3.250	1.313	0.990	1.625	2.750
5	1	1	7/8-14	3/4-16	1.125	0.938	0.375	0.688	0.950	1.499	0.510	7/8	1-3/8	2.500	0.938	0.865	1.375	2.375
	3	1 3/8	1-1/4 - 12	1-14	1.625	1.063	0.375	0.875	1.320	1.999	0.635	1-1/8	1-7/8	3.250	1.313	0.990	1.625	2.750

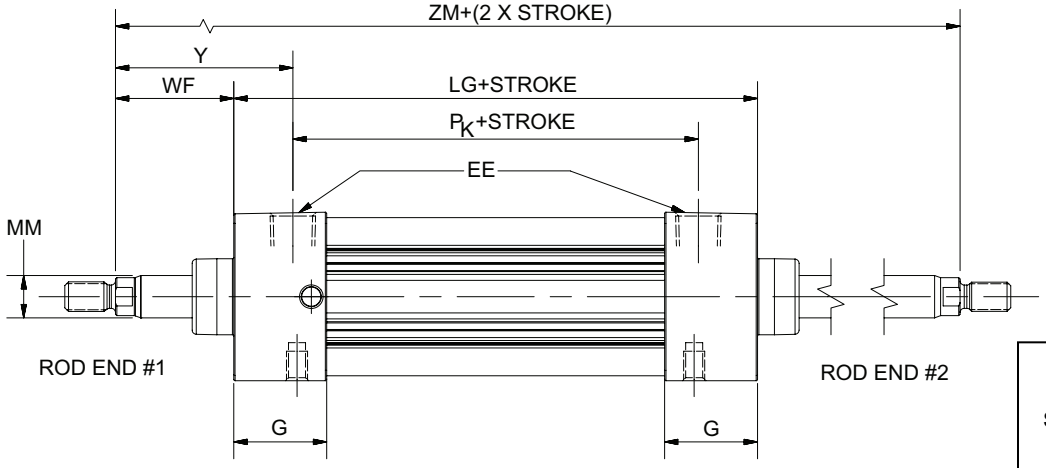
Thread Style 3 - "Special Thread"

Special threads, rod extensions, rod eyes, blanks, etc. are also available.
To order, specify "Style 3" and give desired dimensions for KK or CC, A and W or WF.
If otherwise special, please supply dimensioned sketch.

To determine dimensions for a double rod end cylinder, first refer to the desired single rod end mounting style cylinder shown in this catalog section. After selecting the necessary dimensions from that drawing, return to this page and supplement the single rod end dimensions with those shown in the drawings and dimension table below. Note that double rod end cylinders have a head dimension (G) at both ends, and that LG replaces LF, P_K replaces P, etc. The double rod end dimensions differ from, or are in addition to, those for single rod cylinders.

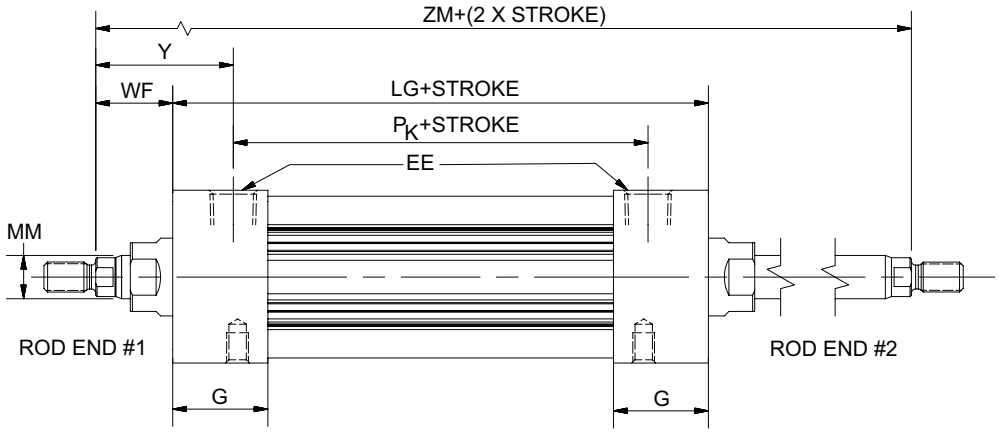
When a double rod end cylinder has two different rod ends, please clearly state which rod end is to be available at which head end.

K-type for 3MA 1 1/2" to 5" Bore



Mounting Styles for Single Rod Models	Corresponding Mounting Styles for Double Rod Models
C	KC
CB	KCB
D	KD
DD	KDD
F	KF
G	KG
J	KJ
NB	KNB
T	KT
TB	KTB
TD	KTD
TE	KTE
TEF	KTEF

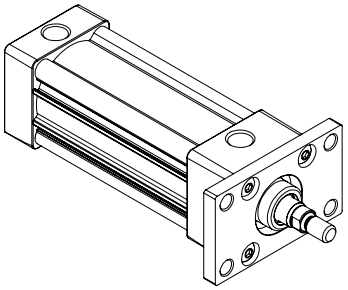
K-type for 4MA 1 1/2" to 5" Bore

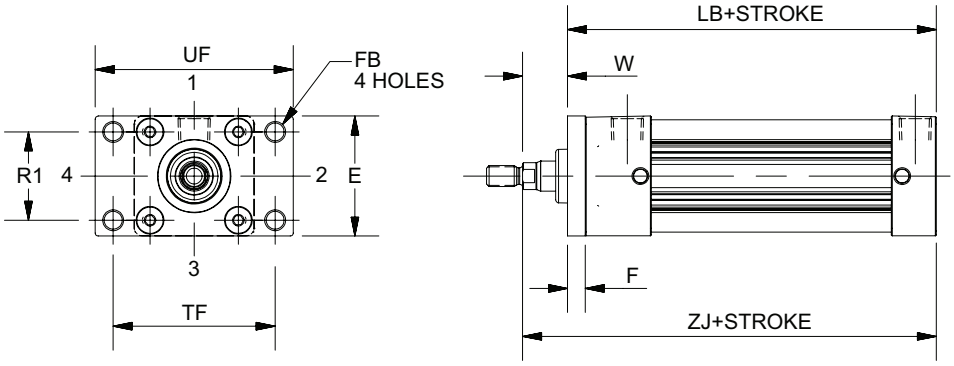


Cylinder Dimensions – K-type

Bore Size	Rod No.	Rod Dia. MM	EE (NPTF)	G	WF	Y	Add Stroke								Add 2X Stroke
							LG	P_K	SA_K	XA_K	SS_K	SN_K	SE_K	XE_K	ZM
1 1/2	1	5/8	3/8	1.438	1.000	1.875	4.125	2.375	6.125	6.125	3.375	2.250	6.375	6.250	6.125
	2	1	3/8	1.438	1.375	2.250	4.125	2.375	6.500	6.500	3.375	-	6.375	6.625	5.760
2	1	5/8	3/8	1.438	1.000	1.875	4.125	2.375	6.125	6.125	3.375	2.250	6.750	6.438	6.125
	3	1	3/8	1.438	1.375	2.250	4.125	2.375	6.125	6.500	3.375	2.250	6.750	6.813	6.875
2 1/2	1	5/8	3/8	1.438	1.000	1.938	4.250	2.375	6.250	6.250	3.500	2.375	7.125	6.688	6.250
	3	1	3/8	1.438	1.375	2.313	4.250	2.375	6.250	6.625	3.500	2.375	7.125	7.063	7.000
3 1/4	1	1	1/2	1.688	1.375	2.438	4.750	2.625	7.250	7.375	3.750	2.625	7.750	7.625	7.500
	3	1 3/8	1/2	1.688	1.625	2.688	4.750	2.625	7.250	7.625	3.750	2.625	7.750	7.875	8.000
4	1	1	1/2	1.688	1.375	2.438	4.750	2.625	7.250	7.375	3.750	2.625	8.000	7.750	7.500
	3	1 3/8	1/2	1.688	1.625	2.688	4.750	2.625	7.250	7.625	3.750	2.625	8.000	8.000	8.000
5	1	1	1/2	1.660	1.375	2.438	4.938	2.813	7.688	7.688	3.563	2.813	-	-	7.688
	3	1 3/8	1/2	1.660	1.625	2.688	4.938	2.813	7.688	7.938	3.563	2.813	-	-	8.188
						Replaces Dimension	LF	P	SA	XA	SS	SN	SE	XE	-
						On Single Rod Mounting Styles	All Styles		CB		C	TEF, F	G		All

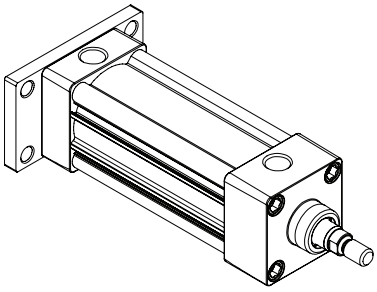
Head Rectangular Flange
Style J
(NFPA MF1)

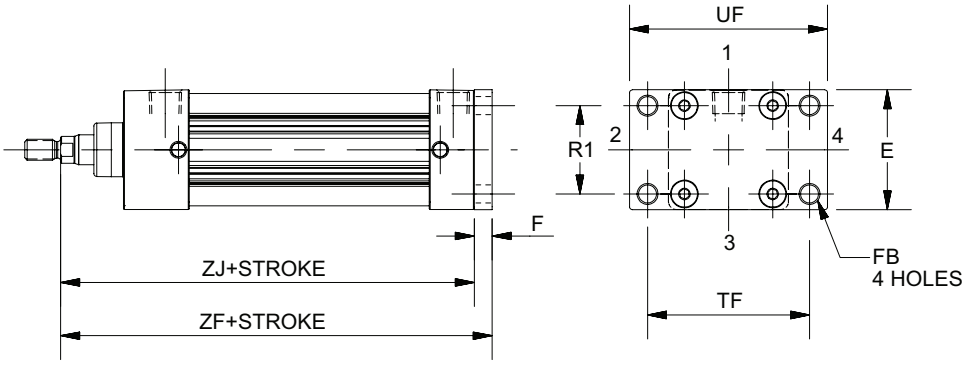




Note: Style J has a "W" dimension instead of "WF" because of the flange installation. For reference, WF = W + F

Cap Rectangular Flange
Style H
(NFPA MF2)

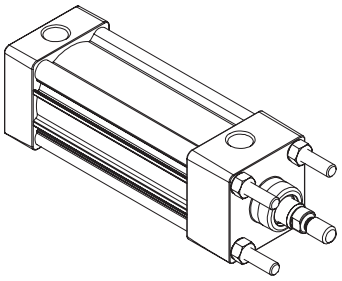


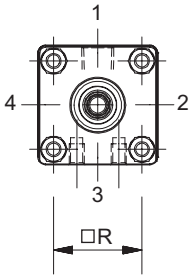


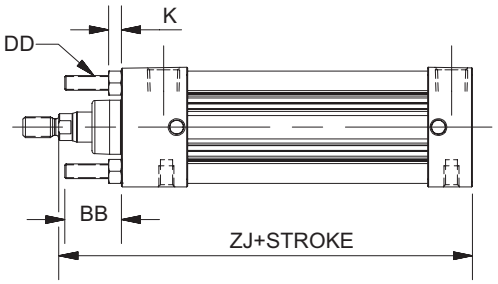
Cylinder Dimensions – Styles J and H

Bore Size	Rod No.	Rod Dia. MM	E	F	FB	R1	TF	UF	W	Add Stroke LB	Add Stroke ZF	Add Stroke ZJ
1 1/2	1	5/8	2.000	0.375	0.313	1.430	2.750	3.375	0.625	4.000	5.000	4.625
	2	1	2.000	0.375	0.313	1.430	2.750	3.375	1.000	4.000	5.375	5.000
2	1	5/8	2.500	0.375	0.375	1.840	3.375	4.125	0.625	4.000	5.000	4.625
	3	1	2.500	0.375	0.375	1.840	3.375	4.125	1.000	4.000	5.375	5.000
2 1/2	1	5/8	3.000	0.375	0.375	2.190	3.875	4.625	0.625	4.125	5.125	4.750
	3	1	3.000	0.375	0.375	2.190	3.875	4.625	1.000	4.125	5.500	5.125
3 1/4	1	1	3.750	0.625	0.438	2.760	4.688	5.500	0.750	4.875	6.250	5.625
	3	1 3/8	3.750	0.625	0.438	2.760	4.688	5.500	1.000	4.875	6.500	5.875
4	1	1	4.500	0.625	0.438	3.320	5.438	6.250	0.750	4.875	6.250	5.625
	3	1 3/8	4.500	0.625	0.438	3.320	5.438	6.250	1.000	4.875	6.500	5.875
5	1	1	5.500	0.625	0.563	4.100	6.625	7.625	0.750	5.125	6.500	5.875
	3	1 3/8	5.500	0.625	0.563	4.100	6.625	7.625	1.000	5.125	6.750	6.125

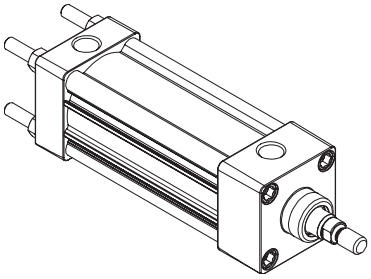
Tie Rods Ext. Head End
Style TB
(NFPA MX3)

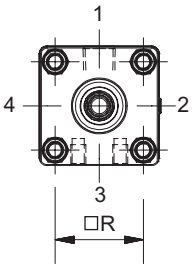


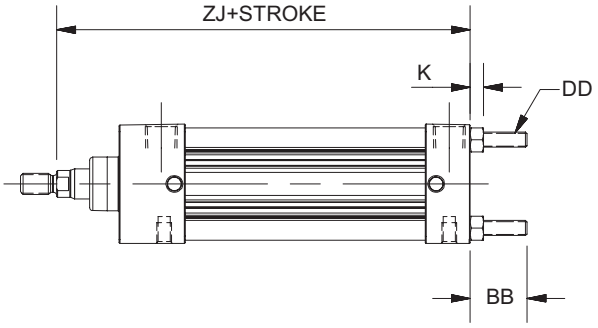




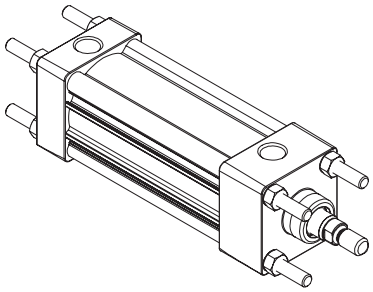
Tie Rods Ext. Cap End
Style TC
(NFPA MX2)

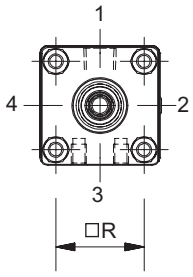


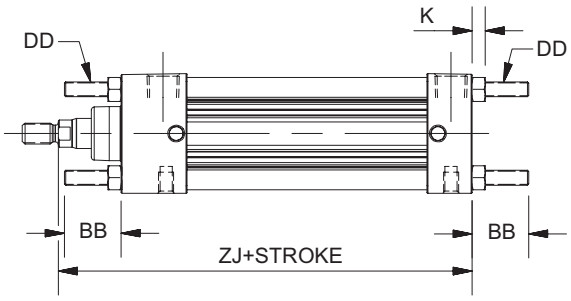




Tie Rods Ext. Both Ends
Style TD
(NFPA MX1)



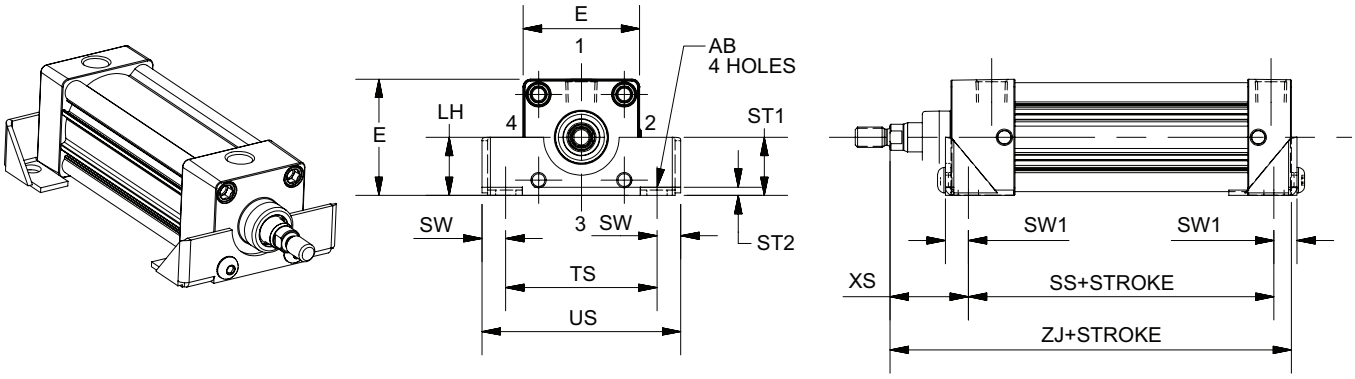




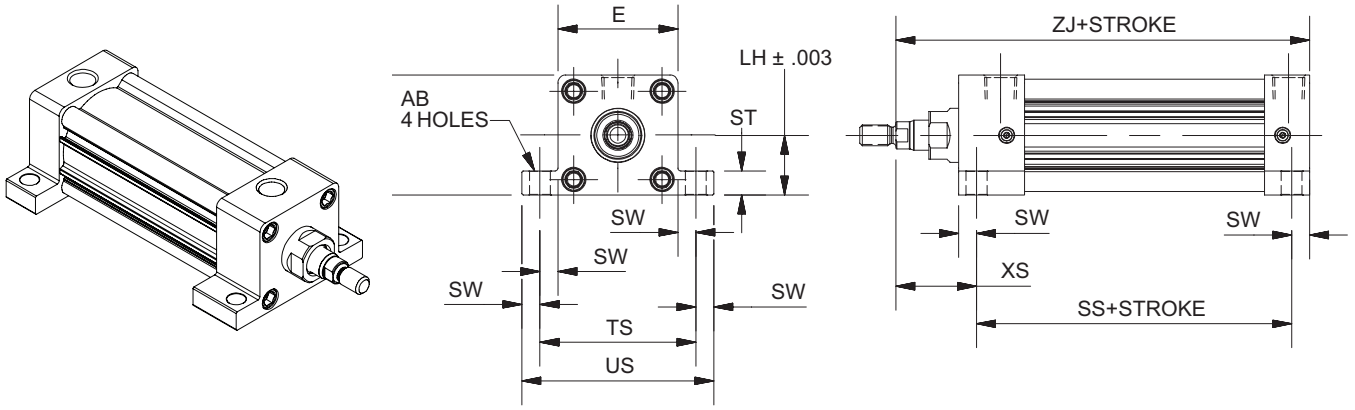
Cylinder Dimensions – Styles TB, TC and TD

Bore Size	Rod No.	Rod Dia. MM	BB	DD	E	K	R	Add Stroke ZJ
1 1/2	1	5/8	1.000	1/4-28	2.000	0.250	1.430	4.625
	2	1	1.000	1/4-28	2.000	0.250	1.430	5.000
2	1	5/8	1.125	5/16-24	2.500	0.313	1.840	4.625
	3	1	1.125	5/16-24	2.500	0.313	1.840	5.000
2 1/2	1	5/8	1.125	5/16-24	3.000	0.313	2.190	4.750
	3	1	1.125	5/16-24	3.000	0.313	2.190	5.125
3 1/4	1	1	1.375	3/8-24	3.750	0.375	2.760	5.625
	3	1 3/8	1.375	3/8-24	3.750	0.375	2.760	5.875
4	1	1	1.375	3/8-24	4.500	0.375	3.320	5.625
	3	1 3/8	1.375	3/8-24	4.500	0.375	3.320	5.875
5	1	1	1.813	1/2-20	5.500	0.438	4.100	5.875
	3	1 3/8	1.813	1/2-20	5.500	0.438	4.100	6.125

Side Lug
Style C for 3MA
(NFPA MS2)



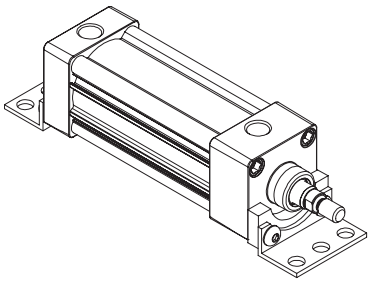
Side Lug
Style C for 4MA/4ML
(NFPA MS2)

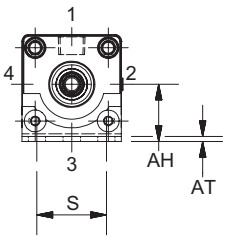


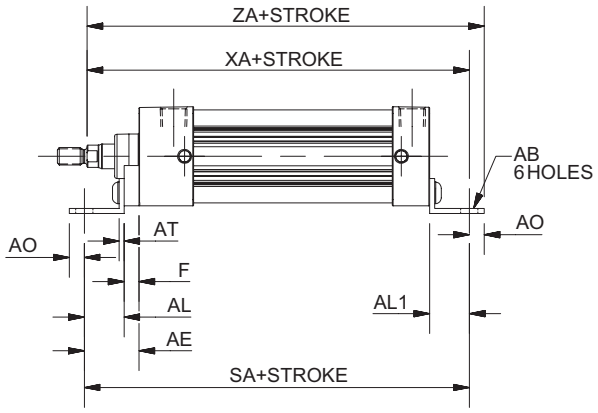
Cylinder Dimensions – Style C

Bore Size	Rod No.	Rod Dia. MM	AB	E	LH	ST	ST1	ST2	SW	SW1	TS	US	XS	Add Stroke SS	Add Stroke ZJ
1 1/2	1	5/8	0.438	2.000	0.993	0.500	1.000	0.120	0.375	0.495	2.750	3.500	1.375	2.875	4.625
	2	1	0.438	2.000	0.993	0.500	1.000	0.120	0.375	0.495	2.750	3.500	1.750	2.875	5.000
2	1	5/8	0.438	2.500	1.243	0.500	1.250	0.120	0.375	0.495	3.250	4.000	1.375	2.875	4.625
	3	1	0.438	2.500	1.243	0.500	1.250	0.120	0.375	0.495	3.250	4.000	1.750	2.875	5.000
2 1/2	1	5/8	0.438	3.000	1.493	0.500	1.343	0.120	0.375	0.495	3.750	4.500	1.375	3.000	4.750
	3	1	0.438	3.000	1.493	0.500	1.343	0.120	0.375	0.495	3.750	4.500	1.750	3.000	5.125
3 1/4	1	1	0.563	3.750	1.868	0.750	1.500	0.188	0.500	0.688	4.750	5.750	1.875	3.250	5.625
	3	1 3/8	0.563	3.750	1.868	0.750	1.500	0.188	0.500	0.688	4.750	5.750	2.125	3.250	5.875
4	1	1	0.563	4.500	2.243	0.750	1.500	0.188	0.500	0.688	5.500	6.500	1.875	3.250	5.625
	3	1 3/8	0.563	4.500	2.243	0.750	1.500	0.188	0.500	0.688	5.500	6.500	2.125	3.250	5.875
5	1	1	0.813	5.500	2.743	1.000	1.500	0.250	0.688	0.938	6.875	8.250	2.063	3.125	5.875
	3	1 3/8	0.813	5.500	2.743	1.000	1.500	0.250	0.688	0.938	6.875	8.250	2.313	3.125	6.125

Side End Angle*
Style CB
(NFPA MS1)







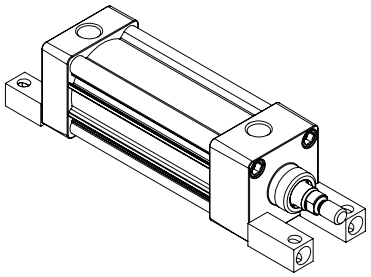
NOTE: DIM "S" IS FOR THE HOLES IN THE MOUNT
(NOT THE SCREW TO SCREW DIM)

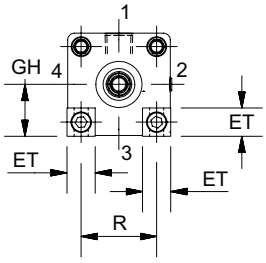
*Maximum recommended pressure for this mount is 150 PSIG

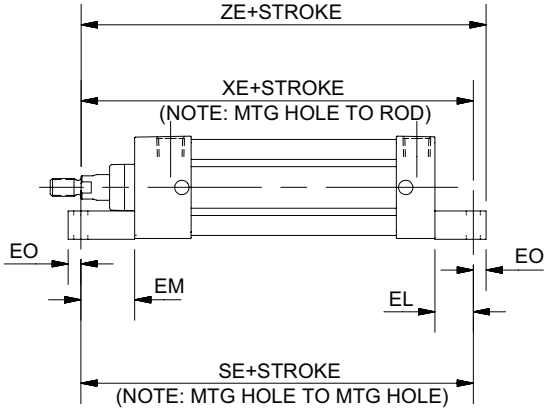
Cylinder Dimensions – Style CB

Bore Size	Rod No.	Rod Dia. MM	AB	AE	AH	AL	AL1	AO	AT	E	F	S	Add Stroke SA	XA	ZA
1 1/2	1	5/8	0.438	1.375	1.188	1.000	1.000	0.375	0.125	2.000	0.375	1.250	6.000	5.625	6.000
	2	1	0.438	1.375	1.188	1.000	1.000	0.375	0.125	2.000	0.375	1.250	6.000	6.000	6.375
2	1	5/8	0.438	1.375	1.438	1.000	1.000	0.375	0.125	2.500	0.375	1.750	6.000	5.625	6.000
	3	1	0.438	1.375	1.438	1.000	1.000	0.375	0.125	2.500	0.375	1.750	6.000	6.000	6.375
2 1/2	1	5/8	0.438	1.375	1.625	1.000	1.000	0.375	0.125	3.000	0.375	2.250	6.125	5.750	6.125
	3	1	0.438	1.375	1.625	1.000	1.000	0.375	0.125	3.000	0.375	2.250	6.125	6.125	6.500
3 1/4	1	1	0.563	1.875	1.938	1.250	1.250	0.500	0.125	3.750	0.625	2.750	7.375	6.875	7.375
	3	1 3/8	0.563	1.875	1.938	1.250	1.250	0.500	0.125	3.750	0.625	2.750	7.375	7.125	7.625
4	1	1	0.563	-	2.250	1.875	1.250	0.500	0.125	4.500	-	3.500	7.375	6.875	7.375
	3	1 3/8	0.563	-	2.250	1.875	1.250	0.500	0.125	4.500	-	3.500	7.375	7.125	7.625
5	1	1	0.688	2.000	2.750	1.375	-	0.625	0.188	5.500	0.625	4.250	7.875	7.250	7.875
	3	1 3/8	0.688	2.000	2.750	1.375	-	0.625	0.188	5.500	0.625	4.250	7.875	7.500	8.125

Side End Lug
Style G
(NFPA MS7)



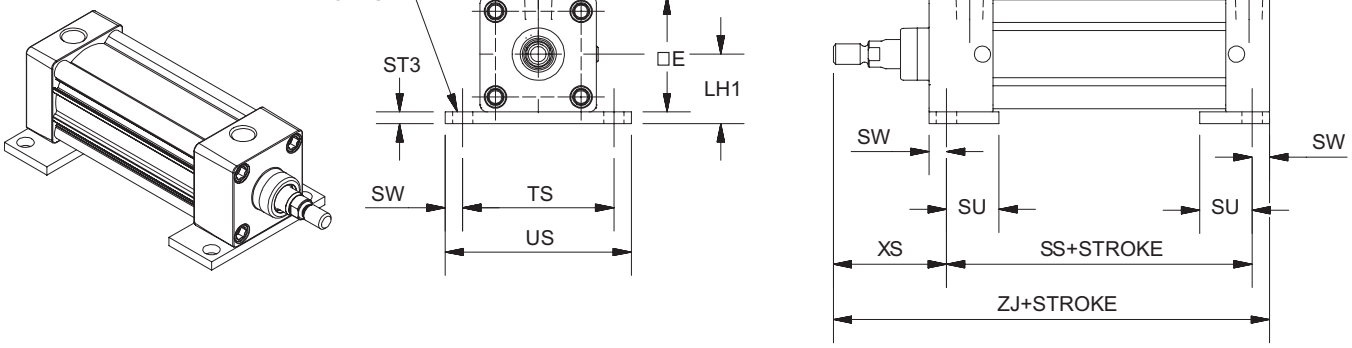




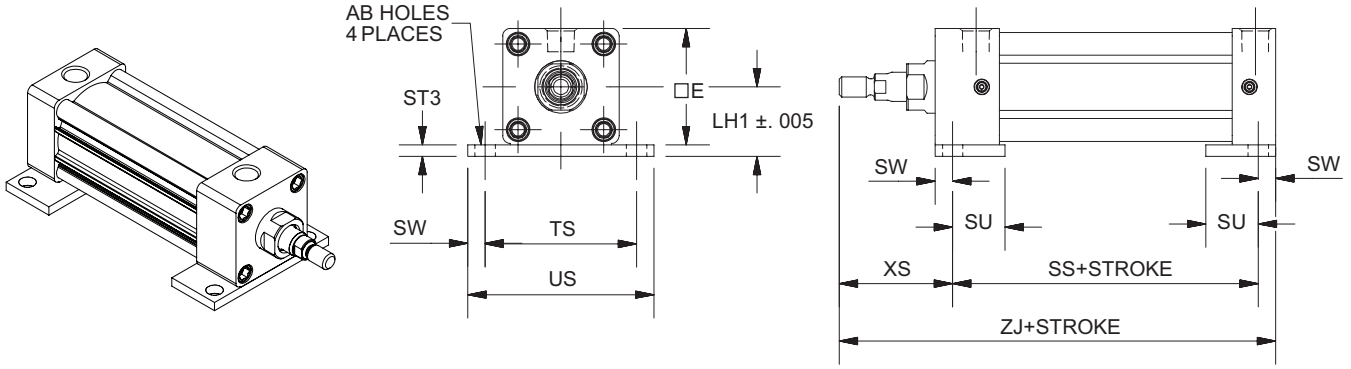
Cylinder Dimensions – Style G

Bore Size	Rod No.	Rod Dia. MM	E	EB	EL	EM	EO	ET	GH	R	Add Stroke SE	XE	ZE
1 1/2	1	5/8	2.000	0.281	0.750	1.125	0.250	0.563	0.993	1.430	5.500	5.375	5.625
	2	1	-	-	-	-	-	-	-	-	-	-	-
2	1	5/8	2.500	0.344	0.938	1.313	0.313	0.688	1.243	1.840	5.875	5.563	5.875
	3	1	2.500	0.344	0.938	1.313	0.313	0.688	1.243	1.840	5.875	5.938	6.250
2 1/2	1	5/8	3.000	0.344	1.063	1.438	0.313	0.813	1.493	2.190	6.250	5.813	6.125
	3	1	3.000	0.344	1.063	1.438	0.313	0.813	1.493	2.190	6.250	6.188	6.500
3 1/4	1	1	3.750	0.406	0.875	1.500	0.375	1.000	1.868	2.760	6.625	6.500	6.875
	3	1 3/8	3.750	0.406	0.875	1.500	0.375	1.000	1.868	2.760	6.625	6.750	7.125
4	1	1	4.500	0.406	1.000	1.625	0.375	1.188	2.243	3.320	6.875	6.625	7.000
	3	1 3/8	4.500	0.406	1.000	1.625	0.375	1.188	2.243	3.320	6.875	6.875	7.250

Base Bar Mount
Style NB for 3MA



Base Bar Mount
Style NB for 4MA

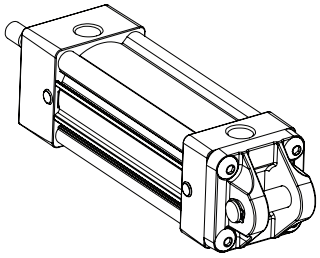


Note: Fasteners for NB base bar mount have been applied with removable threadlocking compound and torqued to bottom of endcaps.

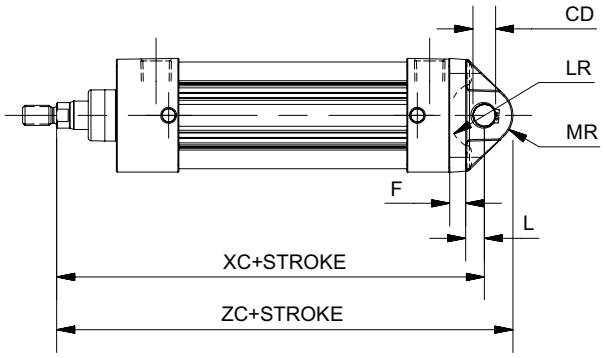
Cylinder Dimensions – Style NB

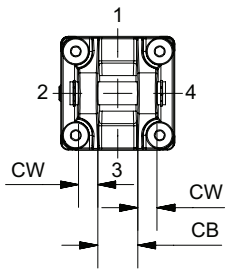
Bore Size	Rod No.	Rod Dia. MM	AB	E	LH1	ST3	SU	SW	TS	US	XS	Add Stroke SS	Add Stroke ZJ
1 1/2	1	5/8	0.438	2.000	1.243	0.250	1.125	0.375	2.750	3.500	1.375	2.875	4.625
	2	1	-	-	-	-	-	-	-	-	-	-	-
2	1	5/8	0.438	2.500	1.493	0.250	1.125	0.375	3.250	4.000	1.375	2.875	4.625
	3	1	0.438	2.500	1.493	0.250	1.125	0.375	3.250	4.000	1.750	2.875	5.000
2 1/2	1	5/8	0.438	3.000	1.868	0.375	1.125	0.375	3.750	4.500	1.375	3.000	4.750
	3	1	0.438	3.000	1.868	0.375	1.125	0.375	3.750	4.500	1.750	3.000	5.125
3 1/4	1	1	0.563	3.750	2.368	0.500	1.250	0.500	4.750	5.750	1.875	3.250	5.625
	3	1 3/8	0.563	3.750	2.368	0.500	1.250	0.500	4.750	5.750	2.125	3.250	5.875
4	1	1	0.563	4.500	2.743	0.500	1.250	0.500	5.500	6.500	1.875	3.250	5.625
	3	1 3/8	0.563	4.500	2.743	0.500	1.250	0.500	5.500	6.500	2.125	3.250	5.875

Cap Fixed Clevis*
Style BB
(NFPA MP1)

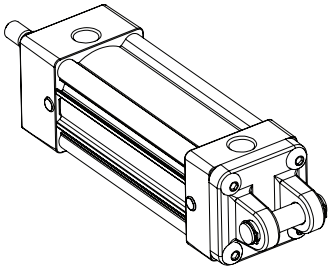


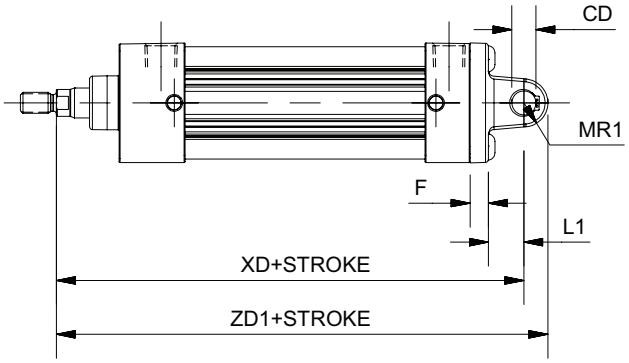
Note: For maximum swivel angle of BB mount with rear mounting plate, see Cylinder Accessories on page 106.

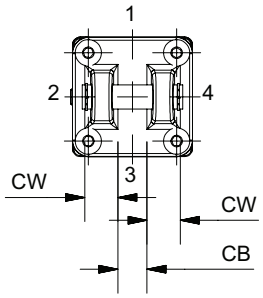




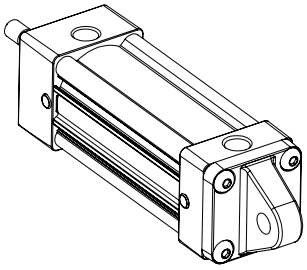
Cap Detachable Clevis
Style BC
(NFPA MP2)

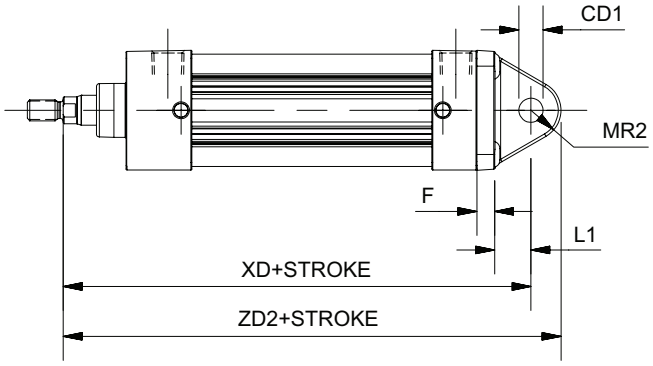


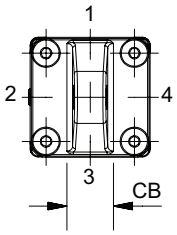




Cap Detachable Eye*
Style BE
(NFPA MP4)





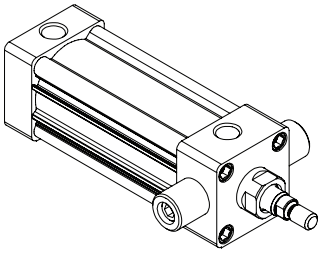


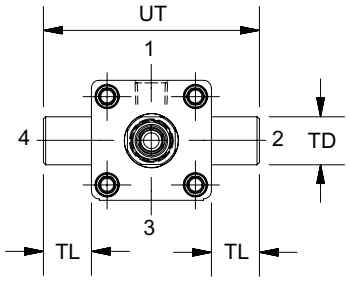
*Not available for 5" bore 3MA, please specify 4MA

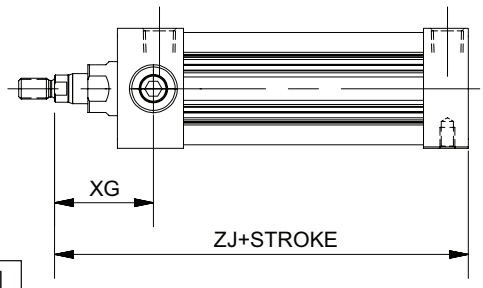
Cylinder Dimensions – Styles BB, BC and BE

Bore Size	Rod No.	Rod Dia. MM	CB	+.000 -.002 CD	+.002 +.004 CD1	CW	E	F	L	LR	L1	MR	MR1	MR2	Add Stroke XC	XD	ZC	ZD1	ZD2
1 1/2	1	5/8	0.750	0.501	0.500	0.500	2.000	0.375	0.375	0.750	0.750	0.625	0.500	0.625	5.375	5.750	6.000	6.250	6.375
	2	1	0.750	0.501	0.500	0.500	2.000	0.375	0.375	0.750	0.750	0.625	0.500	0.625	5.750	6.125	6.375	6.625	6.750
2	1	5/8	0.750	0.501	0.500	0.500	2.500	0.375	0.375	0.750	0.750	0.625	0.500	0.625	5.375	5.750	6.000	6.250	6.375
	3	1	0.750	0.501	0.500	0.500	2.500	0.375	0.375	0.750	0.750	0.625	0.500	0.625	5.750	6.125	6.375	6.625	6.750
2 1/2	1	5/8	0.750	0.501	0.500	0.500	3.000	0.375	0.375	0.750	0.750	0.625	0.500	0.688	5.500	5.875	6.125	6.375	6.563
	3	1	0.750	0.501	0.500	0.500	3.000	0.375	0.375	0.750	0.750	0.625	0.500	0.688	5.875	6.250	6.500	6.750	6.313
3 1/4	1	1	1.250	0.751	0.750	0.625	3.750	0.625	0.625	1.000	1.250	0.938	0.750	0.875	6.875	7.500	7.813	8.250	8.375
	3	1 3/8	1.250	0.751	0.750	0.625	3.750	0.625	0.625	1.000	1.250	0.938	0.750	0.875	7.125	7.750	8.063	8.500	8.625
4	1	1	1.250	0.751	0.750	0.625	4.500	0.625	0.625	1.000	1.250	0.938	0.750	0.875	6.875	7.500	7.813	8.250	8.375
	3	1 3/8	1.250	0.751	0.750	0.625	4.500	0.625	0.625	1.000	1.250	0.938	0.750	0.875	7.125	7.750	8.063	8.500	8.625
5	1	1	1.250	0.751	0.750	0.625	5.500	0.625	0.625	1.000	1.250	0.938	0.750	0.875	7.125	7.750	8.063	8.500	8.625
	3	1 3/8	1.250	0.751	0.750	0.625	5.500	0.625	0.625	1.000	1.250	0.938	0.750	0.875	7.375	8.000	8.313	8.750	8.875

Head Trunnion*
Style D (only for 4MA/4ML)
(NFPA MT1)

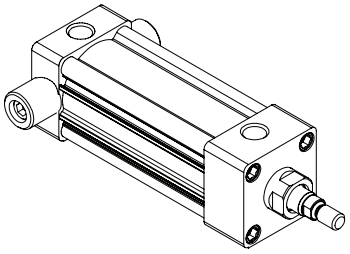


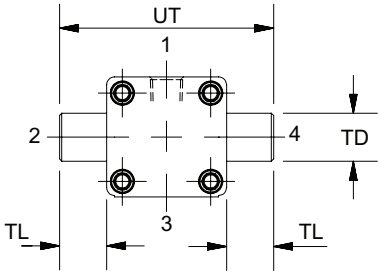


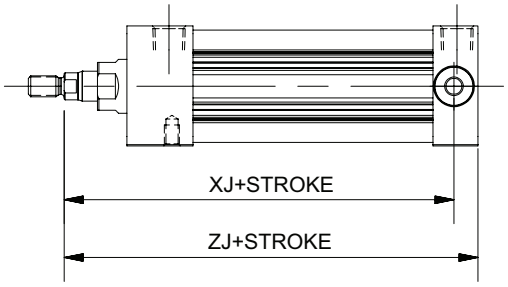


*Not available for 1-1/2" bore with 1" rod

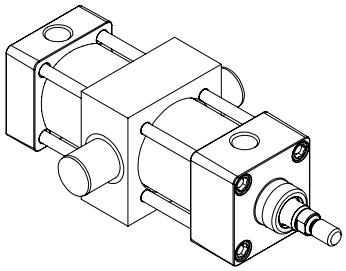
Cap Trunnion
Style DB (only for 4MA/4ML)
(NFPA MT2)

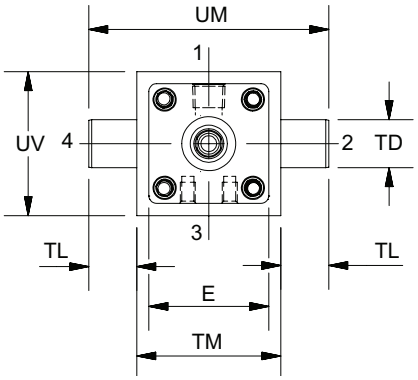


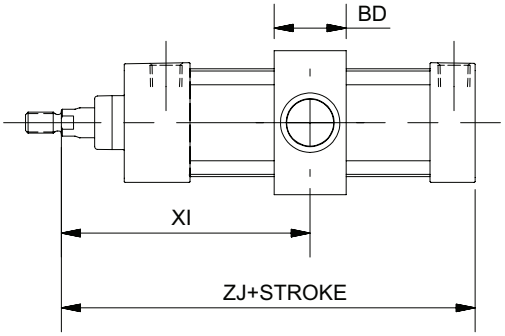




Intermediate Trunnion
Style DD
(NFPA MT4)







Cylinder Dimensions – Styles D, DB and D

Note: Tie rod nuts for Style DD have a slot instead of internal hex.

Bore Size	Rod No.	Rod Dia. MM	E	BD	+.000 -.001 TD	TL	TM	UM	UT	UV	XG	Min. XI	Add Stroke XJ	Add Stroke ZJ
1 1/2	1	5/8	2.000	1.250	1.000	1.000	2.500	4.500	4.000	2.500	1.750	3.125	4.125	4.625
	2	1	2.000	1.250	1.000	1.000	2.500	4.500	4.000	2.500	-	3.500	4.250	5.000
2	1	5/8	2.500	1.500	1.000	1.000	3.000	5.000	4.500	3.000	1.750	3.250	4.125	4.625
	3	1	2.500	1.500	1.000	1.000	3.000	5.000	4.500	3.000	2.125	3.625	4.500	5.000
2 1/2	1	5/8	3.000	1.500	1.000	1.000	3.500	5.500	5.000	3.500	1.750	3.250	4.250	4.750
	3	1	3.000	1.500	1.000	1.000	3.500	5.500	5.000	3.500	2.125	3.625	4.625	5.125
3 1/4	1	1	3.750	2.000	1.000	1.000	4.500	6.500	5.750	4.250	2.250	4.125	5.000	5.625
	3	1 3/8	3.750	2.000	1.000	1.000	4.500	6.500	5.750	4.250	2.500	4.375	5.250	5.875
4	1	1	4.500	2.000	1.000	1.000	5.250	7.250	6.500	5.000	2.250	4.125	5.000	5.625
	3	1 3/8	4.500	2.000	1.000	1.000	5.250	7.250	6.500	5.000	2.500	4.375	5.250	5.875
5	1	1	5.500	2.000	1.000	1.000	6.250	8.250	7.500	6.000	2.250	4.063	5.250	5.875
	3	1 3/8	5.500	2.000	1.000	1.000	6.250	8.250	7.500	6.000	2.500	4.313	5.500	6.125